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EVALUATING THE IMPORTANCE OF A STRUCTURED METHODOLOGY BY MANAGEMENT OF CRITICAL RISK/FAILURE FACTORS IN ERP IMPLEMENTATION

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ABBREVIATIONS

ERP : Enterprise Resource Planning
CRM : Customer Relationship Management
SME : Small to medium enterprise
IT : Information Technology
IS : Information Systems
SDD : Solution Design Documents
FDD : Functional Design Documents
TDD : Technical Design Documents
UAT : User Acceptance Test
OCM : Organizational change management
ISV : Independent Software Vendor
WBS : Work Breakdown Structures

ABSTRACT

Date	July 2011
Authors	Arzu Bayır (19851211) Bhavya Shetty (19850217)
Title	Evaluating the importance of a structured methodology by management of critical risk/failure factors in ERP implementation
Overview	Studies in recent years have revealed the challenges involved in deploying ERP solutions due to its complexity. Before attempting to implement ERP systems, it is essential to study various aspects such as project management, training, and change management in detail to manage the associated risks. When an ERP project is undertaken with insufficient planning, it may result in failure to integrate business processes and in substantial financial loss. Research has been pursued to identify critical risk/failure factors that may arise during implementation and the measures that should be taken to manage them. However, there is lack of research in identifying the management of critical risk/failure factor using a structured methodology. This raises a question of 'can a structured methodology identify and manage critical risk/failure factors and support deploying ERP solutions with a better quality?' A study of Microsoft Sure Step Methodology is performed to identify critical risk/failure factors that frequently occur during ERP implementation. These factors are derived from 8 articles. On determining critical risk/failure factors, we investigated if Sure Step methodology likely contains procedures that approach these factors.
Purpose	The purpose of this research is to identify the frequent critical risk/failure factors that are derived from secondary sources and investigate if Sure Step methodology likely contains procedures that can attend these factors. Based on these findings, we will draw conclusions on importance of using a structured methodology to implement ERP solutions. The research is narrowed to two project types offered by Sure Step to focus on small to medium enterprises.
Method	The study is based on a qualitative approach where information is derived from literature. The literature contains 8 journal articles, 1 conference paper and 1 book. ABI/Inform Global ProQuest, Google Scholar, IEEE Xplore, JSTOR, Emerald, and Science Direct are the databases used for retrieving these articles.
Conclusion & Limitation	The results of this secondary source research showed that a structured methodology has the potential to reduce the critical risk/failure factors as it guides the deployment process. However, research fails to investigate the extent of risk reduction due to limited access to resources. It is also understood that risk/failure factors cannot be standardized as they are specific to an organizations context. Each organization should perform a detailed study before implementing ERP solutions and a methodology can be a useful tool in this process as it provides continuous planning and monitoring at each stage of implementation.

1. INTRODUCTION

The importance of packaged application software has evolved since the 1970's and the idea of integrating enterprise wide processes and functions has been pursued for decades (Klaus, Rosemann, & Gable, 2000, p.141). ERP stands for enterprise resource planning systems. It is packaged application software that emerged in the 1990's. ERP is one of the fastest growing markets in the software industry. Most companies have installed ERP using packages from vendors like SAP, Oracle, and Microsoft because it is more expensive to have custom built software. But custom built software has its own advantages like it meets all the business requirements exactly according to company's specification and minimizes altering of business processes to fit the ERP software. In many cases, ERP systems are much more powerful and cheaper compared to custom built software (Shang & Seddon, 2002, p.271). In a business, ERP is important because it integrates information throughout the supply chain and is used to achieve many objectives like reducing response time to customers & suppliers, providing real time information to people who make decisions and giving authority to appropriate people in the lower levels to make decisions. This implies that managers are not the only ones making decisions throughout the project lifecycle.

ERP implementation is an expensive and extensive undertaking involving many activities and these activities extend across an organization or sometimes across partners in the supply chain. Lately, many organizations do not rush into implementing ERP systems due to the risk involved in it. In the past it has resulted in many cases of partial or complete failure. According to a study done by Trunick (1999), the report resulted in 40% successful ERP implementation, 40% partial implementation, and 20% failure. Other studies have argued that there are more than 50% ERP failures reported, and 60 to 90 percent do not perform as expected (Albadri & Abdallah, 2009). According to Robert Block's analysis project failures can occur due to requirement failure, technical failure, technology failure, planning and control failure, resource failure and methodology failure (Sumner, 2005, p.114). In an ERP project, methodology is used to guide the deployment of ERP solutions. Methodology failure could have subsequent impact on the ERP implementation process but if methodology successfully supports deploying an ERP solution it can result in organizational benefits. In this research, we will evaluate the importance of using a structured methodology and the role it plays in ERP solution deployment. "A methodology is a set of guidelines or principles that can be tailored and applied to a specific situation; they could be a specific approach, templates, forms or checklists used over the project life cycle." A methodology defines the work of all the members involved in a project from the start to end. (Charvat, 2003, p.3) A methodology is useful for customers and service providers as it provides clear end-to-end process flow for solution development and deployment.

Different vendors have introduced methodologies to implement their ERP solutions. SAP has Accelerated SAP methodology which aims at speeding up the implementation of SAP solutions (Esteves & Pastor, 2001), Oracle has Application Implementation methodology (AIM) which aims at effectively conducting project steps on Oracle applications (Material on AIM Methodology, 2002) and Microsoft has introduced Sure Step Methodology to ensure delivery of Microsoft solutions (Shankar & Bellefroid, 2010, p.16). Methodologies aim at reducing deployment time and cost. But the drawback is that all methodologies have at least 5 phases, each phase has a list of activities that needs to be performed. It then becomes important that each activity is undertaken with enough attention to ensure quality deployment. Continuous interaction and coordination among the key people involved in the project is equally important as it is highly demanding to execute each activity addressed in a

methodology. We chose to focus on Sure Step Methodology as it is one of the more interesting examples of a structured methodology and we have been able to access resources that can help us to pursue this research.

Sure Step is broken down into six phases; first phase is a pre-implementation phase called Diagnostic where service providers give sufficient information to choose a suitable solution to meet customers' needs. Analysis, Design, Development, Deployment, and Operation phases are the different implementation phases, and they aim at understanding how Sure Step can help the service provider to deliver the solution that was envisioned in the Diagnostic phase. Sure Step includes two approaches namely Waterfall and Agile. Each approach has a project type fitting specific requirement. Waterfall has 4 project types namely Rapid, Standard, Enterprise and Upgrade, and Agile has 1 project type named as Agile itself. Waterfall is the sequential solution delivery approach, while Agile provides a flexible and iterative solution delivery. The activities in each of these project types are broken down into cross phases. It provides guidance on optimizing engagements and defines the role of all the people engaged in the project both from the service provider and customers end. (Shankar & Bellefroid, 2010, p.16-18, p.190)

1.1. Purpose

When a project is initiated to install ERP systems into an organization, the process can be coined as ERP implementation. Considering many statistics, small and medium size organizations are especially cautious to adapt to ERP systems as they do not have adequate financial and IT resources when compared to large organizations. So such firms are less likely to overcome failed implementation of an expensive ERP system. It is very important to gather, analyze and dissimilate information to choose a suitable ERP system that matches the needs of the organization and result in successful ERP implementation. (Muscatello, Small, & Chen, 2003, p.851)

The purpose of this research is to evaluate the importance of using a structured methodology especially for small to medium organizations. Research is carried out by describing and analyzing critical risk/failure factors that are frequently associated with ERP implementation and then evaluating management of these factors using Sure Step methodology. We will focus on Rapid and Standard project types provided by Sure Step as they focus on small to medium organizations.

Rapid project type is the simplest delivery approach suitable for small to medium businesses with up to 25 users and Standard project type is widely used in medium to large businesses with up to 250 users in a company. If using the standard solution fits customer's requirement close to 90%, then the usage of Rapid project type is justified. And if standard solution fits customer requirement up to 70-80% then selection of Standard project type is justified and the required customization is not too complex. (Shankar & Bellefroid, 2010, p.142, p.144)

1.2. Research and Strategic Questions

Research questions can be answered by performing research and strategic questions cannot be answered by doing research. A research cannot be performed on something that has not yet happened, it can be carried out only on events that are or have been. Strategic questions are asked to guide the research project and they concern the future of the

organizations, with "what should be done" questions. (Fisher, 2007, p.34) Paying close attention to the purpose of this research we have formulated the following questions to start our research.

Research question: What critical risk/failure factors can be identified for management by using Sure Step methodology during ERP implementation?

Management, in general, is defined differently by many, according to Kroon (1990) management is a process whereby people in leading positions utilize human and other resources as efficiently as possible in order to provide certain products or services, with the aim of fulfilling particular needs and achieving the stated goals of the business. Fujimoto & Hartel (2010) define management as a process that involves coordinating resources (Human, material, technological, financial) necessary for an organization to achieve its goals. 'Management' in this research question means the process of overcoming critical risk/failure factors completely or controlling limitations of these factors to a certain extent to deliver the ERP solutions in the best possible way.

Strategic question: What critical factors should companies prepare to control for successful ERP implementation?

1.3. Thesis Plan

Here we give an outline on how we will carry out our research.

Introduction provides an overview of the research topic and explains the purpose of this research with research and strategic questions.

Research methodology gives an understanding of methods used to carry out the research and presents the sources and tools used for data collection.

Identifying critical risk/ failure factors through a Literature Review contains a literature map which shows the keywords of the articles that resulted from search and a critical discussion of 8 chosen articles. The most frequent critical risk/failure factors are also identified in this section. Then a conceptual framework for study is developed using the theories derived from literature review, this framework gives a structure to the research proposal.

Linking Risk factors with Sure Step is based on affiliating the critical risk/failure factors with Microsoft Dynamics Sure Step.

Findings & Analysis section discusses the chosen literatures and analyzes the secondary data findings.

Conclusion presents insights on research results, throws light on areas that would need further research and discussed the research limitations.

Appendix comprises of brief information on the project types, different implementation phases, project management and organizational change management disciplines of Sure Step methodology. The appendix section also contains quality assessment of the 8 articles and Questionnaire formulation for future research.

2. RESEARCH METHODOLOGY

2.1. Topic Selection

The selected topic must be of great interest to sustain required motivation throughout the research period. The topic should be narrowed down to something manageable, specific and clear in order to present it within the given time and resources. The topic must be broad enough to sustain the work needed for a Master's dissertation. The concepts used for study must be clearly discussed and defined. The topic must be relevant and durable. The data required for research must be accessible. (Fisher, 2007, p.32, p.33) Our topic fulfills all the above criteria. The chosen topic is interesting because it gives insights on complex challenges involved in effective ERP solution deployment. The subject is popular in the market which confirms its importance and the opportunity to explore Sure Step software is a good knowledge gaining experience. Microsoft is not the leader in the ERP market, but is one of the leading competitors; we hope this research can contribute towards its further development in the ERP industry.

2.2. Research Process

We pursue this research as Realists with a structured approach. Realist research looks for association between variables and establishes chains of cause and effect wherever possible. This kind of research involves dividing up a problem into its constituent parts and then studying the relationship between these parts to identify patterns and associations. Structured approach imposes a structure on the research based on a preliminary theory, concept or hypothesis. This approach gives a security of knowing the likely structure of the dissertation. (Fisher, 2007, p.42, p.43, p.123)

There are two types of discoverers: explorers and surveyors. Explorers have preconceptions based on their framework, but they do not know what they will find out. (Fisher, 2007, p.153) Our research has an open approach which is the nature of exploratory research where open approach implies the opportunity of disclosing research data while data gathering process is still ongoing (Esposito, 2011).

2.3. Data Collection and Source

Secondary data (qualitative data) is theory or understandings gathered from the literature (Fisher, 2007, p.42, p.43). We have selected 8 articles and a book on Sure Step methodology to gather secondary data. This thesis paper will be presented based on secondary data findings.

Using the following keywords and databases, we retrieved articles for secondary data collection. This is explained further using a literature map in section 3.1.

✓ Keywords: Enterprise resource planning AND methodologies; Project management methodology; Project management AND ERP; Business solutions, Business solution software; ERP Implementation fail*; ERP Implementation risk*; ERP Implementation failure risk; ERP Implementation risk factors; ERP Implementation critical factors; ERP Implementation project failure; ERP Implementation critical issues

✓ Databases: ABI/Inform Global ProQuest; Google Scholar; IEEE Xplore; JSTOR; Emerald; Science Direct

2.4. Data Analysis

Step 1: Each of these 8 articles contains factors that are listed in Table 1. The cross reference column in this table connects repeating factors. For instance if 'lack of top management support' is a factor mentioned in article 1 and if article 2 has the same factor, they are connected in the cross reference column.

Step 2: The factors collected from 8 articles are placed under 9 categories in Table 2 (the factors are mutually exclusive) using the content analysis technique. This technique helps to measure the frequently appearing issues in material. It adds a quantitative element to the analysis of qualitative material. The difficulty is allocation of incidents to the most reasonable categories; so this has been done according to the researcher's best judgment. Other researchers might put some of the incidents in different categories; this is known as the problem of inter-rater reliability. One way of avoiding this problem is to ask several people to categorize the incidents. If the raters do not agree on the categorization of incidents then these incidents can be excluded from the analysis. (Fisher, 2007, p.183-184) In this table the most frequent factors (starred (*) factors) under the 9 categories are revealed, these frequent factors are highlighted in yellow. To narrow the research, the top 5 categories among the 9 are short-listed using the factor count technique.

Step 3: Information on the Sure Step software is retrieved from the book 'Microsoft Dynamics Sure Step 2010'. A connection is established between the frequent factors in 6 short-listed categories and Sure Step methodology in Table 3. The link is established if a Sure Step activity addresses a critical risk/failure factor or has the potential to manage a factor.

