

Enterprise Resource Planning Systems in Higher Education Context: Functionalities and Characteristics

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ABSTRACT: Enterprise Resource Planning (ERP) vendors in Higher Education Institutions (HEIs) rapidly get a new market opportunity as a result of computerized business activities. Enhancements or mere adaptations of these solutions, which derived from business sector experience were not continuously effective. The article focuses on the field of ERP systems and their use in HEIs covering universities, faculties and independent institutions of higher education. Furthermore, new technological advances have placed HEIs into challenging competition while their financing concurrently has been repeatedly declined. As a result of these increasing pressures, there has been a necessity for HEIs to improve operational efficiency and to decrease resources reduplication by applying advanced information systems that span the institution and develop their practices. Accordingly, HEIs have concentrated their efforts to adopt and implement ERP systems. The purpose of this paper is to enhance the discussion on the meaning of ERP systems especially in higher education context by focusing on the characteristics generally attributed to ERP and indicates how ERP is in Business and Its Characteristics as compared to ERP system in Higher Education. Finally, the paper tries to shed light on ERP functional and non-Functional requirements in the higher education context.

KEYWORDS: Enterprise Resource Planning, ERP systems, ERP Functionalities, ERP Characteristics, ERP functions, higher education, HEIs, Egypt.

I. INTRODUCTION

The ERP system has emerged as a popular choice, worldwide, as the system has the potential for those universities adopting the system to streamline their operations to enable increased levels of productivity and profitability; leading to an overall improvement in an organization's efficiency [1]. A system of ERP is not simply an automation of an organization's business processes. ERP enables an opportunity for an organization's business processes to be re-engineered and this can auger well for an organization's success in the long-term. A system of ERP provides a number of benefits including the capacity for better data analysis, improved levels of organizational performance and efficiency due to enhanced processes in place that allow for improved levels of customer service. These advantages that the ERP system can provide to enables organizations to be more competitive in the market [2].

The vast Egyptian higher education sector encompassed of the public, private and international universities besides technical and professional training institutions. There are many problems that occur in this sector and ERP systems can be a positive solution that play a role in mitigating and reducing the effects of these problems. Unfortunately, to date, the complete use of ERP systems have not been adopted by the biggest part of Higher Education Institutions (HEIs) in Egypt [3]. More importantly, the Egyptian higher education sector is now at the point where it has to implement a business software to improve and enhance the efficiency of the university processes. Adopting and implementing an ERP solution has an impact on all aspects of a business, affecting activities and processes, organizational structure and the environment [4-7]. According to Soliman and Karia [8] Egyptian higher education institutions can gain a competitive advantage from adopting ERP system that allow them to produce higher quality educational services for lower costs and to use their resources most effectively.

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There is growing interest in the influence of ERP systems on operational performance at each ERP function and at the systems level [9]. The ERP system is much deeper than a simple collection of information processing functions that support various intra and inter-firm activities. ERP system underlies modules and that the connections and interdependencies among the modules improve operational performance [10-12]. Numerous studies have demonstrated a significant relationship between the number of ERP modules implemented, on the one hand, and operational performance on the other hand [13-15]. Therefore, this study tries to focus on ERP functions and characteristics well to understand how to improve Performance, especially in the higher education context.

The present paper has attempted to contribute to the discussion on the meaning of ERP systems especially in higher education context by focusing on the characteristics generally attributed to ERP system. Similarly, the study indicates how ERP is in Business and Its Characteristics as compared to ERP system in Higher Education. Moreover, it concludes on ERP functional and non-Functional requirements in Higher Education. To sum up, this paper has attempted to set an idea concerning how to motivate HEIs in Egypt to adopt and implement ERP by introducing well defining ERP characteristics and functions consistent with higher education context that enable them to improve operational efficiency and to reduce duplication of resources.

II. GENERAL CHARACTERISTICS ATTRIBUTED TO ERP SYSTEMS

According to Brown [16] an ERP system can be defined as an integrated commercial package that supports, in real time and in an integrated way, the management of furthestmost if not all of an organization's business processes. One can get a better definition of ERP systems by looking at their characteristics and functions. Accordingly, a focused and professional literature will indicate quite a number of characteristics believed to be possessed by ERP systems. Characteristics commonly featured to ERP systems in the literature are shown in Table 1. In doing so, an attempt has been done to comprise all characteristics, notwithstanding the diverse terminologies used by many authors in indicating them.

