CHAPTER 2
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Chapter 2

LITERATURE REVIEW

Literature on ERP systems has developed particularly as of the late 1990 and the early 2000s. With the increasing importance and emergence of new technologies that simplified the processes in manufacturing organizations, the analysis of the benefits of ERP system has becoming the area of growing interest to the researchers. Many studies have been conducted related to ERP systems but literature witnessed almost negligible presence of studies with respect to effect on organizational performance in a comprehensive manner.

2.1 MANUFACTURING COMPANIES AND ERP

Today, manufacturing environment is increasing in complexity and companies are currently under pressure to the continuous shifts in demand and hence require innovations and modifications. According to Pressman (2003), large organizations typically have many different kinds of information systems that support different functions, organization levels, and business processes. For example, coordination has become challenging for many organizations, as their operations have become increasingly distributed both geographically (across continents) and organizationally (across more suppliers and marketing channels). Managers also end up having a hard time in obtaining a comprehensive overall picture of the organization.

In the view of Mabert et al. (2000), in the past few years, hundreds of manufacturing companies worldwide have embraced packaged ERP systems as a basis for business process management integration across business functions for many new applications throughout their enterprise because they encompass a wide range of software products for sustaining routine business operations and supports decision making (Oliver and Romm,
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Many large and midsize companies worldwide have indeed implemented these systems (Everdingen et al., 2000).

Beatty and Williams (2006) pointed that ERP is probably the most important IT-enabled innovations and is one of the fastest growing markets in the software industry (Willis and Willis-Brown, 2002). According to Hessman (2012), under pressure, a growing number of metal casters are turning to enterprise resource planning technologies to help boost efficiency and break down costs. Among medium and large companies, ERP adoption is approximately 75 percent for manufacturing and 60 percent in services (Scott and Shepherd, 2002) and is 80 percent among Fortune 500 firms (META Group, 2004). More than 60 percent of the Fortune 1000 companies have installed or are in the process of implementing packaged ERP systems to support their back-end business activities (Kraft, 2001). According to AMR Research (2002), the ERP application market is expected to grow to almost $50 billion by 2011 with the public sector investing heavily in ERP systems (Miranda and Kavanagh, 2005; Raymond et al., 2005). In fact, ERP systems have been implemented by over 70 percent of companies with more than 2500 employees (Reilly, 2005) and new license revenue for ERP is expected to grow at a compound annual growth rate of 6.3 percent by 2009 (Eschinger et al., 2005). Gefen and Ragowsky (2005) and Carlino and Kelly (2003) reported that worldwide, in the past decade, $500 billion were invested in ERP systems.

2.2 ERP SYSTEMS

It is a consensus among business and academic communities that the ERP system is a top issue in IT management (Niederman et al., 1991; Brancheau et al., 1996; Boar, 1997; Information Week, 1999). Shehab et al. (2004) opinioned that during the past decade, ERP has attracted attention from both academic and industrial communities and according to Grabski et al. (2011), they were descriptive studies of firms those were implementing ERP system.
Esteves and Pastor (2001) surveyed 189 papers from 1997 to 2000 and frame an annotated bibliography. Shehab et al. (2004) analysed 76 papers from 1990 to 2003 and discussed on the selection and implementation of ERP systems. Esteves and Bohorquez (2007) reviewed 640 research papers and studied life cycle of ERP systems from 2001 to 2005. Møller (2005) also carried out literature reviews on the ERP research field. Botta-Genoulaz et al. (2005) analyzed 80 academic contributions and published a survey on ERP systems from 2003 and 2004, from various disciplines and selected six different areas for classification of the publications: implementation, optimization, management through ERP, ERP tools, ERP and SCM. Lee (2000) and O’Leary (2000) have also suggested on ERP research agendas and issues. Longinidis and Gotzamani (2009) have identified three research areas: investigation of critical success factors (CSF) for implementation, analysis of the metrics for evaluating ERP systems and examination of the obstacles and the sources of failure in ERP implementation. Grabski et al. (2011) developed taxonomy for ERP after an extensive review and encouraged ERP research areas as CSF and impact on organization.

Authors in the IS field Klaus et al. (2000), Parr and Shanks (2000), Somers and Nelson (2001), Zhang et al. (2002) and Gable et al. (1997) have written papers in the ERP systems explaining characteristic of integrating information, departments, functions, and processes throughout the entire enterprise.

Research objectives and extensive number of papers that have focused on specific aspects of ERP categorization, helped me to foster ERP research areas into four groups: A first branch of the literature examines the motivations behind ERP installation i.e. the benefits arisen from ERP systems’ implementation. A second branch of the literature identified the critical success factors that assure the effective implementation of ERP systems. A third group of researchers focuses on relation of ERP with business process re-engineering (BPR) and user-satisfaction. This includes a corpus of literature studies of the perspectives, the perceptions, and the behavioral expressions of the main participants.
and stakeholders in an ERP project. And at last, there are researchers who analyze the metrics and frameworks that enable companies to evaluate their ERP systems and projects.

2.2.1 Motivations behind ERP Installation

Implementing an ERP system is costly. The cost of implementing an ERP—software, incremental hardware, training and implementation support may reach $200,000 for a small company (approximately $10M to $20M annual sales), $600,000 to $800,000 for a midsize company (approximately $40M to $80M annual sales), and several million dollars or more for a larger company (Ragowsky and Gefen, 2008).

The ultimate objective of any organizational initiative to install ERP system is to reveal some advantage, whether it is associated with cost savings, improved efficiencies, or better decision-making. ERP systems can provide an organization with many benefits. It is important that these benefits outweigh the costs of the system and they should as long as the correct system for the organization is chosen and the system is implemented properly. Furthermore, both positive and negative aspects of enterprise systems implementation should be considered especially in the areas of economic, technical, organization and social (Soja, 2008). These systems can in the long run save millions of dollars, improve quality of information, and increase workers’ productivity by reducing the amount of time to do a job. ERP systems can virtually eliminate the redundancies that occur from outdated and disparate systems that may be present in each department of an organization.

Grabski et al. (2011) opined that Effect of ERP on economic can be analyzed through two research streams—examining the firm benefits and set of risks including implementation problems. Researchers also concur on the classification of the reasons motivating companies to implement ERP systems into technical and business driven
implementations (Mabert et al., 2000; Chand et al., 2005). On the other hand, Niehus et al. (1998) and Scott (1999) made recommendations on how to maximize benefits or how to avoid project failures.

ERP systems employ a common database which can facilitate information sharing (Lee et al., 2010), which is one of the critical factors for minimizing supply chain dynamics (Chan and Chan, 2009). Velcu (2007) and Kayas et al. (2008) has also determined the benefits arisen from ERP implementation. According to Barua et al. (1995), since ERP systems provide integrated data, key intermediate benefits for ERP might include higher quality data for decision making, efficiency gains in business processes and better coordination among different units. ERP systems allow for a more efficient and effective delivery of value to customers, especially when properly aligned with business processes (Gulledge and Sommer, 2003).