2.5. Research Validity

The factors are derived from 8 articles after assessing their quality so viewpoints of 8 authors have been taken into account. Factors are linked to Sure Step methodology using the information from the book that is written by the architect of the software. This assures that the derived information is legitimate. When searching for literature, we did not find any articles that were any similar to the one we aspired to research, so we believe that our work has originality. The validity however could have been strengthened through primary research which could not be pursued in this research due to time limitation.

2.6. Method Critique

Limiting this research to just one methodology provided by a vendor is a shortcoming as it narrows perception. A comparative study of many such methodologies provided by different vendors would have given more evidence to evaluate the importance of a methodology. It also restricts awareness on other similar technologies. We are unable to understand the drawbacks of this methodology when compared to the rest. A comparative study would also displayed similarities and differences between the software. A repeated pattern of similar activity among three methodologies would affirm the importance of that activity and the differences could be used to evaluate the advantage or disadvantage that difference would bring along.

3. IDENTIFYING CRITICAL RISK/FAILURE FACTORS THROUGH A LITERATURE REVIEW

3.1. Literature Map

Our search resulted in limited number of articles that focused on risk/ failure factors of ERP implementation. From approximately 15 articles we short-listed 8 articles that were suitable for this research. The Figure 1 Literature Map provides keywords of resulted articles; the colored circles represent keywords of 8 short-listed articles. The empty circles in the map are closely related to ERP implementation but are out of focus for our research.
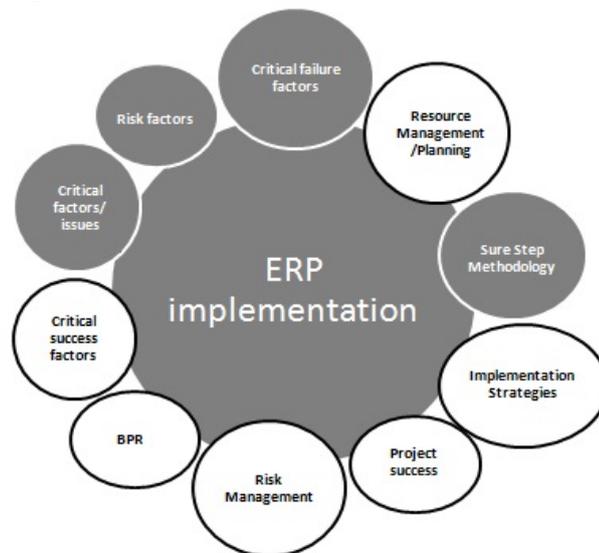
Figure 1 – Literature Map
(Self Illustration)

We found many articles focusing on critical success factors which we had to eliminate because success and failure are two different aspects and their difference is clearly explained in some of our selected articles. Momoh et al. (2010) state that the proportion of failure factors guides implementers to prioritize the critical factors so that these can be avoided during implementation, hence these failure factors have imminent sense of urgency and reality when compared to CSFs that do not critically guarantee failure if all the CSFs are not adhered to. And Françoise et al. (2009) explain that CSFs identify areas where intervention is needed but they are general and fail to specify practical guidance for actors in an ERP implementation project due to which this approach remains incomplete.

3.2. Discussion of the selected articles

The results of research in some of the literature have confirmed that implementation phase has high risk probability. Tsai et al. (2010) provide advices to minimize risk dimensions based on actual ERP implementation occurrences rather than prescriptive recommendations; they categorized 27 ERP implementation risk factors under 6 dimensions and performed a case study on 249 Taiwanese organizations to determine that the top 10 risk factors fell under 'user' and 'requirement' risk dimensions. Dey et al. (2010) categorized the factors from literature review into 3 project phases (planning, implementation and hand over evaluation & operations) and their characteristics. Then they performed a case study on a UK-based energy services group to identify that 'Non-availability of business resources', 'delay in making changes in legacy system', 'effect of other projects on ERP implementation',

'mismanagement of overall IT architecture' have high risk probability. Risks falling under 'organizational transformation' and 'project management process' characteristics from the case study had strong synergy with the risks identified from literature reviews. Guido et al. (2007) has placed customer orientation and legacy integration under technical implementation, and business process re-engineering (BPR) and end user related issues under organizational implementation. Technical and organizational factors were tested by practically implementing the methodological approach which was tested by researchers from Department of Business and Managerial Engineering, SSC (Shared Service Center) personnel and HR management of Telecom Italia Spa. The technical indicators were obtained through meetings with heads of Human Resource departments within Telecom Italia Spa and the SSC group. And organizational indicators were detected through a simulation based on hypothetic organizational scenario. Sumner (2000) categorized the risk factors into organizational fit, skill mix, management structure, software systems design, user involvement, user training, technology planning and project management after performing a case study through a structured interview with 7 companies.

Shi-Ming et al. (2004) consulted 7 experienced practitioners and professional consultants to extract 28 risk factors spread across organization fit, skill mix, project management and control, software system design, user involvement training and technology planning categories. A web questionnaire was sent to 198 members of Chinese ERP society which identifies user involvement and training, and project management and control to be the two primary risk categories. Françoise et al. (2009) found 13 critical factors from an extensive literature review and identified essential practical actions by consulting ERP experts to answer the expectations of the critical success factors but the respondents who participated in this research were small in number.

Momoh et al. (2010) carried out an in-depth literature review based on case studies and research. They classified the findings from the literature review into data quality (DQ), business process re-engineering (BPR), critical success factors (CSFs), change management, implementation failures, customization, and ERP internal integration and implementation challenges in general. They have also considered the findings from two research groups namely Robbins-Gioia and Conference Board. It was concluded that lack of change management, excessive customization, dilemma of internal integration, poor understanding of business implications and requirements and poor data quality received the most attention from researchers. Mehrjerdi (2010) reviewed 4 cases to clarify the intention of ERP software. The 4 cases are performed by previous literatures namely Rolls-Royce case, Texas Instruments case, ERP in China, and Critical success factors examinations. From the articles the author has selectively described 9 risk factors, but this list is random and the basis for these 9 factors is not mentioned. In general, the researchers of this article indicated that clear vision and top management support are the fundamentals for ERP implementation success. Organizations are more adaptable to change when there is good monitoring of an ERP system's post implementation.

All these articles have an element of practicality because the findings from the literature have been cross verified with primary data. Each article has resulted in different outputs due to variation in number of participants, nature of the organization, the ERP software used and the type of research conducted, however all the articles have information on critical factors of ERP implementation which has been collectively used for our work.

3.3. Factor Collection

Table formulation process: We first made a list of all the factors mentioned in these 8 articles, some factors had sub factors which we took into consideration since we wanted to do a detailed study. But we have not mentioned the sub factors in Table 1 since this is a preliminary table; however the sub factors are mentioned in Table 2 because Table 2 will be used for study. We then performed comparative analysis where each factor was compared with the rest of the factors in the list to detect if there was repetition. If the factors repeated (similar or closely related) we cross referenced them. Since we did not mention the sub factors in this table, we used the number of the main factor for cross referencing if a sub factor matched with another factor in the list. The drawback here is that the cross referencing is based on our evaluation which maybe different from the way others would have performed it. Our judgment may not be accurate but encloses reasoning for associating factors.

The table contains three columns, the first column indicates the factor number for each article, the second article lists the factors and the third column cross references repeated (similar or closely related) factors.

Table 1 - Critical risk/failure factors collected from the 8 articles

Number	Factors	Cross reference (*)
1. Challenges In Enterprise Resource Planning Implementation: State-Of-The-Art (A. Momoh, R. Roy and E. Shehab)		
1.1	Excessive customization	5.1, 6.4, 7.5
1.2	Dilemma of internal integration	
1.3	Poor understanding of business implications and requirements	2.3, 3.12 4.2, 4.9, 7.4
1.4	Lack of change management	2.11, 3.2, 5.4, 7.2
1.5	Poor data quality	4.22
1.6	Misalignment of IT with the business	2.7, 5.3, 6.2, 6.8
1.7	Hidden costs	2.5
1.8	Limited training	2.13, 2.15, 3.28, 4.15, 4.17, 4.23, 8.3, 8.14
1.9	Lack of top management support	2.9, 3,13, 4.8, 6.6, 7.3, 7.10, 8.8, 8.10, 8.16
2. Examining the Implementation Risks Affecting Different Aspects of Enterprise Resource Planning Project Success (Wen-Hsien Tsai, Jau-Yang Liu, Kuen-Chang Lee, Jui-Ling Hsu)		
2.1	Exceeds time allotted	
2.2	Ineffective communication	3.21, 4.5, 4.16, 7.6, 7.13, 8.11
2.3	Unclear goals	
2.4	Scale-down modules or functions	
2.5	Exceeds budget	
2.6	Unclear or inadequate ERP system requirements made by departments	3.16
2.7	Lack of ERP fit to organizational process	
2.8	Incorrect system requirements need to add-on programs	
2.9	Lack of top management involvement	
2.10	Lack of adequate corporate policies and	

	Processes	
2.11	Lack of organizational change	
2.12	Unstable organizational environment	
2.13	Users don't understand the ERP functions	
2.14	Users' lack of experience	2.18, 2.22, 2.23, 2.25, 3.7, 3.8, 3.9, 3.10, 7.1, 7.12, 8.4, 8.5
2.15	Users don't understand the benefits of an ERP system	
2.16	Users are not ready to use an ERP system to assist their work	
2.17	Users resistant to change	2.20, 4.14
2.18	Insufficient IT knowledge of users	
2.19	Lack of user participation	3.23, 7.12
2.20	Users don't want to use ERP system	
2.21	Consultants' lack of understanding of corporate operational processes	
2.22	Inadequate IT members	
2.23	Lack of cross-functional team members	
2.24	Inexperienced consultants	2.26, 7.1
2.25	IT members' lack of specialized knowledge required by the ERP project	
2.26	Vendors' lack of specialized skills	
2.27	Difficulty to integrate the ERP with other IT Systems	4.21
3. Assessing Risks In ERP Projects: Identify And Prioritize The Factors (Wen-Hsien Tsai, Sin-Jin Lin, Jau-Yang Liu, Kuen-Chang Lee,Wan-Rung Lin, Jui-Ling Hsu)		
3.1	Insufficient resources	
3.2	Extent of change	
3.3	Failure to redesign business reprocess	
3.4	Fail to support cross-organization design	
3.5	Degree of computerization	3.18, 3.24, 3.26, 6.5, 8.12
3.6	Fail to recruit and retain ERP professionals	3.11, 3.14, 4.3, 7.1, 8.6, 8.7
3.7	Lack of appropriate experience of the user representatives	
3.8	The ability and experience of inner expertise	
3.9	Inappropriate staffing	
3.10	Lack of analysts with business and technology knowledge	
3.11	Failure to mix internal and external expertise effectively	
3.12	Lack of agreement on project goals	
3.13	Lack of senior manager commitment to project	
3.14	The composition of project team members	
3.15	Lack of effective project management methodology	
3.16	Unclear/Misunderstand changing	

	requirements	
3.17	Lack of effective software management methodology	
3.18	Unable to comply with the standard which ERP software supports	
3.19	Lack of integration between enterprise-wide systems	
3.20	Developing the wrong functions and wrong user interface	
3.21	Ineffective communications with users	
3.22	Conflicts between user departments	
3.23	Fails to get user support	
3.24	Capability of current enterprise technical infrastructure	
3.25	Technology newness	
3.26	Stability of current technology	
3.27	Attempting to link legacy systems	8.20
3.28	Insufficient training of end-user	
4. Managing Enterprise Resource Planning Projects (Prasanta Kumar Dey, Benjamin Thomas Clegg and David J. Bennett)		
4.1	Inaccurate business case	7.5
4.2	Unclear objectives	
4.3	Weak implementation team	
4.4	Inappropriate management of scope	
4.5	Lack of communication among ERP implementation team, ERP provider and ERP users	
4.6	Poor contract management	4.7
4.7	Inappropriate contract closeout	
4.8	Lack of management/executive commitment and leadership	
4.9	Lack of synergy between IT strategy and organizational competitive strategy	
4.10	Unclear change strategy	
4.11	Inappropriate change management	4.12
4.12	Inappropriate management of culture and structure	
4.13	Inadequate organizational readiness	
4.14	Resistance to change	
4.15	Lack of user training	
4.16	Lack of communication with the end-users	
4.17	Inadequate training plan for the users	
4.18	BPR incompetence	8.1
4.19	ERP installation incompetence	
4.20	Inappropriate selection of ERP software	
4.21	Inappropriate system integration	
4.22	Lack of data accuracy	
4.23	Inappropriate training and education of	

	operating people	
4.24	Inappropriate system testing and commissioning	
4.25	Multi-site issues	
4.26	Lack of clarity on inspection and maintenance	
4.27	Inaccurate performance measurement and management framework	

5. A Methodological Approach To Assess The Feasibility Of ERP Implementation Strategies (Capaldo Guido, Raffa Lelio, Rippa Pierluigi)

5.1	Customization of the system	
5.2	Evaluation of existing legacy systems	7.4
5.3	Business Process Reengineering activities	
5.4	Change management activities	

6. Enterprise Resource Planning: Risk and Benefit Analysis (Yahia Zare Mehrjerdi)

6.1	High initial investment of ERP software	
6.2	ERP software lack of fit	
6.3	High turnover rate for team members	
6.4	Heavy customization	
6.5	The role of IT infrastructure	
6.6	Top management support	
6.7	Risks as a result of consultant action	
6.8	Risks as a result of ERP mismatch	
6.9	High ROI	

7. ERP Implementation Through Critical Success Factors' Management (Olivier Françoise, Mario Bourgault and Robert Pellerin)

7.1	Project teamwork and composition	
7.2	Organizational culture and change management	
7.3	Top management support	
7.4	Business plan and long-term vision	
7.5	BPR and customization	
7.6	Effective communication	
7.7	Project management	
7.8	Software development, testing and troubleshooting	
7.9	Monitoring and evaluation of performance	
7.10	Project champion	
7.11	Organizational structure	
7.12	End-user involvement	
7.13	Knowledge management	

8. Risk Factors In Managing Enterprise Wide ERP Projects (Mary Sumner)

8.1	Failure to redesign business process	
8.2	Failure to follow an enterprise wide design which supports data integration	
8.3	Insufficient training and reskilling	
8.4	Insufficient internal expertise	
8.5	Lack of business analysts with business	

	technology knowledge	
8.6	Failure to effectively mix internal and external expertise	
8.7	Lack of ability to recruit and retain qualified ERP system developers	
8.8	Lack of senior management support	
8.9	Lack of proper management control structure	
8.10	Lack of a champion	
8.11	Ineffective communication	
8.12	Failure to adhere to standardized specification which software supports	
8.13	Lack of integration	
8.14	Insufficient training of end users	
8.15	Ineffective communication with users	
8.16	Lack of full time commitment of customers to project management and project activities	
8.17	Lack of sensitivity to user's resistance	
8.18	Failure to emphasize reporting	
8.19	Inability to avoid technological bottlenecks	
8.20	Attempting to build bridges to legacy applications	

3.4. Factor Categorization

In this section, the critical risk/failure factors are redistributed under 9 categories using content analysis technique and set forth in Table 2. We chose follow the category convention according to the article written by Al Mashari et al. (2003) because it focuses on the implementation phase and it made provisions to include all the factors that we collected from 8 articles. The other articles that we referred to did not have such an extensive categorization.

