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# Critical Success Factors of Enterprise Resource Planning Systems Implementation in Sudan

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**Abstract-** The aim of this paper is to investigate the critical success factors (CSF) of Enterprise Resources Planning (ERP) implementation in Sudan. The paper explain the CSF for implementing ERP systems in Sudan, users satisfaction impacts the accomplishment of a successful ERP implementation and project scope affect the implementation successes. The paper conducted at private firms and organizations that implementing ERP in Sudan. The theoretical Framework is focusing on ERP Implementation success factors classified the hypothesized factors into five categories. The paper explains that ERP success is subjected to twelve factors. These factors are discussed according correctness, integrity and validity. The results show that the involvement of each of those factors is ranging from case to another.

**Keywords-** *ERP, CSF, BPR, large organization, top management, software package.*

## 1. Introduction

The concept that this paper will study involves the factors that influence an implementation of an enterprise-wide information system in a large organization. More specifically, it will examine what the critical success factors (CSF) are for implementing an Enterprise Resource Planning (ERP) system. ERP stands for Enterprise Resource Planning. ERP is an integration of business management practices and modern technology. ERP is the tool to integrate all departments and functions across a company onto a single computer system that can serve all those different departments' particular needs [1], the typical of ERP system can combine inventory data with human resource, finance, and sales data. This capacity enables the business to manage human resource, manage supply chain, price product, produce financial statement and control financial resource effectively [2]. Investigation into large software packages (which an ERP system is) has been called for in the IS literature [9], pointing out that since ERP systems are so frequently used there ought to be a greater push for paper into issues relating to the use and implementation of such systems. Success factors in information systems implementation projects have been hard to define [14], even though a number of studies in this field have been presented [10]

## 2. Research Questions

The paper task is to discover the 'critical success factors for ERP implementation'. In terms of the broad concepts that this paper involves, please note the figure below (Figure 2-1) that illustrates how the research fits into the existing concepts and literature that the paper comprises:

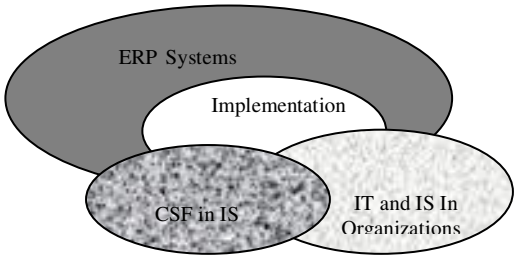


Fig. 1 Areas of Research Interest

The figure above (refer Figure 2-1) shows the areas of interest, specifically focusing on critical success factors (CSF) for the implementation of an information system.

Sub-paper questions have been developed to further explore and clarify what the actual paper problem is concerning. The paper questions are identified below:

- What are critical success factors for implementing an ERP system?
- To what extent can the user satisfaction impact on the accomplishment of a successful ERP implementation?
- In what ways can the ERP project scope affect the implementation success?
- Will an ERP system provide the users with enhanced information and an improved quality system?

- Can the identification of critical success factors for an ERP system assist the development of an enhanced quality information system?

## 3. Literature Review

All of the means and mechanisms for data receipt, processing, storage, retrieval, and analysis. Information Systems can be designed for storage and dissemination of a variety of data products--including primary data sets and both intermediate and final analyses--and for an interface providing connections to external computers, external data banks, and system users. To be effective, the design and operation of an information system must be carried out in close association with the primary producers of the data sets, as well as other groups producing integrated analyses or intermediate products. An ERP system can be seen as a system that integrates all information that runs through an organization [8] and can be categorized as a large information system. [15] Found the IS field to be broad, with a number of different definitions depending on the IS research view.