Characteristics	Explanatory elements
Integration	Interconnections between functions and hierarchical levels, and The interaction between the various processes.
Completeness (generic function)	A wide range of functions, Applicable to various types of firms, and Connectivity with the outside.
Homogenization	Unique data referential, Uniformity of human-machine interfaces, and Unicity of the system's administration.
Real-time	Real-time update and consultation.
Adaptability (flexibility)	Capability to follow rule and organization changes (made possible by parameter-in).
Openness (evolutionary)	Modularity, and Portability.
Transversality (process-oriented view)	System designed in regard to the business processes necessary to achieve objectives, and Focus on value rather than authority flows.
Best practices	The system embeds best practices in the field.
Simulation	Business processes can be simulated.

Table 1: Recapitulation of the main characteristics of ERP systems [17]

Uwizeyemungu and Raymond [17] indicates the identification of three characteristics of the ERP system tended to be crucial if a system is to be qualified as an ERP system, namely integration, flexibility, and transversality as they have been categorized under three dimensions in regards to their nature, namely technical, organizational and informational.

III. ERP IN BUSINESS AND ITS CHARACTERISTICS

The ERP systems gained its global popularity as the so an application that would ascertain high profitability, increase businesses' efficiency, productivity along with streamline their operations [1]. ERP is a term used to define a large amount

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

of activities supported by an application multi-module that supports business management. These activities contain product planning, acquisition of components, maintaining inventories, interaction with suppliers, customer service, and orders tracking. This system may also comprise modules of human resources and others [18]. An ERP may be described as an incorporated system too, what makes possible a single information flow, continuous and consistent for the whole company under a unique database [19]. Systems like ERP have been integrating many other modules, what makes their application important for business operation. Table 2 shows the main characteristics of an ERP.

SN	Features	Utility
1	Financial Accounting	General account payable Ledger, Account receivable, and legal consolidation.
2	Controlling	Cost center accounting, Product cost controlling and activity based costing.
3	Asset Management	Insurance, property value and depression of fixed assets.
4	Project System	Project management, Project tracking and budget management.
5	Human Resources	Information relating personnel and personnel administration, planning and development.
6	Quality Management	Quality Planning, Inspection processing, quality certificates, quality notification.
7	Plant Maintenance	Maintenance of technical object like equipment, functional location, Preventive maintenance, Service management and maintenance order.
8	Production Planning	Operation Planning, MRP, Shop floor control, capacity requirement planning.
9	Material Management	Inventory management, invoice verification, purchase management.
10	Sales and Distribution	Sales order management, Delivery to customer, invoice verification.

Table 2: Enterprise Resource Planning (ERP) systems typically include these characteristics [18]

IV. HIGHER EDUCATION ERP SYSTEM AND ITS CHARACTERISTICS

ERP system may encompass customer relationship management (CRM), human resource management (HRM), marketing and accounting software (MAS), students and academic resources (SAR), supply chain management (SCM), and library information system (LIS) [20, 21]. According to [22] ERP systems that serve administrative and academic sections in Saudi universities cover the following administrative sectors like Human resource, Financial management, Procurement management, Where house (store) man, Student registration mana, Library management. Soliman and Karai [23] reported that ERP system can be described as an innovative technology for greater higher education best practices because of its beneficial consequences

Private businesses, mainly in more competitive environments compared to the non-profit ones, gained many benefits from ERP during the past decades moreover the difficulties of implementing ERP [24]. In recent times, universities have been affected by worldwide movements towards performance needs and management efficiency to invest on ERP. Nevertheless, it is imperative to indicate that it is difficult to ascertain the benefits that come from these applications in terms of performance outcomes and organizational services [25]. The existence of These difficulties as a result that universities, regardless of other businesses, deal with dissimilar circumstances and environments as they use ERP for academic purposes [22]. Althonayan [26] explains the modules usually included in university ERP systems are illustrated in Table 3, taking as an example SAP for Higher Education (HE).

