

The essential characteristics of an enterprise resources Planning System (ERP) and the indicators to operationalize these characteristics

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Abstract— Although there have been a lot of researches on ERP, there is a little research that examines the essential characteristics of ERP in terms of the indicators of successful operationalization and users' acceptance. Many of previous research have encompassed internal and external conditions that affect ERP implementation and operationalization, but there wasn't consideration of indicators and variables to operationalize ERP systems. This paper is intended to explore the essential characteristics of ERP operationalization.

Index Terms— ERP, characteristics of ERP, ERP implementation, successful factors of ERP, ERP operationalization, indicators of successful ERP.

1 INTRODUCTION

The concept of ERP has attracted most organizational initiatives to integrate it with their operations. In research, some researchers describe ERP systems as a full solution that conveys to all information needs of organizations [1]. ERP systems can integrate complex information and business data of all organizational areas and departments. ERP implementation is extensive and tough process; it integrates many business areas such as customer service management, supply chain, human resources, manufacturing, finance, budget, and sales. The acceptance of information systems includes technology acceptance model, task technology fit, and computer self-efficiency, and they can be explained based on different theoretical models [2].

Managers should pay their attention to the adaption and development requirements of ERP either due to changed partners or the nature of internal and external customers' types, in order to support their needs. Hence, ERP operationalization - during implementation and running- is affected by all involved partners, customers, employees, and users [3].

ERP system has many forms; it could be targeted for academic purpose such as student and academic resource planning and library system management, or for human resource management such as customer relationship management, or even for accounting objective such as financial and marketing resource management [4].

ERP life cycle phases are explained below:

- Define business rules, constraints, and policies to build business case.
- Configure and implement ERP system and run up it by experts.
- Trouble shoot bugs, errors, and running issues.
- Users' support and maintenance, upgrade system, and extend system [5].

Up to now, there is no dedicated study that has examined the

critical opportunities emerged by ERP systems. Moreover, the characteristics of ERP that should be existed to operationalize supported operations and processes are not discussed yet.

2 RELATED WORK

The latest study with title "Enterprise Resource Planning Systems in Higher Education Context: Functionalities and Characteristics" has purposed to provide a valuable discussion about ERP systems by focusing on the general characteristics and indicators of ERP systems in higher education institutions. This paper tried to underline the functionalities of ERPs systems that support higher education sector. The paper concluded that academic institutions require high functionalities from ERP systems that should be customized to meet their needs and expectations. Higher education institutions have complex strategies, policies, and structures that challenge the development of ERP systems. Nowadays, higher education and academic institutions begin to move on the way of implementing the best ERP practices and models. ERP systems cannot be easily implemented in higher education; they need to a clear elaboration of purposes and expected results [4].

Another study introduced by Batada & Rahman that has mmeasured the performance of ERP systems using a model that considers four connected dimensions; customer, financial, development, and business case. The paper considered a questionnaire to collect required data from the major targeted areas in Pakistan in order to evaluate the current state of ERP implementation. The study has concluded that user satisfaction is the key characteristic of ERP system. This paper has focused on clearly identification of the current problems and failures of ERP implementation. Hence, the study has stated a set of recommendations and findings that are can make a difference in the real performance of ERP systems. Finally, the paper has well identified the major indicators of successful ERP systems according to their performance and the role in business development [6].

The study of Uwizeyemungu & Raymond has outlined the

major concerns related essential characteristics of ERP that are required to success implementation and operationalization. The major characteristics of ERP systems are: flexibility, adaptability, integration, and compatibility. In addition, the paper outlined the significance characteristics and indicators needed to operationalize ERP systems. The paper has concluded that the framework of ERP systems is extremely affected by the overall organizational settings and strategies [7].

The implementation of ERP systems and knowledge management has been considered in the paper of (Huang et al, 2002). The authors have taken a set of organizations among several nations in order to measure and evaluate these systems in terms of flexibility and efficiency. From theory and practice perspectives, they have outlined the distinguishable characteristics of ERP systems under different implications. The main contribution of this study has enriched the research regarding the characteristics and indicators to success ERP systems. Another significance role of this study was the identification of some essential issues from different perspectives [8].

3 ESSENTIAL CHARACTERISTICS OF ERP SYSTEMS

From experts and researchers perspectives, this paper intends to reveal that ERP systems have many essential characteristics needed to success the project implementation taking into account different factors.

There is an increasing interest in ERP systems due to the great benefits that can be obtained. A little researches have studied the impact of ERP implementation on the operational performance, taking into consideration the essential characteristics and functions of ERP that can enhance the performance and sustain the success [4].

