Evaluation of ERP Post-Implementation Critical Success Factors

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by

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Abstract

**Background:** Enterprise Resource Planning (ERP) system has emerged as a dominant IT solution for management of dispersed information across organisations. Nonetheless, the full benefits of an ERP system cannot be attained unless all steps of the ERP project life cycle are conducted properly. Although ERP post-implementation phase has determining role in the success of ERP projects, it is not studied adequately by existing literature.

**Aims:** The aim of this study is acquiring a correct understanding of the critical factors contributing to the success of ERP post-implementation step. Therefore, the study analyses the given subject from both the theoretical and empirical perspectives in order to develop a comprehensive classification of ERP post-implementation critical success factors (CSFs).

**Methods:** The research is conducted based on qualitative and inductive methods. The data are collected through the analysis of relevant literature and four ERP cases from various industries. Despite the fact that the findings of literature review do not directly provide an inclusive list of post-implementation CSFs, they help to generate an initial set of post-implementation CSFs used as a basis of empirical studies. Moreover, the qualitative content analysis method and thematic approach are used for research analysis. On the grounds that this study is based on inductive approach, the comparison of different cases’ evidences and literature findings contribute to developing an extended classification of post-implementation CSFs.

**Results:** The research outcome determines 17 factors influencing the success of ERP post-implementation. These factors are categorized into 5 main themes including strategic, managerial, technical, operational, and external systems’ factors. The combination of these CSFs can differ according to varied projects’ specifications.
**Conclusions:** In conclusion, a better comprehension of ERP post-implementation CSFs can gain through analysing the cases mainly focusing on this stage of ERP projects. Furthermore, this study recommends more investigation about diverse aspects of the ERP post-implementation concerning various industries, and countries requirements in order to eliminate the gap of knowledge in the given subject.
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Chapter 1: Introduction

1.1. Research Context

Enterprise Resource Planning (ERP) system has welcomed by many organisations due to providing competitive advantages for them in global market. Verville et al. (2007) defined ERP as packaged software integrating various business functions of an enterprise to facilitate the access of information throughout the organisation in a real time. In other words, ERP is pervasive software seeks to display a holistic prospect of the business from a unique information system through consolidating a broad range of the business processes (Al Mashari, 2003).

According to Ngai et al. (2008) ERP system enables an organisation to enhance business processes, performance, and decision making via automating a variety of business functions in an integrated long run system; besides, it diminishes the cost of services and productions through removing process flow redundancies. Hence, as Nah and Delgado (2006) stated the ERP system not only provides the best business practices but also assists corporations in better management of all resources and quicker decision making through improving the visibility of business information. Furthermore, the ability of ERP software to incorporate diverse sources of data into a single database, improving the accessibility of information from varied origins, in addition to its solution for Y2K bugs drives many organisations to replace their old systems with the ERP system.

However, the substantial impact of ERP project on numerous organisation’s functions and application programs increases the project complexity and the probability of its failure to meet the expectations and scheduled time and budget (Chian-Son, 2005). Therefore, studying the factors contributing to the success of ERP project across its entire lifecycle has significant importance. Moreover, regarding the critical role of ERP post-implementation actions like system support, maintenance, and upgrades in the achievement of ERP projects, the effectiveness of the post-implementation phase is notable for e-business accomplishment (Nicolaou, 2004a). That is, it is necessary for successful organisations to realise that
implementing the ERP system is not the final destination but they must continue the system improvement to attain the full values of the system (Chian-Son, 2005).

The investigation of literature indicates that despite the significance and popularity of the ERP post-implementation the major literature emphasises on ERP implementation and adoption subjects such as appropriate selection of ERP vendors and consultants, ERP and business fitness, ERP implementation critical success factors (CSFs), business process reengineering, and implementation methodologies (Law et al., 2010; Chian-Son, 2005). Up to the present, only limited number of literature discussed about the ERP post-implementation success. Besides, they did not have a comprehensive perspective to identify all factors influencing the post-implementation achievement (Zhu et al., 2010). Therefore, due to the existing gap of knowledge in ERP post-implementation success, it seems necessary to pore over the primary issues affecting the ERP project success in this stage.

1.2. Research Aims and Objectives

This study aims to investigate the ERP post-implementation issues in enterprises in order to identify the main success factors of ERP projects in this phase. Hence, defining the following objectives is helpful to achieve the given aim.

- In depth study of ERP concept, implementation lifecycles and strategies, post-implementation context, and the critical factors leading to ERP project success through reviewing the relevant literature.
- Developing a classification of ERP post-implementation CSFs inferred from the literature.
- Examination of various ERP system implementation cases focusing on the factors affecting the success or failure of post-implementation step.
- Developing a final set of well-structured categories of ERP post-implementation CSFs.
1.3. Research Structure

This study is divided into 6 chapters and structured as following.

- Chapter 1: The current chapter provides an introduction to the ERP system definition and benefits. Moreover, it discusses about the importance of studying the ERP post-implementation CSFs due to the high failure rate of ERP projects and paucity of knowledge in the given area. It follows by the research background, aims and objectives, and structure.
- Chapter 2: This chapter reviews the literature about the ERP concept, history, and system components. It also compares a variety of ERP implementation methodologies and approaches and explains different views of ERP post-implementation context and ERP upgrade projects’ stages. Afterwards, wide ranges of ERP project CSFs, derived from the literature, are described and a classification of post-implementation CSFs is developed. Finally, a summary of the chapter is presented.
- Chapter 3: the methodology chapter accounts for the approaches and methods used for conducting the research. Besides, it explains the overall steps of the study and different ways of collecting the data. Moreover, it describes the approaches and stages of the research analysis.
- Chapter 4: It examines four ERP cases through explaining each case’s background and determining the factors and themes affecting the accomplishment of ERP post-implementation for each project.
- Chapter 5: The cross case analysis and discussion chapter refines the major themes and factors and compares the similarities and differences of them across the cases with looking back to the literature. Furthermore, it represents a final set of ERP post-implementation classification.
- Chapter 6: The last chapter describes the implication of the study and the research achievements regarding its initial aims and objectives. Furthermore, it indicates the research limitations and the recommendations for future works.
Chapter 2: Literature Review

2.1 Introduction

ERP has been defined and discussed by numerous authors from various perspectives; however, their definitions of ERP do not have noteworthy differences. Bakry and Bakry (2005) defined ERP as a modular extendable system, automating and integrating the core and supporting business practices of an organisation to improve the enterprise efficiency. As Zhu et al. (2010) discussed, the majority of organisations believe ERP system can provide excessive advantages for them due to its capability to support almost entire business functions and integrate them into the single information system. Al Mashari (2003) classified the benefits of ERP system into five following categories.

- Operational benefits: the advantages provided by cost and processing time decrease together with quality, productivity, and customer satisfaction progress.
- Managerial benefits: the values gained through efficient planning, decision making and management of resources.
- Strategic benefits: the privileges associated to business progress, novelty, and consolidation.
- IT infrastructure benefits: the excellence provided by IT infrastructure ability, IT expenses decline, and business flexibility.
- Organisational benefits: the advantages acquired via establishing communal vision, organisational changes, and improvement business competency.

In addition, corporate motivators for ERP adoption are categorized into technological and operational classes. Technological motivators mostly refer to solving year 2000 (Y2K) bug, substitution of diverse systems, combination of business functions, replacement of outdated systems, and provision of more beneficial and accessible information. While Operational motivators are associated to business performance development, cost reduction, better customer services,

2.2 ERP Evolution and Components

The rudimentary type of ERP called ‘Inventory Control Packages’ formed in 1960 focusing on customary inventory practices. It, later, improved into ‘Material Requirements Planning’ (MRP), and then ‘Manufacturing Resource Planning’ (MRP II) which are used for manufacturing purposes and resource volumes. The current ERP system, which is emerged in the early 1990s, is more comprehensive and includes more business modules providing by prominent ERP vendors in the market such as SAP, Oracle (parent company of JD Edward and Peoplesoft), and SSA Baan. In fact, ERP is created due to the deficiency of MRP II in order management, production planning, inventory management, and growing need of more technical integrated solution (Bakry and Bakry, 2005; Al Mashari, 2003).

Davenport et al. (2004) remarked the early versions of ERP are designed for automating and consolidating of back office functions such as finance, human resources, and manufacturing. Nowadays, ERP system supports more business modules like performance management, supply chain management (SCM), product development, and business analysis. According to Marnewick and Labuschagne (2005), four major components including software, flow of processes, customer attitude, and change management constitute the current ERP systems. The first component of ERP is software including diverse modules represented in table1.

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance</td>
<td>All accounting and inventory concepts which have vital importance for all companies.</td>
</tr>
<tr>
<td>Human resources</td>
<td>All personnel administration procedures.</td>
</tr>
<tr>
<td>SCM</td>
<td>Product, information, and financial flows between supplier, company, distributors, and sellers.</td>
</tr>
<tr>
<td>Supplier relationship management (SRM)</td>
<td>All procurement collaborating processes among company and suppliers.</td>
</tr>
<tr>
<td>Customer relationship management (CRM)</td>
<td>A database storing customers’ information so that company can organize customer relationships and requirements.</td>
</tr>
<tr>
<td>Business intelligence (BI)</td>
<td>An effective tool for corporation knowledge management and decision making regarding the company’s crucial information.</td>
</tr>
</tbody>
</table>

Table1- ERP Software Modules (Marnewick and Labuschagne, 2005)
The process flow is another vital part of an ERP system; since, it identifies the flow of information among ERP modules. In fact, the flow of processes should be considered through designing or reengineering of the business processes. The third component is the customer mindset. Resistance against changes is so prevalent in organizations replacing their old working methods with a new system. This kind of attitude is usually modified through user training, organization culture change, and inducing strong engagement between internal and external participants of the ERP project. The last element of the ERP model is change management. Change management includes the management of changes in user patterns, project scope, business processes, and ERP system (Marnewick and Labuschagne, 2005).

2.3 ERP Implementation Methodology

The given functions of ERP must be implemented through an appropriate methodology providing a detailed guidance for ERP customers. There are various methodologies undertaken by different organisations. This study describes three types of ERP implementation methodology which are mostly cited by literature. Ross and Vitale (2000) discussed about five stages of ERP journey describing in below.