Defining the categories:

Project Management: Approximately 90% of ERP implementations exceed budget and time due to poor cost and schedule estimations in project scope. To manage a project successfully project managers must involve in both strategic and tactical project management activities. Some of the strategic factors are top management support and project schedule/plan. Some of the tactical factors are personnel recruitment, client acceptance, monitoring and feedback, communication and troubleshooting. ERP implementation demands multiple skills covering functional, technical, and inter-personal areas so it is important for an organization to establish knowledge transfer mechanism. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.360)

Cultural & Structural Changes: Customization and configuration of ERP software involves creating a logical structure that contains financial and operational entities. This demands change in organization structure and everyday activities therefore transformation in an organization must be carefully planned with good strategies to deal with both internal and external context changes. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.361)

Communication: Communication must cover scope, objectives and tasks of an ERP implementation project. A good communication plan includes rationale for ERP implementation, briefing of business process management change and change management strategies, demonstration of applicable software modules, tactics, and establishment of contact points. Communication failure can be avoided by having an open information policy. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.359)

System Integration: One of the complexities in ERP implementation is cross module integration. Typically it is found that 50% of organizational budget is inventoried on system integration. Organizations have to develop their own interfaces for commercial software applications when middleware vendors lose focus on linking business processes together. Managing these interfaces and keeping it integrated with other organizational systems is challenging during maintenance. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.360)

ERP Package Selection: Companies often fail to evaluate whether the selected ERP system will match their desired business strategies. A survey on the criteria that organizations use to select IS shows that 'best fit' with their current business procedures is one of the most important factors. According to a research, small and medium enterprises should check for affordability, domain knowledge of suppliers, level of local support, software upgradability, and use of latest technology when selecting an ERP package. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.359)

Legacy Systems Management: Legacy systems have to be defined and evaluated carefully to determine the extent of problems that an organization may undergo during implementation. It is important to plan the infrastructure so that it is reliable and available when required. The transition of legacy systems must be managed carefully with a comprehensive plan during ERP implementation; if the legacy systems are complex the amount of technical and organizational changes required are high and vice versa. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.360)

Process Management: ERP systems are developed to improve business processes, so ERP implementation and BPR activities are closely related. This is done through extreme analysis of business processes to identify potential chances of reengineering the current business process rather than customizing the application software to improve business processes. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.359)

Systems Testing: Testing is important to ensure that the ERP software works as expected. When new business processes are activated, it is critical to test if the processes described in the application software match with the current processes of the organization. Through testing it is possible to determine if the new systems work in parallel with existing systems. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.361)

Training & Education: It is challenging to select an appropriate plan to train key people in the organization who are affected by ERP implementation. ERP training should aim at effective understanding of business processes behind the ERP applications. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.359)

Table 2 - Critical risk/failure factors arranged under 9 categories

Broad Factors	Critical Risk/Failure Factors	Total no. of factors
Project Management	1. <mark>Lack of top management support</mark> (Top management support, Lack of top management involvement, Lack of senior management commitment to the project, Lack of senior management support, Lack of management/executive commitment and leadership, Lack of management participation, Lack of accountability, Executives not involved in achieving objectives, Inappropriate management of decision-making policy, Project champion, Lack of a champion, Lack of fulltime commitment of customers to project management and project activities)************* 2. <mark>Insufficient internal expertise</mark> (Inadequate IT members, IT members lack of specialized knowledge required by ERP project, Ability and experience of inner expertise, Lack of staff members with experience of previous implementations, Lack of internal staff with extensive knowledge, Users lack of experience, Lack of appropriate experience of user representatives, Insufficient IT knowledge of users, Inappropriate staffing, Lack of business analysts with business and technology knowledge, Lack of analysts with business and technology knowledge, Lack of cross functional team members) ************* 3. <mark>Weak Implementation team</mark> (Fail to recruit and retain ERP professionals, Lack of ability to recruit and retain qualified ERP system developers, Failure to mix internal and external expertise effectively, Failure to effectively mix internal and external expertise, Composition of project team members, Difficulties building and retaining a team that possesses ERP knowledge, Composition of the team does not represent the various departments, Difficulties mastering expertise from outside the business, Inexperienced consultants, Vendors' lack of specialized skills)*********** 4. <mark>Exceed budget</mark> (Hidden costs)** 5. <mark>Poor contract management</mark> (Inappropriate contract close-out)** 6. Lack of management control structure 7. Inadequate problem-solving processes 8. Lack of corporate policies and processes 9. Insufficient effort to develop organizational knowledge 10. Inappropriate management of scope 11. High turnover rate for team members 12. Failure to emphasize reporting 13. Exceeds time allotted	18

	14. Lack of effective project management methodology 15. Lack of effective software management methodology 16. Decision making difficulties due to the lack of knowledge beyond a single module 17. Technology newness 18. Insufficient resources	
Cultural & Structural Changes	1. <mark>Lack of change management</mark> (Organizational culture and change management, Lack of organizational change, Change management activities, Extent of change)***** 2. <mark>Resistance to change</mark> (Users resistance to change, Users don't want to use an ERP system)*** 3. <mark>Lack of user participation</mark> (End-user involvement, Fail to get user support)*** 4. <mark>Inappropriate change management</mark> (Inappropriate management of culture and structure)** 5. Inadequate organizational readiness 6. Organizational structure – difference in working style among different project participants 7. Unclear change strategy 8. Lack of sensitivity to user resistance 9. Users are not ready to use an ERP system to assist their work 10. Failure to use the software to improve organizational performance 11. Unstable organizational environment	11
Communication	1. <mark>Ineffective communication</mark> (Ineffective communication, Ineffective communication with users, Lack of communication with end-users, Lack of communication among teams and users, Lack of communication between ERP implementation team, ERP provider and ERP users, Lack of communication among the departments, Lack of communication among the different project teams within departments, Lack of communication between team members and consultants, Problems with information sharing in the project team) *********** 2. Poor communication among the different sites 3. Consultants' lack of understanding of corporate operational processes 4. Conflicts with consultant 5. Increase in organizational conflicts 6. Conflicts of interest among the different departments 7. Lack of encouragement transfer of power or feedback to the project team	7
System Integration	1. <mark>Inappropriate system integration</mark> (Difficulty to integrate ERP with the other IT systems)** 2. ERP installation competence 3. Lack of integration between enterprise-wide systems	7

|		
	4. Dilemma of internal integration 5. Scale down modules or functions 6. Inability to avoid technological bottleneck 7. Failure to understand the side-effects of the integration	
ERP Package Selection	1. Lack of ERP fit to organizational process (Misalignment between application software and business process, ERP software lack of fit, Misalignment of IT with business, Risks as a result of ERP mismatch)***** 2. Multi-site issues 3. Fail to support cross-organizational design 4. Lack of functionalities in the software 5. Inappropriate selection of ERP software	5
Legacy Systems Management	1. Role of IT infrastructure-poor IT system (Stability of current technology, Capability of current enterprise technical infrastructure, Unable to comply with standard which ERP software supports, Failure to adhere to standardized specification which software supports, Degree of computerization)****** 2. Evaluation of existing legacy systems (Lack of understanding of previous systems capacities and limitations)** 3. Attempting to link legacy systems (Attempting to build bridges to legacy applications)** 4. Poor data quality (Lack of data accuracy)** 5. Failure to follow an enterprise-wide design which supports data integration	5
Process Management	1. Excessive Customization (Customization of the system, Heavy Customization, Customization-difficulties modifying the software to suit organizations need, Failure to exploit software's capacity in reengineering)***** 2. BPR incompetence (Failure to redesign business process)** 3. Excessive reengineering efforts resulting in overly burdensome reconfiguration 4. Decrease in systems contribution to optimizing and reengineering efforts	4
System Testing	1. Inappropriate system testing and commissioning 2. Software development, testing and troubleshooting 3. Developing wrong functions and wrong user interface	3
Training & Education	1. Limited training (Insufficient training of end-users, Lack of user training, Inadequate training plan for users, Insufficient training of end-users, Insufficient training and re-skilling, Users don't understand ERP functions, Users don't understand the benefits of ERP system, Inappropriate training and education of operating people,	1

	Stagnation in roles and lack of training)**********	
Pre-implementation &Post Implementation factors	1. Unclear goals (Unclear objectives, Poor understanding of business implications and requirements, Lack of synergy between IT strategy and organizational competitive strategy, Lack of agreement on project goals, Business Plan and long term vision-vision of the ERP as a simple software application)****** 2. Unclear or inadequate ERP system requirements made by departments (Unclear/Misunderstand changing requirements)** 3. Incorrect system requirement need to add-on programs 4. Failure to construct and communicate appropriate business case (Inaccurate business case)** 5. Lack of clarity on inspection and maintenance 6. Inaccurate performance measurement and management framework 7. Monitoring and evaluation of performance 8. ROI	8

Since our focus is only the implementation phase, we have eliminated pre and post implementation factors by graying them out in this table. The symbol * indicates that the factor has been repeated across articles (cross references from Table 1), the total count of the * represents the frequency of the factor. These factors are highlighted in yellow in the table. For the calculation of 'total no. of factors', we counted the starred (*) factors as 1 because they are all the same. For example in the broad factor named 'Training & Education', 'Limited training' has 10 *'s but on a whole it makes one factor, and hence 1 is the total count of factors for 'Training & Education'.

To narrow the research, we will focus on the top 5 categories with high factor count. The top categories are Project management (18), Cultural & Structural changes (11), Communication (7), System Integration (7), ERP Package Selection (5), and Legacy Systems Management (5). Since ERP Package Selection and Legacy Systems have the same factor count, both fall under top 5 which makes a total of 6 categories. Considering all the factors for study would be a lengthier process which cannot be accommodated in the time frame allotted for this project.

The starred (*) factors highlighted in yellow under these 6 categories will be the focus in the following sections; it is evident that they are important due to frequent repetition across articles.

3.5. Conceptual Framework for study
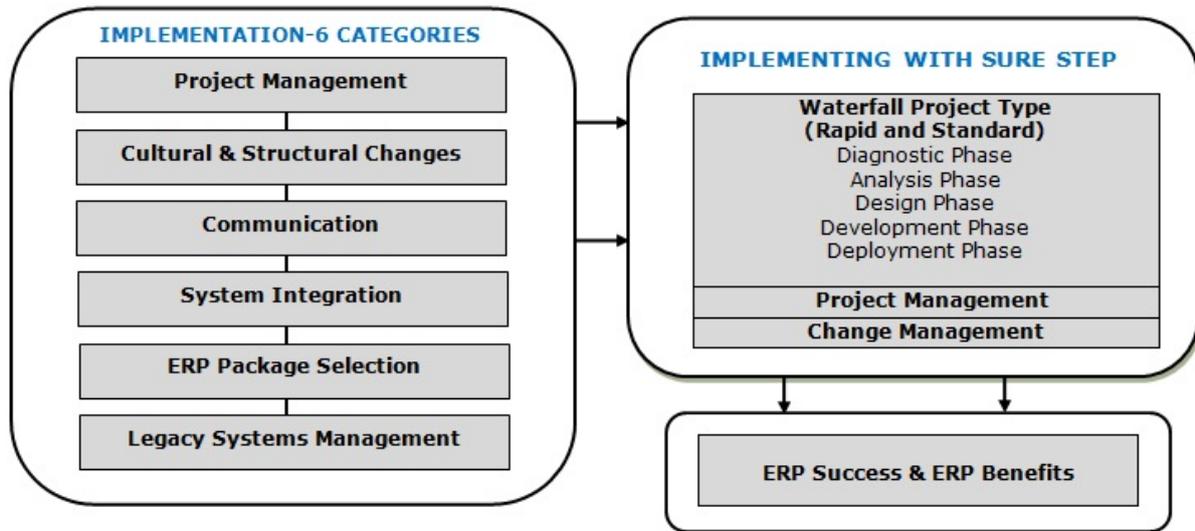
Figure 2 – Conceptual Framework adapted from 'Taxonomy of ERP critical factors'
(Source: Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.357)

A conceptual model explains the patterns and connections that have been found in the research material, it provides structure and coherence to the dissertation by simplifying the research task (Fisher, 2007, p.120, p.122). We studied Sure Step Methodology and described some relevant information in Appendix A. Taking into account the top 6 categories that are determined in the previous section and the information retrieved from Sure Step methodology, the above Figure 2 conceptual framework is developed.

