Information and communication technology and enterprise integration with Enterprise resource planning systems

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Abstract :

The enterprise integration with ERP systems is a complex undertaking with wide-reaching impact on key stakeholders including staff and customers. ERP Systems are the most integrated information systems that cut across various organizations as well as various functional areas. This paper presents an integrated view that could be useful for identifying the concepts which may help to clarify the role of the ERP systems in enterprise integration. They also offer a dynamic approach to understand ERP systems and its mechanisms for incorporating a company's specific functional elements. However, the ERP solution cannot replace every existing ICT tools of integration.

Keywords: Enterprise resource planning ERP, information system IS, information and communication technology ICT, Enterprise integration.

INTRODUCTION :

Today's enterprises must go beyond traditional goals of efficiency and effectiveness; they need to be intelligent in order to adapt and survive in a continuously changing environment and find the better ways to interact with their customers and provide better services with forcing businesses to continuously improve and innovate in terms of speed, flexibility, quality, service, cost and so on. The pace of improvement has to match, if not exceed the forces of change. Companies that succeeded in integrating their systems enjoyed tremendous competitive advantage and reaped huge rewards in sales and market shares by offering unprecedented customer values. Integration traditionally was done in a piece meal fashion and required custom coding that was both difficult and expensive. Attempts to develop enterprise wide integrated systems for the most part have failed. Commercial enterprise resource planning (ERP) systems, first appeared in the 1980s, were considered a major solution to the integration problem. However, it was soon found out that ERP could create its own integration problems, as discussed below.

I. Enterprise Resource Planning (ERP) Systems : Around the globe, companies are increasingly becoming more connected, both internally and with other companies. If you run a business, you'll want to be able to react instantaneously when a customer places a large order or when a shipment from a supplier is delayed. You may also want to know the impact of these events on every part of the business and how the business is performing at any point in time, especially if you're running a large company. [1] Here are three other insights related to enterprise systems to better understand the current state of enterprise systems and their potential:[2]

1. One of the ICT department's most important roles is to provide and support applications that enable workers to access, use, and understand the data.

2. Customer loyalty helps drive profits, but only for customers who are profitable to the company.

3. Inter organizational ISs play a major role in improving communication and integration among firms in a global supply chain.

I. 1. Enterprise Resource Planning (ERP) Systems definition : Enterprise resource planning is a cross-functional enterprise system driven by an integrated suite of software modules that supports the basic internal business processes of a company. ERP software suites typically consist of integrated modules of manufacturing, distribution, sales, accounting, and human resource applications.[3] ERP is the software infrastructure that links an enterprise's internal applications

and supports its external business processes. ERP applications are modular, and the modules are integrated with each other to expand capabilities. An ERP helps managers run the business from front to back.[4] ERP system differs from earlier approaches to developing or purchasing business applications in at least two ways. First, the ERP modules are integrated, primarily through a common set of definitions and a common database. Second, the ERP modules have been designed to reflect a particular way of doing business.[5] The architecture of the software facilitates transparent integration of modules, providing flow of information between all functions within the enterprise in a consistently visible manner. Corporate computing with ERPs allows companies to implement a single integrated system by replacing or reengineering their mostly incompatible legacy information systems.[6] When new information is entered by one process, the information is made immediately available to other business processes. Management could obtain information at any point in time about how the business was operating. The system could also generate enterprise-wide data for management analyses of product cost and profitability. [7] ERP is also helping to transform our industrial landscape. It's making possible profound improvements in ERP: the way manufacturing companies are managed. A half century from now, when the definitive industrial history of the twentieth century is written, the evolution of ERP will be viewed as a watershed event.[8]

