

Exploring Critical Success Factors of ERP Implementation in  
United Nations Types of Organizations: Relationship between  
factors impacting user experience

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## Abstract

Exploring Critical Success Factors of ERP Implementation in United Nations  
Types of Organizations: Relationship between factors impacting user experience  
Harshjot Singh Nijher

The present study entails the literature in critical success factors (Daniel, 1961; Rockart, 1979; Thierauf, 1982; Pinto & Slevin, 1987; Wijn et.al, 1996) namely for ERP implementation (Sarkar et.al, 2003; Jaideep et.al, 2005, Koh et.al, 2011) and the components of user satisfaction (Doll & Torkzadeh, 1988). The primary purpose of this research is to explain the critical factors for successful ERP implementation in United Nations type of organization and set up a grounded research approach that aims to identify and investigate the relationship between the components of user satisfaction with the goal to propose a model that explains the success factors and relevant relationships between information technology usage, information characteristics and business processes.

A three dimension (triangulation) approach consisting of grounded research, a quantitative survey methodology and qualitative semi-structured interviews was used to collect information and data from a United Nations agency in Montreal, Canada. The data for the research was taken over a period of 6 months, studying documents of project implementation, discussions, meetings, observations, a survey with 101 responses and interviewing 10 senior management officials. Exploratory factor analysis (EFA) was performed to identify the relevant factors critical to the success of ERP implementation. A correlation analysis was done to understand the relationship between the components of user satisfaction. Structural equation modelling (SEM) technique was then used to extract a model that explains ERP implementation. Finally, qualitative information were examined in light of the findings to complete our investigation loop.

The findings along with the theoretical and practical significance of the research are discussed.

*Keywords:* Critical success factors, ERP implementation, case studies, user satisfaction, UN

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## Table of Contents

Introduction .....	1
1. Introduction to Enterprise Resource Planning.....	3
1. Enterprise Resource Planning .....	3
2. History of Enterprise Resource Planning.....	4
3. ERP importance.....	7
2. Critical success factors.....	9
1. History of critical success factors .....	9
2. Dimensions of critical success factors .....	10
3. Techniques for Critical Success Factors.....	12
4. Techniques used in the current study .....	12
3. Literature Review .....	14
1. 1st method to identify CSFs .....	14
2. Methodology for the literature review.....	14
3. Analysis of literature review .....	17
4. Division of CSFs for ERP implementation into stages.....	18
5. Division of CSFs for ERP implementation according to industry .....	19
6. Other contexts.....	21
7. CSFs identified by theoretical articles .....	29
8. ERP implementation stages defined.....	34
9. Final list of all the CSFs identified for ERP implementation.....	36
4. Theoretical analysis and CSFs reduction.....	41
1. Basics of CSF reduction.....	41
2. Final list of reduced CSFs as function of stages.....	43
5. Business environment context of study .....	46
1. United Nations.....	46
2. Environmental Context of United Nations .....	48
3. Information Technology Context.....	49
6. Methodology .....	51
1. Context.....	51

2.	Analytical strategy .....	52
3.	Grounded Research .....	53
a.	Background.....	53
b.	Participants.....	53
c.	Organization investigation and analysis.....	53
4.	Quantitative Survey.....	73
a.	User satisfaction and success of ERP implementation.....	73
b.	Procedures .....	75
c.	Participants.....	76
d.	User satisfaction and success of ERP systems.....	77
e.	Analysis and results.....	81
5.	Qualitative Data Analysis .....	98
a.	Narrative analysis.....	99
b.	Procedure .....	100
c.	Big Five Personality Traits.....	101
d.	Analysis and Results – Ratcliff narrative technique.....	102
7.	Research findings.....	114
8.	Conclusion.....	116
9.	Research Implications.....	119
Theoretical implications.....		119
Practical implications .....		120
10.	Directions for future research.....	121
	References.....	123
	Appendices .....	132
Appendix A.....		132
Appendix B .....		134
Appendix C .....		136
Appendix D.....		139
Appendix E .....		160
Appendix F .....		164
Appendix G.....		165
Appendix H.....		166

## List of tables

1. History of ERP.....	10
2. History of Critical Success Factors.....	14
3. The Dimensions of Critical Success Factors.....	14
4. Techniques for CSF Identification.....	15
5. CSFs for ERP Implementation.....	25
6. Change Management CSF.....	29
7. Theoretical articles for CSF in ERP implementation .....	31
8. Original and new Critical Success Factors.....	33
9. CSF and ERP Implementation Stages.....	37
10. Original and New ERP Implementation CSF.....	39
11. Final ERP Implementation CSFs as Function of Stages.....	41
12. Rating of each CSF through grounded research.....	61
13. Comparison of questionnaires.....	67
14. Kaiser's Measure of Sampling Adequacy.....	69
15. Prior Commuality Estimates: SMC.....	69
16. Variance plot for the Eigen values of the reduced correlation matrix.....	69
17. Inter-Factor Correlations.....	71
18. Standardized Regression Coefficients.....	72
19. Standardized Regression Coefficients with factor loadings .....	73
20. Factor loadings for the 5 retained dimensions.....	74
21. Variance ignoring other factors.....	74
22. New and modified questionnaire after Factor Analysis.....	75
23. Fit Indices.....	76
24. Reliability Coefficient.....	76
25. Variables in model.....	77
26: Research hypothesis.....	86
27. Fit Indices.....	86
28. Reliability Coefficients.....	87
29. Variables in model.....	87
30. Personality traits and characteristics.....	92
31. Demographics of the Interviewees.....	94
32. Criteria used to identify positive or negative reaction to CSF.....	96

33. Rating of each CSF during the interview.....	100
34: Mapped CSF for UN type of organizations.....	105



## List of figures

1. Stages developed to identify CSFs during ERP implementation.....	35
2. Reasons for ERP implementation in the organization.....	55
3. Perceived purpose of ERP implementation in the organization.....	58
4. Model of impacted CSFs at 3 levels in the organization.....	73
5. Survey for User satisfaction with ERP systems in UN.....	75
6. Demographics of the survey respondents.....	77
7. Duration of years working at the UN agency.....	77
8. Factors influencing user experience.....	91
9. Proposed Model for user experience with ERP systems.....	93
10. Causal model for user satisfaction in UN context.....	96
11. Structural equation modelling map for the factors identified.....	161

## **Introduction**

Enterprise Resource Planning has been an upcoming topic of interest in the industry and academia for the last few decades. The high degree of interest can be attributed to the complexities associated with the implementation of ERP systems. Also, it is a high magnitude of investment for an organization both in terms of time and money. So, it is very important to ensure that it is successful and results in efficiency savings for the organization. Considering this, it became imperative to define the critical success factors which would result in a successful ERP implementation. There is a lot of research (case studies, theoretical articles, empirical articles) which focusses on establishing critical success factors which would result in a successful process. It includes strategic, tactical, operational and human (change management) factors. However, the list of factors is not constant as it changes according to the various situational contexts. So, various contextual situations need to be studied to establish their particular list of factors which would ensure a successful ERP implementation.

United Nations has a big impact on the world both in terms of peace keeping and establishing regulations. Its agencies are responsible for solving inter-governmental issues, global problems and establishment of rules in various domains. However, there has been no research which has focused on the factors responsible for successful ERP implementation in the UN context. Also, no one has ventured into the complexities associated with the change in UN and its agencies as the HR policies of UN differ from other organizations. So, the factors of ERP implementation which impact the user experience are different from other organizations due to the political context. This is a big gap in this research domain as this situational context is highly unique and it needs to be studied to establish a list of critical success factors for successful ERP implementation. Also, it is important to study the factors impacting user experience. This research is a stepping stone into the domain of ERP implementation at United Nations.

To accomplish this research, I pursued an internship in a UN agency at Montreal for six months collecting data through grounded research (observations, meeting and discussions), quantitative survey and qualitative interviews with the chiefs of functional units. The quantitative survey was focused on establishing a

relationship between factors impacting user's experience with ERP systems in United Nations context. A validated scale (Doll & Torkzadeh (1988) scale of End user computing satisfaction) was used to gather responses which resulted in a total of 102 responses across various functional units. Exploratory factor analysis was performed which was followed by structural equation modelling to establish a causal model between the various factors impacting user experience in United Nations context.

The triangulation technique of extensive literature review, grounded research and interviews resulted in a consolidated list of 13 critical success factors which would ensure a successful ERP implementation at United Nations type of organizations. This research extensively focused on one agency of United Nations. Even though the issues experienced were similar across other UN organizations, it would provide further insights into the complexities associated with ERP implementation in this context if multiple UN organizations are studied with the same model. This research has provided a model which could be applied to other UN organizations to study how it varies and can provide managers with the understanding of factors impacting user experience which would lead to success of ERP implementation.

## **1. Introduction to Enterprise Resource Planning**

### **1. Enterprise Resource Planning**

Enterprise Resource Planning (ERP) refers to organizational information systems that are used to improve process efficiency by providing real time data and thus, making accurate and timely decisions (Holland & Light, 1999). The need of an open and efficient flow of information between the company, its suppliers, distributors and customers has been a primary driver to implement ERP systems (Shang & Seddon, 2000). Moreover, the need for improved businesses processes has resulted from an ever increasing competitive environment that is plagued with delays in supply and whereby production challenges have resulted in loss of financial resources and consequently competitive advantage. Umble et.al (2003) elaborates on the benefits of ERP to “provide information about all the functions of an enterprise by a single system which provides an enterprise wide view of the company”. ERP helps in decision making and projecting a strategy for the future. Some of the various departments influenced by the implementation of an ERP system are finance, human resources, operations, logistics, sales and marketing.

ERP implementation is expected to solve the issues of efficiency of business processes and can result in streamlining the organizations processes which leads to savings in terms of money and time (Shang & Seddon, 2000). However, it is not an easy task to implement an ERP system successfully and it is noticed that a lot of companies even today are unsuccessful at their ERP implementation (Xue et.al, 2005, Mashari & Mudimigh, 2003). They have costly or delayed implementations and their ERP strategy keeps revolving around correcting the issues related to the implementation which leads to no progress towards the ERP strategy (Chang et.al, 2004). Chang et.al (2004) calculated that in 2004, 90% of ERP implementations are delivered late or are over budget and enterprise initiatives show a 67% fail rate in achieving corporate goals and are considered negative or unsuccessful.

This has improved at an organic growth over the years as organizations are increasingly becoming aware of the factors needed to ensure a successful ERP implementation. The Panorama Report (2013) reports that on an average between 2008 and 2012, 53% of the ERP implementations have been delivered

late and 58% of the implementations have gone over budget. Also, around 58% of the implementations failed to realize less than 50% of their corporate goals. There have been various issues identified as the reasons for the failure of these projects. In spite of having a low success rate in these organizations, there is a lot of research (Shanks et.al, 2000, Soh et.al, 2003, Motwani et.al, 2005) being done to find the critical success factors for a successful implementation. There have been studies identifying the factors required for successful ERP implementation at private firms, public firms and multi-national firms.

However, it is important to understand the reasons that the ERP came into existence and the major happenings that made ERP an important strategic asset in the industry. It would provide a foundation to the thesis study providing the reader with the background of Enterprise Resource Planning.

## **2. History of Enterprise Resource Planning**

The ERP evolution started in 1960 (Inventory management and control) as a tool to basically identify inventory requirements and monitoring the usage of items. However, it had constraints as it was highly expensive and big mainframe computers were used to support the system. It was replaced by MRP (Material resource planning) which was a more complete tool with focus towards product integration and planning. It utilized software applications for scheduling production processes. SAP was invented during this time (1970s) but still the system was difficult to operate, costly to implement and time consuming. The upgrade to MRP II happened in 1980s where the focus was on manufacturing strategies and updating account information. People-Soft ERP was invented in this period but it was upgraded to ERP in 1990s as the MRP II did not have planning and scheduling functions and it was running on one platform which was a risk to organizations using it.

According to Hoy (1996), ERP systems follow a trend that there are always improvements in the new versions as it followed a growth strategy that built on the previous versions of ERP. With the birth of ERP in 1990s, an IT tool was produced which would run on multiple platforms and offer a variety of functions like HR, finance and marketing. Even today, there are issues with each version of ERP just like its predecessors but these issues are more related to the processes

than the product. However, a lot of organizations have realized big savings and productivity with the implementation process.

Over the years, the understanding of Enterprise Resource Planning has shifted horizons from being a program or tool to a process. The organizations are realizing that an ERP system development and implementation requires following a validated strategy that aligns to the specific needs of an organization. This change in approach towards an ERP implementation is resulting in more companies being successful and realizing benefits expected from an ERP implementation. Table 1 presents the history and evolution of ERP systems with major milestones along the way. It also presents the shortcomings of the various versions and the resulting improvements in the next versions.

**Table 1. History of ERP**

Table 1 provides chronological information of the historical evolution of ERP. The name of the different systems, their year of introduction, and their purpose and their constraints are presented.

<b>System</b>	<b>Year</b>	<b>Purpose</b>	<b>Constraints</b>
<b>Inventory management and control</b>	1960s	<ol style="list-style-type: none"> <li>1. Identifying inventory requirements</li> <li>2. Setting targets</li> <li>3. Providing replenishment techniques</li> <li>4. Monitoring item usages</li> </ol>	<ol style="list-style-type: none"> <li>1. Big and clumsy</li> <li>2. Large technical staff required to support mainframe computers</li> </ol>
<b>MRP, hardware and software developments</b>	1970s	<ol style="list-style-type: none"> <li>1. Move towards target market strategies</li> <li>2. Emphasis on production integration and planning</li> <li>3. Utilize software applications for scheduling production processes</li> <li>4. <b>Birth of SAP</b> (Systemanalyse und Programmentwicklung) <b>1972</b></li> </ol>	<ol style="list-style-type: none"> <li>1. System was difficult to operate</li> <li>2. Time consuming</li> <li>3. Costly to implement</li> <li>4. No reflection of production and inventory management goals</li> </ol>
<b>MRP II</b>	1980s	<ol style="list-style-type: none"> <li>1. Manufacturing Resource Planning</li> <li>2. Focus on manufacturing strategies designed to replace stand-alone systems</li> <li>3. Sales, inventory and purchasing transactions</li> <li>4. Update inventory and accounting information.</li> <li>5. <b>Birth of Peoplesoft, 1987</b></li> </ol>	<ol style="list-style-type: none"> <li>1. Absence of planning and scheduling functions.</li> <li>2. Running on one platform.</li> <li>3. Requires accurate information</li> </ol>
<b>ERP</b>	1990s	<ol style="list-style-type: none"> <li>1. Enterprise Resource Planning coined by Gartner Group</li> <li>2. Criteria for evaluating the extent that software was actually integrated both across and within the various functional silos</li> <li>3. SAP R3 - use of client-server hardware architecture</li> <li>4. Running on multiple platforms</li> <li>5. Offers other functions like marketing, finance, HR</li> </ol>	<ol style="list-style-type: none"> <li>1. Implementation may require major changes in the company and its processes</li> <li>2. Involves an ongoing, possibly never ending, process for implementation</li> <li>3. Expertise is limited with ongoing staffing problems</li> </ol>

The ERP implementation is an important topic in the research domain and a lot of research has been done on it. This research has helped companies, senior management, implementation teams and users to understand the concept of an

ERP system and adapt better to it. The next section discusses the importance of an ERP system as outlined by the research and the various consulting firms.

### **3. ERP importance**

The importance of ERP is evidenced by several studies such as:

- Approximately \$300 billion has been invested in ERP worldwide in the last decade (Carlino et al. 2000).
- More than 60% of Fortune 1,000 companies had implemented core ERP applications manufacturing, financials, and human resources (Stein 1999).
- ERP market grew by 3.8% in 2013 and it has been a constant growth since 1990s except for a decline during the economic recession of 2008.
- According to Forbes (2013) report, the total market value of ERP systems was USD 24.5 Billion and is increasing at a constant growth rate<sup>1</sup>. The steps to move toward ERP implementation by most of the companies today indicates the increased awareness that these companies have about the importance of a unified ERP system. Panorama Consulting Solutions conducted its 2013 ERP Report from September 2012 to January, 2013 with data from more than one hundred seventy organizations all over the world which showed that:
  - a. Average cost of ERP implementation is \$7.3million.
  - b. Average duration of an ERP project is 16 months.

This shows the heavy investment incurred by the companies in their ERP systems. The companies expect to get benefits such as increase in efficiency of their operations, reduce duplicate tasks, reduce headcount and exploit better opportunities.

The following were the top ten reasons cited for the ERP implementation:

- a. To improve business performance
- b. To replace an old legacy system
- c. To better integrate systems across multiple locations
- d. To position the company for growth

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<sup>1</sup><http://www.forbes.com/sites/louiscolombus/2013/05/12/2013-erp-market-share-update-sap-solidifies-market-leadership/>



- e. To better serve customers
- f. To ensure reporting compliance
- g. To make employee jobs easier
- h. To standardize global business operations
- i. To reduce working capital
- j. Because other companies have ERP

O Leary (2000) mentioned that the ERP affects most major corporations of the world, impacts the behaviour of the competition, changes the consulting market, initiates the concept of best practices and has a huge impact on the market growth and job opportunities. To study the ERP implementation and present the factors which are critical to its success is very important. It is evident from this section that the use of ERP is going to increase over time for achieving efficiency in the business processes.

However, to proceed further in the thesis, we need to first understand the concept of critical success factor and the dimensions of critical success factors. The next section would provide an overall understanding of the concept of critical success factors and some of the techniques to measure it.

## **2. Critical success factors**

The critical success factors (CSF) for any project outline aspects which are essential to ensure its success. It means that these factors, if implemented at timely duration during the project increase the chances of a success as compared to when they are not implemented (Rockart, 1979). According to Hofer & Schendel (1978), these are the factors which are influenced by senior management to provide an edge to the organization with respect to competitors. . In the context of ERP implementation, CSFs would be factors which are required to ensure a profitable ERP venture for an organization. The approach for critical success factors has also been followed from a manager's perspective. Dadashzadeh (1989) also mentions these as factors which a manager considers important for his success. These factors are a part of his performance objective which are monitored to ensure success. Over the course of the last fifteen years, there has been a lot of research done on ERP implementation critical success factors. However, the concept of critical success factors is not a new one and it took a long time for researchers to define this concept.

### **1. History of critical success factors**

The definition of CSF construct is not a new one and it was first attempted to be defined by Daniel, 1961. Daniel (1961) and Rockart (1979) were the first researchers to coin the term critical success factors as factors to ensure the company sustains its competitive edge over the industry. Thierauf (1982) focused on the importance of measurement of results of CSFs by addressing that these should be measured and corrective steps to be taken to ensure success. The research advanced to link strategy and critical success factors as it was evident that these factors were important for success of an organization. Bryton & Zmud (1984) postulated that these factors were important for strategy implementation in a company. These factors monitor the progress of a strategy and should be defined at the start of the project to ensure successful strategy. Bullen & Rockart (1986) progressed the research on critical success factors and mentioned that their sources include industry, competitive strategy of an organization, environmental factors, temporal factors of an organization and every manager's mental models. The research till 1998 was missing the limitations of critical success factors. Peffer & Gengler (1998) provided some limitations of these

factors as they did not have any theoretical base and was just a concept developed from the requirements of the industry. There was no accepted procedure for its application and the implementation for these factors was specific for every industry and their measurement criteria was different in each organization. This might result in biased results which should not be generalized across organizations. Table 2 provides further milestones in the evolution of critical success factors.

**Table 2. History of Critical Success Factors**

Table 2 provides the chronological History of Critical Success factors, adapted from Sousa (2004). The table lists the main exponents of Critical Success factors, their contributions and year of publication.

<b>Authors</b>	<b>Year</b>	<b>Contribution</b>
<i>Daniel</i>	1961	Research initiated
<i>Rockart</i>	1979	Defined what is critical success factors
<i>Thierauf</i>	1982	Results should be adequate to ensure success
<i>Rockart (a), Bryton &amp; Zmud (b)</i>	1979(a), 1984(b)	CSFs are used for strategy implementation
<i>Leidecker &amp; Bruno Pinto &amp; Slevin</i>	1984, 1987	Definition of CSF
<i>Bullen &amp; Rockart</i>	1986	5 sources of CSFs 1. Industry 2. Competitive strategy and positioning of the organization 3. Environmental factors 4. Temporal factors facing the organization 5. Specific to each manager
<i>Peffer and Gengler</i>	1998	Limitations of CSFs 1. Lack theoretical basis 2. No accepted procedure for its application 3. Ad-hoc applications may result in biased results
<i>Dirks &amp; Wijn (a), Wijn et.al (b)</i>	2002(a), 1996(b)	CSFs are used for strategy formulation
<i>Peffer</i>	2003	CSF's can be used to justify investment in IS systems as their benefits are hard to quantify

## 2. Dimensions of critical success factors

Various dimensions of CSFs have been studied in the literature. The critical success factors can exist as a hierarchy in organizations where they are

followed differently at different levels. This dimension is called hierarchy dimension of CSFs. Khandelwal & Ferguson (1999) defined the temporal dimension of CSF as the one with the focus on project, i.e. project scope and the ongoing CSFs where the critical success factor is valid throughout the project and even post the implementation process like project champion. Further dimensions include internal and external CSFs (Flynn & Arce, 1997) which relate to the actions performed inside the organization and outside through the environment context respectively. The CSFs which have to be monitored regularly are called monitoring CSFs (Eberhagen & Naseroladl, 1992). The other dimensions include strategic and tactical CSF (Kelly et.al 1999) and perceived and actual CSF (Grunert & Ellegard, 1993).

The table 3 lists the various dimensions of critical success factors.

<b>Table 3. The Dimensions of Critical Success Factors</b>	
Table 3 provides the different dimensions of Critical Success Factors (Sousa, 2004), and their focus.	
<b>Dimension</b>	<b>Focus</b>
<b>Hierarchy/Group of CSFs</b>	CSFs belonging to a particular industry CSFs belonging to a manager at particular level
<b>Temporal/Ongoing CSFs</b> <i>Khandelwal &amp; Ferguson (1999)</i>	Project champion – Ongoing Project scope – Temporal
<b>Internal &amp; External CSFs</b> <i>Flynn and Arce(1997)</i>	Internal – Related actions performed inside the organization, under manager’s control External – Related actions performed outside the organization, not under manager’s control
<b>Monitoring CSFs</b> <i>Eberhagen &amp; Naseroladl (1992)</i>	Need to be monitored for success regularly
<b>Difference between monitoring and building CSF</b> <i>Flynn &amp; Arce (1997)</i>	Difference between monitoring and building CSFs Monitoring – Existing organization situation Building – Changing organization with future planning
<b>Strategic and tactical CSF</b> <i>Kelly et.al (1999)</i>	Strategic – long term planning and is done by the senior management Tactical – short/medium term planning done by middle management
<i>Pinto &amp; Prescott (1988)</i>	Criticality of CSF’s keep changing over the lifecycle of the project

### 3. Techniques for Critical Success Factors

There have been various suggested techniques to identify the critical success factors. Sumner (1999) identified critical success factors through a case study. Umble & Umble (2001) referred to an extensive literature review to study a context and come to a conclusion. Action research (Kock, 1999) involves studying the phenomenon by observations. Structured interviews (Bullen & Rockart, 1986) can result in creation of a scenario that puts light on the identification of critical success factors through techniques such as narrative analysis. Other techniques to identify CSFs include Delphi technique (Beaucheu et.al, 1996) and multivariate analysis (Tishler et.al, 1996). The table 4 lists all these techniques for CSF identification.

**Table 4. Techniques for CSF Identification**

Table 4 presents the different techniques that have been used for CSF Identification and the Reference of each.

<b>Technique</b>	<b>Reference</b>
<b>Case studies</b>	Holland et.al, 1999, Sumner 1999
<b>Literature review</b>	Esteves & pastor , 2000, Umble & Umble 2001
<b>Action research</b>	Kock et.al 1999
<b>Structured interviews</b>	Bullen & Rockart 1986
<b>Delphi technique</b>	Beaucheu et al 1996
<b>Multivariate analysis</b>	Tishler et.al 1996

### 4. Techniques used in the current study

**Case studies:** The thesis followed more than 30 case studies of successful and unsuccessful ERP implementation. The various case studies are from different contexts and thus present different factors that are important for those situations. This has lead us to create an exhausting list of critical success factors for a successful ERP implementation.

**Literature review:** The literature review performed for the thesis consists of an extensive review of the theoretical articles on ERP implementation and the case studies. Patterns have been explored and discussed and gaps have been identified which is being explored in this study.

Action Research: Four months of action research was performed in an organization where observations were made to identify the critical success factors for the ERP implemented there. Difference of context resulted in a lot of factors becoming negligible and others having high relevance and significance.

Structured Interview: To ensure that all areas are covered and all possible CSFs are identified, structured interviews were conducted with senior management of the organization. The interviews provided further insights into the perceived critical success factors for senior management and how the success factors identified in the action research impacted the implementation. The next chapter discusses the steps followed for the literature review for identification of critical success factors for successful ERP implementation.

### **3. Literature Review**

#### **1. 1st method to identify CSFs**

The literature on CSFs for successful ERP implementation, in specific, is scattered with no particular distinction in any specific domain. There is an exhaustive list of case studies in different contexts producing a list of critical success factors. By aggregating all CSFs for ERP implementation, a relatively long list is produced. To that effect, this chapter identifies and combines these CSFs according to newly defined stages in the ERP implementation process utilizing a smaller and a more consolidated list of CSFs obtained from real world global case studies. These stages are according to the stages used in the industry and understood by project teams and senior management. This would enable implementation teams to better monitor the CSFs by identifying their position in the process and take necessary process to add actions to ensure success.

By understanding what went wrong in big, small and start-up companies and what decisions they took that ensured the success of their ERP implementation, it is possible to gain significant insight into the actual issues of ERP implementation and list possible critical success factors which could be important and significant in an organization like United Nations. The literature review is composed of the identification of CSFs from case studies and theoretical articles. This would generate a consolidated list of factors which would cover all the scenarios and contexts. But our final purpose would be to consolidate a list and reduce the factors and produce a list which contains distinct factors.

#### **2. Methodology for the literature review**

There are a number of literature review methodologies that have been published in research as well as in practice. The research has focused on the need of literature review for enterprise project management. For example, Kitchenham et al. (2009) proposed a systematic approach to synthesize and analyze concepts, organize empirical findings, and identify gaps in the literature. Their approach entailed the following steps: Identification of sources; group of researchers conducting individually their literature review for each source; conducting an inclusion and exclusion criteria for the selection process; performing a group peer quality assessment; data extraction from final set of articles; group peer

assessment for data extraction; finally, all decisions are negotiated within the group until agreement is reached.

There is also a recognized approach to a literature review that is generic to all the fields. Brocke et.al (2009) suggested a literature review approach that is broad and extending to all fields. Their approach is cyclical whereby their literature review is continuously extended and updated. The steps they suggested for the primary review entails definition and review of scope, conceptualization of topic, literature search, analysis and synthesis, and research agenda. These steps coupled with a set of proposed tables and process charts constitutes a framework they had proposed.

A prominent and well established literature review methodology is “The Cochrane Collaboration” used in the field of medicine and healthcare in general ([www.cochrane.org](http://www.cochrane.org)). The Cochrane review is an established systematic review process that is evidence-based – a primary focus of research in the medial and healthcare industry. Their approach is very rigorous that starts with a clearly formulated question.

The literature review approach in the thesis and presented below has many commonalities with other approaches (such as clearly formulated question, agreement for article selection and CSFs, and extraction and organization of data). Our selection of the method was an accepted method and one that seems to be most appropriate to the nature and purpose of our research work and context of the thesis. This research followed the eight category coding steps proposed by Carley (1993). These coding steps ensure that a comprehensive literature review is done with the existing articles in a particular field of research. The purpose of this methodology is to create a list of coded distinct CSFs obtained from case studies and theoretical articles reporting on ERP implementation.

*Step 1: Levels of analysis:* The literature review covered articles in ERP implementation from peer refereed journal articles. The search was focused on ERP systems and more specifically to the implementation of ERP systems. We also made large effort to finding those articles involving case studies about both successful and unsuccessful ERP implementations. The critical success factors



were separately also explored for change management and a list was developed for factors related to change management during an ERP implementation.

*Step 2: Steps to code for:* The coding process identifies whether a pre-determined set of concepts or an interactive approach for coding is followed. *An interactive coding approach was used for this study* to cover all the identified critical success factors.

*Step 3: Decide whether to code for occurrence or frequency of a concept:* The frequency of a concept was explored. By this measure, we were able to identify how many times a particular CSF has been mentioned in the body of literature of case studies. But our purpose of conducting a literature review was to gather all the mentioned critical success factors in the ERP literature. So, counting how many times a particular CSF occurred in the literature was not our part of action.

*Step 4: How to distinguish among concepts:* The 'distinguish factor' used was similarity/difference in the meaning. The success factors which sounded similar were put together and categorized as one. Finally, some critical success factors were merged which improved the collection of factors and led to factors which were distinct. This is a part of CSF reduction technique which follows after this chapter.

*Step 5: Develop rules for coding the text:* All the case studies were re-read to ensure that the factors mentioned were critical success factors. Some articles were rejected because they entailed results of CSFs and not the CSFs. The factors were studied once again and merged into a new set of distinct critical success factor.

*Step 6: 'Irrelevant' information* – Only case studies articles were selected. From that set only articles which contained critical success factors were kept for analysis.

*Step 7: Coding of text/information:* During this stage, the actual coding process was conducted. All translation rules identified in step 5 were followed. Strauss and Corbin (1990a, p. 67) states that with respect to the name attached to the category, *"it is usually the one that seems most logically related to the data it represents, and it should be graphic enough to remind you quickly of its referent."*

*Step 8: Analysis of results:* The results analysis consisted of measuring the count of CSFs identified in each article and noting their context that helped to understand the areas which are more and less explored in the ERP implementation field. The factors were condensed into a single distinct set of CSFs.

The steps 1 to 3 are performed in this chapter of literature review. The step 4 of distinguishing among concepts and making a consolidated list is a part of next chapter – critical success factors reduction.

### **3. Analysis of literature review**

During the synthesis of the final set of articles, we observed that the treatment of CSFs is highly inconsistent. Many approaches, styles and methods were used (Gefen, 2004; Holland et.al, 1999). This made the synthesis process more complex because multiple readings followed by many discussions with my supervisor were necessary to provide a reasonable interpretation of comparative meanings.

In this section, we review the literature of critical success factors for ERP implementation from case studies according to three most prominent contexts:

- ERP implementation stages
- ERP implementation according to industry
- Other contexts

Table 5 presents the final set of case study articles and the CSFs reported in each article. It also explains the context of the study in these articles which helped us better to understand the respective studies. Among all the contexts, top management commitment and support has been defined as the most critical success factor in the research on ERP implementation. (Bingi, 1999; Sumner, 1999; Kotter, 1990; Mabert et.al, 2003; Laughlin, 1999; Bradford & Florin, 2003; Vineets, 2006). The role of top management support has been explained in detail in the literature. Holland et.al (1999) mentioned that top management should provide all the required resources at every stage of the ERP implementation process. Robert and Barrar (1992) mentioned that the top management is also required during the conflicts and their involvement would ensure the smooth operation of the entire process. The top management support is important

throughout the ERP implementation process but it is of prime importance at the earlier stages of the project for the initial change management. Somers and Nelson (2001) mentioned that the changes can lead to resistance from the employees and unrest in the organization and with complete top management support, the initial phase can be dealt with less resistance and ensuring that the vision is communicated to all the employees (Bharathi and Parikh 2012). The next section discusses the research done on critical success factors in ERP implementation at various stages of the process.