ERP systems are also considered a solution to the growing information requirements within organizations to achieve accuracy in management information systems (Singla, 2008), improve competitiveness (Allen et al., 2002; Raymond et al., 2005), boost scale efficiencies of business operations (Harris and Katz, 1991; Mitra and Chaya, 1996), improves efficiencies through computerization, enhancing decision making by giving correct and timely information (Wah, 2000), processes business transactions effectively (Malone et al., 1987; Johnston and Lawrence, 1988), increase effectiveness and cost control (Blick et al., 2000), increase throughput and delivery speed by reducing order cycle time and customer response time (Cotteleer and Bendoly, 2006; McAfee, 2002), monitors and records employee performance effectively (Zmud and Apple, 1992), maintains records of business functions within the organization with lower cost (Cash and Konsynski, 1985), provide products and services of higher value to their customers, that is, to improve their competitive capabilities (Roth and Jackson, 1995), replace legacy systems based on outdated information technology (Chaterji, 1999), improve organizational decision making (Holsapple and Sena, 1999), accessing common database
to avoid duplication costs in data entry and analysis (Ferrando, 2001), allow organizations to re-engineer their business processes (Koch, 2001; Singla, 2008), better communication among organizational units (Miranda and Kavanagh, 2005), Moreover, ERP systems can provide high levels of process integration across interdependent organizational units (Park and Kusiak, 2005), and reduce cash-to-cash cycle times and the time needed to reconcile financial data, thereby reducing the amount of operating capital (Mabert et al., 2000, 2003), provide growth options and enhance firm’s agility and innovativeness (Fichman, 2004; Sambamurthy et al., 2003), integrate business processes (Brakely, 1999), reduces costs and inefficient processes (Harris, 2005).

Zhang et al. (2005) stated that, ERP implementations are expensive and complex undertakings, but once they are successfully implemented, significant improvements can be achieved such as easier access to reliable information, elimination of redundant data and operations, reduction of cycle times, increased efficiency hence reducing costs. Prior research has also shown that improving process efficiency, process effectiveness, and process flexibility leads to improved profitability and earnings valuation (Tang and Tikoo, 1999). According to Vemuri and Palvia (2006), the implementation of ERP systems can improve the day-to-day operations and business processes of enterprises. ERP can automate many business processes and increase the work efficiency. ERP can improve the efficiency and effectiveness of companies through added value, automation, integration of business processes, sharing of data and practices, and real-time information (Gefen and Ridings, 2002; Ragowsky et al., 2005).

Parr and Shanks (2000b) suggested that technical, operational and strategic reasons are the main factors behind ERP implementation. The paper by Maccarrone (2000) investigates the benefits of ERP implementation as far as accounting information and management processes are concerned. The researcher identifies two categories of benefits related to ERP implementation. The time related benefits such as reduced need of time to perform some activities, which can lead to three different types of benefits: cost reduction
due to time savings permitted by the system, less time is needed for single activities meaning that time can be utilized to improve the control activities which should improve the organization's competitiveness and reduced need of time entails also reduced total cycle time and increases correctness of processes. The second category of benefits are *quality-related benefits* including issues related to data during the collection, storing and elaboration processes and improved quality of control activities implying improved decision making which results in higher profits.

Hsu and Chen (2004) discussed the importance of ERP into an integrated, process-oriented, and information-driven and real time organization. According to Nah (2007), numerous benefits include *improvements in cooperation between managers and employees; consolidation of finance, marketing and sales, human resource, and manufacturing applications; management information available—real-time information available anywhere, anytime; informal systems for materials management/inventory/production control; lead-times, manpower costs, overtime, safety stocks, work-in-progress and delivery times.*

According to Shang (2000), companies expect significant benefits, namely *increased operational efficiency and competitiveness* otherwise known as defensive and offensive benefits (Nolan and McFarlan, 2005). Gattiker and Goodhue (2002) suggested four major categories of ERP benefits including: *better information flow* across subunits through standardization and integration of activities, *centralization* of administrative activities, *lower maintenance costs* of information systems and *greater ability* to deploy new IS functionality, and transformation from inefficient business processes toward an accepted best of practice processes. Staehr _et al._ (2002) has also stressed on the business benefits of ERP systems which evolved during the post-implementation period. Robey _et al._ (2002) shed light on the typical motivations for ERP adoption which include upgrading existing systems, compatibility with new requirements, data integration, and decision making.
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The implementation of an ERP system is shown to promote operational, managerial, and strategic benefits (Kennerley and Neely, 2001; Al-Mashari et al., 2003). Similarly, Shang and Seddon (2002) propose a consolidated framework of five benefit dimensions of ERP systems: *Operational benefits* includes decrease in cost and cycle time, enhancing productivity, quality and customer services; *Managerial benefits* includes resource administration, better decision making and proper planning, enhanced performance etc.; *Strategic benefits* includes contribution to business growth, innovations, cost leadership, support for product differentiation etc.; *IT infrastructure benefits* including decrease in IT costs and better IT infrastructure capability, and *Organizational benefits* that includes contribution to organizational changes, learning, empowerment etc.

According to Katerattanakul et al. (2006), benefits of ERP include *quickened information response time*, *increased interaction across the enterprise*, *decreased financial close cycle*, *improved order management/order cycle*, *improved on-time delivery*, *improved interaction with customers*, *lowered inventory levels*, *improved interaction with suppliers*, *reduced direct operating costs*, *improved cash management* and the areas benefitted from ERP are *availability of information*, *quality of information*, *integration of business operations/processes*, *financial management*, *inventory management*, *supplier management/procurement*, *customer responsiveness/flexibility*, *decreased information technology costs* and *personnel management*.

According to Latamore (2000), since ERP systems facilitate integration of data and information with minimum human involvement, labor costs and errors are also drastically reduced. Besides, many companies are implementing ERP packages as a means to reengineer its existing processes, performing supply chain management, requiring for e-Commerce, integrating ERP with other business information systems, reducing inventory costs, changing existing legacy system, requisite for multinational enterprise competitiveness, enhancing enterprise images, and evoluting e-business (Minahan, 1998; Mirani and Lederer, 1998; Pliskin and Zarotski, 2000; Davenport, 2000). The purpose of ERP has been to increase quality, lower inventory levels and enhance customer service mainly via improved manufacturing flexibility (Slack, 1991; Drury, 1996; Siriginidi, 2000b; Huang and Palvia, 2001).

Most companies expect ERP to reduce their operating costs, increase process efficiency, improve customer responsiveness and provide integrated decision information. They also want to standardize processes and learn the best practices embedded in ERP systems to ensure quality and predictability in their global business interests by reducing cycle times from order to delivery (Ross, 1999). ERP systems are perceived to be a tool to tackle today’s increasing complexity, as they provide two major benefits: a comprehensive and unified view of the organization and a common database in which all business transactions are recorded and stored (Umble et al., 2003). Accordingly, some ERP vendors used to boast the ability of their ERP to both improve the operations of the company and to give it a competitive edge (Bailey, 1999). Benefits of ERP include ease of saving and receiving of data, integration of processes, visibility of data, and increase in overall enterprise operational activities quality (Olhager and Selldin, 2003).
Irani and Love (2000), based on the work of Harris (1996), proposed a framework for the challenges associated with categorizing benefits. According to Karimi et al. (2007), at the operational level, IT creates business value by having three separate, but related, effects on business processes: automation effects, which refer to the efficiency perspective of value derived from the role of IT as a capital asset being substituted for labor and from its role in cost reduction; informational effects, which are the results of IT capacity to store, process, and disseminate information and transformational effects, which refer to IT’s ability to facilitate and support process innovation and transformation (Mooney et al., 1995). From a business process manager’s perspective, the effects of these business process outcomes will be reduced cost and cycle time, and improved productivity, quality, and customer service benefits (Shang and Seddon, 2002). Automation effects result in process efficiency by reducing inventory costs, increasing throughput, reducing labor costs, and increasing reliability (Banker and Kauffman, 1988). Informational effects result in process effectiveness by increasing resource utilization, reducing waste, increasing responsiveness, and improving quality (Porter and Millar, 1985). Transformational effects result in process flexibility by enabling product and service innovation, reducing cycle times, and improving customer relationships (Karimi et al., 2001; Mukhopadhyay et al., 1995).