SN	Modules
1	Financial management
2	Enterprise asset management
3	Human capital management
4	Performance management
5	Procurement
6	Governance and compliance
7	Business service
8	Grants and funds management
9	Relationship management, institutional development and enrollments and management
10	Student lifecycle management

Table 3: Processes in SAP for HEI [26]

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

Generally, these systems give diverse benefits to organizations if they are implemented correctly. Even so, not all ERP implementations bring beneficial outcomes. There are situations in which the implementation failed entirely. There have been a lot of tough and expensive implementations that affected organizations negatively [27]. The main problems of ERP implementation are related to technological complexity, compatibility, normalization and so on, but particularly what concerned to the organization and human relationships like changing resistance, organizational culture, incompatible business processes, bad project management, high direction compromise, etc. [24].

V. ERP FUNCTIONALITIES IN HIGHER EDUCATION: FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

Universities throughout the world fight to revamp their identity within an era focused on “commercializing higher education”, software vendors are progressively considering the education market as a worthwhile “industry” potentially worth many hundred billion dollars in revenue [28]. The increasing popularity of ERP technology within the current undefined educational environment has the possibility to redefine intra-organizational operations and transform administrative functioning within many universities.

According to Noaman and Ahmed [24] though the ERP space in higher education is moving rapidly, none of the ERP vendors considerate the higher education ERP real functionalities and the existing ERP in the market is not developed enough to meet the higher education requirements. However, Because of the growing competition Vendors are doing much better now than previously to understand the needs of higher education.

Accordingly, this is the present situation of ERP system in higher education. The real functional requirements describe what higher education ERP system should do while non-functional requirements place constraints on how the higher education ERP system will do so, built on that it is valued to distinguish between higher education ERP functional and non-functional requirements [24]. An example of functional requirements for the higher education ERP system is shown in Table 4

Seq	Functionality	Seq	Functionality
1	Institution profile	16	Internal messaging
2	Staff profile	17	Alumni management
3	Student profile	18	Hostel management
4	Feedback mechanism module	19	Transportation management
5	curriculum	20	Stuff attendance
6	Performance analysis	21	Semesters Calendar
7	Attendance	22	Library management
8	Scorecard	23	Accounting
9	Online examination	24	Fees management
10	Online assignment	25	Academic advising
11	Admission	26	Ad hock reporting
12	Payroll	27	Asset Management
13	Timetable	28	Job / requirements analysis
14	Event management	29	Labor market demand
15	Noticeboard	30	Education / labor market observatory

Table 4: Functional requirements for the higher education ERP system [24]

The functional requirement is indicating the behavior of the system as it relates to the system's functionality. The non-functional requirement enlarges a performance characteristic of the system. Typically, non-functional requirements fall into areas as shown in table (5):

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

Seq	Functionality	Seq	Functionality
1	Accessibility	13	Portability
2	Capacity, current & forecast	14	Quality
3	Compliance	15	Portability
4	Documentation	16	Quality
5	Disaster recovery	17	Response time
5	Efficiency	18	Robustness
7	Effectiveness	19	Scalability
8	Extensibility	20	Security
9	Fault tolerance	21	Stability
10	Interoperability	22	Supportability
11	Maintainability	23	Testability
12	Privacy	24	SLA

Table 5: non-Functional requirements for the higher education ERP system[24]

Eventually, the opportunity of having appropriate ERP system for higher education can be done simply and successfully in case we have a clear definition of the higher education ERP functionalities, then can be classified into higher education ERP modules as per the ERP products in the market.

VI. CONCLUSION

This paper ascertains that ERP system is not a mere acquiring of ERP application. Current ERP systems for business have a diverse group of functionalities that is meaningfully dissimilar from the academic functionalities required for higher education institutions. ERP for higher education should be tailored definitely to address the academic functionality. Hence, ERP for higher education should begin with the organization structure including strategy / policy, data flow, business processes structure, and academic functionalities as a unique discipline. This paper is supposed to be means to an end, that end being innovation for using ERP in higher education in full satisfaction, nowadays the means become the End. There is a common misconception in the ERP market confirms that getting a state of the art ERP application is the end, on the contrary, having the ERP in not the end, but it is the means where the end is the ultimate user satisfaction. Finally, as universities can move toward some best-practice models, the possibility of having proper ERP system for higher education can be done easily and successfully in case we have a clear definition of the higher education ERP functionalities, then can be classified into higher education ERP modules as per the ERP products in the market.

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