#### **4. Division of CSFs for ERP implementation into stages**

There is a wide stream of literature that focuses on identification of CSF's during the stages of ERP implementation. Somers and Nelson (2001) described the impact of critical success factors for different stages of ERP implementation using case study of 86 companies and divided the ERP stages into initiation, adoption, adaption, acceptance, routinization and infusion and identified the factors which are most critical at each stage of the ERP implementation. Bharathi and Parikh (2012) also conducted a similar research but in a particular context of Indian private automobile industry. They identified the different stages of ERP implementation as planning, acquisition, implementation, usage and percolation and extension. They also categorically mentioned that for the planning stage, top management commitment, organization's readiness to change, the vision of the company, project planning and the scope of the ERP are the main critical success factors. During the acquisition phase, existing IT compatibility of the SME, a thorough cost benefit analysis, the right ERP package selection, the analysis of implementation vendor, the roles of consultants and the interaction between owners of SME's are the most critical success factors. During the implementation phase, involvement of process owners, project management, identification of critical mission processes, business process re-engineering and GAP analysis, creation of an implementation road map, training needs and functional testing are the most important success factors. The usage and percolation phase requires periodical and timely communication, percolation of owner's commitment, GAP analysis before and after training, feedback on user satisfaction, review on implications on time and a mandatory ERP environment in the organization are the most important critical success factors during the usage and percolation

phase. The extension phase after the usage and percolation phase requires more work and this is a process that should never stop exploration and exploitation of existing processes to make it better with the help of the ERP implementation.

The literature has focused on the private industry to explain these stages. Also, these stages are not oriented to the industry terminologies of ERP implementation. The managers are not able to clearly relate to these stages as the terminologies are business oriented whereas these terminologies of the different stages are theoretical and provide only a sound base for researchers. As a result, the practitioners are not able to follow these stages and as a result haven't solved the issue of providing a high success rate for the ERP implementation. The next section analyses if the critical success factors vary with context to industries and present the research according to them.

## **5. Division of CSFs for ERP implementation according to industry**

Some case studies focus on a particular industry irrespective of the region as they argue that the success factors are primarily influenced by the industry and so linking them with the industry is of more importance than linking them with the region (Mashari & Mudimigh, (2003); Upadhyay & Dan, (2010); Bozarth, (2006); Jaideep et.al (2005). Dixit and Prakash (2011) performed a study on the issues affecting the ERP implementation at small and medium enterprises and mentioned top management support, training, data collection to measure results, software design and testing as some of the critical factors for successful ERP implementation. Tsai et.al (2011) performed an empirical research to identify the internal and external facilitators in an ERP implementation and concluded that clear vision and understanding, commitment by top management, proper system selection and an effective change management program result in an ERP project success. Koh et.al (2011) performed a critical analysis of the drivers, barriers and CSF's in the ERP implementation in Supply chain industry and concluded that top management, clear vision, robust planning, availability of resources, BPR, change management, pro-active culture, data accuracy, training and monitoring and evaluation as the most critical success factors in supply chain industry.

*Case study at Pratt n Whitney:* Tchokogue et.al (2005) studied the ERP implementation at Pratt and Whitney Canada and concluded that the key lessons

to be learnt from a successful implementation are that an organization should have a capacity to change. By capacity to change, it means that the organization should encounter no resistance to change. That can be achieved by creating an atmosphere that demands the change process or in other words, creates an urgency to change so that the entire organization is on the same page regarding the change. They also mention that Pratt and Whitney were very particular of the right time to start the process re-engineering. This enabled them to have enough time to carefully study their business processes and after a thorough consultation with all the functional areas of the organization. There needs to be a rigorous and expert project management detailing all the steps required for achievement of a particular goal. Tracking the progress of the project and ensuring that all deliverables are achieved and completed on time is achieved by effective project management. They also mentioned that it is very important to develop frameworks to measure the results of the implementation on a timely basis and document it. One of the winning points of Pratt and Whitney was the detailed and strategic change management which was well planned and well executed. The GO-LIVE was well orchestrated with the overall strategy and the timing was ensured to be one where the organization was not involved in its peak operations so that it gave enough time to the employees to get accustomed to the system before they started using it completely.

*Case study at Omantel:* Maguire et.al (2010) studied the ERP implementation at Omantel, a telecommunications firm at Oman and identified some of the success factors for the implementation. They identified the factors as establishing a fit between the vendor and the business and choosing a vendor that is adequate for the business. The importance of project management tailed training along with risk and stakeholder management was recognized in Omantel as a critical success factor. Effective training and minimum customization of the ERP by maximizing the business process re-engineering ensured that the implementation was a successful one which helped in benefit realization of the ERP.

Barker et.al (2003) studied a failed ERP implementation of a soft drink bottler and found the factors that were not present in the ERP implementation were employee involvement in all the project stages of the implementation process. It

also mentioned the absence of recognition and retention leads to low motivation among the employees. Absence of top management support can lead to absence of direction for teams to follow and can prolong a project.

Snider et.al (2009) studied the ERP implementation at five Canadian SMEs and concluded that discipline of the operational process is an important factor in ensuring all the processes are followed on time during the ERP implementation. They mention that a small internal team having project management capabilities would be capable of ensuring the vision of the project is communicated to the entire team and all the project activities are followed properly to ensure timely delivery of the ERP. External end user training conducted by professional trainers would ensure the training process is conducted in a professional manner and all the aspects of training are covered. This has to be supported by the top management providing guidance and vision to the team. The article concluded by mentioning the importance of qualified consultants throughout the implementation and post implementation stages of the implementation to explore possibilities of improvements and optimization. The table below consolidates the different industries and the critical success factors identified in these industries.

There are some studies which indeed focused on the SME's and shows the importance of classifying the CSF's at all the steps of the implementation similar to the study by Bharathi and Patel (2012). This article by Shaul and Tauber (2012) focused on the CSF's in detail and classified the different aspects such as managerial, organizational, strategic, tactical, software and exogenous at all the stages of an ERP implementation. It clustered 94 CSF's into 15 categories using validity, reliability, and principal component and multi-co linearity analyses.

## **6. Other contexts**

It is important for the organization to select an ERP which suits its business needs and which establishes a fit with the organization. Some researchers focus on particular CSFs and mention that their importance is the same across different contexts. The case studies by Soh et.al (2003) and Somers et.al (2001) focus on the selection of proper ERP package selection as one of the critical success factors for a successful ERP implementation. There are a lot of solutions for the industry offered by various ERP vendors. However, it is

important for the organization to choose the solution which fits the needs of the organization.

Nah et.al (2003) studied the perception of Chief information officers about the critical success factors for successful ERP implementation. They concluded that CIO's believe that top management support, project champion, ERP team work and composition, project management, change management, effective communication, business plan and vision, BPR, proper development and testing of the software, monitoring and evaluation of the ERP performance and an appropriate balance of ERP systems and the legacy systems are the factors that are necessary to ensure that an ERP implementation is successful.

Rebstock and Selig (2000) studied the complexities associated with ERP projects that span geographical boundaries. They specifically studied the business process re-engineering which has been concluded to be a very important success factor for a successful ERP implementation. They mention that the processes resulting from the business process re-engineering should be understandable to the local community. For that they should be provided in-depth training and they should be also involved in the business process creation. There should be an independent evaluation of the business processes created because this stage once passed, it becomes very expensive for the organization to reinvent the wheel and this stage is the basic foundation for the next few years of the ERP usage. The catalogue of best business processes should be followed and referred to stay on the right track during the process and the harmonization of the processes followed by the company and the best practices. Continuous monitoring and evaluation over a period of time of the business processes is required to ensure that the organization is following the most recent and best processes in the industry.

Umble et.al (2003) mentioned some implementation procedures which are the critical success factors for an ERP implementation that yields the expected benefits. Clear understanding of the strategic goals of the ERP implementation is mentioned the most critical to start an ERP implementation. Commitment by top management, excellent project management, a competent implementation team, accuracy of the data, extensive education and user training, focussed measures to

evaluate performance and celebrating small wins during the implementation process are some of the procedures which are critical to the success of an ERP implementation.

Aloini et.al (2012) researched on the risk factors associated with ERP implementation by a case study and identified 10 critical risk factors which can be termed as factors which can reduce risks in an ERP implementation. The factors identified were Improper selection, ineffective strategic thinking and planning, ineffective project management, poor managerial conduct, inadequate change management, inadequate training and instruction, poor project team skills, inadequate BPR, low top management involvement and low key user involvement.

Wang et.al (2008) studied the consistency among the facilitating factors and ERP implementation success and concluded through empirical analysis that consultants competence, vendor support, ERP project team members competence, project management leadership, top management support, end user support, decision making and control, efficiency and profitability of the system are the facilitating factors which are related to the success of the ERP implementation. The table 5 consolidates the list of CSFs identified by researching case studies on ERP implementation.



**Table 5. CSFs for ERP Implementation**

Table 8 displays the different Critical Success Factors for ERP implementation according to different contexts and their country of origin.

S.No	Article	Critical Success Factor	Context	Country
1.	<i>Shanks, G. G., Parr, A. N., Hu, B., Corbitt, B. J., Thanasankit, T., &amp; Seddon, P. B. (2000)</i>	<ul style="list-style-type: none"> <li>• Presence of a change champion</li> <li>• Change Management</li> <li>• External consultants expertise</li> <li>• Project management</li> <li>• Clear and measurable goals</li> <li>• Data accuracy</li> </ul>	Elevator company	China
2.	<i>Shanks, G. G., Parr, A. N., Hu, B., Corbitt, B. J., Thanasankit, T., &amp; Seddon, P. B. (2000)</i>	<ul style="list-style-type: none"> <li>• Presence of a change champion</li> <li>• Change Management</li> <li>• External consultants expertise</li> <li>• Project management</li> <li>• Clear and measurable goals</li> <li>• Data accuracy</li> </ul>	Petroleum products	Australia
3.	<i>Soh, C., Kien Sia, S., Fong Boh, W., &amp; Tang, M. (2003).</i>	<ul style="list-style-type: none"> <li>• ERP package selection</li> <li>• Integration</li> <li>• Process orientation</li> <li>• Flexibility</li> </ul>	Hospital	Singapore
4.	<i>Motwani, J., Subramanian, R., &amp; Gopalakrishna, P. (2005).</i>	<ul style="list-style-type: none"> <li>• Clear understanding of strategic goals</li> <li>• Commitment by Top management</li> <li>• Cultural and structural changes</li> <li>• Project management</li> <li>• ERP selection</li> <li>• Open information and communications policy</li> <li>• BPR</li> <li>• Data accuracy</li> <li>• Knowledge capacity</li> <li>• Great implementation team</li> <li>• Focused performance measures</li> <li>• Small celebrations</li> <li>• Post implementation audit</li> <li>• Documentation ERP success</li> <li>• Benchmarking</li> </ul>		
5.	<i>Wang, E. T., Shih, S. P., Jiang, J. J., &amp; Klein, G. (2008)</i>	<ul style="list-style-type: none"> <li>• Consultant competence</li> <li>• Vendor support</li> <li>• Project members competence</li> <li>• Project management</li> <li>• Top management support</li> <li>• User support</li> <li>• Decision making and control</li> <li>• Efficiency and profitability</li> </ul>	Manufacturing firms	Taiwan

6.	<i>Chen, C. C., Law, C., &amp; Yang, S. C. (2009).</i>	<ul style="list-style-type: none"> <li>• Scope management</li> <li>• Outsource IT human resources to global ERP vendors</li> <li>• Risk management</li> <li>• Communications management</li> <li>• Procurement management</li> <li>• Integration management</li> </ul>	Multinational company	California
7.	<i>Tchokogue, A., Bareil, C., &amp; Duguay, C. R. (2005)</i>	<ul style="list-style-type: none"> <li>• Capacity to change</li> <li>• Right time for process re-engineering</li> <li>• Project management</li> <li>• Culture of results measurement</li> <li>• Change management</li> <li>• Well planned GO LIVE</li> </ul>	Aircraft engine manufacturer	Canada
8.	<i>Maguire, S., Ojiako, U., &amp; Said, A. (2010)</i>	<ul style="list-style-type: none"> <li>• Stakeholder consultation</li> <li>• Vendor selection</li> <li>• Project management</li> <li>• Stakeholder commitment</li> <li>• Training</li> <li>• Risk management</li> <li>• BPR and customization</li> </ul>	Telecommunication company	Oman
9.	<i>Barker, T., &amp; Frolick, M. N. (2003)</i>	<ul style="list-style-type: none"> <li>• Employee involvement</li> <li>• Recognition and retention</li> <li>• Management support</li> </ul>	Soft drink bottler	
10	<i>Fui-Hoon Nah, F., Zuckweiler, K. M., &amp; Lee-Shang Lau, J. (2003)</i>	<ul style="list-style-type: none"> <li>• Top management support</li> <li>• Project champion</li> <li>• ERP team work and composition</li> <li>• Project management</li> <li>• Change management program</li> <li>• Communication</li> <li>• Business plan and vision</li> <li>• BPR</li> <li>• Testing</li> <li>• Monitoring and evaluating performance</li> <li>• Business and legacy systems</li> </ul>	Fortune 1000 companies	World
11	<i>Rebstock, M., &amp; Selig, J. G. (2000)</i>	<ul style="list-style-type: none"> <li>• Co-ordinated analysis</li> <li>• Harmonized modelling</li> <li>• Implementation of country specific business processes</li> </ul>	Oil and gas industry	Six western European countries
12	<i>Dezdar, S., &amp; Ainin, S. (2011)</i>	<ul style="list-style-type: none"> <li>• Top management support</li> <li>• Communication of the vision</li> <li>• Training and education</li> </ul>	Corporate	Iran
13	<i>Xue, Y., Liang, H., Boulton, W. R., &amp; Snyder, C. A. (2005)</i>	<ul style="list-style-type: none"> <li>• Business Process Re-engineering</li> <li>• Partnership with local vendors</li> <li>• Human resources</li> <li>• Communication</li> <li>• ERP package selection</li> </ul>	Corporate	China
14	<i>Upadhyay, P., &amp; Dan, P. K. (2010)</i>	<ul style="list-style-type: none"> <li>• User education</li> <li>• Goals and objectives</li> <li>• IT infrastructure</li> <li>• Project champion</li> <li>• Top management support</li> <li>• Project team competency</li> </ul>	SME	India

		<ul style="list-style-type: none"> <li>• Scalability and scope</li> <li>• Project management</li> <li>• ERP importance</li> <li>• User training</li> <li>• External consultants</li> <li>• Interdepartmental communication</li> <li>• ERP package selection</li> <li>• Vendor support</li> </ul>		
15	<i>Al-Mashari, M., &amp; Al-Mudimigh, A. (2003)</i>	<ul style="list-style-type: none"> <li>• Scope</li> <li>• Ownership and transfer of knowledge</li> <li>• Change management</li> <li>• Proper communication</li> <li>• Performance measurement</li> <li>• BPR</li> <li>• Project management</li> </ul>	Manufacturing company	Middle East
16	<i>Snider, B., da Silveira, G. J., &amp; Balakrishnan, J. (2009)</i>	<ul style="list-style-type: none"> <li>• Operational process discipline</li> <li>• Small internal team</li> <li>• Project management capabilities</li> <li>• External end user training</li> <li>• Management support</li> <li>• Qualified consultants</li> </ul>	Public organizations	Canada
17	<i>Moohebat, M. R., Jazi, M. D., &amp; Asemi, A. (2011)</i>	<ul style="list-style-type: none"> <li>• Top management support</li> <li>• Project team and consultants</li> <li>• BPR</li> <li>• Project management</li> <li>• User involvement</li> </ul>	Corporate	Iran
18	<i>Zhang, L., Lee, M. K., Zhang, Z., &amp; Banerjee, P. (2003)</i>	<ul style="list-style-type: none"> <li>• Top management support</li> <li>• BPR</li> <li>• Company wide support</li> <li>• Effective project management</li> <li>• Education and training</li> <li>• User involvement</li> <li>• Suitability of software – hardware</li> <li>• Data accuracy</li> <li>• Vendor support</li> <li>• Chinese organizational culture</li> </ul>	Corporate	China
19	<i>Mandal, P., &amp; Gunasekaran, A. (2003)</i>	<ul style="list-style-type: none"> <li>• Risk management</li> <li>• Quality management</li> <li>• Phased based approach</li> <li>• Training</li> <li>• User requirements and feedback</li> <li>• Strong leadership</li> <li>• Client consultation</li> <li>• Pro-active communication</li> <li>• Multi-functional project team</li> <li>• System integration</li> <li>• Results measurement</li> <li>• Performance evaluation</li> </ul>	Water corporation	Australia
20	<i>Woo, H. S. (2007)</i>	<ul style="list-style-type: none"> <li>• Management style of the company</li> <li>• Communication understandable to the Chinese language</li> </ul>	Electronics	China

			manufaturer	
21	<i>Sambasivan, M., &amp; Fei, N. Y. (2008)</i>	<ul style="list-style-type: none"> <li>• Management approach</li> <li>• Organizational change</li> <li>• Technical aspects</li> <li>• External and social aspects</li> </ul>	Electrical and electronics company	Malaysia
22	<i>Amoako-Gyampah, K. (2004)</i>	<ul style="list-style-type: none"> <li>• Training</li> <li>• Effective communication</li> </ul>	Corporate	North America
23	<i>Yen, H. R., &amp; Sheu, C. (2004)</i>	<ul style="list-style-type: none"> <li>• Alignment of ERP strategy with competitive strategy</li> <li>• National culture and government policies</li> </ul>	Manufacturing firms	USA and Taiwan
24	<i>Xu, H., Nord, J. H., Brown, N., &amp; Nord, G. D. (2002)</i>	<ul style="list-style-type: none"> <li>• Training and user education</li> <li>• Data integration</li> <li>• Data accuracy</li> </ul>	Corporate	Australia
25	<i>Loh, T. C., &amp; Koh*, S. C. L. (2004)</i>	<ul style="list-style-type: none"> <li>• Project champion</li> <li>• Project management</li> <li>• Business plan and vision</li> <li>• Top management support</li> <li>• Effective communication</li> <li>• ERP teamwork and composition</li> <li>• BPR and minimum customization</li> <li>• Change management program and culture</li> <li>• Social development</li> <li>• Testing</li> <li>• Monitoring and evaluation of performance</li> </ul>	SME	UK
26	<i>Berchet, C., &amp; Habchi, G. (2005)</i>	<ul style="list-style-type: none"> <li>• Data integration</li> <li>• Detailed planning</li> </ul>	Alcatel telecomm unications	USA
27	<i>Shashank Saini, Siddhartha Nigam, Subhas C. Misra, (2013)</i>	<ul style="list-style-type: none"> <li>• Integration</li> <li>• IT infrastructure</li> <li>• Data migration plan</li> <li>• System testing</li> <li>• Cross functional employees in team</li> <li>• Empowerment on decision making</li> <li>• Morale of implementation team</li> <li>• User training</li> <li>• Organization's adaptability to change</li> <li>• Top management</li> <li>• Customization</li> <li>• BPR</li> <li>• Contingency plans</li> <li>• Clarity of milestones</li> <li>• Alignment of ERP strategy with business processes</li> <li>• Comprehensiveness of implementation strategy</li> <li>• Consultant expertise</li> <li>• Project status disclosure</li> <li>• Appraisal of clients about ERP strategy</li> </ul>	SME	India

28	Ziamba.E, Oblak.I (2013)	<p><i>Factors related to Public Procurement Procedure</i></p> <ul style="list-style-type: none"> <li>• Clear and precisely defined tender specification</li> <li>• Realistic and chronologically arranged schedule</li> <li>• Clear goals and objectives</li> </ul> <p><i>Factors related to government process management</i></p> <ul style="list-style-type: none"> <li>• Frozen information requirements</li> <li>• Identified government processes</li> <li>• Government process re-engineering</li> </ul> <p><i>Factors related to project team competencies</i></p> <ul style="list-style-type: none"> <li>• Project team competence on ERP system</li> <li>• Project team competence on public administration</li> <li>• Use of consultants</li> <li>• Co-operation with research centres</li> <li>• Expertise in IT</li> </ul> <p><i>Factors related to project management</i></p> <ul style="list-style-type: none"> <li>• Top management support</li> <li>• Clear assignment of roles and responsibilities</li> <li>• Change management</li> <li>• Risk management</li> <li>• User involvement</li> <li>• Interdepartmental communication</li> <li>• Proven management methodology</li> <li>• Effective monitoring and control</li> </ul>	Public Organization	Poland
29	Adam.F, Doherty.P (2000)	<ul style="list-style-type: none"> <li>• Clear managerial objectives</li> <li>• Collaboration with experienced implementer</li> <li>• Performance evaluation</li> </ul>	14SME Corporations	Ireland
30	Wickramasinghe, V., & Gunawardena, V. (2010)	<ul style="list-style-type: none"> <li>• Training and education</li> <li>• User involvement</li> <li>• Managing user expectations</li> <li>• Interdepartmental co-operation</li> <li>• ERP teamwork and composition</li> <li>• Software development</li> <li>• Testing and troubleshooting</li> <li>• Project manager</li> <li>• Project champion</li> <li>• BPR</li> <li>• Change management</li> <li>• Communication</li> </ul>	Corporate	Sri Lanka

The thirty case studies above reflect the trend of ERP research and list all reported critical success factors during an ERP implementation. In order to achieve our goal of consolidating all those CSF into a meaningful set, we identify five stages of ERP implementation which are recognized by the industry as business requirement, project implementation, organizational state, technical solutions and post implementation usage.

As we divided the success factors into the different stages according to the research on case studies it becomes clear that there are some factors in the ERP implementation process which have not yet discovered enough factors to ensure that the success rate is high for the implementation whereas other stages have been thoroughly researched. The next section explores the theoretical articles on ERP implementation and we would attempt to create a consolidated model of ERP implementation.

## **7. CSFs identified by theoretical articles**

There has been considerable research done in the field of ERP implementation using theoretical frameworks to provide a model which encompasses for the variations in the ERP implementation. Some researchers (Zhang et.al, 2002, Monk, 2008) attempted to measure or develop a criteria to evaluate success of an ERP implementation. There is no model which defines the critical success factors in a context to measure the success or failure of the ERP project. There are diverse measures adopted to measure the success. The various research areas include project management (Neveraukskas, 2004) , division into strategic and tactical success factors and their completion at the end of the project (Holland & Light, 1999), change management (Aladwani, 2001) and identification of critical issues in ERP implementation (Ehie & Madsen, 2005). Other areas and their division of critical success factors is shown below in the table 7.

**Table 7. Theoretical articles for CSF in ERP implementation with main emphasis area**

Table 7 presents the authors, number of citations, the main emphasis and critical success factors divisions for theoretical articles for Critical Success Factors in ERP Implementation.

<b>Author</b>	<b>Citations</b>	<b>Type of model/framework</b>	<b>Main emphasis</b>	<b>Critical success factors division</b>
Holland & Light (1999)	932	Division of CSF into a list	Entire range of CSF's required for ERP implementation	1. Strategic 2. Tactical
Aladwani (2001)	403	Division of CSF into stages	Critical success factors to manage the change associated with ERP	1. Knowledge formulation 2. Strategy implementation 3. Status evaluation
Ehie & Madson (2005)	245	Division of CSF into stages	Identify the importance of CSF's during the stages of ERP implementation	1. Project preparation 2. Business Blueprint 3. Realization 4. Final preparation 5. Go Live and support
Martin & Huq (2007)	21	Division of CSF into top management strategic actions and change management strategies	Cultural and environmental context factors	1. Top management actions 2. Change management strategies 3. Skills and competencies 4. Relationships/responsibilities
Rajagopal (2002)	297	Causal stage model developed from case studies of 6 firms	Dividing CSFs on the basis of their impact (positive/negative)	1. Influence 2. Barriers 3. Facilitators 4. Performance
Kwon & Zmud (1987)	1424	Division of CSFs into stages	Providing the division of critical success factors in the stages in which they occur	1. Initiation 2. Adoption 3. Adaptation 4. Acceptance 5. Routinization 6. Infusion
Nah, Lau & Kuang (2001)	957	Division of CSFs into stages	Division of critical success factors into the stages in which they occur	1. Chartering Phase 2. Project Phase 3. Shakedown Phase 4. Onward and upward Phase
Zhang et.al (2005)	311	Listing the CSF's under a broad category	Classify the ERPs in the environment in which they occur	1. Organizational environment 2. User environment 3. System environment 4. ERP vendor environment 5. ERP implementation success

Sawah et.al (2008)	51	Causal relationship model	7 categories of critical success factors related to conclude the ERP implementation success	<ol style="list-style-type: none"> <li>1. Top management support</li> <li>2. Company wide support</li> <li>3. Organizational culture</li> <li>4. Project Management</li> <li>5. Vendors and consultants support</li> <li>6. BPR and customization</li> <li>7. Training and involvement</li> </ol>
Akkermans & Van Helden (2002)	543	Causal relationship model where a change in one element directly affects the other	10 critical success factors identified to conclude the ERP implementation success	No distinctions; just the critical success factors are defined and correlated but might miss some factors which are not included in the model

Martin & Zuq (2007) performed a distinct and interesting study as they focused on the importance of cultural and environmental context factors during an ERP implementation. They mentioned that the top management could improve the employee's attitude towards the ERP implementation by modifying the environmental context. The previous research has concluded that organizational culture has an influence on the firm implementing an ERP system and vice versa, the adoption of the ERP system paving the way for the change of a culture of the organization (Bagchi et.al, 2003). Another research indicated that the primary driver of a successful ERP implementation is top management which itself affects the organizational culture (Shore, 2005).

It is evident that the adoption of an ERP system is dependent on the ability of an organization to systematically change its culture, adopting new sets of behaviours. These behaviours can be changed internally as well as from an external environmental perspective (Lewin's, 1951). Martin & Huq (2007) mentioned that there are measures that can be taken internally within an organization by the top management to understand and accept the new ERP to be adopted. These measures include delegating some involvement to other personnel, sharing facts and information about the importance of adopting ERP system for the organization's success and the organizational goals that need to be changed to complement the new organizational culture.



Moreover, training, communication of new vision to be developed, as well as the introduction of new motivation systems that would occur with the new organizational culture would help in the development phases of ERP. Without these behavioural and social measures, there could be resistance by the organization members and a higher probability of failure of a successful ERP adoption (Martin & Huq, 2007).

Another way to change employees attitude towards this process is by using external (environmental) measures (Lewin's, 1951). It can also be observed that the environment modifies the human behaviour before, during and post an ERP implementation. Specifically, top management should find themselves responsible for allocating organization's funding to the ERP system, to be used for educational purposes, training of employees and installing a new system throughout the organization. Also, it is important to note that top management should clarify how the ERP system would co-exist with the organization goals in short term and long term basis. Identifying potential schedule conflicts and the presence of certain risks during the implementation are important, while planning ahead for its adoption.

Although these internal and environmental measures may be taken in later phases of the ERP implementation cycle, top management should stay proactive in making many strategic changes and preferably take these actions during the pre-implementation stages. This would, as mentioned result in lower resistance due to the change among the employees (Martin & Huq, 2007).

The environment and culture of United Nations type of organizations is characterized by high bureaucracy and politics where decisions are driven by more than one motive of improving efficiency. In such a context, senior management involvement and support with a unified vision becomes even more important and relevant to ensure that the ERP implementation is successful.

The table 8 outlines the theoretical articles on CSF's on ERP implementation outlining the various CSF's which are important during an ERP implementation.

**Table 8. Original and new Critical Success Factors**

Table 8 presents different critical success factors and their relevant reference.

Articles	Critical Success Factors
Al-Mashari, M., Al-Mudimigh, A., & Zairi, M. (2003)	<ul style="list-style-type: none"> <li>• Business Plan</li> <li>• Project mission/goals</li> <li>• BPR</li> <li>• Analysis of user feedback</li> <li>• User education and training</li> <li>• Targeted and effective communication</li> <li>• Consultants expertise</li> <li>• Define project milestones</li> <li>• Enforce timelines</li> <li>• Track milestones</li> <li>• Top management support</li> <li>• Allocation of resources</li> <li>• Legacy systems</li> <li>• Testing</li> <li>• ERP package selection</li> </ul>
Bajwa, D. S., Garcia, J. E., & Mooney, T. (2004)	<ul style="list-style-type: none"> <li>• Enterprise wide structure and culture management</li> <li>• User education and training</li> <li>• IT workforce and re-skilling</li> <li>• Consultants expertise</li> <li>• Project scope</li> <li>• Project management</li> <li>• Top management support</li> <li>• Resource allocation</li> <li>• Minimum customization</li> <li>• Package selection</li> <li>• Data conversion</li> </ul>
Bingi, P., Sharma, M. K., & Godla, J. K. (1999)	<ul style="list-style-type: none"> <li>• BPR</li> <li>• User education and training</li> <li>• Best people in the team</li> <li>• Consultants expertise</li> <li>• Top management support</li> <li>• Integration</li> </ul>
Buckhout, S., Frey, E., & Nemec, J. (1999)	<ul style="list-style-type: none"> <li>• Business plan and vision</li> <li>• Best people in the team</li> <li>• Top management support</li> </ul>
Collins, K. (1999)	<ul style="list-style-type: none"> <li>• Business plan and vision</li> </ul>
Falkowski, G., Pedigo, P., Smith, B., & Swanson, D. (1998)	<ul style="list-style-type: none"> <li>• Justification of investment in ERP</li> <li>• Recognizing the need for change</li> <li>• Culture and structure management</li> <li>• Executive sponsor as change champion</li> <li>• Project management</li> </ul>

	<ul style="list-style-type: none"> <li>• Performance tied to compensation</li> <li>• Best people in the team</li> <li>• Targeted and effective communication</li> </ul>
Gefen, D. (2004)	<ul style="list-style-type: none"> <li>• Partnership</li> <li>• Trust</li> <li>• Risk sharing</li> <li>• Incentives</li> </ul>
Haines, M. N., & Goodhue, D. L. (2003)	<ul style="list-style-type: none"> <li>• Business and technical knowledge of team members and consultants</li> </ul>
Holland, C. P., Light, B., & Gibson, N. (1999)	<ul style="list-style-type: none"> <li>• Business Plan and vision</li> <li>• BPR</li> <li>• Analysis of user feedback</li> <li>• Communication</li> <li>• Project progress monitoring</li> <li>• Balanced cross functional team</li> <li>• Clear project scope</li> <li>• Define project milestones</li> <li>• Allocate resources</li> <li>• Legacy systems</li> <li>• Troubleshooting</li> </ul>

## 8. ERP implementation stages defined

The research on Enterprise Resource Planning, as mentioned above has attempted to understand the various stages associated with an ERP implementation process. The division into stages might provide a better understanding of the impact of these CSFs during different stages of the process. The divided stages are initiation, adoption, adaption, acceptance, routinization and infusion (Somers & Nelson, 2001) and planning, acquisition, implementation, usage and percolation and extension (Bharathi & Parikh, 2012). Although these stages are explained and they help understand the process from a conceptual point of view, it is not a concept used in the industry. So, for managers and implementation teams, it is important to design stages which correspond to the terminology used in the industry. The software development life cycle (Jones & Rastogi, 2004) contains stages which are followed as a standard across the industry. So, we are making an attempt to design stages which contain SDLC stages that are understandable and recognized by the practitioners. The stages developed in the thesis are compared to the stages followed in the SLDC and displayed below.