The reasons for enterprises’ introduction of ERP system included, global operational management, close connection of each functional data system, reduction of operational costs, upgrades of enterprise operational efficiency, enhancement of enterprise decision-making quality and management efficiency (Reinhard and Bergamaschi, 2001). Generic software packages, such as ERP systems, cover the fullest range of organizational activities and processes and are adopted with the aim of achieving substantial cost savings as well as improved access to tried and tested solutions; they give an opportunity to update procedures and align with perceived examples of best practice (Pollock and Cornford, 2004).
Another important benefit of ERP systems is its ability to improve the information flow across multiple sites, even in different countries with the ability to translate from one language to another. Since exchange rates are available via the internet in real time, business transactions can be conducted with real-time adjustments for currency values. According to Spathis and Constantinides (2003), benefits of ERP systems include increases flexibility in information generation, internal communication, user-friendliness of IS, integration of applications, stock turnover; improves quality of reports/statements, decision-making process, co-ordination between departments, delivery times, helps in easy maintenance of databases, reduces stock levels time for issuing of reports/statements, errors in logistics time for transaction processing, total operating and administration costs. ERP system also offers companies the ability to improve their business processes by integrating all the functional areas within an organization. This software is diffusing worldwide among organizations with a desire to replace aging legacy systems, improve inter- and intra-operational efficiency, gain strategic advantage, etc. (Davenport, 1998; Ifinedo, 2006a).

ERP systems also offer the managers of this business the opportunity for the standardization of business processes, for the reconciliation and optimization of conflicting goals within the company and allow to improve the control activities. Another benefit involves increased flexibility in information, the integration of accounting applications, improved quality of managerial reports, making the process of planning easy and increasing reliability (Colmenares, 2008). ERP systems have significant benefits to offer an enterprise in terms of improving operational efficiency (Chou and Chang, 2008). ERP systems are the most ambitious use of IT by businesses and incorporate best business practices into one integrated software application package that can affect every function within a business.

After a review of several studies of Bailey and Pearson (1983), Ives et al. (1983), Raymond (1987), Sengupta and Zviran (1997), Kennerley and Neely (2001, 2003), and
an examination of ERP system characteristics (Bendoly and Jacobs, 2004; Bingi et al., 1999; Everdingen et al., 2000; Holsapple et al., 2005; Kennerley and Neely, 2001; O’Leary, 2000; Ross, 1999), Wu and Wang (2006) derived following items pertinent to ERP: reliability, relevance, accuracy, precision, completeness, timeliness, ease of use, output format, information age, usefulness, system integrity, system flexibility, user knowledge and involvement. Gibson et al. (1999) replaced participation with involvement because of the important contribution of users in the implementation of ERP system.

Based on the study of Deloitte, the benefits of ERP’s include reduction of stocks, trimming of labor force, increase of output, improvement of order management, reduction of IT and purchase costs, improvement of cash flow management, increase of profits, reduction of transportation and logistics costs, reduction of system maintenance requirements, improvement of the ratio for immediate goods delivery, reinforcement of the visibility of corporate information, offering of the latest or best operational procedure, improvement of response time to customers’ needs, reduction of costs out of expectation, close connection among the systems, increase of flexibility, data sharing in the whole company, solution of the Y2K problem, and improvement of overall corporate efficiency (Majed et al., 2003).

Other benefits of the ERP system suggested by Yusuf et al. (2004) include the improvement of supply chain management through e-communication and e-commerce, reducing operational costs, offering the information needed by the clients, and management’s ability to treat external suppliers, corporate alliances, and clients as a virtual enterprise. Al-Mashari and Zairi (2000) suggested some other benefits of ERP systems like integration, minimized data entry, upgradability, portability, adaptability, training for ease of portability, implementation and maintenance.

According to Saatcioglu (2008), since ERP system is an integrated one, the most important benefits seem to be related with controlling. The least important five benefits
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include cycle time reduction, lowered inventory levels, productivity improvement, and performance improvement and generate product differentiation. Botta-Genoulaz and Millet (2006) summarized the motivations for adopting an ERP system from an operational aspect as follows: poor or uncompetitive business performance, cost structure too high, not responsive enough to customers or suppliers, complex, ineffective business processes, inability to support new business strategies, business becoming too global, and inconsistent business processes. Davenport and Brooks (2004) proposed that implementing ERP systems brings many benefits to the organization, including reduction of cycle time, improvement in information flow, rapid generation of financial information, promotion of e-commerce, and assistance in development of new organizational strategies.

ERP system makes promises that it will enable organizations to integrate information about their entire enterprises seamlessly, including customer orders, production, purchasing, inventory, distribution, human resources, and receipt of payments (Daft, 2001; Fisher et al., 2004; King, 2005; Lall and Teyarachakul, 2006; Nah and Delgado, 2006; Zviran et al., 2005). Zhang et al. (2002) stated different benefits of ERP which include improvement of customer service, better way for production scheduling and manufacturing cost reduction. ERP systems are multi-module application software that helps enterprises manage their important processes, including production planning, purchasing, inventory management, suppliers’ management, etc. ERP systems facilitate the exchange of data among divisions. Consequently, ERP systems can reduce production and inventory costs, production demand and forecasting (Hasan et al., 2011).

Palaniswamy and Frank (2000) suggest that ERP systems can reduce the number of systems greatly and can improve the performance of the manufacturing function significantly. According to Davenport (1998) and Markus and Tanis (2000), ERP systems may eventually allow for integration of inter organizational supply chains. Minahan (1998) suggests that ERP systems can leverage information to make better decisions.
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According to Foss and Stone (2003), ERP systems can help create a customer-driven or demand organization, which better serves the customer's value chain. ERP can also integrate corporate information and reach the corporate goals of rapid delivery of goods, lower costs, internationalization, and improvement of the whole enterprise's performance (Yen et al., 2002). Based on the study of Deloitte (2000), the benefits of ERP's include reduction of stocks, trimming of labor force, increase of output, improvement of order management, reduction of IT and purchasing costs, improvement of cash flow management, increase of profits, reduction of transportation and logistics costs, reduction of system maintenance requirements, improvement of the ratio for immediate goods delivery, reinforcement of the visibility of corporate information, offering of the latest or best operational procedure, improvement of response time to customers' needs, reduction of costs out of expectation, close connection among the systems, increase of flexibility, data sharing in the whole company, solution of the Y2K problem, and finally, improvement of overall corporate efficiency (Majed et al., 2003).

An ERP system standardizes and integrates the business activities and thereby streamlines procurement by client, increases efficiency, reduces inventory and waste, and finally improves competitiveness. Glasgow (2002) suggested that the chief claim of ERP systems is to increase efficiency and profitability while simultaneously increasing the level of control; a company has over its entire operations. Gurbaxani and Whang (1991) examines the effect of an ERP system on the internal operations of an organization. According to Malone et al. (1987), internal operations of an organization are divided into production costs and coordination costs. But, Since ERP systems are not meant for production purposes, they are not expected to impact production costs, but they are expected to reduce monitoring costs by integrating process, thereby extending support to managers for efficient and effective management.

