

A Study and Analysis of Various Existing Implementation Framework Related to Enterprise Resource Planning

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Abstract— Despite the difficulties, risk and failures, higher education institutions are continuously implementing the ERP Systems to meet the demands of increased competition and customer expectation. So, it is important to understand and follow an implementation frameworks to reduce/avoid the implementation failures. This study focuses on the overview of different frameworks/models used in ERP implementation and raise an alarm to indicate that there is only limited research available in this area of higher education hence it should be given more focus.

Keywords— Enterprise Resource Planning (ERP), ERP Implementation, Higher Education, Implementation framework, Implementation model.

I. INTRODUCTION

Higher education is undergoing a paradigm shift. This historically low competition industry is suddenly turning highly competitive [1]. An increasing number of higher education institutions have introduced ERP systems to improve their operations and make them manageable and more transparent. ERP systems are the largest software applications adopted by most of the educational organizations along with some investments in their implementation [2]. ERP systems for higher education are developed in the direction of support for key administrative and academic services [3]. ERP system implementation has brought significant benefits in business organization, such as improved access to accurate and timely information [4], however, information systems developed for business may not be directly appropriate for universities [5]. While ERP systems have a lot of advantages, but the major concern is the high failure proportion [6]. ERP Implementation is a single biggest project that an organisation ever launched [7]. So, high importance to be given for the implementation models and frameworks to avoid poor implementation.

II. OVERVIEW OF EXISTING LITERATURE

a. History of ERP

The evolution of the systems dates to the 1960's. Initially, systems were developed to handle inventory management and control the systems in the yesteryears were designed to assist the manufacturing process [9].



Fig.1: Evolution of ERP [8]

In 1975, MRP (**M**aterial Resource Planning) the first software was developed for inventory management. In 1980s another advanced version of MRP which MRP 2 with the acronym of **M**anufacturing Resource planning. The Enterprise resource planning systems are a more specialized form of the material requirement planning (MRP) that originally derived from the manufacturing resource planning systems [10].

ERP came into being with effect from 1990, though the fact remained that many people believe ERP existed from the year 1960 in the form of MRP1 and MRP 2. In-fact MRP II was an ERP except for its inability to coordinate departments other than marketing [8]. The whole period from the year 1960 is denoted as the age of ERP. The benefit of ERP was slowly felt from this stage onwards [9].

b. ERP Systems in HEI context

The challenge of increased competition, demands from the government and rising customer expectations has added pressure to the higher education sector to improve their operational efficiency. These substantial and continuing shifts in the sector, demand more efficient

management processes [11,12] and improved administrative operations [11].

Traditional ERP systems address basic business administrative functions such as HR (Human Resource), Finance, Operations & Logistics and Sales and Marketing applications. Yet, the HE sector requires unique function like Admissions, Student Administration, Programme and course management, Batch schedule management, Assessments, Student Services Facilities etc., not part of traditional ERP.

According to Fisher [13], ERP systems were initially introduced into HEIs in the US in response to the same drives that encouraged private sector adoption. US HEIs viewed ERP adoption as a method of gaining greater integration of their management systems to better manage increasingly complex operations [14].

“While ERP implementation in HEIs is often described as difficult, expensive, and risky and has often been considered unsuccessful or ineffective” [3, 6, 15, 16,17]; belief in the solution, and its adoption across the sector, has continued globally [18].

Though there are some similarities described in the literature between corporates and HEIs [19, 20] Pollock and Cornford [12] suggest that though Universities share similarities with manufacturing organisations, but recognise that Universities have specific and unique administrative needs. The uniqueness of HEIs according to Lockwood [19] is as follows:

- complexity of purpose,
- limited measurability of outputs,
- both autonomy and dependency from wider society,
- diffuse structure and authority, and
- internal fragmentation.

[21] Despite a limited number of implemented integral programme solutions in higher education institutions, some cases of unsuccessful implementation can be found in practice:

- At Cleveland State University they were almost forced to take legal action against the ERP vendor, after they had found out that only half of student requests can be dealt with in 1998. The University continued with the implementation of ERP system despite rising costs (the planned amount was exceeded by \$10.8m and amounted to more than \$15m).
- Similarly, the planned cost of the implementation of integral information solution at Ohio State University rose from the initial \$53m to \$85m.
- The University of Minnesota had a similar experience, when the planned cost of \$38m rose to \$53m, and finally reached \$60m.