Figure 1-1 How Enterprise Resource Planning work
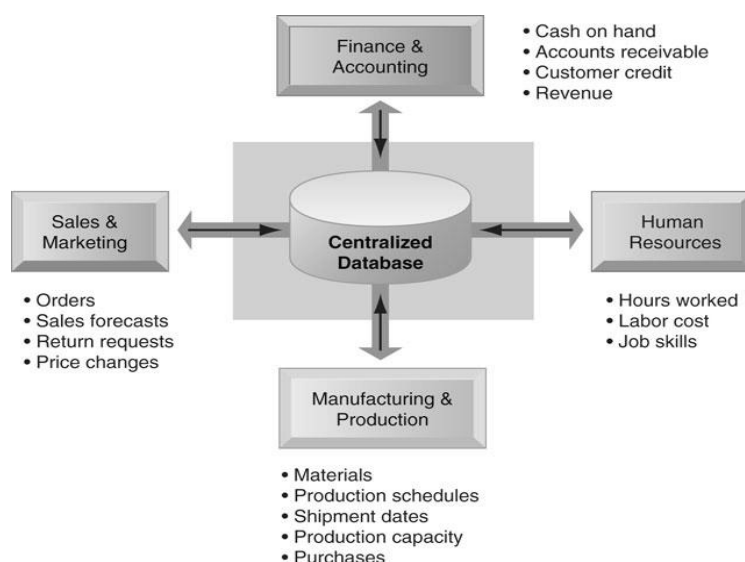
Source: Kenneth C. Laudon, Jane P. Laudon, "Management Information Systems: Managing the digital firm", Twelfth edition, Pearson Education, USA, 2012, P338.

I. 2. The Evolution of ERP Systems: The evolution of ERP systems closely followed the spectacular developments in the field of computer hardware and software systems. During the 1960s most organizations designed, developed and implemented centralized computing systems, mostly automating their inventory control systems using inventory control packages .[9] ERP began life as Material Requirements Planning (MRP[10]), an outgrowth of early efforts in bill of material processing. MRP's inventors were looking for a better method of ordering material and components, and they found it in this technique.[11] In simplest terms, MRP systems involved the calculation of quantities of materials and the times they were required in order to improve operations within manufacturing organisations. MRPII [12] systems were to extend upon this concept during the 1970s, and encompassed new functionality like sales planning, capacity management and scheduling. However, during the 1980s companies began to realise that profitability and customer satisfaction. By the early 1990s, with continued growth in package functionality and the need for greater organisational integration, ERP packages began to emerge. In response, software companies provided a myriad of application tools that promised enterprise integration of all kinds and for every company. Comprehending the nature of these vendor packages and their promises requires consideration of the generic characteristics that make ERP

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packages distinct from other ICT investments.[13] The fundamentals of ERP are the same as with MRP II. However, thanks in large measure to enterprise software, ERP as a set of business processes is broader in scope, and more effective in dealing with multiple business units. Financial integration is even stronger. Supply chain tools, supporting business across company boundaries, are more robust.[14]

I. 3. ERP System Benefits : One of the main benefits for introducing an ERP package is to achieve greater operational benefits. New advances in technology, and ERP packages, will make decision making a core part of the ERP package. Such benefits in management will invariably allow for greater strategic benefits. ERP packages can assist in building strategic partnerships, supporting alliances, creating new business opportunities and markets and developing a competitive advantage for the firm. ERP packages afford organisations with an opportunity to implement an integrated ICT plan, that is, greater ICT infrastructure benefits. ERP packages also support organisational change and business process reengineering BPR[15], therefore providing the firm with new organisational benefits. An ERP package facilitates organisational cultural change by allowing the ERP package to give the enterprise a specific vision.[16] Enterprise systems also help firms respond rapidly to customer requests for information or products. Enterprise systems provide much valuable information for improving management decision making. Enterprise software includes analytical tools for using data captured by the system to evaluate overall organizational performance. Enterprise system data have common standardized definitions and formats that are accepted by the entire organization. Performance figures mean the same thing across the company. Enterprise systems allow senior management to easily find out at any moment how a particular organizational unit is performing, determine which products are most or least profitable, and calculate costs for the company as a whole.[17] Other benefits of an ERP System are :[18]