Grabski (2001), Hsu and Chen (2004) has classify ERP benefits into tangible and intangible benefits. Tangible benefits include planning for production capacity, availability of more accurate market demand forecast, support customization and standardization and facilitate flexibility in manufacturing, boost inventory turnover rate, decrease inventory level and enhance product quality, fasten up new product development cycle and reduce the cycle time of completion of order, facilitate operational excellence etc. Intangible benefits include distribute organizational resources in a better manner, support for better communications among departments, integrated information flow from corner to corner, availability of decision support information for enterprise planning activities, improved response time to customer queries, tracking customers orders, improve service quality, customer satisfaction thereby increasing sales records and loyalty.

Hossain et al. (2002) stated that the benefits of ERP are reliable information access because there is a common DBMS, consistent and accurate data and improved reports; avoid data and operations redundancy because all the ERP modules access common data from the integrated and centralized database, input of data is done for single time and operations are handled accordingly, decrease in delivery and cycle time since it minimizes time taken for retrieving and reporting; decrease in cost because of time savings, improved control by organizational wide analysis of organizational decisions; better adaptability due to changes in business processes; improved scalability because of modular and structured design; improved maintenance since vendor support is included in long-term contract when the system is procured; world-wide outreach since it has extended modules such as CRM, SCM and E-Commerce because of e-business internet commerce, collaborative culture etc.

According to O’Leary (2000), the ability of ERP systems is also to disseminate timely and accurate information thereby facilitate in better decision-making by employees. On one hand, managers can make decisions based on the accurate information generated,
while workers can also improve their performance by better understanding due to integrated information of the organization. However, integration of Harris’s (1996) with Shang and Seddon’s (2002) benefits models might be the better technique for evaluating the benefits of ERP system since they emphasized on the importance of gathering information from all employment levels.

2.2.2 Critical Success Factors Related to ERP System

One of the most enduring research topics in the field of information systems (IS) is that of system success (Lyytinen and Hirschheim, 1987; DeLone and McLean, 1992; Ballantine et al., 1996). But, the findings from studies that investigated the impact of contingency factors on IT success or effectiveness cannot be considered sufficient for ERP systems because ERP are different from other IT systems (Davenport, 2000; Klaus et al., 2000; Markus and Tanis, 2000; Martin, 1998) as their implementations often include constructed technological, operational, managerial, strategic, and organizational components (Stefanou, 2001; Yu, 2005). Though the organization has spent a huge amount for ERP systems, but organization are still facing difficulties during implementation phase.

Adam and O’Doherty (2000) stated that though ERP systems have beneficial effects, these benefits are matched with high level of risk because of complexities of ERP systems. Some companies even abandon implementation of ERP projects or achieve only some of the benefits they aim (Martin and Cheung, 2005; Sammon and Adam, 2004; Al-Mashari et al., 2003). King and Burgess (2006) reported that many implementations of ERP have been criticized regarding the time; cost and disruption caused by the implementation and sometimes limited benefits once the systems become operational. Sammon and Adam (2005) also reported that planning phase of an ERP implementation project, the complexities of the ERP market and complex implementation caused high rates of failure in ERP project implementation.
Karimi et al. (2007) has the opinion that ERP implementation remains however one of the most significant challenges for IS practitioners in the past decade. Implementation related publications account for about one third of the articles reviewed and is the more developed research as far as the researchers related to ERP are concerned. Tsai et al.(2005) and Lui and Chan(2008) also expressed that though ERP system are used around the world since many years, still there are many recent reports saying about the complexity and the difficulties in ERP implementation. This complexity arises mainly because these systems integrate and process large amounts of data. This has resulted in ERP systems possessing user interfaces (UIs) which suffer from poor usability (Singh and Wesson, 2009). Usability problems can hamper the extent to which a system can be used by its users to achieve a set of goals within a specified context of use (Iso, 1998).

Markus et al. (2000) suggest that firms can configure their ERP systems in different ways at the operational level, the business activity level, and the business process level. Ekanayaka et al. (2002) studied the methods in which ERP systems be supplied to customers, e.g. through ASP’s. Also, since ERP systems have many modules, so the organization needs to look many factors including module selection according to requirement, world-wide reach, services to customer, online feature, advanced ERP features etc.

Authors have emphasized firm size as an important factor during ERP implementation. Bernroider and Koch (2001) focused on the potential differences between ERP implementations in large firm versus small and midsized enterprises and examined the ERP selection and implementation process. According to Buonanno et al. (2005) also, SME structural issues was also a main factor in finalizing ERP systems. On the other hand, SMEs requires top management support (Muscatello et al., 2003), effective process management, and experienced project management consultants (Snider et al., 2009), strategic linkages (Mabert et al., 2003). The research work of Stefanou(1999) and Bradford and Roberts(2001) for ERP system implementations is worth mentioning.
ERP implementations have also been investigated through *case studies* with varying intent; to describe the impact of ERP on job characteristics (Pawlowski and Boudreau, 1999); to explore strategic options open to arms beyond the implementation of common business systems (Holland and Light, 1999); to identify issues of alignment (Smethurst and Kawalek, 1999; Volkoff, 1999), to analyze challenges of ERP implementations outside the business world (Sieber and Nah, 1999); and to describe global SCM (Chatfield and Andersen, 1998).

Holland and Light (1999) in his study have reported two causes of implementation problems: technical and organizational aspects. The common problems include migrating legacy data and applications into the ERP system, training IT as well as non-IT personnel, and creating a culture that is adaptable to the new processes (Gale, 2002). Verville *et al.* (2005) stressed that ERP software has also some barriers. Soh *et al.* (2000) pointed out about the problems which are caused by the difference between functionality offered by the package and that required by the firm in ERP projects. While trying to adjust the ERP software and the system in the enterprise, there will be some barriers. *Barriers* cause firms to experience a decrease in organizational performance instead of realizing improvements (Hirt and Swanson, 2001). Hawking *et al.* (2004) discussed the role of barriers in limiting the realization of benefits and categorizes barriers as people, process or technology related barriers.

Cissna (1998) finds that factors relating to top management support, assignment of best people to implementation teams, and strong involvement of people from the field are important in reducing the resistance to changes involved in ERP implementation. Gupta (2000) illustrates several common problems associated with ERP implementation which included resistance to change, unplanned cost associated with new requirements emerging after the freezing stage and poor training of end-users. Organizational change is one of the most important barriers encountered in transition of new systems and business
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processes (Kumar et al., 2003) and is an important reason for the failures (Al-Mashari et al., 2003; Khawk, 2006; Hong and Kim, 2002).

The major problems of ERP implementation are different from other information systems because ERP systems mainly faces organization and personal problems like employees resistance, organizational culture, incompatible business processes, improper project management, over budget, delays in the implementation schedule, involvement of top management etc. while other information systems are facing mainly technologically related issues such as technological complexity, compatibility, standardization, etc. ERP projects shift a significant proportion of the implementation effort from code development to the configuration of a pre-existing software package and complexity from technical to organizational factors (Grabski et al., 2011; Somers and Nelson, 2001; Akkermans and Helden, 2002).