### 3.1 The ERP Phenomena

The focus of manufacturing systems in the 1960's was on Inventory control. Most of the software packages then (usually customized) were designed to handle inventory based on traditional inventory concepts. In the 1970's the focus shifted to MRP (Material Requirement Planning) systems that translated the Master Schedule built for the end items into time-phased net requirements for the sub-assemblies, components and raw materials planning and procurement. In the 1980's the concept of MRP-II (Manufacturing Resources Planning) evolved which was an extension of MRP to shop floor and Distribution management activities. In the early 1990's, MRP-II was further extended to cover areas like Engineering, Finance, Human Resources, Projects Management etc i.e. the complete gamut of activities within any business enterprise. Hence, the term ERP (Enterprise Resource Planning) was coined.

### 3.2 Implementation Strategies

There are two distinctive ways of implementing an ERP found in the literature. These phases are termed the 'phased' implementation and the 'Big Bang' approach. Depending on the organizational structure, the complexity of the organization, economical issues, strategic partners, time constraints and geographical locations, the appropriate implementation approach should be selected. The Big Bang approach requires simultaneous implementation of multiple modules of an ERP package, while a phased implementation consists of designing, developing, testing and installing different modules of the same ERP package. The 'Vanilla' implementation approach is another implementation approach that focuses on minimal customization of the ERP package and has been found to be a common implementation approach.

### 3.3 ERP and Organizational Change

Enterprise resource planning, or ERP, is designed to improve the efficiency and effectiveness of generic business processes, and where applicable, specific business processes within each company. It involves seamless data integration between all aspects of a company's systems such as manufacturing and logistics, finance and accounting, sales and marketing, and human resources. An ERP system helps the different parts of the organization share data and knowledge, reduce costs, and improve management of business processes.

In spite of their benefits, many ERP systems fail [23]. Many ERP systems face implementation difficulties because of workers' resistance. [5] assert that effective implementation of ERP requires establishing five core competencies, among which is the use of change management strategies to promote the infusion of ERP in the workplace. Although some studies tried to address this problem by identifying change management strategies that facilitate the success of ERP implementation, many ERP systems still face resistance, and ultimately, failure.
Another stream of research that also deals with the introduction of new products (or ideas) puts forth a different story. Despite the large number of new products and services that they introduce every year, marketers can still achieve high rates of success [7]. Why? I believe the answer rests in the strategies and techniques employed by marketing professionals.

### 3.4 Critical Success Factors for ERP Implementations

Critical Success Factors - or CSFs, are those things which must go right for the organization to achieve its mission. CSFs are: a simple concept which helps focus attention on major concerns; easy to communicate; and easy to monitor. CSFs should be derived from the firm's strategic plans; and they may be established for the company, the business unit, the department, or an individual. CSFs are categorized as those which monitor current results and those which build for the future. Sources of CSFs include: industry CSFs resulting from specific industry characteristics; strategy CSFs was resulting from the chosen competitive strategy; environmental CSFs resulting from economic or technological changes; temporal CSFs resulting from internal organizational needs. CSFs should

be associated with one or more primary measures for monitoring [3].

## 4. Research Methodology

It discusses the research methodology that has been chosen for this project. An information system research classification overview will be presented to illustrate where this research method fits in. Potential all the data collection techniques used within this research are discussed. Research in information systems field stems from the management information systems (MIS) field [2] and has investigated research concept such as analysis, effective design, delivery, technical implementation (construction), evolution (enhancement maintenance) and use of information systems and information technology in organizations [9].

### 4.1. Qualitative Approaches Available

Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. Examples of qualitative methods are action research, case study research and ethnography. Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions.

The following section describes the various research methods available for the researcher within the qualitative research field.

#### 4.1.1 Case Study

A case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one of a few entities (people, groups or organizations) [6]. According to [12], case study research is the most commonly employed research strategy in the IS field.

The quality of the case study is dependent on the sensitivity and integrity of the researcher. The researcher's primary data collection method is said to be interviews, according to [25]. There are typically three methods for case study process, namely interpretational, structural, and reflective analysis [26]. A case study can be either a single-case study or a multiple-case study [26]. The typical case study would generate three types of verbal data: interview transcripts, observer notes, and field documents [25]. Data collection for a case study research can be time-consuming and can often result in a large collection of data to be analyzed [26].