Fig 1: Stages developed in the thesis to identify CSFs during ERP implementation

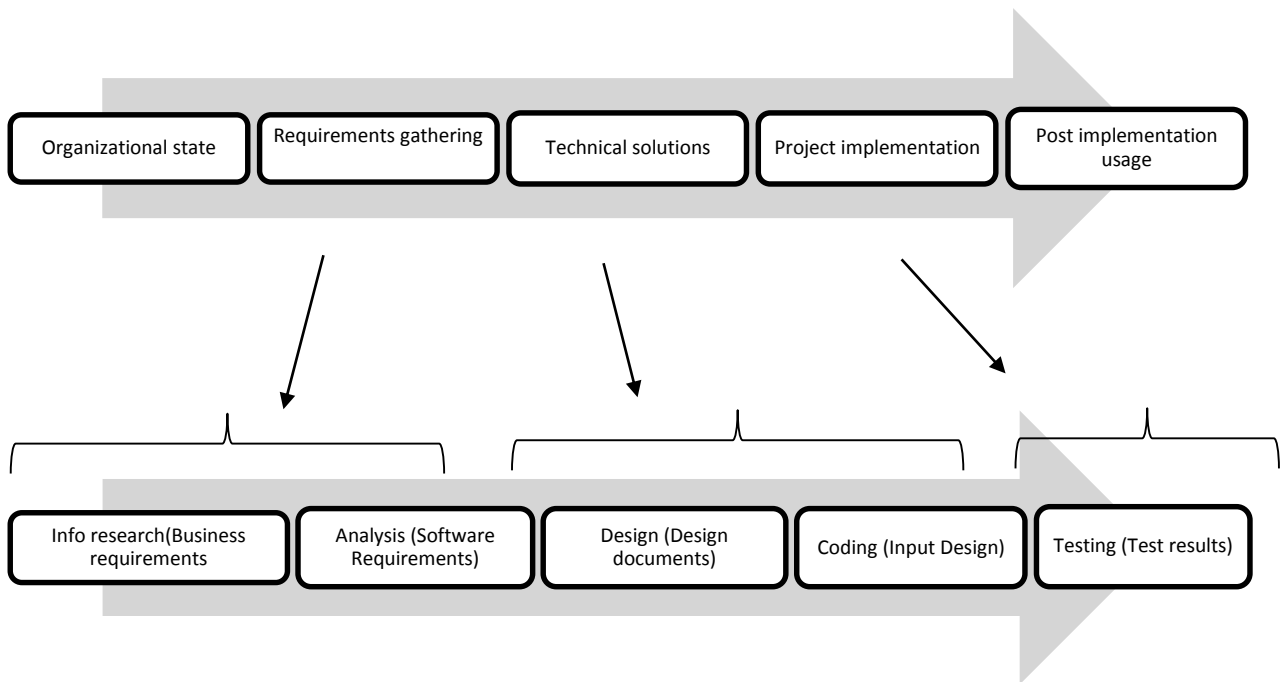


Fig: Software Development Life cycle stages

The stages in SLDC life cycle are only restricted to the project management in software development life cycle and is mainly used by the service providers. However, for an implementation within an organization, the project team has to follow these steps but there are other stages which become important to deal in the organization. The organization has to be in a state to accept a change of this magnitude. The employees have to understand the importance of the new ERP system in the organization (Aladwani, 2001). The change management strategies have to be firmly developed and implemented before the start of the process. This stage where the various tasks such as readiness assessment, organization assessment and change awareness are created constitute the stage *organization state* as defined in this thesis.

The *requirements gathering* stage as developed in the thesis correspond to two stages of the SDLC life cycle (business requirements and software requirements). The requirements are gathered and business process re-engineering is performed at this stage to re-design the business processes

according to the processes in the ERP. This ensures that the organization follows the best practices in the industry.

The *technical solution* stage developed in the thesis refers to the stage where the technical team in the project develops the code and requirements for the various modules in the organization. This consists of designing documents for locking the requirements and coding for the particular needs of the various functional units. This correspond to the stages called design and coding of the SDLC life cycle.

The *project implementation* stage refers to the stage where the project management office monitors the progress of the project. Ideally, this stage is active throughout the ERP implementation process but in this thesis, we refer this stage to the stage where the organization is close to going live with the ERP implementation. This stage involves a lot of testing of data and functionalities and thus, it corresponds to the testing phase of the SDLC life cycle.

The *post implementation usage* refers to the stage after the implementation of ERP is complete. As discussed before, ERP is a process and not a program. So, after the GO-LIVE, the process of results measurement and performance evaluation starts. This is one of the most important phases which is not realized by a lot of organizations thus losing the real benefits expected from the ERP implementation even after the software was implemented successfully. This stage also consists of optimization of usage of the ERP for the organization.

## **9. Final list of all the CSFs identified for ERP implementation**

The table 9 presents the division of critical success factors into the following stages. It is important to note that we do not conclude that the CSFs are only a part of the stages by categorizing them. It means that the maximum prominence of the factors is during these stages of the ERP implementation. 52 critical success factors were identified through the extensive literature review of the articles.

**Table 9. CSF and ERP Implementation Stages**

Table 9 presents the Critical Success Factors categorized into five Implementation stages.

<b>Organizational state</b>	<b>Requirements gathering</b>	<b>Technical solutions</b>	<b>Project implementation</b>	<b>Post implementation usage</b>
Organizational culture	Knowledge capacity	Data integration	Cross functional employees in team	Document ERP success
Company wide support	Network relationship	Data accuracy	ERP teamwork	User feedback
Cultural and structural changes	Outsourcing IT resources to global vendors	Quality management	Best people in the team	Effective use of ERP
Cultural readiness	Minimum customization	Risk management	Morale of implementation team	Harmonized modelling
Empowered decision makers	Legacy systems	Data migration plan	Multi-functional project team	Results measurement
Social aspects	ERP package selection	Business Process Re-engineering	Small internal team	Focussed performance measures
IT infrastructure	Software vendor	Country specific business process	Comprehensiveness of implementation strategy	Performance evaluation
Top management support	Detailed planning		Interdepartmental communication	Post implementation audit
Stakeholder commitment	Alignment of ERP with Business requirements		Open information and communication policy	
Flexibility	Client consultation		Process discipline	
	Cost of ERP implementation		Clear and measurable goals	
	Partnership with local vendors		Co-ordinated analysis	
			Benchmarking	
			Contingency plans	
		Timing of GO-LIVE		

Since ERP implementation is a long and resource intensive process, it involves a lot of change in the organization. The normal reaction to change is resisting the change (Kwahk & Lee, 2008) and it hence, becomes a critical aspect for the organization to accept the change. The change should be accepted at the user level who deal with the new implemented ERP in the organization (Aladwani, 1999). According to Sheth (1981), the user resistance with new innovations is primarily due to the two factors which are perceived risk with the new system and the habit which ties them to their current system usage. Identification of critical success factors which result in an effective change management during an ERP implementation occupies a vital importance. Hence, we identified a total of 11 change management critical success factors identified in the research which are listed in the table below. These success factors are not restricted to one stage of the ERP implementation and most of these factors traverse multiple stages during and post implementation. There is a lot of research done on the change management in ERP implementation (Aladwani, 2001; Kwahk & Lee, 2008; Kumar et.al, 2003) which covers a lot of different areas associated with the change. It is highly urgent to identify change management as a very critical aspect for a successful ERP implementation. However, we would only list the critical success factors for effective change management and not go further in the direction as this is outside the scope of the thesis.

Table 6 presents the 'change management' related critical success factors associated to the different ERP implementation stages from the articles mentioned above. This table allows us to better understand the importance of CSFs necessary for an ERP implementation to introduce change in the organization.

**Table 6. Change Management CSF**

Table 9 Identifies the change management related factors that have been addressed at the different stages of the ERP implementation process. The eleven factors are sorted in increasing order to show at which stages they have been studied (last column on right hand side) and to identify the number of factors that were addressed in each stage (last row – bottom).

Stages → Critical Success Factor ↓	Business Requireme nt	Project Implementati on	Organizati on State	Technic al Solutio ns	Post Implementati on usage	Tota ls
1. Capacity to change			✓			1
2. Business vision	✓					1
3. Scalability and scope	✓					1
4. Social Development			✓			1
5. Clarity of milestones	✓					1
6. User consultation & support		✓		✓		2
7. Communication of vision	✓		✓			2
8. Recognition and retention		✓			✓	2
9. User education and training		✓		✓	✓	3
10. Decision making and control	✓	✓		✓		3
11. Employee involvement	✓	✓	✓	✓	✓	5
<b>Totals</b>	6	5	4	4	3	



The above table identifies the change management related factors that have been addressed at the different stages of the ERP implementation process. The eleven factors are sorted in increasing order to show at which stages they have been studied (last column on right hand side) and to identify the number of factors that were addressed in each stage (last row – bottom). For example, Employee involvement was studied in each of the five ERP implementation stages while capacity to change was only studied at the organization stage. Similarly, at the business requirement stage, 6 out of the 11 factors were addressed, studied and reported while only 3 factors were studied in the post implementation usage stage.

## **4. Theoretical analysis and CSFs reduction**

### **1. Basics of CSF reduction**

Since we had a consolidated list of 52 critical success factors recognized in the literature, an attempt was made to reduce the factors which had a similar meaning to a final reduced and minimal list of critical success factors as identified in the previous chapter. This is done according to Step 4 of the literature review methodology identified earlier. We distinguished the factors according to the similarity in their meaning. Success factors that were similar in meaning were put together in one category. The decision for two or more factors to have similar meaning was based on the word itself as well as the intention and description of it in the article that it is being used in. To that effect, we stress that this task was not a trivial one because it entailed great synthesis effort. Table 10 aggregates the new factors and mentions the original factors that were combined to create these new factors. This CSF reduction procedure resulted in a final list of 22 critical success factors for ERP implementation.

**Table 10. Original and New ERP Implementation CSF**

Table 10 presents the original and the new ERP implementation of Critical Success Factors. They are listed for Organizational state, business requirements, technical solutions, project implementation and post implementation usage.

New factors	Original factors combined
<b>Organizational state</b>	
1. Cultural change readiness (CCR)	Cultural and structural changes Cultural readiness Social aspects
2. Top management support and commitment (TMSC)	Company wide support Empowered decision makers Stakeholder commitment Supportive IT infrastructure Top management support
<b>Business Requirements</b>	
3. Knowledge capacity production network (KCPN)	Network relationships Knowledge capacity Detailed planning Client consultation
4. Minimum customization (MC)	Minimum customization
5. Legacy systems support (LSS)	Legacy systems
6. ERP fit with the organization (EFO)	ERP package selection Alignment of ERP with business requirement
7. Local vendors partnership (LVP)	Software vendor Partnership with local vendors
8. Detailed cost (DC)	Cost of ERP implementation
<b>Technical solutions</b>	
9. Business Process Re-engineering (BPR)	Business Process Re-engineering Country specific Business Process Consultants expertise
10. Quality management (QM)	Data Integration Data Accuracy Quality Management
11. Risk management (RM)	Risk management

12. Detailed Data Migration Plan (DMP)	Data migration plan
<b>Project implementation</b>	
13. Measurable goals (MG)	Comprehensiveness of implementation strategy Clear and measurable goals Co-ordinated analysis
14. Small internal team of best employees (STBE)	Cross functional employees in the team Best people in the team Multi functional project team ERP teamwork Multi functional project team Small internal team
15. Open and transparent communication (OTC)	Interdepartmental communication Open information and communication policy
16. Base point analysis (BPA)	Process discipline Benchmarking
17. Morale maintenance (MM)	Morale of the implementation team Celebrating small wins
18. Contingency plans (CP)	Co-ordinated analysis Contingency plans
<b>Post implementation usage</b>	
19. ERP success documentation (ESD)	Document ERP success
20. User feedback usage (UFU)	User feedback Harmonized modelling Optimization opportunities
21. Max. Potential usage (MPU)	Effective use of ERP
22. Results measurement (RM)	Results measurement Focussed performance measures Performance evaluation Post implementation audit

## 2. Final list of reduced CSFs as function of stages

This chapter focussed on the reduction of critical success factors to distinct factors using the case studies from previous chapter. To provide clarity about the duration of their usage and importance, these CSF's were divided into five stages

based on their occurrence in the ERP implementation process. The five factors were organizational state, business requirements, technical solutions, project implementation and post implementation usage. The factors for change management are relevant throughout the implementation process and the article has divided the factors according to the relevance in each stage. The primary conclusion of this chapter was to condense the 64 overlapping success factors into distinct 22 success factors and also mentioned the factors which were included in the creation of these 22 success factors.

Table 11 below refers to final list of 22 critical success factors combined in the table 10 and categorize them according to the stages defined in the previous chapter.

**Table 11. Final ERP Implementation CSFs as Function of Stages**

Table 11 Presents the final ERP Implementation Success Factors as Function of Stages, namely, organizational stage, business requirements, technical solutions, project implementation and post implementation usage.

<b>Organizational State</b>	<b>Business Requirements</b>	<b>Technical Solutions</b>	<b>Project Implementation</b>	<b>Post Implementation Usage</b>
Cultural Change Readiness (CCR)	Knowledge capacity production network (KCPN)	Business Process Re-engineering (BPR)	Measurable goals (MG)	ERP success documentation (ESD)
Top management support and commitment (TMSC)	Minimum customization (MC)	Quality management (QM)	Small internal team of best employees (STBE)	User feedback usage (UFU)
	Legacy systems support (LSC)	Risk management (RM)	Open and transparent communication (OTC)	Maximum potential usage (MPU)
	ERP fit with the organization (EFO)	Detailed data migration plan (DMP)	Base point analysis (BPA)	Results measurement (RM)
	Local vendors partnership (LVP)		Morale maintenance (MM)	
	Detailed cost (DC)		Contingency Plan (CP)	

The critical success factors identified by studying case studies in different contexts and theoretical articles outline different factors which are created by the combination of scattered factors present in the literature. This would provide a complete understanding of the research done in this domain in the literature. Practitioners can use these factors to relate to their industry and only concentrate of these factors which are most prevalent in the industry. The researchers can focus on this list and identify arenas or further exploration to develop the concept. The article also helps managers to understand the factors which have a maximum relevance at the various stages of the ERP implementation. The stages defined are closest to the actual stages during the ERP implementation process and so the factors can be related to them directly without overlap or confusion. So, the chapter results in very practical and industry oriented framework to ensure the success of an ERP implementation and at the same time, provide an avenue for further research.

## **5. Business environment context of study**

The research work presented herein takes place in a United Nations (UN) agency which has undertaken an ERP (AGRESSO) implementation, and which lasted 7 years with limited success. It is worth at this point to overview the nature of UN context and business.

### **1. United Nations**

The United Nations was established on 24th October, 1945<sup>2</sup> to promote international peace and co-operation. It has 193 member states which refer to the countries that are associated with the United Nations. These countries participate in the decision making process in global peace and other regulations. The UN headquarters is situated in New York and it has other major offices in Geneva and Vienna. The various UN agencies are situated all across the world with office in various countries some of them being Canada, Brazil, Russia, China and Australia. The member states (referred to as the countries which are a part of the United Nations) donate funds to the United Nations for its operations and to continue to exploit the privileges associated with it. The main objectives of United Nations are:

- a. Maintain International Peace and security
- b. Promote Human Rights
- c. Foster Social and Economic Development
- d. Protecting the environment
- e. Providing humanitarian aid in cases of famine, natural disaster and armed conflict

The efforts of the United Nations and its contribution at the global level has been recognized and valued throughout the world. The organization won the Nobel Peace Prize in 2001. Also, its various officers and agencies have been awarded various prizes at the global level. There are more than 30 specialized agencies of United Nations. All these agencies are responsible for specific functions and govern global regulations

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<sup>2</sup><http://www.un.org/en/aboutun/history/1941-1950.shtml>

which apply to all the member states. Some of the best known UN agencies are World Bank, World Health Organization (WHO), United Nations Educational, Cultural and Scientific Organization (UNESCO) and Food and Agricultural organization (FAO).

One of the main factors that distinguish the operations of United Nations with respect to other organizations is its budgeting process. There is a very formal process followed by the United Nations to approve the budget for each agency. It is called General Assembly where the contribution from each member state is calculated based on their Gross National Income. Most of this budget is used for peace keeping which amounted to USD 7.54 Billion for the fiscal year 2013-14. Some of the agencies such as UNICEF are also financed by personal and governmental contributions. This provides us a good amount of information about the importance of United Nations for the countries in pursuit of global objectives which are agreed upon by all the countries. It also helps establish global law and order by deciding the policies during the general assembly which are to be followed by countries.

Since the United Nations played a major role in establishing and maintaining global peace and regulations, it was decided to implement ERP systems in the various agencies to ensure that their internal operations are efficient. The ERP systems were implemented across twenty three United Nations agencies with a total cost of 796 Million<sup>3</sup>. There has been very little or no research regarding the ERP implementation in United Nations and the factors which lead to success in some UN agencies and failure in other. It was observed in the previous chapter that a lot of contexts have been studied in the ERP implementation. However, the environment of United Nations is different from a regular public sector organization because of its global presence and the magnitude of impact on the world.

Studying an ERP implementation in a United Nations agency would provide an understanding of the critical success factors which are specific to the United Nations and how these factors impact the success of a project. This thesis would explore the critical success factors at a specialized agency of United Nations and extrapolate a list

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<sup>3</sup><http://www.un.org/News/Press/docs/2013/gaab4091.doc.htm>



of factors which were critical to their ERP implementation. This can be replicated in other United Nations agencies to ensure that a better understanding of the common and distinct factors can be obtained which would help UN agencies which are on the verge of an ERP implementation to understand these factors and pursue a successful implementation. To explore further, we would focus on diving deeper into the environmental context of the United Nations. We would discuss in brief about the information technology context as well because it is discussed in detail in the grounded theory research.

## **2. Environmental Context of United Nations**

Various UN agencies have adapted the ERP systems since the last decade such as SAP and Oracle which required a big investment but it has improved the efficiency of these organizations by introducing processes which are according to the best practices in the industry<sup>4</sup>. A feasibility study is currently undertaken by United Nations to explore possibilities of having an integrated ERP for the entire United Nations whose results would be provided by the end of year 2014. So, the current trend of the United Nations is moving towards involving ERP implementations for the operations.

The organizational culture of the UN agency studied can be characterized as a political and bureaucratic culture as there are a lot of factors which impact any particular decision. According to Wallach (1983), bureaucratic cultures have clear lines of responsibility and authority, work is highly organized, compartmentalized and systematic. The information and authority flows are hierarchical and based on control and power. Overall, bureaucratic companies tend to be mature, stable and relatively cautious. The information sharing in such organizations is dependent on the mentality of the employees and the type of data involved.

The UN agency which was the subject of the present study had a culture where most of the times, delays in decision making and expected results are explained in terms of “due to the process” which refers to the high procedure orientation. In this

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<sup>4</sup>[https://www.unjui.org/en/reports-notes/JIU%20Products/JIU\\_REP\\_2012\\_8\\_English.pdf?Mobile=1](https://www.unjui.org/en/reports-notes/JIU%20Products/JIU_REP_2012_8_English.pdf?Mobile=1)

context, it was expected from top management that the ERP implementation would change the way things worked in the organization. The ERP implementation was expected to break the silos of information in the organization and provide transparency across the various functional units of the data and progress. However, there is the general perception considering the organizational culture of the UN agency under study that it would hinder the maximum achievement of the benefits from the ERP system, mainly due to the lack of power of some of the involved units and the anti-data sharing mentality of a lot of employees. There is a lot of emphasis on ownership of the data in the organization and employees are not willing to share it as they believe it would result in the loss of their power. So, it becomes an interesting case study to see how the various critical success factors identified in the previous chapters impacted the ERP implementation at this organization. The next section briefly discusses the information technology context of the UN agency under study.

### **3. Information Technology Context**

Prior to the implementation, the IT in the organization was composed of legacy systems which resulted in a lot of duplication of work and information. It was highly inefficient and there was a lot of usage of paper in the organization. The jobs composed of tasks which could be easily managed by the computer and this resulted in expenses which could be controlled by the organization.

In 2007, the senior management of the UN agency realized that existing systems did not support its strategy of moving towards a unified system to improve efficiency in its existing processes. As mentioned before, the legacy systems were quite old, its IT infrastructure had become quite rudimentary, and part of its personnel had a low level of computer competences. The decision to go ahead with implementing a new ERP system was taken by the top management with the IT team as they realized that the organization was performing highly inefficient tasks due to old redundant processes. However, most of the employees did not share this vision as they had been working with these processes for a long time and they were used to it. So, they were not comfortable when there were discussions about introducing a new ERP in the

organization which meant a new way of working for the employees. Moreover, there was no established IT team before the project started. So, there was a high level of uncertainty involved in the project of ERP implementation. The IT context is explored further in the later section. The next chapter discusses the methodology of the study to understand the critical success factors for ERP implementation in UN organizations and providing a model to understand the IT implementations in context of UN agencies.

## **6. Methodology**

### **1. Context**

The UN agency that is subject of this research study is a UN specialized agency (UNSA), created over 70 years ago upon the signing of the Convention. Typical of all UN agencies, the UNSA works with the Convention's 191 Signatory States and global industry and organizations to develop international Standards and Recommended Practices (SARPs) which are then used by States when they develop their legally-binding national regulations. The business rules are the same across all the United Nations agencies and the environment is described as bureaucratic and extremely hierarchical with a lot of formalization of rules and policies.

There are currently over 10,000 SARPs reflected in around 20 Annexes which UNSA oversees, and it is through these SARPs and complementary policies, auditing and capacity-building efforts that this agency operates to influence the world.

This context was chosen because of the following reasons:

- Personal motivation – I wanted to understand the complexities associated with ERP implementation in these organizations
- Employees are in a comfort zone as there is a no fire policy. So, it becomes interesting to notice the motivation behind changing the way of work.
- Extremely political context makes decision making complex as the performance is not the only criteria in selecting an option.
- These organizations have employees working for more than 30 years; so it becomes interesting to measure the factors for success for ERP implementation
- The high importance of UN to the world in peace keeping operations
- There was no research done in ERP implementation success in UN organizations

## **2. Analytical strategy**

There are two primary goals for this research study. First, is to aggregate and consolidate all reported critical success factors extracted from case studies; and second is to propose a model for the successful implementation of ERP. In order to achieve those goals the analytical strategy entailed the following steps:

- i. Locate and retrieve research work case studies published in peer-refereed journal,
- ii. Aggregate and consolidate all critical success factors into a unique set following established criteria of factor reduction,
- iii. Based on ii and other (scarce) empirical work, create an adapted (to UN agency context) form of questionnaire including quantitative and qualitative information,
- iv. Perform iii in the field – In the present case, I spent 6 months in the organization (hence grounded research) to observe, study documents and administer the survey and interviews,
- v. Perform exploratory analysis for construct reduction and validation,
- vi. Propose a model for user experience with ERP implementation,
- vii. Test the model using confirmatory factor analysis,
- viii. Report on observations and interview results to interpret the final proposed model.

This attempt to understand the CSFs for ERP implementation at United Nations type of organizations, through a user satisfaction perspective follows a triangulation technique to ensure that all the aspects of the study are completed and there is no issue or factor missed or uncovered during the research. The participants, procedures, measures, data preparation and the analytical strategy used for the study are described in this section. The methodology consists of the following three sections:

- ✓ Grounded Research
- ✓ Quantitative survey
- ✓ Qualitative interview

### **3. Grounded Research**

#### **a. Background**

Grounded research emphasises on the phenomena to make conclusions. Strauss and Corbin (1990, p. 101) stated that phenomena are “the central ideas in data represented as concepts”. According to their account, the purpose behind naming phenomena is to enable researchers to group similar events, happenings, and objects under a common heading or classification. The phenomenon addressed in this study is the implementation of an ERP system in a specialized agency of United Nations. It is important to pursue grounded theory research as it is one of the prominent methods to measure critical success factors as outlined in chapter 2. Most of the analysis in the grounded research is through the business documents and observations.

#### **b. Participants**

The grounded research was done over a period of six months. The focus of the grounded research was primarily observing and studying the documents created and maintained over a period of seven years from the start of the ERP implementation at the organization to the current date. The important data was analysed and it served as the basis of understanding of the entire phenomenon over the 7 years of ERP implementation. Furthermore, the observations were made by regular meetings with the top management and the project team on a daily basis. This also confirmed the authenticity of the documents and the validated the data read from the documents. Due to agreement of confidentiality, we cannot write the names of the original documents but there were a total of 15 types of business documents read which involved the criteria of ERP selection, project management, communication strategy, change management plan, risk assessment, strategic objectives, business plan and other ERP implementation related documents.

#### **c. Organization investigation and analysis**

The ERP system implemented in this specialized UN agency was hosted on premise, meaning that the ERP system along with the servers were located at the organization. The functional areas covered by the ERP implementation included

supply chain (procurement and logistics), project management, finance and human resources. The process of selection of the ERP began in the year 2006. After a detailed evaluation process, the software was purchased in April, 2007. The initial GO-LIVE was scheduled in 2008 and the first upgrade was planned in 2013. The total implementation and maintenance costs for the ERP implementation amounted to USD 7,100,000 as of July 2011. Most of the annual recurring maintenance costs (USD 5,50,000) were attributed to the support staff costs for developing an internal capacity to reduce consulting and ERP hosting costs. From the meetings and discussions, the overall mood of the organization seemed to be neutral to this ERP implementation with the positives and negatives cancelling out each other.

I pursued an internship for four months in this organization to further understand and make observations about the implementation of ERP system in the organization. This time was also utilized in gathering data through a survey, interviews but most importantly, it enabled to make observations through meetings, discussions with senior officials, archived documents, internal articles and physical gestures which became an integral part of the thesis process. The numbers in this chapter are a reflection of the official numbers of the organization. Hence, this chapter would outline the observations made during the course of four months by interacting with the employees of the organization and an extensive review of documents related to the implementation of the ERP in the organization.

The analysis performed from the grounded research included extensive review of the documents related to the ERP implementation and observations through discussions and meetings to reveal underlying phenomena. We start the analysis with the causal conditions.

#### Causal Conditions

Based on the project documents and having meetings with the employees, we identified the main reason to adopt the ERP system in the Phase 1 was primarily the introduction of financial services in the ERP systems:

1. **Obsolete Legacy systems.** The back office financial systems were technologically obsolete and their maintenance was difficult. The system posed an unacceptable business risk as identified in the business case.

2. Efficiency issues: The legacy systems were not linked to other systems which resulted in efficiency issues. It resulted in multiple data entry, inaccurate information and inefficient processing.
3. Compliance with International Public Sector Accounting Standards: It was important to significantly modify the financial systems in order to provide the functionality to fully comply with IPSAS. It was believed that investing in modern systems would facilitate the application of accounting standards adopted by UN.
4. Lack of financial information to management and stakeholders: The United Nations was moving to a performance based and decision making management and the current system was not able to provide adequate, timely and accurate financial information. It was difficult to compile the management information and to ensure that manual validations are not required which consume a lot of time, it was important to switch to modern systems.

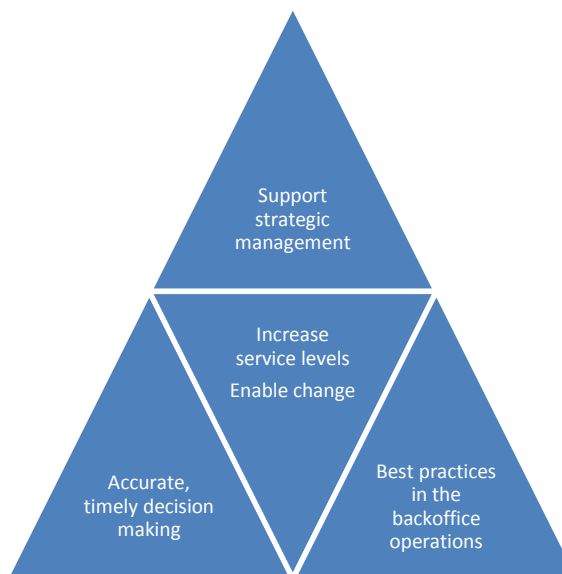


Figure 2: Reasons for the ERP implementation

**Phase 1** was basically focused on Finance and the decision to expand into other modules such as travel, sales of publications, payroll, fixed assets controls, procurement and human resources was not included.



**Drawbacks:**

1. Detailed risk analysis was not performed to assess the drawbacks of not going to a new system
2. The goals/strategic objectives set were not measurable quantitatively

The one primary factor that distinguishes any initiative at United Nations than at any other industry is the environment which is characterized by political and international forces at United Nations. Every decision taken at the agency level has to go through the consent of a lot of political forces and hence, it becomes equally important to package the product in a way that receives the least amount of resistance from the shareholders. Our first analysis was done around the environment context of this agency and how it impacted the ERP implementation.

The focus of the grounded research would be to gain insight into the:

- i. Sustained top management support
- ii. Organizational change management
- iii. Readiness assessment
- iv. Project scope management
- v. Business Process Re-engineering
- vi. Project management role
- vii. User involvement and participation
- viii. Communication
- ix. Formalized project plan
- x. Training program
- xi. ERP implementation strategy
- xii. ERP customization
- xiii. Testing plan

**Sustained top management support**

According to the interviewed and observed participants, the continuous support of the top management was exercised specifically by the director of the agency. It was she who participated more actively in the ERP implementation process, mainly after the initial deviation from the first project plan. All the senior members of

the agency from different impacted bureaus were involved in the ERP implementation as well. However, most of the decision making and knowledge management was in the control of the project managers that were leading the ERP implementation.

According to some interviewees, at that time, top management in general played a more political action than a management one, which complicated decision-making processes. Some interviewed actors think that top management should have had more authority during the ERP project in order to realize and cater to the organizational changes that were coming with such a highly impactful project.

The large size of the agency with organizational structure frontiers very well defined, and the high levels of management autonomy from the organizational units, clashed with the transversal and integrative nature of a solution like an ERP system. At the beginning of the project, some organizational unit managers showed their adversity to the pursued organizational change. This was prominent with a lot of employees who had been working in the agency for a long time. It was required that a carefully organized change management campaign would result in communicating the true benefits of the ERP system and make them realize the value obtained by it. This would have brought all the employees on the same page and removed all their uncertainties surrounding the ERP implementation. It thus, becomes important to study the change management performed during the time and what impact it had on the current day scenario.

The employees were asked about their perception of the reason of ERP implementation. The following graph is a collection of responses from 30 middle or senior management people about their understanding of the reason of ERP implementation.

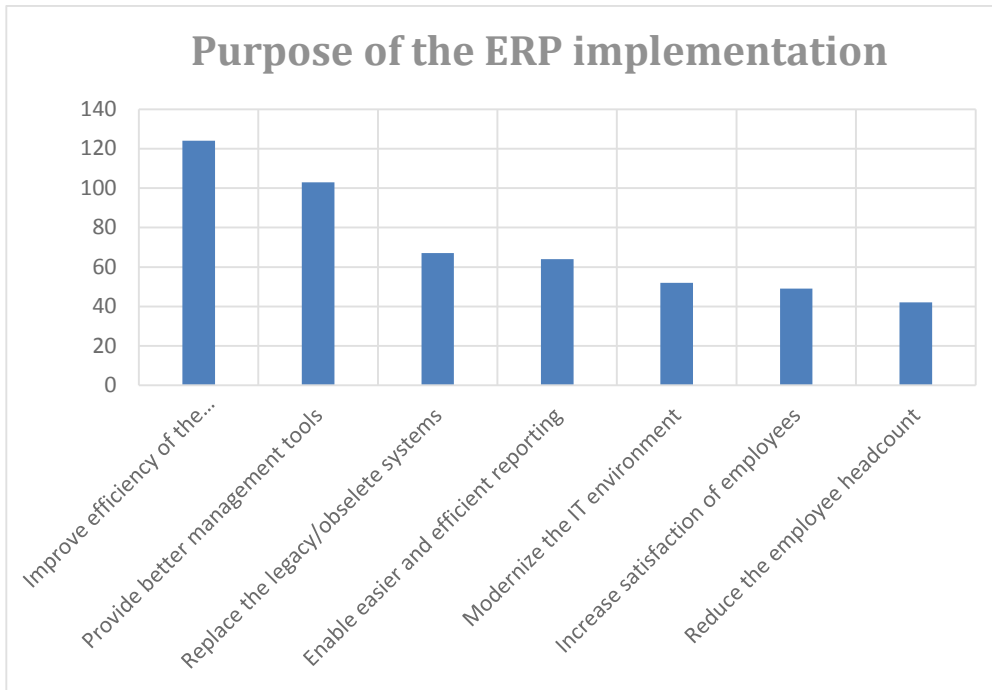


Figure 3: Perceived purpose of ERP implementation in the organization

It becomes evident from the above graph that the most of the senior and mid management understood the reason of the ERP implementation as improving the efficiency of the organization. They had positive perceptions of the use of the ERP to provide better management tools and replace the old and legacy systems. The top management was successful in establishing a correct vision of the project among senior and mid management.