- Design: This stage involves decision making processes about adopting software package or customizing them which affects the system support and upgrade later. The second decision is related to the process standardisation scope determining whether the standardisation encompasses the whole organisation or merely the specific modules.
- Implementation: The implementation stage concerns all activities leading to system going live. In that “going live” is always along with significant organisational changes, organisations often concentrate on arranging a proper implementation team providing adequate user training on new processes and system as well as other implementation plans.
- Stabilisation: Stabilisation stage refers to the period in which data and processes cleansing, further user training specifically on work practices, and troubleshooting and fixing bugs are conducted. In many corporations the stabilisation phase is accompanied by a preliminary performance drop differing based on adopted implementation strategy and approach.
Continuous improvement: In this stage, companies mainly focus on system development through adding other modules and bolts-on to the system. Moreover, they commence process reengineering enabling them to use additional advantages of the system.

Transformation: Transformation implicates modifying the organisational borders and structure regarding the system to enhance organisational productivity.

As it can be concluded from the given methodology, it mainly focuses on the impacts of ERP system on corporations and the activities involved after the system implementation to gain more values from the new system rather than the actions required for pre-project and ERP implementation. Although the first two steps of this methodology are discussed about the activities leading to ERP implementation, it seems they do not cover all the essential operations which must be conducted during these stages.

Accelerated SAP (ASAP) is another ERP implementation methodology recommended by SAP and performed through the following phases.

- Project preparation: This phase involves the project establishment via organising the project team, acquainting them with ASAP, determining high level project scope and plan, and processing hardware orders.
- Business blueprint: The aim of this phase is analysing the current business operations and identifying new business functions. Furthermore, business process master list, which depicts the software transactional scope and adjusts the software with business practices, is defined during this phase.
- Realization: realization phase provides the technical basis of the system which completely fits with the corporate structure and supports nearly 80% of the processes. Designing the interfaces, data migration, and pilot testing of functions are major activities of this phase leading to a configured system called the “baseline system”.

- Final preparation: During this phase all the prior phases’ activities are integrated. Final preparation phase involves final tests of the system, complete data conversion, and user training.

- Go live, support and continuous change: following by going live, the system implementation review is conducted approving all business and technical aspects of the system. In addition, the concept of business processes enhancement and system improvement are pursued constantly (Ehie and Madsen, 2005; Gulledge and Simon, 2005).

In contrast to the first methodology, ASAP provides sufficient information of project preparation and implementation issues. On the other hand, it does not discuss about the actions required for the system stabilization and enhancement and merely indicates the general aims of this step. Figure 1 represents five stages of ASAP implementation methodology (Ehie and Madsen, 2005).
Figure 1 - Five Stages of ASAP Implementation Methodology (Ehie and Madsen, 2005)
Another ERP life cycle consists of four phases including chartering, project, shake down and onward & upward phases. Each steps of this lifecycle explains as follows.

- **Chartering phase**: This phase consists of creating a business case for adopting an ERP system, appointing ERP conducting committee, assessing and selecting vendor and consultant, and developing a project plan.
- **Project phase**: Project phase is a stage for system configuration, integration, testing, data conversion from the legacy system, user training, and launching the new system. In this stage, the close collaboration among internal and external project contributors is essential for project success.
- **Shake down phase**: This phase is once the system go-live takes place until the normal operation of the system is acquired. During this period, monitoring and adjusting the system performance, fixing the system bugs, and staff retraining is the main activities should be performed until the system becomes stable.
- **Onward and Upward phase**: The phase is related to further maintenance and development of processes and system until the upgraded or new system is substituted (Wei et al., 2005; Markus and Tanis, 2000).

The above ERP methodology seems to have more moderate attitude towards the different stages of an ERP project in comparison to the previous methodologies. On the other words, it explains each step of the ERP life cycle adequately and provides a better classification for the entire project life cycle.

All in all, last stages of all given methodologies indicate ERP Post-implementation issues and actions. Willis and Willis-Brown (2002) stated ERP projects divide into two waves. The first wave is related to building the project foundation, providing essential tools, and system implementation. This wave ends with system going live. The second wave, known as ERP post-implementation, encompasses all activities performed for organisation productivity, agility, and evolution carried out after system goes live. Thus, ERP post-implementation comprises system audit, all end-users retraining or training, dealing with on-going
business requirements, business processes reengineering, change management, maintenance, user support, and system upgrades (Law et al., 2010; Willis and Willis-Brown, 2002).

According to Nah and Delgado (2006), all steps of the latter methodology are applicable for ERP upgrade projects too. In fact, once the company discovers the requirement for system upgrade during onward and upward phase of the primary system implementation, the charting phase of upgrade project is started and decision about the version of next system is made. In project phase of the upgrade project, the requirement for effective system transformation into new one is determined. Then, the new system goes live which means the completion of the primary project life cycle and beginning the shake down phase of the upgrade project. The shake down phase continues until the new system becomes stable and the upgrade project enters to onward and upward phase. Figure 2 illustrates the relevance of the primary and upgrade projects’ phases.

![Figure 2- Phases of the Primary Implementation and Upgrade Projects (Nah and Delgado, 2006)](image)

2.4. ERP Implementation Approach

Notwithstanding the ERP methodologies, different implementation approaches can be adopted by organisations. Venkatesh (2008) described two traditional implementation approaches mainly focusing on timeframes perspective and known as big bang and phased approach. Big bang approach is a rapid implementation approach in which all functions of the system are implemented in a same time and then linked to the system. In contrast, in phased approach ERP
modules are implemented successively and connected to the main system one after each other. On the other hand, Parr and Shanks (2000) discussed about implementation approaches from more extensive perspective regarding various business characteristics and indicated three main categories: comprehensive, middle road, and vanilla.

Parr and Shanks (2000) stated the comprehensive approach is the riskiest one which is more appropriate for multi-site and multi-national organisations. Besides, in this approach all functions of an ERP system together with some business particular modules are implemented and then linked to the legacy system either in module by module way or conjointly. Hence, in such extensive projects the probability of business process reengineering (BPR) is higher and they often require high amount of budget, time, and other resources. On the other hand, the middle road approach can be applied for multiple sites or one expansive corporation interested in implementing a mixture of key modules. These kinds of projects need medium level of BPR, and resources. In contrast with comprehensive approach, vanilla approach is more proper for one-site company adopting merely core modules of ERP with the least BPR requirement in order to be in line with the ERP system. These projects often involve fewer users and require the minimum level of time, and cost.

Parr and Shanks (2000) pointed out these three approaches are designed according to different companies’ characteristics so that they select one which is more fitted with their features. These characteristics comprise physical scope, technical capability, BPR level, required resource, and module implementation strategy. Physical scope usually determines with respect to the number of sites involving in the project and their geographical distribution or the number of end users. Technical capability refers to the level of technical suitability of the selected software package with the certain business and industry and the amount of software customization. BPR level is related to the level of reengineering in company’s business processes which is nearly inevitable in most ERP projects. The changes in company’s operations can be conducted either through refining the existing processes of the company or abandoning them completely. Resources indicate the amount of required time and budget for performing the project. Finally, the module implementation strategy implies whether a corporation decides to implement each
module after another and integrate each one to the current system separately or first implement all functions and then incorporate them to the system.

Therefore, it can be inferred that two types of the traditional approaches merely concentrate on the implementation strategy characteristic of three latter groups of approaches.

2.5. ERP Project Critical Success Factors

Prosperity in ERP projects necessitates defining some critical success factors for each step of ERP implementation and monitoring them constantly. CSFs are some major fields that accomplishment in them guarantees the business goals achievement. These factors vary for diverse sectors, time, and managers; however, persistent consideration of management on these areas and careful monitoring of their performance is essential for all business thriving (Rockart and Bullen, 1981).

Variant literature defined different ERP implementation CSFs from diverse viewpoints overlapping with each other in some areas. Holland et al. (1999) assumed two categories for evaluating the CSFs of ERP implementation process: The strategic factors and the tactical factors. Each of the given categories encompasses various factors which are shown in Figure3.

![Figure3- A CSF Model for ERP Implementation (Holland et al., 1999)](image-url)
Al Mashari (2003) determined taxonomy of 12 CSFs based on the ideologies of business process management and considered a balanced perception of both organisational and technical requirements to measure the ERP benefits and success. The taxonomy represents the vital features of an ERP system and classifies them into three groups shown in Figure4.

Nah et al. (2001) analysed the CSFs of an ERP project regarding the impacts of them on each step of the ERP life cycle and classifies them as Figure5. Nah and Delgado (2006) adopted another viewpoint for investigating the CSFs. The aim of the investigation was generating an inclusive list of the CSFs emphasising on their importance in both concepts of ERP implementation and upgrades. The result of the given study was 7 main factors including: business plan and vision, team composition, system selection and technical implementation, change management, project management, communication, and top management commitment and championship. On the other hand, Umble et al. (2003) evaluated the issues affecting the software selection and ERP implementation. The evaluation outcome is a comprehensive list of 9 CSFs as following: comprehension of strategic objectives, upper management commitment, project management, knowledgeable implantation team, organisational change management, data accuracy, training, performance measurement, and multi-site issues.
2.6. ERP Post-implementation Critical Success Factors

Although post-implementation plays a significant role in the success of ERP system implementation and operation, the post-implementation success factors have not been sufficiently discussed by literature (Law et al., 2010). Nicolaou (2004b) stated ERP post-implementation success is severely influenced by the implementation process quality and its achievement to provide proper modifications and development which improve the system performance, project management, and system expansion processes. Therefore, it cannot be investigated without taking the earlier practices into consideration (Law et al., 2010). Based on the lack of adequate studies in ERP post-implementation CSFs, this study tries to identify these factors through analysing the common areas of given ERP implementation CSFs with post-implementation aims and activities excluding the mutual processes of ERP upgrade projects and primary system implementation. The analysis findings are discussed in following.

- **BPR:** On the grounds that the packaged software never completely matches with various industries and businesses, all organisations should
reengineer their processes in some degree instead of customizing the software. BPR enables a company to use all the advantages of an ERP system, which is basically developed as a tool for business practices enhancement. Besides, reengineering the business processes in the project phase and afterwards helps organisations to prevent the consequent errors of software customization and modification costs (Ngai et al., 2008; Al Mashari, 2003). In that constant business improvement and adding the system functionalities are one of the major steps of ERP post-implementation, redesigning the business processes after the system rollout has significant effect on the success of post-implementation. In fact, in many ERP projects some areas of the system functionalities are discovered after the system stabilisation and gaining sufficient knowledge of the system potentials. Therefore, effective reengineering of business practices is necessary for maximizing the values of the system (Willis and Willis-Brown, 2002).

