

Critical Factors of Post Implementation of ERP in Higher Education Systems Survey Review

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Abstract. ERP system is an automated system which helps in streamlining the process and/or operations and organise data of a business. Keeping this in mind the educational institutions have been rapidly inclined towards adopting the system for their organizations. Initially the ERP systems were designed for business sector, their adaptation in educational institutions require modifying the basic architecture of the system design which has to engulf the three major nexus of academic institution, v viz., finance, students and human resource. Along with this, the ERP implementation calls in a huge investment from the adopting institution. Each additional domain cost more. In addition to this the training of thousands of end-users is also a tedious task. Also, in any academic institution the security of the data related to student's examination and employee files is a major concern. This paper is a result of a survey conducted amongst the end-users of six major colleges and universities of Delhi/NCR who has already adopted the ERP system and is currently using the same. The paper covers the aforesaid issues and the opinion from the sight of end-users.

1. Introduction

ERP or enterprise-resource-planning, is a unified system via which a business can accomplish the efficient functioning the working units, logistics, manufacture, economic, management, and human reserve. ERP is being widely adapted by different business houses due the advantage of single-application-multiple operations [1]. ERP is a module-based software system whose architecture unifies the major operational divisions of any business operation. ERP architecture majorly incapacitate a central software component which are known as modules whose main aim is to interconnect the business organization functioning areas, such as finances, accounts, human-resource, manufacturing and raw-material management, client-customer-relationship management and supply-chain-management. Any business house if free to choose the type and number of modules of its needs from the pool of modules offered by the out-sourcing company, or if they want to design their own set-up that can also be done by the parent organization from scratch [2]. ERP architecture is one of the major reasons which determine the accomplishment and sustainability for a business house. Technically, ERP architecture is of 4 major types, viz., three-tier-architecture, web-based-architecture, service-oriented-architecture and cloud-computing-architecture [3].

In three-tire-architecture, there is no direct communication between the client and database. In this design, presentation layer is used for data browsing and also provides a user interface. The next layer, the application layer wherein the business rules and logic are implemented and all the data can be transferred or retrieved from the database servers [4]. The web-based-architecture, allows its users to have remote access to their ERP. Here the presentation is divided into two layers one is responsible for web-services and other is responsible for web-browser. Generally, the business houses do not support this type of ERP as they do not want to provide access to their system from outside their premises, but this model is very apt for usage in the educational institutions [5]. The third architecture model, service-oriented-architecture model, is entirely designed basing on the services rendered by the ERP and is not concerned with the network method used. In this model, for each service there is different designated system so that the functioning of the services is not affected [6].



The last architecture model type, cloud-computing-architecture is the result of the increased usage of cloud computing technology. Here the entire system and storage is done on cloud to ease the access and make the system process faster. Due to the success achieved by the ERP in the business sector, the educational institutions have now adapting the ERP rapidly to reorganize the functioning of their organization. But the reality is completely different as the ERP model for academic sector is entirely different from business sector [7]. From literature review it has been observed that approximately 40 percent of academic school have started using ERP. Due to the fact that the ERP was initially designed for the business sector, for implementation in the academic sector various different hosting services are available, the leading amongst these is SAP, Oracle, Microsoft. The implementation process for academic sector involves the basic steps such as: Preparation & Planning; Designing; Development; Testing; Deployment; Operation [8].

It has been also observed that since the majority of academic institutions re-engineer the ERP from the pre-existing business models which is entirely different from their requirement leads to the unsuccessful implementation of ERP in academic sector. Education ERP software provides a technical provision for the educational organizations to automate their database. Due to the increasing demand of educating the next generation, there is huge flow of data which has to be managed in a systematic, easy to access form. Along with this the data related to campus administration, student and/or staff management, their attendance, managing inventory, Finance and payroll procedures [9]. There are several advantages of using ERP in academic institutions, such as:

- 1.) As all the records are saved into the digital form it helps in saving the paper.
- 2.) Its implementation reduces the long lines for deposition of fees, which can be done using e-portals.
- 3.) Connects different departments of the campus with the additional support to the administration for handling the multiple locations, if any.
- 4.) Helps in improving employees working efficiency.
- 5.) When ERP has enabled the mobile application in the system, the clients can access the database at any time from any location.
- 6.) The human resource division can regulate the employee's attendance and in the end the payroll system can be automated [10].



