A study of published Literature on ERP: An attempt to find Gaps for further research

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Abstract:

According to the APICS* dictionary, Enterprise Resource Planning (ERP) is a: "...framework for organizing, defining, and standardizing the business processes necessary to effectively plan and control an organization so the organization can use its internal knowledge to seek external advantage."

***Enterprise resource planning (ERP)** is defined as the ability to deliver an integrated suite of business applications. ERP tools share a common process and data model, covering broad and deep operational end-to-end processes, such as those found in finance, HR, distribution, manufacturing, service and the supply chain.(*www.gartner.com/it-glossary/*)*

ERP systems are very complex systems which are integrated in nature, huge and address the needs of all the departments across the organization. These systems are a deviation from the traditional way of functioning where by organizations followed separate individual systems for each department. HR system for example used to be a separate system and the inventory management system used to be a separate system. Sales department had a separate billing system while there was a separate system for production. This traditional way of working and the modern day ERP systems are eons apart in their approach to address the system needs of the organization. This huge difference in the way of working results in a huge impact on the organization as well as the individuals working in the organization.This impact gives rise to various issues which deserve a study giving rise to various research areas.

In the beginning research in the area of ERP focused on the ERP implementation itself as a research area. These early studies were very primitive in nature and many times were plain descriptive studies on those organizations which implemented ERP.After this phase the focus of ERP research slowly shifted to other facets of ERP implementation, and researchers started to look at other problem areas arising out of the ERP implementations. The change ERP brought about in the functioning of organizations was huge and the various questions arising on account of this huge impact were research areas which attracted inquisitive researchers. Very soon the body of knowledge on the subject expanded into a collection of studies addressing different facets of ERP and it's impact.

A study of different published studies on the same shows the following research areas were addressed by different researchers:

Critical success factors,

Organizational impact,

Economic Impact,

Cost –benefit analysis and so on.

In this paper we are making an effort to study the ERP related publications / papers published so far , categorize these into research areas and then we will try to find gaps if any which are available for fresh research into ERP. This study attempts to answer the following questions:

1. What is it that is already available in terms of research in the ERP Domain?

2. Which area in the ERP domain has not been studied so far and is available for fresh research.

*APICS The Association for Operations Management is the global leader and premier source of the body of knowledge in supply chain and operations management, including production, inventory, materials management, purchasing, and logistics.

The various research questions further led to the development of the major ERP research areas:
1. ERP systems Critical Success Factors (CSF) which examines a variety of topics, ranging from system implementation, user acceptance, and adaptation to domain specific ERP factors related to country, culture, and industry,
2. ERP organizational impact research which includes research focused on business processes, management control, security, regulatory, and organization change issues, and
3. The economic impact of ERP systems both external and internal. From each of these major areas a more refined set of research topics arose. (Grabski, Leech, & Schmidt, 2011)

1. Critical success factors

Initially research around the ERP Critical success factors was focused on identifying critical success factors

The literature on ERP systems Critical success factors (CSF's) grew very fastand quickly matured to the extent that it moved on from identifying the critical success factors to examination of specific Critical Success Factors in ERP systems and measurement of the impact of each CSF   (Grabski, Leech, & Schmidt, 2011).

As with time the research done on ERP matured further, it was recognised that organizations do an evaluation of the success of ERP implementation.They evaluate the success by comparing the actual benefits of ERP to what benefits they had planned to draw from an ERP implementation. So from this evolved the post implementation phase research area.

Based upon the ERP organizational impact studies, many other research areas came into existence thathave been studied using a variety of research techniques, including grounded research techniques, longitudinal studies, and cross-sectional research. Research has been done to address questions regarding regulatory compliance, how organizations adapt to their environment, system security, and audit of ERP environments, managerial use of ERP system reports and management control systems, Research on regulatory issues and impact on policy has resulted from external pressures and mandates upon organizations yet there is very little research that focuses on empirically documenting these advantages.

 (Esteeves & Pastor, 2001), This review focuses on finding what areas in the ERP domain are yet not studied and hence tries to find the way forward in ERP research.

The next section focuses on the research done so far on ERP Critical Success Factors research, and then a section which will review the organizational impact studies. Then the study will have an analysis of the economic impact studies.