With the introduction of global ERP solutions, enterprises should organise and standardise their business activities. ERP systems were first recognized to be useful in manufacturing industries and it is will not be directly useful in the situation higher education. The unique context of HEIs suggests unique challenges and risks of ERP implementation and evaluation, which demands sector-specific research.

c. ERP Implementation models

ERP Implementation is not as similar as the traditional software implementation

Mixed empirical results are always an invitation to seek theory. We believe that a productive approach is to move from the question of whether IT creates value to how, when and why benefits occur or fail to do so [21].

There are around 50+ theories/frameworks/models found in the literature between 1982 to 2015. There are 52 literatures shared between IT, IS, ERP, IS and ERP. The following table will give you further classification,

Table.1: Focus of Articles

Focus	Abbreviation	Number of articles
Information Technology	IT	6
Information Systems	IS	11
Enterprise Resource Planning	ERP	30
Information Systems and Enterprise Resource Planning	IS & ERP	5

This section of the paper gives an overview on only 7 frameworks/ models. The 7 framework or models are selected on the following basis: As only limited literature is available; all the 4 higher education frameworks are considered and out of the remaining publications 3 frameworks are considered based on highest average citation and the publication should be from the year 2000 and above.

1. Umbleframework (2003)[23]

Umble says, many ERP implementations have been classified as failures because they did not achieve predetermined corporate goals. Contrastingly, he also given some examples where the companies have increased or saved money because of the ERP implementation. However, in order for an ERP success, he focused the three critical areas, as follows:

1. Critical success factors

2. System selection
3. Implementation

The critical success factor list provided by Umble is a consolidation of numerous author's identification of variety of factors for the success of an ERP implementation. Umble is also insisting that the ERP selection decision be conducted with great care, because, according to [6], An estimated 50–75% of US firms experience some degree of failure in implementing advanced manufacturing technology. Hence, Umble insists that the actual software selection process must not be underestimated. From his own personal, and from the other available resources he developed a 13 steps process for the selection of software.

Since the ERP implementation can be complex and difficult and he had put a new framework. This framework has 11 recommended steps which are integrated from several works [24,25,26,27], for a successful ERP implementation. The important 11 recommendation steps are,

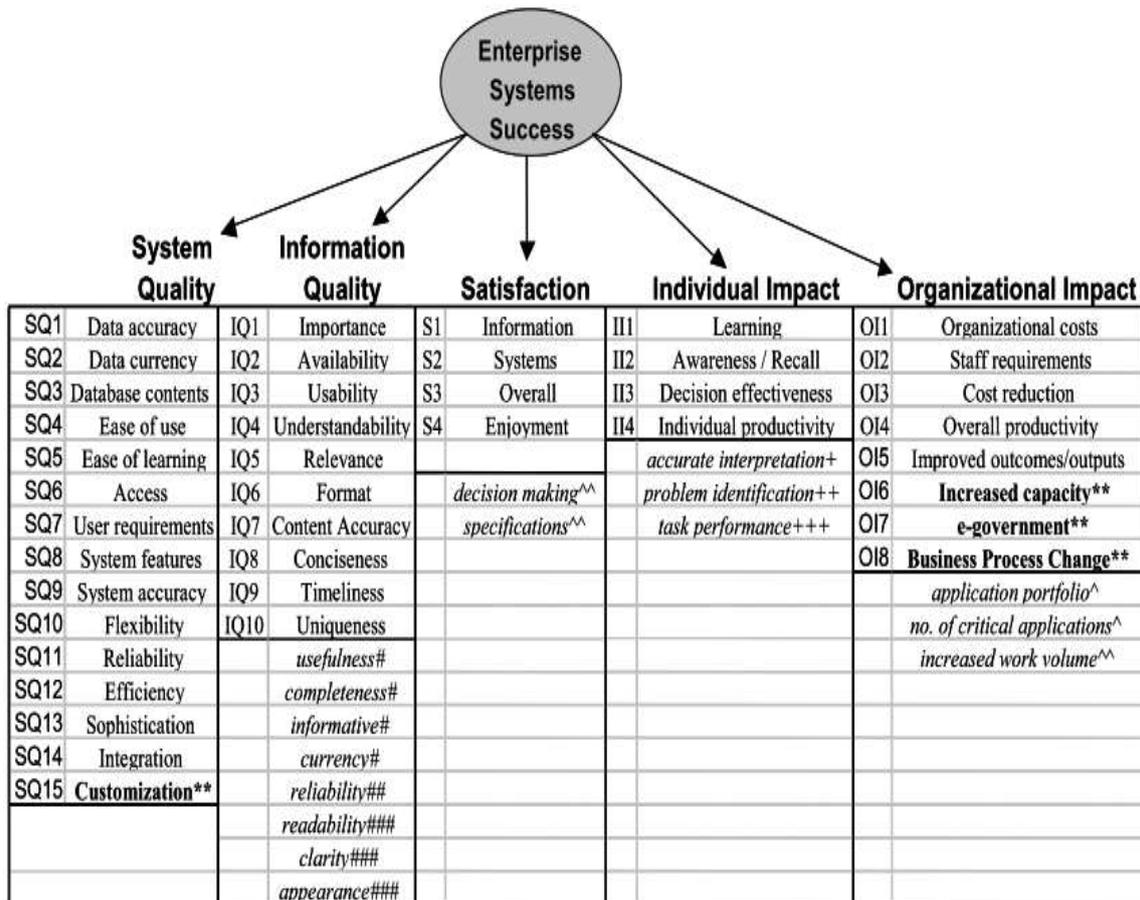
1. Review the pre-implementation process to date.
2. Install and test any new hardware.
3. Install the software and perform the computer room pilot