Figure 1: ERP Modules in Educational Institution

Figure 1 explains the common modules and sub-modules which are applicable for an academic ERP. These are explained as follows:

- *Student-Information-Module:* It is responsible for creating and managing the database related to students personal & academic details at the time of admission which includes - Student's photographs, earlier educational marksheets and certificates, other necessary needed proofs

at the time of admission. It also sustains all-inclusive record of all students enrolled in the institution. It includes sub-modules such as: a) Student-Registration, b) Generation of Identity Cards, c) Student-database-enrolment [11].

- *Attendance-Management-Module*: It helps the staff and faculty to maintain the attendance with precision and with real-time access.
- *Fee-Management-Module*: It enables the access to the parents and/or guardians for making fee payments and along-with they can also access their wards performance in the organization. It also reorganizes the fee procedure by collecting different types of fees applicable in each student case individually. It includes following sub modules: a) Online-fee-payment, b) Fee's reminder and dues notification and details, c) Total Fees Collected Report [12]
- *Hostel-Management-Module*: It is an all-inclusive module that includes number of hostels available in the organization, students housed in each hostel, room allocation, fee handling and other hostel amenities. It helps the administration to keep a track of daily expenditure of hostel in real-time. It encompasses the following sub-modules: a) Admission, b) Room allotment, c) Hostel Mess management [12].
- *Library-Management-Module*: Helps in maintaining the records of library catalogue along-with books availability and issue-return details. Also permits the search of library-assets. Also produces automatically created real-time reports for total number of books, available books at that particular time, issued-books [12].
- *Course-Management-Module*: It permits the faculty to create time-table, faculty allocation, generation of quiz, test, assignments, enrolling of students in courses.
- *Staff-Management-Module*: It offers the end-users to access details of their payroll. This module can also be integrated with a bio-metric system to maintain the real-time attendance records of the employees. It enables the employees to apply for their leaves and keep a record of their vacation days. There are different classes of sub-modules in this domain: a) Employee-Information-Management b) Time-and-Attendance, c) Payroll, d) Employee-Self-Service [13].
- *Inventory-&-Purchase-Management-Module*: It keeps a record of all the purchases made, stock available and/or consumption records, movement of assets within and/or outside the organization [14].

2. Related work

ERP as generally considered is not a relatively new concept. It begins during 1960s as inventory control system which later on evolved into MRP I (1970s) to MRP II (1980s), to streamline and increase the efficiency of production operations of business as it required arranging and managing huge databases. Slowly and steadily ERP system was developed which founded its roots in the foundation of almost all business practices nowadays. [15]. The journey of ERP adaptation in the business sector began when a German software company, Siemens collaborated with SAP in 1987 and implemented ERP. In 1988, Dow Chemical designed their own ERP and implemented it to enhance globalization of their business. It has been estimated that the ERP industry reached 70 billion dollars by 2004 [16]. Since then, the ERP industry is growing continuously and is now not just limited to business sector but is now expanded to education sector also. Furthermore, due to its effective usage the significance of post-implementation success of ERP is a critical pointer for success of an organization. It has also been efficiently pointed out that nowadays the organizations are more focusing on establishing an effective ERP rather than thinking about whether they need it or not. In other words, nowadays ERP has become an integral part of a business and how effectively the business can establish the ERP is a major concern [17].

ERP distinctly impact the functioning of the whole organization with usage of above 1000 modules & 10,000 program applications which normally cost from 3 million to 4 million for smaller units to as much as above 1 billion for larger units, this cost covers the maintenance, development of ERP for 1 to

4 years depending on how complex the ERP is. This cost investment affects the ERP adaption, and is one of the major critical success factors [18]. The effectiveness and its measurement have been studied by various researchers and their results have rendered the ERP system unsuccessful.

From the review of literature, the critical success factors can be classified into:

- a) Effect on data processing, labor decrease, time saving i.e., the unit work perspective.
- b) End-user standpoint – includes reliability, ease-of-use, security.
- c) The cost of ERP – which includes cost-benefit analysis, return of amount invested by organization [19].