- **Change Management:** Organisations must be capable to manage the inevitable changes in their structure, culture, processes, and policies as a result of implementing an ERP system. Effective management of changes has positive impact on ERP post-implementation success. It is apparent that replacing the old-style dispersed systems by an integrated system will bring several changes into a corporation like business process modification and power redistributions. Consequently, an enterprise must use the proper change management techniques like training all users and modifying regulations and procedures to counteract any resistance to changes occurring after the new system rollout. Furthermore, the company must be capable enough to manage the users’ change requests to stabilise the system operation after the implementation stage (Law et al., 2010; Zhu et al., 2010; Umble et al., 2003).

- **Communication:** Adopting the proper and effective communication policy has positive impact on all steps of ERP projects. Communication includes all relationships, stakeholder expectations, user feedbacks, and announcement of project progress within the organisation and external contributors. A successful ERP project actively involves IT staff,
consultants, vendors, directors, and users to work with each other across the project lifespan. Moreover, close communication among all external and internal groups of the project, during the post-implementation phase, facilitates the problems identifying and solving and ensures transferring the external knowledge of the system to the organisation and all parties’ commitment to the project (Law et al., 2010; Nah et al., 2001; Holland et al., 1999).

- **Data Accuracy:** Apart from the importance of data compatibility, data conversion, and identification of required data and their sources which must be managed throughout the earlier phases of an ERP project, data accuracy and availability are also crucial for proper performance of ERP system in post-implementation phase. In that, the integrated characteristic of ERP necessitates the accurate data entry, after the system rollout, to impede any mistake affecting the whole enterprise. Besides, the accessibility and availability of valid data is essential for the success of ERP post-implementation. With amended data, the ERP package can provide valid information supporting real-time, operational, and managerial decisions (Zhu et al., 2010; Ngai et al.; 2008; Umble et al., 2003).

- **ERP Team Composition:** A proper ERP team must be a combination of internal and external participants with both technical and business expertise. In order to provide appropriate functionalities, information must be shared in honest environment and incentives should be considered for team members according to project work load. Hence, selection of qualified members who are empowered enough to make rapid decisions is critical for success of all stages of an ERP project (Nah and Delgado, 2006; Nah et al., 2001).

- **Vendor, Consultant, and Trading Partner Support:** During ERP post-implementation, companies usually faces with problems that solely can be rectified by assistance of other organisations including ERP vendors, consultants, and trading partners. The evaluation criteria which should be examined for right vendor selection are vendor technical support, training capability, financial power, technical strength, and reputation. The
complication of ERP systems and on-going evolution of ERP packages necessitate a close connection between vendor and client for continuous upgrades, support, and maintenance of the software after the system implementation. Furthermore, ERP consultants play a prominent role in the post-implementation phase through proper knowledge transfer on the efficient use of the system in the organisation. Trading partners can also contribute to ERP system development during post-implementation phase by providing accurate and consistent data especially when the ERP system of trading partners and main company are connected to each other (Law et al., 2010; Zhu et al., 2010; Ngai et al., 2008).

- **Project Management:** According to Ngai et al. (2008), the ability of project manager to determine and achieve project goals, manage the project scope and possible changes, adopt suitable strategy and approach, define project schedule and resources, and monitor the project progress based on predetermined functions, time, and budget is critical for success of any ERP project in all stages including the post-implementation. Besides, according to integrated nature of an ERP system, proper coordination among all groups affected by ERP system and considering the impact of any decision or changes on the entire system is crucial for project achievement (Nah and Delgado, 2006). Project management also includes monitoring the information exchange between the members of project team and analysing the user feedback to ensure the project progress is in line with the technical and organisational aspects of project plan. In fact, most of the given activities like project scope management, monitoring the project status, resource management, project coordination, and studying the user feedbacks about the implemented system are substantial during the ERP post-implementation as well (Nah et al., 2001; Holland et al., 1999).

- **Top Management Support:** An ERP project can be successful solely when acquire the support of top management to ensure the organisation commitment across the project and after system goes live. The top management must be willing to redefine the organisation goals, structure, roles and responsibilities, and allocate sufficient amount of resources to the
project. Even after the system implementation, the necessary resources must be available for best use of the system and system development and upgrades. Moreover, increasing the top management knowledge through post-implementation practices contributes to effective use of the system for decision making and gaining managerial benefits. Additionally, the mediator role of top management in times of conflict between variant interest parties is paramount for such a comprehensive project (Zhu et al., 2010; Nah et al., 2001; Holland et al., 1999).

- **Minimal Customization**: ERP system customization denotes modifying the software to match the business and country specific function requirements through changing user interfaces, program codes, and outputs; or adding bolts-on. Due to the complexity of ERP packages, software customization exposes the project with risk of instability, incorrectness, time overrun, and brings difficulties for future maintenance and system upgrades which directly affect the post-implementation success. Therefore, many organisations prefer to modify their business operations to be consistent with ERP system leading to less system customization and relevant consequences in one hand and more modification in work practices and organisational structure on the other hand. Nonetheless, customizing ERP packages are almost inevitable and most companies face the user requests for the system modification during the project post-implementation. Thus, companies must reach a consensus on the degree of customization in order to not be threatened by customization risks and difficulties after the system rollout (Buonanno et al., 2005; Ross and Vitale, 2000; Teltumbde, 2000).

- **Training**: lots of ERP post-implementation failures are associated with human errors and inexperienced users. Thus, providing constant and suitable user training and knowledge transfer for realizing the diverse business practices behind the ERP system applications accompanied by qualified user manuals and other training tools can be conducive to the improvement of company’s internal skills for operation and maintenance of the ERP system during the post-implementation stage. Although providing the adequate level of training before the system implementation
is essential for the project success, expanding and retaining the ERP knowledge and skills will stay a significant challenge during the project post-implementation (Law et al., 2010; Zhu et al., 2010; Al Mashari, 2003).

- **Troubleshooting:** Due to the ERP system intricacy, the implemented system usually encounters some software errors, bugs, and problems which may bring interrupts into the regular operation of the system. Consequently, effective troubleshooting, maintenance, and close collaboration with consultants for analysing and solving the problems have a significant impact on the project post-implementation success and development (Zhu et al., 2010; Al Mashari, 2003; Nah et al., 2001).

In order to provide a better classification of ERP post-implementation CSFs, the given factors are classified to five general themes. This classification is performed based on the common concept of the given factors and is represented in Table 2.

<table>
<thead>
<tr>
<th>Theme</th>
<th>CSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial factor</td>
<td>Top Management Support</td>
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<tr>
<td></td>
<td>Project Management</td>
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<tr>
<td></td>
<td>Change Management</td>
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<tr>
<td>Technical factor</td>
<td>Data Accuracy</td>
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<tr>
<td></td>
<td>Minimal Customization</td>
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<td></td>
<td>Troubleshooting</td>
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<tr>
<td>Operational factor</td>
<td>BPR</td>
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<td>Training</td>
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<td>Organisational factor</td>
<td>Team Composition</td>
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<td></td>
<td>Communication</td>
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<td>External Systems’ factor</td>
<td>Vendor ontology</td>
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<tr>
<td></td>
<td>Consultant Support</td>
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<td></td>
<td>Trading Partner Support</td>
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</tbody>
</table>

**Table 2:** Classification of ERP Post-implementation CSFs
2.7. Summary

ERP market has faced the fast growth during the past decades. It has been successful to attract more and more organisations by providing a shared platform, accelerating the decision making processes, cost reduction, more data clarity, using best business practices, speeding customer response, and facilitating the managerial control over the worldwide dispersed business operations (Al Mashari, 2003, Ross and Vitale, 2000).

In general, variant issues should be considered by organisations with their specific business, culture, and country requirements in order to take advantages of implementing an ERP system. According to Chian-Son (2005), ERP packages have always evolved to meet the on-going needs of different businesses and industries. Based on wide scope of the ERP concept, literature looked at diverse aspects of ERP systems with different viewpoints. ERP implementation methodology is one of the areas discussed by lots of literature. Although the main activities which must be performed during the ERP system lifecycle are almost same in all the ERP methodologies, various stages have been presented for implementing an ERP system. This study explains three of these methodologies which are mostly cited by literature. Comparison of given methodologies shows while ASAP methodology mainly emphasises on the activities conducted before system implementation and allocates four out of five stages of the methodology to them, the ERP journey stages discussed by Ross and Vitale (2000) dedicates three stages known as stabilisation, continuous improvement, and transformation to ERP post-implementation actions and summarizes the implementation processes in design and implementation phases. On other hand, the latter ERP life cycle, explained by Wei et al. (2005) and Markus and Tanis (2000), seems to be more comprehensive and moderate than others as it is described the ERP pre-implementation activities in charting phase, implementation actions in project phase and post-implementation processes in shake down and Onward & Upward phases.

Another remarkable ERP subject which is studied here is the implementation approach adopted by enterprises based on their organisational goals and characteristics. Reviewing ERP literature represents a variety of classifications for
these approaches which are defined upon one or more factors. The traditional ERP implementation approach mainly focuses on the project plan for implementation and integration of each module in terms of their time sequence and indicates two main approaches: big-band and phased approach. On the other hand, the second approach discusses an appropriate implementation approach is defined concerning five business characteristics among them the implementation sequence of variant modules refers to solely one of these characteristics. Furthermore, the latter approach, which proposes three classes of approaches, recommends corporations can select the most suitable approach according to fitness of its business features with each of these three classifications.