· Reduced operating costs by better planning (and hence improved resource utilization) ,

· Lower inventory control cost due to better visibility and efficiency ,

· Cost savings due to reduction in duplicated efforts ,

· Reduction in non-value added activities (lean processing) ,

· Improved capacity utilization due to efficient operations ,

· Lower CRM[19] cost due to better customer expectation management i.e. meeting timeline and cost savings due to improved operational control,

· Adherence to defined process ,

· Improvement in decision making through more accurate and real-time data as well as historic data

· Availability of instant information to all concerned organs of the business

· Data standardization and accuracy across the enterprise as it allows Single Point of Entry (i.e. at the source of that data), and hence single source of truth ,

· Reduced Lead and Cycle Times and hence ease in meeting customer expectations regarding timelines ,

· Improved planning and forecasting due to availability of historical data and analysis data,

· Better financial control through extended capabilities for financial estimations, analysis of cash flow, and monitoring of various transactions.

ERP systems can generate significant business benefits for a company. Many companies have found major business value in their use of ERP in several basic ways:[20]

• Quality and efficiency . ERP creates a framework for integrating and improving a company's internal business processes that results in significant improvements in the quality and efficiency of customer service, production, and distribution.

• Decreased costs . Many companies report significant reductions in transaction processing costs and hardware, software, and ICT support staff compared to the non integrated legacy systems that were replaced by their new ERP systems.

• Decision support . ERP provides vital cross-functional information on business performance to managers quickly to significantly improve their ability to make better decisions in a timely manner across the entire business enterprise.

• Enterprise agility . Implementing ERP systems breaks down many former departmental and functional walls or "silos" of business processes, information systems, and information resources. This results in more flexible organizational structures, managerial responsibilities, and work roles, and therefore a more agile and adaptive organization and workforce that can more easily capitalize on new business opportunities.

ERP can also provide substantial benefits to the different phases of business process management BPM [21] activities and social software provide an extra benefit for the enterprise by overcoming the information-pass-on-barrier and fostering process innovation while management attention to business process improvement is reduced. Additionally, social business process management has also the potential to reduce the mismatch of a companies' business process models with the in reality performed processes—the model-reality-divide.[22] Business processes supported by ERP systems are: [23]

1. Financial and accounting processes, including general ledger, accounts payable, accounts receivable, fixed assets, cash management and forecasting, product-cost accounting, cost-center accounting, asset accounting, tax accounting, credit management, and financial reporting.

2. Human resources processes, including personnel administration, time accounting, payroll, personnel planning and development, benefits accounting, applicant tracking, time management, compensation, workforce planning, performance management, and travel expense reporting.

3. Manufacturing and production processes, including procurement, inventory management, purchasing, shipping, production planning, production scheduling, material requirements planning, quality control, distribution, transportation execution, and plant and equipment maintenance.

4. Sales and marketing processes, including order processing, quotations, contracts, product configuration, pricing, billing, credit checking, incentive and commission management, and sales planning.

If companies want to reap the maximum benefits from enterprise software, they must change the way they work to conform to the business processes in the software. Although initially designed to automate the firm's internal "back-office" business processes, enterprise systems have become more externally-oriented and capable of communicating with customers, suppliers, and other entities.

