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Fahd Nazir Ahmed

Implementation of ERP System in SMEs

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Implementation of ERP System in SMEs

SUPERVISOR: Dr Ip-shing Fan

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ABSTRACT

This thesis tries to propose a list of Critical Success Factors (CSFs) in the form of CSFs framework for Enterprise Resource Planning (ERP) system implementation at Small and Medium sized Enterprises (SMEs).The research describe in this thesis tries to test them by going through the experience of ERP system implementation in SME called Hazelwood Sound & Vision Ltd (HSV).

In a first instance, the author compared implementation models and suggested most appropriate model for HSV. Furthermore, literature search for critical success factors of ERP implementation has taken place. This led to a general CSFs framework for ERP system implementation. At later stage, CSFs were classified into the phases of selected implementation model. This resulted in integrated framework which later used for ERP system implementation called Smart Office in HSV. Through this experience of implementing Smart Office in HSV, the author determined factors which were critical for the success of the ERP implementation in HSV and compared them with CSFs found in literature.

The study also examines, through the critical success factors, the impacts and issues in implementation related to these factors. Findings include: an increased emphasis upon the determination of clear goals and objectives at the project outset, and, importantly, vendor support added value in terms of specialist software knowledge and enhanced project team capability. Results show that most of the success factors, found in the literature apply to HSV, although change management, and communication among departments, don't seems to be regarded as top CSFs for HSV.

Implementation is an expensive investment, and difficult to implement, due to its complexity. It is hoped that knowledge and understanding of these factors will assist SMEs in successfully implementing ERP and enable them to further improve their systems in order to maximize returns. Furthermore, by identifying relevant CSFs for SMEs, managers can better prioritize implementation efforts and resources to maximize success of ERP implementations. One of the outcomes of this research is implementation of Smart Office which fulfils the business needs of the HSV.

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I would like to thanks several people for their continuing support not only throughout production of my thesis, but also throughout my university career.

Firstly, I would like to thank my family for their continuing support throughout my university career. Without them it wouldn't have been possible for me to attend university.

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GLOSSARY OF TERMS

SMEs	Small & Medium Enterprises
CSFs	Critical Success Factors
HSV	Hazelwood Sound & Vision Ltd.
ERP	Enterprise Resource Planning
ESI	Enterprise System Implementation

1 INTRODUCTION

This chapter introduces the research project that has been undertaken, giving an outline of why such research has been done, placing the research in context and demonstrating its importance. This also includes aim and objectives. The structure of the report is also discussed at the end.

1.1 Background

ERP systems are extensive, integrated software systems, supporting the internal operations of an enterprise. They bring about enormous investments in software and in package customization.

Many cases are known of ERP implementations, failing to deliver the promised functionality and even endangering the future of the implementing company. A survey in the United States revealed that 70% of the companies implanting ERP consider the project as successful (Mabert et al. 2000). More than 55% of the companies admit that the planned budget was exceeded, with an average of 60.6%. When these budget overflows are counted as failures, the success rate of ERP implementations does not reach 50%.

These alarming figures call for a better understanding of the implementation process and critical elements constituting a successful implementation. The benefits of a well implemented ERP system are significant and the price of a poorly implemented one is great (Koh et al, 2005).

The author has found literature written by different writers about the ERP implementation, but they hardly focus on SMEs ((Gibson et al (1999), Nelson et al (2001), Bhatti (2005), Nah et al (2001),), Shanks et al (2004), Umble et al. (2003) and Ibrahim (2007)) Though, most of the previous research in this area focused predominantly on implementation of ERP systems within large organizations. This comes as no surprise since the ERP market which was primarily focused at the high end spectrum only recently changed the focus towards SME's (Kremers et al, 2000)

The objective of this research is to propose a pilot CSFs framework of ERP implementation. It is also proposed to examine existing business processes of HSV and align them with the processes of Smart Office and transfer data from the existing system to Smart Office. Lastly, this study seeks to test the pilot CSFs framework by applying it on HSV.

1.2 HSV-Overview

HSV specialises in providing audio visual and sound solutions to their customers. HSV has over 30 years of experience in providing sound solutions

to churches, offices, village halls and schools. The annual turnover of company is around £150000.

Business growth and competitiveness in the market has made it difficult for HSV to meet their timelines and project delivery within budget without a proper integrated IT system. Currently, the company is using excel sheets to manage their inventories and contacts which is resulting in issues like duplication, poor quality and management of information. Creation of project proposal is wasting enormous amount of time in creating project proposal. Installation of Smart office will allow them to overcome these issues and focus on their core business competencies. Smart Office is a small ERP system specifically developed to address the needs of the company specializing in audio, video and sound solutions.

1.3 Project Rationale

1.3.1 Academic perspective:

The main aspect that need to be taken into consideration when implementing an ERP process within an organisation is the overall goal to improve existing processes and introduce cost efficiency. The question of how effectively ERP system can be implemented may require a thorough understanding of the business processes and critical elements constituting a successful implementation. This study proposes to conduct this examination through a case study of a small manufacturing company called HSV, where author is implementing an ERP system called Smart Office. This study aims to capture top CSFs from the literature and link them with the implementation of Smart Office in HSV. This will help in successful completion of implementation process. The focus of this research is on CSFs in SMEs.

1.3.2 Client Perspective:

The potential benefits of this project for HSV are

- Integrate project proposal process, inventory management, stock ordering and labour costing
- Introduction of Smart Office has reduced time for project proposal generation by 20%
- Implementation of Smart has reduced time for stock order and stock management by 15%

1.4 Aim & Objectives

The main aim of the project is to develop a CSFs framework for ERP implementation within SMEs. It is expected that the proposed framework will increase the managers can better prioritize implementation efforts and resources to maximize success of ERP implementations within manufacturing SMEs. The overall objectives are to:

- Identify the most suitable generic ESI approach for sponsoring company called Hazelwood Sound & Vision (HSV)
- Conduct a comprehensive literature review about the CSFs of ERP implementation.
- Propose a CSFs framework for ERP implementation within SMEs
- Capture business processes in the form of As-Is model within HSV.
- Align As-Is model with the selected ERP system called Smart Office in order to gain full benefits of ERP implementation.
- Perform data cleansing and transfer data to the Smart Office
- Validate working of the Smart Office within HSV
- Evaluate application of the proposed CSFs framework within HSV

1.5 Thesis Structure

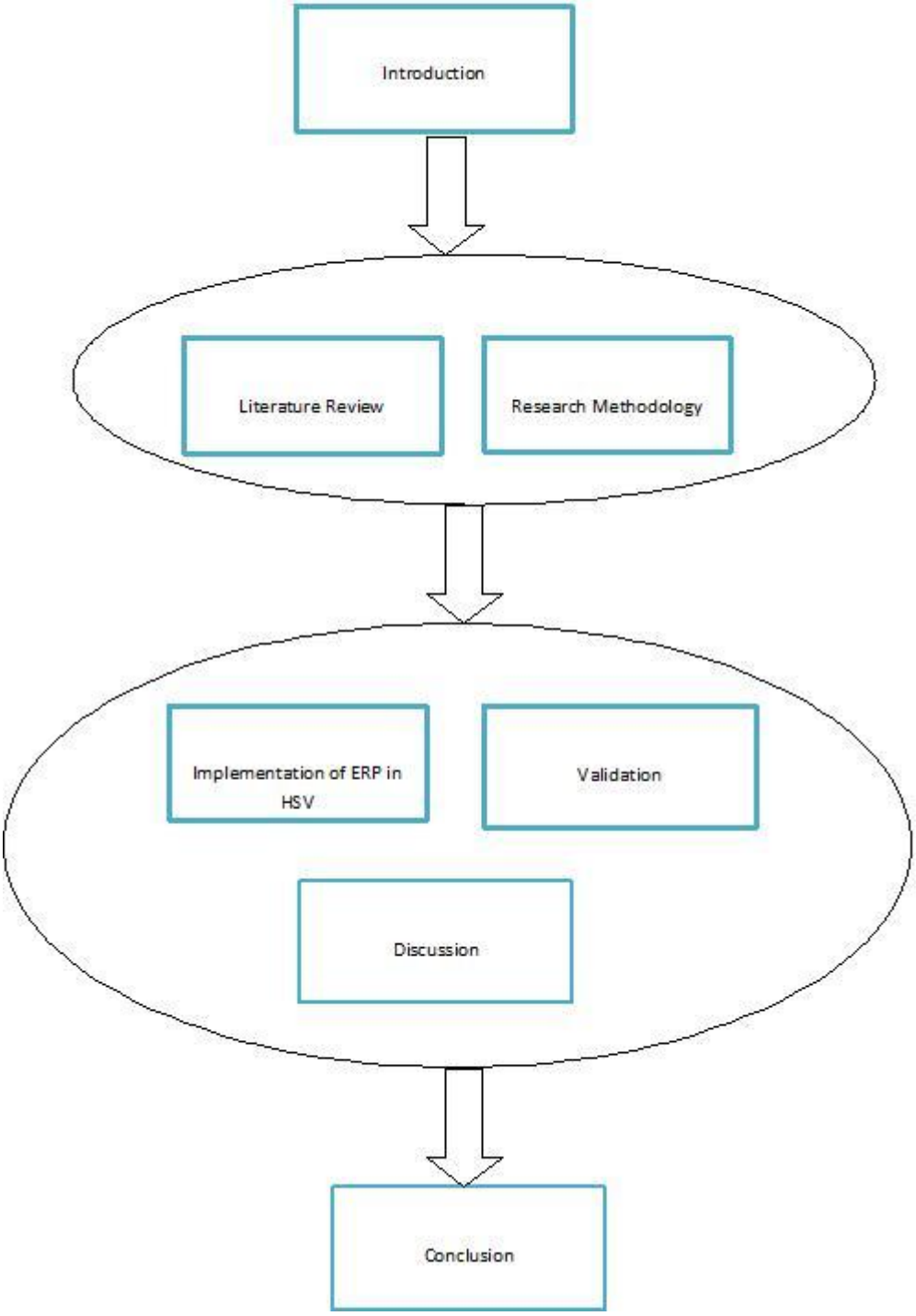


Figure 1-1: Methodology

2 LITERATURE REVIEW

The purpose of this chapter is to introduce readers with ERP and different models available for ERP implementation. It identifies the most appropriate implementation model. It guides the reader through the process of selecting 9 best CSFs for SMEs and presents a pilot CSFs framework for ERP implementation.

2.1 ERP & SMEs

In today's competitive world, companies require immediate information business processes (stock, orders, profit etc). The information is gathered from different systems that are not connected with each other. The effectiveness of these systems can be increase by connecting these systems in order to present a business view from single information. The integration removes duplication of data and enables standardization of data across the company.

"ERP system as customizable, standard application software which includes integrated business solutions for the core processes (e.g. production planning and control, warehouse management) and the main administrative functions (e.g. accounting, human resource management) of an enterprise" (Rosemann, 1999)

The increase in competition makes it difficult for SMEs to survive. Absence of robustness normally associated with large companies has forced SMEs to tap the power of IT and an integrated information system in order to stay competitive and customer oriented. ERP is often considered the answer for their survival (Rao, 2000).

ERP implementation is one of the main factors in reducing inventories in manufacturing sector anywhere from 15 to 35 per cent (Gupta, 2000). Seddon et al (2003) has given insight into the benefits of ERP by categorizing them in five dimensions operational, managerial, strategic, IT infrastructure, and organisational as shown in table 1 below

Dimensions	Sub dimensions (21 in total at this stage)
Operational	1.1 Cost reduction, 1.2 Cycle time reduction, 1.3 Productivity improvement, 1.4 Quality improvement, 1.5 Customer services improvement
Managerial	2.1 Better resource management, 2.2 Improved decision making and planning 2.3 Performance improvement
Strategic	3.1 Support business growth 3.2 Support business alliance 3.3 Build business innovations 3.4 Build cost leadership 3.5 Generate product differentiation (including customization) 3.6 Build external linkages (customers and suppliers)
IT Infra-structure	4.1 build business flexibility for current and future changes 4.2 IT costs reduction 4.3 Increased IT infrastructure capability
Organisational	5.1 Support organizational changes 5.2 Facilitate Business learning 5.3 Empowerment 5.4 Built common visions

Table 1: Benefits of ERP

Despite the advantages offered by ERP systems, empirical evidence suggests that there are many instances where organisations have abandoned the implementation process. This happens for various reasons, such as lack of time especially for SMEs, problems related to integration (Ekanayaka et al, 2002) and a gap between the functionality offered by the package and that required by the adopting organisation (Shehab et al, 2004)

This calls for a better understanding of the implementation process and critical elements constituting a successful implementation. The benefits of a well implemented ERP system are significant and the price of a poorly implemented one is great (Koh et al, 2005).

2.2 Implementation of ERP system

Before an Enterprise Resource Planning (ERP) system is implemented, it is imperative for organizations to understand the infrastructure and business needs of their companies (Rao, 2000) and to make a change in their culture (Legare, 2002). Success with IT is primarily about people and business. Business drivers and problems have to be considered and the existing business processes and systems must be analysed to see where they need improvement. An ERP implementation should be an opportunity to improve your business. This implementation could be done by using different models as discussed below.

2.2.1 Implementation Models:

The main purpose of implementation model is to divide the complex process into phases which allow manager to manage the process. There are several approaches to implement ERP, applicable in different scenarios depending upon company needs.

Bancroft et al., (1998) presented an implementation model based on discussion with 20 experts and 3 multinational companies. The Bancroft et al. (1998) model consist of five phases

- 'Focus' phase: in other words is a planning phase in which main activities are formation of a project team and setting up a management committee, drawing a project plan.