The largest investment on ERP projects in many organizations affects the organizations budget, IT departments, activities, processes, organizational structure, work environment and other business areas [4]. The essential characteristics of ERP systems do not rely only on implementation phase, but they also depend on the configuration and running operations, including budget, effort and time resources [3].

Depending on the nature of information system, interdependent information systems characteristics are:

- Organizational impact.
- Individual impact.
- System quality.
- Information quality.
- User satisfaction.
- Usability and functionality.

The most essential characteristics of ERP systems should first be able to integrate and automate organization's business processes in real time environment, including sharing, analyzing, and managing information among all departments [5].

There are three dimensions of dividing ERP characteristics depending on the nature: the organizational characteristics,

individual characteristics, and technological characteristics. ERP systems have some essential characteristics that encompass technological, individual, and organizational characteristics. Figure 1 illustrates how these three characteristics are related and integrated to support ERP operationalization.

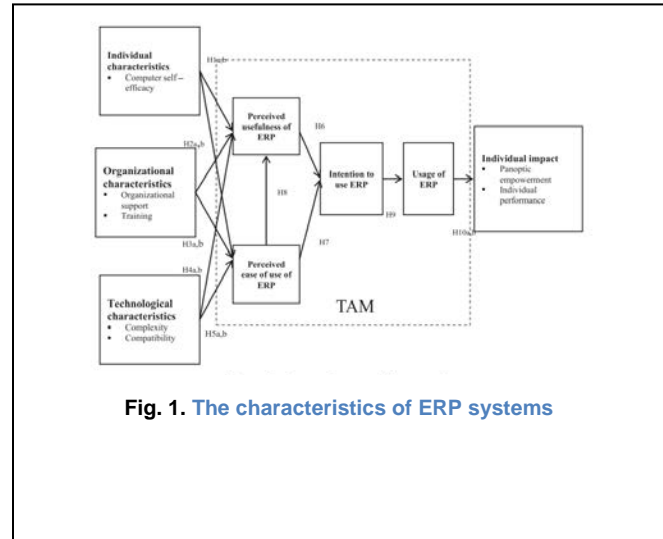


Fig. 1. The characteristics of ERP systems

5 Technological characteristics

Technological characteristics relate to the facilities and capabilities provided by ERP application compared with traditional systems such as development capability. Technological characteristics involve two parts: the openness and the adaptability [7]. The acceptance of information systems includes technology acceptance model, task technology fit, and computer self-efficiency, and they can be explained based on different theoretical models [2]. ERP systems operationalization reveals some implementation issues and problems; these issues regard to complexity of programs, technological and technical issues.

The current opportunities of ERP system including technological development purposes require many resources. Development methodologies are also required to maintain tools and systems of ERP. Therefore, the performance of operations processed by ERP should be accepted by the user regarding the speed and the quality of generated solutions. At the end, ERP systems should meet resources, operations, development and maintenance requirements; at well as emerging flexible solutions within reasonable time, effort, and budget [9].

6 Organizational characteristics

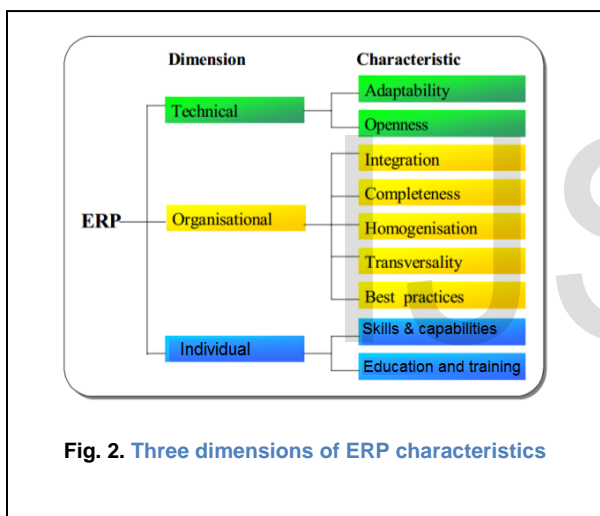
Organizational characteristics are the nature of organization and the business type of the organization. They also include the strategies, structures, procedures, and policies that the organizations hold to deploy systems. This dimension of characteristics is the most essential component that has the biggest impact on ERP system since it is reflected by the structures and practices. Organizational characteristics include the homogenization, inclusiveness, and integrative [7].

Organizations should provide adequate support for their employees in order to enhance their productivity and motivate them to use new systems in work environment [2]. In particular, organizational culture and project management compromise a high direction for organizations to employ ERP systems successfully [4].