Grabski et al. (2009) used multiple controls for multiple purposes rather than one control and maintained a record of control procedures used by organizations for ERP implementation. They suggested five important control factors for a successful ERP implementation: project management, change management, business alignment with the new information system, internal audit activities and consulting and planning activities.

Gulledge (2006) and Moon (2007) based on their survey gave some important suggestions in solving the problems of ERP implementation. Several approaches and methodologies related to the implementation of ERP systems have also been introduced by a number of authors and practitioners (Fitzgerald and O’Kane, 1999; Reel, 1999; Brehm and Markus, 2000; Apperlrath and Ritter, 2000; Saharia and Sandoe, 2000; Gibson et al., 1999; SAP, 2000; Markus and Tanis, 2000; Slooten and Yap, 1999; Bancroft et al., 1998; Computer Technology Research, 1999; Welti, 1999, Holland and Light, 1999; Kelly et al., 1999; Deloitte Consulting, 2000; Everdingen et al., 2000; Markus et al. 2000; Al-Mashari and Zairi, 2000; Umble et al., 2001; Weston, 2001;
Akkermans and Helden, 2002; Gefen, 2002; Abdinnour-Helm et al., 2003; Craighead and LaForge, 2003; Mabert et al., 2003; Schniederjans and Kim, 2003; Somers and Nelson, 2003; Umble et al., 2003; Sheu et al., 2004; Ehie and Madsen, 2005; Ngai et al., 2008; Al-Mashari et al., 2003).

Rockart (1979) defined critical success factors (CSF) as “the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization”. In the ERP context, Holland and Light (1999) define them as the factors that are needed to make sure an ERP project is successful. Saini et al. (2010) developed a conceptual model based on three factors namely people, organizational and technological for evaluation of critical success factors. Esteves and Pastor (2000) classify critical success factors into Organizational and Technological, and then further sub-divide them into strategic and tactical factors. Somers and Nelson (2001) identified 22 CSF and evaluated them across stages of ERP implementation. The top six factors across the stages were: top management support, project team competence, inter-departmental cooperation, clear goals and objectives, project management, and inter-departmental communication. Another comprehensive examination of the critical success factors of ERP implementation was carried out by Nah and her colleagues (Nah et al., 2001, 2003; Nah and Delgado, 2006) and they identified seven broad categories.

Al-Mashari et al. (2003) suggested taxonomy of critical success factors for ERP implementation and proposed a framework consisting of setting-up; implementation; and evaluation phases. Karimi et al. (2007) grouped many CSF and did a study based on formative indicators. Bradley (2008) examined CSF based upon classical management theory. Through an extensive literature review, Finney and Corbett (2007) found 45 articles that were useful in finding the CSF for implementation of ERP. Various Critical Success Factors related to ERP has been analyzed by other scholars in the table 2.1.
## Review of Literature

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<td>Somers and Nelson, 2001; Al-Mudimigh <em>et al.</em>, 2001; Bingi <em>et al.</em>, 1999</td>
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Researcher have also been carried out in other disciplines with respect to ERP implementation (Huang et al., 2004). Wang and Zhang (2007), Zhang et al. (2005), and Sprott (2000) discussed on ways ERP can be customized and configured to integrate ERP systems and other systems. Markus et al. (2000) and Kraemmergaard and Rose (2002) studied on the work tasks and organizational and managerial challenges that can be expected in each phase of the implementation. According to Roque (2008), different ERP implementation projects may face similar problems and there are plenty of suggestions for successful ERP implementation in the available literature (Cliffe, 1999; Crisostomo, 2008). Al-Mashari and Al-Mudimigh (2003) and Kim et al. (2005) have identified the problems in ERP implementation.

Bernard et al. (2004) suggested that, ERP implementation entail considerable risks, which must be mitigated in an appropriate manner. Wei et al. (2005) and Wei and Wang (2004) identified the criteria that should be used in selecting the ERP system. Sedera et al. (2003) and Wang and Chen (2006) investigated the effect of contingency factors on success of an ERP system. Møller (2005) discussed on the expectation for the future development of ERP systems. Ng et al. (2002) depicted ways to prioritize between the different ERP maintenance initiatives and system review during the post-implementation.

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<tr>
<th>Limit customizations</th>
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<tr>
<td>Management expectation</td>
<td>Somers and Nelson, 2001; Akkermans and Helden, 2002; Saini et al., 2010</td>
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Table 2.1: List of Critical Factors Identified from Different Studies
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phase. Ifinedo (2007) investigated the impact of organizational IT factors like IT assets, IT skills, IT resources, and satisfaction with legacy system on ERP system success.

Wu et al. (2006) in their study included 22 semantic differential items measuring end-user satisfaction and two seven-point Likert-style global items measuring perceived overall satisfaction and perceived ERP success level: These 22 items included relationship, communication with the ERP project team; domain knowledge and attitude of the ERP project team; training; documentation; required time for ERP implementation; accuracy; timeliness; reliability; response time; completeness; output requirement; relevancy; system stability; auditing and control; ease of use; usefulness; feeling of user involvement; system understanding; system flexibility and system integrity.

2.2.3 ERP and Other Studies

2.2.3.1 Effect of Business Process Reengineering on ERP

Introduction of ERP systems in organizations raises the issue of change management. Adequate change management strategies are needed at different stages of the implementation process for successful ERP implementation (Aladwani, 2001). When a company implements ERP, business processes reengineering is the key factor to maximize ERP utility (Kohli and Hoadley, 2006). Business process reengineering is frequently linked with ERP implementations, as ERP systems embed business processes, thereby restricting and enforcing organizational routines (Hammer and Champy, 1993; Boudreau and Robey, 1996; Davenport, 1998; Nah et al., 2001). In fact, according to Singla (2008), software and business processes need to be aligned with the proper mix of business process design and software configuration. A company should think about BPR carefully before ERP implementation since, routines are a double-edged sword. They are helpful when they provide options, but disadvantageous when they obstruct task changes in the organization (Butler and Gray, 2006). Also, some organizations who are interested in business process reengineering, use ERP systems as the means to achieve. ERP
implementation decisions also resolve the extent to which processes will vary with respect to redesigned processes (Huang et al., 2004; Wenrich and Ahmad, 2009).

### 2.2.3.3 ERP and User Satisfaction

According to Amoako-Gyampah (2004) and Ifinedo (2007), management and users of ERP are two different groups. User satisfaction is regarded as the best surrogate measure of IS success (Seddon and Kiew, 1994). Zviran et al. (2005) examined, in the ERP context, the relations between user satisfaction and perceived usefulness. Calisir and Calisir (2004) constructed an instrument that consisted of 28 items measuring six interface usability characteristics, namely system capability, compatibility, flexibility, user guidance, learn ability, minimal memory load for determining perceived usefulness and ease of use.

Kositanurit et al. (2006) identified six factors as having an impact on individual performance namely system quality, documentation, ease of use, reliability, authorization and utilization. Sedera et al. (2003) measured the individual impact of ERP system implementation with four items namely learning, awareness/recall, decision-making effectiveness and individual productivity.