Studies show that the period between ERP package releases decreased from nearly 3 years in 1990s to 1.5 or 2 years in recent years. Hence, the shorter life span of ERP products implies the ERP implementation alone is not sufficient for gaining competitive advantages unless the company has an appropriate plan for the system maintenance and continuous system enhancement and evolution to meet its on-going business needs (Law et al., 2010). The existing ERP literature mostly emphasises on ERP adoption, implementation methodologies, and ERP implementation CSFs rather than ERP post-implementation issues (Ifinedo, 2010). The existing gap of knowledge in ERP post-implementation issues drives more in depth investigation on CSFs related to this project phase. Thus, this research tries to first explore about ERP concept, various implementation methodologies and approaches influencing the ERP project progress, and wide ranges of CSFs for ERP implementation. Then, a classification of ERP post-implementation CSFs is developed through comparing the ERP post-implementation perceptions and the areas covered by each success factor of ERP implementation. (Table2) Nonetheless, a sound final classification of ERP post-implementation CSFs will merely generate via a proper comparison of these 13 CSFs derived from literature and findings of real world cases presented in the following chapters.
3.1. Research Approach

This research attempted to identify paramount factors influencing the success of ERP post-implementation. Due to the exiting gap of knowledge in given area, this research could not completely rely on a predetermined notion to develop a set of comprehensive CSFs. Hence, the inductive methodology was adopted to acquire a correct inference of ERP post-implementation CSFs through analysing both the literature and ERP cases. Since, according to Michalski (1983), inductive research aims to extract logical statements of a phenomenon from certain evidences via concluding, reconstructing, and rectifying the obtained knowledge. In contrast, the deductive method is used for re-examining the prior studies concerning the similar phenomenon in diverse situations (Elo and Kyngas, 2008).

Furthermore, the qualitative approach was more appropriate for this study’s goal which is acquiring rich interpretation of the factors contributing to the achievement of ERP post-implementation. In that, as Berrios and Lucca (2006) discussed, the qualitative approach is based on in depth study of the phenomenon’s nature leading to examination of the collected data and explanation of them without any limitation by pre-set theories. In other words, the qualitative method allows researcher to analyse objects or conceptions in their natural context and interpret them as he perceives (Ritchie and Lewis, 2003). Thus, the combination of inductive and qualitative approach was chosen for conducting the research.

3.2. Research Design

This research initialized with identifying the research objectives and then conducting a review of literature to understand the main characteristics of ERP system and ERP project CSFs from theoretical perspective. Thus an in depth and breadth study of various aspects of the ERP system was carried out. On account of the fact that the current literature did not sufficiently focus on the CSFs of ERP post-implementation, first an initial set of post-implementation success factors was
inferred through comparison of ERP post-implementation activities and the concept of each success factor of ERP projects. Next, the empirical studies were performed to examine, extend, and rectify the initial inference. The empirical surveys were based on desk based study gathering information about ERP projects through multiple cases. According to Yin (1981b), case study tries to analyse the real concept of a concurrent phenomenon particularly while the distinction between the concept and phenomenon is not explicit. Additionally, multi-case adoption provides more valid results through examining a phenomenon occurring in diverse circumstances which are formed based on the replication of findings (Yin, 1981a).

Several steps can be defined for conducting the case study. The first step in case based researches is specifying research objectives and potential relevant conceptions derived from literature. Then, concerning diverse business situations, opposed types of cases should be selected permitting replication and improvement of results (Eisenhardt, 1989). In this research four cases provided by European Case Clearing House were selected carefully to meet the research aims. These cases were chosen from varied business sectors and regions. Two of these cases were related to the successful ERP projects, while implementation of the other ones brought serious problems for their companies. These divergent cases enabled the exploration and replication of the studies framework in these contexts. Besides, using contrasting contexts allowed expansion of the findings according to different situations. Moreover, the initial classification of ERP post-implementation CSFs, developed through analysis of the literature, was used as a basis for examining the cases. However, the research framework was revised after analysis of the cases in order to develop an inclusive categorisation of post-implementation CSFs.

After selection of suitable cases a draft of case studies’ findings must be generated based upon certain concepts or questions which can be modified during the research (Yin, 1981b). Subsequently, a case analysis method must be chosen and carried out. Yin (1981a) explained a type of cross case analysis method known as case comparison can be an appropriate approach for qualitative research analysis. In given method, the findings of each case compare with others and additional enhancements are conducted so far as a set of more general interpretation is formed. The analysis part of this study was established upon qualitative content analysis and
pre-defined thematic approach for examining the cases which will be explained in detail in the next section. In summary, a transcript of ERP post-implementation success criteria for each case was developed and coded regarding the prior categories identified via the literature review in addition to further classes realized through examining the cases. Then, compare and contrast between the evidences of each cases and relevant literature was conducted leading to reinterpretation, amendment, and re-classification of success factors which are still conforming to all cases. Finally, a set of well-categorized criteria is generated in a way that combination of them can be used as a guideline for the success of ERP post-implementation. Figure6 illustrated the overall steps of conducting the research.

**Figure 6- Research Procedure**
3.3. Research Analysis

In view of the fact that case studies have major role in this research findings, the qualitative content analysis and thematic approach were adopted for conducting the research analysis. Content analysis is a data analysis method for gaining reliable and replicable derivations from data according to their content in order to provide new perceptions and correct description of the phenomenon (Elo and Kyngas, 2008). As Elo and Kyngas (2008) stated, content analysis is applicable for both qualitative and quantitative approaches; besides, it complies with both inductive and deductive methodologies determining based on the research questions and goals. The qualitative content analysis method, which was used by this study, is a subjective explanation of the context of text data through classifying them into different codes and defining relevant themes (Hsieh and Shannon, 2005). According to Braun and Clarke (2006), a theme finds significant evidences within the data regarding the research question and represents them as a pattern. Thus, thematic approach refers to exploration of the themes with in the data which seem to be important for delineation of the phenomenon. These themes are used as categories for the research analysis (Fereday and Muir-Cochrane, 2006).

In case the existing studies and theories regarding a phenomenon are inadequate or need more investigation, the directed content analysis approach will be used for conducting the research. Moreover, the prior studies facilitate the initial coding process or determination of relationships between different codes (Hsieh and Shannon, 2005). Despite the scarcity of existing research about post-implementation success factors, this study used the existing knowledge to develop a set of ERP post-implementation CSFs which were explained according to the literature. These success factors were categorized into more comprehensive themes based on the researcher understanding of their concepts and used as a basis of preliminary coding scheme for case studies. Moreover, some findings within the cases which did not belong to the pre-determined codes were classified into the new categories. This approach conforms to one of the strategies of directed content analysis method in which data are coded into pre-set codes and those of cannot be codified are examined later to identify whether they indicate new codes or a subcategory of the current codes. In directed content analysis approach, the prior studies guide the research.
discuss. Additionally, the new findings either represent an opposing opinion or enhance the existing theory. Hence, the major strengths of the given approach are the researcher has more sophisticated perception of the phenomenon and the current studies can be supported or enriched. Nevertheless, reliance on former studies may cast a shadow over the contextual sides of the phenomenon and leads to discover evidences which are mostly supportive of the existing theories (Hsieh and Shannon, 2005).

The analysis of this research was mainly based on the six steps of thematic analysis. According to Braun and Clarke (2006), these steps include familiarising with data, developing preliminary codes, seeking themes, reviewing themes, refining and defining themes, and writing the report. Therefore, the research analysis began with reading and reviewing the case studies and writing down the initial notions. Next, based on the understanding of the phenomenon and replication of findings, data were encoded either into prior codes inferred from the literature or new ones regarding their context. Then, all codes which were relevant to the same pattern were collated into the potential themes and the general story of the research findings was told. After identifying the possible themes, each code was reviewed to ensure whether it was correctly classified into the potential theme or needed revising. Then, the specifications of each theme were refined and the explicit definition and name of the themes were generated. As a result, some themes and their subcategories were merged with each other and some codes were categorized into a new theme. Afterward, the similarities and dissimilarities of each theme across different cases were extracted and analysed in regard to the research aims and literature. Finally, the analysis report comparing the findings of each case and the literature was produced and an inclusive classification of ERP post-implementation CSFs was developed. Figure 7 demonstrates the overall steps of the research analysis.
Familiarising with the case studies

Developing the initial success factors of each case

Collating factors into the potential themes for each case

Producing the research findings report

Reviewing the themes and subcategories

Defining the final themes and subcategories

Cross case analysis and comparison to the literatures

Developing the final classification of ERP Post-implementation CSFs

**Figure 7 - Research Analysis Steps**
Chapter 4: Research Findings

4.1. Introduction

This chapter represents the research findings inferred through studying four ERP system implementation cases. The given cases are selected from both successful and unsuccessful ERP system implementation projects to examine all the potential factors leading to the success of the system post-implementation. Each case study begins with introduction and then follows by diverse themes contributing to the ERP system post-implementation success. Each theme denotes a classification of several factors which are related to the same concept. These themes and factors are based on the classification of ERP post-implementation CSFs derived from the literature in addition to some other factors concluded from analysing the cases. Although all the themes and factors are not found in all cases, they replicate in more than one case. The main themes describe as following.

- Managerial factors are related to all the aspects affecting the project management and progress like time, resource, and change management.
- Technical factors refer to all the system features and technical decisions influencing the system functionality.
- Operational factors indicate the issues contributing to the business operations and support them in any respect.
- Organisational factors denote factors affecting the project based on the organisation structure, communication, and human resources.
- External systems’ factors signify the organisation’s external partners playing a vital role in conducting the project.

4.2. HP Case Study

Hewlett-Packard’s Company (HP) established in 1938 by Bill Hewlett and David Packard as an electronic instrument producer. Since then, HP has had wide spread growth in various business areas. Until 2004, HP implemented various products of SAP ERP systems within the company. However, the
implementation of SAP Fusion Order Management system brought serious problems to the company after system cutover in June 2004. The details of HP’s background are presented in Appendix-A (Chaturvedi, 2005).

4.2.1. **Theme1: Managerial factors**

The managerial factors found in HP ERP project comprise contingency plan, project management, top management support, and change management. The explanation of each factors are as following.

- **Contingency Plan**

  HP formulated the contingency plan regarding the technical and business features to prevent some problems which might be occurred in the post-implementation stage. “*The Company anticipated disruption of three weeks for IT problems and catered to the business aspect by taking over a portion of an empty factory at Omaha as a provider of buffer stock for any customized configuration order*” (Chaturvedi, 2005:6). However, their prediction of customized server demands was 35% less than the actual orders. Since, they had assumed the same proportion of sales for both customized and standard servers. In addition, the project team did not have adequate perception of data integration consequences after system rollout. They would not think about “*enough manual processes in place to be able to meet the demand*” in case the system encountered any difficulties (Chaturvedi, 2005). Furthermore, poor conception of marketing team about “*all the configurations, customers could order*” caused inadequate testing for customized server demands affecting the post-implementation orders fulfilment (Chaturvedi, 2005:7).