4. Attend system training.
5. Train on the conference room pilot.
6. Establish security and necessary permissions
7. Ensure that all data bridges are sufficiently robust and the data are sufficiently accurate
8. Document policies and procedures.
9. Bring the entire organization on-line, either in a total cutover or in a phased approach.
10. Celebrate.
11. Improve continually

2. Ross and Vitale framework (2000)[28]

Ross and Vitale in 2000 conducted a study with 15 different firms who had gone live with one of the leading ERP packages to identify the impacts of packaged ERP systems on organizations. Specifically, it was intended to identify how firms were leveraging their ERP environments to generate business value. Ross and Vitale compared their framework with a diver escape from island prison.

They recommended a five-stage framework in ERP journey are (1) design, (2) implementation, (3) stabilization, (4) continuous improvement, and (5) transformation.



In their study, they have also indicated the organisations performance using the following graphical representation. Fig 2. Implementation survey analysis [28]

From the graph, it is very evident that implementation has serious challenges. But from the explanation it is very difficult to realise what went wrong in “go live” situation or what the exact problem was, or the challenges faced in the “go live”. Many literatures are published with generic statements as their focus may be different. But providing the details will help the future research. For example, many literatures say that ERP implementation is very difficult and risky but there are not enough literature available with the details of the risk and complexity.

3. ERP success a priori model (2003) [29]

Priori model is a success measurement model. Gable et al, (2003) having adapted their framework through review of the literature, the round 1 survey, and a series of expert workshops, the authors proposed the following: a priori model of ES success. Fig 3 shows how the a priori model deviates from Delone and McLean and Myers et al. with omitted measures italicized and new measures bolded. Further note, as indicated previously, the satisfaction construct was included in the a priori model with some trepidation.

Unlike the original Delone and McLean model, the a priori model (Fig 3) is simply a measurement model for assessing the multidimensional phenomenon of ES success using five separate dimensions of success (constructs): system quality, information quality, satisfaction, individual impact, and organizational impact. The model does not purport any causality among the dimensions. Rather, the dimensions are posited to be correlated and additive measures of the same multidimensional phenomenon—ES success.

4. An Evaluation Framework for Higher Education ERP Systems (2009) [30]

Authors suggested a pre-evaluation framework to select the right ERP system to fit to the current processes and procedures of the university. To identify which ERP solution best fits, the authors developed a framework. The preparation for the evaluation framework development consisted of:

- Analysis of the Higher Education ERP solution market;
- Identification of the main Higher Education ERP vendors.
- Direct contact with some of the vendors.
- Definition of the evaluation framework;
- Evaluation of some ERP solutions using the elaborated framework.

Based on the preparation of the evaluation framework they developed an analysis criteria and selected four

vendor’s products for evaluation. They applied all the criteria on all the four products to identify which product have more functionality and best fits to the institution. The evaluation framework focused on the core areas of education institutions such as Admission, Semester scheduling, Graduation, Human resource, financials, reporting and general aspects.