Implementing with Sure Step

Sure Step aims at delivering solution to the customer on time, on budget and in scope using two approaches namely Waterfall and Agile. We will only be focusing on Rapid and Standard project types that fall under the Waterfall approach as they are applicable for small to medium companies. The rapid or standard project type is selected and executed depending on preconditions. In the diagnostic phase, the service provider and the customer have to do proper due diligence to determine that using the standard software as is would be the best solution for customer's requirements. If the requirements change when the project is in progress then the project type that was selected in the initial stage may no longer be the best fit, this could be a hitch. The fit between the software and requirements is mentioned in percentage for each project type however there is no detailed information on how this calculation is performed.

Sure Step has divided implementation into phases which are namely Analysis, Design, Development and Deployment. (Shankar & Bellefroid, 2010, p.138) Sure Step also has project management activities that address the specific objectives of the customer organization's business, and change management activities that provide approaches to transition individuals, teams and organizations with minimized resistance and maximized adoption. (Shankar & Bellefroid, 2010, p.51, p.55, p.252)

ERP Success & ERP benefits

ERP implementation success differs depending on the viewpoint it is evaluated from, Consultants and ERP project managers identify ERP project success in terms of finishing the project within budget and on time. ERP system users judge ERP success by having smooth operations with the system. And according to top managers, an ERP system is successful when the company achieves business improvements and other predetermined goals. (Dezdar & Ainin, 2011, p.912, p.13) According to Al-Mashari et al. (2003), ERP success is broken down into Correspondence success, Process success, Interaction success and Expectation success. Correspondence success measures if the IT systems match with the specific planned objectives. Process success determines if IT project is completed within time and budget. Interaction success estimates if users have a positive attitude towards IT and Expectation success assesses the extent of user expectations about IT systems.

Operational benefits pertain to cost and cycle time reduction, improved productivity, quality, and customer services. Managerial benefits are related to improved resource management, decision making, planning, and performance. Strategic benefits concern supporting business growth and business alliance, building business innovations, external linkage and cost leadership, and generating product differentiation. IT infrastructure involves building business flexibility, IT cost reduction, and better IT infrastructure capability. Organizational benefits relates to facilitating organizational changes and business learning, building common visions, and empowering. (Al-Mashari, Al-Mudimigh, & Zairi, 2003, p.356) Benefits of ERP systems can be measured in terms of tangible and intangible benefits. Tangible benefits consist of reduction of employees, inventory reduction, improved productivity, faster closing of financial cycles, improvements in order management, enhancement of cash flow management, reduction in procurement costs, reduction in logistics and transportation costs, increase of revenue and profits, improvement in on-time delivery performance, reduction in system maintenance needs, improved information and processes, internal integration, and improved customer service. And intangible benefits include improved or new business processes, better visibility of corporate data, improved responsiveness to customers, unexpected cost reduction, worldwide sharing of information, increased flexibility, enhanced business performance, cost efficiency in staff, inventory, procurement and cash/order management, improvement in productivity, and overall profitability. (Dezdar & Ainin, 2011, p. 914)

4. LINKING RISK FACTORS WITH SURE STEP

In this section, connection is established between the tabulated top 6 categories and the different phases/activities of Sure Step. Sure Step offers a variety of tools and activities which are analyzed with the factors. When a Sure Step activity or tool directed towards management of a factor we established links with 'X' mark. Following table is built based on study and analysis and lacks practical experience. However, this can be verified and fine-tuned using the survey results. From the analysis, we noticed that some Sure Step activities has the scope to manage the identified critical factors, and these activities are indicated in red font in the 'Factors' column. The reason that Sure Step has not covered all the factors could be either because of narrowed focus on just two waterfall based project types or because Sure Step may not facilitate management of these factors.

Table 3 - Linking Sure Step with the coverage of risk factors

FACTORS	DIAGNOSTIC PHASE	ANALYSIS PHASE	DESIGN PHASE	DEVELOPMENT PHASE	DEPLOYMENT PHASE
PROJECT MANAGEMENT					
Lack of top management support (Sure Step Champion and V-team)	X				
Insufficient internal expertise (prerequisites for Standard project type, Project Charter confirmed before deployment, WBS)		X			
Weak Implementation team (Project planning session and kick off meetings)		X			
Exceed budget (Project Charter – project planning and kick off meetings, Project Management essentials, library and WBS)	X	X			
Poor contract management (Project Management discipline)					
Lack of management control structure (Project planning sessions, Project Management essentials)		X			
Lack of corporate policies and processes					
Inadequate problem-solving processes					

Insufficient effort to develop organizational knowledge					
Inappropriate management of scope (Business Process Workshop, Fit/Gap Analysis, Project Planning Sessions, Project Management library, essentials and WBS)		X			
Failure to emphasize reporting (Business Process Workshop report)					
High turnover rate for team members					
Exceeds time allotted (Project Charter – project planning sessions and kick off meetings, Project Management library, essentials and WBS)	X	X	X		
Lack of effective project management methodology (implementation phase – waterfall project type)	X	X	X	X	X
Lack of effective software management methodology			X		
Decision making difficulties due to the lack of knowledge beyond a single module					
Technology newness					
Insufficient resources (Project Planning Sessions, Project Management library- Resource Management)		X			
CULTURAL & STRUCTURAL CHANGES					
Lack of change management (Project Planning Sessions)		X			

Resistance to change (OCM)					
Lack of user participation (UAT)					X
Inappropriate change management (Project Planning Sessions)		X			
Inadequate organizational readiness					X
Organizational structure – difference in working style among different project participants					
Unclear change strategy (OCM)					
Lack of sensitivity to user resistance (OCM)					
Users are not ready to use an ERP system to assist their work					X
Failure to use the software to improve organizational performance					
Unstable organizational environment					X
COMMUNICATION					
Ineffective communication (Fit/Gap Analysis, Deployment Plan, Project Planning sessions, kickoff meetings, customer interview, Business Process Workshop, WBS and Project library- Communication management, OCM)	X	X	X	X	X
Poor communication among the different sites (Business Process Workshop report)		X			
Consultants' lack of understanding of corporate operational processes	X				
Conflicts with consultants (Business		X			

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Process Workshop report)					
Increase in organizational conflicts (Business Process Workshop report)		X			
Conflicts of interest among the different departments (Business Process Workshop report)		X			
Lack of encouragement, transfer of power or feedback to the project team					
SYSTEM INTEGRATION: Factors in this category are taken into consideration when selecting a suitable Waterfall based project type.					
Inappropriate system integration(integration testing)				X	
ERP installation competence				X	
Lack of integration between enterprise-wide systems				X	
Scale down modules or functions					
Inability to avoid technological bottleneck (Project charter)	X	X			
Failure to understand the side-effects of the integration	X				
Dilemma of internal integration					
ERP PACKAGE SELECTION: Factors in this category are handled when selecting a suitable Waterfall based project type. The Project Charter built in the Diagnostic stage is a key document that captures accurate requirements.					
Lack of ERP fit to organizational process (UAT)					X
Multi-site issues					

Fail to support cross-organizational design		30			
Lack of functionalities in the software					
Inappropriate selection of ERP software					
LEGACY SYSTEMS MANAGEMENT: Standard project types					
Role of IT infrastructure-poor IT system			**X**	**X**	**X**
Evaluation of existing legacy systems					
Attempting to link legacy systems					
Poor data quality (FDD and TDD, OCM-Align and Enable Organization)			**X**	**X**	
Failure to follow an enterprise-wide design which supports data integration (OCM-Align and Enable Organization)					

5. FINDINGS & ANALYSIS

5.1. Analyzing selected 8 articles

The 8 chosen articles are based on critical risk/failure factors of ERP implementation and they range from the year 2000 to 2010, four among them are from 2010 to make sure that the data is current. Seven of these articles are published in journals and one is a peer-reviewed conference paper. The first four articles are based on case studies, the next two are derived from ERP expert consultation and the last two focus on literature reviews performed on case studies. These articles examined ERP implementations in various countries, regions and continents like the USA, the UK, China, Germany, Cyprus, India, France, Finland, the Netherlands, Canada, Japan, Australia, Ireland, Taiwan, Mexico, Greece, Bahrain, Asia, Middle East, Africa, America, Europe, Denmark, and Arab Gulf states. Multiple industries like retail, banking and finance, telecommunications, energy, brewery, transport, service industries, manufacturing and investment brokerage firms are covered in these articles.

The SAP ERP system is commonly mentioned in most articles, some focusing only on SAP HR module and SAP R/3 system, others have considered systems like PeopleSoft, Oracle, and Baan. The articles that focused on risk or failure factors of ERP implementation were limited as explained in section 2, none of these articles have mentioned Microsoft Dynamics solutions (such as NAV, AX or CRM) which is a drawback of this research. If articles discussed risk/failure factors on deploying Microsoft solutions, then evaluating the management of these factors by using Sure Step methodology would have given more precise results(in terms of practicality) as Sure Step methodology is used as guidance to implement Microsoft's ERP solutions.

Some of the articles have focused on large organizations, some on small to medium organization and the rest is a mix of three enterprise types. We have collectively taken information from all articles even if they focus on large organization because we presume that the critical risk/failure factors that occur in large organization can be considered by SMEs to prepare or plan their ERP implementation process.

5.2. Findings from Table 2 - Critical risk/failure factors

It is evident that 6 categories have reasonably high count of associated factors and among the associated factors, the starred (*) factors have more importance because they are repeatedly cited across articles. The starred (*) factors are lack of top management support, insufficient internal expertise, weak implementation team, exceeding budget, poor contract management, lack of change management, resistance to change, lack of user participation, inappropriate change management, ineffective communication, inappropriate system integration, lack of ERP fit to organizational process, role of IT infrastructure, evaluation of existing legacy systems, attempt to link legacy systems, and poor data quality. The 8 articles used in this research confirm that most of the factors are cross verified with primary data and hence we can conclude these factors are critically important to be considered for successful implementation of ERP systems. We will now analyze how different authors have discussed the 6 categories, however we will not be considering all the associated factors for analysis, only the starred (*) factors will be taken into account due to their prominent significance.

Project management: Top management support is one of the most important critical factors to accomplish project objectives and align them with company's business goals. (Sumner, 2000) They must define new objectives to employees to give a clear vision of the orientation that the company will take by implementing the new system. Top management is

expected to be supportive when the middle management resists on using the new software or have opinions on using the systems they are familiar with. (Mehrjerdi, 2010) Top management must allocate necessary resources and time for proper execution of the project. This will help to resolve many conflicts that may arise in the long run. (Françoise, Pellerin, & Bourgault, 2009) They should also provide sufficient financial support and human resources to complete a project. Limited financial support results in a rushed implementation process that can lead to an overloaded implementation team, high staff turnover rate, ineffective knowledge transfer, and political problems. (Mehrjerdi, 2010) Since ERP implementation is considered as transformation in the way company does its business, changes are involuntary and neglecting these changes causes conflicts among different departments. The implementation process is at high risk if top management is not strongly committed to the system, lacks actively participation in the implementation process and overlooks the changes demanded by ERP. (Shi-Ming, I-Chu, Li, & Ming-Tong, 2004)

Companies that install ERP solutions may underestimate hidden costs which dramatically increases the implementation cost. Training the entire staff on new ERP systems is expensive and is usually taken for granted. Integration and implementation costs are sometimes overlooked. According to Shankar & Bellefroid (2010), after testing the code and making required changes the configuration settings are frozen, this indicates that they are not open for further modification. Unplanned cost may arise with new requirements that emerge after freeze stage. The cost associated with transferring data from old systems to new package is often ignored. Data should not just be transferred but also modified to fit into the new system. The need to hire professionals for this task increases the cost. Consulting costs may be high if companies do not plan this budget properly. Overall cost is underestimated with the notion that the project will end on time. (Momoh, Roy, & Shehab, 2010)

Shortage of internal expertise leads firms to hire consultants to overcome technical and procedural challenges in design and implementation, and these results in higher cost. (Sumner, 2000) Organization must have a good knowledge management process in place that will help to acquire maximum knowledge from consultants so that the systems can be used autonomously. (Françoise, Pellerin, & Bourgault, 2009) Consultants play the role of change facilitator and use techniques such as guided learning, formal training and knowledge creation activities to transfer necessary knowledge required for implementation. Their guidance saves considerable time and effort in knowledge search costs. (Mehrjerdi, 2010) Business analysts with business and technology knowledge are critical workforce requirements for an ERP project. Having skilled business analysts can reduce resources required for ERP project like the number of programmers. (Sumner, 2000) Employees possess base of knowledge which should not be overlooked during reengineering. (Françoise, Pellerin, & Bourgault, 2009) and replacement of incapable employees should be postponed and monitored until project completion. (Shi-Ming, I-Chu, Li, & Ming-Tong, 2004)

Project teamwork and team composition is the core for critical activities throughout the project, the needs and interactions between different departments should be taken into account by a multidisciplinary team. Autonomy should be insured to the team for fast decision making and efficient functioning of the project. A balanced team with appropriate authority is not sufficient for project success; there should be cohesion among team members. However, the team must be supported by top management or a leader. The people in the team must be freed to a large extent from their other responsibilities in the organization. (Françoise, Pellerin, & Bourgault, 2009) Mixing consultants with internal staff enables the internal staff to increase their technical knowledge and experience in ERP system design and

implementation. Management must understand the criticality of recruitment and retaining specialists as the market rates for these people are high. (Sumner, 2000)