- **Project Management**

  The inability of project management to define a proper communication plan is one of the factors leading to the project failure. Lack of the right communication plan brought so many problems for such a project with various high dependent groups during the project post-implementation. Besides, it seems the project management did not pay enough attention to users feedbacks and suggestions. Media reports indicated the sales personnel had notified that choosing the lightest quarter for the system rollout alone did
not offset the massive risks of the project. “The staff had suggested that some kind of backup system should be put in place” for controlling the project risks throughout the system stabilization period; however, the project management “turned a deaf ear to this” (Chaturvedi, 2005:8). Furthermore, the project management team was not successful to adopt a proper approach to adjust IT and business goals. HP’s officials claimed they can identify and fix the post-implementation issues in 15 days; however, their problems remain for more than a month. According to an insider, “one of these managers wants to keep an old application in the new system just because he wrote it” (Chaturvedi, 2005:11).

- **Top Management Support**

  According to the case discussions, it seems top management of HP did not support the project properly since “employees had been under a steady fear of layoffs” (Chaturvedi, 2005:8). Additionally, top management had a significant role in creation of distrust working environment, in that the employees were considered “as being overpaid and inefficient” by upper management (Chaturvedi, 2005:8). Consequently, lots of Vice-presidents of the company left HP and became a member of competitor companies which had negative effect on the project success and solving the post-implementation problems. Beyond everything, top management failed to encourage employees for early identification and correction of problems (Chaturvedi, 2005).

- **Change Management**

  Each ERP implementation project accompanies by changes in company’s culture, processes, and structures. Cultural split within the HP Company was one of the major issues during the ERP project post-implementation requiring the efficient change management. This problem once surfaced through lack of appropriate cooperation between the business and IT teams and another time revealed by operational difficulties rooted in opposing culture of HP and Compaq companies. “HP had traditionally been very systematic, risk averse and slow; Compaq’s culture had been very aggressive and risk loving” (Chaturvedi, 2005:8). Analysts believed HP could solve this issue by
recruiting an external operations manager who has rigorous control over operational matters (Chaturvedi, 2005).

4.2.2. Theme2: Technical factors

Technical factors affecting the ERP post-implementation include troubleshooting, implementation quality, and system improvement which are discussed in below.

- **Troubleshooting**
  
  As a result of programming errors, “around 20% of the customer orders for servers could not move from the legacy order system to the new SAP system” after the ERP system went live (Chaturvedi, 2005:7). These errors fixed with HP maintenance team during a month. Nevertheless, it was late to meet the orders lag caused by these programming errors (Chaturvedi, 2005).

- **Implementation Quality**
  
  The success or failure of ERP post-implementation highly depends on the quality of implementation operations. As it is discussed in the case, “lack of effective product training and improper product data management” led to integration problems between the new system and legacy system (Chaturvedi, 2005:7). These problems were major reasons of customer orders backlog putting the company in troublesome situation after system rollout. Moreover, “the customer service representatives were given training two weeks in advance” (Chaturvedi, 2005:7). Although they completed the proficiency testing, they did not have sufficient time to develop their knowledge of the new technology. Thus, it caused numerous mistakes during the post-implementation stage and exacerbated the order delays (Chaturvedi, 2005).

- **System Improvement**
  
  In January 2005, HP decided to develop the “SAP-based ordering system in its PC business” enabling the company to receive customized orders from customers (Chaturvedi, 2005:10). This project known as Genesis launched to improve the company’s capability to “handle direct sales” and compete with Dell Corporation (Chaturvedi, 2005:10). However, their mistake to force a
real-time ordering process onto the new SAP system again caused difficulties in the project implementation (Chaturvedi, 2005).

4.2.3. Theme 3: Operational factors

BPR and training are two operational factors influencing to the post-implementation outcome in HP Company. The effects of these factors on the project are discussed in following.

- **BPR**

  One of the main failure reasons of ERP project in HP was due to flaw of its business processes. In fact, their endeavour to customize “ERP software to reflect the existing order processing system which itself was inadequate to handle the increased demand” rather than redesigning their processes directly contributed to the post-implementation failure in fulfilling the customer orders (Chaturvedi, 2005:9). This improper approach once again showed itself in similar ERP project in HP’s PC business when they try to “cram a legacy shipping system into a real-time ordering system” (Chaturvedi, 2005:11).

- **Training**

  The inadequate training arose some mistakes after the implementation of the new system. Therefore, the company decided to commence “refresher training” for IT staff and users in post-implementation phase (Chaturvedi, 2005:7). Despite the fact that providing the sufficient level of training was essential for developing the staff skills and knowledge of the new system, it did not mitigate the company’s difficulties inasmuch as the increase of order backlogs was becoming uncontrollable (Chaturvedi, 2005).

4.3. Keda Case Study

Keda was established in 1992 as a small Chinese’s ceramics machinery producer by Lu Qin with capital of only US$13,500. Nonetheless, Keda succeeded to develop its business after a few years. By 2003, Keda decided to implement the SAP ERP system which is successfully carried out during 5
months. More details about the background of Keda Company are described in Appendix-B (Fung et al, 2011).

4.3.1. Theme1: Managerial factors

The managerial factors associated to Keda’s ERP post-implementation are change management, project management, and top management support as following.

- Change Management
  As soon as the project went live, it faced with “resistance” from some users since “workflow and operations changed dramatically” and the system imposed some “technical changes” opposing to the Chinese professional context (Fung et al, 2011:9). Furthermore, the redesigned business processes made “redistribution of power” in some sections like inventory management which had previously worked autonomously and did not accept to have shared resources (Fung et al, 2011:9). Therefore, senior executives decided to replace the staff trying to ignore the ERP system. They justified their decision based on the Chinese culture in which “a new person is promoted to a new position he will have no conflict of interest with the new system and will therefore be willing to comply” (Fung et al, 2011:10). However, this strategy did not mean that the company never accepted any user request for modifying the new system.

- Project Management
  One of the main issues in project management is precise project schedule. In case of ERP post-implementation, choosing the proper time for system rollout is an effective factor in minimizing business interruptions. Therefore, Keda project manager decided to rollout the new system in August since for Keda “the months of August, September, and October were the low season when production pressure was lower” (Fung et al, 2011:9). Another successful strategic decision of the project manager was selecting an appropriate implementation approach. Although the phased approach is less risky, Keda decided to adopt the big bang approach to speed up the full
processes. One of the Keda officials explained their reason for adopting big bang approach as follows.

“We did foresee the possible problems immediately after cutover, such as delay or even suspension of production. However, if we were to do a parallel rollout, it would take a month at least to stabilize, during which all data and work would need to be processed twice.” (Fung et al, 2011:9)

- **Top Management Support**

Before the system went live, the project team had informed the top management about the possible consequences of system rollout such as production delays and operational changes. “The Director was extraordinarily supportive and said that he could tolerate ERP-affected deliveries in the first year” (Fung et al, 2011:9). Thus, the director’s support gave assurance to the staff to find the best solution for the technical issues in post-implementation phase.

4.3.2. **Theme2: Technical factors**

Three technical factors contribute to the post-implementation success in Keda consist of minimal customization, data accuracy, and system improvement. The impacts of these factors on the project explained in below.

- **Minimal Customization**

One of the main issues directly affecting the post-implementation success was the company’s decision to customize the system as less as possible. They made this decision due to the SAP competencies in establishing diverse systems. An insider discussed “We were more inclined to adopt the model the system was originally designed for, and make changes to the workflow and its management” (Fung et al, 2011:8). Hence, many departments’ operations and processes were redesigned and organisation structure was rearranged to be in line with the new system. Furthermore, the company succeeded to minimize the degree of the system customization since “the users were the same people who originally specified most of the system operations” (Fung et al, 2011:10). Therefore, any request for the system customization after the system going
live was equivalent to their inadequacy in determining the correct business processes.

- **Data Accuracy**
  Few months after the system rollout, data accuracy had significant improvement across the company. This improvement was so remarkable especially for inventory management and production planning sections in which the validity of data had raised from 85% to 98%. An insider described the transparency of data achieved after the ERP implementation was so beneficial for the company. For instance, “before ERP it was very difficult to trace price paid for materials purchased, but after ERP, price analysis could be done conveniently” (Fung et al, 2011:10).

- **System Improvement**
  ERP is an empowered technology with the capability to develop constantly. Although the ERP system enabled Keda in areas like CRM, decision making, and SCM, the company did not yet completely supplied by central processes and data. Therefore, “the company was facing significant information needs, and needed to improve productivity and decision-making” through developing its ERP system in order to have successful system post-implementation (Fung et al, 2011:11).

4.3.3. **Theme3: Operational factors**

Business and system alignment is the only operational factor affecting the Keda’s project as following.

- **Business and System Alignment**
  The ERP system successfully aligned with the Keda processes and brought lots of operational advantages for Keda such as “improved market responsiveness, decreased stock holding costs, a significantly better product delivery time, and faster monthly financial reconciliation” (Fung et al, 2011:10). As a case in point, Keda often had delay in fulfilling the orders for machine press before the ERP; however, a year after the system implementation, they succeeded to increase the monthly production from six presses to more than 30 presses. Furthermore, implementing the ERP in Keda
improved the quality of decision making due to the enhanced information diffusion. For example, the cost analysis of polishing machine revealed the cost of producing this machine was higher than the selling price. Hence, “management shifted its focus from developing foreign markets to controlling costs” (Fung et al, 2011:11).

4.3.4. Theme4: Organisational factors

The study shows team composition has significant impact on the post-implementation success regarding the following evidences.

- **Team Composition**

  ERP implementation team of Keda consisted of three major roles: The key users who were the core of the team, the consultants who were responsible for training, and the IT staff supporting the consultants and users. The key users included managers of the departments and key operational employees who had “a comprehensive understanding of the operations and needs of the departments” and “would oversee the business process redesign and system design aspects” (Fung et al, 2011:6). Furthermore, “each ERP system module was assigned an owner from the associated department” (Fung et al, 2011:6). This arrangement of roles and responsibilities was so helpful to decrease the user change requests in post-implementation stage. As most of the system processes was determined by the same users, “they had to accept and adapt” themselves with the new operations (Fung et al, 2011:10). The team structure is shown in Appendix-C.

4.4. Hershey Case Study

In 1894, Hershey Chocolate Company was formed by Milton Hershey and gradually became famous for introducing a variety of chocolates to the market. By 1999, Hershey chose SAP, Siebel, and Manugistics companies as its vendors to implement the ERP system and IBM to consolidate these three software functions. This project faced the immense failure during the implementation. The company’s background is described in detail in Appendix-D (Perepu, 2008).
4.4.1. Theme1: Managerial factors

The following study reveals that project management is the main managerial factor influencing the ERP post-implementation in Hershey.