There have been numerous situations where a case study has been brought into an ERP research situation [18]. According to [26], case studies are preferred research methods when the investigator has little control over the events and when focusing on a contemporary phenomenon within some real-life context. This is precisely what this research will be undertaking, to find critical success factors for the implementation of the ERP project.[26] Found some examples of "poor research results with case studies" and that they "take a long time to complete". Another potential limitation when selecting a case study method is that the research can have inadequate resources to gather data in order to select a research site to conduct the case study, something that can affect the quality of the research site selection process [17].

A case study research method is however preferred over a field study research, because a field study is usually a research approach that is considerably time consuming, according [19]. Action research has not been adopted, as the researcher is not part of the implementation team or in any way has any connection or influence with the implementation project. Ethnographic research is similar to a case study [19], but again the time factor is a limiting factor of the research approach.

Overall, a case study approach has been selected due to the fact that it will be the most appropriate research method based on the fixed timeline of the project and the nature of the research question. In addition, a case study method is a well-known research method in the field of study and has been used before during similar research projects.

## 5. Research Framework

Models for information system implementation vary. Every vendor has its own model, and large companies have their own practices. Most traditional model is perhaps the waterfall model. Original model [20] included five phases: Analyze, Specify, Design, Build, and Test. Model have been modified, further developed and criticized ever since. However, this model doesn't suite well for implementation of pre-engineered software packages, as the case is in implementation of an ERP system. Some models specially designed for implementation of ERP systems can be found from literature, but , those models doesn't cover all important parts of ERP systems implementation project, but are rather focusing to some part(s) of it.

ERP systems implementation is a long-term program, not a short-term project that is finished just after system installation. Once organizations have purchased ERP packages from external vendors, a project team including external contractors' consultants and internal will be setup.

Based on the ERP literature, the researcher classified the hypothesized factors into five categories with: (1) organizational environments, including top management support, re-engineering business process, effective project management, and company-wide commitment; (2) people characteristics, including education & training, and user involvement both at system requirements definition and ERP project implementation; (3) technical problems, including suitability of software & hardware and data accuracy; (4) ERP vendor commitment, including vendor support; and (5) cultural impact including organizational cultures.

It's difficult to define ERP success. ERP success is a nebulous and highly subjective concept. Until now there is not a concerted definition of ERP success and there are some attempts to define success in the ERP literature. In his classical books, proposed a classification system named ABCD for MRP II user companies. [16] defined ERP success from several angles, including: (1) Success viewed in technical terms; (2) Success viewed in economic, financial or strategic business terms; (3) Success viewed in terms of the smooth running of business operations; (4) Success as viewed by the ERP-adopting organization's managers and employees; and (5) Success as viewed by the ERP-adopting organization's customers, suppliers, and investors. Among Markus's dimensions of success, it's difficult to use quantitative analysis to measure success from angles of economic benefits and the adopter's customers, suppliers, and investors.