In a survey by Tsichritzis, 1999, it was found that 40 percent of instigated ERP are fully effective and 20 percent are sparras as full failures [20]. Whereas Ptak and Schragenheim, 1999, reported that 60 percent to 90 percent of executed ERP are less operative than the anticipated [21]. It is a general conception that the education is an important factor which affects the training of end-users. But one should understand that both training and education are completely different from each other [22]. On one hand is education, which teaches the concept, how ERP affects functioning of an organization, end-user's familiarization with ERP amongst others. On the other hand, is training which is in actual is a hands-on operating experience of working with the ERP system including data input, understanding the functioning of each module of the implemented system in the organization, amongst others. Therefore, both education and training are two separate entities while analyzing the critical success factors [23].

The Educational ERP is an automated system devised specifically for the academic institutions for the smooth functioning of the organization. There are various advantages of using ERP in educational institutions, such as cost savings, data can be accessed with ease, organized database for each member of the institution, easy synchronization of updated data, etc. Along with this the fraternity members of the institution including administration staff, faculties, students, non-teaching staff, each can have access to the required database for their easy working [24]. During the literature survey, it was distinctly observed that ERP are generally employed in the technical-educational-institutions (TEIs). ERP is adopted for integrating the functioning of different divisions of any technical-educational-institution (TEI) and to use a centralized database for conduction of the workings of divisions with precision and suitability [25]. Generally, ERP comprises of two parts viz., hardware & software. Hardware includes the infrastructure of the ERP, which consists of computers, servers, network – intranet & internet, databases. Software consists of the information and data of all the modules functioning in the organization. Any failure in either of these two components of ERP leads to the failure of the system. Hence, both the hardware and the software are also the critical success factors of ERP adaptation. Another critical success factor is the security system of the ERP which includes the security of the database, information stored, access to the different modules of the system and admin control. Any breach into these domains directly affect the success rate of the adaptation process [26].

In spite of the challenges faced during and after adaption of ERP, business sector units are continuously using the ERP and elucidating their benefits continuously for last two decades. This have resulted in the adaption of ERP in the higher-education-institutions (HEIs) with an aim to increase the working efficiency of the organization. In 2004, Pollock & Cornford, discussed that the adaptation of ERP results in generating a tension amongst the employees of the organization which affects the working of the HEIs [27]. Same was pointed out by Feemster earlier in 2000, wherein it was described that when the ERP was adopted in college in U.S.A. as a merging manner with old and new database resulted in retraining of employees and instigating massive cost & pain [28]. In a study conducted by Frantz in 2002 it was pointed out that the HEIs prefer using the merge method of adoption as have achieved success in doing so [29]. Noaman, enlisted the major advantages of using ERP system in HEIs, viz.,

- (a) Accessing different divisions data-base in real-time by the end-users.
- (b) Usage of latest web and mobile-phone technology to allow the end-users and stakeholders to interact with the organization.
- (c) Ease of access to the information related to the organization planning and management

- (d) Reduced security related risks
- (e) Improved working efficiency of the end-users [30].

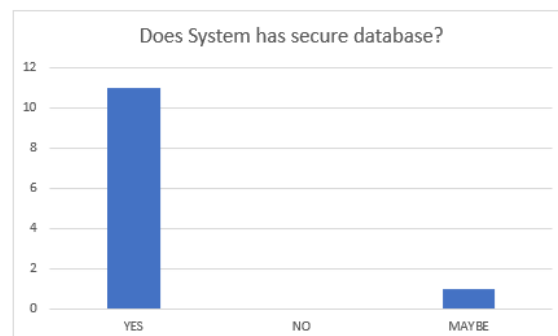
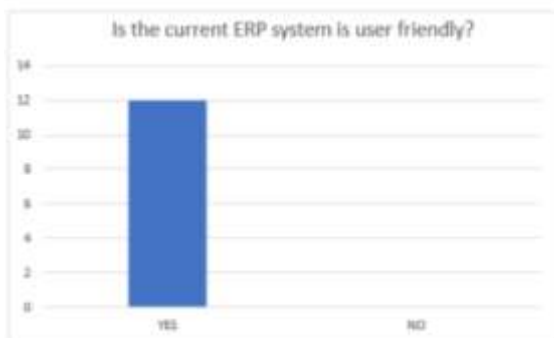
Sabau, et.al, in 2009 also added the technical usage and improved business as the benefits of adoption of ERP in the educational sector [31].