- **Project Management**

  Imprecise time estimation led the ERP project rollout “three months behind schedule” (Perepu, 2008:6). While Hershey had lost the low season for the project implementation, it was not in a situation to put the implementation off to a later time as the “Y2K problem” was imminent (Perepu, 2008:6). Therefore, the company chose “big bang approach to ERP implementation” to hasten the project and fulfil the Halloween orders without considering the complexity of the project with three different vendors (Perepu, 2008:6). In fact, this approach did not provide the advantages of phased implementation for the company in which they can test the integration issues, identify the problems, and fix the bugs of each implemented module and then move on to the next module. Furthermore, “Hershey’s mistake was in going ahead and implementing ERP during its busiest season” (Perepu, 2008:8). ERP project in Hershey was a complicated one in which “three to six weeks was required after implementation to identify problems and fix them” (Perepu, 2008:8). Hence, the poor project management in selecting improbable deadlines, inadequate implementation approach, ignoring the sufficient time for the system testing, and selecting wrong implementation time endangered the post-implementation success. Consequently, a short while after the project implementation “the problems pertaining to order fulfilment, processing and shipping started to arise” and they caused long delays in several order shipping and deliveries (Perepu, 2008:6).

4.4.2. Theme2: Technical factors

As it is discussed in the following, troubleshooting, data accuracy, and system improvement are the major technical factors concerning the ERP post-implementation in Hershey.
• **Troubleshooting**

After the implementation system failure, "Hershey made efforts to stabilize SAP and other systems"; thus, "a rigorous software testing program" was conducted to identify the problem areas (Perepu, 2008:10). In addition to some system bugs, the assessment showed "Hershey did not have enough infrastructure to support the project" (Perepu, 2008:10). The company’s network could not support all the three system applications. By identifying the system bugs and problems, the technical staff solved all the system issues and the company successfully went back to its routine operation (Perepu, 2008).

• **Data Accuracy**

The inaccuracy of inventory data was one of the major issues postponing the on-time delivery of orders and causing obstacles against the system post-implementation. During the peak-season "the temporary facilities where products were stored were not identified as storage points as far as SAP R/3 ERP software was concerned" (Perepu, 2008:7). In fact, the misidentification of all inventory sources and shortcoming of operational staff and business partners in supply of the valid storage information led to the system inaccessibility to all sources of inventory information and its inability to provide accurate stock data.

• **System Improvement**

Due to the ERP project success in improving the business performance, Hershey "began working with SAP R/3 4.6” in July 2001 to enhance its system and gain more advantages of the ERP system functionalities (Perepu, 2008:10). This new release of ERP was a component of MySAP products and was successfully implemented in less time and cost in comparison with the estimated time and budget. Moreover, Hershey expanded its existing SAP functions into “marketing analysis and brand management, order management, etc.” and acquired great progress in these areas (Perepu, 2008:10).
4.4.3. Theme3: Operational factors

Operational factors which have impact on the project post-implementation comprise training, BPR, and business and system alignment.

- **Training**
  The implemented ERP system in Hershey was too complex as the employees “had to learn the intricacies of not one, but three new systems” (Perepu, 2008:10). Thus, retraining in post-implementation stage was essential for all end-users to know “how the system functioned and also how different modules interacted with one another” (Perepu, 2008:10). On the other hand, rolling out the system in the “peak season” did not allow employees to spend so many times for learning the new system. “Analysts were of the view that though some, though not all, of the problems could have been avoided if there had been more focus on training” (Perepu, 2008:10).

- **BPR**
  As the successful system implementation is not the end of ERP projects but just a start point for continuous improvement of the system, Hershey decided to develop its system into “SAP R/3 4.6” in July 2001(Perepu, 2008:10). As a result of this system development, “Hershey redesigned the processes” to be in line with the new version of SAP system; In fact, their prior experiences helped them to successfully reengineering the operations and made them consistent with the new system applications (Perepu, 2008:10).

- **Business and System Alignment**
  After the successful running of the ERP system and with over 18 months using the system, Hershey’s business processes fully fitted with the software. In 2001, the company’s staff felt the new system had notable effect on their way of doing the business. “Hershey employees are much more comfortable and are able to execute at a higher level of performance” (Perepu, 2008:11). Hence, Hershey proceeded to implement the new release of the system. “Within 60 days of implementation, major improvements were made to processes like invoice verification, credit processing, etc.” (Perepu, 2008:10).
4.4.4. Theme4: Organisational factors

The two major organisational factors related to ERP post-implementation in Hershey are communication and team composition. The detailed explanation of them comes in following.

- **Communication**
  The lack of proper communication among the technical and operational staff was one of the main reasons of delay in processing the orders after the system implementation. Hershey used to pile up the products in several temporary places in the peak seasons. These temporary warehouses were apart from the usual storage locations identified by SAP system. In fact, the negligence of operational staff to inform the technical staff about this deficiency of the inventory function led to the inaccuracy of stock data. Consequently, “Hershey missed out on the deliveries, in spite of having enough products at its warehouses” (Perepu, 2008:7).

- **Team composition**
  An ERP team must consist of expert members who have sufficient knowledge of both business and technical issues to ensure the project success during the entire project lifecycle. Unfortunately, Hershey ERP team was not experienced enough to predict and provide the required facilities for ERP post-implementation. “The board did not have any representative with competence in the field of IT” (Perepu, 2008:9). They did not think about any back up system which has vital importance for the success of all ERP post-implementation projects. “Without any data about the products in its hand, Hershey was often forced to call up customers and inquire about the details of the quantity they received and ordered” (Perepu, 2008:6). After the implementation catastrophe, “the board recruited Allen Loren, then CIO of American Express, to join the board” (Perepu, 2008:9). Furthermore, Hershey understood that lack of the CIO position within the company, who manages the IT department, directly contributed to their failure. “The company appointed a CIO, George Davis”, and then succeeded to solve its problems under his leadership (Perepu, 2008:10).
4.4.5. Theme 5: External Systems’ factors

Vendor and trading partner support are two factors demonstrate the effects of external systems on the project post-implementation.

- **Vendor Support**

  According to the project complexity and operation of more than one software package, the occurrence of post-implementation bugs and problems was almost inevitable for the Hershey project. Inasmuch as three vendors were responsible for fixing the post-implementation issues a close cooperation between vendors and Hershey’s ERP team was essential. However, existence of three vendors was a good reason for “*each party to blame the other for any mess-up*” (Perepu, 2008:9). Therefore, the lack of adequate support by the vendors prevented the smooth system post-implementation.

- **Trading Partner Support**

  One of the main problems of the new system was existence of “*several regional warehouses some of which were operated by third parties*” (Perepu, 2008:11). The shortcoming of these partners to provide the correct data of their inventory brought the data inaccuracy problem in the post-implementation stage which was later solved by building a focal distribution centre and closing a number of warehouses (Perepu, 2008).

4.5. Cisco Case Study

Cisco was established in 1984 by two Stanford researchers and has produced router as its major product. With the internet technologies development, Cisco faced the upsurge demand for its products and soon acquired a dominant position in the market. By 1994, Cisco began implementing Oracle ERP system and selected KPMG as its consultant. The project was successfully implemented in 9 months. The details of the company’s background are represented in Appendix-E (Austin et al., 2002).
4.5.1. Theme1: Managerial factors

The managerial factors affecting the ERP post-implementation in Cisco are contingency plan, top management support, and project management which are fully discussed in below.

- **Contingency Plan**
  
  One of the main issues contributed to the success of ERP post-implementation in Cisco was the precise contingency plan and mitigation approaches. From the beginning of the project, Cisco intended to “avoid modification of the ERP software” to prevent the consequent post-implementation difficulties like migrating to future system releases; However, during the system implementation, the ERP team realized “some of the changes would be substantial” for supporting the company’s operations (Austin et al., 2002:8). Consequently, the team classified all required changes and defined a rigorous process for approving them. “In the end, 30 developers were needed for three months to modify Oracle to support the business” and minimize the negative effects of customization on post-implementation success (Austin et al., 2002:9). In addition to the diagnosis of essential modifications, the ERP team also found out “the Oracle package would not adequately support the after sales support needs of the company” (Austin et al., 2002:9). Hence, the team attempted to select and plan for implementation of supportive software matching the Oracle package and implementation plan. The ability of the company to identify these issues and consider timely mitigation approaches was so helpful for the post-implementation success (Austin et al., 2002).

- **Top Management Support**
  
  The company’s top management showed their commitment to the ERP project several times either by announcing it as “one of the company’s top seven goals for the year” or providing the required resources (Austin et al., 2002:6). They continued their support during the post-implementation phase as “ERP project status became the number one agenda item for weekly executive staff meetings” until the system was completely stabilized (Austin
et al., 2002:11). Furthermore, after the system rollout and determination of hardware insufficiency to support the new system, the top management did not hesitate to provide “additional hardware” notwithstanding that it imposed more expenditure to the company (Austin et al., 2002:10).

- **Project Management**

  In addition to the qualified management of ERP implementation which had positive impact on the project post-implementation. The project management competency to make an exceptional contract for providing the required hardware in post-implementation phase was too helpful to solve the system processing problems, in that the project management handed over responsibility of the hardware performance to the vendor completely. According to the given contract, “Cisco purchased equipment based on a promised capability rather than a specific configuration” (Austin et al., 2002:10).

4.5.2. **Theme2: Technical factors**

  Three main technical factors influence the project post-implementation are implementation quality, troubleshooting, and minimal customization. The research findings regarding these factors come in below.

- **Implementation Quality**

  Thorough system configuration and consideration of a “data warehouse” as a “single source for their information needs” were ERP implementation strengths in Cisco (Austin et al., 2002:9). As a result, the company could use the well-organised system and the accurate data as privileges facilitating the ERP post-implementation. However, “the company had gone wrong in its final testing of the system” since “the system lacked the capacity to process the required load” after cutover (Austin et al., 2002:10,11).