### **Organizational change management**

There were two stages of the ERP implementation and thus, two stages of change management performed by the organization to bring all the employees to the same level to accept the ERP implementation. The initial change management was performed by an external consulting firm. According to the interviews and discussions, the change management process was not satisfactory for the organization to anticipate, move and tackle this major change initiative. There was not enough budgets kept for the change management initiative and hence, the

consulting company had a short project in the agency which was not effective for the magnitude of change required at the organization.

The documents revealed that there was a very basic plan for training for the employees but upon interviews and discussions, the employees mentioned that there was varying levels of training in different bureaus which resulted in varying comfort levels with ERP among users. Some employees mentioned that no training for them to use the new system and they had to learn the system themselves. One of the employees commented, *"I had to work with two systems at one time because I was not sure as to how to use the new ERP system. I didnt believe that the system was giving me the correct information; so I had to double check every time I sent an entry. It was a hard time!"*

The change management program was responsible for creation of the following documents:

1. Project Kick-off:
  - a. Initial meetings with core team on site
  - b. Collecting preliminary data on the project
  - c. Preliminary study of project data
  - d. Project kick-off meeting with project sponsor
  - e. Project kick-off meeting with organization super users
2. Stakeholder management:
  - a. Stakeholder list template creation
  - b. Stakeholder data collection
  - c. Stakeholder analysis worksheet
3. Change management : Project work plan
  - a. Work plan creation
4. Change and communication management
  - a. Information gathering and analysis for devising implementation guidelines
  - b. Determining change management implementation and application rollout strategy

- c. Identification of appropriate communication vehicles and target audience groups
5. Role change study
6. Change history study and cultural assessment
7. Readiness and resistance assessment
8. Communication plan implementation
9. Training and roll out facilitation
10. Roll out feedback and success evaluation

Although the following documents were created, the amount of efforts required to ensure that the change is tackled properly were not enough. The people expressed distress that they were not involved in the change process and the new technology was thrown at them and they were ordered to use it. They did not have enough time to get used to it and become comfortable with it. One of the major reasons for a low acceptance was the data-sharing factor. The employees were not comfortable with sharing data of their bureau with the rest of the organization. However, there was a readiness assessment done before the ERP was rolled out. The next section details the assessment performed.

### **Readiness assessment**

According to the readiness assessment done by the consulting firm which was responsible for the creation of change management program at the organization and upon meetings with employees who were actively present in the ERP implementation, following observations were made:

1. Organizational level readiness: There were some issues in the organization wide readiness such as:
  - a. Not enough awareness or resistance in some departments (which were not highly affected)
  - b. Timing of the project might result in conflicting priorities at the operational level during the Christmas and New Year.
  - c. Time constraints affected the testing of some modules
  - d. Availability of employees in a few departments for testing

- e. Motivation required to convince employees to use the system

So, the organizational level readiness was not a major issue other than the issues related to the timing of the project which might interfere with the proper implementation of the project.

2. Technology and infrastructure level readiness: It was observed that the consulting firm that the overall IT skills were enough to handle the new project. But upon meetings with other people of the organization, it was suggested that the project always had depleted resources. The super users did not get an extensive training. There were overall concerns with the knowledge of the ERP among the users and other users on the web. Training manual was not updated and it was notified in the document that the training would not finish before the GO-LIVE of the project which might create issues with proper usage of the system. It was suggested that the training material should be updated and the training should be finished as soon as possible after the GO-LIVE. The support structure for end users was not developed.
3. Application level readiness: The defects were not formally tracked in a tracker and it was mentioned that there was a possibility that those defects might not have been solved. There was no standard evaluation of the risks of the system. Also, there was no formal migration plan. There was also a need mentioned for development of business continuity and a disaster recovery plan.

So, the organization was in a fair stage but not enough prepared to go ahead with an ERP implementation of such a magnitude. There were a few factors, as mentioned above, that needed to be completed before proceeding ahead with the implementation. The technological and application level readiness was low which could have catastrophic effects on the ERP implementation. Moreover, the project scope was changed mid-way during the project. So, the next section details the project scope management during the implementation process.

### **Project scope management**

The scope of the project was only limited to Finance module in the Phase 1 but increased to an overall enterprise wide implementation in the Phase 2. It was also

reflected in the interviews where the interviewed actors mentioned that, in general, the project scope increased drastically after the initial phase of implementation.

According to the project charter, the project was implemented using an incremental approach allowing for optimal decisions based on proper scoping of the project. Go/No-Go decisions were supposed to be based on value and available funds. The project was comprised of three phases namely transformation phase, Implementation Phase 1 and Implementation Phase 2.

According to the project charter, the ERP was implemented to support the following processes:

- a) Budget and Funds Control
- b) Capital Assets and Inventory
- c) Management of Projects
- d) General Ledger and Financial Reporting
- e) Cash Management
- f) Receivables and Receipts (Sales of Publication)
- g) Procure to Pay
- h) Travel
- i) HR/Payroll
- j) Reporting
- k) Regional Offices services

Most of the processes were not a part of phase 1 of the implementation process and gradually, were included in the phase 2. So, the increment of the scope of the project was of high magnitudes which lead to some functional units being not satisfied by the decision. One of the best practices in the industry is to reduce the customization to a minimum and re-engineer the business processes to meet the ERP process which brings maximum efficiency to the organization. The next section discusses the Business process re-engineering that was done in the organization.

### **Business Process Reengineering**

Before the commencement of the ERP implementation, the committee invited a consulting firm (different from the firm that performed the change management program) to explore and map the existing (AS-IS) processes to the future (TO-BE)

processes to understand the gap between the present and the required situation. The AS-IS report was created by studying the existing processes and their impact on the overall system. It concluded that it was important to move to a new system as most of the current processes were manual which lead to delays in obtaining reports. The task of producing accuracy of reports was on the employees which was a very risky path to follow. Duplication of tasks and no succession planning was resulting in the loss to the organization. These factors were considered and the TO-BE report was made which catered to these issues by providing an ERP system.

Since it was a global non for profit organization, making big changes in the processes was difficult as there was a huge impact on regional offices as well. Due to the large number of employees which were going to be affected and not a strong change management program, an attempt was made to align and customize the ERP according to the needs of the employees. According to the ERP literature, this is not a good step for an effective ERP implementation as it creates issues during the upgrade process as the upgrades provided by the vendors are on standard modules. Hence, the customization has to be reversed before the upgrade process and then re-customized once again which results in loss of time and money. However, this was the chosen path for the ERP implementation at the agency. The project manager role was important throughout the implementation process as he was primarily responsible to ensure the success of the project. The next section discusses his role and his impact on the implementation.

### **Project manager role**

The project manager (according to the interview) was not involved in the initial planning of the ERP project where an attempt made to share the ERP project costs with other global NGOs. He was introduced into the project in 2005 because of his expertise in the IT operations and understanding of the environment of the NGO by being a part of it for a long time. According to the interview with the project manager, *"I was introduced at a tough time to fix things because the partnership did not work out and they were getting eager to implement the ERP system"*. So, the start of the project was not smooth as a lot of focus was on getting the work finished. But



during the project, the project manager was responsible for delivering the expected results by forming a core team which was responsible for overall implementation of the project. There were assigned roles for all the team members. The project manager's external origin and his experience in the organization helped him avoid organizational conflicts.

However, the project was mainly a learning phase for the team as most of the project members including the project manager did not have previous experience of implementing the ERP systems. This led to situations where the team was facing unexpected situations with confusions but the core team made the best efforts maybe not the correct efforts to deal with it.

Some interviewees mentioned the lack of monitoring and formal control of the project by the project manager and the project team. The project manager and the consulting company did not adopt a validated and a clearly communicated implementation methodology. In the same sense, they were not able to incorporate the best practices in the industry for ERP implementation. Moreover, there was no feedback mechanism which could have been incorporated to monitor the progress of the ERP implementation. These were the indications of the immaturity of the project team at the time of the implementation.

According to the project manager and other interviewees, the project did not receive help in terms of project management from the consulting company since the assigned consultants had a more functional profile than a project management profile and it was an off the shelf ERP. Moreover, the consulting office was located in another city which created problems in effective communication and caused unnecessary delays. This was one of the reasons that the project team decided to explore the system themselves avoiding the delays caused due to the long distance between the organization and the consultants. So, the project was taken over by the project team and thus, the support from users and staff became more important to help the team tackle the issues by providing functional and technical inputs. The next section discusses the support from the users during the process of implementation.

## **User involvement and participation**

According to the project documentation and the opinion of most of the interviewed actors, the level of participation of general users of the units along the project was low, due to the fact that the project team and the steering committee did not involve them sufficiently. Only the super users were involved to a certain extent as it was believed that they would be most impacted by the system. This resulted in - uncertainty about the impact of ERP implementation in the organization.

According to the project manager, this situation was due to the limitation of budgetary resources that did not allow the partial liberation of some users so that they could be devoted more to the project. It was also due to the time constraints as the agency could not afford to give away time to the employees during that time of the year. One of the employees from one of the functional units commented, "*We were not given a direct training of the system and we basically had to figure out everything ourselves. Since we have regional offices in other countries which are also operating this system, so we used to sit till late in the night sometimes to explain them the functionality of the system (whatever we learnt ourselves)*". In consequence, people that participated in the ERP project had to carry out an added effort to their daily tasks. If the personnel from functional units would have been (more) involved, it would have helped to diminish the uncertainty that existed around the project among the organization. As a result, even today, they have issues communicating with the members of other departments as they are not exposed to the full functionality of the system. As commented by one of the interviewer "*We want to have more transparency across the departments. We believe we are still doing redundant work*".

So, the level of involvement of users was insufficient during the project and it reflects in the delayed interest of the users towards the ERP system. The communication is one of the most important critical success factors for an ERP implementation. The next section details the communication during the implementation and how it impacted the process.

## **Communication**

During the ERP implementation project, there was a formal communication plan developed. The communication activities were however, not maintained after

the initial development of the communication plan. All the functional departments affected by the implementation were not involved in the process. The steering committee including the project team was primarily the part of the meeting which discussed the progress of the project. Some employees mentioned the lack of communication with the consultants. There was a general consensus that a lot of functional departments outside finance and HR were not involved in the communication process due to which these departments were not updated about the progress and development taking place in the organization. As per one of the employee from a different functional unit than Finance and HR, *"We just got the news that we have to start using this system from the next year. It came across as a surprise for us"*.

Initially, top management promoted the project both internally and externally in a way that created very high expectations but a lot of concerns at the same time. However, the lack of adequate communication during the project had a negative impact in the management of such expectations. These aspects impacted the project duration and its costs. Due to the lack of information towards the rest of the organization, the informal communication networks began to work and it resulted in rumours about the project, sometimes correct but many other times false, thus further eroding the perception of the ERP implementation in the organization. This resulted in many people of the organization maintaining a negative perception of the project, ignoring the project details and how and why some events occurred. The project team improved in experience with the years and in the current day, the communication is done by the project administrator by sending out the details of the developments in the ERP implementation and acting as a point of contact in case of any issues.

However, the events during the implementation stages regarding the communication resulted in creating a negative perception among the non-super users about the impact of ERP implementation in the organization. The project team is still trying to figure out a method of communication that works best in such organizations. The project team was responsible for other tasks as well such as creation of a project

plan. The next section discusses the project plan and its impact on the ERP implementation.

### **Formalized project plan/schedule**

The first and only formal ERP implementation project plan was defined at the beginning of the project in 2007. All the interviewees mentioned that this ERP project plan was very ambitious and optimistic, since it defined the go live of the ERP system on January of the 2008. It was not a detailed plan, being limited to describing the main phases of the project, duration, objectives and the main tasks within each phase. The concrete duration of tasks was not detailed neither the allocation of resources. There was no key performance indicators defined to measure the achievement of those stages.

Another important aspect is that this plan had a very aggressive training strategy which would not have been possible in a political environment where a lot of people put their own interests before the interest of the organization. It mentioned the start of training to about a month and a half before the GO-LIVE of the project. The GO-LIVE was not delayed but at the same time, it was not welcomed by a large number of departments as they were not prepared for a change of such a magnitude. The ERP was not customized as it was a very good overall match apart from the HR module which was customized as it was very specific for the particular UN agency. Moreover, some of the key performance indicators defined in the business plan is not the key performance indicators followed by the industry to monitor progress.

Hence, best practices were not completely followed during the course of the implementation of ERP which lead to an atmosphere of confusion and frustration between some of the functional areas. Training and education of the users is one of the most important critical success factors for successful ERP implementation as discussed in the previous chapter. The next section discusses the training program in the organization.

### **Training program**

During the implementation, the training process had two important stages: the project team training and the end users training. According to the interviewees,

the initial project team training was very basic. The team members got basic training sessions by the vendors regarding the ERP usage and functionalities. There were no formal training needs assessments carried by the project team. The departments which were not directly impacted by the ERP implementation were assumed to learn the system by working with it.

However, the main drawback of the training process was its timing with respect to the GO LIVE. The timing of the training was delayed until two months before the GO LIVE of the project. This resulted in a lot of departments not being comfortable with the system at the time. As mentioned by one of the employees from the regional office, *“Training on the ERP for the regional offices has been very limited both in terms of scope and quality”*. This resulted in a lot of sections working extra time after the implementation as they had to focus on two tasks of learning the system and also completing their daily tasks. The training for regional offices was provided by the concerned departments from the head office. Due to time differences between the head office and regional office, they had to sit late or ask the employees from regional offices to come to office early to train them with the ERP system. As noted by one of the employees, *“If it was not for our dedication, I don’t know how regional offices would have learnt the system”*. High level usage or training documentation was created for the main implemented departments but there was no documentation for the other relatively less impacted departments.

The key users (also known as focal points) also complained about the lack of advanced training, and in the functionality of data extraction and reporting. Initially, the end user training was also very basic. They were only trained in the minimum functionality required for the ERP system Go Live. After six years of the implementation, there is still no focus on providing additional training. The enhancements done by the core project team are documented at a high level and an email is sent out to the entire organization to create awareness about the new development.

The training manual is not up-to-date with all the changes and prospective developments that are planned for the ERP. There is a feeling amongst the entire organization that they have not been exposed to the maximum functionalities offered

by the system. They believe that the system is very strong but they don't know enough about the system. Several end users mentioned the feeling of receiving too much information in very little time.

The training could have been planned better to make the employees comfortable with the system which also reflected in their hesitancy to go beyond than the normal applications and exploring the system. Creation of a strategy for implementation can yield quantitative benefits starting early for an ERP implementation. The next section discusses the ERP implementation strategy for the organization.

### **ERP implementation strategy**

The organization opted by a phased implementation approach for the ERP implementation. It began by implementing financial module and then later on moving to other departments such as HR, Payroll and Project management. From the interviews, it was clear that the organization did not have a lot of expertise in the ERP domain when it started the project. It was expected that project scope would be increased gradually as the implementation team would learn more about the ERP towards the implementation. The ERP was taken off-the-shelf which enabled the organization to go ahead with the standard method of implementation.

The implementation methodology followed by the consulting firm did not follow the best practices in the industry. They did not consider the difference of environment as was the case in this implementation and proposed strategies which was aggressive and did not take into account the political environment and the delays associated with it for the implementation. So, the ERP implementation strategy was not completely suited for the organization at the starting of the project but it eventually moved towards a more sustainable strategy.

One of the best practices of the industry is to avoid customization of the ERP and to perform an extensive business process re-engineering program to ensure that the new processes are efficient and according to the industry norms. The next section discusses the customization done at the ERP level in the organization.

## **ERP customization**

The approach followed for the customization of ERP was different for HR department than other functional areas. Initially, it was assumed that there would not be any customization required for HR as was the case with Finance and other departments. In the case of finance department, the system implemented was a result of a standard configuration of the standard ERP system. Although the solution improved the performance of the Finance department, some interviewees believed that due to the standard implementation, there were a lot of processes which were not included in the implementation because the efforts were not made on the business process re-engineering.

In the HR department, the ERP system was customized through enhancement, change and modification of the functionality. The HR processes of United Nations were different from the package offered by the ERP vendor. There was a sense of dissatisfaction among the employees of HR department because the magnitude of re-engineering was a lot. So, the HR module was heavily customized to tackle the resistance from employees and suited to the UN processes. However, it cost financial resources to the organization and at the moment, it runs the risk of costing more to the organization during the upgrade as the customization has to be rolled back before pursuing the upgrade process.

The data accuracy is an important factor during an ERP implementation to build the user trust to use the system. Also, extensive testing is required to ensure that all the defects are treated before providing the users with the system. The next section details the testing plan followed by the organization.

## **Testing Plan**

The organization created and made an attempt to follow a detailed testing plan due to which there were few testing related issues post implementation. The data migration was performed within the organization by the project team with the help of the consultants. It came across in a meeting with an employee that 'sometimes they had to stay in the office during late hours to ensure that the migration was complete but it did not complete due to some issues which were not predicted by the

team. So it was frustrating for them at times. This led to decreased motivation levels at times.'

It was mentioned that only the focal points of the departments were involved during the testing phase which verified the data and the test cases and the sign off was provided only after the consent of the focal points of the departments. There were a few reported issues after the implementation which were tracked in the appropriate documents and were solved by the project team with the support of the consultants.

### **Concluding remarks**

The overall business priorities for the ERP implementation at this UN agency grew in scope from the initial plan. This resulted in a lot of concerns among departments which were not expecting the arrival of an ERP that would change the way they had been working for a lot of years. There could have been a better change management plan, communication methodology and a strategy but the project team improved over time to perform actions consistent with the best practices in the industry. The grounded research resulted in a list of critical success factors studied under the UN context. The table 12 shows the ratings of each CSF from observations, meetings and documentation available in the organization.

A model depicting the impact of organization's context on the three levels of critical success factors across the organization. At the strategic level, it impacted the scope of the project, top management support, the implementation strategy and assessment of organizational readiness to prepare itself for the change associated with an ERP implementation. At the project level, the various CSFs identified are project plan, project manager role, decision to customize ERP, ERP training and the testing plan. At the operational level, the critical success factors which are important are user involvement, communication and organizational change management with respect to users. It is hard to measure the strategic factors quantitatively as they are subjective to each individual. So, these are measured through grounded research in addition to the personal interviews in the later chapters for the purpose of the thesis.



**Table 12 Rating of each CSF through grounded research**

Table 12 presents each Critical Success Factor that has been studied and their rating. The rating system consist in a scale from 1 to 5, being a rating of 1 assigned to a Critical Success Factor considered “Highly inappropriate”, and a rating of 5 considered “Highly appropriate”.

<b>Critical Success Factors studied</b>	<b>Rating (on a scale of 1 to 5) 1 = Highly inappropriate 5 = Highly appropriate</b>
Top management support	4
Organizational change management	2
Organizational readiness	2
Project scope management	2
Business Process re-engineering	3
Project manager role	2
User involvement and participation	1
Communication	1
Project Plan/Schedule	2
Training	3
ERP implementation strategy	2
ERP customization	4
Testing Plan	3

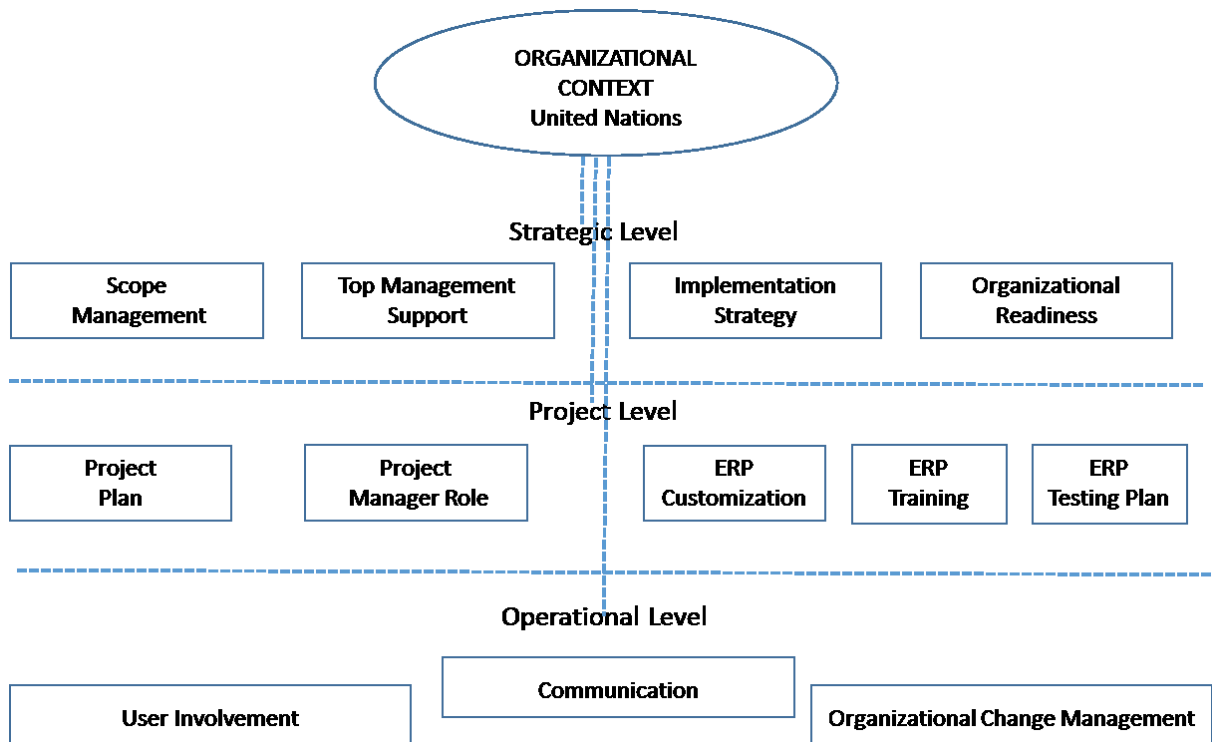


Figure 4: Model of Impacted CSFs at 3 levels in the organization

#### 4. Quantitative Survey

##### a. User satisfaction and success of ERP implementation

User satisfaction has been regarded as one of the most important measures of ERP implementation success. According to De Lone and Mclean (2002) in the six dimensions of success of IT systems, user satisfaction is one dimension to measure success others being system quality, information quality, use of system, individual impact and organizational impact. Some researchers have focused on the importance of user satisfaction from a project management perspective during an ERP implementation. According to Baroudi & Orlikowski (1988), “User satisfaction remains an important means of measuring end-users’ opinions on ERP systems and should cover the entire end-users’ experience cycle from project management to receipt information”. According to Ginzberg (1981), user satisfaction can be used to measure information systems implementations

success. Powers & Dickson (1973) utilized the factor satisfaction of users to measure MIS project success. Raymond (1987) applied user satisfaction as a measure of MIS success in small organization. Hence, the research identifies user satisfaction as an important factor to measure success.

A survey methodology approach was followed for the collection of quantitative data regarding the user experience with the ERP systems in the UN agency. A validated scale for user satisfaction (Doll & Torkzadeh, 1988) was used to measure the employee satisfaction with the ERP system implementation. The other section of the survey collected data regarding specific departmental information as they relate to the ERP implementation and their strategic objectives. The responses to those parts very specific to the functional unit and thus, are not included in the research for the thesis. There were two primary constraints to conducting the survey. First it had to be brief and second, politically correct. All attempts were made to keep the survey as brief as possible without compromising data collection. The brevity of the survey was crucial for its successful administration because it was conducted during working hours. Moreover, a small survey will allow participants to maintain reasonable focus and attention to answer questions appropriately. However, in a UN type of organization, the political environment is the driving force and therefore the questions needed to be phrased appropriately. Figure 5 which is adapted from Doll and Torkzadeh (1998) shows the constructs that were considered for the survey. The exact questions are given in Table 13 shown below.

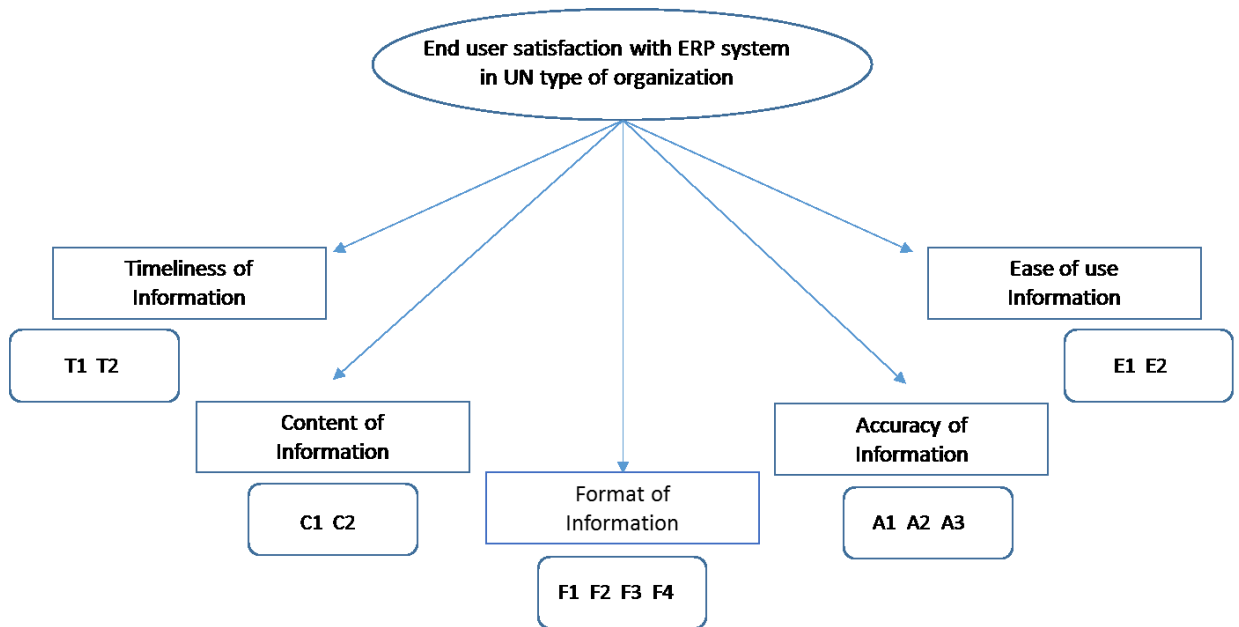


Fig 5 End user satisfaction survey with ERP systems as adapted for the UN organizations.

#### b. Procedures

The decision to implement an ERP took a few years. The entire organization was involved and impacted during its implementation and subsequent usage. Some employees used the ERP systems on a daily basis whereas other employees used it only to fill out absence leaves and timesheets. The senior management used the ERP systems frequently to pull out reports which were used to measure the performance of the organization. Hence, it was important to send the survey to all the employees in the organization. However, due to the political and highly bureaucratic nature of the environment, it was expected that the response rate would be low as it is hard to convince the employees regarding the confidentiality of information. The following measures were taken to improve the response rate of the survey:

1. An email was sent by the assistant of director of the organization to all the employees informing them that their responses would be confidential and only the researcher would be aware of it.

2. Before the survey started, their consent was taken by a consent form which was attached to the survey. The survey was created on the share point website of the organization and I was provided the full administrative rights for that survey meaning I could delete, modify and store the survey or the responses at any point of time.
3. Participants could not be identified individually as the link that was sent to them generated a random code number for their response.
4. Also, it was very hard to buy the time for these employees, so a brief and a compact survey were used to fetch the data. The average response time was 3 to 4 minutes to complete the survey.

The participants were informed about the purpose of the study and it was also mentioned that this study had the support of the director of the organization and hence, it was alright to go ahead and fill the survey. They were informed on the first page of survey that the study would measure the user satisfaction of employees with the ERP and at the same time, also measure the completion of strategic objectives for various departments.

Participants were also informed that they have a right to withdraw from the study at any time without any negative consequences. They proceeded ahead by pressing the "Next" button at the bottom of the screen. At the end of the questionnaire, they were de-briefed and thanked for taking out the time to fill the survey. They were also provided the name and email ID of the research team if they had any further questions or concerns or if they wanted to be notified of the results.

The data was regularly taken from the share point website and stored as an excel file in the first class email which is a secured connection by John Molson School of Business, Concordia University. The survey responses were deleted from the share point website as soon as they were stored in the first class.

The quantitative survey was done in the organization to understand the user satisfaction with regards to the ERP system implemented in the organization.

### c. Participants

The participants of the study were employees of a United Nations agency situated in Montreal. The employees were either full-time or contract consultants.

The questionnaire was sent to all employees of the organization which comprised of both primary users and secondary users. A total of 102 responses (45% male and 55% female) were recorded over a period of 2 weeks with two reminder emails. The response rate was 15% which was disheartening as a lot of efforts were made to ensure that there were a large number of responses. Even though the number of responses was not enough but they were gathered from more than 20 departments which show the richness of the information. The information from the survey represents an organization wide view of the user satisfaction with the ERP systems. The employees which responded to the surveys were distributed widely according to the duration of working at this organization ranging from less than one year to more than 20 years. The average duration of years working at UN agency for the respondents was 11.8 years. So, most of the responses carried high validation and coming from the employees which have been involved in the organization during the implementation of ERP.

Figure 6: Demographics of UN agency

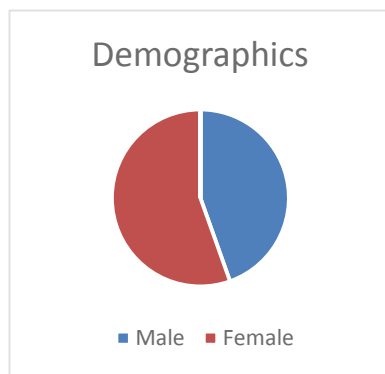
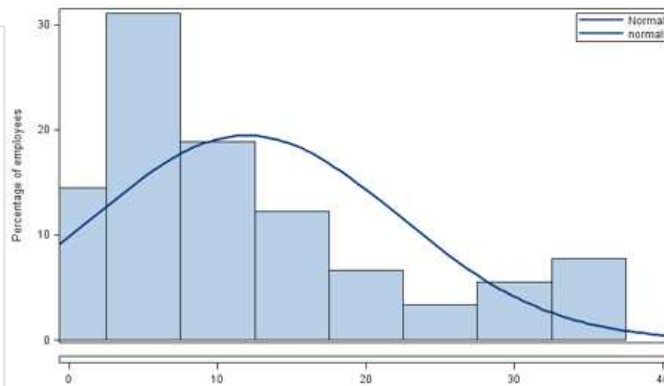


Figure 7: Duration of years working at the



#### d. User satisfaction and success of ERP systems

End user satisfaction is one of the significant constructs to determine the success of an ERP implementation. A measure of satisfaction is the output of individual experiences with the technology being used. The financial performance of the ERP system is another measure to access its success in the organization. However,

at this UN agency, most of the access to the information is secured by the “information owners” and is not accessible to other functional units. So, it was not possible to measure the success financially. From the interviews and observations, the term “hijacking” came forward where it was mentioned that the organization felt hi-jacked as it had invested a lot of money in the ERP implementation. The situation was that some senior management officials were starting to feel that the ERP was not yielding the expected benefits and hence, it was not a very profitable implementation for the organization. But it was not sure how satisfied the employees were who use it for their daily tasks felt about the system. Did they feel that the various components of the ERP such as its information accuracy, the timeliness of information, the format of the output, the ease of use of the system and the content was relevant to their work? These factors needed to be explored to measure the success of ERP system with respect of the user satisfaction.