- 'AS-IS' phase: consists analysis of current business and ERP training is also a part of this phase.

- 'TO-BE' phase: application of necessary will convert the As-Is model to To-Be model.

- Construction & testing phase: configuration of the system takes place and all types of testing are performed

- Implementation phase: includes installation of ERP system and training program for the users as well

Similarly Ross (1998) has recommended a five-phase model. The phases of this model are

- Design phase: similar to focus phase of the Bancroft's model

- Implementation phase: merge last four phases of the Bancroft's model together in the form of implementation phase.

- Other phases are Stabilization, Continuous improvement and Transformation.

Markus et al., (2000) developed a four-phase model of ERP implementation:

- Project chartering
- The project,
- Shakedown and,
- Onward and upward.

The chartering phase begins before Bancroft's' focus and Ross' (1998) design phases. The description of their project phase is similar to Ross' (1998) project

phase and it includes last four phases of Bancroft et al.'s (1998). Markus et al. (2000) onward and upwards phase is a mixture of Ross' (1998) continuous improvement and stabilization phases.

Stermberger et al (2008) has proposed a model consist of seven stages as shown in figure 2-1.

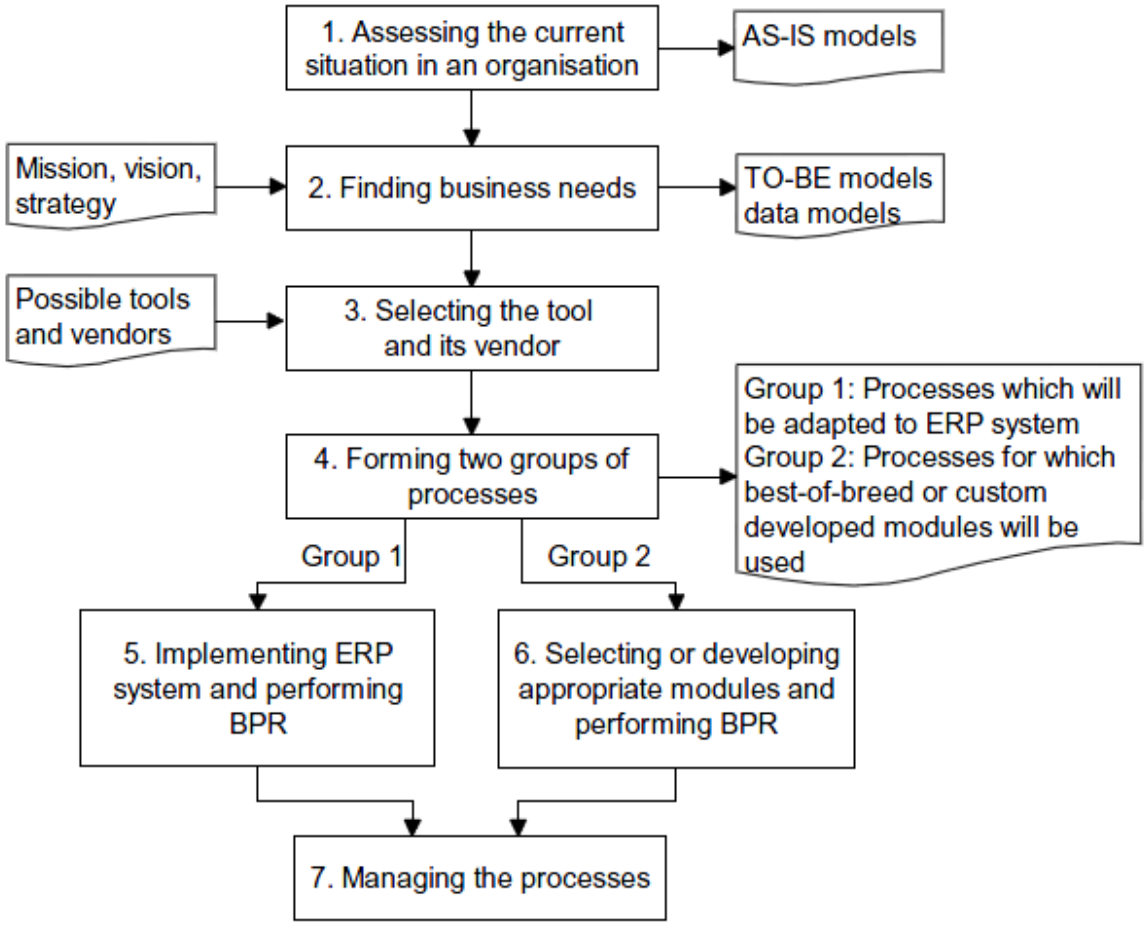


Figure 2-1: Implementation Model

The first stage of the model is similar to Ross (1998) 'As is 'phase and second stage is same as Ross (1998) 'To be' phase. At third stage, company select tool on the basis of their business needs mentioned in stage 2. During the implementation, stage 3 can be ignored if the organisation has already selected the ERP package. During stage 4, processes are divided into two groups, group 1is for processes adapted to ERP system and Group 2 is for complex process for which ERP system need to be modified. Stage 5 is performed on Group 1processes and stage 6 is performed on limited and crucial group 2 process

due to high cost. Stage 7 is a continuous business improvement process and actually never ends.

There are several points of interests with these three models. Firstly, Markus et al. (2000) and Ross (1998) include a planning phase which occurs prior to the actual implementation Project. Stermberger et al (2008) completely ignore the planning phase. Secondly, Markus et al. (2000) and Ross (1998) merge the actual implementation project into one phase. In contrast, Bancroft (1998) categorized the stages of the actual project into four project sub-phases (as is, to be, construction and testing, and actual implementation) and Stermberger et al (2008) divided the actual project implementation into seven phases (Assessing the current situation in an organisation, Finding business needs, Selecting the tool and its vendor, forming two groups of processes, Implementing an ERP system and performing BPR, Selecting or developing appropriate modules and Managing the processes).

Thirdly, three of the models (Ross, 1998; Markus et al., 2000, Stermberger et al. 2008) include a post- project phase (which are referred to as either continuous improvement, transformation, or onward and upwards, or managing the processes) in the model of the whole ERP implementation enterprise. Fourthly, Stermberger et al (2008) has not included testing as a separate phase or discussed in any of his phases. On the other hand, Bancroft et al (1998) mentioned testing as a separate stage and two of the models considered testing part of project phase of Ross (1998) and or implementation phase of Markus et al (2000).

2.3 Selected Implementation Model for HSV

The author has decided to use the seven phased Stermberger et al (2008) model for ERP implementation in HSV as shown in figure 2-1.

Main reasons for selecting this model are

- Documentation of the changes in business processes and ERP. Results of the investigation done by Genovese further strengthened the decision of documenting the changes in an ERP system and/or business processes In 41% of companies, these changes are not documented at all and in 39% of them they are only partly documented. He insisted business process modelling would be a very appropriate way to document changes (Genovese, 2005)
- Perform Business Process Modelling technique to asses company needs.
- The model will allow finding a balance between standard business process and customised business processes.

It was also decided to avoid too much detailed process modelling which can lead to delay.

2.4 Critical Success Factors:

A critical success factor (CSF) is a factor which, if addressed, significantly improves the chances of a successful project implementation (Pinto et al, 1987). There is no general consensus on the number of critical success factors of an ERP implementation. In the literature, the number of CSFs varies from nine to twenty four ((Gibson et al (1999), Nelson et al (2001), Bhatti (2005), Nah et al (2001),), Shanks et al (2004), Umble et al. (2003) and Ibrahim (2007))

Companies that managed these factors carefully had a higher probability of implementation success. Success and failure is the subject of number of studies in the information systems literature. More specifically, a number of models have been developed to identify CSFs for Enterprise system Implementation (ESI)

Critical success factors for implementations of ERP in a SME environment may differ substantially from ERP implementations in large enterprises: it is by no means obvious that critical success factors of ERP implementations may be extrapolated to SMEs. In a first instance, we search the literature for critical success factors of ERP implementations. This leads to a general classification framework for ERP success factors. Later, these CSFs classified in different phases of ERP implementation model as discussed in chapter 4. After ERP implementation, we verify if the ERP critical success factors, discovered in the literature, are relevant for HSV. This verification will take place through workshops as discussed in chapter 5.

2.4.1 CSFs Models

There are various CSFs models and CSFs proposed by different authors. Originally 10 CSFs for project management was introduced by Pinto et al (1996). Their model research was further elaborated by Gibson et al (1999). The model divides the CSF into strategic and tactical factors as shown in figure 2.2

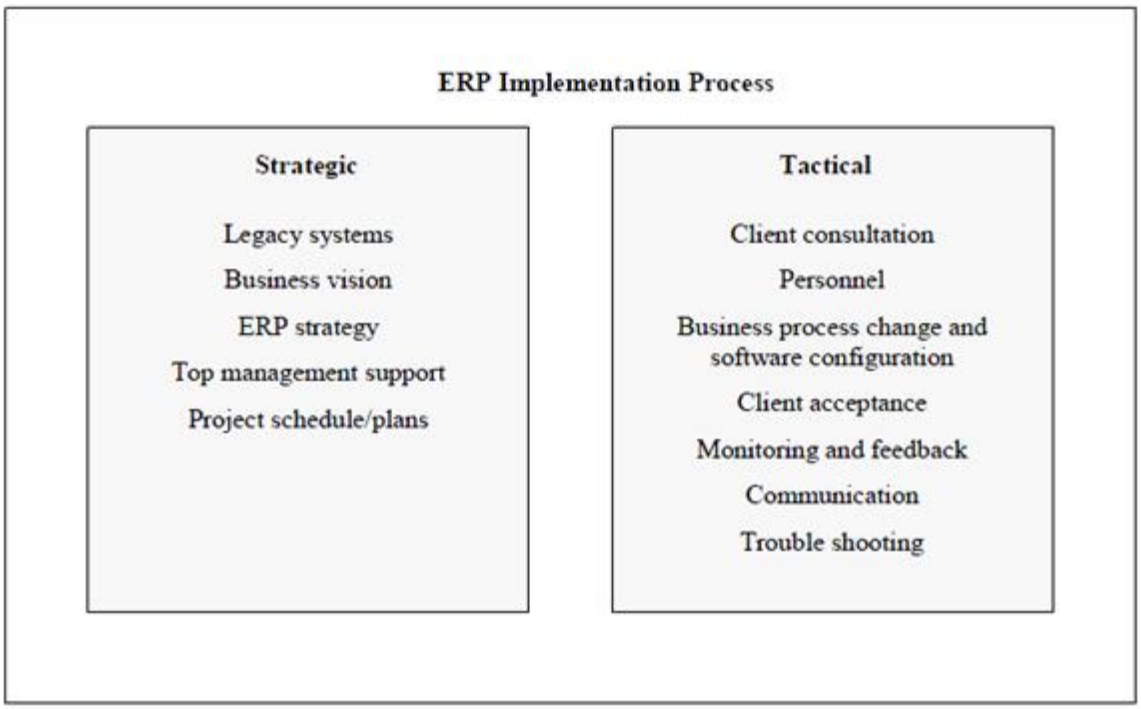


Figure 2-2: Gibson's CSFs Model

Gibson et al (1999) pointed out the importance of legacy system. He insisted that most of the CSFs models ignore legacy systems and underestimate their importance. Legacy systems are not separate problems since their design and operation bind so many components of a business (Gibson et al, 1999)

Later on in 2001 Somers and Nelson proposed a list of CSFs based on answers from US executives as shown in figure 2.3.

Critical success factor	Mean	Std. Dev
1. Top management support	4.29	1.16
2. Project team competence	4.20	1.07
3. Interdepartmental cooperation	4.19	1.20
4. Clear goals and objectives	4.15	1.14
5. Project management	4.13	0.96
6. Interdepartmental communication	4.09	1.33
7. Management of expectations	4.06	1.37
8. Project champion	4.03	1.58
9. Vendor support	4.03	1.60
10. Careful package selection	3.89	1.06
11. Data analysis & conversion	3.83	1.27
12. Dedicated resources	3.81	1.25
13. Use of steering committee	3.79	1.95
14. User software training	3.79	1.16
15. Education in new business processes	3.76	1.18
16. Business Process Reengineering, BPR	3.68	1.26
17. Minimal customisation	3.68	1.45
18. Architecture choices	3.44	1.19
19. Change management	3.43	1.34
20. Partnership with vendor	3.39	1.21
21. Use of vendors' tools	3.15	1.57
22. Use of consultants	2.90	1.20

Figure 2-3: Nelson's CSFs Model

Nelson et al (2001) mean rankings of CSFs is based on the importance of a factor in ERP implementation. Somers and Nelson identified 22 CSFs; work is based on a large range of case study analysis in the field of ERP implementation. The research of Somers and Nelson was claimed to be most comprehensive by Hedman (2003)

Many other research proposed different models and identified CSFs for implementing ERP systems. Models developed by Nah et al (2001), Bhatti (2005), Shanks et al (2004), and Umble et al. (2003) are shown below table 2 and table 3

Nah et al (2001)	Bhatti (2005)
ERP teamwork and composition Top management support Business plan and vision Effective Communication Project management Appropriate business and IT legacy systems Project Champion Minimum BPR and customization Software development and testing Change management program and culture Monitoring and evaluation of performance	Project Management Process redesign User training Technological infrastructure Change management. Risk Management Top management support Communication Team work User involvement Use of consultant Clear goals and objectives

Table 2: List of CSFs (Nah & Bhatti)

Shanks et al (2004)	Umble et al. (2003)
Top management support: External expertise: Balanced project team Data accuracy Clear goals Project management Change management: Education and training: Presence of a champion Minimal customisation Best people full-time	Strategic goals with the system Commitment of management Project management Managing change The team Data accuracy Education and training Focused performance measures Selection of system

Table 3: List of CSFs (Shanks & Umble)

Nah et al (2001) identified 11 CSFs for ERP implementation in order to provide support to the companies. These factors range from strategy to technological issues. CSFs identified by Bhatti (2005) are based on a survey of 53 organisations in Australia. He listed down 12 most common CSFs in his paper. Umble, et al (2003) pointed out that commercially available software packages promise seamless integration of all information flows in the company-financial and accounting information, human resource information, supply chain information, and customer information. However, managers have struggled, at

great expense and with great frustration, with incompatible information systems and inconsistent operating practices.