- **Troubleshooting**

  After the system implementation, the initial problems surfaced and “the system went down nearly once a day” (Austin et al., 2002:10). The ERP team embarked a deep assessment and identified several reasons for the system
instability. “The primary problem, as it turned out, was with the hardware architecture and sizing” (Austin et al., 2002:10). Thus, the company decided to fix this issue by buying the hardware guaranteeing the system performance. The second problem was as a result of incomplete system testing in which the company did not test the full loaded database and all the system operations simultaneously. Hence, the system was not capable to “handle the transaction volume required in the Cisco environment” (Austin et al., 2002:10). During the two month after implementation, the IT staff worked hardly to deal with the technical problems. Finally, the company succeeded to stabilise the new system and improve the system capacity with the help of its vendors (Austin et al., 2002).

- **Minimal Customization**

Due to the relevant risks and difficulties of customized software during ERP post-implementation projects, Cisco aimed to adopt the vanilla implementation using the original Oracle system. However, further investigations showed the company cannot avoid some of the substantial modifications in the ERP package. Therefore, they started to define a modification strategy in which the amount of modifications was minimized as much as possible. According to this strategy, “all modification requests were classified as Red, Yellow, or Green” (Austin et al., 2002:9). Then, each of these requests went to the related team and was evaluated by the team members. Moreover, “a red had to go to the steering committee for approval” (Austin et al., 2002:9). Therefore, the given strategy helped the company to minimize the software customization and its affiliated drawbacks in the post-implementation stage.

4.5.3. **Theme3: Operational factors**

As it is explained in below, communication is the only factor which has effect on Cisco’s operations during the post-implementation stage.

- **Communication**

The problems arose after the system implementation necessitated the close communication and coordination between the project team, the vendors,
the consultant, and all end-users to identify and solve the issues. Thus, the severe two-month process of fixing the system problems and bugs only succeeded due to the proper analysis of user feedbacks, information exchange among all the project parties, and cooperation of all external and internal groups (Austin et al., 2002).

4.5.4. Theme 4: External Systems’ factors

Vendor and consultant support is an external systems’ factor contributing to the post-implementation success in Cisco as following.

- **Vendor and Consultant Support**

  Cisco’s ERP post-implementation success to fix the software problems owed to “strong commitment vendor from Oracle, the hardware vendor, and KPMG” (Austin et al., 2002:11). They did their best during 60 days to make the system stable and enhance its efficiency. The hardware vendor assigned “30 people on site at one point” leading by its president to solve Cisco issues (Austin et al., 2002:11). Regardless the fact that the success of this project could provide a great credit for the vendor, they lost huge amount of money during this period as they sold the capability to Cisco (Austin et al., 2002).
Chapter 5: Cross Case Analysis and Discussion

5.1. Introduction

This chapter synthesises the findings of case studies through analysing the similarities and differences of each cases and comparing them with the existing literature. Moreover, the discussion is made based on the outcome of the cases and the factors playing a strong role in the success or failure of them. The results are classified into major themes encompassing various factors and represented at the end of the chapter. The final themes and classifications are slightly different with the categories indicated by the previous chapter. Besides, a number of these factors were not found in all four cases and some of them were not presented in the literature, inasmuch as the inductive approach allows inferring a phenomenon from the empirical cases and restructuring the prior findings.

5.2. Strategic factors

Top management attitude towards the ERP project and the degree of software customization are two significant strategies which must be defined by organisations to ensure the success of system post-implementation. Although, these two factors belonged to other themes in prior chapters, further analysis denotes they can be perceived as organisation aims and strategies towards the ERP project.

Placing the ERP project as one of the seven annual goals of the Cisco Company or Keda’s management decision for accepting the negative consequences of the project at the first year after the implementation demonstrates these companies’ supportive strategy regarding the ERP project. Consequently, the staff of these two companies ensured of top management support and made their best effort to identify and rectify the problems occurred after the system cutover. In contrast, the discouragement attitude of HP’s top management led to resignation of the key employees which had inverse impact on the system stabilisation. Furthermore, the top management strategy in creating the organisation commitment to the project and providing enough resources for the system maintenance and upgrade is essential for
ERP post-implementation success (Holland et al., 1999). This perception is validated by the success of Cisco’s management strategy in which the project post-implementation status was the first priority of the company. Besides, the company’s approach in providing the required hardware for rectifying the infrastructure problems revealed after launching the system showed their full support of the project.

Moreover, Law et al. (2010) stated companies must decide on the extent of customization to diminish the consequences of functionality misalignments and meet the user demands during the post-implementation phase. Additionally, many corporations believe the software customization must be avoided to minimize its potential risks unless it can be properly justified. The given arguments are completely consistent with the strategy of Keda and Cisco regarding the system customization. In fact, Keda’s decision to redesign the business operations was based on its goal to have the minimum amount of customization. Furthermore, the company’s strategy to involve users in defining the work processes was in line with its aim to reduce the user modification request after the system cutover. Similarly, Cisco intended to avoid the system modification from the beginning of the project. However, after realizing that some level of modification is inevitable, they adopted a strict strategy for modification approval to have minimal customization.

5.3. Managerial factors

Analysis of the cases and the literature review indicate managerial factors play a strong role in the success of ERP post-implementation. Managerial factors comprise project management, change management, contingency plan, team composition, and communication management. This theme concerns with the capability of the manager or the management group to construct an adequate team, predict the potential events influencing the project, and manage variant aspects of the project like time, resources, information exchange, and the changes affecting the project scope or organisational issues. Apart from the contingency plan, all the other factors were identified by various studies which are discussed in following. Nonetheless, the importance of the accurate contingency plan and appropriate mitigation approaches in the success of ERP post-implementation revealed through analysing the HP and Cisco cases. In fact, the ability of Cisco’s management team to
predict the essential changes in the ERP package and determine the inadequacy of Oracle software regarding the after sales support function accompanied by their proper mitigation tactics for minimizing the effects of these problems facilitate their post-implementation processes. Whereas, the failure of HP’s management team to have adequate predictions of all kinds of configuration orders, orders’ volume, and the consequences of data integration led to increase of order backlog after the system implementation and endangered the success of post-implementation.

Besides, it seems that project management is the most dominant success factor of this theme as it was highlighted by all the cases. A successful project management approach must define realistic schedule and resources, choose appropriate implementation approach, review the user feedbacks, manage changes in the project scope, and monitor the project time and budget (Ngai et al., 2008; Nah et al., 2001). Failure in conducting each of the given aspects has remarkable effect on ERP post-implementation success as the Keda’ project management success in identifying the thorough schedule and implementation approach and adhering to the time schedule led to smooth project post-implementation, while inadequacy of Hershey’s project management in the same areas brought lots of difficulties to the post-implementation stage. Likewise, the ability of Cisco’s project management approach to manage changes in the project scope through delegating the responsibility of the new hardware performance to the vendor ensured the company to have the vendor support during the post-implementation but the HP’s project management had a significant shortcoming by ignoring the user suggestion about considering a backup system for supporting the system after implementation.

As Nah and Delgado (2006) remarked, the implementation of ERP system leads to changes in enterprise structure, culture, and work practices which must be managed properly to diminish the consequent resistance against them. The study of Keda’s approach for managing the drastic changes in its processes and structure denotes that good understanding of Chinese work culture helped the company to manage the staff resistance to the changes after the system rollout. However, the lack of proper insight to manage cultural gaps occurred in HP exposed the company in difficult situation for solving the post-implementation issues. Furthermore, reviewing the literature and cases led to classify ‘team composition’ and ‘communication’ as
managerial factors rather than organisational factors. Since they are attributed to management capability to involve all external and internal parties in the project, manage their communication, and construct an empowered team with sufficient business and technical knowledge (Law et al., 2010; Nah and Delgado, 2006; Umble et al., 2003). As a case in point, Keda’s management power to establish the strong team including both consultant, IT personnel, and empowered users who have enough knowledge of the business practices and Cisco’s ability to manage the communication between all internal and external parties facilitated the acceptance of the new processes and fixing the new system problems within these two companies. In contrast, lack of the IT experts in Hershey’s team and their inability to exchange the information between the operational and IT employees encounter Hershey with data inaccuracy problem and difficulty in solving the system issues after the implementation.

5.4. Technical factors

Troubleshooting, data accuracy, implementation quality, and system improvement are classified as technical factors influencing the success of ERP post-implementation. In fact, technical factors encompass all the issues related to the system functionalities. Troubleshooting and data accuracy are discussed by varied literature. Nah et al. (2001) emphasized on crucial role of solving the programming errors and system issues in the success of project post-implementation. Furthermore, precise data entry and availability of correct data contribute to the achievement of the project goals in post-implementation stage through improving the business operations and strategic decisions (Al Mashari, 2003; Ross and Vitale, 2000). Therefore, thorough troubleshooting solved all the system problems arising after the ERP implementation in HP, Hershey, and Cisco companies via the precise assessment of the system and fixing the system bugs and errors. Moreover, the visibility of accurate data helped Keda to gain better perspective of its business condition, while invalid stock data in Hershey put the company in unmanageable situation.

In addition to the given factors, implementation quality and system improvement are two other success factors concluded through analysis of ERP cases.
Although Zhu et al. (2010) discussed about the effect of implementation quality on post-implementation success, their study did not succeed to provide a good classification of its relevant aspects. Since, they incorporated the managerial and technical aspects with each other. The case study of Cisco and HP companies showed well implementation of all the technical factors which must be considered during the implementation phase like system integration, data migration, system configuration, and testing can prevent the consequent problems threatening the success of ERP post-implementation. Additionally, the continuous system improvement is one of the major goals of ERP post-implementation (Zhu et al., 2010). Therefore, organisations achievement in improving the system functionalities or upgrading the system can be considered as one of the success factors of the post-implementation step. In other words, the system improvement and upgrade in HP and Hershey companies and Keda intent for system development demonstrated these companies accomplishment to move towards this post-implementation aim and improve their business functionalities and managerial benefits.

5.5. Operational factors

Here, all the factors affecting the business operations or supporting them are classified as operational factor. Operational factors include BPR, business and system alignment, and training, derived either from literature, cases, or both of them. According to Ngai et al. (2008), redesigning the business processes helps organisations to use more system functionalities. Companies’ need for BPR can be found out during or after the implementation and reduces the post-implementation problems caused by system customization. This research analysis indicates that HP’s mistake in retaining their imperfect work flows and customizing the software according to their own operations led to the system inadequacy to manage orders after the system ‘go live’. On the other hand, the first implementation failure experience in Hershey persuades them to reengineer their operations to fit with the next software release during the system upgrade stage. Furthermore, investigation of Keda and Hershey cases conduces to another success factor which is not studied by literature. In fact, the fitness of the system with the business operations is a paramount factor in success of the ERP post-implementation. Based on the given cases, the evidence of this alignment can be found through performance
improvement, well-established business processes, more production, better services, and enhanced decision making. In addition to the given factors which are directly related to business operations, training is crucial for supporting the work practices and improving the staff knowledge of how the system operates. The staff retraining in HP and Hershey companies validate the discussion of Al Mashari (2003) indicating continuous training is essential for improving the user skills and their knowledge of the system in order to be able in conducting the business operations and the system maintenance.