The scale to measure end user computing satisfaction with ERP system used was taken from Doll and Torkzadeh (1988) end user satisfaction survey (Table 13). The scale was developed keeping in mind both the primary and secondary users of an organization. It has been cited more than 1800 times which emphasizes on the validity of the scale. Primary users are the employees which have a large interaction with the ERP system on an everyday basis. The secondary users are the employees which use the system to extract reports and do not utilize the system on a daily basis. The scale contained five variables which were used to measure the user satisfaction.

Table 13 includes three columns. The first column on the left provides an intuitive label for each question. The middle and second column presents the questions used by Doll and Torkzadeh (1988). Doll and Torkzadeh (1988) aimed in their study to measure the satisfaction of users who had a direct interaction with the computer using a target specific application. We utilized these questions and adapted them in our study as shown in the third column – out most right. After conducting a factor analysis of the survey results, the questions will be re-classified to the appropriate factor. It is important to also note that the reliability coefficient for this scale in the present study is 0.977 ( $\alpha = 0.963$ , M and SD).

The questionnaire measured five variables as mentioned above. Five questions were used to measure the satisfaction of the employees with the content of the ERP system. This factor would measure if the employees understand the content and find it useful and relevant for their work. Three questions were used to measure the satisfaction of the employees with the perceived accuracy of the ERP system. This factor measured if the employees feel that the information provided by the ERP is accurate for their work and could be replaced by the information provided by legacy systems. Three questions were used to measure the user experience with the format of the ERP. There was a single ERP in the organization but every user would have different perceptions of the format of the system. This factor measured the perception of users regarding the format of the ERP system. Three questions were used to measure the satisfaction of the employees regarding the ease to use the system effectively. This taps directly into the expertise of the employees with the system which results from providing training with the system. Ease of use is a subjective phenomenon and varies across individuals, as a result it has been referred to as perceived ease of use in technology acceptance model (Davis, 1985). In the context of United Nations, it can be expected that there would not be a lot variation in the perceived ease of use of the system as the employees share a similar tenure at the organization. Finally, two questions were used to measure the satisfaction of the employees regarding the time taken to retrieve information from the ERP system and the measure of the updated information. This is an external variable and cannot be subjected to variations across employees. The timely information enhances the user experience with the ERP systems and creates a positive perception about the ERP's dimensions (the information accuracy, the format and the content). There was an open ended question in the end of the survey to capture any other information which the survey respondents wanted to share with us. The responses from the open ended questions are present in Appendix (IV) and are joined across departments. The next section discusses the analysis of quantitative data and the results achieved.



<b>Table 13. Questionnaire comparison between Doll and Torkzadeh and present study</b>		
Table 13 compares a questionnaire completed by Doll and Torkzadeh (1988) and the questionnaire that will be used in our study for the dimensions for timeliness, format, ease of use, accuracy and content.		
	Questionnaire based on <b>Doll and Torkzadeh (1988)</b>	Questionnaire used in our study
TIM1	Does the system provide up-to-date information?	The ERP provides up-to-date information
TIM2	Do you get the information you need in time?	I get the information that I need in an appropriate time frame
EOU1	Is the system efficient?	The ERP is efficient
EOU2	Is the system easy to use?	The ERP is easy to use
EOU3	Is the system user friendly?	The ERP is user friendly
FOR1	Is the output easy to understand?	The output is easy to understand
FOR2	Are you happy with the layout of the output?	I am happy with the layout of the reports from the ERP
FOR3	If the information clear	The information from the ERP is clear
FOR4	Do you think the output is presented in a useful format?	I think that the output from the ERP is presented in a useful manner
ACC1	Do you find the system dependable?	I feel that the ERP is dependable
ACC2	Do you feel the output is reliable?	I feel that the output from the ERP is reliable
ACC3	A3 Are you satisfied with the accuracy of the system?	The ERP system provides me with accurate information
ACC4		
CON1	Do you find the output relevant?	I find the output from the ERP relevant for my work
CON2	Does the system provide sufficient information	The ERP provides sufficient information to carry out my work
CON3	Does the system provide reports that seem to be just about exactly what you need?	The ERP provides reports that seem to be just about what I need
CON4	Does the information content meet your needs?	The ERP content meets my needs at work
CON5	Does the system provide the precise information you need?	The ERP provides me with precise information that I need

e. Analysis and results

We began the data analysis by performing the test for Kaiser’s measure of sampling adequacy. In table 14, Kaiser’s Measure of Sampling Adequacy is shown. MSA values below 0.5 are considered insignificant and should not be included in further analysis. As all the variable are all above 0.5 with an overall MSA OF 0.918 and are retained for further analysis.

**1. Factor analysis**

**Table 14.**  
*Kaiser’s Measure of Sampling Adequacy. The table summarizes how adequate the 17 questions are for a reliable analysis.*

---

**Overall MSA = 0.91778962**

T1	T2	E1	E2	E3	F1	F2	F3	F4	A1	A2	A3	C1	C2	C3	C4	C5
0.95	0.94	0.9	0.84	0.86	1	0.91	0.94	0.96	0.95	0.91	0.94	0.9	0.96	0.88	0.93	0.9

Table 15 shows the amount of the variance of each question shared by other questions. We also noticed that the SMC value for all the questions is fairly high which implies a principal component analysis would yield similar results.

**Table 15.**  
*Prior Commuality Estimates: SMC*

T1	T2	E1	E2	E3	F1	F2	F3	F4	A1	A2	A3	C1	C2	C3	C4	C5
0.81	0.79	0.86	0.92	0.93	1	0.88	0.89	0.84	0.76	0.88	0.82	0.8	0.77	0.8	0.84	0.8

In Table 16, variables that have a proportion of the eigenvalue that contribute more than 1% to the common variance are retained. This criterion goes to show that the remaining eigenvalues with a proportional contribution of less than 1% account for little of common variance and are not relevant.

**Table 16.**  
*Variance plot for the Eigenvalues of the reduced correlation matrix*

	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	11.867	10.756	0.836	0.836
Factor 2	1.112	0.602	0.078	0.914
Factor 3	0.51	0.136	0.036	0.95
Factor 4	0.373	0.064	0.026	0.976
Factor 5	0.308	0.124	0.022	0.998
Factor 6	0.184	0.062	0.013	1.011

Figure 8 shows the proportional and cumulative contribution of each factor to the common variance. We notice that each successive component accounts for a lower proportion of the total variance.

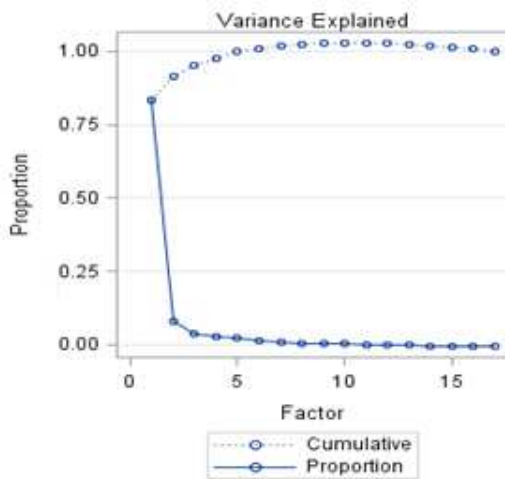


Figure 8: Proportion and cumulative contribution of each factor to the common variance

It is important to note that the estimate of common variance amongst all questions is 14.197 which constitutes 83.5% of total variance among all questions.

Also, a partial correlation matrix is obtained. The inspection of the partial correlation matrix yields similar results: the correlations among the 17 questions after the retained factors are accounted for are all close to zero. The root mean squared partial correlation is 0.088, indicating that six latent factors can accurately account for the observed correlations among the 17 questions. (See appendix for partial correlation matrix).

The Appendix for the pre-rotated graphs shows the correlations between factors. A good rotation would place the axes so that most variables would have zero loadings on most factors. As a result, the axes would appear as though they are put through the Variable clusters, shown in the appendix for the rotated graphs.

An oblique rotation is used in order to allow for the correlation between factors and get a more differentiated pattern of factor loading, which would lead to an easier interpretation of factors. Table 17 shows the correlation between the factors presented in our study.

**Table 17.**

*Inter-Factor Correlations table that showing the correlations in between each of the factors.*

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Factor 1	1	0.492	0.626	0.691	0.625	0.191
Factor 2	0.492	1	0.565	0.472	0.595	0.259
Factor 3	0.625	0.565	1	0.64	0.553	-0.03
Factor 4	0.691	0.472	0.64	1	0.599	0.1
Factor 5	0.624	0.595	0.553	0.599	1	0.191
Factor 6	0.191	0.26	-0.03	0.101	0.191	1

The table 18 shows the factor loadings for each question on the 6 factor categories after oblique promax rotation. The Factor loadings above 0.5 would be extracted and each factor would be classified with regards to the nature of the questions significantly loaded on that factor.

**Table 18.**

*Standardized Regression Coefficients. Displayed are the loadings on three factors in a factor analysis of a 17-item satisfaction survey for end-user computing satisfaction.*

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
T1	0.48	0.14	0	0	0.4	0.1
T2	0.09	0.1	0.14	0.08	0.64	-0.09
E1	0.03	0.32	0.07	0.12	0.53	0.07
E2	0.01	0.92	0.02	0.03	0.02	-0.04
E3	0.04	0.89	0.13	0	-0.02	-0.05
F1	0	0.18	0.67	0.05	0.17	-0.03
F2	0.06	0.18	0.73	-0.09	0.2	0.23
F3	0.08	0.25	0.58	0.17	0	0.07
F4	0.17	0.21	0.47	0.22	0.02	-0.09
A1	0.76	0.02	0.11	0.02	0	0.05
A2	0.84	0.02	0.09	0.03	0.04	-0.05
A3	0.73	0.1	-0.03	0.15	0.01	0.05
C1	0.26	-0.25	0.03	0.44	0.28	0.07
C2	0.04	0.07	0.17	0.67	0.04	0.06
C3	0.29	-0.12	0.53	0.25	-0.13	0.37
C4	0.19	0.14	0.03	0.69	-0.02	0.04
C5	0.22	0.12	-0.07	0.49	0.21	0.19

In table 19, the factor loadings above 0.5 are extracted. Factor 6 would be dropped since all factor loadings for factor 6 are below 0.5. Factor 1 would also be known as accuracy, as the questions A1, A2, A3 loaded in this factor explain the perception of the accuracy of the information/data from the ERP system. Also, factor 2 would be known as ease of use, since the questions E2, E3 that are retained in the factor explain the perception of users about the ease of use of the ERP system.

**Table 19.**

*This table, displaying the Standardized Regression Coefficients, shows the loadings above 0.5 on three factors in a factor analysis of a 17-item satisfaction survey for end-user computing satisfaction*

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
T1	-	-	-	-	-	-
T2	-	-	-	-	0.64	-
E1	-	-	-	-	0.53	-
E2	-	0.92	-	-	-	-
E3	-	0.89	-	-	-	-
F1	-	-	0.67	-	-	-
F2	-	-	0.73	-	-	-
F3	-	-	0.58	-	-	-
F4	-	-	-	-	-	-
A1	0.76	-	-	-	-	-
A2	0.84	-	-	-	-	-
A3	0.73	-	-	-	-	-
C1	-	-	-	-	-	-
C2	-	-	-	0.67	-	-
C3	-	-	0.53	-	-	-
C4	-	-	-	0.69	-	-
C5	-	-	-	-	-	-

Similarly, factor 3 will be noted as format, since the questions F1, F2, F3, C3 loaded in this factor refer to the format of the data from the ERP system. Also, factor 4 will be known as content since the questions C2, C4 loaded in this factor refer to the content of the data. Finally, factor 5 will be noted as timeliness, as the questions T2, E1 loaded in the factor explain the timeliness of the data in the ERP system.

**Table 20**

*The table shows the factor loadings for each of the 5 extracted dimensions (Accuracy, ease of use, format, content and timeliness).*

Dimension	Factor Loading
Accuracy	
A1	0.76
A2	0.84
A3	0.73
Ease of use	
E1	0.92
E2	0.89
Format	
F1	0.67
F2	0.73
F3	0.58
F4	0.53
Content	
C1	0.67
C2	0.69
Timeliness	
T1	0.64
T2	0.53

Referring to table 20, questions A1, A2, & A3 are loaded under accuracy, questions E1 and E2 are loaded under Ease of use, questions F1, F2, & F3 are loaded under format. Question C3 has also been loaded under the format dimension as opposed to the categorization according to Doll and Torkzadeh (1988) who had mentioned question C3 under Content. Similarly, C1 and C2 are classified under content and T2 and T2 (formerly referred to as E1) are retained and classified under the timeliness dimension.

Table 21 explains the variance of each factor ignoring other factors and we find out that for all the five factors, the variance is high except factor 6 which is removed.

<b>Table 21</b>					
<i>The table explains the variance by each factor ignoring other factors.</i>					
Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
9.005	7.209	8.403	8.365	7.582	0.783

<b>Table 22</b>	
<i>The table shows the new questionnaire with the modified factors and their corresponding questions.</i>	
TIM1	I get the information that I need in an appropriate time frame
TIM2	The ERP is efficient
EOU1	The ERP is easy to use
EOU2	The ERP is user friendly
FOR1	The output is easy to understand
FOR2	I am happy with the layout of the reports from the ERP
FOR3	The information from the ERP is clear
FOR4	The ERP provides reports that seem to be just about what I need
ACC1	I feel that the ERP is dependable
ACC2	I feel that the output from the ERP is reliable
ACC3	The ERP system provides me with accurate information
CON1	The ERP provides sufficient information to carry out my work
CON2	The ERP content meets my needs at work

The final set of questions that is created by the analysis of the data in the context of United Nations is reduced to 13 questions from 17, as shown in Table 22. We follow our analysis by performing structural equation modelling (SEM) on the factors defined by the 13 questions in order to investigate relationship.



## **2. Structural Equation modelling**

In this section we use the SEM software EQS to perform structural equation modelling with latent variables that reflect both the analysis of interdependence (the measurement equations that relate the observed measures X and Y to the unobservable factors) and the analysis of dependence (the structural equations that describe the dependence relationship among the unobservable factors) (Lattin et.al, p.355 2003). EQS is a software that is used to test full range of structural equations models including multiple regression, multivariate regression, confirmatory factor analysis, structured mean analysis and multiple population comparison.<sup>5</sup>

We apply SEM to our study because it enables us to simultaneously measure our latent (unobservable) variables – timeliness, user satisfaction, format, accuracy and content using different measures for each of them, as well as show the interdependence between one dependent latent variable (timeliness) and independent latent variables (user satisfaction, format, accuracy and content).

The structural equation map is shown in Appendix G and it displays the results from the structural equation modelling. It shows the co-variances between the various factors along with the factor loadings of each variable on the factor. The values are listed below in the tables on the subsequent pages. It is also important to study the goodness of fit of the model through the fit indices seen in table 23.

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<sup>5</sup> <http://www.mvsoft.com/whyuseeqs.htm>

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**Table 23.**

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*The table presents Fit Indices for study the goodness of fit of the model. The indices include CFI, Bollen's, McDonald's, Joreskog Sorbom's Gfi Fit Index and Joreskog Sorbom's Agfi Fit Index.*

Comparative fit index	0.959
Bollen's	0.959
Mcdonald's	0.726
Joreskog sorbom's GFI fit index	0.87
Joreskog sorbom's AGFI fit index	0.785

We see that the CFI has a value of 0.959 which a highly desirable value and therefore shows good fit between the data and the model. It is also recommended that we look at the reliability coefficients of the model, as well as the Cronbach's Alpha. Table 24 represents the reliability coefficients.

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**Table 24**

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*The table shows the reliability coefficients of the model, including the Cronbach's alpha and the Reliability Coefficient RHO.*

Cronbach's Alpha	0.965
Reliability Coefficient RHO	0.983

In regards to Table 24, a Cronbach’s alpha of above 0.9 shows that the inter-correlations among test variables are high. To study the maximal reliability for the unit-weight composite based on this model, we will look at the standardized factor loadings. Table 25 presents the factor loadings for each of the variables in the model.

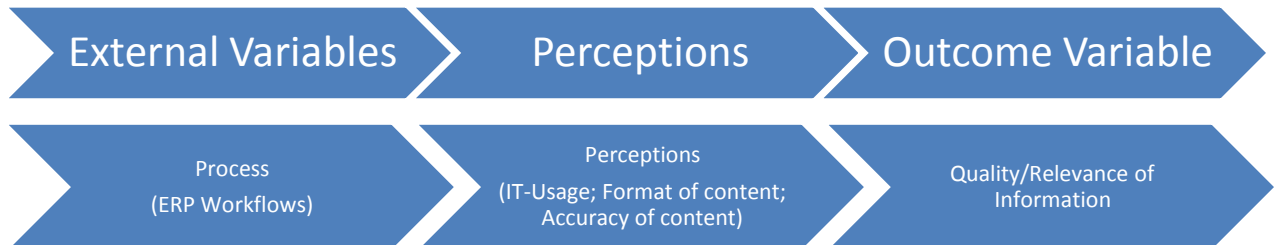
**Table 25.**

*The table, variables in model, represents factor loadings for each question obtained from SEM.*

TIME1	0.801
TIME2	0.873
EOU1	0.82
EOU2	0.843
FOR1	0.881
FOR2	0.886
FOR3	0.915
FOR4	0.751
ACC1	0.775
ACC2	0.838
ACC3	0.795
CON1	0.812
CON2	0.836

Our work on (1) critical success factors found in the body of knowledge, (2) observations from the grounded research part, and (3) the exploratory factor analysis, allows us to establish an overarching theoretical framework to represent ERP implementation. The figure below represents this theory, which is in line with socio-behavioural theories.

Fig 10: Factors influencing user experience



Considering the EFA results and the final factors, the structural model proposed is shown in figure 10. In this model,

*External variable*

Process: It refers to the timeliness of the information received by the ERP system. It can be also be attributed to the workflows provided by ERP system to reduce the time taken to provide the information.

*Perceptions*

IT-Usage: It is measured by the ease of use variable which refers to the perception of the employees of the ease of using the ERP system. It also refers to the comfort levels of an employee with an ERP system.

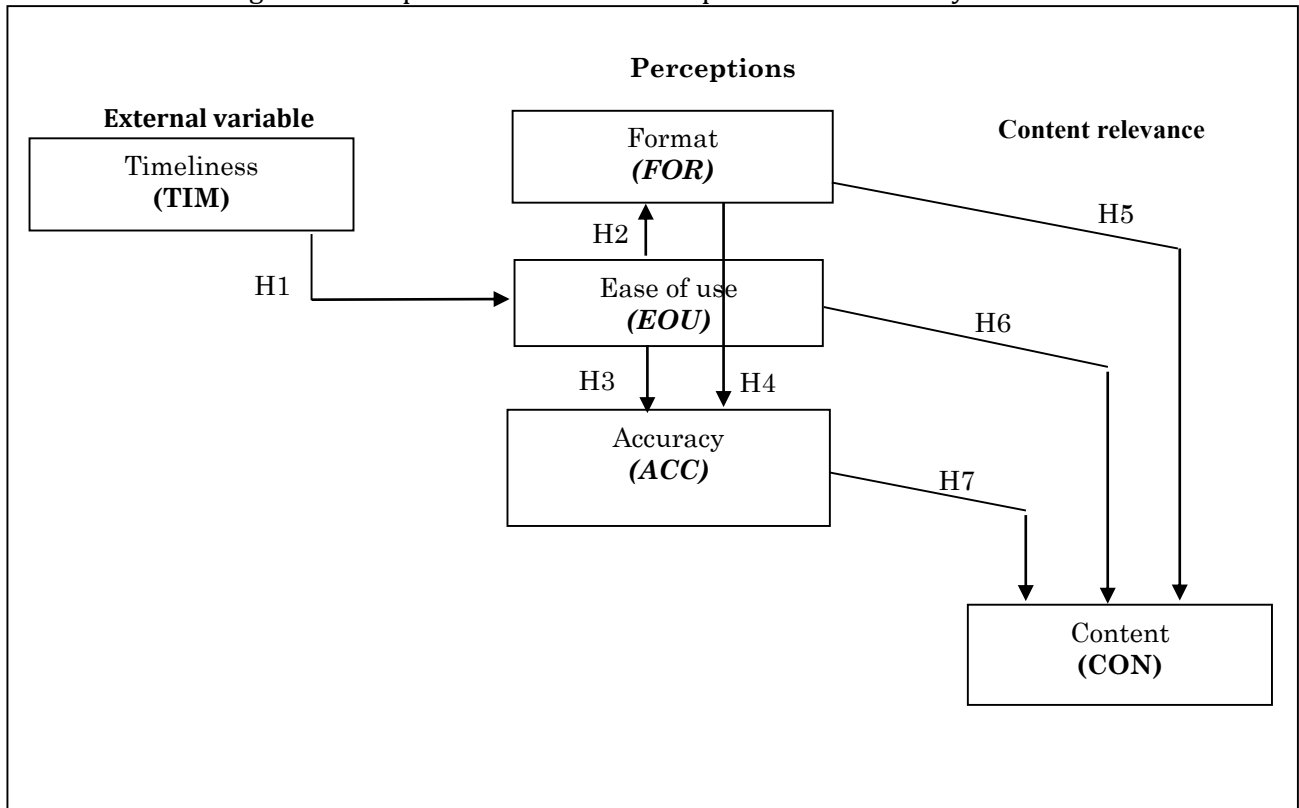
Format: It refers to the user friendly degree of format. Again, this is a perception of employees how user friendly they find the format of the system for their use.

Accuracy: It refers to the accuracy of the information provided by the ERP system. Based on the format of the system and the degree of ease of use, employees might find a system accurate as they perceive to know the system better.

*Outcome variable*

Content: Based on the ease of use of the system, coupled with its format and accuracy, the content of the system gets affected. If employees know how to use the system and perceive the format user friendly, they are bound to make correct decisions regarding the accuracy of information which would result in the system providing the right content or reports for usage

Figure 10. Proposed Model for user experience with ERP systems



Based on the latter discussion and the extensive analysis of our literature review on CSFs, observations via grounded research and EFA we posit the following hypotheses (Table 26). The model investigates the causal relationships between timeliness of the information and the perceptions of the ERP system. The relationship of the three ERP perceptions is also studied with respect to the content of information provided. The timeliness of the information is expected to cause the perceptions among the employees regarding the usage, format and accuracy of the system. Finally, these perceptions are expected to result in a desirable content of the information by the ERP system.

**Table 26***Research hypotheses for the model described above*

	Relationship	Hypotheses
H1	TIM-EOU	Timeliness of information from ERP influences perceived EASE of USE of the ERP system.
H2	EOU-FOR	Perceived ease of use of the ERP influences the perception of the format of the ERP system.
H3	EOU-ACC	Perceived ease of use of the ERP influences the perception of the accuracy of the ERP system
H4	FOR-ACC	Perceived format of ERP influences the perception of the accuracy of the ERP system.
H5	FOR-CON	Perceived format of the ERP influences the content of the ERP system.
H6	EOU-CON	Perceived ease of use of the ERP influences the content of the ERP system.
H7	ACC-CON	Perceived accuracy of the ERP influences the content of the ERP system.

This path diagram (appendix 7) highlights the structural relationships between the variables that were obtained after the factor analysis. Between these variable are hypotheses, each explaining a relationship of correlation between the variables.

In order to better and further explain these relationships, a causal relationship must also be performed.

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**Table 27.**

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*Table represents Fit Indices for study the goodness of fit of the model. The indices include CFI, Bonett's, McDonald's, Joreskog Sorbom's GFI Fit Index and Joreskog Sorbom's AGFI Fit Index*

---

Comparative fit index	0.932
Bonett's	0.903
Mcdonald's	0.59
Joreskog sorbom's GFI fit index	0.838
Joreskog sorbom's AGFI fit index	0.721

---

We see that the CFI has a value of 0.932 which a highly desirable value and therefore shows good fit between the data and the model. Other goodness-of-fit statistics are in an acceptable range. It is also recommended that we look at the reliability coefficients of the model, as well as the Cronbach's Alpha. Table 28 represents the reliability coefficients.

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**Table 28.**

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*The table shows the reliability coefficients of the model, including the Cronbach's alpha and the Reliability Coefficient RHO.*

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Cronbach's Alpha	0.965
Reliability Coefficient RHO	0.982

---

In regards to Table 28, a Cronbach's alpha of above 0.9 shows that the inter-correlations among test variables are high. As shown in the table, A Cronbach's Alpha of 0.965 shows that the proposed model has variables which are highly inter-correlated. To study the maximal reliability for the unit-weight composite based on this model, we will look at the standardized factor loadings. Table 29 represents the factor loadings for each of the variables in the model.

---

**Table 29.**

*The table represents factor loadings for each question obtained from SEM.*

---

TIME1	0.643
TIME2	0.766
EOU1	0.858
EOU2	0.871
FOR1	0.873
FOR2	0.877
FOR3	0.909
FOR4	0.746
ACC1	0.757
ACC2	0.818
ACC3	0.776
CON1	0.79
CON2	0.822

---

According to Table 29, the factor loadings range from 0.64 to 0.91 which indicates high correlations between items and their factors. Also, it is important to note that the coefficient of determination for the structural model was 0.805, indicating that the six attitudinal factors together explain about 80.5% of variation in user performance



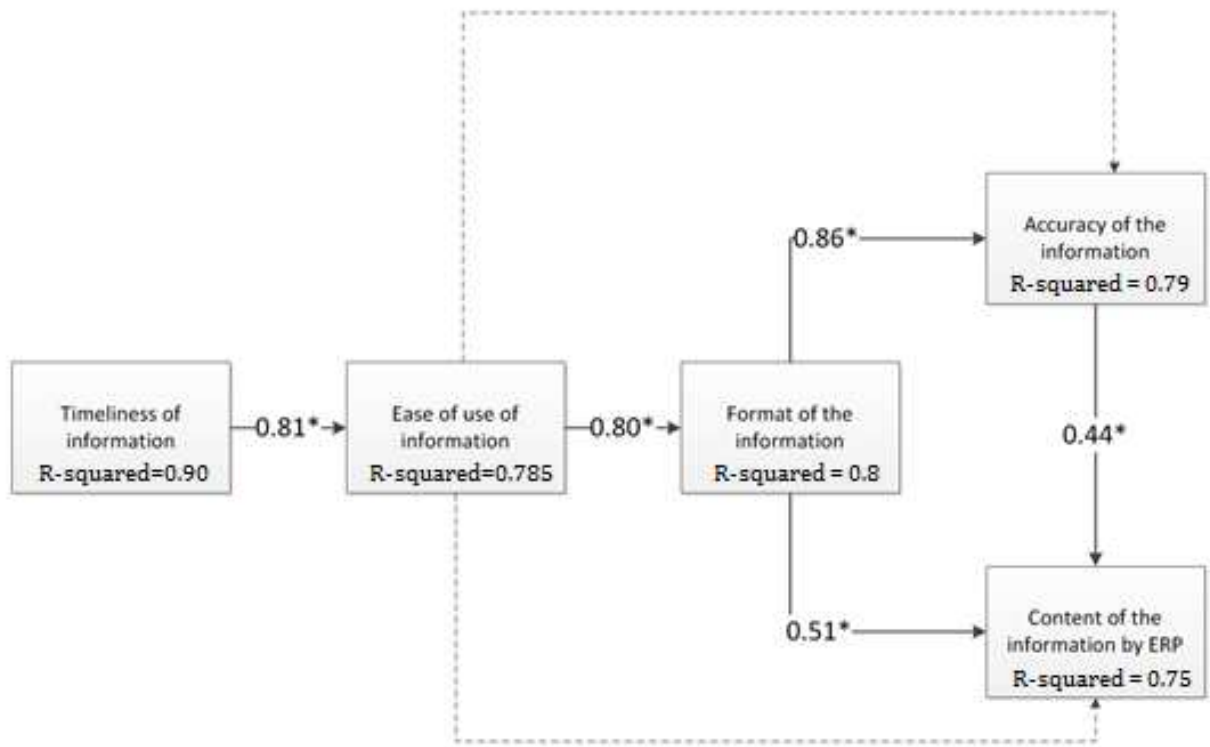


Figure 11. Causal model for user satisfaction ERP implementation in UN context

The causal model in figure 11 within context of UN organizations explains that:

- a. Timeliness of information received by the influences the perception of the ease of use of information among user
- b. Ease of use of information influences the information to appear accurate to the user
- c. Ease of use of information influences the content of the system
- d. Ease of use of information influences the format to appear better to the user
- e. Better format of the information influences the perception of better accuracy of data among the user
- f. Perception of an accurate information influences the perception of better content for the user

- g. Better format of the information influences the content of the information to be more useful to the user

These factors could help explain the factors which enhance the user experience with the ERP system. It is interesting to note that in the organizational context, the perception of ease of use of the system could improve the content of the system which could make it more useful for the users and provide meaningful information. This puts light on the importance of training and change management in the organizations like United Nations.

## **5. Qualitative Data Analysis**

Donald (1995) refers narrative inquiry as a “subset of qualitative research designs in which stories are used to describe human action” (pg.5). The term narratives have been used in a variety of ways in the literature. It has been referred to any data that is in form of a speech (Miles & Huberman, 1984), it has been referred to as a story (Connelly & Clandinin, 1990). Stories are a means of re-living the human experience by expression (Ricoeur, 1986). It is arranged into an understandable meaning by plots. According to Donald (1995), the plots are a concept where the outcome is the meanings of particular events within their context. This measure is gaining significance among the research industry and is becoming as a more prominent approach for qualitative analysis (Josselson, 1993). It configures the events in a story by deciding the start and end of the story, providing guideline for selecting events, ordering events which lead to a conclusion, presenting the importance of the events for the conclusion (Donald, 1995).

There have been various explanations and definitions of narratives over a period of time. Labov (1972) mentioned that narratives are just the occurrences of the past events. The validity of this statement was argued as later on, research indicated that narratives have a bigger influence or importance in the overall understanding of a phenomenon. Mumby (1987, p.114) explains the narratives as a “politically motivated production of a certain way of perceiving the world which privileges certain interests over others”. They could also be used to convince the listener and create belief regarding certain situation (Reissman, 1993). The importance of narratives have grown over the years and it has taken a significant place for data analysis process in individual – organization relationships (Gabriel, 1991). The narratives also offer an insight into situations where the pursuit of power and politics play a major role in determining outcomes (Boje, 1991). It is valuable for analysing the changes in the organizational culture (Martin & Meyerson, 1988). Hence, the literature has indicated the importance of interviews in environments characterized by politics and power.

a. Narrative analysis

The narratives create a phenomenon of the events by extracting information which might be lost and specific questions and expressions extract it thereby, making it more than just a technique of creating replicas of the present or past organization. The narrative analysis has gained popularity during analysis of data from information systems. It is used to create a political advantage during an ERP implementation (Brown, 1998). The narratives can explain failed ERP implementations by digging out the factors which might have led to the situation (Brown & James, 1998).

There are two types of narrative inquiry namely analysis of narrative and narrative analysis (Donald, 1995). The basic difference between the two forms is that the former is used when the interview is in a story format and data has to be extracted from it to make conclusions. The analysis results in description of parts of the overall story that is relevant throughout the story and taking out insightful information from it. The second method is called narrative analysis where the description of various events is synthesized to produce a story (case study). So, to perform a study in a narrative analysis, the researcher proceeds from data to a story.