Ibrahim (2007) further discussed the proposed models in detail and classified the list of CSFs into three categories Strategy, People and Organisational as shown in table 4.

Soft Factors (Strategy)	**Soft Factors (People)**	**Soft Factors (Organisational)**
Top management commitment ERP strategy Clear goals, focus and scope Legacy systems management	Training and education Employees attitude Empowerment Project team User involvement and satisfaction	Organisational culture Effective communication Computer culture Effective project management Change management strategy Process management IT maturity

Table 4: List of CSFs (Ibrahim)

Critical Success Factors	Frequency of CSF found in literature
1. Top Management commitment and Support	14
2. Business Process Reengineering	14
3. Use of Project management to manage implementation	13
4. Change Management Culture & Program	13
5. Clear Goals, focus and scope (Business Plan and Vision)	11
6. Selecting the right team (competence)	10
7. Avoidance customization	10
8. Project Champion	9
9. User Training and Education	9
10. Effective Communication	9
11. Use of ERP's consultants	8
12. Vendor package selection	6
13. User participation	5
14. Technical and business knowledge	5
15. Integration of the system	5
16. Appropriate Management expectation	4
17. Appropriate Business & IT Legacy Systems	3
18. Software Development, Testing & Troubleshooting	3
19. Vendor Partnership	3
20. Use of vendors' development tools	3
21. Monitoring & Evaluation of Performance	2
22. Management Structure	2
23. Interdepartmental cooperation and communication	2

Figure 2-4: Wong's CSFs list

Figure 2.4 is taken from Wong et al (2003). It consists of a list of 23 CSFs and how many times each factor was identified in the 17 papers. List of 23 CSFs appears to be comprehensive and used to compare it with list of CSFs given in table 5.

2.4.2 Pilot CSFs Framework

Most of the researchers identified and developed lists of CSFs. Researchers like Ibrahim provided additional support to managers by categorising CSFs into groups of Strategy, People and Organisational factors. In this research, the author has first identified 9 most important and common CSFs found to be important in other ERP implementations and then the author grouped them in three categories, Strategic, Tactical and Operational factors.

After carefully looking into seven papers(Gibson et al (1999), Nelson et al (2001), Bhatti (2005), Nah et al (2001),), Shanks et al (2004), Umble et al.

(2003) and Ibrahim (2007)), the author identified the following CSFs and frequency of each factor.

No	Critical Success Factors	Frequency of CSF found in literature
1	Management commitment and Support	7
2	Organizational change management	6
3	Good project management	6
4	Balanced Project team	6
5	Business process reengineering	5
6	User involvement	2
7	Project champion	3
9	committed staff and consultants	5
10	Strong communication among departments, staff, and users	4
11	Formalised project Plan/schedule/goals	7
12	Appropriate training program	5
13	Vendor Support	1
14	Appropriate usage of consultants	1

15	Empowered decision makers	1
16	Adequate ERP implementation strategy	1
17	Avoid customization	3
18	Adequate ERP version	3
19	Adequate software Testing	2
20	Legacy systems management	3
21	Appropriate Management Expectations	1
22	Technical Business Knowledge	1
23	Integration of the system	1
24	Monitoring and Evaluation of Performance	3
25	Business Vision	2
26	User Acceptance and Management	2
27	Risk Management	1

28	Data Analysis and Validation	3

Table 5: Combined List of CSFs

The author provided a name for the same concept phrased differently by the different authors. The author identified that his list of top 9 CSFs were slightly different from the list of Wong et al (2003) as shown in figure 2-4. For example: Avoid customization ranked at no. 7 in Wong's list and in author's list it is not present in top 9 CSFs.

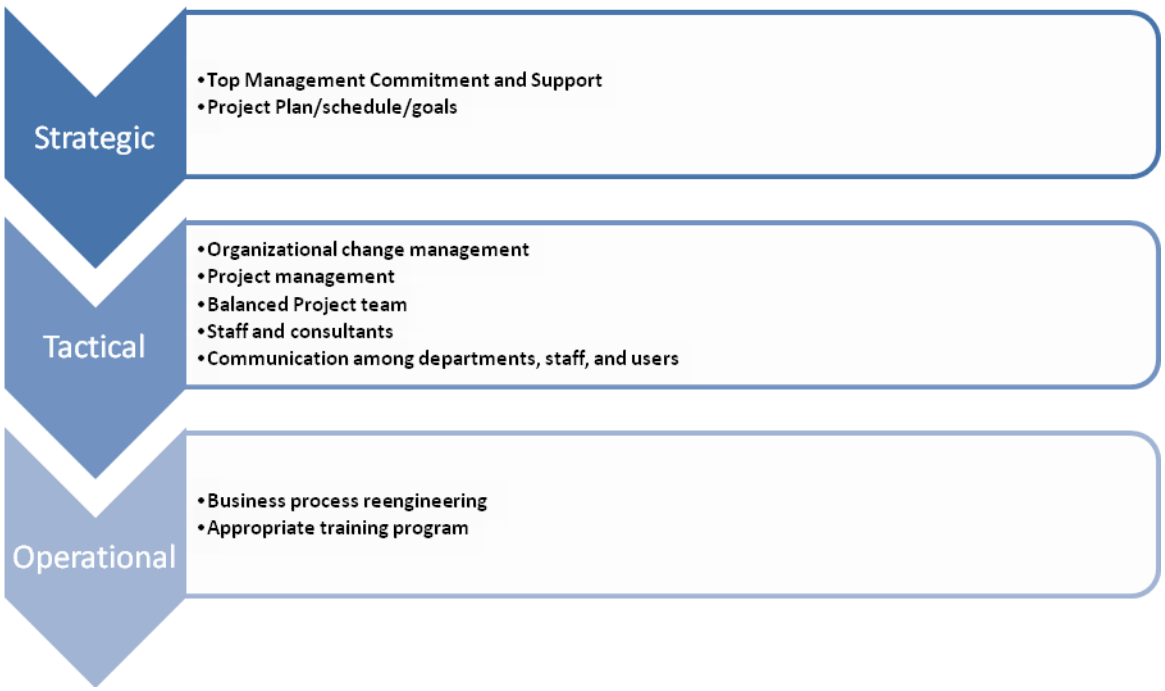


Figure 2-5: Pilot CSFs Framework

2.4.3 List of Critical Success Factors:

Strategic factors:

Top Management commitment and Support

Nelson et al (2004) describe the top management support as the most crucial success factors in ERP projects. Research on ERP failures shows that project cancellations occur when senior management delegates progress monitoring

and decisions at critical junctures of the project to technical experts (Motwani, 2002)

Top management support in ERP implementation has two main facets:

(1) Providing leadership; and
(2) Providing the necessary resources.

To implement ERP system successfully, management should monitor the implementation progress and provide clear direction of the project. (Banerjee, 2003)

The project sponsor is responsible for budgetary support and ensuring that key business representatives play a role on the project team. According to Rosario (2000), the task of the project champion is critical throughout the life cycle. It is important that the one in charge has great business skills, which can give the project a business perspective (Sumner, 1999)

Project Plan/schedule/goals/

According to Pinto (1996), Clear goals and objectives are essential to guide an ongoing organizational effort for ERP implementation as it usually exceeds the time frame for a typical business project. Goals and visions outline the direction of the project and need to be understood by all involved parties. Visions and goals have to remain clear throughout all the phases (Nelson et al, 2004). Rosario (2000) states that this plan will make work easier.

Tactical:

Organizational change management

According to Nelson et al (2003), Change management is a primary concern of many organizations involved in ERP project implementation. Change management activities are important in the early stages and continue throughout adaptation and acceptance phases (Nelson et al, 2004).

Enterprise wide culture and structure change should be managed which include people, organization and culture change (Rosario, 2000).

Aladwani (2001) discussed the need for management to proactively and constructively deal with user resistance rather than reacting when it arises. However, this requires management to understand the nature of user

resistance and take appropriate steps, such as appropriately marketing the ES to employees (Aladwani, 2001).

Critical success factors will be adopted to serve as a guiding force for successful adaptation to the system. The factors include:

1) Understand the organization's culture in terms of readiness
2) capability for change,
3) Manage and mitigate unexpected problems
4) Adopt continuous improvement methodologies to sustain change.

(Nah et al, 1999)

Project management

According to Ryan (1999), ERP systems implementation is a set of complex activities involving all business functions and often requiring between one and two years of effort. The vast combination of hardware, software and the myriad of organizational, human and financial issues make ERP projects huge and inherently complex, requiring new project management skills.

Projects should have clear, mutually agreed and understood project and business objectives, which correspond to the project deliverables. Typical success factors are the application of balanced planning and time management rules, the application of appropriate standards and templates, the existence of a supportive infrastructure and team building measures, ensuring synergy effects from teamwork (Juli, 2003).

There are five major parts of project management

1) having a formal implementation plan,
2) a realistic time frame,
3) having periodic project status workshops,
4) having an effective project leader who is also a champion, and having project team members who are stakeholders (Banarjee, 2003)

Balanced project team

Project team was identified as critical success factors by Nah et al (2001); Bhatti (2005) and Nelson et al(2001). A good project team is crucial to the success of any large endeavour, and this is especially so in a large ERP project (Davenport, 2000).

ERP implementation teams were “multidisciplinary, dedicated teams, comprised normally of Information Technology specialists, key users and operations personnel, as well as consultants with process redesign and change management skills” (Caldas et al, 2000). Using a mix of consultants and internal staff to work together in the project team would enable internal staff members to grow the necessary technical skills for ERP system design and implementation (Sumner, 1999). The project team and consultant should be assigned on a full time basis to ensure their focus on the project (Adams et al, 1990).
Two important factors are the integration of third-party consultants and retention within the organisation of the relevant knowledge (Collado et al, 2005)

Staff and consultants

Consultant and vendor support was identified as critical success factors by Nelson et al (2001) and Bhatti (2005).

Consultants should be involved in a way that helps the implementation process while also sharing their expertise with the internal staff involved. This is related with the recruitment and motivation of staff and consultants.

Caldas et al (2000) also suggested that ERP consultants were simply jumping in the ERP bandwagon and, for the most part, they did not possess the requisite skills for the job. For example, their survey revealed that only 47% of respondents believed that their consultants were operative and influential during the implementation process. Only 23% stated that the consultants had the necessary skills and experience for the project (Caldas et al, 2000).

Ginzberg et al. (1988) stated that of the important factor associated with the successful implementation of ERP is greater vendor participation in implementation and support

Communication among departments, staff, and users

Communication is crucial from the initiation to the system acceptance phases, as it helps to minimize the user resistance (Nelson et al, 2004). Sumner (1999) argues that it is important that employees are informed about the scope, objectives, activities and updates in advance to make work more

Operational

Business process reengineering

Another important factor that is critical for the success of ERP implementation is the Business Process Reengineering. It is defined by Champy (2003) as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed.(Bhatti, 2005)

BPR is important in the early stages from the initiation through the adaptation phase of the implementation. BPR is not that important when the system is running and it tends to be moderately important in the acceptance stage (Nelson et al, 2004).

ERP software configuration is different from building a customized system because the development focuses shifts from system analysis and design to software configuration (Gibson et al, 1999).

Dimensions concerning business process reengineering are

a) Company's willingness to reengineering,
b) Company's readiness for change, and
c) Company's capability of reengineering. (Banerjee, 2003)

Appropriate training program

The training program should cater both the employee and end user of the system. In ERP implementation process many projects fail in the end due to lack of proper training.

Many researchers consider users training and education to be an important factor of the successful ERP implementation (Nelson et al (2001), Bhatti (2005), Shanks et al (2004), Umble et al. (2003) and Ibrahim (2007)).

Three aspects concerning the contents of training are:
a) logic and concepts of ERP,
b) Features of the ERP system software
c) Hands-on training.

(Banerjee, 2003)

2.4.4 Importance of CSFs for HSV

This study will give HSV better understanding of the issues faced in implementation of ERP. It will better prepare the readers for making decisions and resources management for any implementation. The issues related to critical success factors can be identified at initial stage in order to allocate time and resources.

3 RESEARCH METHODOLOGY

This chapter discusses and determines the research methodology and process for the dissertation. The chapter starts with a review of the two types of research methods, quantitative and qualitative, and is followed by the justification to use qualitative methodology to investigate the research objective. This is followed with a discussion on the research preparation and data collection process.