5.6. External Systems’ factors

External systems refer to ERP vendor, consultant, and trading partners who can have a vital role in the success of ERP post-implementation through supporting the organisation. Since these three groups do not operate inside the focal corporation, they are classified as external systems serving the focal company. Moreover, each of these parties can provide different kinds of support to an ERP project. Constant support of vendors for system maintenance and upgrade, consultant role in improving the organisation knowledge about all the potential functionalities of the system, and trading partners’ assistance in supplying the valid and compatible data signify the importance of the external systems’ support during the post-implementation phase (Zhu et al., 2010). Thus, parts of Hershey’s problems in rectifying the software issues reflected to inconsistency of its three vendors and negligence of its partners in providing the precise stock data. Likewise, Cisco’s success in stabilising the new system mainly owed to the assistance of its vendors and consultant.

5.7. Summary

According to the above discussion, an extended and integrative classification of ERP Post-implementation CSFs is developed, based on the findings of both the literature review and the real ERP cases analysis. As it is demonstrated in Figure8, the research outcome consists of 5 major themes and 17 CSFs. Four CSFs including contingency plan, implementation quality, business and system alignment, and system improvement were brought in as a result of cases’ analysis and the other ones were found in both literature and cases. Furthermore, the classification of the main
themes was formed based on the author inference from the context of each factor and did not presented by the literature.

Figure 8- Classification of ERP Post-implementation CSFs
Chapter 6: Conclusion and Recommendation

6.1. Research Implication and Conclusion

ERP is an extensive system integrating an enterprise’s strategy, operations, and structure with the information system. Successful corporations will continuously look for improving their ERP systems through adding the system functionalities, amending their processes, and upgrading the system to acquire all the system values (Holland et al., 1999). An appropriate project plan, and implementation do not alone guarantee the success of an ERP system. The ERP post-implementation activities and processes are also crucial for the system achievement (Law et al., 2010).

Due to the intricacy of the ERP subject, this study aimed to first investigate the ERP system perception, varied system lifecycles, different implementation approaches, ERP post-implementation concept, and diverse factors related to the ERP system success through reviewing the literature. Next, based on analysing the given subjects, a general classification of ERP post-implementation CSFs was generated and represented in table 2. Then, four ERP implementation cases from diverse business sectors and regions and with opposed outcomes were studied to gain a factual understanding of the CSFs contributing to the system post-implementation success. Finally, a set of ERP post-implementation CSFs was developed via comparing the findings of cases and literature. The final outcome was categorised into 5 major themes and 17 factors illustrated in Figure 8. According to the research findings all the given themes have vital importance for the success of ERP post-implementation. These themes were inferred both from the findings of existing literature and cases. Moreover, each of the specified success factors can be effective in the successful ERP post-implementation based on various project conditions. Some of these factors were identified by previous studies as outlined in section 5.7 and 2.6. Others were derived from the analysis of the case studies in this research. These additional factors comprise contingency plan, implementation quality, system improvement, and business and system alignment. In additional contribution of this
research includes establishing relationship between these different factors and integrating them into an explanatory framework.

In general, this study reminds organisations that ERP implementation is not an end but it is a start to gain the true advantages of the system. Therefore, organisations must take an appropriate combination of these success factors into account in order to achieve the ERP post-implementation goals and maximize their operational and strategic benefits. Besides, the study provides a deeper insight into existing literature of ERP post-implementation CSFs.

6.2. Research Limitations

This research is mainly restricted by time and resource limitations. Although the ERP system subjects are broadly investigated by literature, ERP post-implementation and the factors leading to its success have not been studied sufficiently (Zhu et al., 2010). Consequently, the study is not completely supported by a set of studies focusing only on the post-implementation CSFs. Moreover, published ERP cases focusing exclusively on the post-implementation stage were not found. Therefore, the exhaustive case selection process was performed and 13 cases were reviewed to select the most appropriate ones in terms of details and scope. Nonetheless, the four selected cases merely provide an overall comprehension of ERP projects and they are not only designed for post-implementation. These limitations accompanied by time and research length restrictions did not allow the researcher to develop a more comprehensive classification of ERP post-implementation CSFs through analysing more cases. However, the author tried to make the best use of the available resources and synthesised the findings in a correct way to meet the research aims and objectives.

6.3. Recommendations for Future Work

In view of the fact that ERP adoption and implementation issues are sufficiently investigated by variant literature and regarding the growth of ERP post-implementation services, it seems that ERP post-implementation has great potential for future researches (Chian-Son, 2005). Therefore, this study suggests conducting more research on ERP post-implementation subjects especially its CSFs, system
maintenance and upgrade, and the effect of post-implementation issues on the success of the entire project. Although this study faced the given limitations, it can be used as groundwork for developing a more inclusive set of ERP post-implementation CSFs. Moreover, future researches on ERP post-implementation can be narrowed down concerning diverse sizes of organisations, business sectors, or countries.

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References


Appendices

Appendix-A: HP’s Background

HP has produced a variety of printers, computers, data storage instruments, and ancillaries across the world. It also started a close cooperation with SAP to provide consultancy services for SAP’s supply chain and ERP packaged software in 1989. Consequently, over 50% of SAP clients preferred to use HP’s infrastructure and consulting services for more responsiveness and quicker ERP implementation. In 2004, HP had $80 billion incomes and net profit of $4.2 billion. The company attracted over 1 billion customers served by 150,000 employees working in 160 countries (Chaturvedi, 2005).

By 2000, HP implemented diverse versions and interfaces of more than 20 SAP R/3 within the company. In 2001, the company decided to implement MySAP SCM to build a unique backbone for connecting employees, clients, and partners. The merger of HP with Compaq Computer Corporation in 2002 drove HP to renovate all its supply chains. Moreover, the company used the MySAP Product Life Cycle Management function to consolidate the two merged corporations’ product lines. In January 2004, Gilles Bouchard, who appointed as the CIO of HP one year ago, became in charge of implementing ERP system and the supply chain. The project consisted of several parts among them the creation of organisational model for incorporating the regional business with IT groups and industry standard server migration onto ERP systems are performed by May 2004. However, implementing of SAP Fusion Order Management Platform, combining HP and Compaq order management systems and including over 70 supply chains and an install of SAP R/3 version-4.6C, faced the migration failure immediately after the project going live in June 2004. The financial effect of this failure was appraised around $160 million, over 5 times of the ERP project implementation cost (Chaturvedi, 2005).
### Appendix-B: Keda’s Background

Keda benchmarked its business model concerning the European forerunner of the market and gained remarkable achievements in the Chinese machinery manufacturing market. In the early years of this millennium, Keda exceeded most of its rivals and acquired the second place of building materials machinery producer in the world. According to Keda financial reports, the total revenues of the company were US$209 million in 2009. In 2010, Keda had over 2,000 staff and great variety of products such as ceramics machinery, building material processing, stone processing, and energy resource management. Besides, the company provided extensive plant layout and technical consultancy services to its customers (Fung et al, 2011).

In general, Keda business was based on various decentralized business functions without defined processes. These separate business divisions did not give a holistic view of the business to managers and often brought some difficulties to the company such as task redundancy, cost increase, lack of information flow, and improper strategic decision making. Thus, Keda required taking some innovative steps to remain as a pioneer enterprise in the global market. Besides, the government incentives for computerization development in Chinese firms to compete with overseas corporations accompanied by inadequacy of existing MRP II system for expanded product lines of the company and cease of the MRP II maintenance services by the vendor obliged Keda to revise its IT strategies in 2003. Consequently, Keda decided to develop an extensive long term computerization plan. After six-month analysis and planning, six major projects were defined as Keda’s five-year IT plan in which the ERP implementation project had the highest priority. The company selected SAP as its ERP vendor due to the SAP capability to support their complicated business operations. The ERP project was successfully completed within five months and had significant advantages for the company (Fung et al, 2011).
Appendix-C: Keda’s ERP Project Team Structure

Source: Keda Industrial Co. Ltd. (Fung et al, 2011)
Hershey, which is first established as chocolate producer, expanded its business by acquiring numerous companies and diversifying its productions into non-chocolate products like pasta across the years. In 1968, the company’s name was changed to Hershey Foods Corporation. Hershey sold almost 3300 products in over 90 countries and raised its sales from US$334 million in 1969 to US$4.94 billion in 2006. Furthermore, over 14,300 staff were recruited by the company in 2006 (Perepu, 2008).

In late 1996, the company decided to upgrade the company’s software and hardware and replace its legacy systems to overcome the Y2K problems via the project called Enterprise 21. Hershey intended to improve the customer services by sharing the product delivery information with retailers. Consequently, the company decided to turn to the ERP system in April 1999. Hershey chose SAP package including finance, material management, purchasing, warehousing, billing, and order processing modules; Siebel software for CRM and price promotion modules; and Manugistics’s shipping management, forecasting and planning, and production management functions. Moreover, Hershey selected IBM Company for integrating these three vendors’ software. The overall cost of the project was estimated around US$110 million and the implementation time was planned to be on April 1999 when was the lowest sales period for the company. However, some modules did not progress according to the project plan and the project going live postponed until July 1999. This delay led to massive ERP implementation failure in Hershey accompanied by 12% drop in the annual revenues (Perepu, 2008).
Appendix-E: Cisco’s Background

Cisco has produced router as its main product which play significant role in the Internet and Intranets network. In January 1993, Cisco IT system was based on a UNIX software package, supporting its core operations like manufacturing, finance, and order receiving. However, regarding the growing perspective of Cisco, this system was unable to provide the required level of maintainability, redundancy, and reliability. Consequently, in January 1994, the company was ceased operating for two days due to the severe failure of its legacy system. Finally, after a long selection process and with the consultancy of KPMG, the company decided to replace the legacy system with Oracle ERP package in 9 months and with cost of US$15 million (Austin et al., 2002).