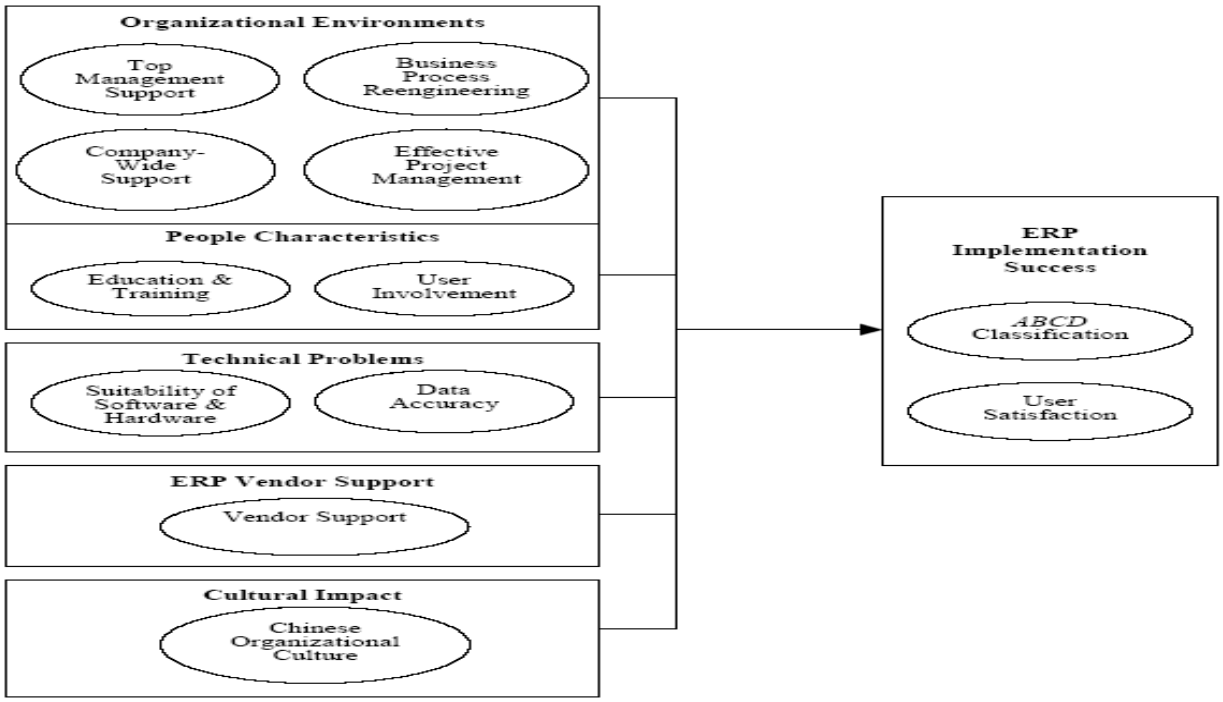


Fig. 2 Conceptual research model of ERP implementation success in Sudan

## 5.1 Top Management Support

The most important requirement to handle success is top management support or commitment. ERP should be treated as a business project—not an IT project driven by the Information Systems department. ERP requires top management commitment and it should be business-driven. So it's important to get the involvement of the function heads and top business executives. ERP implementation initiative is generally triggered by business need to increase productivity and cut operational costs. However, the ROI is generally not reflected in the company bottom-line immediately, and thus most of these projects don't have complete support from top management, which is imperative for such change initiatives. The involvement of top management can be at different levels. For example, one company conducted for functional heads and key users during the implementation phases. The chairman would attend these meetings for a few minutes to review the day's work, and hence showed he was involved in the project. In another instance, the functional heads would enter data into the new system

rather than leave this tedious task entirely to other users. The important thing is that management support should be visible. Thus, we get the following hypothesis:

**H1**: Top management support has a positive impact on ERP implementation success.

## 5.2 Re-engineering Business Process

Strategic Enterprise? Extended Enterprise? BR or BPR? ERP? Where do all these fit in & how do they mesh together? These are frequently echoed in the Sudanese Corporate circles nowadays. Business Process Re-engineering (BPR) is the strategic analysis of business processes and the planning and implementation of improved business processes. The analysis is often customer centered and holistic in approach. BPR is a multi-disciplinary subject and should involve more than IT specialists. Nevertheless, IT can support BPR in many ways: Software can be used to help with gathering information about the current business organization. Workflow, process analysis tools, business modeling, simulation, On-line analytic processing (OLAP), all have a role to play. Business process re-engineering (BPR) is defined by [25] as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, Quality, service and speed".