3.1 Qualitative vs. Quantitative Research Methods

Data can be quantitative or qualitative. The two methods are considered complementary rather than competitive (Malhotra, 1993). Quantitative research attempts to quantify data and uses statistical analysis to test the hypothesis that the researcher begins with. This is the default research method for much of scientific research (McPhail, 1999). On the other hand, qualitative research produces findings without the use of statistical procedures (Neuman, 1997). Furthermore, qualitative research provides insights and understanding, while quantitative research tries to generalize the insights to a population (Perry 1998).
There is much debate on the benefits and differences between quantitative and qualitative research (Yin, 1994). Many researchers argue that a quantitative approach to research is superior to a qualitative one because the use of surveys, experimental design, and statistics are perceived to provide both scientific rigor and objectivity. Therefore quantitative research is assumed to have greater validity, generalizability, and replicability. Hence it provides greater theoretical contributions (Guba et al, 1994).

Despite these criticisms of qualitative research, there are strong counter-pressures against quantitative methods according to Guba et al (1994). A variety of implicit problems in quantitative research include: context stripping (due to selective selection of variables), exclusion of meaning and purpose (that is, not understanding human behavior), and exclusion of the discovery dimension in inquiry (because the verification of hypothesis tends to gloss over the source or the discovery process) (Guba et al. 1994). For these reasons, qualitative research is gaining popularity (Easterby et al, 1991)

The qualitative method was assessed to be useful for the purposes of this study, since quantitative data research is useful when general trends have to be identified or measured (Trochim 2001), when the issues under study impact upon a significant number of people and may be widely applicable to the general population rather than simply being relevant among limited groups where examination of the individual differences becomes necessary. In this case, the study specifically deals only with owner of the company. The nature of the study is also such that a special understanding was sought on the specific

issues of business processes; hence a qualitative approach was felt to be suitable.

3.2 Selected Research Methodology:

For this study, it is decided to use the qualitative research technique called case study approach. There are several reasons for this:

- Since the focus of this research is on one company
- Selection of CSFs can be a complex process. In such a dynamic setting it is best to use qualitative research methodology (using case studies) to understand the situation.
- Face-to-face semi-structured interview with the owner can help to provide understanding and information on several qualitative areas, such as: identifying customer requirements, reasons for implementing specific CSFs, customer needs data, and discussions and feedback.
- A case study approach can provide a robust insight and thus achieve a higher level of external validity and reliability

3.3 Research Process:

3.3.1 Research Preparation

Case study research is an inductive, theory generation; process (Parkhe, 1993). There is, however, the question of whether one starts from a zero base or some prior theory. Eisenhardt (1998) recommends the zero-base or grounded-theory approach – in such a case the process is inductive, flexible, and opportunistic, and allows for adding questions during a series of workshops. Therefore, for this dissertation, zero base theory is utilized.

3.3.2 HSV selection

There are several reasons for this:

- The focus of thesis is on SMEs. HSV fall under the same category.
- SMEs are recognised as the most responsive engine of economic growth. The UK's 3.7 million SMEs account for approximately 40% of our GDP and have annual turnover of one trillion pounds (Anon, 2009). These figures highlight the importance of doing research on SMEs.
- Small size of HSV is ideal for understanding the business logic within given time. It would be more difficult to implement ERP system in comparatively larger organisation within given time.

- The author is expecting to face business and external issues in this project similar to other SMEs. Lessons learnt here can help whilst implementing ERP system in other SMEs.
- List of CSFs for HSV are expected to be similar to other SMEs.
- HSV is the sponsor of this project and company is willing to give full access to the company information.

3.3.3 Data Collection

The objective of data gathering is to obtain a rich set of information for this dissertation in order to capture the research topic's complexity, corroborate the learning, and to be able to triangulate one's findings. This phase is considered important and critical to ensure that dissertation's findings are accurate. Hence, advance preparation is essential for the research to ensure that multiple sources of evidence are investigated (Yin, 1994).

In this dissertation, workshops are the primary data collection technique. These data are complemented and triangulated with other sources of evidence such as internal company documents, company websites, and information from secondary sources, such as Internet Web-sites

3.3.4 Data Analysis

After the workshops, the contents will be analyzed. The main goal of data analysis is to produce convincing conclusions and to eliminate alternative explanation. Data analysis involves reviewing, categorizing, tabulating, and recombining evidence to ascertain meaning related to the dissertation's initial aim and objective, research questions and issues (Yin, 1994). Analysis of field data and the succeeding interpretation are considered the heart of theory building from case studies. However, this is the most difficult and the least codified part of the process (Eisenhardt, 1989). It is very important to ensure that all data are treated equally and without bias while preserving its original meaning and context (Yinm 1994).

Hence in this dissertation, data analysis will begin after the first workshop, and will continue through the entire data collection phase and beyond. This approach will be used to guide the data collection process and will provide a focus to limit the amount of excess data collected (Morse, 1994). It is planned to enhance the data analysis by

- Relying on all available and relevant information
- Considering alternative explanations and rival theories
- Focusing on the most significant aspects of the data, and
- Building on prior experience and expert knowledge

3.3.5 Implementation

This phase consists of process mapping, implementation of Smart Office and evaluation of CSFs framework

4 ERP IMPELEMENTATION IN HSV

The main objective of this chapter is to discuss implementation of Smart Office within HSV in the form of case study. The chapter starts with the company background and followed procedure for capturing As-Is and To-Be model. This is followed with the discussion on implementation of Smart office.

4.1 Company Background

HSV is providing the sound solutions to churches, offices, village halls and schools. In the near future, company is looking to expand and wants to move into the home entertainment market. Currently, the company is using Excel sheets to manage their inventories and contacts which results in issues like duplication, poor quality and management of information. Enormous amount of time is wasted in creating project proposal. Installation of Smart office will allow them to overcome these issues and focus on their core business competencies

The company needs to automate its business process in order to stay competitive in the market. By implementing ERP system called Smart Office HSV is trying to achieve benefits mentioned in chapter1

4.2 Relationship between CSFs and Implementation model

Selected Stumberger implementation model consists of different phases, as presented in figure 4.1. As different factors are important in different stages, it is important to classify the selected CSFs into the phases of implementation methodology where the factors may come into play. Figure 4.1 shows the classification of CSFs into implementation model.

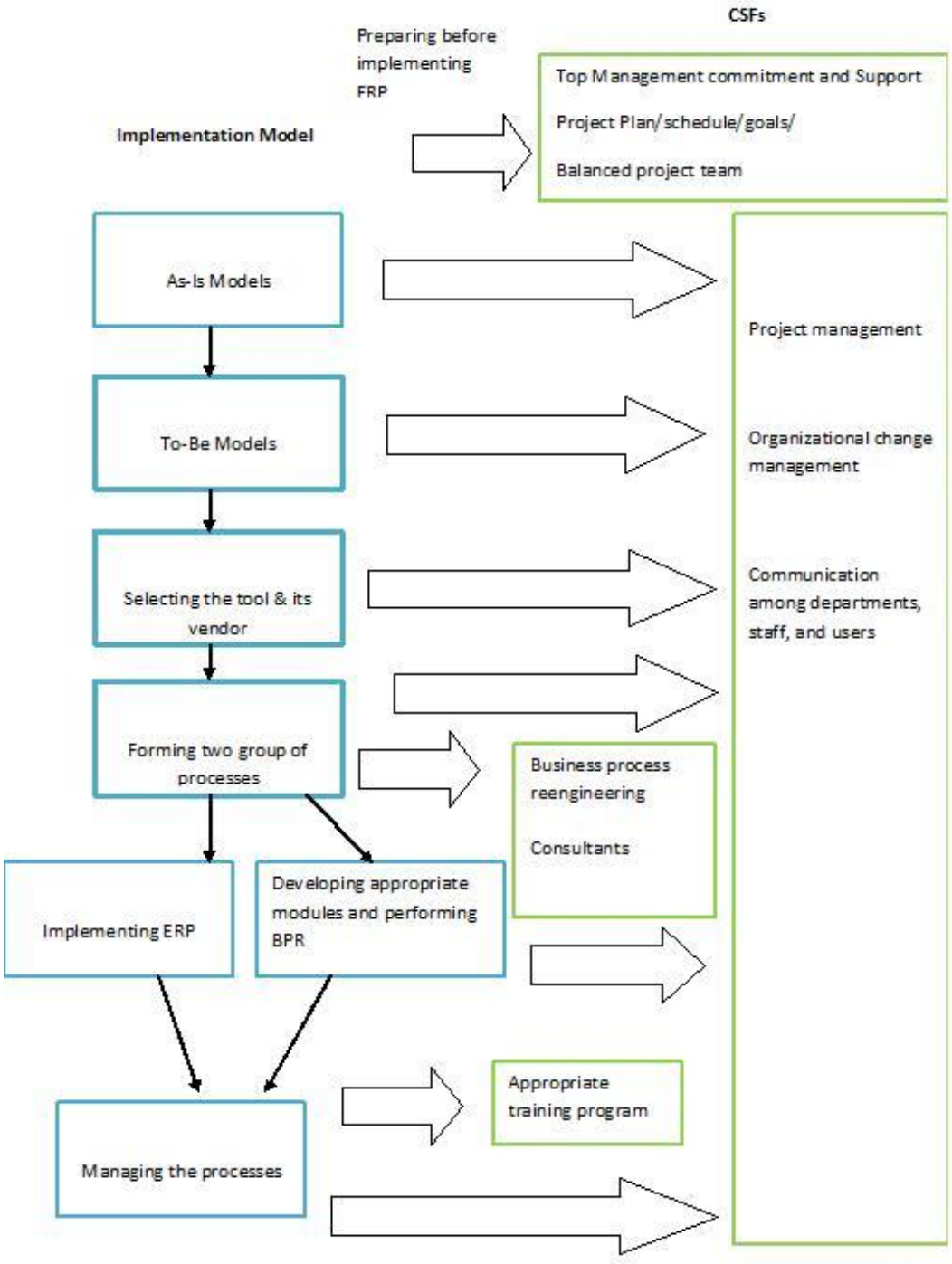


Figure 4-1: Classification of CSFs of implementation model

There are some CSFs which are considered as preparation CSFs (see figure 4.1). The author has decided that these CSFs must be looked into before initiating the first phase of the implementation process.

Top Management commitment and Support

Commitment of the owner of HSV is needed before initiating the implementation of Smart Office. Owner of HSV has committed to provide required resources time during the implementation. This also involves personal involvement for required amount of time.

Project Plan/schedule/goals/

Clear goals and objective were set to meet business needs. Project plan was also developed to divide the project into components to make work easier and manageable.

Balanced project team

Setting up a balanced team in this case was not a complicated task. It consists of author, owner of HSV and supervisor allocated by Cranfield University.

Project management

Good project management is essential for the project. The author has tried to set a project plan with realistic time frame especially all meetings were scheduled at convenient time for the owner.

Organizational change management

After the Smart Office implementation, the owner of HSV will mainly use the system. Owner of HSV seems to be quite interested in the project so it can be assumed that there will be negligible resistance to use new system.

Communication among departments, staff, and users

It was decided to update stakeholders with every activity of this Smart Office implementation project.

Business Process Reengineering

It was to decided to align As-Is processes with the Smart Office. Smart Office was not decided to be modified, as far as possible. Avoiding modifications help in reducing errors and taking advantage of upgrading to new version in future.

Consultants

The author and owner of HSV were novice users of Smart Office. It was decided to involve experts from vendor as consultants in the project. Requests were decided to be made wherever required.

Appropriate training program

It was decided to ensure that the owner of HSV understands Smart Office. The training will cover logic and concepts, features and working of Smart Office.

4.3 Process Capturing

Workshops were conducted for capturing both As-Is and To-Be processes. Workshops offered face to face sessions with the HSV to resolve issues, with concern to their business.

The purposes of workshops were:

1) To capture the As Is model in the form of flow chart

2) Identify the limitations of the As-Is model

3) To align As-Is model with the ERP systems in order to gain full benefits of ERP implementation.

4) Discuss reasons for the selection of Smart Office

5) To verify continuous feedback from the customer during the implementation process

There were nine workshops conducted and duration of each workshop was 8 hours. The team running this session would consist of the author and owner of the HSV. The author was responsible for taking notes and coordinating the session.