### 2.3 ORGANIZATIONAL PERFORMANCE, PRODUCTIVITY AND ERP

Singla (2008) identified a total of forty-six variables in order to study the impact of ERP systems on small and medium-sized public sector organizations and proposed *three categories for their taxonomy namely tangible benefits, intangible benefits and impact on business performance*. Sedera et al. (2003) on the other hand measured the organizational impact of an ERP system implementation with five items including organizational costs, staff requirements, overall productivity, product/ service quality and business process change. Although the academe has presented various studies (Norris et al., 2000; Poston
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and Grabski, 2001) with respect to the effectiveness of the ERP system’s introduction, the studies tended to focus on the verification or categorization of effectiveness, sometimes using a case company to validate the effectiveness generalized by past literature.

Moreover, in referring to Farbey et al. (1994) classification, Hedman and Borell (2004) conclude that ERP systems have an impact potential under all eight IT categories and cumulate the uncertainties associated to each category. Referring to Hochstrasser’s (1990) classification, Irani and Love (2000) suggested that the traditional economic methods using cost benefit analysis and financial ratios would be appropriate for cost replacement projects that provide gains in efficiency, but would be inappropriate for new technology projects whose aim is more strategic and whose benefits are more intangible. In effect, what distinguishes ERP from other IT is its integrative or unifying ambition; to regroup all the organization’s productive and administrative activities (Bazet and Maye’re, 2004).

Chen and Wang (2010) developed an index system for the analysis on performance evaluation system of ERP implementation based on sixteen factors namely human resources, software resources, hardware resources, management philosophy, collaborative commerce, decision-making, management standards, business reputation, corporate image, innovation learning, marketing, production, financial, assets operation, capacity development and information resources.

According to Wee (2000), an overall architecture for an ERP should be formulated before its deployment, thus preventing reconfiguration at various stages. Other papers indicated that the use of proper modeling methods, tools and architecture will be useful in ensuring ERP success (Scheer and Habbermann, 2000; Murray and Coffin, 2001). To evaluate ERP implementation projects, several researchers suggest that the assessment of success for ERP systems can be viewed from different points in time, including success in the
project phase by measuring cost relative to budget, time relative to schedule, functionality relative to original project scope, success in making transition from go live to normal operations; short-term changes in key performance indicators by measuring length of time before key performance indicators achieve normal or expected levels, short-term impacts on suppliers and customers, and success in capturing the majority of benefits and planning for the next steps by measuring achievement of business results expected, ongoing improvements, ease in adopting new ERP releases (Markus et al., 2000).

Nicolaou (2004) analyzed the method of post-implementation review for ERP systems. He did a case study of two companies and on the basis of his previous research, he developed a conceptual framework of post-implementation review and he opinioned that the post implementation review moderated the success of the ERP project. Nicolaou and Bhattacharya (2006) also opinioned that the factors of the post-implementation review were important and discussed that, using post-implementation review resulted in improved differential performance.

Poston and Grabski (2001) focused on specific accounts within reported financial results of firms that implemented ERP systems from 1993 to 1997. Building upon their study, Hunton et al. (2003) discussed the impact of ERP systems on performance of the firm and reaction of market after the announcements of ERP implementation.

In their model for measuring IS implementation success, DeLone and McLean (1992) stated that ISs’ implementation success is a variable dependent on six dimensions namely information quality, system quality, information use, user satisfaction, individual impact and organizational impact. They reviewed 180 articles related to IS success using these dimensions and constructed a model. In an update of this model, the authors combined individual and organizational impacts into a single variable which they called net benefits (DeLone and McLean, 2003). They defined individual impact as the effect of information on the behavior of the recipient, and organizational impact as the effect of information on
organizational performance. They suggested a variant of the *balanced scorecard approach* to grasp the main impact of an installed system. Somers and Nelson (2001) explored the ERP success from the end-user point of view and proposed a socio-technical model for examining ERP software implementations.

Tan and Pan (2002) proposed models for the assessment of ERP success which can be considered of a particular importance for the study at hand. White (1986) defined successful ERP implementation along two dimensions: improved performance and user satisfaction. Stefanou (2001) and Skok and Legge (2002) analyzes the metrics and frameworks that enable companies to evaluate their ERP systems and projects. A model was developed by Galbraith (1974) which emphasized on organizational information processing theory, that discussed the impact of ERP on costs and benefits and this was confirmed using two case studies. They opinioned that some successfully transformed firms would get these ERP benefits while some due to firm and site specific differences might not be get these benefits.

Uwizeyemungu and Raymond (2010) after an extensive literature review suggested that IT impact evaluation models can be regrouped under four categories: *causal models, contingency models, process models, and scorecard models*. Causal models (Byrd and Marshall, 1997; Siricar *et al.*, 2000; Thatcher and Oliver, 2001; Hitt *et al.*, 2002; Hendricks *et al.*, 2007; Shin, 2006), also known as variance models, attempt to establish a cause–effect relationship between IT investments on the one hand, and organizational performance on the other.

In contingency models (e.g., Bergeron *et al.*, 2000; Somers and Nelson, 2001; Gattiker and Goodhue, 2005; Ragowsky *et al.*, 2005), it is assumed that the impact of IT on organizational performance depends not on IT as such but rather on the alignment or fit of IT with other dimensions of the organization such as its strategy, structure, and business processes. Process models (Soh and Markus, 1995; Wieder *et al.*, 2006)
conceptualize the contribution of IT to performance through a temporal series of interlinked effects. This process is then one of converting the potential value of IT into realized value for the enterprise (Davern and Kauffman, 2000).

Scorecard models highlight the multiple dimensions of performance, and their use to evaluate the impacts of IT in general (Wright et al., 1999) and of ERP systems in particular (Rosemann and Wiese, 1999; Chand et al., 2005) seems well indicated, given that IT, and ERP even more so, are deemed to affect the organization in many different ways. The evaluation approach based on the concept of IS business value is similar to the scorecard approach to the extent that this concept is broken down into multiple aspects of performance (Kraemer et al., 1994).

For measuring organizational performance, Wei et al. (2007) expressed that initially, a project team for measuring ERP performance should be formed which should include managers, user, system experts and consultants. Managers will help to develop an evaluation plan and guidance for measuring ERP system performance. User from different departments should be involved to gather and provide data based on their responsibilities. They also recognized three main categories namely system factors that include factors for evaluating the effectiveness of the ERP system; vendor factors for evaluating the performance of the ERP vendor and impact factors to determine the impact of information on the organizational performance.

Merriam (1998) focused on grounded theory for effectiveness assessment model of the ERP System’s. It is a research method which allows the investigator to play the role as the primary instrument of data collection and analysis. Its end result is a theory emerging from the data; it uses the statements and concepts in the original data and applies the methods of reorganization, analysis, constant comparison, and coding; it collects and analyzes data through a systematic method, and is considered to be a critical means to
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reorganize qualitative data (Strauss and Corbin, 1990). It can also be the most scientific and rational method among the different qualitative methodologies (Hammersley, 1989).

Dehning and Richardson (2002) put forward a framework that captures five analysis paths of the relation between IT and firm performance. The first and most analyzed link is the direct relation between IT and firm performance. The second, less analyzed link provides insights into the relation between IT and business process measures such as gross margin, profit margin, turnover ratios, inventory turnover, customer service, quality, and efficiency. The third path analyzes how these process measures combine to determine overall firm performance. Recent research has attempted to address the alignment of ERP systems to strategies by using an analytic network process model built on a strategic alignment model to reduce failure that may increase the success rate of ERP implementation (Presley, 2006). Barua et al. (1995) argue that truly understanding how IT investments create value for the organization requires a fine-grained unit of analysis and a research model that includes the intermediate benefits or intermediate variables through which the functional impacts occur. At the aggregate level, an ERP might help a firm survive because it leads to higher profits.