The ERP implementation in the organization was started 7 years ago and there were a lot of employees who had left and joined the organization during that time. Half of the senior management had also changed during the 7 years. So, the incidents describing the happenings in these 7 years were subjective and limited in information. They all had their side of the story but very few people could provide the complete picture of the happenings of the 7 years of ERP implementation. Moreover, the organization is extremely silo oriented with a conservative approach towards information sharing. As a result, a lot of employees did not know the other side of the story and perceived the happenings from their own point of view. In such a case, conducting the qualitative research through an approach of narrative analysis was justified and hence, used.

In the narrative analysis, the interviewer gathers reactions from the interviewee, expressions and other queues and further discusses a topic which wasn't

clearly explored. They together complete the story by filling in their own information and thus, it becomes a dynamic process of ongoing change until the gaps are filled and the story is complete to arrive at conclusions. The current research attempts to extend this stream of analysis by performing qualitative analysis on the ERP implementation in a UN agency characterized by an environment of politics and power.

**b. Procedure**

In the current UN agency, interviews were conducted among the senior management which were influential in the decision making during the ERP implementation. The various chiefs of the functional units were targeted and special permissions were taken from the deputy director to go ahead and carry out the interviews. An email was sent from the deputy director to all the heads of the functional units to take out time for the interviews and accommodate with me.

The plan was to send separate email to each of the chiefs of the functional units to plan a suitable time for an interview. They were informed that the interview consists of questions related to ERP implementation in the organization and the purpose is to explore the critical success factors usage during the ERP implementation. 12 departments were contacted out of which 10 chiefs replied back with suitable timings. Their personal offices were chosen as the meeting venue. Since I had managed to establish a basic connection with the chiefs of all the departments, there was an atmosphere of comfort during the interview. After the schedule of the interview was fixed, I reported to their office on time to start the exercise.

The interview started by reading them the consent form which is attached in the appendix and an oral consent was taken from them to maintain confidentiality. They were provided with contact number and information of my supervisor if they wanted to understand more about the research. Most of the interviews lasted for around 20-30 minutes. Few interviews went up to 55 minutes. However, all the interviews provided relevant data which was essential to complete the ERP story at the UN agency and understand the critical success factors for ERP implementation.

### c. Big Five Personality Traits

To categorize the employees into different behavioural types so that their replies could be translated appropriately, “Big Five” personality traits were used. The 5 factor model of personality, or the “Big Five” was formed as a generalization of all personality measures and cultures. The model consists of the following 5 dimensions: Neuroticism, extraversion, openness to experience, agreeableness and conscientiousness, some of which are more relevant for career success than others.

Costa and McCrae (1988) study neuroticism as the more prevalent trait that generalizes most personality traits. The authors break neuroticism into these 6 instabilities: anxiety, hostility, depression, self-consciousness, vulnerability and impulsiveness. Those individuals’ score higher in neuroticism suffer from the latter 6 emotional instabilities, due to negative events in their lives. Another trait of the “Big Five” is Extraversion. Watson and Clark (1997) define extraversion as individuals that are more socially oriented, active, impulsive and ambitious. Individuals that score higher in extraversion are more likely to become leaders and have a better and a more closely knitted support system. Conscientiousness, a third personality trait that takes part of the 5 factor model of personality assumes achievement orientation, dependability and orderliness. In other words, self-control is assumed a definition of conscientiousness and is a valid predictor of career success. This is reaffirmed by Costa, McCrae and Dye (1991). Other literature discusses the link between conscientiousness, effective job seeking behaviour and attendance at work and indicates that conscientiousness leads to individuals to live longer. The three above stated personality traits are the more relevant to career success. The two other traits are openness to experience and agreeableness. The first assumes individuals that are intellectually and philosophically intelligent. The latter refers to those who are cooperative and likeable.

**Table 30. Personality traits and characteristics**

Table 30 lists several personality traits, namely, neuroticism, extraversion, conscientiousness, openness to experience and agreeableness. The table describes the characteristics of each of these personality traits.

<b>Personality Trait</b>	<b>Characteristics</b>
Neuroticism	<ul style="list-style-type: none"><li>• Individuals with this trait suffer from anxiety, hostility, depression, self-consciousness, vulnerability and impulsiveness</li><li>• They have gone through a negative event in their life.</li></ul>
Extraversion	<ul style="list-style-type: none"><li>• Individuals that are more socially oriented, active, impulsive and ambitious.</li><li>• Individuals with this trait become leaders and have a better and a more closely knitted support system</li></ul>
Conscientiousness	<ul style="list-style-type: none"><li>• Individuals are achievement-oriented and dependant.</li><li>• This trait leads individuals to live longer</li></ul>
Openness to experience	<ul style="list-style-type: none"><li>• Individuals are intellectually and philosophically intelligent</li></ul>
Agreeableness	<ul style="list-style-type: none"><li>• Individuals are cooperative and likeable</li></ul>

**d. Analysis and Results – Ratcliff narrative technique**

The analysis process followed the steps suggested by Ratcliff (2002) for the narrative technique to measure the qualitative data. It consisted of the following steps:

**Step 1:** Getting to know the data

**Step 2:** Focus the analysis

**Step 3:** Categorize information

**Step 4:** Identify patterns and connections within and between categories

**Step 5:** Interpretation – Bringing it all together

The interviews were conducted with the chiefs of all the impacted departments where the ERP was implemented. This helped us to get a high quality data from sources which represented the views and interests of their departments. There were ten interviews conducted with the representatives from the departments as mentioned in the table below.

### **Step 1: Getting to know the data**

According to Huberman & Miles (1994), (p.32), "Valid analysis is immensely aided by data displays that are focused enough to permit viewing of a full data set in one location and are systematically arranged to answer the research question at hand". The first task of the interview would be to understand the interviewees and their background in the organization. The interviews were conducted with the representatives of various bureaus or departments where the ERP was implemented. The various departments were interviewed during the process:

- a. General Ledger
- b. Budgets
- c. Payroll
- d. Language and Publication Bureau
- e. Administrative Bureau
- f. Strategic planning
- g. Finance
- h. Knowledge management
- i. Project management

Although the sample of interviewed employees is not a large number, the data is very rich in information because of the following reasons:

1. The interviewed employees were the focal points of their departments
2. The interviewed employees also consisted of top management officials
3. The duration of the interviews were long enough to get insights into the ERP implementation in the organization
4. The average duration of employees working in the organization 10 years
5. These employees represent the views of their department

Among the interviewed employees, 40% of the employees were females and 60% were males. It means that the distribution was majorly even and the results of the analysis should not be biased due to the gender. The total interview hours were 275 minutes which provided a lot of information to carry out the analysis. There was



no deception technique used during the interview and it was made aware to the participants that this was a research project for the completion of a thesis at Concordia University. The organization and its employees were assured that the confidentiality of the information including their names, the name of the ERP and the organization name would not be disclosed and coded. A sample consent form was read and an oral consent was taken from all the respondents before starting the interview. The following coding scheme is used for the analysis:

- Participants – Code 001 to Code 010
- ERP name – XYZ ERP
- Organization name – UN Agency

The first section of the interviewed questions were primarily focused on measuring the critical success factors during and post the ERP implementation process in the organization. The second section discussed some questions related to change management. Most of the questions were open ended to extract maximum information from the participant. The interview concluded with questions related to risk management and future optimization opportunities which were focussed at identifying areas of improvement. This tapped into the understanding of the maturity of ERP at the organization level.

The table below present the demographics of the interviewees. As we can notice from the table, 8 of the interviewees were chiefs of their respective functional units.

**Table 31. Demographics of the Interviewees**

Table 31 presents the following demographics of the Interviewees: Gender, position, department, years in the organization and the duration of time of the interview.

<b>Interviewees</b>	<b>Gender</b>	<b>Position/ Department</b>	<b>Years working in organization</b>	<b>Length of the interview</b>
Interviewee 1	F	Chief, General Ledger	12 years	17 mins 50 secs
Interviewee 2	F	Chief, Payroll	32 years	21 mins 32 secs
Interviewee 3	F	Chief, Language and Publication	33 years	57 mins 33 secs
Interviewee 4	F	Chief, Budgets	14 years	23 mins 13 secs
Interviewee 5	M	Chief, Finance	5 years	25 mins 55 secs
Interviewee 6	M	Chief, Administrative Bureau	5 years	23 mins 33 secs
Interviewee 7	M	Consultant Involved in development	3.5 years	26 mins 4 secs
Interviewee 8	M	Chief, Strategic Planning	4.5 years	25 mins 47 secs
Interviewee 9	M	Chief, functional department	15 years	47mins 15 secs
Interviewee 10	M	Consultant in Knowledge management	4 years	17 mins 19 secs

The data to be gathered were distinct critical success factors at various stages of the ERP implementation and how those factors varied over the years at the organization. It was also aimed to know if they realized the importance of these factors and their impact on the organization. This information was also used to understand the reasons for successful and unsuccessful attempt at measuring these factors during the course of the ERP implementation.

## **Step 2: Focus the analysis**

This is one of the main steps to conduct an interview. According to Marshall and Ross (1995), (p.114), "Identifying salient themes, recurring ideas or language, and patterns of belief that link people and settings together is the most intellectually challenging phase of the analysis and one that can integrate the entire endeavour." If the analysis is not focused, the interview can go in multiple directions and it could result in the researcher having no relevant data from the interview.

The analysis was focused around the identification of critical success factors during and post implementation of the ERP within the organization and ranking them. The grounded research which was undertaken in the organization for four months resulted in the creation of a list of possible success factors which might had a strong impact on the success or failure of the ERP implementation. The other sections of the interview primarily extracted any possible information that might have been missed in the earlier sections either due to some open ended questions being asked or the interviewee simply forgetting about it. So, the analysis was focussed with questions being asked that were both open ended and closed ended to capture the maximum data required for the analysis.

The focus was on identifying key words used during the interview. For each CSF measured, there were words which were considered important and noted. These words provided an accurate indication of the trend of the response whether it is positive or negative for each factor. The table below show the expected words to assign a positive or a negative value to each critical success factor that would help in the completion of the story by understanding it from all the functional areas which are in information silos.

**Table 32.**

Table 32 presents the criteria used to identify a positive or a negative reaction to each CSF

<i>Critical success factor</i>	<i>Words expected for positive impact</i>	<i>Words expected for negative impact</i>
Top management	Supportive, good, helpful, yes	No, not present, change
Business Process Re-engineering	Thorough, involvement, minimum	Don't know, failure, unsatisfied
Project team	Knowledgeable, good, helpful	Less effort, no efficiency, unsuccessful
Training	Schedule, timely, proper plan	Sudden, not enough, improper
Communication	Constant, on time, periodic	Inefficient, unaware, too abrupt
Support from vendors	Helpful, informative	Not quick, never seen
Organizational culture	Changing, improved	Difficult, reluctant

### **Step 3: Categorize Information**

Categorizing information creates clear set of ideas and data that has to be measured. For the purpose of our thesis, the information was categorized into the following categories:

1. Critical Success Factors
2. Change Management
3. Risk Management
4. Optimization opportunities

The critical success factors identification was done through grounded research and a detailed analysis was performed using the interview answers and categorizing them into the categories. The sections 2, 3 and 4 contained questions on change management, risk management and optimization opportunities which put further insight into the ERP implementation process and validated the understanding of the factors.

### **Section 4: Identify patterns between and with segments**

The patterns between the information received were developed using the criteria of identifying the key words from the audio transcripts. The trends from the different interviews were interpreted and combined to form a common conclusion.

The trends in the top management support varied to some extent as different department chiefs expressed distinct reactions to the question on support of top management during ERP implementation. It was consistent with the grounded theory results research as the ERP implementation was driven by the top management and hence, they attempted to support the project in all regards but weren't totally successful. However, they underestimated the impact of change required and its consequences as they did not have an ERP background.

Most of the departments had their own interpretation of support from top management. For example, according to the Finance chief, *"Funding was available with few problems and they (top management) were important during all stages"*. The Chief of Information Technology mentioned, *"They did not understand the exact meaning of ERP and this led to less budget and less allocated resources"*. The Payroll chief believed that although the initiative was taken very seriously, but it was not on the top priority list and was replaced by other issues which had high priority. The overall understanding varied for the top management support but not on the scale of intentions. The departments believed that the top management support was adequate due to the resources provided by them. However, the departments which were not completely satisfied by the top management associated the reason to the latter's unawareness of the effort required for ERP implementation process. Moreover, once the senior management realized the amount of efforts required, they attempted to make changes and fix the issue. So, the overall understanding was shared across the organization that the top management made attempts to help implement a successful ERP solution.

The responses regarding the business process re-engineering extremely varied among individuals. Some employees were happy with the activity as they believed it was done thoroughly and satisfactorily in the organization. For example, the finance chief mentioned, *"It was done thoroughly in the finance department and there was minimum ERP customization"*. The chief of General Ledger department also voiced a similar opinion. The employees who were not directly involved in the implementation mentioned that they had experienced mixed reviews which were the

case with the chief of information communications technology. According to him, *“Business Process Re-engineering at the agency was a complete failure. They completed the first stage of implementation but never performed the second stage of optimization”*. Since there were no key performance indicators defined to measure performance, the organization had no measure to check if the business process re-engineering was a success or failure.

The project team was skilled and capable of handling such ERP implementations as mentioned by a lot of respondents. They understand that in such an environment with high bureaucracy and political motives, it becomes hard to implement IT systems that require a big magnitude of change. Besides, the agency took an *“off – the – shelf”* version of the ERP meaning that there was no configuration done to implement the system. Hence, the major task of the project team was related to project management activities and providing training to the end users for the system. As mentioned by the finance chief, *“Project team’s work was primarily related to how the system works but yes, they did have answer to our queries”*. The opinions of the Chief, ICT coincide with the Chief Finance but he was more critical about the project team as he mentioned, *“I believe they know the product but they did not make enough effort to sell the ERP”*. There was also a concern as raised by payroll chief that they could be more pro-active in providing solutions to the entire organization. The overall mood of the organization was neutral towards the project team and they believed that the team was capable enough to undertake the project. However, they could have utilized the opportunity to do a better task.

The biggest concern for the organization was about the training conducted for various functional units. It was a common concern voiced by all the interviewees. The major concerns regarding training were that it was not enough in terms of content. A very basic training course was given to the employees of finance but even that was not detailed. According to the chief of general ledger department, *“Due to time constraint, we did not get enough training and had to learn the system ourselves”*. Some employees feel that these types of systems are learnt best by working on them. According to chief, finance, *“We did not get enough training and had to learn the system*

*ourselves, but I believe the best way is to learn on the job. But yes, the training was not enough.* The employees who were not directly involved in the system were not aware of the training plan followed by the project. According to the consultant, *"I haven't even heard if there was any training to be honest"*. This is the only factor which had a common response from all the departments and interviewees. So, it is a good indication of the less or almost no formal training for the concerned departments. The organization did not follow a detailed training plan and hence, users were unsatisfied and uncomfortable using the system.

The communication during the pre-implementation stage from the project team to the organization was minimal. It was restricted to the senior management to make the strategic decision to go ahead with the ERP implementation. The involvement from the functional units was basic with no detailed feedback and evaluation. According to the Chief of Payroll, *"We were not involved in the initial communication regarding the project, if we knew these details, we could have asked for more resources."* During the implementation stage, the project team attempted to make some improvements in their communication strategy by involving the main functional units and establishing communication links with them. According to Chief of ICT, *"During the implementation phase, the communication was enough in Finance but it should have been an organization wide exercise."* The users were not informed of the crucial dates on time and they got a "surprise" when they got to know the dates from when they were supposed to start using the system. According to the finance chief, *"We were given a system and told to make it work. We had no parallel system at GO LIVE which was a big big risk"*. The communication post implementation improved considerably but the employees had to suffer from the inadequate communication plan. According to the budget chief, *"Once the project started, we were informed constantly about the changes"*. The communication between the project team and the organization improved gradually from the pre implementation phase to the post implementation phase.

The support from vendors was not enough post implementation as the vendors did not have an office in the same city as the agency. So, there was some

downtime (time between the request sent and the response received) when the different functional units had to raise a service request to the vendors to assist them in critical issues. According to the budgets chief, *"We got support with some downtime. That is why we are trying to develop an in-house expertise."* Some employees attribute the delay to the mandate that was signed between the organization and the vendor. According to a chief of a functional department, *"I don't know why the response was low, maybe it was not fixed in the mandate"*. The organization is moving towards developing an in house expertise so that it has a reduced dependency on the external vendors and it is creating a positive atmosphere for the users with the system since their concerns and issues are being handled within the organization.

One of the biggest factors which determine the success or failure of an ERP implementation in an organization process is its culture. In the current case, the organization culture was highly bureaucratic with information silos existing across functional units. The ERP was an ideal solution to remove the silos and change the culture to make it more transparent. However, the organizational context was political and the effort to break the information silos was herculean. The ERP implementation is bringing the functional units closer to each other and exchange of information has initiated. According to the chief of business planning unit, *"a lot of people are still reluctant to use the system and they are getting used to it"*. The employees are starting to use the system as they are exploring the benefits associated with it. Hence, the culture of the organization is moving towards accepting and optimising the use of ERP system.



**Table 33.**

Table 33 presents the rating of each CSF during ERP implementation by the interviewees

Critical Success Factors ranked in the qualitative interview (on a rating of 1 to 5, 1 being poorly implemented and 5 being well implemented)

Critical success factors	Emp 1	Emp 2	Emp 3	Emp 4	Emp 5	Emp 6	Emp 7	Emp 8	Emp 9	Emp 10
Top management	4	3	3	2	3	4	4	3	2	2
Business Process Re-engineering	5	5	3	1	4	5	3	1	3	1
Project team knowledge	5	5	2	4	4	5	5	2	2	3
Training	2	2	1	4	1	2	2	2	2	1
Communication	2	2	2	3	2	3	2	2	2	3
Support from vendors	3	3	1	2	2	3	1	1	3	2
Organizational culture	3	3	1	3	4	3	2	2	3	3

### **Step 5: Bringing it all together**

It is evident from the interviews that there are information silos that exist in the organization. Although they all have their own perspective of the ERP implementation process in the organization as it affected their department, all the responses showed a trend for some success factors. Factors like training and communication were majorly unsuccessful in the organization pre and post implementation but project team knowledge was on the bright side of the story. Other factors such as top management support and support from vendors got different opinions from different departments. From the grounded research and interview, we were able to derive a 'story' using narrative analysis as mentioned before.

The ERP system was introduced in the year 2007 in the organization after careful assessment of options available in the market. However, the functional units

were not involved much and their expertise was not a major criteria for consideration as the plan was to only implement the finance module. The business process re-engineering activity was done thoroughly in the finance department and an extensive implementation plan was created. During this time, the top management decided to increase the scope of the project to four other departments. This led to more requirement of resources and time. The project team did not have experience with ERP systems and hence, it was a learning curve for them. There was no detailed communication plan to inform the organization about the big changes coming in the organization. There were a lot of informal groups created during the process and information started to flow through these channels. This led to difference in expectations among the functional units about the benefits of using the ERP system. The project manager played an important role in putting the ERP implementation back on track when it had gone off route in the starting of the process. The GO-LIVE was a badly strategized decision as it was not decided considering user's situation. It happened within a month of the start of training for the users. Employees were not aware of the system functionalities when it was handed to them and at the same time, there were no parallel systems running which could be supportive to them. They had to learn the system by themselves as the training was very brief and inadequate to deal with their daily requirements. It was a hard and long learning curve for the employees for the initial years of implementation. The project team, which was composed of five resources was trying its best to address the needs of the employees. It took two years for the situation to calm down and the employees to get used to the system. At the same time, there were multiple small applications running in the organization which had to be accommodated within the umbrella of the ERP. So, the project team was performing the additional tasks of integrating these applications with the ERP.

The organization has reached a situation where the main users of ERP have started to realize its potential and benefits and are increasingly becoming fond of using it. However, there still is a large number of employees in the organization who are disconnected from the ERP as they do not understand the implications for the

organization to use it. The project team has developed a competency to solve issues and not approach the vendors unless it is a critical issue which requires expertise which the project team doesn't possess. The organization has saved a lot of money and resources by opting for an ERP which was not a recognized ERP in the industry and was in its development stage in the industry. There were motivation issues associated with this approach as it became increasingly hard to convince the users that this ERP could make processes efficient for them. Moreover, there was very little or no expertise available in the market for this ERP and it was hard to find solutions in the beginning with the project team dependent on the vendors for all the tasks. The training documentation is being maintained properly now and regular updates are being sent to the employees regarding progress made with ERP integration with other applications. The organization is moving in a right direction but as mentioned by most of the employees, it is in a stabilizing and recovering stage of its ERP implementation.

The details of change management, risk management and optimization opportunities were also gathered during the interview process but they are outside the scope of our thesis.

## **7. Research findings**

In this thesis, making sense of ERP implementation critical success factors was undertaken. A large effort was put to explain those critical success factors for ERP implementation as reported in published case studies around the world. During our search, none of these studies considered the United Nations context, even though it is quite known that the United Nations has committed itself to implement an ERP system in all of its agencies. As an ultimate outcome, we aimed to propose a model that explains not only the critical factors affecting a successful ERP implementation in United Nations type of organizations but also their influence on each other. The path leading to this model is lengthy and involved.

To that effect, it is important that this section summarizes the most important findings of this research:

1. From literature review synthesis
  - a. Aggregating and consolidating 61 critical success factors into a distinct set of 21
  - b. Categorizing the consolidated list of CSFs into a meaningful and new list
2. From grounded research observations
  - a. 8 critical success factors identified to be important in the context of UN agency.
  - b. Creating a framework based on three organizational level (Strategic level, project level and operational level)
  - c. Establishing a score to each of the CSFs through extensive analysis of documents, attending meetings and making observations
3. From quantitative analysis
  - a. Adaptation of a validated instrument to the UN context
  - b. 5 factors were identified through EFA
  - c. ERP implementation model proposed and tested
4. Qualitative analysis
  - a. A 'story' of the ERP implementation by narrative analysis
  - b. Implementation of each CSF and their impact on ERP
  - c. Identification of CSFs concurring with the research with grounded research

## **8. Conclusion**

The purpose of this thesis study was (1) to investigate the state-of-the-art in ERP implementation success via the literature on critical success factors (Daniel, 1961; Rockart, 1979; Thierauf, 1982) for ERP implementation (Sarkar et.al, 2003; Jaideep et.al, 2005, Koh et.al, 2011) and the components of user satisfaction (Doll & Torkzadeh, 1988), (2) to unify and consolidate all CSFs into a meaningful set, and (3) to propose a model that explains the success of ERP implementation. The context of this thesis is focused on United Nations type of organization. This is done via a number of tools: systematic literature review; grounded research; survey method; and interviews.

Using these tools, it was possible to collect information and data from a United Nations agency in Montreal, Canada. Thirteen critical success factors were identified during the grounded research through observations and studying documents related to the project. Out of these 13 factors, 8 were studied and explored further during the ten interviews with senior management including chiefs of various functional units. The technique of narrative analysis produced a consolidated and complete story of the ERP implementation at this agency. It presented the score of implementation of these success factors according to the replies by the interviewees. This final list of critical success factors was superimposed on the 22 critical success factors identified during the extensive literature review to complete the triangulation process with identification of distinct critical success factors. The grounded research (Glaser & Strauss, 2009) included studying documents, taking observations and producing a list of critical success factors to be studied in the organizational context. These factors impact the organization at three level namely strategic level, project level and operational level.

<b>Critical success factors identified from the grounded theory research</b>	<b>Critical success factors identified from the interviews</b>
Top management support	Top management
Organizational change management	Business Process Re-engineering
Organizational readiness	Project team knowledge
Project scope management	Training
Business Process re-engineering	Communication
Project manager role	Support from vendors
User involvement and participation	Organizational culture
Communication	Overall ERP implementation
Project Plan/Schedule	
Training	
ERP implementation strategy	
ERP customization	
Testing Plan	

The tables above mention the critical success factors identified from the grounded theory and the critical success factors from the interviews. Table 3 combines these factors and present them in the context of the results of literature review. 13 CSFs are identified critical to ERP implementation success at United Nations as listed below. The various stages of implementation are mentioned and the success factors are mapped to present the importance of these factors at every stage of the ERP implementation process.

<b>Table 34</b>				
<b>Table 34: Mapped critical success factors for UN type of organizations</b>				
<b>Organizational State</b>	<b>Business Requirements</b>	<b>Technical Solutions</b>	<b>Project Implementation</b>	<b>Post Implementation Usage</b>
Cultural Change Readiness (CCR)	Local vendors partnership (LVP)	Business Process Re-engineering (BPR)	Measurable goals (MG)	ERP success documentation (ESD)
Top management support and commitment (TMSC)	Minimum customization (MC)	Quality management (QM)	Small internal team of best employees (STBE)	User feedback usage (UFU)
	Legacy systems support (LSC)	Risk management (RM)	Open and transparent communication (OTC)	

A questionnaire was adapted from various literature related to the context of a United Nations type of organization. This questionnaire included factors which could be used to assess user satisfaction in this type of environments through their experience with the ERP systems. The quantitative analysis was performed to measure the user satisfaction with the ERP systems through a user experience perspective. It was developed from the Doll & Torkzadeh (1988) end user computing satisfaction scale according to the UN context. Common factor analysis resulted in the reduction of number of questions from 18 to 13 and re-grouping them into the five factors (timeliness, ease of use, format, accuracy and content). The technique of structural equation modelling was performed to measure the path coefficients and hypothesis were developed for the model.

We concluded that timeliness (which is viewed in the UN agency as workflows) of information from ERP is positively related to perceived ease of use of the ERP implemented. This goes along with the results of Gelderman (1988) where the correlation exist between user satisfaction and usage of information system. In a United Nations context, employees perceive the ERP easy to use if it provides them information in a timely and efficient manner which supported hypothesis 1. The

results supported that perceived ease of use was positively related to perceived accuracy which supported the hypothesis 2. The easier the user perceives the system, the more accurate he perceives the information from the ERP. The ease of use of ERP was found to positively relate with the perceived format of the ERP which supports hypothesis 3. If a user finds a system easy to use, they would perceive the system to be accurate. The perceived format of the ERP is positively related to the perception of accurate information which leads to further satisfaction which supports hypothesis 4. A positive perception of the format and accuracy of the ERP system results in producing meaningful content for the end users. Our model concludes that perceived format and accuracy of the ERP system is positively related to content of the ERP which supports hypothesis 5 and 6 respectively. Finally, the easier a user perceives a system to use, the more meaningful content is generated for their use. This concludes that ease of use of the ERP is related positively to the useful content generated by the system which supports our hypothesis 7.

The model was then tested using the structural equation modelling approach. The results generated a causal relationship between timeliness and ease of use of ERP, ease of use and format of the ERP, format of the ERP and accuracy of the ERP, format of the ERP and content and finally accuracy of the ERP and content of the ERP.

## **9. Research Implications**

### **Theoretical implications**

The results fill a gap in the literature when it comes to empirically explaining the factors affecting the user experience with ERP implementation in United Nations type of organizations. The theories that can be used to test the success of ERP implementation may include technology acceptance and adoption due to the fact that the ERP is an information technology that users interact with. This type of socio-behavioural theories can be used to test user satisfaction even though we did not find literature to that effect. However, the approach utilized in this study is all inclusive in terms of identifying the constructs from multiple (and confusing) sources and unifying them into the smallest practical set. In essence the approach to theory



development started from the data extracted. In the end, a theoretical model is proposed as the culmination of investigation, manipulation and synthesis of these CSFs into constructs and relationships.

A model therefore is developed which explains the relationship of timeliness of information obtained from ERP with perceived content of ERP output among the users through the ease of use, accuracy and format of the system in the context of United Nations. Further analysis of the identified critical success factors and the model could further establish relationships which could further explain the variations in the success and failure of ERP implementation at United Nations. This model marks the beginning of testing and refining a theory that bridges ERP, its implementation, operations, and strategy.

### **Practical implications**

This is a first study that was performed in a United Nations context to understand the factors for successful ERP implementation and propose a model for studying the relationship between factors that impact the user experience with ERP systems. The critical success factors specific to UN context could be used by managers of other UN organizations to ensure successful ERP implementation. The division of these factors into industry specific stages helps the managers in identifying their organization's position and narrow down on the critical success factors which might need immediate attention. The model to explain user experience with ERP systems from the study is the biggest outcomes for practitioners. More than half of the UN organizations already have implemented their ERP systems but are at a position where they are not able to figure out the factors which could enhance the ERP user experience. A big factor for the low usage of ERP by the users is the culture of the UN type of organizations. Most of the employees have been a part of the organization for a long time. It is very important to understand the exact factors which would enhance their experience with the ERP system. This study performs a starting point to focus on the user in the ERP implementation process and address issues which might hinder his effective usage of the ERP system. The exact issues can be tackled and dealt

which could result in higher usage and hence, removing inefficiencies in the process and ensuring the progress of the organization to following the best practices in the industry.

### **10. Directions for future research**

This thesis opens up new possibilities for future research in the domain of critical success factors identification and consolidation. The division of critical success factors into stages which are closer to the industrial stages has resulted in a clearer picture on the research done according to the stages of ERP implementation. Future research can concentrate on exploring factors related to organization state which can result in a successful ERP implementation as according to our research, this stage has not been explored extensively. This thesis sheds some light on the possible distinction of factors related to each stage. Empirical studies can focus on the combined factors and validate the relationship between these factors and the stages in which they occur. Some of the factors might move to other stages which could be validated through empirical studies. More case studies could be studied in contexts which were not found in the research literature of ERP implementation to figure out if there are other factors which could be present in particular contexts and what are the parameters which make these factors differ than the factors described above in the chapter.

The identified critical success factors and the model can be inter-related to form a better understanding of the situational factors which impact an ERP implementation. For example, the perception of ease of use of the system can be related to the training program of the organization (Karahanna & Straubb, 1999). It can also be related to the customization of the ERP. The systems which are more customized according to the business needs are perceived to be easy to use by the users. However, too much customization could result in issues during the upgrade of the system (Bingi, 1999). Hence, training of the employees become even more important to ensure that they are comfortable using the system. The future research could focus on performing empirical analysis on this relationship in different contexts

and measure if there are variations according to different situations. The questionnaire administered to the UN agency consisted of change management questions adapted from literature but the response rate was very low. So, it wasn't included in the analysis for the thesis and the section of change management was removed from the scope of the thesis. As a result, this thesis did not study the impact of factors related to change management in detail but touched on them at a high level. Future studies could explore the relationship between the various factors for change management and their relationship with the user experience of the ERP system.

Moreover, this study could be replicated in other UN contexts to gather a better view and consolidate the list of critical success factors identified during the ERP implementation. Although an attempt was made to have maximum responses to the survey, we were not able to get the desired number of responses. To accommodate that, another triangulation technique involving extensive literature review, grounded research and qualitative interview was used to provide better results. In future studies, the relationship between various factors of user satisfaction could be measured with a bigger sample which can be better generalized across the UN organizations.

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# Appendices

## Appendix A

### Survey Questionnaire

Survey Name:	[Redacted] User Satisfaction Survey
Survey Description:	Please fill out this survey on [Redacted] system. It would take around 15 minutes to fill the survey if you are an advanced user of the system and around 5 minutes if you use the system occasionally for filling Absence or doing a Direct Purchase Order. Note - The individual results of the survey would be kept confidential.

This is the screen which would mention that the results would be confidential. If they want to proceed, they would go ahead with the survey, otherwise they could opt to leave the survey.