4.4 Implementation Model

Phases of selected Stermberger implementation model are shown in figure 4.1. Next, these phases are discussed in detail

4.4.1 As-Is Model

As-Is model was captured in first two workshops. As-Is model as shown in Figure 4.1, involves a great deal of manual labour of the sales man and Engineer. The entire sales procedure is elaborated as follows:

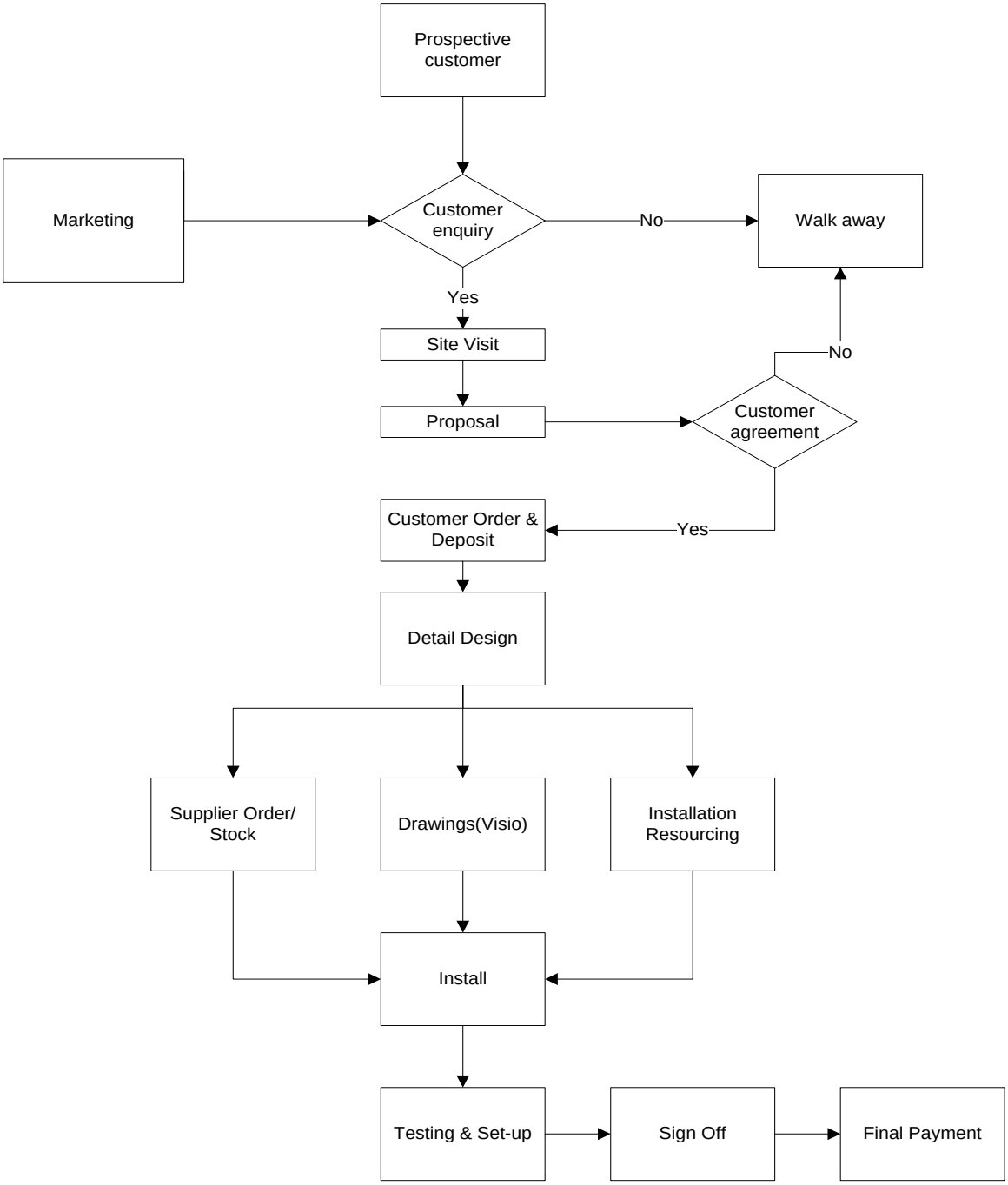


Figure 4-2: AS-IS Model

After receiving an enquiry request from the customer, the salesperson of HSV will manually collect customer requirements on a sales enquiry form and book an installation engineer for a site visit. At the end of site inspection, the engineer generates a quotation by using the existing system as shown in appendix 1. If a customer accepts the quotation, engineer feed the information into their existing system and issue a project proposal (Appendix 2). When a project proposal is accepted by the customer and paid the required deposit. He

will create a manual detail design. At the same time, the engineer will check the stock by using the system. Because engineer is too busy managing all the projects, making an inventory count, converting design into drawing by using Microsoft Visio, ordering for the out of stock items, it is hard for the engineer to keep updated on a daily basis so most of the time he can at only best estimate the installation date.

Stock check takes place randomly and at the time of project proposal creation. Engineer order for out of stock items through telephone. Manually created reference number is given to the distributor or manufacturer in order to keep the track of the purchase order. After the order, the engineer will enter the purchase order information into the current system (Appendix 3). After receiving the delivery, boxes are hand carried to the warehouse, where they are placed in their allocated rack spaces.

Customers normally pay 50% of the total amount at the point of project acceptance and 25% of the total amount prior to the installation. After the installation, the system is tested and setup. When the customer signs off the project, he pays the rest of the 25 % of the total amount within 14 days.

The main system is in the form of excel sheets, consisting of three types of working sheets

Master supplier list- This is a master sheet where information about the stock order, stock management and project proposal is saved.

Project Quotation- For every project, a new worksheet is created and information relevant to that project is copied across and necessary calculations are made by using built in formulas.

Project Proposal for Customer- Necessary information is copied to a new sheet called project proposal. Information is manually modified to make it readable for customer.

Other applications used by the engineer are

- Microsoft Visio is used to create a detail design of the system.
- Microsoft Outlook- it is used for contact management.

4.4.2 Validation

The owner of HSV verified and confirmed these processes.

4.4.3 Issues with the As-Is Model:

- Any member of the staff might make an arithmetic error while using the system. For example, if a member of the staff isn't careful in calculating the project selling price, the price might be so low that the company receive little or no profit.
- Lack of business process integration of the system- The result is isolated functionality, multiple instances of the same data, redundant manual activities, higher costs and inefficient responses to the customers

- Unable to calculate Labour costing -Time is a valuable resource and it is important to maximize team's time and get as much efficiency as possible.

- The installation engineer is responsible for the management of the business processes from project proposal creation to stock management. The installation engineer normally gives date of completion on the basis which results in dissatisfaction of the customers when projects are delayed

- Project management and scheduling is done manually by the installation engineer and this wastes time.

- There is no system available for stock ordering and maintaining stock levels. This is managed manually by the engineer. This wastes time and increases risk of error.

4.4.4 To-Be Model

The client was overall satisfied with the existing overall business logic at abstract level. As a result, the author has assumed To-Be model same as As-Is model as shown in figure 4.2. Differences between these models came into the picture at more detailed level. At this level, the existing business processes of HSV are unnecessarily long and time consuming. Manual input of data and lack of integration among different processes forced HSV to implement Smart Office. With the implementation of the Smart Office system, these problems could be resolved. It was decided to align business processes with the ERP systems in order to gain full benefits of ERP implementation. As a result, processes of Smart Office were considered as To-Be model. Smart office helps in integrating and automating the business processes as shown in figure 4.2

4.4.5 Tools and Vendor:

Simply Reliable Software's Smart Office is all in one business software for the custom integration industry. Smart Office focuses on the process of the company and helps them to organize, control and monitor their business. It leads the user through initial customer contact, the proposal process, design, project management, labour integration and finally to accounting and billing.

HSV found Smart Office suitable for their business. Smart office allows the company to integrate their business processes and overcome problems.

4.4.6 Implementation

Time constraints restricted implementation of the whole system. In this thesis, the author put emphasis on saving contacts, managing project, creating proposals, inventory management, generating purchase orders and creating invoices to highlight the benefits of implementing Smart Office. These processes are divided into two groups.

- Group 1: Processes which will be adapted to ERP system
- Group 2: Processes for which there is a need for customization of ERP system

4.4.7 Group 1: Processes which will be adapted to ERP system

The business processes which will be adapted are

Saving Contacts:

Customer retention is not possible without managing the relationship with the customer. Smart Office provides the facility of saving customer's and vendor's information. Saved information is available to every user of the system.

Figure 4.3 show the process used to manage contacts in Smart Office. In Smart Office, an installation engineer must identify the classification of the contact. The classification as shown in Figure 4.4 allows the system to identify the vendors and link them with preferred vendor field in Product module. For every contact, the system generates a unique code. This code acts as the primary identifier for the contact.

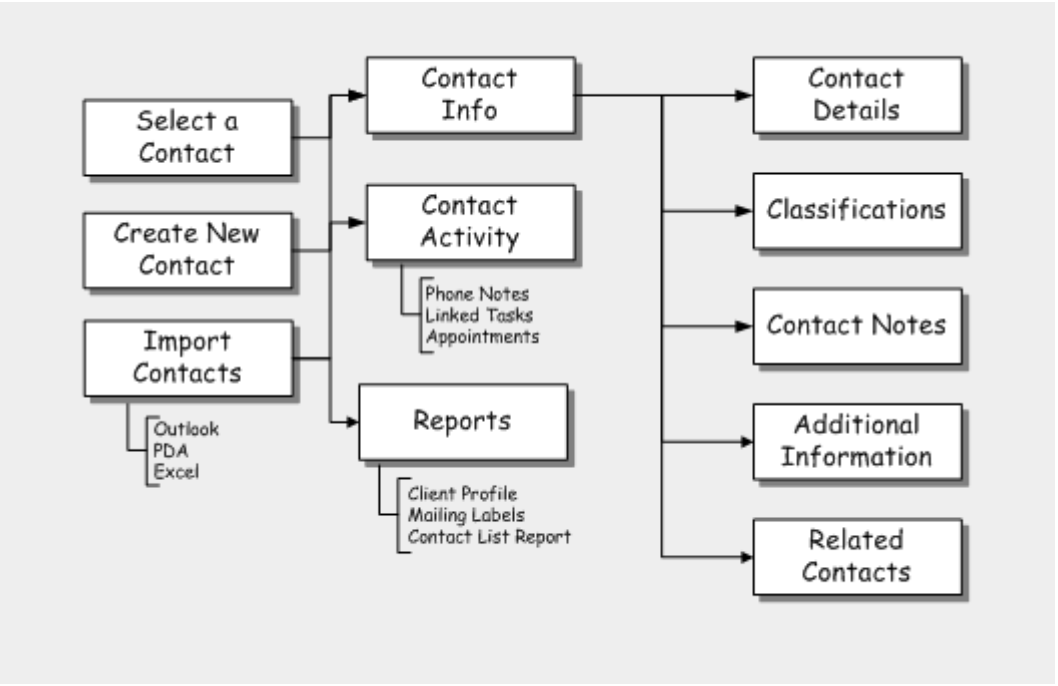


Figure 4-3: Contact Process (Smart Office)

Smart Office is also integrated with Microsoft Outlook in order to import contacts and send emails. The changes made in one of the software can be transferred through synchronization saving customer's time. The list of contacts in Smart Office appears as shown in figure 4.4

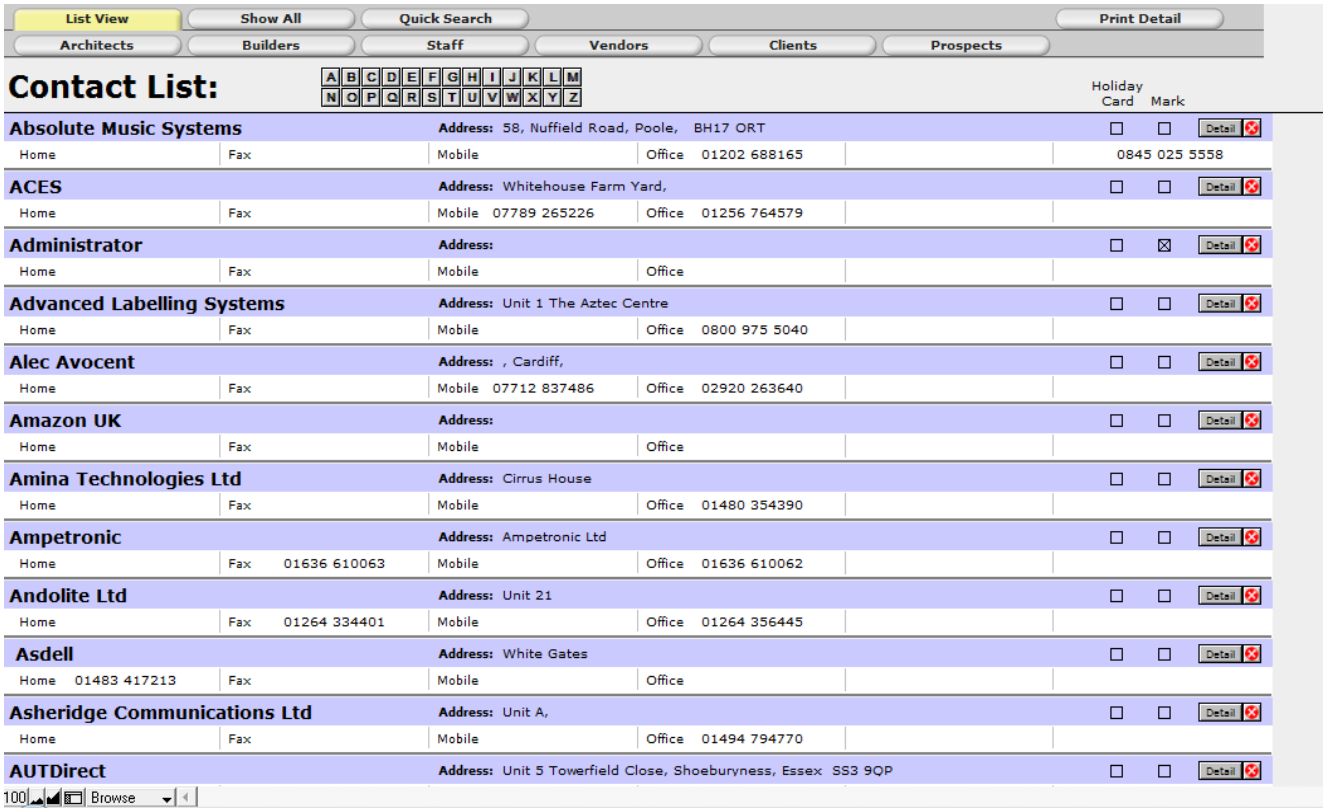


Figure 4-4: Contact List (Smart Office)

Managing Projects:

Management of resources and time within the budget is crucial for the success of the project. Smart Office ensures the management by providing capabilities of scheduling, work orders, reporting and Gantt chart. All of these modules linked with inventory and the required information is generated through the proposal. The following figure shows the process of scheduling (Figure 4.5) and work order (4.6)