5. Policy framework for efficient ERP in TEIs (2011) [31]

The policy framework focused on three important factors: Improvement, Enhancement and Control based on the important success factor and identified problems faced in efficient implementation of ERP. And then the focus given to the features for efficient ERP: functionality, security, and quality. The ERP framework designed focuses on features to be enhanced, improved and controlled to make ERP system efficient to provide optimum user satisfaction

On the basis of factors derived from literature review and responses from the diverse groups of users’ on critical success factors as well as problems encountered in ERP applications, authors have proposed a framework to help the technical educational institutions in implementing an efficient ERP. The first step of the research was to identify important success factors and the next was to identify the problems faced in efficient Implementation of ERP System. The two when related, revealed that certain features needed improvement., some to be enhanced. The authors were also able to conclude the potential effectiveness of an ERP from users’ perspective.

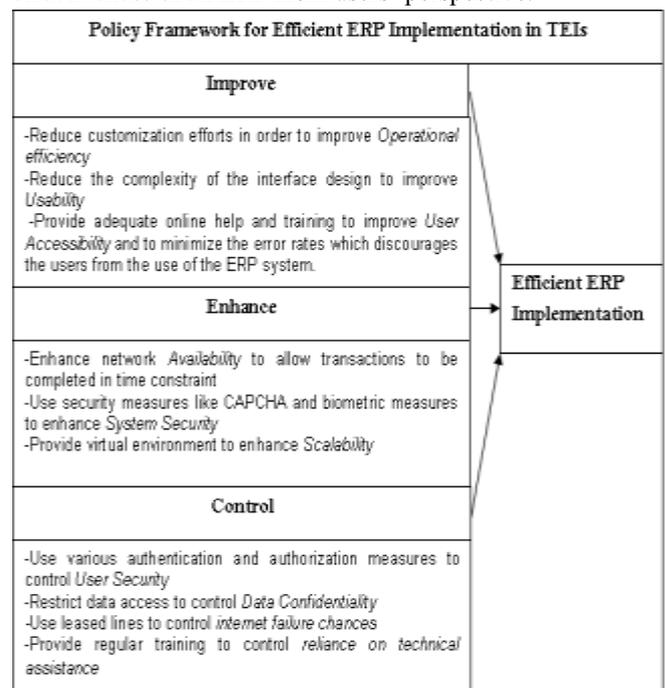


Fig.4. Policy framework for efficient ERP implementation in TEIs

6. ERP Pre-Implementation Framework for Higher Education Institution (2015) [32]

Compared to the evaluation framework model (2009), this model provides more insight into the pre-evaluation model in terms of general management including project management, change management, and technical process reengineering and legacy data clean up.

The proposed framework suggests conducting general management of project management, change management, and technical support simultaneously while preparing ERP system modules themselves in project preparation phase. These activities are the ones that must be completed at the beginning of every ERP implementation project, regardless of the software that will be selected and implemented. It reveals the fact that ERP system implementation has its impact not only on related business process but also on the broader organizational process.

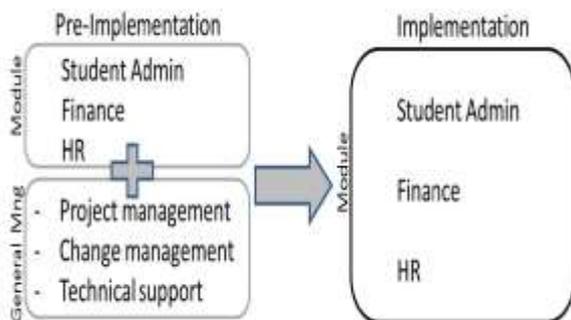


Fig.5.Pre-Implementation framework

This study is part of a large study to better understand ERP system implementation preparation, software selection, adoption, and evaluation in HEIs

III. FINDINGS AND CONCLUSIONS

Initially, ERP systems were centred on manufacturing and business sectors. Huang Z. &Palvia [34] stated that the Implementation experiences vary across different developing countries. Similarly, the ERP implementation experience varies depending on the sector. Though there is wider say in the literatures about the difficulties and risk in implementing there is no clarity or focus is given to handle the risk. Since higher education is unique in nature ERP projects are highly vulnerable to risk in higher education sector. It is important to have well-structured risk management focus is essential while implementing ERP in higher education sector. Hence it is important that the unique context of HEI's challenges and risks of ERP implementation and evaluation, demanding sector-specific research.

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