This review then presents suggestions for future research based upon the gaps that appear to be there in the extant literature.

II. ERP CRITICAL SUCCESS FACTORS

Here, we review the literature that attempts to identify the factors necessary for a

successful ERP system implementation andsuccessful on-going usage. The ERP critical success factors (CSF) topic is one of the topics thatis the most researched area in early ERP research. This research has identified many contributing factors, but has not fully succeeded in specifying the necessary and sufficient factors. (Moon, 2007)

Finally, this section concludes with a review of the research surrounding post-implementation issues.

Critical Success Factors Research

A very large amount of amount of ERP research has focused on identifying the factors critical forsuccess in implementing ERP systems. ERP systems are very expensive, complex, impact theentire organization, and if they fail, they have the potential of contributing to the failure of theorganization itself (Scott, 1999). Critical success factors have been defined as those fewthings that must go well to ensure success for a manager or an organization (Boynton & Shanks, 1984). CSF were developed to help identify critical areas of importance for successful implementation and provide measures that would aid in the management of those areas (Boynton & Shanks, 1984)

Various studies identified a set of core factors that are very importantfor the success of ERP implementations, such as top management support, the implementation team, organization-wide commitment to the system, and fit between the ERP systems and the organization (Boynton & Shank, An assesment of critical success factors:ERP, 1985)

 (Leary, 2000)examined the role of ERP systems in a number of e-business initiatives and found ERP systems provided the infrastructure and technology that allowed major changes in processes that supported e-business.

Other studies have used different approaches to identify critical success factors for ERP implementation success. (Bradley, 2008)examined success factors based upon classical management theory,(Bradford & Florin, 2003)based their study upon the theory of diffusion of information, and(Wu & Wang, 2007)explored organizational process fit of the ERP system.

There is so much existing literature published on critical success factors that it gives an impression of critical success factors research being a very mature area of research in the field of ERP. But each individual critical success factor itself has the potential to qualify as an independent research area. Also comparison of different critical research factors, their significance and criticality can be yet another avenue of research topics.

Main areas of research identified by critical success factors research

The critical success factors research consistently identified many areas that are critical to the success of ERP implementations. Here an attempt is made to examine the areas identified one by one:

Business Processes

Business process reengineering (Malhotra, 1998)is mentioned many timesin different studies as one important "critical success factor"

ERP implementation decisions also focus on the extent to which work processes

will be different from past practices in favour of redesigned business processes or "best practices" (Huang, Chang, Li, & Ling, 2004)

Change Management

Another critical success factor for ERP systems: "Change management", Was found from research in the organizational change management and information systems disciplines. (Buckhout, Frey, & Nemec, 1999)

ERP change management studies include individual case studies (Ross, 1999), comparative case studies (Chiang, 2013),empirical studies assessing multiple firms' implementations using interviews (Markus, Axline, Petrie, & Tanis, 2000).

User Acceptance

There is alot of published research on ERP systems which talks about implementation and other technical issues such as efficiency, effectiveness, and business performance. But there is not much attention given to the social context, that is, user acceptance, in determining the organizational success of ERP systems (Bourdreau & Robey, 2005)

Post-Implementation Phases

Many Literature reviews indicate (Esteeves & Bohorquez, An updated ERP systems annotated bibliography : 2001 -2005, 2007)that a majority of ERP research is focused on ERP selection, success factors, and the implementation phase, but there is not much attention or research done on the post-implementation impacts. This gives us a critical research gap, as there is a great need for continued improvement and assessment as ERP use evolves over time. On the most basic level of post-implementation review, the organization many times is unable to pre decide on the measurable outcomes and hence the factors on which latter the system success will be evaluated. So also deciding on the metrics for measurement before the implementation is one more area where organizations lack.

(Nicolaou, 2004)studied the process of ERP system post-implementation review. Basedupon prior research and a case study of two firms, the research postulated that the postimplementation review moderated the success of the ERP project, and a conceptual framework of post-implementation review quality was developed.