Dimensions concerning business process reengineering are: (1) Company's willingness to reengineering; (2) Company's readiness for change; (3) Company's capability of reengineering; and (4) Communication. Prior studies claimed that the more willing an organization is to change, the more successful the implementation. [26] Suggested that the organization should be prepared and ready for fundamental change to ensure the success of BPR. There should exist the trust between top management and the staff within the company, which would facilitate the change process. [8] Stressed that the company should be capable of conducting reengineering in that the process entails much time, capital, and the sustainability of leadership. For the service providers and more importantly the users, it is now imperative that in any re-engineering exercise or implementation the emphasis moves from the functionality and speed, to achieving significant business benefits that are recognized by organizations. The need of the hour seems to be the fundamental re-structuring of enterprise, which in turn cascades across enterprises to create the extended enterprise of the relationships between suppliers, customers, affinity groups and competitors. Thus, we get the following hypothesis:

**H2**: Business process reengineering has a negative impact on ERP implementation success.

## 5.3 Effective Project Management

Change management is about handling the issues arising due to differences in legacy processes/ systems and the new ERP system. Business processes may have to be re-engineered for ERP, something that's bound to draw disapproval, especially from function heads. User organizations and consultants think of ways to motivate employees and get them to accept the new system. Rewarding employees with cash incentives is one such approach. Another approach is to involve all users, right from the beginning, or even before the project begins. This helps get the 'buy-in' for ERP. Consultant should organizes workshops for users at various levels (end-users, operational managers, executives), within the organization. This helps to involve them in the processes of business process design, systems configuration, and testing. Such involvement helps us get their buy-in for the changes in the business processes, system, and roles & responsibilities. You have to ensure that there is a business buy-in for any process changes that you are bringing in. The business benefits must be realized at the user level. This must be done before you roll out ERP or before implementing a new change. HR department can play an important role in handling change among employees. But HR must be involved at the beginning of implementation.

Conducting periodic project status meetings in which each team member reports progress and problems is an invaluable means for evaluating the progress of the ERP implementation. Selecting the right project leader is also important for the project implementation success. Thus, we get the following hypothesis:

**H3**: Effective project management has a positive impact on ERP implementation success.

## 5.4 Company-Wide Commitment

Successful implementation of an extended ERP system is the result of knowledgeable and dedicated people working together. It entails company-wide commitment, openness to change, good planning and experienced guidance. Success in going global is directly related to a company-wide commitment. That company-wide commitment involves you alone if you are a sole proprietor, or in the case of a large corporation, the executive committee, finance, operations, marketing and sales, logistics, research, technology, and culture.Three aspects of company-wide support are considered: (1) Functional department heads are champions of the ERP project; (2) They provide necessary resources to support their subordinates; (3) Other people outside the team support the project. Thus, we get the following hypothesis:

**H4**: Company-wide support has a negative impact on ERP implementation success.

## 5.5 Education and Training

Most issues that arise while implementing ERP concern the people in the organization. That's why it is important to communicate the benefits and improvements that ERP can bring in. Users must also be trained to use ERP. There has to be good communication between the project team, end-users and customers. This will ensure continuous feedback so that problems are sorted out quickly. Poor communication has often been the reason for failed ERP projects. It is important to communicate the benefits and functionality of ERP to users. This should be done through continuous training sessions so before implementing ERP it's important to get a consensus from all employees in the organization. It's better to handled this by maintaining strong communication channels with every employee. It must be feedback and training sessions where doubts and difficulties were cleared and also told employees that there was no second option Thus, we get the following hypothesis:
**H5**: Education and training has a negative impact on ERP implementation success.

## 5.6 User Involvement

In this research, we evaluated user participation and involvement in the context of enterprise resource planning (ERP) systems. Since ERP systems are enterprise wide in scope, these systems have a high level of complexity, and require a different implementation methodology. While most studies analyze implementation at an organization or industry level, there is a dearth in research in ERP system adoption at the individual or user level. In this study, we examine ERP system acceptance even at the individual level. In this research, we expected to find differences in the nature of user participation and involvement in ERP compared to other information systems. Given the nature of ERP and its implementation, traditionally formalized links between influencers of users' attitude and involvement may need to be revised.

We have discussed why we need to seek alternate forms of influencers. In doing so, we suggest that investments be made in preparatory work practices and employee development prior to ERP decisions. Such investments are complementary to information technology and are widespread throughout the firm. We believe that such investments will play a significant role in influencing the attitude of users toward any system and also their involvement. The hypothesis is as follows:
**H6**: Involving user has a negative impact on ERP implementation success.