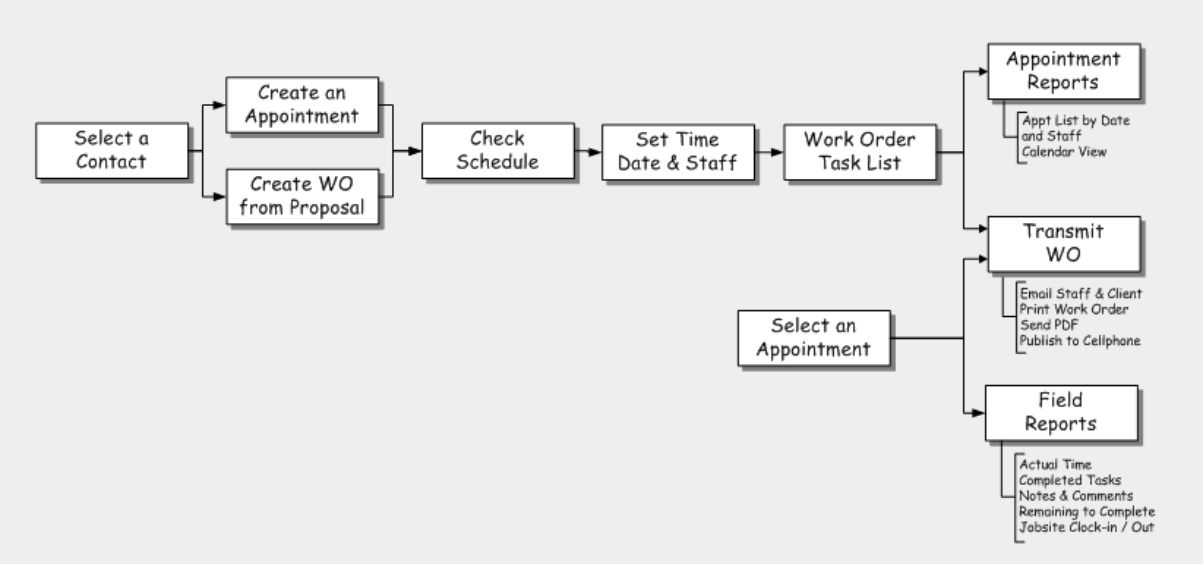


Figure 4-5: Scheduling & Work Order (Smart Office)

Scheduling

Managing schedules manually is the frustrating and time consuming job for a manager. Time is a costly resource and it is crucial to fully utilize the team's time. Smart office saves staff's time and gets maximum efficiency. The system saves employee and customer schedules and allow management to check their appointments in the form of colour charts. Smart Office provides facility of individual employee schedule or project schedule on daily, weekly or monthly basis as shown in figure 4-6.

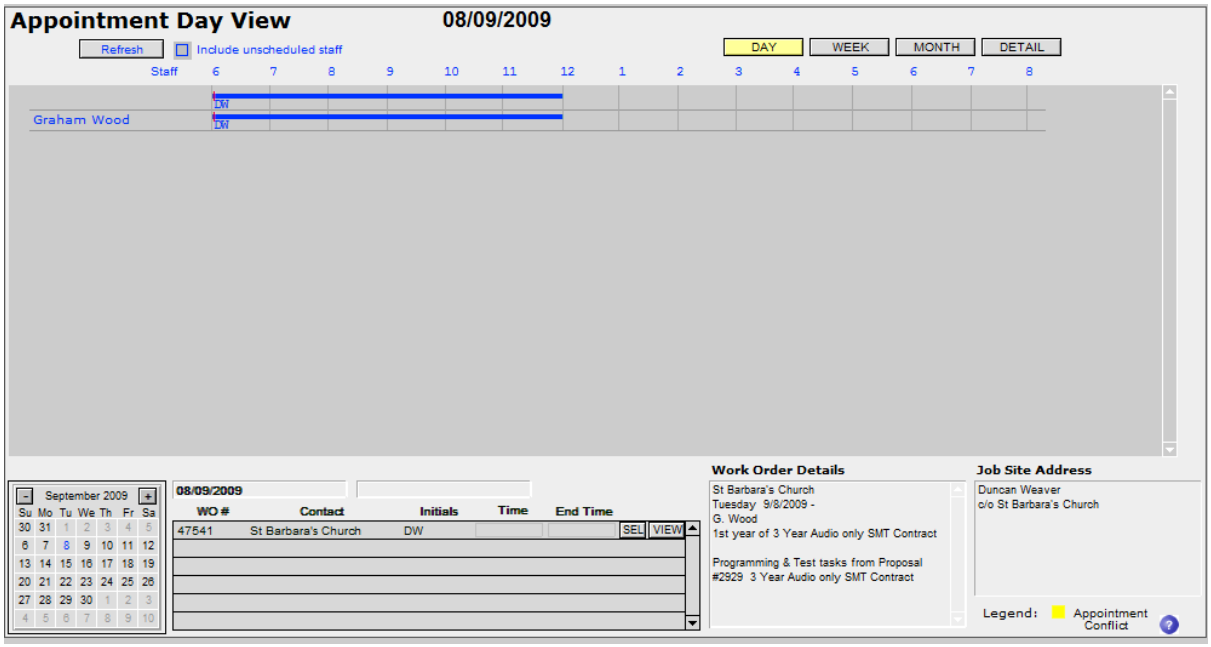


Figure 4-6: Appointment Report (Smart Office)

Work order

Smart Office provides a facility of allocate work in the form of tasks assigned to each member of the staff. The information about the tasks is available on the schedule. Timing, ownership, and availability of the staff is organised by the installation engineer. After completion of the work, engineer only input the time and cost of the job is instantly calculated and update on the system. Please see the appendix 4 for the work order.

Gantt Charts

Gantt chart provides help in management of resources consumption and estimate resources required in the futures. This tool assists in reducing time wastage and improves overall performance of the team.

Labour detail:

Smart Office assists in calculating labour cost and allows saving time spend in calculating cost. After having discussion with the client, the labour was divided into five different types and labour rates were setup as shown in labour breakdown report. Please see appendix 5

4.4.8 Group 2: Processes which needs customization of ERP

Creating Project Proposal

The following strategy is adopted in order to create the best proposal

Standardization

The author has developed a standard look by using a same logo, company name and address everywhere.

Pictures

It was decided to use display pictures for every product to make the proposal more meaningful.

Personalise

The words in the proposal help customers to visualise the experience of ownership. The words used represent represents customer's emotion.

Proposals

Smart Office provides a facility of assemblies and quickspec group which allow quicker addition of multiple items. Advance proposal design provides facility of adding all the features discussed in ‘strategy for the best proposal’. These facilities allow staff to put effort in generating more sales and providing customer service instead of spending it in front of computer.

The Project proposal processing consists of a number of steps as shown in figure 4-7. Customer is selected from the contact list so that the information (customer name, address, phone number) is included in the project proposal. A unique number is assigned by the system to each proposal, because a customer may have more than one proposal.

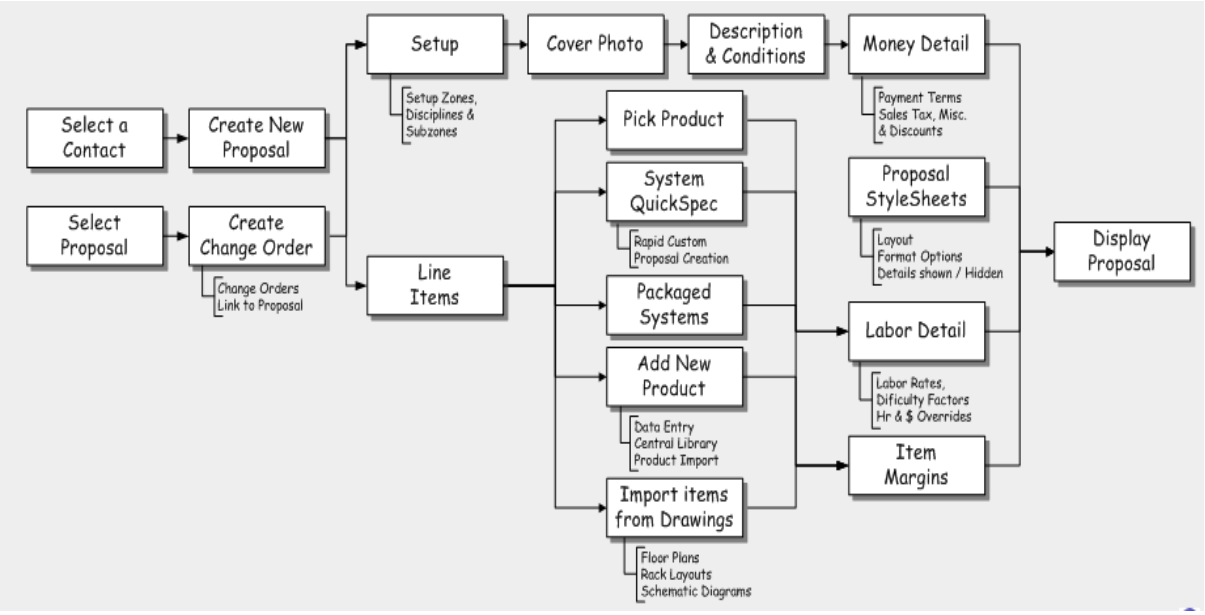


Figure 4-7: Project Proposal (Smart Office)

Smart Office will automatically generate product description and relevant price. Furthermore, it also calculates the total price for labour cost and sales tax, with which the staff can provide an accurate price to the customer. The system automatically transfers the relevant information from project proposals to invoices. When all the required information is entered, the installation engineer generates a project proposal. Subsequently, after acceptance of the project proposal, the engineer posts the invoice. Smart Office provides the facility of progress billing by dividing payment into phases. Please see appendix 6 for the project proposal.

Inventory Management

The inventory module provides a solution for HSV to manage their stock by using “Just in Time”. Smart Office helps in improving efficiency and reduces

handling time. It allows the engineer to keep track of the stock by using functions such as request, order, receive, and deliver. One of the key facilities of inventory management is to provide capability of maintaining minimum stock level. This module helps in managing the growing stock of HSV.

Inventory management process:

The overall process of inventory management is shown in figure 4-8

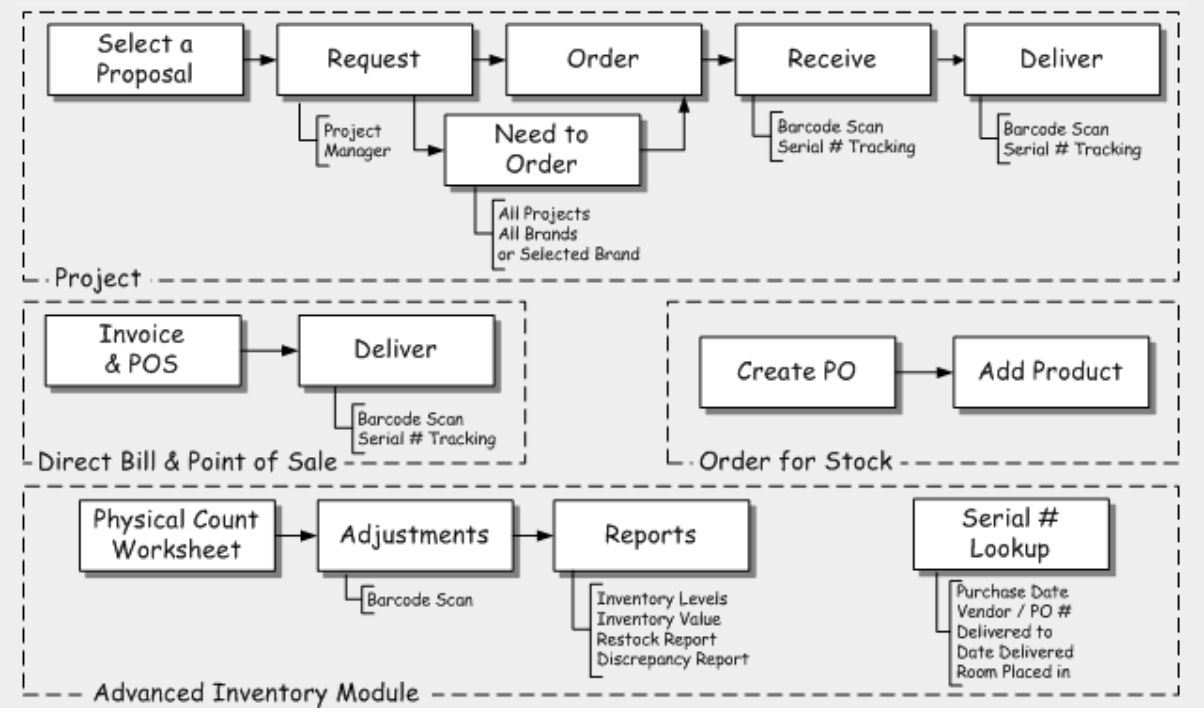


Figure 4-8: Inventory process (Smart Office)

The improved process of managing and ordering is generalised as follow

Request Product:

Smart Office only orders for the items when they are needed .The list of items is generated when the proposal is accepted and converted into project. The system only asks the user to enter the receiving date in order to sends the request.

Ordering Product:

Installation engineer reviews the items requested. The engineer orders for the products by selecting vendor and creating a purchase order as shown in appendix 7.

Receive Items:

When products arrive, staff counts them and cross checks them with accompanying document to determine the related purchase order. After counting, the engineer updates the corresponding inventory records, and items are identified as received and available to use.