Cultural & Structural Changes: An organization may be open to change or the opposite depending on the existing strength and endurance of its culture. (Françoise, Pellerin, & Bourgault, 2009) The congruence between ERP systems and organizational culture is a prerequisite for successful ERP implementation. Two reasons for change management failure are lack of communication with users and failure to recognize the importance of change. Organizational change initiatives must involve intertwining technology, task, people, structure and culture. Such initiatives can reduce resistance to change and in some cases eliminate it, so cultural readiness for an ERP implementation must be planned carefully. (Momoh, Roy, & Shehab, 2010) End user involvement from start to finish of the ERP project is as crucial as top management involvement; this reduces resistance and increases quality. Users must perceive the system as necessary and useful for their everyday activities. Even the best system in the world will not improve performance if employees do not use it. (Françoise, Pellerin, & Bourgault, 2009) According to a study, human factors are constituted as major problems in project failures especially in small and medium sized companies. When the system is up and running, poor training of users gives rise to issues such as erroneous data input, poor use of the systems, increased training cost, employee resistance to integrate ERP system into the business processes and the need to hire IT personnel. And unsatisfactory operation of the system causes irreversible drifts like demotivation. (Momoh, Roy, & Shehab, 2010)

Communication: It is important to communicate scope, objectives and activities of ERP project (Sumner, 2000) A good knowledge management process facilitates knowledge exchange and resolution to organizational problems. In addition, it ensures that the information is correctly exchanged within the project team. ERP project brings together many people from different departments, and cultures, thus a common language must be set up. Effective communication affects all critical factors so a communication plan would be vital, the one that clearly defines who needs what information, who provides it, when should it be provided and the medium of transmission. (Françoise, Pellerin, & Bourgault, 2009)

System integration: ERP systems have a shared database and the different applications interact with these databases to guarantee data integrity and synchronization. (Guido, Lelio, & Pierluigi, 2007) ERP implementations are challenging due to cross module integration, data standardization, adoption of business model, tight implementation schedule and large number of stakeholder involvement. The strength of the ERP system lies in coupling modules during integration, but close coupling reduces responsiveness to local requirements in particular functional areas. ERP solutions are modular and demands integration, so greater the module, greater is the complexity, cost, risks and changes. But they can also bring great benefits. Practitioners must be educated on the impacts of intra enterprise and module integration. Incorrect integration affects daily operations of the business. (Momoh, Roy, & Shehab, 2010) Due to integrated nature of ERP, uniform data is accessed throughout the organization. Inaccurate data entry may have a negative domino effect across the organization. Domino effect causes ERP to lose credibility and increases user resistance to use the new system, the company would then have to continue to run with old systems. (Shi-Ming, I-Chu, Li, & Ming-Tong, 2004)

ERP Package Selection: ERP tends to impose its own logic on a company's strategy and culture. The non flexible nature of ERP systems pushes organizations to fit the package and disregards their way of doing business. The possibility of a perfect match between

technology and organization is slim, and this can be rectified through technological measures, organizational measures or a combination of the two. (Momoh, Roy, & Shehab, 2010) The misfit may occur due to poor evaluation by consultants who help the organization to find the best ERP software possible. (Mehrjerdi, 2010)

Legacy systems: It is important for organizations to build an excellent IT infrastructure. A poor IT system reduces the processing capability of the ERP system. (Mehrjerdi, 2010) The transition of data from old to new systems must be handled carefully to avoid redundancy or data overlap. A detailed list of all the existing legacy systems must be introduced before the new system is implemented. The data must be transferred to the new systems and all legacy systems must be closed as they do not need to exist in parallel with the new system. Problems may occur during data insertion, some information needs to be inserted more than once and in different systems, which lead to data redundancy so it is necessary to monitor and plan the number of legacies that must be shut down. (Guido, Lelio, & Pierluigi, 2007) Information research has demonstrated that inaccurate and incomplete data severely affects the competitive success of an organization. If the data quality is poor, information can have significant social and business impacts. Data misfits arise when the organizational requirements are incompatible with the data format of the ERP package. At an operational level, poor data quality increases operational cost because lot of resources and time is invested in detecting errors. If data inaccuracy is detected, then the whole system is suspected. Since ERP systems integrate data and several departments use this data, delay in the system by one department directly impacts the operation of others. In order to remain competitive, business must function continuously and data should be available at any point in time. (Momoh, Roy, & Shehab, 2010) Attempts to integrate ERP systems with legacy applications can bring time overruns and significant cost due to the lack of integration and duplication of business processes. When designers try to implement links between ERP modules and legacy applications, technology bottlenecks may arise. (Sumner, 2000)

5.3. Findings from Table 3 - Linking Sure Step with risk factors

In table 3, connections are established between Sure Step and critical risk/failure factors for certain reasons.

'Top management support' is linked with Sure Step champion and V-team because the need for right senior level people in the project is addressed in these activities. Sure Step activities like Fit/Gap Analysis, Deployment Plan, Project Planning sessions, kickoff meetings, customer interviews, Business Process Workshop, WBS, Project management library and OCM are linked with 'Ineffective communication' because they address planning interactive communication in every phase of the implementation. 'Lack of ERP fit to organizational processes' is linked with Project charter and UAT because it checks if the selected solution supports business processes. 'Poor data quality' is linked with FDD and TDD documents

'Insufficient internal expertise' is linked with prerequisites for standard project type, Project Charter and WBS as they discuss the importance of involving reasonable number of expertise with IT knowledge and experience. Project planning sessions and kick-off meetings are linked with 'Weak implementation team' as their agendas include topics related to project structure, team and organization, and these activities aim at minimizing the risk of having team-related issues. Cost management issues are addressed in the Project Charter through project planning and kick off meetings, Project Management essentials, Project Management

library and WBS. 'Exceed Budget' is linked with these activities as they discuss budget constraints of the project.

Poor contract management does not fall under any implementation phase but is discussed under one of Sure Steps project management disciplines called sales management which provides descriptive context of planning the diagnostic phase. We have taken this factor into account for investigation in the questionnaire prepared for future research (see Appendix C) and presume that this factor may have been discussed in the pre or post implementation phases of Sure Step which are not covered in this study.

'Lack of change management' and 'Inappropriate change management' is linked with project planning sessions in the analysis phase because the agenda of this activity includes planning for change control and the OCM discipline aims at minimizing resistance during the adoption process. Scenarios which are based on real-life data are tested by the users in the deployment phase through UAT sessions so 'Lack of user participation' is linked with UAT. 'Poor data quality' is linked with FDD and TDD documents since it captures information on data migration and it is also linked with OCM pillars (Align and Enable Organization) because they discuss master data management process to ensure data integration and accuracy with the new solution.

'Lack of ERP fit to organizational processes' is determined by measuring the degree of fit between customer's requirements and the solution in percentage, but there is no clarity on how this calculation is performed and what factors are taken into consideration to calculate the percentage. If the calculation is accurate then selecting the appropriate software is predetermined. Sometimes if requirement is not fulfilled then the project may not proceed until some alternate options are thought of.

It is obvious that right people have to be identified for the task since it is a huge undertaking. People behave and commit to the project depending on a lot of external factors like organization culture, politics, and motivation. Structured Methodologies stress on the importance of identifying key roles and deploying key people before initiating the project, thereby it helps manage this risk/failure in a better way but it cannot guarantee either elimination of this risk or implementation failure because of the risk. There may be cases where organization would fall short of providing resources in which circumstance the service providers along with the consultants would be compelled to deploy solution using available resources. But since planning is a key aspect of a structured methodology, it takes all the essential matters into consideration before diving straight into deployment. So it is better to have a methodology than not having one which would initiate problems at a later stage of the project.

Sure Step methodology intends to minimize the issues associated with transitioning people and organization during the ERP implementation process by forming a team of dedicated key people who can help to adopt change in an organization. The OCM discipline in Sure Step provides necessary measure for transitioning. Involving the end user through activities like the user acceptance test can expose the level of user support. Users would provide support depending on their convenience to use the new system or their interest to accept change. These issues can be tackled through training and involving end users in as many activities as possible so that they get well acquainted before starting to use the system for their daily work. Legacy system related issues during transition would be harder for large enterprises due to their size and transactions and comparatively easier for small to medium

enterprises especially if data migration is structurally planned. A structured methodology is useful in change management as it gives guidance to change every aspect of the organization that is affected by implementation on a step by step basis, rather than forcing change adoption once implementation is complete.

Communication plays a key role in every project to ensure transmission of correct information. Misunderstandings can occur either due to inaccurate or unclear information, which are the attributes of poor communication. Communication can be strengthened by assuring that the message that is sent across is received accurately at every point of interaction. Sure Step has addressed this factor frequently which highlights the fact that a lot could go wrong when information is misinterpreted. The activities provided in a structured methodology aim towards improving communication by taking measures in areas where it could go wrong.

Cost issues depend on what predictions have been set forth in the beginning of the project and a determination as to whether the project has been accomplished within those expectations. Tangible and intangible benefits are the outcomes of an investment. On successful project completion, even if the budget exceeds customer expectation it can be considered as a positive factor depending on the higher benefits it would reap. Since most of the ERP implementation projects cost more than expected, having many activities for cost management is an advantage of using a structured methodology. A methodology could play a major role in cost reduction as it plans every stage of deployment, this however this can be verified accurately through a survey. Comparing the budget of a deployment that was undertaken using a methodology with a deployment did not use a methodology would display prominent difference. Contracts are based on terms and conditions set forth hence making each contract unique. Two entities must agree to the clauses, if there are disagreements they must rebuild new proposals. A sign off on project deployment is almost the first step that happens between the vendor and the customer so unless some major problem occurs while the project is in progress, this factor should not cause much of a hindrance.

When different components are fit together, they must function as a system. Before a project type is selected to deploy the ERP system its compatibility with other third party systems is verified. Integration test is performed in the Development phase, it is an end-to-end testing of integrations or interfaces to any external sub-systems, and it is performed with the company's SMEs, key users, IT staff and the application consultants. Sure Step advices to test the compatibility between the ERP system and other IT systems to avoid integration related problems. Testing can identify issues so that necessary actions are taken before deployment.

The agenda for some of the activities are discussed next; the agenda for the kick off meetings covers project approach, introduction, project definition and objectives, key deliverables, success criteria, project team and organization, roles and responsibilities, training and testing controlling, reporting, and sign-off communication project scope. And the project planning session agenda includes project overview, timeframes, deliverables, project structure establishment, risk and stakeholder analysis, communication plan, change control, resources and quality. Since there are many agendas for these sessions, it may be unpractical to cover them all; each one may be time consuming and may not receive the required amount of focus.

We can also draw some conclusions on important Sure Step activities by observing their frequency in Table 3, these activities are project planning sessions, business process

workshop, project management library, project charter, WBS, project management essentials, project management discipline, kick off meetings, OCM, and UAT. These can be considered as assets of Sure Step. Sure Step activities are not just limited to the starred (*) factors, they cover many other factors as seen in Table 3; this exposes the wide scope of these activities. We have already discussed that the frequently repeating starred (*) factors have weightage, and since Sure Step activities have attended the starred (*) factors, we can conclude that a magnitude of risk is reduced to a reasonable amount.

6. CONCLUSION

ERP implementation projects are complex and a good methodology provides support and guidance for its successful execution, so it is vital to undertake ERP projects with the assistance of well defined methodologies. We witnessed from our research that 8 articles addressed critical risk/failure factors of ERP projects, most of them were backed by primary data findings, and none of these articles mention the usage of a methodology when conducting practical research. The results that they found would have been quite different if a new variable like methodology was added to the scenario. The purpose of this paper was to evaluate the importance of using a structured methodology for deploying business solutions. We approached this task with the aim of finding out if Sure Step has the capacity to moderate critical risk/ failure factors, and our work based on secondary data has shown positive results. We can conclude that Sure step is designed to moderate risk factors up to a certain extent if not completely.

A methodology has the potential to achieve ERP success and benefits. The research was confined to small to medium businesses, and we are aware that it would be harder for such organizations to overcome failure when compared to large organizations because of limited finance and resources, so it becomes even more important for these organizations to be careful before deploying business solutions. It may be advisable for companies to evaluate risks associated with ERP projects before deployment and cross verify how a methodology could tackle them; such a detailed study may increase customer's confidence to take up the task. We have detected the frequently cited critical failure or risk factors but have not studied the extent of difficulties associated with each of these factors; this could be a limitation of our work. But even if the extent of risk is small or big, risk management can only be beneficiary. Because the highly cited risks occur frequently, avoiding them becomes crucial, and Sure Step has provided detailed guidance for most of these risk factors. Based on this observation, it can conclude that it is important to have a well structured methodology to deploy ERP solutions that have comprehensive overreaching capabilities.

It is also understood from all these findings that there are unique IT-related risks associated with each project, hence risk factors cannot be standardized, and they are rather specific to the context. So to answer our strategic question, we think that companies should be prepared to handle the risks that are frequently identified by many researchers. Even in our research we see that there are frequently cited risk factors (the starred (*) factors), but again this is determined only from 8 articles. However, organizations must conduct an extensive study considering all important parameters to determine what may affect them the most. Along with preparing to overcome the obvious risks, they should also be proactive to foresee and plan other risks that may occur in their organizations context. One way to carry out this identification process could be by using a structured methodology which emphasizes planning sessions and continuously monitors the occurrence of difficulties during every phase of the project lifecycle.