III. ORGANIZATIONAL IMPACT

This section focuses on reviewing the literature that attempts to identify the organizational-level impacts of an ERP system. More and more, theories applied to the ERP domain are acknowledging effects on organizations from the interaction between the social and technical nature of ERP systems. Just as ERP-related change influences individual employees requiring change management strategies; it can also alter the nature and culture of the organization itself.(Grabski, Leech, & Schmidt, 2011)

Organizational Change

When the techno change approach is appliedfor analysis of the organizational impact caused by an ERP system we find that each lifecycle phase in an ERP implementation involves both new IT functionality and related organizational changes, such as redesigned business processes, new performance metrics, and training

(Ke & Wei, 2008)have written theories about the impact of top management and organizational culture on ERP implementation, and they came out with a series of propositions which showed the relation between ERP implementation success and organizational culture and strategic decisions made by top management. ERP success isdependent upon how well the ERP system matches the organizational culture. Additionally, there is research proposing that the organizational culture can be modified by top management, especially when transformational leaders are in place. As a result, we can say that the success of the ERP implementation is related to the organizational culture as it relates to learning, participative decision-making, power sharing, support and collaboration, and risk and conflict tolerance, and how a desired culture can be fostered by top management (Ke & Wei, 2008).

Organizational Control Strategies

There is a wide range of effects that an ERP system has on the organization. These effects can be managed positively in such a way that they help the organisation to improve its decision-making capabilities.Improvement in decision-making is often used as one of the important non-quantifiable benefits when an organization proposes implementing an ERP system and also be used as a catalyst to restructure the organization. . (Grabski, Leech, &Schmidt, 2011) . Since information can now be easily shared, the organization structure can be flattened.

This section dwells on the review of literature surrounding the use of decision support via ERP systems and managerial control systems.

Decision Support and Business Intelligence

ERP systems are integrated and all inclusive enterprise recordkeeping systems. Decisionsupport systems, DSS, and business intelligence -BI systems, i.e., analytical systems, are designed to support decision-making, either through various generalized or specialized decision aids or through the examination of significant volumes of data coupled with the appropriate programming intelligence to help generate valuable information for decision-making (Holsapple & Sena, 2005). ERP systems, while not a DSS based upon traditional definitions, offer substantial decision support benefits due to the integrated database inherent in ERP systems .

Management Control Systems

The impact of ERP systems on management accounting and on management accountants hasbeen the focus of a considerable amount of research with mixed results. In Rom and Rohde's (Rom & Rohde, 2007)review of related literature, they report that the role of management accounting is becoming increasingly dispersed in the organization and that an understanding of the relationship between ERP systems and the design of management accounting techniques is lacking.

Let us take a look at the different research areas so far researched in the ERP domain by arranging them diagrammatically:

Figure 1: Research Areas
: The various research areas discussed above have been put into a diagram:
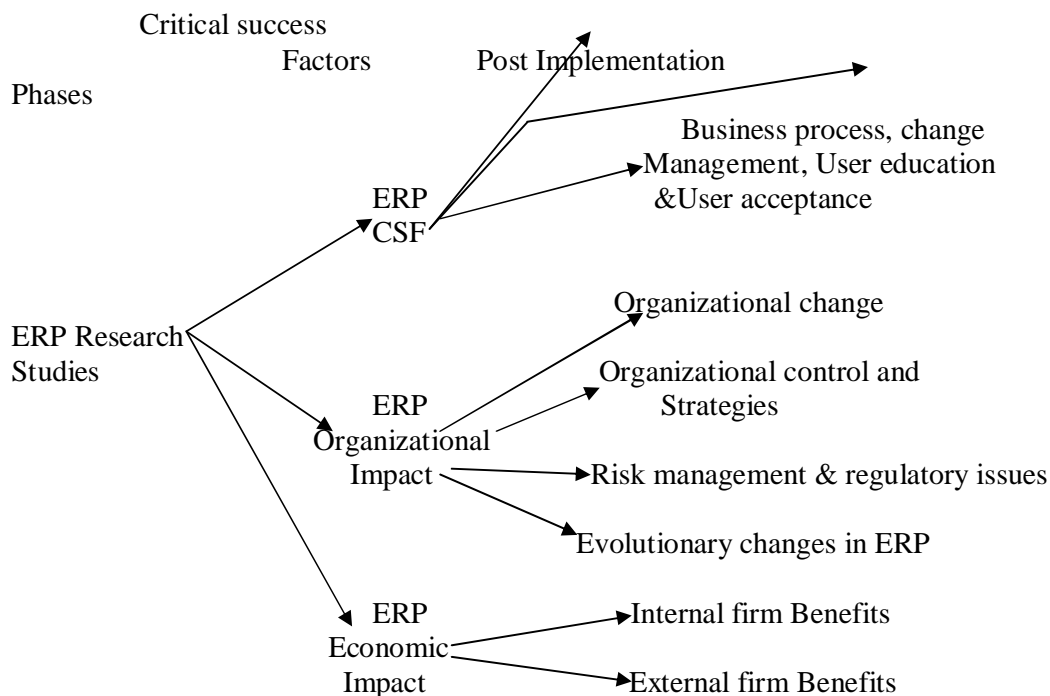