Deliver Items:

When products are delivered to a project site, staffs remove them from the system. This is done by marking and posting all related items delivered.

Reporting

In order to run a successful business, it is crucial for management to stay updated with the performance of the business. Smart Office provides the report which management needs to keep them updated with the progress of the business. Diverse range of reports, ranging from sale to inventory can be generated. Examples of few reports are shown in appendix 8
.

4.5 Data cleansing and transfer

The process of cleansing data for making it fit for the system and users. Following methods are used

4.5.1 Parsing

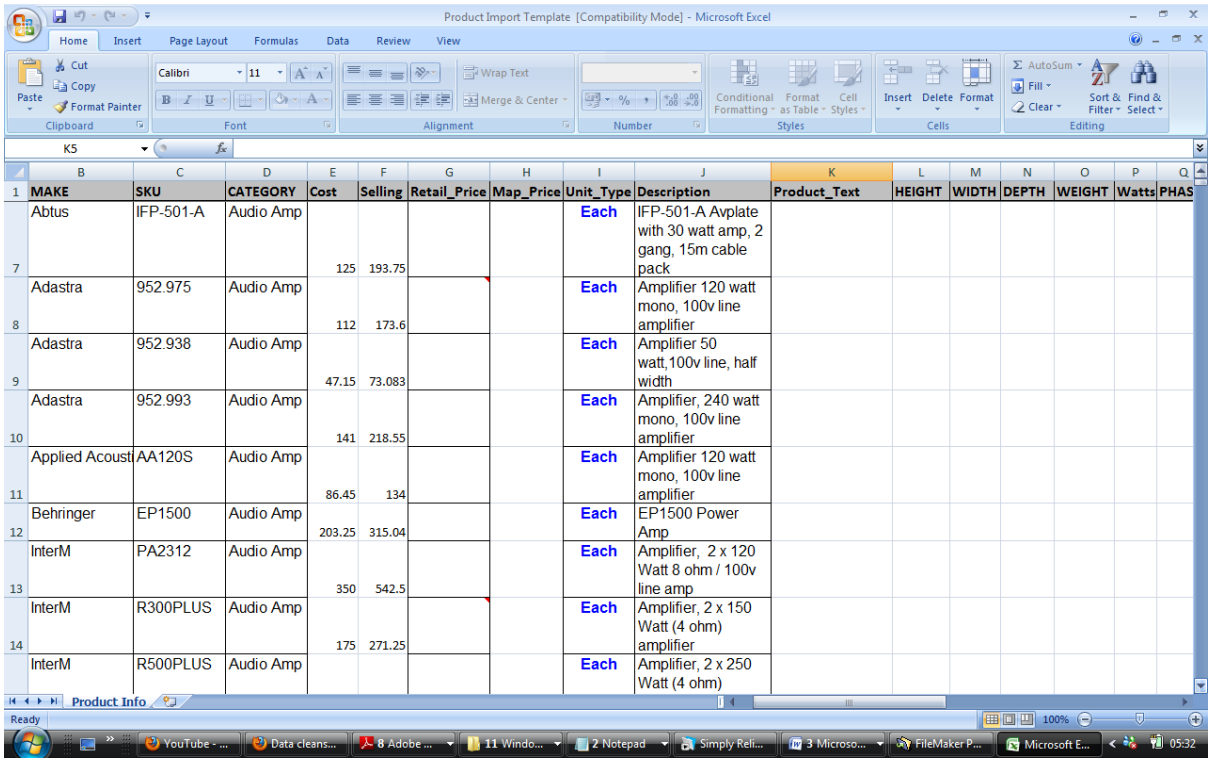
During this process, syntax and grammar mistakes are removed. The data language is change into acceptable form.

4.5.2 Data Duplication removal

During this process, duplicate data is identified and the data not required is removed from the system.

4.5.3 Data Transformation

The data format is changed into the format required by the Smart Office. For example, for products loading data is converted into the template as shown in figure 4-9.



	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	MAKE	SKU	CATEGORY	Cost	Selling	Retail_Price	Map_Price	Unit_Type	Description	Product_Text	HEIGHT	WIDTH	DEPTH	WEIGHT	Watts	PHAS
7	Abtus	IFP-501-A	Audio Amp	125	193.75			Each	IFP-501-A Avplate with 30 watt amp, 2 gang, 15m cable pack							
8	Adastra	952.975	Audio Amp	112	173.6			Each	Amplifier 120 watt mono, 100v line amplifier							
9	Adastra	952.938	Audio Amp	47.15	73.083			Each	Amplifier 50 watt,100v line, half width							
10	Adastra	952.993	Audio Amp	141	218.55			Each	Amplifier, 240 watt mono, 100v line amplifier							
11	Applied Acousti	AA120S	Audio Amp	86.45	134			Each	Amplifier 120 watt mono, 100v line amplifier							
12	Behringer	EP1500	Audio Amp	203.25	315.04			Each	EP1500 Power Amp							
13	InterM	PA2312	Audio Amp	350	542.5			Each	Amplifier, 2 x 120 Watt 8 ohm / 100v line amp							
14	InterM	R300PLUS	Audio Amp	175	271.25			Each	Amplifier, 2 x 150 Watt (4 ohm) amplifier							
	InterM	R500PLUS	Audio Amp					Each	Amplifier, 2 x 250 Watt (4 ohm)							

Figure 4-9: Data Import Template

4.6 Data Cleansing Issues

4.6.1 Data maintenance

The process of data cleansing is time consuming and expensive and any changes need to be made carefully made in order to avoid cleansing on the whole data.

4.6.2 Error correction

The most challenging problem is to correct errors. It is lengthy and time consuming process. If any changes are made to the data, the cleansing process should be performed on the affected data.

5 VALIDATION

The main objective of this chapter is to validate the working of Smart Office framework with the help of workshops and proposed CSFs on the basis of personal observation. This is followed with discussion on results of these workshops.

5.1 Smart Office Validation

Workshop was conducted for testing the Smart Office. Workshop offered face to face sessions with the HSV to resolve issues, with concern to their business.

The purpose of workshop was:

- Assess how useful the Smart Office is for HSV
- Validation of Smart Office
- Identify limitations within Smart Office in conjunction with the business need of HSV
- Resolve straightforward issues and suggest solution for overcoming the complex issues.

The Workshop helped the HSV to quickly resolve uncomplicated issues and document the complex issues. Workshop allowed the author to closely work with the client and ensure Smart office is performing according to customer expectations.

5.1.1 Methodology

The workshop was conducted and session of the workshop was approximately 8 hours. The team running this session would consist of the author and owner HSV. The author was responsible for taking notes and coordinating the session.

1) The first step consists of semi-structured interview. Please see appendix 9

2) The last phase included a brainstorming session to resolve the straightforward issues rose during interview and find solutions for complicated issues later. The main focus of brainstorming session was on identifying the limitations, resources available to solve the problem, and if the resources are not available, identify alternative ways to reduce the impact of the limitation.

5.1.2 Results for Smart Office

The author has found mixed results and feedback from the client was reasonable. The only exception was the project proposal's display. The client was satisfied with the output of other deliverables (purchase order, invoice etc).

Minor issues like the fixing of broken button, deactivation of advance inventory modules were resolved by contacting Vendor's support department.

Complex issues forced HSV either to make changes to their business process or request for customization of the software. A few of them are

Warehouse - Smart Office only allows saving the name of the warehouse and does not provide any facility of saving information about the locations within the warehouse e.g. physical rack spaces. This forced HSV to stop to save information about physical rack spaces in the system which they used to do while using the legacy system.

Project Proposal- There is quite a few issues while designing a project proposal. This is one of the main deliverables and crucial for his business. This is the first document the customer will see from HSV and the issues raised during the workshop in relation to the project proposal cannot be resolved without customization of the Smart office. The issues are;

Customer wants the log in the top right corner. Currently, Smart Office only allows displaying logo either on the bottom right corner or the top left corner as show in appendix 10. Furthermore customer wants to remove the logo from the title page.

Currently, the quantity column is not present and item's quantity is shown on the left hand side as shown in appendix 11. This confuses customer and find difficult in the first sight to understand that the numbering given is for quantity.

It is identified that there is no section numbering. This helps the when talking to the client or writing a letter pointing out certain items for a particular reference.

While testing the sales tax functionality, the issue was identified. Sales tax exemption depends upon the type of the billing whether billing is line item or progressive billing. Line item billing appeared to exclude VAT on labour but progressive billing appeared to include labour for the VAT calculation so giving different VAT calculations for each type of billing. For example, the author has chosen a taxable customer, and then entered two items with associated labour. One item is declared tax exempt (a loop assembly) the other a CD player with tax. Different final cost was appeared in both cases.

5.2 CSFs Validation

The author has evaluated the proposed CSFs framework on the basis of his personal experience of implementing Smart Office in HSV. The factors that were found critical by the author are shown in figure 5-1

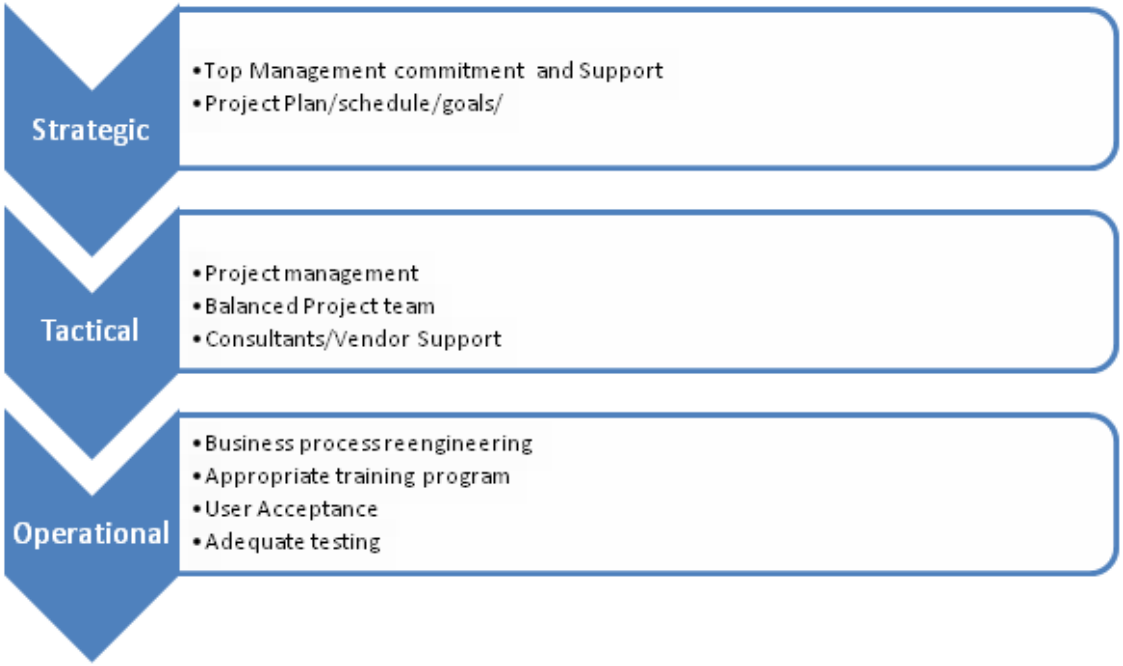


Figure 5-1: CSFs Framework for HSV

5.2.1 Results for CSFs framework

During this project, support from the owner of HSV was found to be the most important factor. It was not possible to even initiate the project without his support. The support from him covered budget, resources, and conflicts. His assistance made the Smart Office implementation smoother. Project plan was thought as 2nd most important factor. It was prepared before implementation and outlined proposed strategic benefits, resources, cost, objectives and timeline. If there was no project plan, it would not be possible to see the clear picture of the project and determine main requirements of the project. Unavailability of the owner of HSV in third month of the four month project, has taken into consideration during the preparation of project plan. Project plan has continuously evolved during the implementation. One of the main reasons for it was business commitments of the owner. The owner was unable to give his next four months schedule however; he initially committed eight days for it.

Project management was found to be another critical factor. Managing resources and meeting deadlines is very crucial for successfully completing this project. During the implementation of Smart Office, the author has faced multiple issues in relation to project management. First issue was time commitment. The author realized that project required more time from the client than committed in the project plan. It was resolved by requesting for extra time and customer agreed to give two more days for the project. Second issue was time allocation for unexpected tasks. Unexpected tasks rose in this project, were allocating time to vendor for answering queries and customization of Smart Office. These tasks resulted in delay and project could not be finished on time.

Involvement of the owner of HSV in this project, as a team member is critical for this project. He was the only available source of contact for accessing information. During the third month, absence of owner was felt. Vendor support was critical as well for this project. Support questions were asked throughout the project for resolving technical issues related to the Smart Office. Questions were asked through email however the author organised two online meetings near the end of the project to get instant answers.

Business process reengineering (BPR) with minimum customization was another important factor. In the beginning of the implementation process, it was decided to align business processes with the ERP systems in order to gain full benefits of ERP implementation. Efforts were made to avoid customization but requirement of making changes to the reporting function could not be avoided at later stages and was considered very important for the system to go live.
Delay in customization of reporting function from vendor, was the main reason for not going live and not finishing project on time.

Appropriate training and education was thought as the one of the most important factor in this case. Because HSV was first time implementing any type of ERP system, most users could be considered as novice users. Training and education were needed for them to work with the new system, because most of them even have no IT experience. Therefore, it was important to train the owner.