6.1. Scope and Recommendations

Scope of this project includes locating critical risk/failure factors that are frequently associated with ERP implementation and evaluating management of these factors using Sure Step methodology. The research has not focused on other methodologies, conducting a comparative study on different types of existing methodology can be a useful research topic. The research has only focused on Rapid and Standard waterfall based project type to keep the scope only to Small and Medium businesses. Evaluating Enterprise and Agile project types

(for more than 250 people) is a recommendation for future research. We have limited this research to the implementation phase, the importance of a methodology for pre and post implementation phases can also be considered for future research. Moreover, it would be useful to analyze the extent of critical risk/failure associated with various factors rather than studying the most frequent factors based on citations from different articles.

6.2. Research Limitations

A comparative study on different types of methodologies would have added more value to this research. One of the biggest limitations of our research is the lack of primary data to verify the secondary data findings. However, a questionnaire is set forth in appendix section for future research; the results of this questionnaire can then be used for a comparative study to detect the similarities and differences in theory and practice.

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APPENDIX

Appendix A - Implementing ERP with Sure Step

Despite of the risks associated with business solutions like ERP, companies still invest in such endeavors to gain competitive advantage in the market. Small and medium organizations must realize the importance and benefits of choosing ERP as a business solution upfront as they cannot afford to lose time and cost on a non-profitable project as compared to large organizations. When companies invest in ERP projects that provide business solution, they do not just expect it to be a success but they expect high quality deployment. Sure Step is developed with an intention to meet these needs**.**

Waterfall based project types

Sure Step aims at delivering this solution to the customer on time, on budget and in scope using two approaches namely Waterfall and Agile. We will only be focusing on Rapid and Standard project types that fall under the Waterfall approach as they are applicable for small to medium companies. Another reason to narrow down the research is the time constrains of this Master's dissertation.

"Waterfall approach is a sequential process that depicts a linear flow of activities from one phase to another, culminating with the solution being promoted to production and then into operation." (Shankar & Bellefroid, 2010, p.138) Sure Step provides three waterfall based project types named as Rapid, Standard and Enterprise. Each of these project types have activities that are grouped vertically under the different implementation phases and horizontally across the different cross-phase processes. The implementation phase is vertically broken down into analysis phase, design phase, development phase, deployment phase, and operation phase. The cross phase processes are horizontally grouped as organization, solution and technology. Each of this group includes multiple activities; some activities may last during multiple implementation phases of a project. The diagram below gives an understanding of this arrangement. (Shankar & Bellefroid, 2010, p.138, p.139)
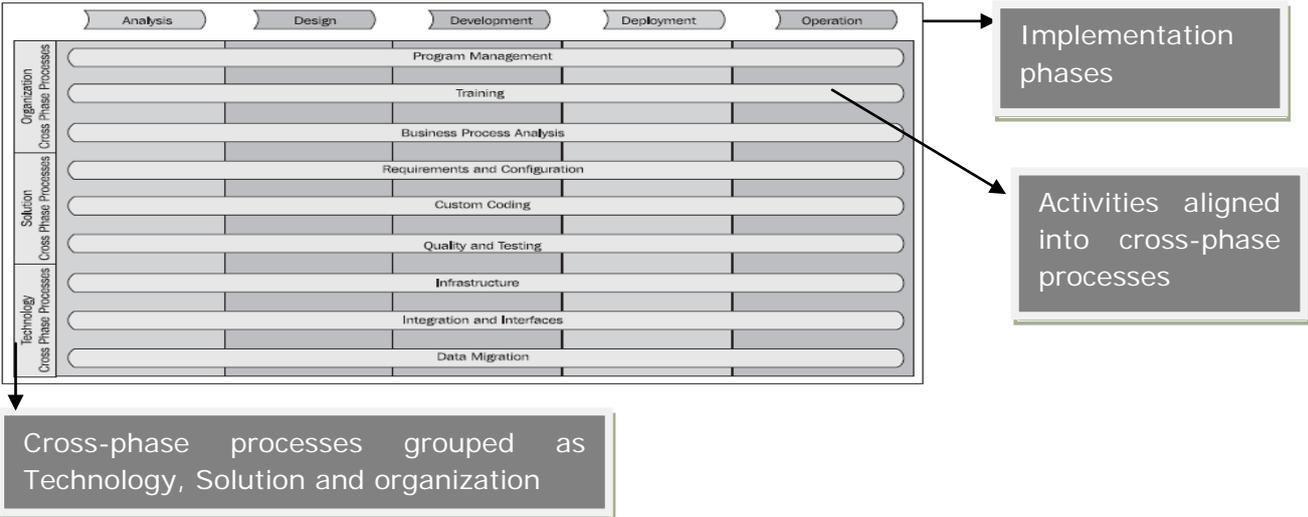
Figure 3 – Implementation Phases and Cross Phase Processes
(Source: Shankar & Bellefroid, 2010, p.139)

Rapid project type is the simplest delivery approach suitable for small to medium businesses with up to 25 users in a company, such compani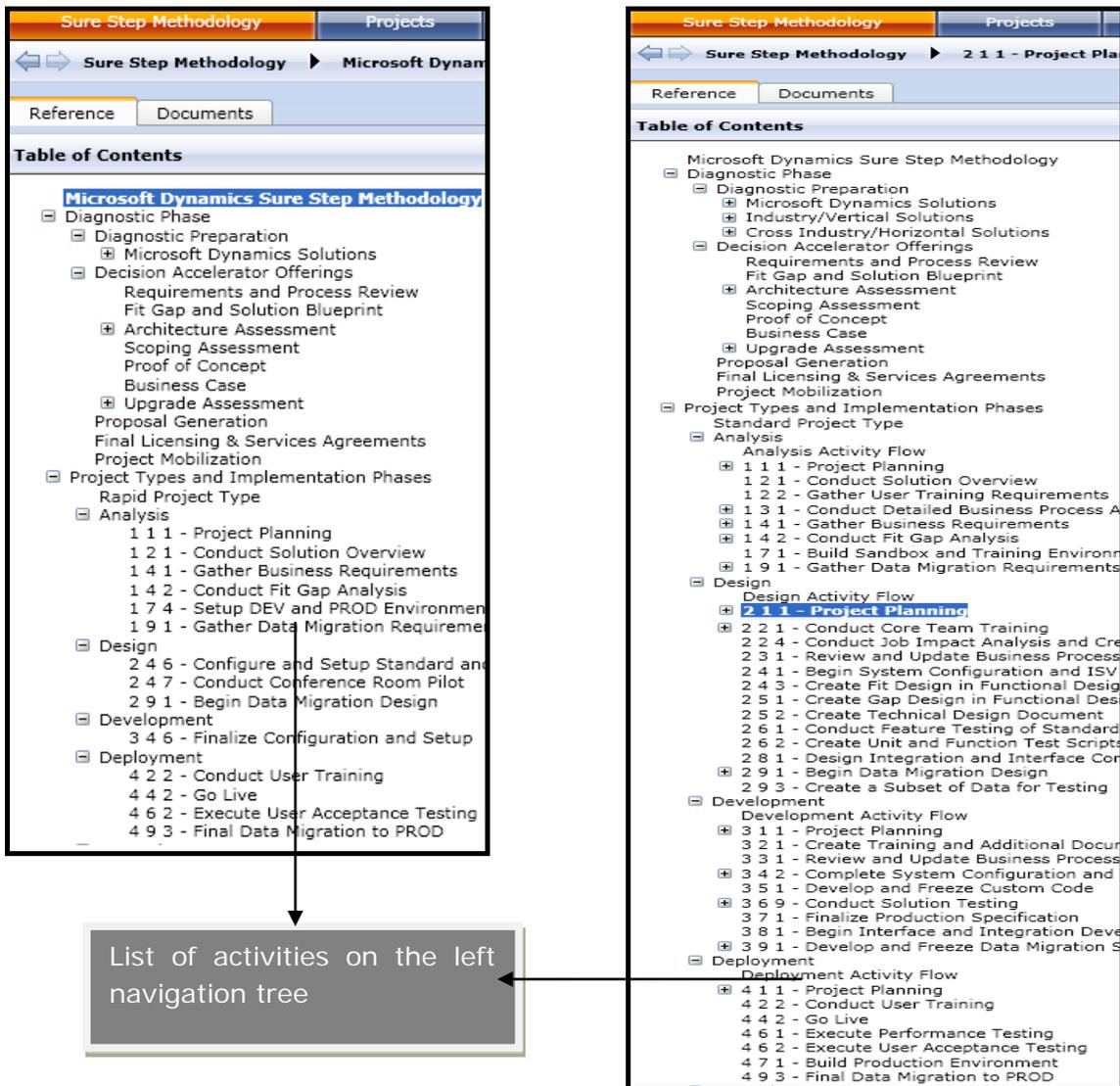es would chose ERP solutions to either move away from legacy systems or upgrade from an outdated system. But the solution should not be confined to number of users, rather to the needs of the requirement and the nature of the project. The project type can be used in multisite deployments where the solution that was delivered to the first site is applicable to other sites. If using the standard solution fits customer's requirement close to 90%, then the usage of Rapid project type is justified. The standard software should be used as is which means no customization or demands minimum customization, and that there is no need for add-on Independent Software Vendor (ISV) Some activities are not in scope of this project type like custom coding, interface and integration to third party software, business process analysis and data migration from legacy systems. Simple custom codes would be developed when 'gaps' are mentioned in the requirement. Interface and integration may demand much more than what this project type can handle since there would be need to integrate third party software. Business process analysis activity is out of scope because customers should be able to undertake this project without the help of a consulting team. (Shankar & Bellefroid, 2010, p.140-142)

Standard project type is widely used in medium to large businesses with up to 250 users. Companies adapting this kind of solution have reasonable number of business and IT users with prior experience in such business solutions, and these resources can be an integral part in choosing the solution that would best meet the company's needs. It is the apt solution to choose when the standard software and customer requirement fit up-to 70-80% and the required customization is not too complex. The customization may include integrating solutions from ISV. The business process analysis activities include process maps through which customers and service providers can map future workflows of using the solution functionality. It helps the customer to visualize how their current process can fit with the new system and find opportunities to lessen the complex customization. Custom code development needed for the 'gaps' classified in the requirements, integration or interfaces to third party software, and data migration from legacy or third party systems. (Shankar & Bellefroid, 2010 p.143-145)

'Activity' is defined as a specific action or step in the flow, it may either result in a deliverable as the output of the step or it may be a prescribed step in the process that leads to an output. (Shankar & Bellefroid, 2010 p.92) The figure below shows the list of activities in Rapid and Standard project type, Rapid project type has relatively the lowest number of activities when compared to other project types.

Left panel:

Sure Step Methodology | Projects

Sure Step Methodology ▶ Microsoft Dynam

Reference | Documents

Table of Contents

- **Microsoft Dynamics Sure Step Methodology**
- Diagnostic Phase
  - Diagnostic Preparation
    - Microsoft Dynamics Solutions
  - Decision Accelerator Offerings
    - Requirements and Process Review
    - Fit Gap and Solution Blueprint
    - Architecture Assessment
    - Scoping Assessment
    - Proof of Concept
    - Business Case
    - Upgrade Assessment
  - Proposal Generation
  - Final Licensing & Services Agreements
  - Project Mobilization
- Project Types and Implementation Phases
  - Rapid Project Type
  - Analysis
    - 1 1 1 - Project Planning
    - 1 2 1 - Conduct Solution Overview
    - 1 4 1 - Gather Business Requirements
    - 1 4 2 - Conduct Fit Gap Analysis
    - 1 7 4 - Setup DEV and PROD Environmen
    - 1 9 1 - Gather Data Migration Requireme
  - Design
    - 2 4 6 - Configure and Setup Standard an
    - 2 4 7 - Conduct Conference Room Pilot
    - 2 9 1 - Begin Data Migration Design
  - Development
    - 3 4 6 - Finalize Configuration and Setup
  - Deployment
    - 4 2 2 - Conduct User Training
    - 4 4 2 - Go Live
    - 4 6 2 - Execute User Acceptance Testing
    - 4 9 3 - Final Data Migration to PROD

> List of activities on the left navigation tree

Right panel:

Sure Step Methodology | Projects

Sure Step Methodology ▶ 2 1 1 - Project Pla

Reference | Documents

Table of Contents

- Microsoft Dynamics Sure Step Methodology
- Diagnostic Phase
  - Diagnostic Preparation
    - Microsoft Dynamics Solutions
    - Industry/Vertical Solutions
    - Cross Industry/Horizontal Solutions
  - Decision Accelerator Offerings
    - Requirements and Process Review
    - Fit Gap and Solution Blueprint
    - Architecture Assessment
    - Scoping Assessment
    - Proof of Concept
    - Business Case
    - Upgrade Assessment
  - Proposal Generation
  - Final Licensing & Services Agreements
  - Project Mobilization
- Project Types and Implementation Phases
  - Standard Project Type
  - Analysis
    - Analysis Activity Flow
    - 1 1 1 - Project Planning
    - 1 2 1 - Conduct Solution Overview
    - 1 2 2 - Gather User Training Requirements
    - 1 3 1 - Conduct Detailed Business Process A
    - 1 4 1 - Gather Business Requirements
    - 1 4 2 - Conduct Fit Gap Analysis
    - 1 7 1 - Build Sandbox and Training Environm
    - 1 9 1 - Gather Data Migration Requirements
  - Design
    - Design Activity Flow
    - **2 1 1 – Project Planning**
    - 2 2 1 - Conduct Core Team Training
    - 2 2 4 - Conduct Job Impact Analysis and Cre
    - 2 3 1 - Review and Update Business Process
    - 2 4 1 - Begin System Configuration and ISV
    - 2 4 3 - Create Fit Design in Functional Desig
    - 2 5 1 - Create Gap Design in Functional Des
    - 2 5 2 - Create Technical Design Document
    - 2 6 1 - Conduct Feature Testing of Standard
    - 2 6 2 - Create Unit and Function Test Scripts
    - 2 8 1 - Design Integration and Interface Cor
    - 2 9 1 - Begin Data Migration Design
    - 2 9 3 - Create a Subset of Data for Testing
  - Development
    - Development Activity Flow
    - 3 1 1 - Project Planning
    - 3 2 1 - Create Training and Additional Docum
    - 3 3 1 - Review and Update Business Process
    - 3 4 2 - Complete System Configuration and
    - 3 5 1 - Develop and Freeze Custom Code
    - 3 6 9 - Conduct Solution Testing
    - 3 7 1 - Finalize Production Specification
    - 3 8 1 - Begin Interface and Integration Deve
    - 3 9 1 - Develop and Freeze Data Migration S
  - Deployment
    - Deployment Activity Flow
    - 4 1 1 - Project Planning
    - 4 2 2 - Conduct User Training
    - 4 4 2 - Go Live
    - 4 6 1 - Execute Performance Testing
    - 4 6 2 - Execute User Acceptance Testing
    - 4 7 1 - Build Production Environment
    - 4 9 3 - Final Data Migration to PROD

Figure 4 – Rapid & Standard project type activities
(Source: Microsoft Dynamics Sure Step 2010)

Implementation phases

Implementation phase aims at understanding how Sure Step can help the service provider to deliver the solution that was envisioned in the diagnostic stage.