3. Methods and methodology

For the purpose of the research work the data collection was using the random snowball sampling technique. Firstly, the educational institutions wherein the ERP system has been implemented were identified in the region of Delhi-NCR. A total of six such higher educational institutions were selected, all these HEIs are autonomous-UGC approved universities, with different vendors for ERP system. Furthermore, the respondents from these universities were contacted to fill-in an online-based questionnaire survey which was specifically designed to gain information for three types of responders, viz., faculty, students and administration employees. The purpose of collecting data from faculty and students is to survey the end-users for determining post-implementation success and from administration employees to survey the implementation procedure. The total sample size including all responders is 427 from six universities.

4. Results and Discussion

Using three different sets of questionnaires responses were collected from three separate sets of end-users – administration employees, faculties and students respectively. The questionnaires were specifically designed for the purpose of data collection in relation with to determining the adequate critical success factors – cost, user-friendly, end-user training, security, work efficiency, ease-of-access, database, information availability. On reviewing the data collected it was observed that although the administration vows for the secure database, the other end-users are doubtful towards the security of the data. The end-users who have received technical education consider the ERP user-friendly. Those users who have been trained in the ERP holds the same opinion but for others the results vary. It is extremely clear from the data analyzed that the work efficiency of the employees is increased after the adoption of ERP in their organization. In terms of feedback and registering problems in relation with the ERP., the majority of universities are using digital mode of communication for registering the complaints, this also helps in keeping the track of the types of complaints received and the solutions provided which can be centrally monitored by the university administration. Despite of the user-friendliness of the ERP a major number of responders still wants to save the data with themselves as they are concerned about the security and sustainability of the ERP.