## 5.7 Suitability of Software and Hardware

Due to the lack of professional expertise and experience on developing ERP systems in-house, many companies prefer to buy off-the-shelf systems to shorten the ERP implementation cycle. ERP packages provide generic off-the-shelf business and software solutions to customers. More or less they can't fully meet the company's needs, especially when the business processes of the company are unique. Thus, to increase the chance of success, management must choose software that most closely fits its requirements. ERP vendors use different hardware platforms, databases, and operation systems and certain ERP packages are only compatible with some companies' databases and operation systems. Thus, companies should conduct requirements analysis first to make sure what problems need to be solved and select the ERP systems that most fit their requirements. The hardware then is selected according to the specific ERP systems' requirements. Three aspects should be cared when selecting software and hardware: (1)
Compatibility of software/hardware and company's needs; (2) Ease of customization. We get the following hypothesis:

**H7**: Suitability of software and hardware has a positive impact on ERP implementation success.

## 5.8 Data Accuracy

Data Migration Service is designed to dramatically reduce the time and risk involved with fulfilling the extensive data requirements for ERP system implementations. If you lie to the ERP systems, then the ERP systems will lie to you and you will get inaccurate or misleading results. Thus, data accuracy is a major determinant of ERP success. Thus, the following hypothesis is developed:

**H8**: Data accuracy has a positive impact on ERP implementation success.

## 5.9 Vendor Support

The most common criticism enterprises have of their ERP vendor is poor support. Although your vendor may offer "guaranteed" service levels, customer may find that it is difficult to enforce these without jeopardizing his overall relationship with them. Even worse, the support partner is treating your problem as a "profit centre". Alternatively, customer simply might not "get on" with the support partner assigned to him. Not that it worries the support partner because they probably have monopoly rights to his geographical area, or market sector. If customer relationship with the vendor or support partner breaks

down, he may has no choice but to move entirely over to another vendor's product.

Three dimensions of vendor support are classified: (1) Service response time of the software vendor; (2) Qualified consultants with knowledge ability in both enterprises' business processes and information technology including vendors' ERP systems; and (3) Participation of vendor in ERP implementation. We get the following hypothesis:

**H9**: Vendor support has a positive impact on ERP implementation success.

### 5.10 Organizational Culture

An organization must also be prepared for ERP and be clear about its requirements. This necessitates knowing the business objectives and goals, and mapping the processes to these. ERP is just the enabler that automates the entire process. The objective for ERP must also be identified, documented, and communicated. For selecting ERP, the critical business processes should be identified. The ERP solutions considered for evaluation should at least meet these requirements. Assessing the readiness of an organization has to be done from three dimensions: People, Systems & Infrastructure, and Processes in the organization. In the evaluation stage users should articulate their business requirements and see whether a particular ERP solution meets their needs. This way you close the gap between what the package offers and your business requirements. Implementation should not begin without this. Often, employees have high expectations and think ERP will solve most business problems. Consultants say it is necessary to make realistic expectations before embarking on an ERP project. This is addressed by preparing a project realistic expectations, and key performance parameters to be focused on during the project. Having defined this, it is necessary to communicate this to the stake holders in the ERP project. Thus, we get the following hypothesis:

**H10**: organizational culture has a negative impact on ERP implementation success.

## 6. Conclusion

This study uses various tools and techniques for data collection. The basic data collection tool in this research is the questionnaire. We gave the participants all parts of the questionnaire that represent the interactions with ERP systems in their firms and enterprises. We asked the participants some questions about their background, age and previous experiences. Their answers help us very much to understand their ways to interact with the system and their performance. The questions were classified to categories in order to fit the purpose of the study. Each category is disseminated to whom it may concern.
This research aims to improve understanding of critical factors affecting ERP implementation success in Sudan. Our study is motivated by the fact that a greater emphasis needed to understand the critical success factor of ERP. We made empirical assessment of the current ERP success factors in Sudan in order to know the situation looks like. Our evaluation, there by, can be used to better implement more ERP systems in Sudan.

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