Diagnostic Phase is a pre implementation phase but the activities performed during this phase are useful in the following implementation phases. In this phase, the customer and the service provider arrive at a common understanding of business needs and the vision of the required solution. (Shankar & Bellefroid, 2010, p.137) The diagnostic phase includes activities from decision accelerator to proposal generation. The decision accelerator has three steps: Requirements and Process Review, Fit Gap and Solution Blueprint, and Scoping Assessment. The Working Deliverables are tools and templates used to help consultants. Key deliverables are documents that service providers deliver to customers as an output of the engagement. A key deliverable generated during the proposal generation stage is the Project Charter which gathers all the diagnostics conclusions. The project charter captures all the crucial information about the project. (Shankar & Bellefroid, 2010, p.154, 155)

Analysis Phase is the start of implementation of the project. Fit/Gap analysis is an important exercise performed between the customer and sales teams to evaluate the solution, the premise of this analysis goes through requirements defined for new solution and determine if the proposed solution can meet these requirements (Shankar & Bellefroid, 2010, p.99).The Project planning sessions in the analysis phase are conducted with the customer, and these sessions include an overview of the project, timeframes, deliverables, the establishment of the project structure, risk and stakeholder analysis, planning for communication, change control, resources, and quality. Customers might take a while to finalize and sign the contract to confirm deployment of the solution from the service provider, some requirements might have changed during the time gap between diagnostic and analysis phase. It is important to verify if the information stated in the Project Charter still remains the same before starting the deployment. This is verified and validated during the kick off meetings. (Shankar & Bellefroid, 2010, p.156, p.158)

In Sure Step, training is addressed as 'Conduct Solutions Overview' and it is important to train key user team at this point so that they understand the functional outline of the solution and unfold healthy discussions, it is inefficient to train the end user at this stage as it would take a long time before they use the newly implemented system. Sure Step helps in scope creep detection by conducting detailed business process workshops and producing workshop reports. Condition of existing data, data cleansing, amount of historical data to be migrated, identification of existing data sources, and master data management should be addressed during these workshops so that they can be tackled from the very beginning. The workshop report must contain information generated from customer interaction, drawing conclusions, identifying issues, motivate process change, avoid excess customization etc. Business analyst would need to report new or changing requirements that unveil during these discussions, and identify scope creep at this point. (Shankar & Bellefroid, 2010, p.160-171)

Design Phase breaks down the solution designing activities in time in order to manage the project in a better way. An active Design phase involves planned customer interaction to create awareness of the solution. Implementation of standard functions which are not dependant on the customized functions is initiated in this phase. Documentation is needed for customized functionalities and configuration settings. Functional Design Documents (FDD) are used for the configuration and customization outlines. Technical Design Documents (TDD) are used for the technical details of each system modification. Solution Design Documents (SDD) are used to provide a view of the solution design for the business decision makers and stakeholders. (Shankar & Bellefroid, 2010, p.172-174)

Some training should be provided on the features of the solution to get sufficient commitment from the key user. Interaction with infrastructure department should also start in order to give them a better insight on the infrastructural consequences of the solution. (Shankar & Bellefroid, 2010, p.174-175)

Development Phase: Software developers play the major role in this phase, preparation of the infrastructure department should continue for the Deployment phase. The customization requirements that are designed in FDD and TDD documents are developed in this stage, by addressing the functional requirements, data migration and interface requirements. (Shankar & Bellefroid, 2010, p. 177)

Change requests are still handled in the Development, but by the end of this phase the level of change must be the lowest for a successful Deployment phase. Along with the changes to the business solution design, reviewing and updating the business process models

should be done based on the testing activity feedbacks. After implementing and configuring the customized functionalities in this phase, the system configuration can be completed since the standard features are already installed in the Design phase. Then the configuration changes are handled which are brought along with the testing, and configuration settings can be frozen for the new business solution. (Shankar & Bellefroid, 2010, p. 179)

Deployment phase prepares the transition to the operational use of the new solution, along with the infrastructural readiness, organizational readiness of the customer should also be ensured. Starting with a broad overview of the solution, Sure Step offers a task-oriented training for the end-users, according to their specific activities. The role-based training activities in the Deployment phase aims at avoiding knowledge erosion, since the users can forget what they have learnt unless they practice. (Shankar & Bellefroid, 2010, p. 182)

User Acceptance Tests must be performed before the go-live procedures start. UAT must test the complete system to see whether the business requirements are met by the new solution or not. Test scenarios are based on the daily routines of different departments and real-life data. A stable environment must be ensured in this phase for the post go-live phase. Sure Step provides a Go-Live Checklist to finalize the preparation to go-live, in order to avoid the possible delays and crashes. System readiness and all the necessary steps are checked and ensured by the checklist. After everything is in place, the new solution can be pushed live and daily business transactions can be initiated with the new system. (Shankar & Bellefroid, 2010, p.184-186)

Project Management

Project management is needed to finish the projects on-time, within budget and scope; but also the specific objectives of the customer organization's business should be addressed. (Shankar & Bellefroid, 2010, p.51, p.55)

In the Analysis phase, a high level of customer interaction is performed with the customer interviews, kick-off meetings and workshops. But in the Design and Development phases, where technical and development activities are performed, communication levels can drop significantly unless some customer interactions activities are triggered. Then in the Deployment phase, the interaction levels start to rise again, since everything that is not planned before has to be done in this phase. Communication must be spread equally among the phases of the project and this depends on a lot on planning. A proactive attitude is expected from project manager to prevent failures rather than just detecting failures. (Shankar & Bellefroid, 2010, p.63, p.67, p.68)

Project Management Essentials: Phases are the smaller units of the project lifecycle, and the main purpose of dividing a project into phases is the ability of control. Work Breakdown Structures (WBS) is a project management technique that describes the planned deliverables for the project scope. (Shankar & Bellefroid, 2010, p.74-82)

Project Library: The project management library provides all the essential fundamentals on project management. As shown in the screenshot below, it covers Project Management Discipline, Project Management Processes, and Organization Change Management. Project Management Discipline handles has 9 domains and a project manager is responsible for handling these domains. (Shankar & Bellefroid, 2010, p.238)

Figure 5 – Project Management Library
(Source: Microsoft Dynamics Sure Step 2010)

Project Champion: A champion is a senior-level person who is responsible for the developing and executing the adoption plan for the company. The ideal champion is an expert and has the credibility to facilitate, lead, and coach enterprise-wide changes. A champion should have a deep knowledge about the business and must be supported and well respected by senior members in the company. He/she should understand people's fear in order to coach them. The champion's first task is to recruit candidates to form the V-team, to assess, configure and deploy Sure Step. The V-team includes at least a sales manager, a senior application consultant, a senior development consultant and a senior project manager. An ideal V-team would also involve the partial participation of IT, Marketing and HR members as change initiative should match to the company's culture. (Shankar & Bellefroid, 2010, p.276)

Organizational change management (OCM)

OCM is a discipline that provides a structured approach to transitioning individuals, teams, and organizations from a current state to a desired future state while minimizing resistance and maximizing adoption" (Shankar & Bellefroid, 2010, p.252) The Sure Step guidance for OCM is aligned in 5 pillars and each pillar has a list of activities:

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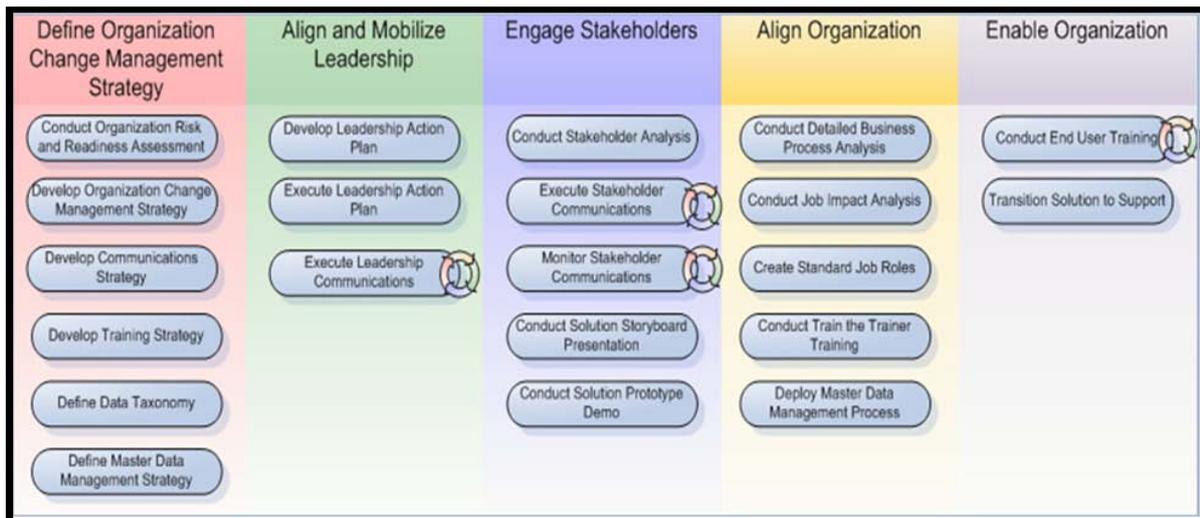
Figure 6 – Activities under each pillar of OCM
(Source: Microsoft Dynamics Sure Step 2010)

Organization Change Management strategy defines the vision, objectives and activities for change management components in a project. (Shankar & Bellefroid, 2010, p. 256)

Align and Mobilize leadership: Leadership action triggers change strategy by defining communication among people who are most impacted by the solution. Leadership communication ensures periodic communication of sponsors and business executives with stakeholders. (Shankar & Bellefroid, 2010, p. 257)

Engage Stakeholders: Ensures that project stakeholders are proactively engaged throughout the project lifecycle. Solution Storyboard presentation involves presenting of storyboard to stakeholders to get active feedback before completion of design. And prototype demo involves presenting the demonstration of the solution. (Shankar & Bellefroid, 2010, p. 258-259)

Align Organization: Ensures that stakeholders are prepared to adapt to the new configured solution. Future state business process models provides baseline to train and align stakeholders to adopt the new solution. Job impact analysis is used to ensure that stakeholders have clear understanding of project impacts once initiated. Master Data management process ensures that ownership and accountability for the data is established. (Shankar & Bellefroid, 2010, p. 259)

Enable organization: Ensures deployment of new solution and user training also makes sure that the support processes are made operational. Transition solution to support ensures that the solution is handed over to the team that will provide ongoing support. Master Data management process handover ensures that data management processes are handed over to data owners to maintain data integrity and accuracy in the new solution. (Shankar & Bellefroid, 2010, p 259-260)

Appendix B - Assessing the quality on the chosen literature

<u>Examining the Implementation Risks Affecting Different Aspects of Enterprise Resource Planning Project Success (2010)</u>

Provenance	Authors: Wen-Hsien Tsai, Sin-Jin Lin (Department of Business Administration, National Central University, Taiwan), Jau-Yang Liu (Department of Business Administration Tungnan University, Taiwan), Kuen-Chang Lee, Wan-Rung Lin (Department of Business Administration National Central University, Taiwan), Jui-Ling Hsu (Department of International Trade Feng Chia University, Taiwan) Paper appears in 'The 40th International Conference on Computers and Industrial Engineering (CIE), 2010'. The conference had 23 topics of interest which include ERP and the articles selected by a committee formed from 71 academicians and each holds a Ph.D. degree from different universities in different countries. (The 40th International Conference on Computers & Industrial Engineering, 2010). Since the conference does not have an open standard for selecting the articles and it was held in 2010 so the article is up-to-date, these increase the credibility of the information given.
References	The article is 6 pages and uses 28 journals and 2 books as references. The date of the references range from 1949 to 2010. Majority of the references are journals, so up-to-date information is given and high number of references is used when compared to the page number. On the contrary, wide date range of the references shows the referral to the old findings on the subject.
Precision of the writing	The article has a clear structure starting with an abstract and introduction part, explaining the purpose of finding the different effects of the 6 dimensions defined on ERP implementation. It continues with the literature review and research methodology part, and showing the table of the results of their search in which ERP risk factors categorized under different dimensions. Representing the collected information makes it easier to comprehend the article. The authors also gave some suggestions for managers to handle the risk factors and they propose areas for future research, allowing the reader to search if interested.
Description or Analysis	The article is mostly based on the analysis of the results of the questionnaire performed, after the focus of the work is described in the introduction and literature review parts.
Research Evidence	ERP implementation risk factors are found from the literature review performed for the first part the research, and the factors are categorized under 6 dimensions. For the second part 249 Taiwanese organizations are analyzed with a questionnaire to find the primary risk areas.
Forensic critique	The authors have used both quantitative and qualitative methods to search and analyze the data. For both data collection and analysis, tables are used to clearly demonstrate the results, which indicate that arguments are not swept.