I. 4. ERP-Life Cycle Phases : There are four phases : "Chartering" phase contains several activities like preparing the business case for the ERP system adoption, the ERP vendor selection, the decision on the project and the set-up of the project organization. "Project" phase is the one generally associated with an ERP system, i.e. the implementation of an ERP system in the adopting enterprise until the system and the end users are "up and running". After the going life until "normal operation" has been achieved, this phase is called "Shakedown". The intention of the implementation project is to minimize this phase and the related impact. The phase "onwards

and upwards", also called post-go-live or post implementation phase, "encompasses the ongoing maintenance and enhancement of the ERP system and relevant business processes. Additionally, proposes an additional phase called "transformation", which is linked to introduction of new business models or major changes in customer structure. Similar effects on the ERP system can be experienced with mergers and acquisitions or carve-outs. [24] Implementing an enterprise system is the most important and challenging phase because it requires extensive changes in processes, people, and existing systems. Three required changes are:[25]

1. Redesign of business processes. Processes need to be simplified and redesigned so that they can be automated, either totally or partially. Tasks that are no longer necessary are removed from the processes.

2. Changes in how people perform their jobs. Jobs and how they are performed will change to accommodate the new processes. Enterprise systems require retraining of end users, whose productivity will slow initially as they adjust to a new way of doing their jobs.

3. Integration of many types of information systems. Integrating information systems is necessary so that data can flow seamlessly among departments and business partners.

I. 5. Characteristics of Enterprise Systems : The distinct characteristics of ERPs include integration, the nature of the ERP package, best practices, assembly requirements, and the evolutionary nature of these systems. A brief review of each of these characteristics is now offered. From an integration perspective, one of the core functions of an ERP, in comparison to all integration technologies, is its promise to "seamlessly integrate" all information flowing throughout the organisation. Another characteristic unique to ERP is the suite of best practices afforded to implementing organisations. Enterprise systems are built to support generic business processes that may differ substantially from the way the implementing organisation does business. From a technical perspective the term "seamless integration" seems slightly flawed when considering enterprise systems. Finally, like all ICT systems, ERP systems are constantly evolving and changing.[26] An ERP system is required to have the following characteristics:[27]

- Modular design comprising many distinct business modules such as financial, manufacturing, accounting, distribution, etc.

- Use centralized common database management system (DBMS)[28] ,

- The modules are integrated and provide seamless data flow among the modules, increasing operational transparency through standard interfaces ,

- They are generally complex systems involving high cost ,

- They are flexible and offer best business practices ,

- They require time-consuming tailoring and configuration setups for integrating with the company's business functions ,

- The modules work in real time with online and batch processing capabilities ,

- They are or soon they will be Internet-enabled, The modules of an ERP system can either work as stand-alone units or several modules can be combined together to form an integrated system.

I. 6. Understanding ERP success and failure factors : In almost every case, the business managers and ICT professionals of these companies underestimated the complexity of the planning, development, and training that were needed to prepare for a new ERP system that would radically change their business processes and information systems. Failure to involve affected employees in the planning and development phases and to change management programs, or trying to do too much too fast in the conversion process were typical causes of failed ERP projects. Insufficient training in the new work tasks required by the ERP system and failure to do enough data

conversion and testing were other causes of failure. In many cases, ERP failures were also due to overreliance by company or ICT management on the claims of ERP software vendors or on the assistance of prestigious consulting firms hired to lead the implementation. The following experience of a company that did it right gives us a helpful look at what is needed for a successful ERP implementation.[29] Many managers assume that success or failure depends on the software and, furthermore, that a failure is the fault of the software that's purchased or licensed. In reality, 95 percent of a project's success or failure is in the hands of the company implementing the software, not the software vendor. These ERP experts were given a list of five factors and asked to select only one of them as most important. The sixth alternative was all five factors. The results are:[30]

1. Strong program management: 6 percent

2. Executive support and buy-in: 19 percent

3. Organizational change management and training :13 percent

4. Realistic expectations: 8 percent

5. Focus on business processes: 5 percent

6. Interaction of all five factors: 49 percent

That is, 49 percent of the ERP experts have found that success depended on all five factors. Stated another way, nearly half of the experts indicated that the failure of any one of these five factors would or could cause the ERP to fail.

There are also two ways to make the move to ERP successfully:[31]

− The first is limited to firms that already have the good management practices recognized by installed ERPs. The transfer of existing procedures into the ERP is simple, and the firm can retain its operating methods while also benefiting from the advantages of ERP's data integration.