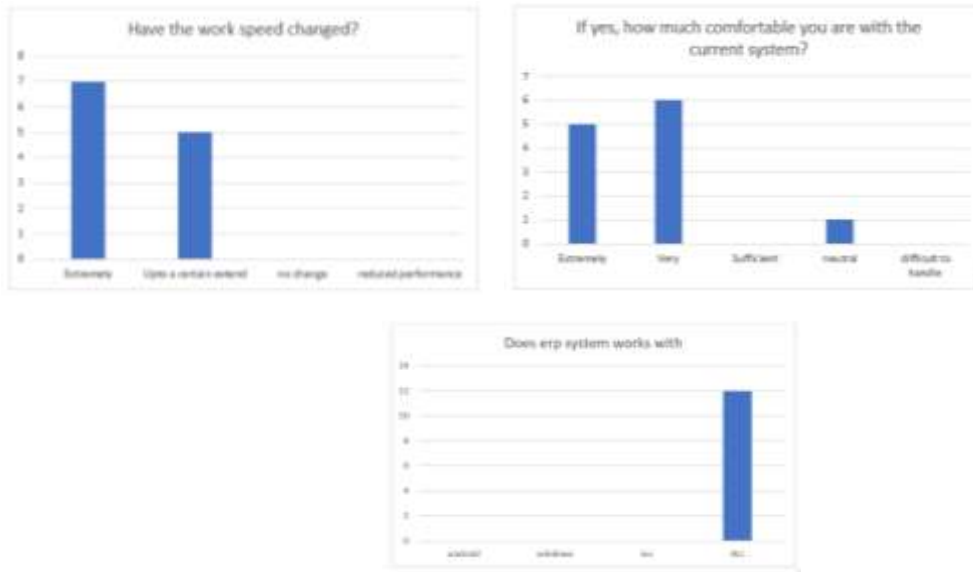


Figure 2: Responses of Administration Employees

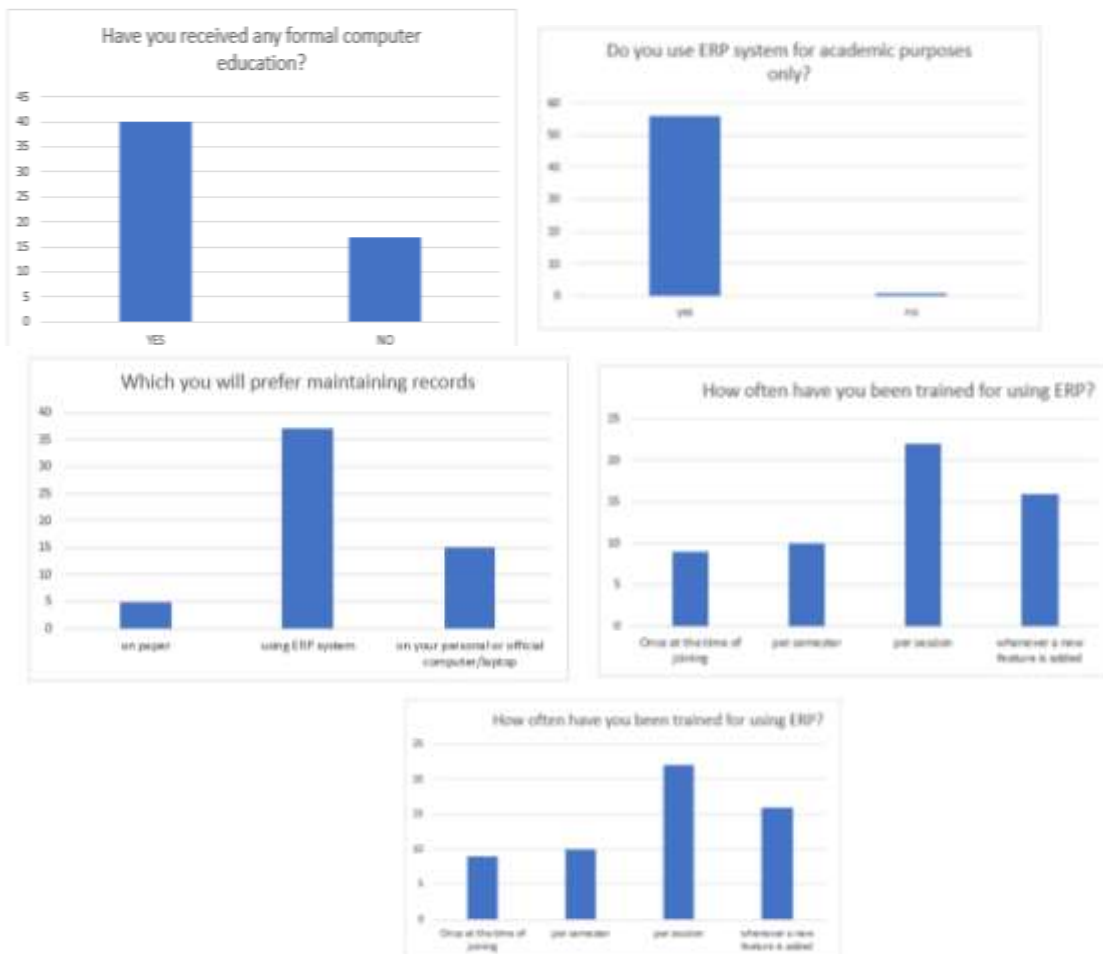


Figure 3: Responses of Faculties



Figure 4: Responses of Students

5. Conclusion

ERP implementation is not only a tedious task as well as very expensive investments the risk factor is also very high, and having failure rate of ERP exceed the costs of system significantly. Ensuring successful Enterprise Resource Planning ERP system implementation in any domain of business need to required considerable research work in the present time and feature also. Although, Post Implementation success/failure critical factors distinctly contrarily defined by different sectors, organizations, units, which have adopted ERP but satisfaction of the operational system with usefulness. In addition to this, usual ERP employment study can be measured as a statistic-factor-research, which is unable to elucidate the dynamics of the execution procedure. This study has revealed that the critical success factors for determining the effectiveness of ERP adaptation is greatly dependent on the end-user training, cost input, step-wise implementation rather than the big-bang approach and lastly the technical training of the users.

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