In a review of more than 1,000 issues of research journals published between 1987 and 2000, Danziger and Andersen (2002) categorized the impact of information technology within the public sector in four broad taxonomic domains and twenty-two specific impact categories. Stratman and Roth (2002) proposed an integrated conceptual model of ERP competence, which was defined as a model that comprised of several organizational aptitudes and functions, including strategic planning, executive commitment, project management, IT skills, business process skills, ERP training, change readiness and learning. They argued that a firm’s ERP competence must be used effectively in order to harness capabilities of an ERP system for gaining competitive advantage. However, this framework does not link competence to managerial/IT infrastructure competence as recommended by Harris (1996) and Shang and Seddon (2000).
According to strategic alignment theory by Kang et al. (2008), a firm's business performance improves as the firm achieves better fit among its business strategy, its information system strategy, its organization infrastructure, and its information system infrastructure (Henderson and Venkatraman, 1991; Lederer and Mendelow, 1987; Lederer and Sethi, 1988; Luftman, Lewis and Oldach, 1993; Sabherwal and Chan, 2001; Sambamurthy and Zmud, 2000; Venkatraman and Camillus, 1984; White, 1986). Organizational integration refers to coordination and control of the business activities of departments to accomplish the entire organization's objectives (Daft, 2001; Lawrence, and Lorsch, 1967; Thompson, 1967). Based on a review of the coordination and control literature (Baliga and Jaeger, 1984; Eisenhardt, 1985; Edstrom and Galbraith, 1977; Gupta and Govindarajan, 1991; Martinez and Jarillo, 1991; Nobel and Birkinshaw, 1998), three specific integration modes can be identified: people-based, standardization-based, and centralization-based.

Gable et al. (2003) developed an ERP system success measurement model that redefines the dimensions in the widely cited DeLone and McLean’s (1992) IS success model. They eliminated (through multi-stage data collection and statistical analysis) the use and user satisfaction dimensions in the DeLone and McLean (1992) framework. Arguments against dropping them are also available in the literature (Ifinedo, 2006b). Palvia et al. (2001) and Lee et al. (2002) also did system and data quality assessment of information system. Through literature reviews and case studies, Ifinedo (2006a) and Ifinedo and Nahar (2009) proposed an extended ERP system success measurement model to include workgroup impact and vendor/consultant quality not included in other models.

Matolcsy et al. (2005) used a generic framework for the development of performance measurement model of ERP. Their framework classifies existing research on IT-performance measurement using five paths. For measuring the performance of ERP systems, financial performance methods such as return on investment, return on assets as proposed by Kivijarvi and Saarinen (1995) and Murphy and Simon (2002) could be used,
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but they were used rarely because evaluation of success of information system requires qualitative measures and the need to integrate the traditional performance indicators with latest techniques for building up extensive performance measurement systems was realized.

Now a days, some latest methods have been used to evaluate the performance of ERP systems like analytic hierarchy process as proposed by Chan et al. (2006) and Chan and Kumar (2007), data envelopment analysis as proposed by Stensrud and Myrtveit (2003), importance-performance maps proposed by Skok et al.(2001), and balanced scorecard was suggested by Michael and Jens (1999) and Hagood and Friedman (2002).

According to Shin (2006), case studies are more appropriate to provide concrete and significant lessons for ERP implementation and exploitation strategies based on the experiences of other firms. However, Gattiker and Goodhue (2005), Ragowsky et al. (2005) and Hendricks et al. (2007) adopted a survey or secondary data-based deductive approach to test hypotheses with samples whose size varies from 106 to 525 firms. These studies provide most interesting and relevant results from a macroeconomic point of view, allowing us to better understand the global ex post impacts of ERP systems. Dong (2000) proposed a conceptual model for exploring impact of top management on ERP software implementation effectiveness.

Several researchers have used the TTF model to explain the impact of IS and task characteristics on individual performance (Goodhue and Thompson, 1995; Dishaw and Strong, 1998; Ferratt and Vlahos, 1998). Although the TTF model does not answer the question of what characteristics of IS lead to the highest levels of user performance, it suggests some constructs that are relevant to investigation.

DeLone and McLean (1992) validate the constructs, system quality, information quality, use, user satisfaction, and individual and organizational performance. Later, Etezadi and
Farhoomand (1996) developed a questionnaire instrument for analysis. There is apparently a lack of complete, objective, and measurable effectiveness assessment models and appraisal methods. The first comprehensive empirical analysis of the performance of ERPS uses ERPS adoption as the only independent variable, and then compares the performance of organizations pre and post-adoption (Poston and Grabski, 2001). Later research considers and investigates the time-factor in more detail, or more precisely: the time-difference between the adoption of an ERPS and when performance is measured (Nicolaou et al., 2003).

Traditional performance indicators, such as standard cumulative abnormal returns (Hayes et al., 2001), ROA, return on sales, ROI (Hunton et al., 2003; Nicolaou, 2004; Hendricks et al., 2007), cost of goods sold, labor productivity (Poston and Grabski, 2001), etc. were used in many studies to measure the effectiveness of ERP implementation.

Performance indicators of the ERP’s introduction based on effectiveness have been found in the researches by Kaplan and Norton (1996), Booth (2000), Lipe and Salterio(2000), Banker et al.(2004), Dilla and Steinbart (2005). Saatcioglu et al. (2008) conducted a study to evaluate the system by using benefits, barriers and risks with their effects on user satisfaction. For evaluating the impacts of ERP systems based on a balanced scorecard framework, Chand et al. (2005) identified parameters including - Financial: cost of ERP implementation, financial input necessary for achieving targeted performance level; Customer: efficient support to individual needs, benefits derived for the company from a certain level of performance; Internal process: improvement of internal business processes, effectiveness and efficiency of internal processes in operations.; Innovation and learning: flexibility of ERP software to integrate future changes and future customer needs.

Whether the ERP will provide a strategic impact should also depend on the level of operational complexity of the company. Because ERP systems enable companies to
improve their operational efficiency and task coordination (Gattiker and Goodhue, 2005), the more unique and complex this operational environment is, the more strategically valuable the ERP system should be to the company. Indeed, the perceived value of an ERP system increases as the operational variability it manages increases (Gefen and Ragowsky, 2005), as more ERP modules are implemented and in more sites (Ranganathan and Brown, 2006), and as the ERP system is employed to handle more complex business activity (Karimi et al., 2007). Again, in accordance with contingency theory, the more complex the operational environment, the more value the ERP system can have by allowing the company to adjust and respond better to its operational environment. Such increased operational complexity includes, a larger number of suppliers and purchase orders per month, a larger number of customer and sale orders per month, and higher investment in inventory (Ragowsky et al., 2000).

DeLone and McLean (1992), Jacobs and Bendoly (2003) and Kennerley and Neely (2002) suggested that measuring success of system in monetary terms is often desirable but, such measures are often not possible because it is not possible to measure impact on intangible benefits and besides, it is not possible to isolate the effect on information system from numerous environmental variables that may contribute to measure organizational performance. In involuntary situation, according to Doll and Torkzadeh (1988), perceptual measures of satisfaction may be appropriate.