− The second applies to firms that have made poor choices and find themselves with incomplete systems that enable a partial integration, i.e., an introduction. These architectures often improved matters at one time, but have since shown their limits and shortcomings. The sooner and the more completely the firm abandons its use of them, the fewer problems it will face when it migrates to an ERP. Although the above solution may be costly and difficult to implement, such firms must set aside their former software and move on, without regrets, to a comprehensive solution.

Despite their potential benefits, not all companies invest in ERP, typically because they are unable to meet or overcome the following requirements:[32]

· Applications must be tightly aligned with well-defined and well-designed business processes, which is a standard that few enterprises are able to achieve.

· Selecting the appropriate ERP is time-consuming, complex, and expensive.

· Business processes must be modified to fit the software.

· Initial costs to purchase or lease and set up the ERP may be extremely high.

· The complexity of the applications might make it too difficult for employees to use the ERP correctly for maximum efficiency and Return On Investment ROI[33].

Management practices contributed to success as well. Contractual arrangements with vendors worked well and good working relationships were maintained within the implementation teams. Project management adhered to the following principles: the partial scope of the implementation was not changed during the project, except for adding the maintenance module, software modifications were avoided as much as possible; and sufficient investment was made in testing, data conversion, and user training.[34] ERP implementations are not only costly, time and resource consuming but are difficult to manage and measure its success. ERP implementation involves

many internal and external factors and has a great impact on the organisation in terms of the risks involved and the opportunities provided. [35]

II. Enterprise Integration: The highly competitive nature of the current business environment creates tremendous pressure for global company operations. Global organizations strive for agility and flexibility in order to cope with rapid changes in both internal and external environments. To rapidly respond to a changing environment, an enterprise must integrate business functions into a single system efficiently utilizing ICT, and share data with third-party vendors and customers.[36] The lack of integration of information systems has created a variety of problems. The most serious ones among those problems are the following:[37]

• Redundancy, i.e., the same information is stored and maintained several times.

• Inconsistency, i.e., information about the same entity stored in different places is not the same.

• Lack of integrity, i.e., databases where such information is stored are not correct.

The types of company that ought to switch to this method of integrating: [38]

·   The problem of managing innovation : Advances in computing do not come only from inventions. There are also successful innovations

·   Process innovation : This involves the setting up or adoption of new methods of organization, development, production, or distribution.

·   Breakthrough innovation : An innovation is said to be a breakthrough when it completely changes the way in which customers use it.

·   All the big firms have gone through the same technologic cycles : Individual choices may have been different, technologic breakthroughs are unifying by nature.

Enterprise Integration also refers to the plans, methods, and tools aimed at modernizing, consolidating, and coordinating software applications among a group of businesses or organizations that interact as consumers and suppliers. Enterprise integration might involve developing a total view of the organizations' businesses and applications, seeing how existing applications fit into the new model, and then devising ways to efficiently reuse what already exists while adding new applications and data. Enterprise integration is done for the mutual benefit of all organizations involved.[39] A successful program supplies an intelligence capability that both draws on enterprise data resources and is available as a resource across the enterprise. This implies that there must be well-defined processes for integrating information from multiple sources, whether it means merging data sets aggregated and deposited at a staging area or providing the means for integrating collections of data instances as they move through articulation points in the enterprise. Extract/transform/load (ETL[40]) processing, enterprise application integration (EAI[41]), and Web Services are all examples of process architectures designed for enterprise integration.[42] The Integration of information systems can be considered from several perspectives: from the data, the functions, the operations, the processes, the methods, and the software perspectives. The most important aspects are data integration, operations integration, process integration, and software integration:[43]

• Integration of data means that data models and databases are unified so that all departments of an enterprise use the same data entities, with the same values.