Assessing Risks in ERP Projects: Identify and prioritize the factors (2004)

Provenance	Authors: Shi-Ming Huang (Department of Accounting and Information Technology, National Chung Cheng University, Taiwan), I-Chu Chang, Shing Han-Li, Ming-Tong Lin (Department of Information Management, National Chung Cheng University, Taiwan) Paper appears in 'Industrial Management & Data Systems, 2004'. The journal is among the top 10 journals in the 'Engineering and Industrial' category (Journal-Ranking.com, 2011). This journal aims to improve the skills and understanding of a manager by providing awareness of new technology and products (Emerald Group, 2011). Since the article is taken from one of the top journals in this particular category, it can be said that it has a high quality.
References	The article is 8 pages and uses 30 journals, 3 books, 3 research reports, 1 web article as references. The date of the references range from 1979 to 2002. Most of the references are composed of journals, but the usage of other resources is a sign for variety of data as a plus for up-to-datedness. The number of references is high for the page number, which adds strength to the article.
Precision of the writing	The article consists of a long background part after the introduction, which explains the methods that are going to be used to identify and prioritize the ERP implementation risk factors. This gives a clear insight to the reader about the search conducted. Then the data collection and analysis parts are clearly explained along with the tables and figures. In the conclusion part, the authors defined what their work is adding to the previous researches performed; this is a good way to show the difference of the article. But the authors have not stated their research question of their area research.
Description or analysis	The article is majorly based on analysis, along with a sufficient amount of description provided in the introduction part.
Research evidence	Potential ERP implementation risk factors are identified with a Delphi method in which a discussion among a group of people is performed in order to reach a consensus. Then, in order to find the most important categories to be addressed, a web-questionnaire is performed among the Chinese Enterprise Resource Planning Society.
Forensic critique	The authors have used systematic methods for their research and they have clearly explained them before showing the results with tables and figures. These both show that their arguments are sound.

Managing Enterprise Resource Planning Projects (2010)

Provenance	Authors: Prasanta Kumar Dey, Benjamin Thomas Clegg and David J. Bennett (Aston Business School, Aston University, Birmingham, UK) Paper appears in 'Business Process Management Journal, 2010'. The journal was ranked with a Q1, which is the highest rate and Q4 is the lowest (SCImago Journal & Country Rank, 2011). This journal examines the integration of the business processes with the organizational efficiency and how it can be managed in order to gain competitive advantage

	(Emerald Group, 2011). Journal is highly rated and the article is published in 2010, these indicators show that the article has a high quality and it is up-to-date.
References	The article is 16 pages and uses 35 journals, 3 conference papers, 2 books, 1 web article and 1 working paper as references. The date of references range from 1998 to 2008. Five types of resources are used in the references, mostly being journals. Since the references are dated in the last 12 years before the 2010, up-to-date information is used in different type of resources.
Precision of the writing	The article has a structured abstract part which gives the purpose of the paper, and the general outline of the paper. Then in the introduction part ERP and the challenges of ERP implementation are clearly defined and referenced, and this prepares reader for the rest of the paper. Authors have elaborated their literature review and case studies with the figures of proposed framework and table, these all make it easier for the reader to understand their research. The only limitation is that the research question was not formulated by the authors.
Description or analysis	Description and analysis are balanced in this article. The author gives clear explanations for the proposed framework, and also for the analysis of the framework according to the case study.
Research evidence	A literature review is performed to identify the critical issues for the ERP projects and the developed framework is applied to a UK-based energy utility through a case study.
Forensic critique	The authors have used a case study approach to test their framework, which lasted for 10 and the impacts of the risk factors are clearly shown with a table. It can be said that the arguments and conclusions derived are sound, since they are based on real-life data.

Enterprise resource planning: A taxonomy of critical factors (2003)

Provenance	Authors: Majed Al-Mashari and Abdullah Al-Mudimigh (Department of Information Systems, King Saud University, Saudi Arabia) Mohamed Zairi (ECTQM, University of Bradford, UK) Paper appears in 'European Journal of Operational Research, 2003'. The journal is ranked as 22th in the 'Operations Research and Management Science' category and also is among the 'Business 80' category, which lists the top business journals (Journal-Ranking.com, 2011). This journal publishes original papers which contribute to the practice of decision making and to the methodology of operational research (Elsevier, 2011). The rankings and the criteria of original paper selection of this journal shows the high quality of the article.
References	The article is 13 pages and uses 42 journal articles, 4 conference proceedings, 9 books, 1 document form the web and 1 company document as references. The date of the references range from 1969 to 2002. Mostly journals are cited in the article along with the peer-reviewed conference proceedings. Referring mainly journals shows that the information given is updated, however the publication date of the article is 2003 and date range of the references is wide.
Precision of	The author provides a clear structure starting with an introduction part which

the writing	is followed by 2 other sections that provide ERP definitions, drivers, cost, and impact. The article continues with the taxonomy of critical factors and the concepts in the taxonomy are elaborately defined and discussed, which give clear insight to the reader. The authors have stated the most essential element for successful and effective ERP implementation from their proposed taxonomy in the conclusion part, but they did not mention what their results are adding to the previous researches and what can be done for future research. Also the research question is not provided in the article.
Description or Analysis	The article is mostly based on describing the concepts in the proposed taxonomy, but these definitions are based on comprehensive analysis and comparison of different resources.
Research Evidence	The authors have performed a comprehensive literature review on ERP literature which combines organizational experiences and research studies.
Forensic critique	The interrelationships between the concepts of the proposed taxonomy are represented via comparing different articles and providing organizational experiences, these shows that the reasoning of the taxonomy is based on a vast research.

'Microsoft Dynamics Sure Step 2010: The Smart Guide to the successful delivery of Microsoft Dynamics Business Solutions'

Provenance	The authors of the book are Chandru Shankar and Vincent Bellefroid. Chandru Shankar is the architect of Microsoft Dynamics Sure Step and a Microsoft Services Director. He is responsible for the design and content of Sure Step methodology and finding solutions/offerings for Microsoft Dynamics program office. (Shankar & Bellefroid, 2010, p.FM12) Vincent Bellefroid is a Microsoft Certified Trainer and the founder of Plataan which specializes in training and consultancy in Microsoft Dynamics and Project Management. He is an experienced implementation consultant and performed Sure Step training sessions along with helping the development of Microsoft Sure Step training materials. (Shankar & Bellefroid, 2010, p.FM16) The authors' deep involvement in the software assures reliability and credibility of the information given in the book.
	The book was published by Packt Publishing in January 2011. The publishing company has published more than 400 books. Packt Publishing produces books and e-books for developers and administrators, to understand and apply IT Technologies. Additionally, the book was reviewed by 6 professionals; 3 of them are working for Microsoft Dynamics products and 3 of them are from other companies (Shankar & Bellefroid, 2010, p.FM17-19). This is a good composition of reviewer team to get detailed insight and constructive criticism.
References	The book has 319 pages and each chapter has its own references at the end, 19 in total and most of them are books. The number of references is low when compared to the number of pages, but there is weightage to the book as one of the authors is the architect of the software.
Precision of	The book defines important concepts like implementing business solutions and project management, before the explanation of Sure Step

the writing	implementation methodology which starts at chapter 5. This structure prepares the reader for the main part of the book, rather than jumping to explain the methodology. Chapters are elaborated with graphs and figures which gives better understanding. The subtitles under each chapter add a good structure to the book, and the metaphors used help in comprehension.
Description or Analysis	The book is a blend of description and analysis. Concepts are clearly explained and challenging aspects of implementations from experience is considered.
Research Evidence	The authors have not performed a particular research for the book.
Forensic critique	The arguments are sound as there is good reasoning to why each activity has to be performed at a particular point in time. For example the authors justify the need for user training only towards the end of deployment, as early training might become obsolete by the time users use the newly implemented system, however they emphasize on spreading awareness at an early stage. There is reference to Microsoft case studies, which gives strength to the arguments as they are based on practical results.

Appendix C – Questionnaire for future research

Primary data:

The questionnaire will be used for eventual primary data collection if the survey is carried out in the future.

The Question formats are Dichotomous questions that offer respondents two alternatives to choose from and Checklists that allow respondents to tick as many items as they wish. Some of the checklist questions also provide Likert scales of 1 to 5 or 7 that indicate the nature of respondent's opinion as to the checked questions. It is good to include open-ended questions in a questionnaire since only having tick boxes can irritate people as they may be forced to respond to predetermined categories. The provision of space for them to answer in their own words diminishes the frustration. (Fisher, 2007, p.193, p.194, p.197)

Questionnaire design: General issues associated with designing a questionnaire is usually concerned with maximizing the response rate. A criterion to consider is to keep the questionnaire as short as possible in two or four sides of A4 paper. The design must look attractive and the structure must be logical and sequential. It is better to divide the questionnaire into parts that correspond to the various issues. A good design is to ask easy questions first and the hard ones later. (Fisher, 2007, p.192)

Sample Size: In the case of a general questionnaire, a return rate of 30 per cent would be very good. The sample size needed to evaluate the research results depends on the size of the margin of error that is acceptable and the size of the population from which sample will be collected. The sample size is yet to be estimated depending on which the margin of error and response rate will be calculated. (Fisher, 2007, p.189, p.190)

The questionnaire is broken down into 3 parts to differentiate the question types. We presume that it is convenient for participants.

Purpose of study: You are being invited to take part in this research study as your contribution will give a heads-up on critical issues that are frequently overlooked during ERP implementation; these issues may be taken into consideration and worked upon in order to provide better service in future interactions.

Participation: You have been chosen because of your work experience in this area. About *(this number)* of participants will be asked to complete this questionnaire. While you have the choice of not participating in the survey, should you decide to participate, your contribution will generate information that will be of value to ERP implementers. We will be sharing a summary of our key findings with you. Please add a note to your return email if you want to receive the results.

Results of research: The research will be written up as an academic dissertation. It will be stored in the archives at Mälardalen University and will be available for inspection on request. The research is being undertaken as part of a programme of academic study at Mälardalen University leading to the award of Master's Degree in IT Management.

Personal details: These details are required for communication purposes only and will not be disclosed in any published results.

Name:

Position:

Contact details:

Telephone:

Email:

PART 1:

1. Was Microsoft Sure Step methodology used to implement the ERP software that you selected?

   a) Yes   b) No

   If No, please specify if any other methodology was used: _____

2. Which of the following Sure Step project types was chosen for implementation?

   a) Standard   b) Rapid

   Please specify the reason: _____

3. Was internal communication handled effectively due to Sure Step usage?

   a) Yes   b) No

If Yes, please rate the extent: (1 = minimal to 5 = large extent)

1   2   3   4   5

_   _   _   _   _

If No, please specify: _____

4. Did the selected ERP package fit well with your organization's processes?

    a) Yes   b) No

    If yes, please rate the extent:

    1   2   3   4   5

    _   _   _   _   _

    If No, please specify: _____

5. Was it challenging to integrate the ERP with the existing IT systems?

    a) Yes   b) No

    If yes, please rate the extent:

    1   2   3   4   5

    _   _   _   _   _

    If No, please specify: _____

PART 2: In the following section, please select all options that apply and on a scale of 1 (minimal) to 5 (large extent), rate the extent to which you think the methodology used has helped to manage these factors. Please skip any that were not encountered.

1. Rate the extent of management of the encountered project management difficulties:

	1	2	3	4	5
a) Lack of top management support	_	_	_	_	_
b) Poor contract management	_	_	_	_	_
c) Exceeding planned budget	_	_	_	_	_
d) Insufficient internal expertise (like experienced IT professionals and business analysts)	_	_	_	_	_
e) Weak implementation team	_	_	_	_	_

    f) Others (please specify):_____

2. Rate the extent of management of the encountered Change Management difficulties:

	1	2	3	4	5
a) Lack of change management activities	_	_	_	_	_
b) Inappropriate change management	_	_	_	_	_
c) Resistance to change	_	_	_	_	_
d) Lack of user participation	_	_	_	_	_

e) Others (please specify):_____

3. Rate the extent of management of the encountered Legacy Systems difficulties:

	1	2	3	4	5
a) Role of IT infrastructure-poor IT system_	_	_	_	_	_
b) Poor data quality	_	_	_	_	_
c) Attempting to link legacy systems	_	_	_	_	_
d) Evaluation of existing legacy systems	_	_	_	_	_

e) Others (please specify):_____

PART 3: Answer the following section only if Sure Step methodology was used for ERP implementation.

1. Did Sure Step handle any other challenging issues that your organization faced?

   Please specify: _____

2. Did Sure Step overlook any other challenging issues that your organization faced?

   Please specify: _____

3. Did Sure Step achieve any of the following benefits?

   a) Cost Savings

   b) Process time reduced

   c) Resource allocation streamlined

   d) Others (please specify):_____

Thank you for your participation

If you have any questions regarding the questionnaire please contact any one of us on the following email addresses: Bhavya Shetty - bhavs.shetty@gmail.com; Arzu Bayır - rzoo1985@gmail.com