The above figure which summarises the different areas of research in ERP domain shows that the research area : ËRP Organizational impact" so far had 4 research subareas :

1. Organizational change
2. Organizational control and strategies
3. Risk management and regulatory issues
4. Evolutionary changes in ERP

But on discussions with subject matter experts and professionals from the ERP industry this Area is found to have one more sub area of research "Functional impact".This is a gap which deserves further research. Further this Sub area of research- Functional impact can be further classified into smaller focus areas of research like Functional Impact on sales and distribution function, functional impact on production planning function, functional impact on Finance function, and functional impact on Material management function and so on as shown in bellow figure:

Figure 2: New Research areas under Organisational impact in the ERP domain
(New areas shown by Arrows)
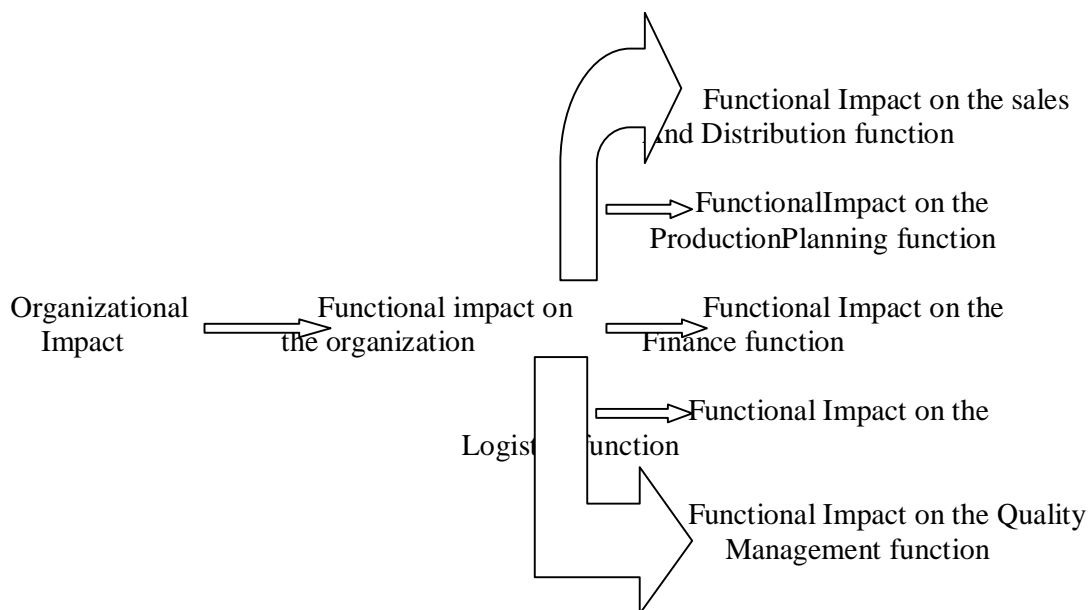
Thus we have arrived at 5 different new research areas in the ERP domain as shown in above diagram:
1. Functional impact of ERP on Sales and distribution function
2. Functional impact of ERP on Production planning function
3. Functional impact of ERP on Finance function
4. Functional impact of ERP on the Logistics function
5. Functional impact of ERP on the Quality management function

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