• Integration of operations requires connecting individual operations, or steps of a business process, with preceding or succeeding operations, respectively.

• Integration of processes means that interfaces between different business processes are explicitly considered.

• Integration of software means that different programs, e.g., information systems for different business functions, can run together and use each other's data and operations.

Companies that succeeded in integrating their systems enjoyed tremendous competitive advantage and reaped huge rewards in sales and market shares by offering unprecedented customer values. Systems integration has been an important topic ever since businesses started using mainframes to support their back-office operations.[44] As organizations become more complex and diverse in the global context, it becomes nearly impossible for organizations to implement their global business concepts without enterprise integration. Enterprise integration should enable organizations to become more agile and flexible. To achieve agility and flexibility, it is necessary to have both technical and behavioural integration. Conversely, it can be argued that behavioural integration is critical to the success of enterprise integration. The technical integration can be a success but if the organization is not going to internalize the enterprise system, the entire project is a failure. As such, to achieve the maximum benefit and impact from enterprise integration, we need to have both successful technical and behavioural integration. [45]

II. 1. Integration through ERP : Organisations have introduced enterprise systems in order to reduce problems associated with legacy systems, cope with year 2000 challenges, offer the firm greater competitive advantages, compete globally, and to assist the company achieve a single "integrated" technological platform. With organisations stressing the need for greater supply chain integration, these systems offer the first glimmer of hope to achieve such integration. Continued technological advances "extend" current ERP packages along the supply chain, with future systems focusing on the penultimate goal, that is, inter-enterprise integration.[46] ERP represents a major commercial solution that enables companies to integrate business operations across functions. Due to the extreme complexity of the software and the major changes required in the associated business processes, many ERP projects were abandoned or had their scope dramatically reduced. As a result, a typical company only implements a very small portion of an ERP package. Many companies continue to rely on their legacy systems or special software to support their operations. Integration of ERP with various enterprise applications remains a challenge.[47] The requirement to integrate diverse information assets continues to grow, whether it stems from the proliferation of business applications, growth by acquisition or the need to interoperate within an integrated business community. Integration can be at the data level or require the application of business rules, policies or basic logic. Whether the desired result is shared data, shared logic or simply a unified or consolidated view of your business, you will be faced with choices. You may wind up replacing systems or writing custom interfaces. Or you may turn to enabling technologies to blend old technology with new in order to achieve that all-important, emerging metric of interoperability.[48] An ERP integrates functions, including a suite of ICT modules that can be purchased as needed by the company. The core ERP functions are integrated with other systems or modules that are bolted-on, including SCM[49], PLM[50], CRM, and BI[51]. The ERP interfaces with legacy applications through an enterprise application integration (EAI) layer and with external business partners through a B2B[52] gateway . EAI is middleware that connects and acts as a go-between for applications and their business processes.[53] The introduction of an ERP package assists in integrating a firm's business processes and removing disjointed legacy systems, unstable ICT architectures, and ICT expenditure related to maintenance of these systems.[54]

II. 2. New Developments in ERP Integration : ERP systems have to become social systems able to address both their technical and organisational challenges, questioning the compatibility and possible synergy between information system efficiency and organisational work, taking into account the information and communication issues, and the technology as a social construct. This will ask for combining and developing technical and organisational knowledge through a renewed collaboration between computer and engineer scientists and social scientists, that is to say, going further in the debate between different disciplines.[55] ERP systems have provided companies with a backbone for managing internal business processes and controlling transaction level activity at an arm's length from their suppliers and customers, but now businesses must take the next step, shifting their focus outward. Are you ready? E-transformation is not a single giant step, but a series of smaller steps that become a journey to full E-business[56] integration.[57] Today, ERP is still