Various prescriptions for improving organizational performance from ERP implementations have also been put forward, including the following three: standardize business practices to fit with the ERP software (Sumner, 1999; Kremers and Dissel, 2000; Markus and Tanis, 2000; Palaniswamy and Frank, 2000); avoid customizing the software (Parr and Shanks, 2000; Mabert et al., 2003; Murray and Coffin, 2001); and provide appropriate training in the use of the system (Bingi et al., 1999; Sumner, 1999; Al-Mudimigh et al., 2001). Lee and Lee (2004) show a relationship between organizational IT assets and ERP effectiveness. Clemons and Weber (1990) pointed out that most of the mechanisms were at the stage of conceptualization and could not yet be accepted by the public. From the literature, it was observed that the choice of an appropriate IT evaluation method would depend on one of the following criteria: the object of the IT investments (Hochstrasser, 1990; Fitzgerald, 1998), the extent to which the IT benefits are tangible (Remenyi and Sherwood-Smith, 2001), or the characteristics of the IT project and of the implementation context (Farbey et al., 1992, 1994). The choice itself or the order of priority of the chosen performance measures will also depend on the IS structure (Heo and Han, 2003), as the intrinsic nature of these measures can provide indications as to what method is more appropriate.
Most studies on evaluating impact of IT have used one or two measures of organizational performance. Thus, IT impacts are often measured in terms of financial ratios (Hitt et al., 2002) or yet again in terms of productivity ratios (Thatcher and Oliver, 2001), in terms of competitive advantage (Sethi and King, 1994), or in terms of increased sales and market value (Sircar et al., 2000). Therefore, Milis and Mercken (2004) finally and enthusiastically recommended the use of the integrated method as the proper assessment mechanism to evaluate the investment project of information technology. Integrated methods combine different approaches, both objective and subjective; different dimensions, both financial and non-financial; different factors, both tangible and intangible; and different considerations, both operational and strategic (Kaplan and Norton, 1996). These methods aim to span the complexity and variety of benefits that an organization can obtain from its use of IT (Wright et al., 1999). According to Ho (2007), although successful users enjoy considerable cost savings, it is actually very difficult to quantify all the benefits, tangible or intangible, of implementing this enterprise system.

Lin et al. (2006) based upon the information systems success model by DeLone and McLean (1992, 2003) related the individual impact to BSC measures i.e., financial effectiveness, customer effectiveness, internal business effectiveness, and innovation and learning effectiveness. They demonstrate that the integration of the information systems success model and the BSC constructs jointly predict ERP system success. They suggest that the use of the BSC will allow organizations the ability to more easily assess the positive and negative effects of the ERP system and enhance the ability to manage the ERP system implementation. A criticism made of previous IS evaluation models such as DeLone and McLean’s (1992) model among others is that they do not sufficiently elaborate on the organizational impact measures (Kennerly and Neely, 2001). It was, however, found necessary to add a scorecard model in order to account for the intrinsically multidimensional character of organizational performance (Markus et al., 2000), and for multiplicity of potential effects of an ERP (Shang and Seddon, 2002).
The Balanced Scorecard (BSC) can manage overall performance evaluations and combine the vision and strategies of the enterprise. The BSC is a performance management and measurement tool; it is a concept for measuring whether the micro operational activities of a company are aligned with its macro objectives in terms of vision and strategy. Its underlying rationale is that measuring an organization’s performance mainly based on the financial perspective is not sufficient as this effort cannot directly influence financial outcomes (Kaplan and Norton, 1992). According to Maloni and Benton (1997) also, the BSC manages a broader range of ERP effects, as it proposes that managers can select measures from three additional categories or perspectives: customer, internal business processes and learning and growth (Kaplan and Norton, 1992). Thus, the model also has non-financial and less tangible aspects such as employee perception, customer satisfaction, time involvement, quality of information and support in organizational strategic decision making.

Kaplan and Norton (1992) indicate that financial facet includes some index used to indicate whether an organization’s business operations are resulting in improvement of the bottom line. Customer facet consists of index that can be used to measure an organization’s performance from the customer perspective. Internal process facet focuses on the core competencies. Learning and growth facet contains index for evaluating an organization continuous business improvement.

According to Kaplan and Norton (1992, 1993) “BSC is a framework to structure the relevant key performance indicators for performance management” – can be applied for measurement (Walton 1999, Van der et al., 1999, Rosemann and Wiese, 1999; Brynjolfsson and Hitt, 2000). It is typically designed to monitor business processes and is the consistent conversion of visions into objectives and measures.

BSC is a model that was first developed to measure the performance of a business enterprise or unit (Hoffecker and Goldenberg, 1994; Kaplan and Norton, 1993, 1992). It
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enables translation of a company’s vision and strategy into a coherent set of performance measures that can be automated and linked at all levels of the organization. Organizations have come to realize the importance of a strategic feedback and performance measurement/management application that enables them to more effectively drive and manage their business operations (Edwards, 2001).

Markus et al. (2000) also found necessary to add a scorecard model in order to account for the intrinsically multidimensional character of organizational performance, and for the multiplicity of potential effects of an ERP system (Shang and Seddon, 2002). According to Mei-Yeh and Fengyi (2006), using BSC model increases the completeness and the quality of the reports concerned with ERP systems.

According to Kaplan and Norton (1996), “Companies can use the BSC to track financial results while simultaneously monitoring progress in building the capabilities and acquiring the intangible assets they will need for future growth.” BSC helps managers to change firms by leveraging their ability to get a better picture of intangibles, like employee satisfaction, customer satisfaction, product development, along with fixed assets (Bible et al., 2006). They also suggest that dispersion of the measurement system across the four financial and nonfinancial parameters can contribute to single business strategy. Besides, it is also superior to the traditional measurement systems because it links long-term strategy with short-term targets, thereby facilitating the best utilization of resources (Norreklit, 2000). BSC is also considered as a clear measurement system since it allows managers to know whether they have enhanced in one area at the cost of another (Kaplan and Norton, 1992). It is considered more effective than traditional financial-based models that used to concentrate only on single departments (Seraphim, 2006), and since they provide data that is of much help to management in shaping overall strategy (DeBusk and Crabtree, 2006). Other advantages include the strategy to monitor obligations to stakeholders and to provide accurate financial and other information that can be used to create effective internal control environments.
By 2002, 60 percent of Fortune 1000 companies had experimented with the BSC (Moxham, 2009; Kaplan and Norton, 2005, 2009), and its implementations in companies like Best Buy, Cigna, DuPont, Exxon Mobil, Hilton Hotels, Ricoh, Southwest Airlines, Sprint, UPS and Wendy’s have been examined in detailed case studies. Hillstrom (2009) reported that by 2004, it was implemented by 80 percent of large US companies for improving performance. BSC use has spread to the public and nonprofit sectors (Niven, 2003), higher education (Beard, 2009; Dorweiler and Yakhou, 2005; McDevitt et al., 2008) etc. Harvard business review listed it as one of the 75 most influential business ideas of the twentieth century since, it was received and used so enthusiastically and successfully in last year’s (Bible et al. 2006), while Kaplan and Norton’s first BSC monograph (Kaplan and Norton, 1996a) was chosen as one of the 100 best books of all time by business columnists (Covert and Sattersten, 2009).

With reference to productivity, Glasgow (2002) suggested that the use of computer based ERP systems by companies of all sizes and functions contributes to its productivity. Barua and Lee (1997), Sarkis and Sundarraj (2003) and Kalling (2003) also highlighted the need to examine IT productivity within the context of how the IT is used.