Q1. Gender – Male/Female

Q2. Department – Textbox

Q3. Designation – Textbox

Q4. Years working at the organization – Drop down box

#### **PART 1: Measuring the End user satisfaction survey (Doll, W.J., Torkzadeh, G., 1998) (EUSS)**

1 - Strongly agree, 2- Agree, 3- Neither agree nor disagree, 4- Disagree, 5- Strongly disagree

(5 point Likert Scale)

- I feel comfortable working with this ERP (EUSS 1)
- The ERP provides up-to-date information (EUSS 2) (Timeliness)
- I get the information that I need in an appropriate time frame (EUSS 3) (Timeliness)
- The ERP is efficient (EUSS 4) (Efficiency)
- The ERP is easy to use (EUSS 5) (Efficiency)
- The ERP is user friendly (EUSS 6) (Efficiency)
- The output is easy to understand (EUSS 7) (Format)
- I am happy with the layout of the reports from the ERP (EUSS 8) (Format)
- The information from the ERP is clear (EUSS 9) (Format)
- I think that the output from the ERP is presented in a useful manner (EUSS 10) (Format)
- I feel that the ERP is dependable (EUSS 11) (Accuracy)

- I feel that the output from the ERP is reliable (EUSS 12) (Accuracy)
- The ERP system provides me with accurate information (EUSS 13) (Accuracy)
- I find the output from the ERP relevant for my work (EUSS 14) (Content)
- The ERP provides sufficient information to carry out my work (EUSS 15) (Content)
- The ERP provides reports that seem to be just about what I need (EUSS 16) (Content)
- The ERP content meets my needs at work (EUSS 17) (Content)
- The ERP provides me with precise information that I need (EUSS 18) (Content)

Q. Are you an advanced user of AGRASSO? (Yes/No)

**If yes**

Change management – 2 out of 5 phases (Implementation and post implementation)

**Measuring the communication of vision (CV)**

**PART 2: What do you believe was the mission of the ERP implementation (Ranking from 1 to 7)**

- Modernize the IT environment (CV1)
- Replace the obsolete systems (CV2)
- Improve efficiency (CV3)
- Provide better management tools (CV4)
- Enable easier reporting (CV5)
- Reduce the headcount of employees (CV6)
- Increase the satisfaction of employees (CV7)

Q. Were you a member of the implementation team? (Super user, Subject matter expert, etc)

Yes/No

If yes,

**PART 3: According to you, during the change process of implementation of the ERP, (5 point Likert scale)**

**Change management (CM)**

- The exercise followed a detailed plan (CM1)
- The exercise followed a rigorous methodology (CM2)
- The project team was made up of people that had diverse competencies (CM3)
- The members of the project team were dedicated full time (CM4)
- The expectations towards the project seemed realistic (CM5)
- The budget for the project seemed sufficient (CM6)
- It allowed for an increase in the global performance of an organization (CM7)
- It allowed for a reduction in the costs to the organization (CM8)
- It allowed for an increase in the staff satisfaction in the organization (CM9)

- It allowed for an increased satisfaction in the users (CM10)

**PART 4: According to you, at this moment within your domain, (5 point Likert scale)**

#### **Results Measurement (RM)**

- The changes put in place are well integrated in the policies and practices of day to day management (RM1)
- We have the necessary tools to measure the result of the transformation (RM2)
- The results of the transformation are measured on a regular basis (RM3)
- The employees understand the importance of switching to the ERP from earlier systems (RM4)
- The organization is able to review its practices on a regular basis (RM5)
- The organization is more aware than before of efficient ways of doing work (RM6)

**Thank you for your time!**

## **Appendix B**

### **Qualitative interview**

#### **Section 1: CODE NAME OF THE RESPONDENT**

- Code Number of the Respondent
- Function/Department
- Describe your task in the project
- Years working in ICAO

Identification of critical success factors:

What do you think about the following critical success factors for ERP implementation and how were they implemented in the organization? Do you think they were/are critical?

- Top management support
- Business Process re-engineering
- Project team
- Training
- Communication
- Support from vendors
- Organizational culture

Effective change management

- Involvement in planning
- Involvement in business plan
- Definition of KPIs
- Duration of training
- Timing of training
- Training manual
- Change champion
- Expected changes

#### Risk management

- New changes in ERP
- Processes doing manually
- Inclusion in ERP system
- Manual processes in ERP
- Similarity between UN processes

#### Optimization opportunities

- Identify areas of improvement
- Flexibility of the system
- Upgrade required
- Awareness of upgrade
- ERP current position in lifecycle



## Appendix C

### Comments by the survey respondents in the open ended question in the survey

<b>Sr.No</b>	<b><u>Comments</u></b>
1	The system is very slow and it needs to produce results faster.
2	They showed an interest for the overtime to be represented in hours so that they could decide if they could take a complete day off or just few hours.
3	The budget reports for the years prior to 2011 should also be provided to be extracted
4	The time taken to produce reports is too long and so it was suggested that the request for approval of leave should be sent to the required parties as soon as it is submitted.
5	It was mentioned that the submission and scanning of hard copies is still required which results in duplication of effort and longer processing times
11.	One of the suggestions in the format of the system was that the Drop Down menus could be simplified and eliminated by avoiding options which are not being used to be removed from it.
12.	The mode of presentation of the information could be changed from oldest at the top to newest at the top
13.	There should be a simpler mechanism to attach the medical certificates as currently, it takes a lot of time
14.	The headings of the folders are not clear
15.	Since the interface is confusing and unpleasant to navigate, it leads to a laborious procedure to enter absences
16.	The procurement codes are confusing. Also the interface is confusing

17.	The process is not highly optimized for leave purposes as a paper is still required which leads to duplication of efforts
18.	There should be updated instruction booklets on how to use some of the functions of ERP
19.	There is little or no backup and very few supervisors available to resolve the issues
20.	Super users are trained properly with the system but others are not comfortable with it
21.	The reporting feature is very good and use it in PRO
22.	The set-up of the reports is complicated and requires input from ICT.
23.	In regards to leave, it would be better to have a dedicated folder which is NOT time and expense and that includes a SEND button and not a SAVE button. It is very confusing this way
24.	COMPANY needs to invest the time in considering better alternatives to ERP
25.	It would be great to have a feature which allowed staff members amend their leave request forms after they have been submitted
26.	The system needs to be improved to obtain the reports and amendments easily
27.	The format could be changed to display the annual leave balance which currently displays the sum of the field 'year' at the top which is currently at the bottom
28.	<p>The report displaying the annual leave balance is not useful since it mixes all types of leave together.</p> <p>It could be made simpler by showing:</p> <ol style="list-style-type: none"> <li>1. Annual leave available - Taken = Current balance</li> <li>2. Total uncertified sick leave taken in a year</li> <li>3. Available compensatory leave available VS Taken</li> </ol>
29.	It should be a web based electronic platform (html) like PACE
30.	It should never require the attachment of pieces of paper unless this is not mandatory as an extra.
31.	ERP when accessed through the Secretariat website has less functionality than through the CITRIX system
32.	It is annoying as it pops up whenever we unlock out notebook or log in.

33.	COMPANY should consider moving to a single, integrated system based on a proper document management system
34.	ERP should be made more clear, intuitive and integrated using Internet/Intranet based protocols
35.	I believe that I have not been exposed to some of the interesting functionalities being offered by ERP as I was not given adequate training
36.	We need more transparency among the Bureaus and Sections financially; there are some controls to play with it
37.	Learn from other DGCA's business innovation during the Council presentation by France, cost less, benefit more with the minimum staff to run the organizational business.
38.	We are not sure of what kind of information is actually available in ERP and how it can be extracted
39.	In terms of Budgeting and Reporting for Field Projects, ERP may be used more if it is adapted to the needs of the section
40.	A lot of work in the below fields is done manually. More information and workflows need to be included especially for : <ol style="list-style-type: none"> <li>1. The recruitment of field experts</li> <li>2. Contract extensions</li> <li>3. Mission Travel</li> <li>4. Budgeting/cost monitoring</li> </ol>
41.	Reporting should be improved. Most Payroll reports need the assistance of IT because of presentation requiring cross referencing and layout. If reports are readily available then we are talking higher efficiencies with less time to complete tasks. I still hope.
42.	Some of the budget reports are not clear nor up-to-date
43.	The leave balance is not up-to-date and it takes a long time to produce the report
44.	The GRINs are a BIG advantage. It is quick and easy
45.	The information is not up-to-date
46.	There is a slow response time to queries
47.	There is an ineffective User Interface and consequently poor user experience

48.	It can be improved but it needs to free itself from Windows 98 style, feel and functionalities
49.	MTA's are not in the system as early as the PO's
50.	There is no provision for the managers to plan expenditures
51.	I require more training on some of the modules
52.	While assigning a substitute in ERP Self-Service, there is no drop-down list from which to choose. We have each time to refer back to HQ to ask them to change to substitute's name, when needed
53.	It is not easy to segregate the duties in the small offices especially in FINANCE department
54.	ERP System should be more friendly to both enter information, as well, to make corrections
55.	I would like to be trained to use ERP beyond Absence only, like most of my colleagues

## Appendix D

### Transcripts of the qualitative interview

#### Interview 1 – General Ledger Chief

<b>Critical Success Factors</b>	<b>Initial Observation</b>	<b>Rating</b>
Top management	Top management was supportive in all the ways	4
Business Process Re-engineering	It was done thoroughly in the General Ledger department	5
Project Team	Project team is very knowledgeable and they had hands on experience	5
Training	Due to time constraint, we did not get enough training and had to learn the system our self	2

Communication	Communication should have been better to inform us of the timelines	2
Support from vendors	It was just fine, not enough because it was a short timeframe of implementation(10-11 months)	3
Organizational culture	It was hard for them to accept the change but slowly and eventually it is changing and improving	3

Categories	Tasks	Observations	Related CSF
<b>Change Management</b>	Involvement in planning	No involvement in planning, I was called after the decision was made	
	Involvement in business plan	Totally involved, I was the main business person in General Ledger	
	Definition of KPIs	We defined KPIs upon analysing the old processes and identifying the areas of improvement	
	Content of training	It was limited but content was appropriate	
	Duration of training	It was a very short duration, so it was not enough at all, we had to learn it ourselves	
	Timing of training	Timing should have been better, it was during the month of December	

		when people were not available	
	Training manual	Manual is updated and useful	
	Change champion	Hired an outside firm to implement change management program which was not beneficial	
	More change in the future	I don't think so we need more changes	
<b>Risk Management</b>	New changes in ERP	I don't think there should be more changes, we need to get used to this ERP	
	Processes doing manually	Yes, there are few processes which we do manually	
	Inclusion in ERP system	We have to figure out ourselves and we make steady progress	
	Manual processes in the ERP	We believe we are using the full functionality of the system	
	Similarity between other UN processes	I am not aware of the similarity, it there exists any	
<b>Optimization Opportunities</b>	Identify opportunities for improvement	I feel there are areas which we could improve	
	Flexibility of system	The system is very flexible	

	Upgrade required	I would require an upgrade	
	Awareness of upgrade	The kickoff meeting is next week	
	ERP current position in its lifecycle	Stabilizing and then some more advancements	

**a. Interview 2: FINANCE CHIEF**

<b>Critical Success Factors</b>	<b>Important comments</b>	<b>Rating</b>
Top management	<ul style="list-style-type: none"> <li>• Top management was very important during all the stages</li> <li>• Funding was available with some problems</li> <li>• Mid-stream they allowed a change of scope, additional resources for that were not available, issue with making those resources available</li> </ul>	3
Business Process Re-engineering	It was done thoroughly in the Finance department with minimum customization	5
Project Team	<ul style="list-style-type: none"> <li>• Project team's work was primarily related to explaining how system works since we took an off the shelf system</li> <li>• They have answers to our queries</li> </ul>	5
Training	<ul style="list-style-type: none"> <li>• Due to time constraint, we did not get enough training and had to learn the system ourselves, but I believe the best way is to learn on the job</li> <li>• Training was not enough but again, we learnt ourselves the system.</li> </ul>	2
Communication	<ul style="list-style-type: none"> <li>• Communication was minimal</li> <li>• Handed a system and told to make it work</li> <li>• We were given no parallel system upon GO-LIVE</li> </ul>	2
Support from vendors	<ul style="list-style-type: none"> <li>• Long turn-around times due to the location</li> <li>• Bigger issue, no institutionalized support system</li> </ul>	3

Organizational culture	<ul style="list-style-type: none"> <li>• Impacted heavy duty users of the organization</li> <li>• Impacted the business owners and thus, a change of culture</li> <li>• But, again vast people have no familiarity</li> </ul>	3
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Categories	Tasks	Observations	Related CSF
<b>Change Management</b>	Involvement in planning	I believe there was a team set for evaluation, not aware if Finance was involved or not	
	Involvement in business plan	The focal points from each department were involved	
	Definition of KPIs	We defined KPIs upon analysing the old processes and identifying the areas of improvement	
	Content of training	Content was provided by vendor but it was limited	
	Duration of training	No enough, we were expected to learn while using the system	
	Timing of training	The timing was not good at all, the month was December and half of the staff was not available	
	Training manual	There are training manuals, webinars and super users, but most of it, we learnt ourselves	
	Change champion	<ul style="list-style-type: none"> <li>• No change champion</li> <li>• We were just thrown in the system and told to use it</li> </ul>	



	More change in the future	<p>We haven't explored the system</p> <p>We have learnt to master our tasks</p> <p>I want to see upgrades which are useful for us</p>	
<b>Risk Management</b>	New changes in ERP	<ul style="list-style-type: none"> <li>• Bad Risk management!</li> <li>• No parallel run during implementation</li> <li>• We need to explore the system</li> </ul>	
	Processes doing manually	<ul style="list-style-type: none"> <li>• Travel module is still manual</li> <li>• Issue receipts manually</li> <li>• Update the system manually</li> </ul>	
	Scope of inclusion	All the above 3 processes can be included in the ERP system	
	Similarity between other UN processes	<ul style="list-style-type: none"> <li>• Payroll could easily be shared across the UN</li> <li>• We could have one instance of the ERP and different company codes, thus work efficiently</li> </ul>	
<b>Optimization Opportunities</b>	Identify opportunities for improvement	Some areas in all departments of finance which need to improve	
	Flexibility of system	The system is very flexible	
	Upgrade required	<ul style="list-style-type: none"> <li>• Looking forward to it</li> <li>• Hoping it will fix the issue in payroll</li> </ul>	

	Awareness of upgrade	The kickoff meeting is next week	
	ERP current position in its lifecycle	More towards matured stage	
<b>Overall experience of ERP implementation - 6</b>			

#### b. KNOWLEDGE MANAGEMENT

<b>Critical Success Factors</b>	<b>Important comments</b>	<b>Rating</b>
Top management	<ul style="list-style-type: none"> <li>• Top management support was there, but with conditions that there was a limited budget</li> <li>• The team was told to find a solution within that budget</li> <li>• They were and are still not happy with certain aspects of implementation</li> </ul>	3
Business Process Re-engineering	I don't know about it but I have heard mixed reviews about it	5
Project Team	<ul style="list-style-type: none"> <li>• I believe they know the product</li> <li>• They did not make enough effort to sell the ERP</li> <li>• They have not been successful in sharing the information</li> <li>• They have answers to our queries</li> </ul>	5
Training	<ul style="list-style-type: none"> <li>• Haven't heard if there was any training</li> <li>• Most people are not very comfortable with system</li> <li>• People were surprised on getting the system</li> </ul>	2
Communication	<ul style="list-style-type: none"> <li>• Heard a lot of communication issues</li> <li>• We were not aware of the changes coming</li> <li>• Communication strategy should have been better</li> </ul>	2
Support from vendors	<ul style="list-style-type: none"> <li>• I don't know if there was support and how was it.</li> <li>• I did not hear about it</li> </ul>	3
Organizational culture	<ul style="list-style-type: none"> <li>• Using it because there is no other option</li> <li>• Since they invested so much, we are stuck and have to use it for the better</li> </ul>	3

	<ul style="list-style-type: none"> <li>Trying to make it work and improve the inefficiencies</li> </ul>	
<b>Overall ERP implementation - 5</b>		

**Interview 4: Chief, Information and Communication Technology, Revenue Production, Travel**

<b>Critical Success Factors</b>	<b>Important comments</b>	<b>Rating</b>
Top management	<ul style="list-style-type: none"> <li>Top management support was there, but they did not fully understand the meaning of ERP</li> <li>They underestimated the magnitude of change effort required</li> <li>This lead to less budget and lesser resources</li> <li>Big expectation and realization gap</li> </ul>	3
Business Process Re-engineering	<ul style="list-style-type: none"> <li>It was a total failure</li> <li>The first stage of implementation was performed, the second stage of optimization wasn't performed</li> <li>There was no efficiency improvement</li> </ul>	1
Project Team	<ul style="list-style-type: none"> <li>I believe they know the product</li> <li>They did not make enough effort to sell the ERP</li> <li>They performed the mandate that they were given</li> </ul>	5
Training	<ul style="list-style-type: none"> <li>The impacted departments were given enough training</li> </ul>	2
Communication	<ul style="list-style-type: none"> <li>Was enough in Finance department</li> <li>It should be an organization wide communication</li> <li>So it was not a success</li> </ul>	2
Support from vendors	<ul style="list-style-type: none"> <li>Very hard to get support as no expertise in the market</li> <li>Completely dependent on vendor which was not local</li> <li>Some of departments don't know the ERP well</li> <li>System implemented is not in line with reality</li> </ul>	2
Organizational culture	<ul style="list-style-type: none"> <li>Made the organization to move towards automation and integration</li> <li>Still not 100% on board with the ERP but they starting to sense the benefits</li> </ul>	3
<b>Overall ERP implementation - 6 on 10</b>		

### Interview 5 : Payroll Chief

Critical Success Factors	Important comments	Rating
Top management	<ul style="list-style-type: none"> <li>• Top management support, I believe is very important</li> <li>• But an effective ERP is not a strategic objective</li> <li>• It takes a back seat whenever any other issue comes up</li> </ul>	3
Business Process Re-engineering	<ul style="list-style-type: none"> <li>• It was a done effectively in our department</li> <li>• For some processes, the ERP was customized, for the most part, we modified our processes</li> </ul>	1
Project Team	<ul style="list-style-type: none"> <li>• Project team has been helpful to solve our queries</li> <li>• It would be great if they could be pro-active in providing solutions</li> <li>• I think they did a decent job during the implementation</li> </ul>	5
Training	<ul style="list-style-type: none"> <li>• The training was not enough</li> <li>• It happened during and after the project</li> <li>• We explored the system on our own</li> <li>• There is no current training manual</li> </ul>	2
Communication	<ul style="list-style-type: none"> <li>• We were not involved in the initial communication regarding the project</li> <li>• It could have been better</li> <li>• If we knew that the time to implementation was so less, we could have asked for more resources</li> </ul>	2
Support from vendors	<ul style="list-style-type: none"> <li>• Not regular support from vendors</li> <li>• We are trying to develop an in-house expertise</li> <li>• Long response time as they are not available locally</li> </ul>	3
Organizational culture	<ul style="list-style-type: none"> <li>• It's a flexible system</li> <li>• Top management getting more timely and dynamic reports</li> <li>• Tough learning curve</li> <li>• People realizing it has improved the working condition</li> </ul>	3
<b>Overall ERP implementation - 6</b>		

<b>Categories</b>	<b>Tasks</b>	<b>Observations</b>	<b>Related CSF</b>
<b>Change Management</b>	Involvement in planning	No involvement in planning, I was called after the decision was made	
	Involvement in business plan	Totally involved, I was the main business person in Payroll	
	Definition of KPIs	Maybe they were defined; but not well communicated	
	Content of training	It was very limited and we had to learn system by ourselves	
	Duration of training	Not satisfied at all with the duration. Not enough resources were allocated towards it	
	Timing of training	Timing should have been better, it was during the month of December when people were not available	
	Training manual	No idea	
	Change champion	I think the Chief FINANCE was the change champion; but again I am not very sure how well we did on this front	
	More change in the future	Yes, I really think we need more changes and I would be welcoming those changes	

<b>Risk Management</b>	New changes in ERP	I don't think there should be more changes, we need to get used to this ERP	
	Processes doing manually	Yes, there are few processes which we do manually	
	Inclusion in ERP system	I believe there is a scope of including those processes in the system	
	Manual processes in the ERP	We believe we are not using the full functionality of the system	
	Similarity between other UN processes	Yes, the payroll processes are similar across the UN; we have the same pay scales	
<b>Optimization Opportunities</b>	Identify opportunities for improvement	There are few areas where we could be more efficient	
	Flexibility of system	The system is very flexible	
	Upgrade required	I would like to see an upgrade	
	Awareness of upgrade	The kick off meeting is soon	
	ERP current position in its lifecycle	Stabilizing and more importantly, we have to move towards optimization	

### Interview 6: Budget Chief

Critical Success Factors	Important comments	Rating
Top management	<ul style="list-style-type: none"> <li>I would have to say I am happy with the top management support</li> <li>Apart from few glitches along the way, it was pretty constant</li> </ul>	4
Business Process Re-engineering	<ul style="list-style-type: none"> <li>There was extensive Business Process Re-engineering done</li> <li>I am satisfied with the BPR done in my department</li> </ul>	5
Project Team	<ul style="list-style-type: none"> <li>It was believed that they knew the legacy system and we took an off the shelf ERP</li> <li>So they would be good enough to help with the transition</li> <li>I am happy with the effort of the project team considering their in expertise with that ERP system</li> </ul>	5
Training	<ul style="list-style-type: none"> <li>The training was not enough</li> <li>It happened during and after the project</li> <li>We explored the system on our own</li> <li>There is no current training manual</li> </ul>	2
Communication	<ul style="list-style-type: none"> <li>We were not involved in the initial communication regarding the project</li> <li>Once the project started, we were informed constantly about the changes</li> <li>The timing of implementation before GO LIVE was too short</li> </ul>	3
Support from vendors	<ul style="list-style-type: none"> <li>We got regular support from the vendors with some downtime</li> <li>We are trying to develop an in-house expertise</li> </ul>	3
Organizational culture	<ul style="list-style-type: none"> <li>Initially, the change was difficult</li> <li>Now since people started seeing the benefits, they are supporting it</li> </ul>	3
<b>Overall ERP implementation - 6.5/10</b>		

Categories	Components	Observations	Related CSF
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<b>Change Management</b>	Involvement in planning	No involvement in planning, I was called after the decision was made, However we knew there was an initiative coming up	
	Involvement in business plan	I was not involved in the creation of business plan	
	Definition of KPIs	I believe those were defined by the project manager, we got the goals and the target dates	
	Content of training	The documents provided were not satisfactory; the organization did not know how to work with this ERP; we learnt a lot ourselves	
	Duration of training	Not satisfied at all with the duration. Not enough resources were allocated towards it	
	Timing of training	Timing should have been planned better, it was during the month of December when people were not available	
	Training manual	I believe that is the biggest thing missing	
	Change champion	In my department, I was the change champion as I did most of the communication	



	More change in the future	Yes, I really think we need some changes but I am not aware if there are any coming.	
<b>Risk Management</b>	New changes in ERP	I want to see some upgrades in the system	
	Processes doing manually	Yes, there are few processes which we do manually, example Travel module	
	Inclusion in ERP system	I believe there is a scope of including those processes in the system	
	Manual processes in the ERP	We believe we are using the full functionality of the system in our department	
	Similarity between other UN processes	Yes, the budget processes are similar across the UN; we have the same pay scales	
<b>Optimization Opportunities</b>	Identify opportunities for improvement	There are few areas where we could be more efficient	
	Flexibility of system	The system is apparently flexible	
	Upgrade required	I would like to see an upgrade	
	Awareness of upgrade	The kick off meeting is soon	

	ERP current position in its lifecycle	Stabilizing and more importantly, we have to move towards optimization	
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### Interview 7 : Business Planning Unit

<b>Critical Success Factors</b>	<b>Important comments</b>	<b>Rating</b>
Top management	<ul style="list-style-type: none"> <li>• Top management pushed for the ERP</li> <li>• I don't know how well was it sold to the staff</li> </ul>	4
Business Process Re-engineering	<ul style="list-style-type: none"> <li>• If I look at the overall organization, we were in the middle I feel</li> <li>• I would admit that we have tried to fit the ERP with our style of working</li> </ul>	5
Project Team	<ul style="list-style-type: none"> <li>• It has been a good team</li> <li>• Whenever I asked elementary questions, I got the answer</li> <li>• However, they have not been successful in creating transparency of data</li> <li>• Maybe it is a cultural thing</li> </ul>	5
Training	<ul style="list-style-type: none"> <li>• The training that was offered to me was offered at a strange time</li> <li>• Training cycles were not well planned</li> <li>• I was not even present in the office when it happened</li> <li>• Probably because we were not the most impacted department</li> </ul>	2
Communication	<ul style="list-style-type: none"> <li>• Since I am not a daily user, I do not get a lot of communication</li> <li>• I have heard that people still say that they don't know how to do their stuff</li> <li>• They ask others to do stuff for them</li> </ul>	3
Support from vendors	<ul style="list-style-type: none"> <li>• I have never seen more than one guy in the office</li> <li>• I haven't heard of us taking support from them either</li> </ul>	3

Organizational culture	<ul style="list-style-type: none"> <li>Initially, the change was difficult</li> <li>A group of people have gotten used to the change and used to the system because they don't have an option</li> <li>A group of people are still reluctant to use the system</li> <li>A part of it would be attributed to their tenure in the organization and other half to the ineffective change management and selling the benefits of the ERP to the organization</li> </ul>	3
<b>Overall ERP implementation - 5/10</b>		

Categories	Tasks	Observations	Related CSF
<b>Risk Management</b>	New changes in ERP	Changes are coming here but the pace of the change is slower than what you would like to see. Again there are reasons for that. The main question would be: How to win people over with the change? I believe a constant team should be there which makes people believe that the changes are coming for the better.	
	Processes doing manually	I am sure there are processes being done manually as I see a lot of paper. But I don't know how the HR model works but I would want to know how it does.	

	Inclusion in ERP system	I believe there is a scope of including those processes in the system	
	Manual processes in the ERP	I have heard some processes which can be accommodated in the system which we are doing manually. Travel is one of them.	
	Similarity between other UN processes	Yes, there are similarities between some departments	
<b>Optimization Opportunities</b>	Identify opportunities for improvement	Communication could be better  I would like to see ERP marry with more freedom and transparency	
	Flexibility of system	The system is apparently flexible	
	Upgrade required	I would like to see an upgrade	
	Awareness of upgrade	An upgrade is coming soon, I have heard	
	ERP current position in its lifecycle	Stabilizing phase but I feel that we have not taken it to the next level, still a lot of exploration is needed	

**Interview 8 : Chief, Safety and Health Management**

<b>Critical Success Factors</b>	<b>Important comments</b>	<b>Rating</b>
Top management	<ul style="list-style-type: none"> <li>• There was not enough support as is required for an effective ERP implementation</li> <li>• However, I don't know if it was because of the mandate</li> <li>• Or Due to lack of priority</li> <li>• Or lack of budget</li> </ul>	4
Business Process Re-engineering	<ul style="list-style-type: none"> <li>• In my view, there was no business process re-engineering done</li> <li>• We had wanted a seven year period to implement the solution which was approved with a smaller budget and a smaller time frame</li> <li>• No effort was put into business process re-engineering as the initial scope of implementation was only the finance module</li> </ul>	5
Project Team	<ul style="list-style-type: none"> <li>• Some sections of organization feel that they were let down by the system</li> <li>• But the mandate was not clear from the beginning that what the system is supposed to achieve (efficiency, reduced headcount, etc.)</li> </ul>	5
Training	<ul style="list-style-type: none"> <li>• It was a very complex system, even if the effort was doubled, there would be slightly less frustration, but the learning gap was so big, there was frustration</li> <li>• There was not a proper training plan, if there was, it wasn't followed properly</li> </ul>	2
Communication	<ul style="list-style-type: none"> <li>• Communication is based on the reporting structure, so it is very inefficient</li> <li>• We did not know what were the parameters to measure the success/failure of implementation</li> </ul>	3
Support from vendors	<ul style="list-style-type: none"> <li>• The responses were not quick enough</li> <li>• But again, I don't know what the mandate was or what was signed in the contract about the time limit in which the response is expected</li> </ul>	3
Organizational culture	<ul style="list-style-type: none"> <li>• I don't think so the system has reduced the workload</li> <li>• It can, but it hasn't at the moment as there are too many decision points in the system; highly inefficient</li> <li>• I don't think so because of the way it has been implemented, there has been any efficiency gained</li> </ul>	3

	<ul style="list-style-type: none"> <li>• Even if there was, there is no place where it is documented</li> </ul>	
<b>OverallERP implementation - 5.5/10</b>		

<b>Categories</b>	<b>Components</b>	<b>Observations</b>	<b>Related CSF</b>
<b>Change Management</b>	Involvement in planning	I wasn't senior enough to be involved in the planning stage	
	Involvement in business plan	I am no aware that if we have been a part of creation of business plan	
	Definition of KPIs	I don't think so they were defined, I am not aware of them	
	Content of training	I was involved with project manager for the training; there was no formal training plan. We were supposed to do and learn	
	Duration of training	Formal training was given one month before theGO Live and that too, in the month of December.	
	Timing of training	The timing was a big failure. I was training them even after they had started using the system. It was a big chaos. There was some issue why it was supposed to be implemented on 1 <sup>st</sup>	

		January when we had no arrangements for it	
	Training manual	There is some training manual on the website but I don't know the quality of the information there. I hope it is properly documented	
	Change champion	In my department, I was the change champion as I did most of the communication	
	More change in the future	From what I have heard, the ERP has a lot of potential for project management.  Not a lot of people have confidence in the system  Definitely better integration is required with the system	
<b>Risk Management</b>	New changes in ERP	I want to see some upgrades in the system	
	Processes doing manually	Yes, there are few processes which we do manually	
	Inclusion in ERP system	I believe there is a scope of including those processes in the system	
	Manual processes in the ERP	Definitely not, the data validation still needs to be there to ensure that	

		the information is correct	
	Similarity between other UN processes	I am not aware. I think we do work differently right now, but yes maybe down the line	
<b>Optimization Opportunities</b>	Identify opportunities for improvement	There are few areas where we could be more efficient	
	Flexibility of system	I don't think so the system is flexible	
	Upgrade required	I would like to see an upgrade	
	Awareness of upgrade	I have no awareness, but it would be good if we get one	
	ERP current position in its lifecycle	Stabilizing because there is a lot of work which is supposed to be done on optimization	



## Appendix E

### Other quantitative analysis

The inspection of the partial correlation matrix yields similar results: the correlations among the 11 questions after the retained factors are accounted for are all close to zero. The root mean squared partial correlation is 0.088, indicating that six latent factors can accurately account for the observed correlations among the 11 questions.