7 Individual characteristics

Individuals should have the ability to judge of their capability of organization and execution of required activities to achieve desired performance. ERP systems require serious training and education from top management to successfully implement those systems because of popular failures of ERP systems implementation refer to the poor training and education[2].

Information characteristics relate to the beneficial and useful information offered by ERP systems in order to present the quality of real time information needed for actual practices in business [7].



8 OPERATIONALIZATION OF ERP SYSTEMS

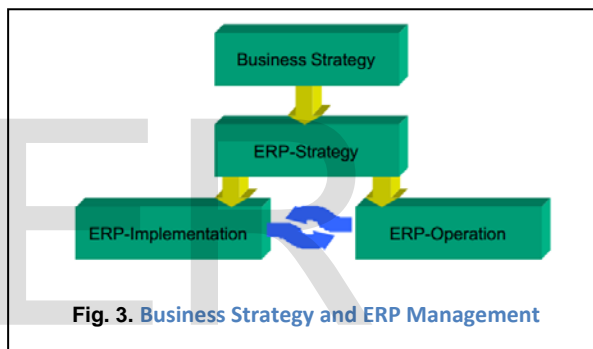
ERP implementation requires organizations to ensure of correct understanding and acceptance of changes emerged by ERP systems by activating efficient communication. ERP systems are complex in nature and require serious training and education from top management to successfully implement those systems [2]. Popular failures of ERP systems implementation refer to the poor understanding of system benefits to the business process, while it cannot be achieved without well training and education [2].

ERP systems have the greatest impact on internal and external operations, according to their complexity purposes and implementation. The sensitive information such as financial and production information makes the serious challenge to the management [10].

There are many considerations to successfully operationalize ERP systems, but the main criteria is to find the proper structure that conveys better interaction between different levels as well as the structure of ERP systems that include the flow of tasks, operations, and information [11].

Contingency variables such as the size of organization, technology factors, individual characteristics, and organizational structure form other essential considerations to operationalize ERP systems [12].

To operationalize ERP systems, the structure of the management should divides the processes and tasks across current organizational structure. Additionally, the management should takes into consideration to combine both business strategy and ERP strategy in order to successfully operationalize ERP systems. ERP projects have two essential inputs: ERP-strategy and business strategy. While the interaction between ERP implementation and ERP operations are required at all operationalization processes [3].



ERP systems operationalization reveals some implementation issues and problems; these issues regard to complexity of programs, technological and technical issues, normalization and maintenance problems, and compatibility and adaptability issues. For example, incompatible business processes and changing resistance of human relationship could be some concerns to the management. The complexity of ERP implementation comes from the socio-technical challenges regarding users' acceptance of a new technology [2].

In particular, organizational culture and project management compromise a high direction for organizations to employ ERP systems successfully [1].

9 INDICATORS OF SUCCESSFUL ERP SYSTEMS

Many organizations realize the usefulness of ERP systems that carry different benefits to the business operations, while many others are afraid from the high costs of some failed ERP systems [1]. There are some standpoints that the success of ERP systems depends on; these standpoints are distributed over ERP system development life cycle. The first stand point is the operational requirements that imply to have the expected functionality of ERP system once it implemented. The second

is the financial requirement that encourages the organization to focus on different key indicators to determine ERP system, such as performance and financial indicators. The third standpoint is the implementation requirement that decide whether the ERP project implementation matches the time and budget constraints as anticipated [1].

IT infrastructure in the organization should be flexible to adapt rapid changes and conditions in order to enhance the performance and to sustain and improve the competitive advantage especially in terms of upgrading entire resources [7].

The key feature of ERP systems is to enable the organizations to have an opportunity to redesign and reengineer business processes that manage long term strategies for sustainability success. ERP systems in general maximize performance levels, present better data analysis, enhance productivity of employees, improve efficiency of customer service, and at the end pretend a competitive advantage within the marketplace [4]. There are a set of indicators of that facilitate to determine how to correctly operationalize ERP systems:

- Changes indicators that are triggered based on the actions and behaviors of control and management inside the organization.
- Quantitative indicators such as performance levels and rates.
- Wellness indicators such as quality based indicators that help to define how ERP systems yield better advantages.
- Profits indicators that used to measure the operations outcomes and obtained results from ERP operationalization.
- Practical indicators related to work environment processes and practices (Selmeçi et al, 2012).

10 CONCLUSIONS

A few publications have discovered the essential characteristics of ERP operationalization in terms of which approaches and what the advantages and disadvantages of each approach. The current paper highlights what should be taken into consideration to operationalize ERP characteristics such as: system flexibility, integration, and compatibility. It also proposes a framework to examine the impact of these essential characteristics on ERP systems performance and settings.

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