Adequate testing was critical as well for minimizing the risk of system failure. After going live. It would be almost impossible for HSV to roll back Smart Office in case of failure. Despite of the importance, author could not be able to find time to perform full testing before project deadline. The main reason was delay in transfer of data. User acceptance was also found to be critical. The author attempted to involve the owner and ask for his feedback at every step of the project for increasing user acceptability. It would not be possible to successfully run the system within organisation without user acceptance.

6 DISCUSSION

This chapter analyse the theoretical and empirical findings and compare them against the objectives of the project and discusses the benefits to the organisation. In this chapter, the author critically reviews the implementation process of ERP in HSV and discusses the CSFs framework. Furthermore, differences between the CSFs frameworks derived from the literature and HSV are discussed.

6.1 Introduction

The objectives of this project were already discussed in chapter 1. The main purpose of the research described in this project is to propose a CSFs framework that will help SMEs like HSV to successfully implement the ERP system.

Initially, the most appropriate implementation model was selected by comparing available methodologies. Furthermore, a pilot CSFs framework for ERP implementation was proposed on the basis of existing literature. Proposed CSFs framework was integrated with selected implementation model in the form of integrated framework (see chapter 5).This integrated framework was then used for the implementation of Smart Office. After implementation, workshop was organised to validate the system results. In addition, the author tested the pilot CSFs framework on the basis of his personal experience.

The author has divided the discussion into areas

6.2 Implementation Models

Review of existing implementation indicates that every implementation model got its own weaknesses and strengths. Some got strength in testing and others in risk so the selection of the model should depend upon the requirements of the project and nature of the organisation. Selected implementation model (figure 2.1) was found to be appropriate for HSV.

6.3 CSFs Framework:

Initially, a pilot CSFs framework (figure 2.5) has been created by combining the CSFs gathered from existing literature. A selection of top 9 CSFs was based on the frequency of each factor. Later, these CSFs were classified into selected implementation model (see figure 4.1). Critical aspect of this selection criterion is that it fails to provide the reasons behind the ranking of the CSFs.

During validation (see chapter 5), a list of CSFs in the form CSFs framework for HSV (figure 5.1), identified by the customer was almost same as the one given in the pilot CSFs framework. CSFs called organisation change management

and communication among departments were replaced by adequate testing and user acceptance in case of CSFs framework for HSV.

Findings from the case study, could lead to a conclusion that the differences in business needs, businesses processes, culture, and structure can result in different CSFs. The study reinforces the need for more research that is focused on SMEs for deeper understanding.

The owner of HSV found the pilot CSFs framework quite useful. It has allowed the organisation to look into critical factors at initial stage for better resource and time management.

6.4 Smart Office implementation

The expected duration of Smart implementation was four months but due to lack of experience and knowledge on Smart Office resulted in delay. It takes few months after implementation to experience the benefits so it was not possible to evaluate the performance of Smart Office.

In the initial stage of the project, the author has failed to define a clear project plan due to the lack of experience. As a result, the process of moving back to the previous phase resulted in delays and frustration. Failure to allocate some time for software customization stopped the system from going live.

During the implementation stage, the author has created product assemblies: These assemblies ensure that all necessary items are included in the proposal. One example is an in wall speaker. To get this installed there is need of a speaker, the new construction bracket, and the speaker wire. The wire and new construction bracket are installed during the pre-wire phase of the project and the speaker is installed during the trim out phase. Each device needs a labour type attached to it during these phases.

Initially involvement from customer was under estimated and the amount of time committed was less than actual time required for information gathering. This has forced both the author and customer to work extra hours towards the end of the project

6.5 Limitations of Smart Office:

During the implementation, there were limitations found in the Smart Office. These issues were in relation to the Human Computer Interaction (HCI). These issues are

6.5.1 Error prevention and handling

The prevention of errors is far cheaper than their later correction. At the moment, Smart Office does not have capability to prevent errors. Addition of validation checks to prevent syntax errors will reduce the cost and time for data maintenance.

6.5.2 Lack of consistency

During the implementation process, lot of time was wasted in order to figure out the right button every screen. For example, information on screen is automatically saved and on the other screen information is only saved by clicking save button. On some screen the same button was called submit as well.

6.5.3 Help

The help button on the screen only provides very basic information. It does not discuss all fields appearing on the screen and business logic behind those screens.

This phase helped the author to find the limitation of the software from customer's point of view. In conclusion the workshop was proved successful and provided the foundation for future study.

6.6 Data Cleansing:

Due to the time constraint, data cleansing was only performed only performed on 80% of the data and then loaded on the system so that the results can be tested. Rest of the 20% still needs to through the data cleansing and loading process.

Overall, the project has been satisfactory. Although there were some issues, these aspects could be improved with time.

7 CONCLUSION

The conclusion summarise the important aspects of the study. These aspects are identified and discussed with the help of empirical and theoretical study. The discussion also covers the objectives of the project set in chapter 1 in order to evaluate the success of the project. Recommendations for future study are included in this chapter.

7.1 Conclusion

The main objective of this project was to propose a CSFs framework for ERP implementation in SMEs. After reviewing the journals, books and articles, the author has recommended the most appropriate implementation model for HSV as discussed in chapter 2. The findings from the literature have shown that every implementation model got strengths and weaknesses. Selection of the model is based upon the business needs of the organisation and varies from one organisation to another. The author has also revealed list of CSFs based on literature about CSFs for ERP implementation. The selected CSFs were linked with phases of selected implementation model. The 9 most common factors were listed and thought to be the most essential for success of the implementation process. (Figure 7.1)

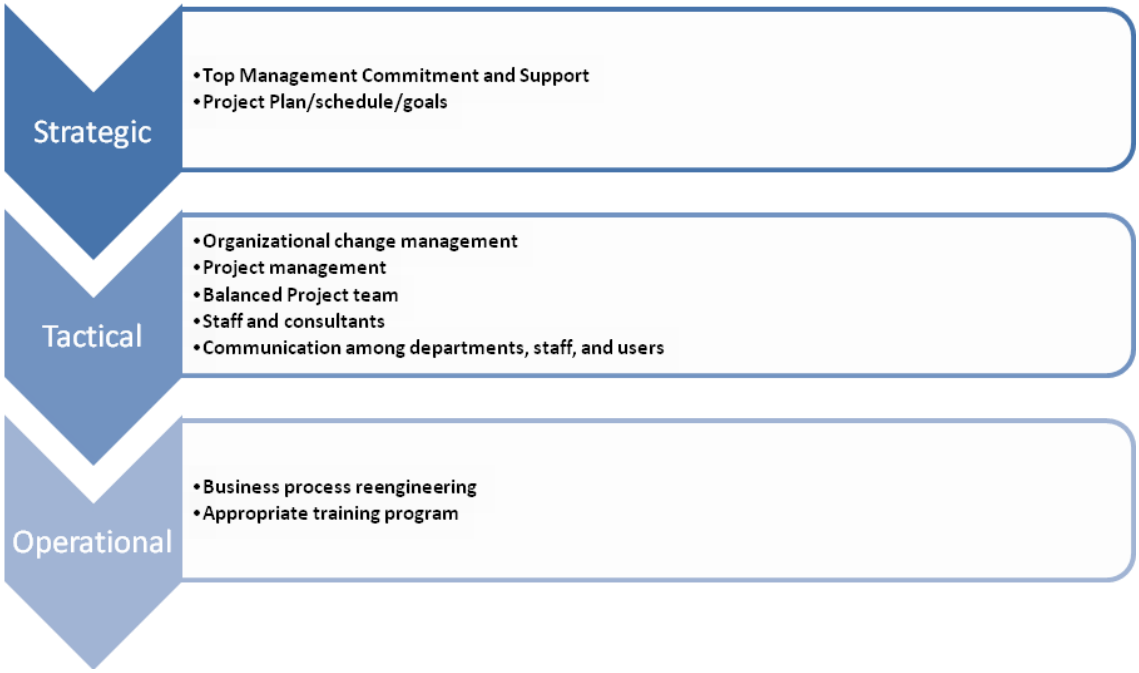


Figure 7-1 Pilot CSFs Framework

Whilst testing the application of CSFs pilot framework on HSV, the author found that some changes need to be made. These changes can be seen by comparing figure 7-1 and figure 7-2.

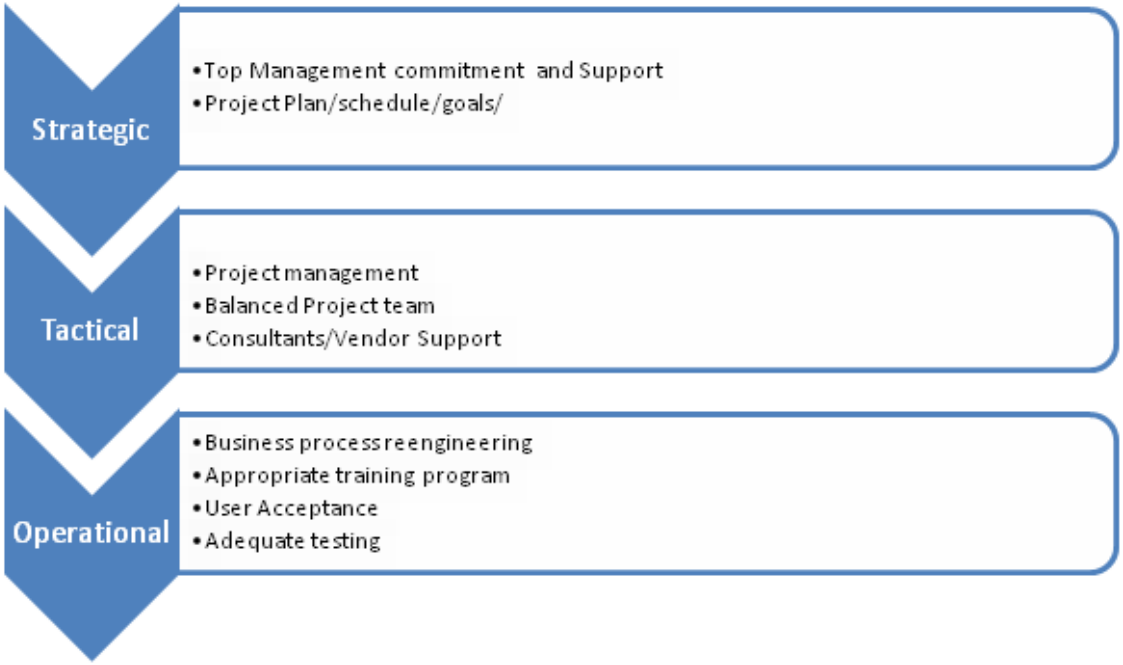


Figure 7-2 CSFs Framework for HSV

As you can see there are 7 common factors and the remaining 2 factors (adequate testing and user acceptance) are different. Main reason for this difference is every organisation got their distinctive culture, requirements and business processes which led to these differences in list of CSFs. On the basis of these results, we conclude that the largest fraction of the critical success factors, found in the literature, apply to the Smart Office implementation in HSV.

Research has given in depth understanding about the issues faced by organisation whilst implementing ERP system. The study helps the author to understand the differences between implementation models and importance of CSFs. The Process of Smart office implementation has given the opportunity to experience the implementation process in real business world.

This study has given better understanding of the issues faced in implementation of ERP in SMEs. It will prepare the readers for making decisions and resources management for any implementation. The issues related to critical success factors like vendor support can be identified at planning stage in order to allocate time and resources.

One of the objectives of this project was to implement Smart Office in HSV. The process of implementation was examined in the form of case study. During the study, the author has found that the implementation process not only consist of

technical aspects but management aspects as well. The planning phase of the project was found the most crucial phase in this project. During the planning stage, the author has not allocated any time for customization of the Smart Office which later on become the main hurdle in stopping the system from going live.

On the basis of experience gained through the implementation process, the author arrived at the conclusion that it is important to allocate time for unseen issues in the project plan.

7.2 Limitations

The main focus of this project was CSFs for ERP implementation in SMEs so we had chosen HSV as our target organisation. The findings from HSV help us to see the implementation of proposed theoretical CSFs framework in SMEs and overcome the limitations. Due to time constraint, the study is only based on the findings within HSV only. As the study is done only on one organisation, might constrain the validity of findings.

All this study was focussed on service sector organisation, potentially limiting the findings to other industries.

The author has fulfilled the main objectives of the project. The only exception is Smart office where system couldn't go live due to project proposal's display and stock location issues. These issues could not be resolved without customizing the Smart Office. The author has already requested the vendor for the respected changes.

Due to the time constraint, the author has not differentiated between primary and secondary sources while collecting data.

7.3 Future Recommendations:

The empirical study in this research is only limited to one company. Further study of at least five SMEs is needed before recommending this framework to SMEs. Once the top 9 CSFs are identified, the future research can look into how to handle these factors. How can we improve these factors in SMEs?

The future research can be continued by making attempt to link to CSFs framework with different phases of other implementation models. Future research could involve a survey study that includes multiple SMEs. This would allow a statistically valid comparison of CSFs between different types of SMEs.

During the evaluation, the customer has raised concerns about display of the project proposal and absence of stock locations in the inventory module. It is essential to contact vendor for these issues and necessary steps should be taken to overcome them.

During the implementation, the author has realised importance of the customer involvement in the project. Involvement of the customer throughout the implementation process is crucial for the success of the project,

The support of the vendor is essential for the success. The customisation of the software is required which is not possible without any support from the Vendor.
It is essential to perform adequate software testing during the implementation process. Higher risk of failure is associated especially in a case where organisation cannot move back to the old system.

Clear scope of the project is crucial for the SMEs. Making changes later in the project results in delays.

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