<i>Partial Correlation Factors</i>																	
	T1	T2	E1	E2	E3	F1	F2	F3	F4	A1	A2	A3	C1	C2	C3	C4	C5
T1	1.00000	0.02073	0.05394	-0.10209	0.03589	-0.00036	-0.08241	0.14554	0.00604	-0.10924	0.03795	0.12909	-0.02522	-0.08562	0.01514	-0.01264	0.05474
T2	0.02073	1.00000	-0.00041	0.05377	-0.09112	0.11146	0.12779	-0.10014	-0.02163	-0.02545	0.04880	-0.01386	0.03336	-0.06796	-0.08752	0.07915	0.07264
E1	0.05394	-0.00041	1.00000	0.08021	-0.00981	-0.20372	0.04901	0.11017	0.04996	0.06637	-0.11256	-0.02595	0.08164	0.10257	-0.02401	-0.15155	-0.03829
E2	-0.10209	0.05377	0.08021	1.00000	0.26421	-0.03774	-0.01828	-0.17412	-0.01559	-0.09217	0.14429	0.00720	0.03913	-0.01954	0.13703	0.01877	-0.07503
E3	0.03589	-0.09112	-0.00981	0.26421	1.00000	-0.06750	0.05770	-0.09537	0.10876	0.02210	-0.01478	-0.09287	0.13454	-0.04725	0.00951	-0.06675	0.03802
F1	-0.00036	0.11146	-0.20372	-0.03774	-0.06750	1.00000	0.10332	0.19180	-0.16140	0.00974	-0.12705	0.17695	-0.09184	0.08075	-0.14409	-0.00663	0.05718
F2	-0.08241	0.12779	0.04901	-0.01828	0.05770	0.10332	1.00000	-0.13144	0.01633	0.09122	0.02309	-0.08776	-0.11033	0.02890	0.16586	0.00635	-0.04365
F3	0.14554	-0.10014	0.11017	-0.17412	-0.09537	0.19180	-0.13144	1.00000	0.09484	-0.05296	-0.05956	0.10709	-0.18242	0.04472	-0.05020	0.06224	-0.03627
F4	0.00604	-0.02163	0.04996	-0.01559	0.10876	-0.16140	0.01633	0.09484	1.00000	0.03124	0.11537	-0.18857	0.09076	-0.06521	0.03077	0.06475	-0.04199
A1	-0.10924	-0.02545	0.06637	-0.09217	0.02210	0.00974	0.09122	-0.05296	0.03124	1.00000	0.13266	-0.02076	-0.04444	0.00430	-0.06293	-0.02407	0.10552
A2	0.03795	0.04880	-0.11256	0.14429	-0.01478	-0.12705	0.02309	-0.05956	0.11537	0.13266	1.00000	0.03650	0.11196	-0.00986	0.03311	-0.07939	-0.02739
A3	0.12909	-0.01386	-0.02595	0.00720	-0.09287	0.17695	-0.08776	0.10709	-0.18857	-0.02076	0.03650	1.00000	-0.08869	0.06289	-0.02342	0.11919	-0.10517
C1	-0.02522	0.03336	0.08164	0.03913	0.13454	-0.09184	-0.11033	-0.18242	0.09076	-0.04444	0.11196	-0.08869	1.00000	0.02312	0.19188	-0.06156	-0.10638
C2	-0.08562	-0.06796	0.10257	-0.01954	-0.04725	0.08075	0.02890	0.04472	-0.06521	0.00430	-0.00986	0.06289	0.02312	1.00000	-0.05674	0.07238	0.04158
C3	0.01514	-0.08752	-0.02401	0.13703	0.00951	-0.14409	0.16586	-0.05020	0.03077	-0.06293	0.03311	-0.02342	0.19188	-0.05674	1.00000	-0.04936	0.01578
C4	-0.01264	0.07915	-0.15155	0.01877	-0.06675	-0.00663	0.00635	0.06224	0.06475	-0.02407	-0.07939	0.11919	-0.06156	0.07238	-0.04936	1.00000	0.12627
C5	0.05474	0.07264	-0.03829	-0.07503	0.03802	0.05718	-0.04365	-0.03627	-0.04199	0.10552	-0.02739	-0.10517	-0.10638	0.04158	0.01578	0.12627	1.00000

### The FACTOR Procedure Prerotation Method: Varimax

In the first graph you see that E1, F1 and f2 are clustered at the positive side of factor 2.

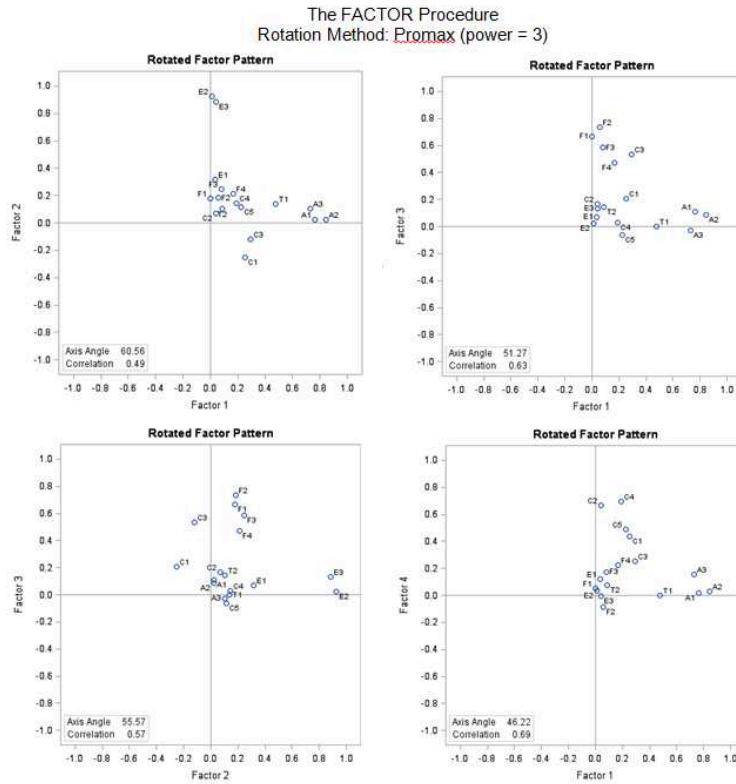
C2 and C5 are clustered at the negative side of factor 2. And so on in other graphs.

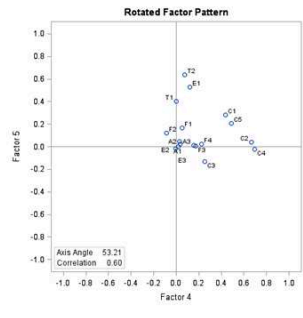
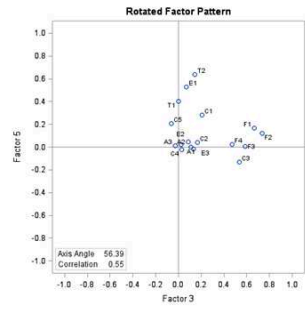
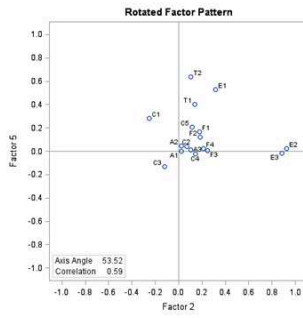
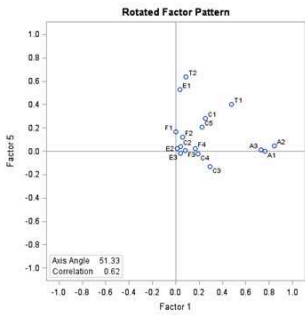
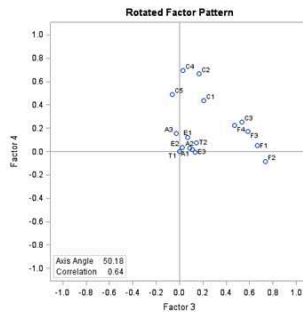
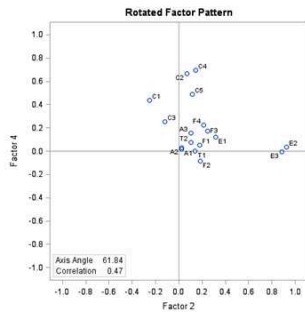
A good rotation would place the axes so that most variables would have zero loadings on most factors. As a result, the axes would appear as though they are put through the

Variable clusters.

### Principal Factor Analysis: Oblique Promax Rotation

In order to allow for the correlation between factors and get a more differentiated pattern of factor loading which leads to an easier interpretation of factors we used an oblique rotation.





## Correlations between factors

Inter-Factor Correlations						
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
Factor1	1.00000	0.49154	0.62568	0.69191	0.62488	0.19079
Factor2	0.49154	1.00000	0.56537	0.47196	0.59458	0.25980
Factor3	0.62568	0.56537	1.00000	0.64039	0.55352	-0.03038
Factor4	0.69191	0.47196	0.64039	1.00000	0.59892	0.10090
Factor5	0.62488	0.59458	0.55352	0.59892	1.00000	0.19118
Factor6	0.19079	0.25980	-0.03038	0.10090	0.19118	1.00000

Factor loadings pattern (in Oblique Promax Rotation you can't interpret factor loadings as correlations between variables and factors and you should turn to the factor structure matrix for examining the correlations between variables and factors)

<i>Rotated Factor Pattern (Standardized Regression Coefficients)</i>						
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
T1	0.47685	0.13694	-0.00165	-0.00215	0.40294	0.09694
T2	0.08654	0.10142	0.14484	0.07699	0.63706	-0.09140
E1	0.03356	0.31848	0.07083	0.12253	0.52675	0.06879
E2	0.01274	0.92438	0.02199	0.03201	0.02284	-0.03512
E3	0.04188	0.88583	0.13498	-0.00319	-0.01601	-0.05152
F1	-0.00217	0.17756	0.66883	0.05112	0.16684	-0.03154
F2	0.05811	0.18372	0.73485	-0.08723	0.11947	0.22650
F3	0.08361	0.24564	0.58361	0.17354	0.00369	0.06718
F4	0.16853	0.21457	0.47298	0.22224	0.02155	-0.09149
A1	0.76278	0.02214	0.11175	0.01756	-0.00222	0.04965
A2	0.84195	0.02115	0.08850	0.02784	0.04375	-0.04874
A3	0.73093	0.10195	-0.02603	0.15421	0.01176	0.04718
C1	0.25530	-0.25003	0.20704	0.43518	0.27981	-0.07291
C2	0.03844	0.06790	0.16869	0.66768	0.04070	0.06134
C3	0.29471	-0.11926	0.53168	0.25078	-0.13158	0.37355
C4	0.18786	0.14247	0.02959	0.69360	-0.02335	0.03968
C5	0.22191	0.11600	-0.06543	0.48932	0.20690	0.19170

We look at each row and find the questions with factor loading of more than 0.5 on each factor and based on the nature of the questions name(categorize) the factors

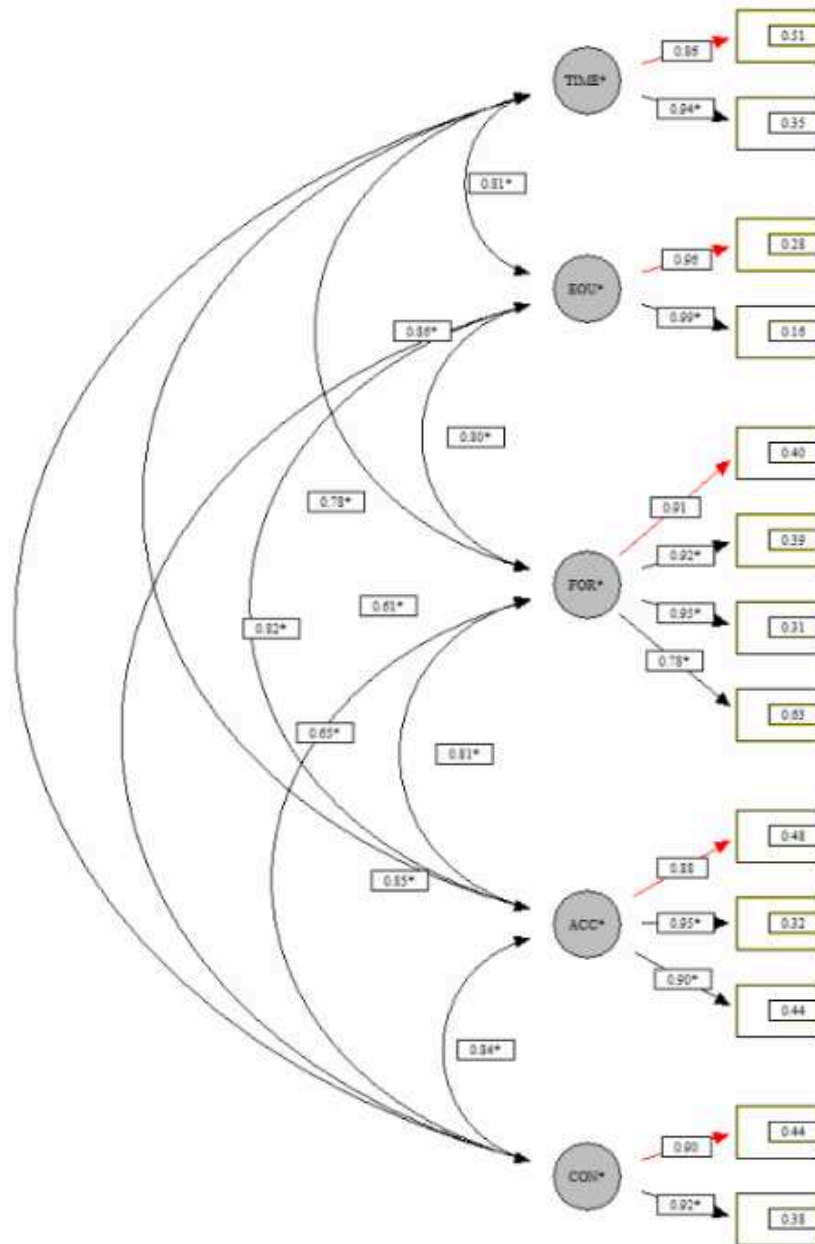
## **Appendix F**

### **Original response file used to perform analysis**



Original response file

**Appendix G**  
**Structural equation modelling map for the factors identified**



## Appendix H Summary Protocol Form



### Summary Protocol Form (SPF)

### University Human Research Ethics Committee

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Office of Research – Research Ethics and Compliance Unit: GM 1000 – 514.848.2424 ex. 7481

[ethics@alcor.concordia.ca](mailto:ethics@alcor.concordia.ca)

### Important (Faculty, staff, students)

- Approval of a Summary Protocol Form (SPF) must be issued by the University Human Research Ethics Committee (UHREC) prior to beginning any research involving human participants.
- The central UHREC reviews all faculty and staff research, as well as some student research (in cases where the research involves greater than minimal risk). The UHREC, Disciplinary College reviews all minimal risk student research (minimal risk course related research intended solely for pedagogical purposes is reviewed at the Department level).
- Faculty and staff research funds/awards cannot be released until appropriate certification has been obtained. For information regarding the release of faculty and staff research funds/awards please contact the Office of Research. For information regarding the release of graduate student funds/awards please contact the School for Graduate Studies. For information regarding the release of undergraduate student funds/awards please contact the Financial Aid and Awards Office or the Faculty/Department.
- Please submit one signed copy of this form to the UHREC c/o the Research Ethics and Compliance Unit via e-mail at [ethics@alcor.concordia.ca](mailto:ethics@alcor.concordia.ca). *Please allow at*

*least one month for the central UHREC to complete the review; students should allow at least 14 days for the UHREC, Disciplinary College to complete the review.*

- All research must comply with the [Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans](#), funding/award agency policies and guidelines, applicable law and governmental regulations, as well as the [Official Policies of Concordia University](#) as required.
- Once obtained, the Certificate of Ethical Approval for Research Involving Human Participants is valid for one year and must be renewed on an annual basis throughout the life of the project. This requires the submission of an Annual Report Form before the current approval expires. A project's approval expires automatically if a renewal request is not received before the current approval expires. No research activities
- involving human participants may be conducted under an expired approval.
- For more information regarding the UHREC, UHREC Disciplinary College or the procedures for the ethical review of research involving human participants, please see the *Concordia Policy for the Ethical Review of Research Involving Human Participants, VPRGS-3* and related *Procedures for the Ethical Review of Research Involving Human Participants* ([Official Policies of Concordia University](#)).

## **Important (students)**

- If your project is encompassed within your supervising faculty member's SPF, your supervisor need only inform the Research Ethics and Compliance Unit via e-mail of your addition to the research team. If your project is an addition to, or an extension of, your supervising faculty member's SPF where a similar methodology is proposed, your supervising faculty member must submit a detailed modification request and any revised documents via e-mail; no new SPF is required.

## **Instructions**

This document is a form-fillable Word document. Please open in Microsoft Word, and tab through the sections, clicking on checkboxes and typing your responses. The form will expand to fit your text. *Handwritten forms will not be accepted.* If you have technical difficulties with this document, you may type your responses and submit them on another sheet. Incomplete or omitted responses may cause delays in the processing of your protocol.



Status:

- Faculty/staff
- Graduate student (PhD, Masters)
- Undergraduate student
- Postdoctoral fellow

This research (check all that may apply):

- Is health and/or medical related
- Is to take place at the PERFORM Center
- Includes participants under the age of 18 years
- Includes participants with diminished mental or physical capacity
- Includes Aboriginal peoples
- Includes vulnerable individuals or groups (*vulnerability may be caused by limited capacity, or limited access to social goods, such as rights, opportunities and power and includes individuals or groups whose situation or circumstances make them vulnerable in the context of the research project, or those who live with relatively high levels of risk on a daily basis*)
- Involves controlled goods/technology, hazardous materials and/or explosives, biological/biohazardous materials, or other hazards (radioisotopes, lasers, x-ray equipment, magnetic fields)
- Is multi-jurisdictional/multi-institutional/multi-centric

## 1. Submission Information

Please check ONE of the boxes below:

This application is for a new protocol.

This application is a modification or an update of an existing protocol:

Previous protocol number (s): \_\_\_\_\_

## 2. Contact Information

Please provide the requested contact information in the table below:

Principal Investigator/ Instructor	Department	Internal Address	Phone Number	E-mail
Harshjot Singh	Msc Management		5144020941	h_nijher@jmsb.concordia.ca
Faculty Supervisor ( <i>required for student Principal Investigators</i> )		Department / Program		E-mail
Raafat Saade		DSMIS		r_saade@jmsb.concordia.ca
Young Chul Jeong		Management		yjeon@jmsb.concordia.ca
Co-Investigators / Collaborators		University / Department		E-mail
Research Assistants		Department / Program		E-mail

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**3. Project and Funding Sources**

Project Title:	Exploring Critical Success Factors of ERP Implementation in United Nations Types of Organizations: Relationship between factors impacting user experience
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In the table below, please list all existing internal and external sources of research funding, and associated information, which will be used to support this project. Please include anticipated start and finish dates for the project(s). Note that for awarded grants, the grant number is REQUIRED. If a grant is an application only, list APPLIED instead.

Funding Source	Project Title	Grant Number	Award Period	
			Start	End

**4. Brief Description of Research or Activity**

Please provide a brief overall description/lay summary of the project or research activity. The summary should not contain highly technical terms or jargon and should be in a style similar as to how you would describe your work to an individual without any discipline specific training. *Do not submit your thesis proposal or grant application.*

The thesis topic is: Exploring Critical Success Factors of ERP Implementation in United Nations Types of Organizations: Relationship between factors impacting user experience

The purpose of the study specifically is to measure the relationship between success factors during an ERP implementation and user satisfaction in United Nations Type of Organizations.

The research on ERP implementation has focused on a lot of case studies to identify critical success factors according to specific contexts. The purpose of this thesis is to build on the understanding of those success factors to explore the factors required for a successful ERP implementation at a specialized agency of United Nations. With this start, we would have an understanding of the factors which are specific for a public non for profit organization such as United Nations. I chose United Nations because there is a large discrepancy in the success of ERP implementation across United Nations. Some implementations have been a big success while others have been devastating for the organization where it has suffered huge losses. United Nations is on an agenda of introducing a common ERP across its agencies to optimize the transparency levels across the related functions units and reduce the redundancy of the tasks. This thesis provides a stepping stone for a bigger research which might involve other United Nations agencies and provide them with a model to measure the success of their ERP implementation.

I have approached this thesis with a three dimensional methodology involving grounded research, quantitative survey and qualitative interviews. To perform a grounded research, I would be pursuing an internship at this specialized UN agency for four months where I would be involved in ERP strategic operations and have meetings with the ERP project manager who has been handling this project for the last 15 years. I would make observations which would help me to develop an understanding of the possible factors which need to be explored for measuring the success of the ERP implementation in this agency.

I have performed an extensive literature review on the articles describing the critical success factors (case studies, empirical articles and theoretical models). These would provide a sense of the direction in which the research on ERP implementation is headed.

I have designed a survey using a validated scale for User satisfaction for ERP implementation, measuring the communication of the vision, change management and the completion of strategic objectives using the objectives defined in the business case of the ERP. There would be two overlapping groups of subjects for the survey, one which are advanced users of the ERP like Finance, HR, Payroll, etc. and the others which use the ERP occasionally for filling their time sheets and absent forms. But they also form a significant group of subjects as they are the driving force to exploit the maximum out of the ERP because a lot of work performed by them is being done manually or in different legacy systems. So, the responses for user satisfaction would be taken from all the subjects whereas the responses for change management or the completion of strategic objectives would be taken from the advanced users of the systems as these subjects were involved in the ERP implementation process.

Finally, I would perform qualitative interviews from the focal points of the various departments which are responsible to take strategic actions in their departments. They would provide insights into the issues faced during the ERP implementation process which would also relate to the absence of some success factors that would be explored in the thesis.

This thesis is an exploratory study to measure the success of an ERP implementation by performing exploratory factor analysis and cognitive mapping simulation and we aim to come up with a model which measures the success of an ERP implementation and is valid for public non-profit organizations. This model would be empirically tested with the data collected from the survey in this specialized UN agency

## 5. Scholarly Review / Merit

Has this research been funded by a peer-reviewed granting agency (e.g. CIHR, FQRSC, Hexagram)?

Yes      Agency: \_\_\_\_\_

No      If your research is beyond minimal risk (*defined as research in which the probability and magnitude of possible harms implied by participation is no greater than those encountered by participants in those aspects of their everyday life that relate to the research*) please complete and attach the Scholarly Review Form (Scholarly Review Forms for student research may be signed by thesis committee members)

## 6. Research Participants

a) Please describe the group of people who will participate in this project.

The employees are the full time staff and consultants of a specialized agency United Nations organization where an ERP system has been introduced 5 years ago. All the employees using the ERP system would participate in the survey and the active users of the system would participate in the qualitative interview.

- b) Please describe in detail how participants will be recruited to participate. Please attach to this protocol draft versions of any recruitment advertising, letters, etcetera which will be used.

The sampling mechanism would be a non random convenient sampling as I have to only recruit those participants which are the direct users of the new system to get any substantial data

- c) Please describe in detail how participants will be treated throughout the course of the research project. Describe the research procedures, and provide information regarding the training of researchers and assistants. Include sample interview questions, draft questionnaires, etcetera, as appropriate.

The participants would be asked to participate in a survey questionnaire according to their usage of the ERP systems. They would also be requested to participate in the qualitative interview which would provide us some depth in the answers

## 7. Informed Consent

- a) Please describe how you will obtain informed consent from your participants. A copy of your written consent form or your oral consent script must be attached to this protocol. If oral consent is proposed, please describe how consent will be logged/ recorded. *Please note: written consent forms and oral consent scripts must follow the format and include the same information as outlined on the sample consent form.*

I would read a script of consent form during the personal interviews where they would be asked questions on the change during the ERP implementation. The consent would be an oral consent where I would be taping it and attaching the audio transcript with the research.

For survey, I have not included questions which ask them about their name which would ensure confidentiality. Also, I have explicitly mentioned in the questionnaire that the responses would be confidential. An email would be sent before sending the questionnaire to confirm the same.

The screen of the survey would mention that the individual results would be kept confidential. Once they read this message, they have the option of going ahead with the survey or leaving it. There is no method to force the respondents to reply to the survey.

- b) In some cultural traditions, individualized consent as implied above may not be appropriate, or additional consent (e.g. group consent; consent from community leaders) may be required. If this is the case with your sample population, please describe the appropriate format of consent and how you will obtain it.

There is no specific consent required from any community. Consent is on a personal basis.

## 8. Deception and Freedom to Discontinue

- a) Please describe the nature of any deception, and provide a rationale regarding why it must be used in your protocol. Is deception absolutely necessary for your research design? Please note that deception includes, but is not limited to, the following:

deliberate presentation of false information; suppression of material information; selection of information designed to mislead; selective disclosure of information. Please describe the proposed debriefing procedures post-participation.

Not applicable as it is a survey whose results would be beneficial for the organization

- b) How will participants be informed that they are free to discontinue at any time? Will the nature of the project place any limitations on this freedom (e.g. dissemination and/or publication date)?

The ones participating in the survey can discontinue whenever they want as it would be online. The participants for the qualitative interview would be informed that they can exit the interview or not respond to any question which they feel uncomfortable with.

## 9. Risks and Benefits

- a) Please identify any foreseeable benefits to participants.

The results of the study would identify critical success factors and map them to the benefit realization framework which would be used by the participants to realize the benefits of the ERP system. This would be used to measure the critical success factors for a successful ERP implementation and establish their relationship with the user satisfaction with ERP systems

- b) Please identify any foreseeable risks or potential harms to participants. This includes low-level risk or any form of discomfort resulting from the research procedure. When appropriate, indicate arrangements that have been made to ascertain that subjects are in “healthy” enough condition to undergo the intended research procedures. Include any “withdrawal” criteria.

There is very minimal risk to the participants as the complete anonymity of the respondents would be maintained in the survey and the interview. I would get all the results in a



spreadsheet of the survey which would be coded randomly by the system. This is to ensure that there is a least chance of a person getting identified with their response.

- c) Please indicate how the risks identified above will be minimized. Also, if a potential risk or harm should be realized, what action will be taken? Please attach any available list of referral resources, if applicable.

Not applicable

- d) Is there a likelihood of unanticipated “heinous discovery” (e.g. disclosure of child abuse, revelation of crime) or “incidental finding” (e.g. previously undiagnosed medical or psychiatric condition) outside of the intended scope of the research that could have significant welfare implications for the participant or other parties, whether health-related, psychological or social? If so, how will such a discovery be handled?  
*Note that in exceptional and compelling circumstances, researchers may be subject to obligations to report information to authorities to protect the health, life or safety of a participant or a third party (TCPS2, Article 5.1) Note that if, in the course of the research, incidental findings are discovered, researchers have an obligation to inform the participant (TCPS2, Article 3.4).*

Not applicable

## 10. Data Access and Storage

- a) Please describe what access research participants will have to study results, and any debriefing information that will be provided to participants post-participation.

They would not have the direct access to the results of other participants as it is a confidential study in terms of the individual results but the overall analysis would be shared with them on a voluntary basis.

- b) Please describe the path of your data from collection to storage to its eventual archiving or disposal. Include specific details on short and long-term storage (format and location), who will have access, and final destination (including archiving, or any other disposal or destruction methods).

I am going to have an online survey which is on the company's share point website and I would get the results in an excel spreadsheet as a data. I would store the spreadsheet on my JMSB email which is a secured account.

## **11. Confidentiality of Results**

Please identify what access you, as a researcher, will have to your participant(s) identity (ies):

<input checked="" type="checkbox"/>	Fully Anonymous	Researcher will not be able to identify who participated at all. Demographic information collected will be insufficient to identify individuals.
<input type="checkbox"/>	Anonymous results, but identify who participated	The participation of individuals will be tracked (e.g. to provide course credit, chance for prize, etc) but it would be impossible for collected data to be linked to individuals.
<input type="checkbox"/>	Pseudonym	Data collected will be linked to an individual who will only be identified by a fictitious name / code. The researcher will not know the “real” identity of the participant.
<input type="checkbox"/>	Confidential	Researcher will know “real” identity of participant, but this identity will not be disclosed.
<input type="checkbox"/>	Disclosed	Researcher will know and will reveal “real” identity of participants in results / published material.
<input type="checkbox"/>	Participant Choice	Participant will have the option of choosing which level of disclosure they wish for their “real” identity.
<input type="checkbox"/>	Other (please describe)	

a) If your sample group is a population in which the revelation of their identity could be particularly sensitive, please describe any special measures that you will take to respect the wishes of your participants regarding the disclosure of their identity.

The survey and the interview would be fully anonymous. Random numbers would be used instead of names to maintain full anonymity.

b) In some research traditions (e.g. action research, research of a socio-political nature) there can be concerns about giving participant groups a “voice”. This is especially the case with groups that have been oppressed or whose views have been suppressed in their cultural location. If these concerns are relevant for your participant group, please describe how you will address them in your project.

Not applicable

## 12. Additional Comments

- a) Bearing in mind the ethical guidelines of your academic and/or professional association, please comment on any other ethical concerns which may arise in the conduct of this protocol (e.g. responsibility to subjects beyond the purposes of this study).

Not applicable

- b) If you have feedback about this form, please provide it here.

Not applicable

## 13. Signature and Declaration

Following approval from the UHREC, a protocol number will be assigned. This number must be used when giving any follow-up information or when requesting modifications to this protocol.

The UHREC will request annual status reports for all protocols, one year after the last approval date.

**I hereby declare that this Summary Protocol Form accurately describes the research project or scholarly activity that I plan to conduct. Should I wish to make minor modifications to this research, I will submit a detailed modification request or in the case of major modifications, I will submit an updated copy of this document via e-mail to the Research Ethics and Compliance Unit for review and approval.**

ALL activity conducted in relation to this project will be in compliance with:

- [The Tri Council Policy Statement: Ethical Conduct for Research Involving Humans](#)
- The policies and guidelines of the relevant funding agency
- The [Official Policies of Concordia University](#)

Principal Investigator Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**Faculty Supervisor Statement (required for student Principal Investigators):**

*I have read and approved this project. I affirm that it has received the appropriate academic approval, and that the student investigator is aware of the applicable policies and procedures governing the ethical conduct of human participant research at Concordia University. I agree to provide all necessary supervision to the student. I allow release of my nominative information as required by these policies and procedures in relation to this project.*

Faculty Supervisor Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## **SAMPLE CONSENT FORM TO PARTICIPATE IN RESEARCH**

*Consent must be obtained from any study participant. Written consent forms must follow the format of this template, including the “I understand” format, (exceptions may be given to multi-institutional projects). Oral consent scripts should include the same information. Please adapt this template to suit your project. Language should be at no more than a grade eight reading level. If you are using written consent forms, note that participants should be given two copies of the consent form – one to keep, and one to sign and return to the researcher.*

### **CONSENT TO PARTICIPATE IN THE ERP CSF’s IDENTIFICIATION STUDY**

I understand that I have been asked to participate in a research project being conducted by Harshjot Singh of MSc in Administration - Management of Concordia University (514-402-0941, [harshjotnijher@hotmail.com](mailto:harshjotnijher@hotmail.com)) under the supervision of Raafat G. Saade of Decision Sciences and Management Information systems of Concordia University (5147175563, [r\\_saade@jmsb.concordia.ca](mailto:r_saade@jmsb.concordia.ca)).

#### **A. PURPOSE**

I have been informed that the purpose of the research is as follows:

“Exploring Critical Success Factors of ERP Implementation in United Nations Types of Organizations: Relationship between factors impacting user experience”

#### **B. PROCEDURES**

*I understand that I would have to answer questions in a qualitative interview on the ERP system implemented in the organization. The interview would be on a voluntary basis and the employees can be leave the interview at any time.*

### C. RISKS AND BENEFITS

*I understand that there are no potential risks to me as complete confidentiality of the identity of the individuals would be maintained. The results of this study would identify the critical success factors and identify the current situation of the ERP in the organization which would help the organization make the ERP strategy moving ahead.*

### D. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is voluntary
- I understand that my participation in this study is fully anonymous (i.e., no one would know about the identity of the respondents including the researcher)
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please  
print)

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SIGNATURE

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If at any time you have questions about the proposed research, please contact the study's Principal Investigator

*Indicate in this section the name, Department and contact information for the Principal Investigator. Student investigators shall add; or (Name of Faculty supervisor) of (Name of Department) of Concordia University (contact info including phone and e-mail).*

If at any time you have questions about your rights as a research participant, please contact the Research Ethics and Compliance Advisor, Concordia University, 514.848.2424 ex. 7481 [ethics@alcor.concordia.ca](mailto:ethics@alcor.concordia.ca)