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evolving—adapting to developments in technology and the demands of the market. Four important trends are shaping ERP's continuing evolution: improvements in integration and flexibility, extensions to e-business applications, a broader reach to new users, and the adoption of Internet technologies . Companies that installed ERP systems pressured software vendors to adopt more open, flexible, standards-based software architectures. The growth of the Internet and corporate intranets and extranets prompted software companies to use Internet technologies to build Web interfaces and networking capabilities into ERP systems. These external links signalled a move toward the integration of internal-facing ERP applications with the external-focused applications of supply chain management (SCM) and a company's supply chain partners. Of course, the goal of these software suites is to enable companies to run most of their business processes using one Web-enabled system of integrated software and databases, instead of a variety of separate e-business applications. [58] Future ERP packages need to pay constant attention to technological advances and organisational needs. Such attention will increase package functionality and continued ERP growth. However, with the emergence of Internet technologies, implementation upgrade difficulties and cost of ownership have been dramatically reduced. The future of ERP packages will therefore involve constant technological configuration in order to meet changing organisational demands. Greater emphasis will be placed on total supply chain integration, with various new technologies offering such extensions, and inter-enterprise integration promising to be the penultimate prize. ERP packages will also be expected to act as knowledge warehouses and support decision-making and corporate intelligence. ERP packages will no longer be exclusive to large corporations; instead the SME market promises to be the most lucrative from a vendor perspective over the forthcoming years.[59]

II. 3. ERP Limitations and challenges for the integration: Like all ICT systems, there are as many limitations as there are benefits for enterprise systems. These issues will now be discussed. Excessive focus on technical aspects to the detriment of business aspects has been identified as a leading factor for many ERP failures. The reasons they give for such costs are due to the scale of business process reengineering (BPR) and change management issues involved in the implementation of the software. ERP packages can be structured, systematic packages that make the organisation "fit" the software rather than the software fit to the needs of the enterprise, that is, inhibiting organisational flexibility. This level of inflexibility can prohibit organisational change and business process growth. It pushes companies toward full integration, and changes various business processes into generic ones even if the company wants to customise some of these business processes. Another problem for ERP packages is the cost of workarounds and upgrades in specific modules, particularly when an organisation is customising the package to suit organisational business needs.[60] Other challenges of ERP systems:[61]

· Customization is limited in many situations: ERP system should readily allow partners and customers to customize and get the most out of the system to realize their full potential.

· The need to reengineer business processes: Businesses may not be willing to reengineer their business processes as they are using time-proven processes suitable for their custom needs and conditions.

· Rigidity: ERP solutions may be too rigid for specific organizations that are either new or want to move in a new direction in the near future.

With outcomes such as these there are clearly obvious challenges facing organisations implementing ERP packages. Many process models tend to move through the implementation process using CSFs[62] as benchmarks, without paying adequate attention to the organisational and human elements of the project. The second part of the suggested answer cuts to the very core of an ERP's existence, that is, questioning their nature to promise "seamless integration". ERP packages are comprised of two types of integration: these are technological and organisational integration. Technological integration can ever only be successful if there is organisational alignment between the technology and business processes of the enterprise. Organisational integration relates to how

the business processes are aligned, or realigned, with the ERP package, and how the elements of change are integrated into the overall ERP strategy.[63]

CONCLUSION :

Today's enterprises must create its integration with its information systems through the introduction of an efficient, flexible, and communication system that greatly enhances the integration, coordination, and collaboration of people and resources in an organization. Although traditional information systems offers a certain degree of integration, it is in general limited, fractural, and static in nature. An organization needs an ICT that is integrated, comprehensive, dynamic, and adaptive. This would enable an enterprise to have agility and flexibility as well as standardization and compatibility through the Internet (allowing for efficient e-commerce, e-business, m-commerce, for example). With new achievements in information and communication technologies ICT, companies are vulnerable if they do not respond to those technologies in a fast and proper way. Core competencies, however, are nearly always built from understanding the differences and similarities between the ways of doing business and desired new technologies. Top management should first strive to understand their business and needs for enterprise integration, and then select a methodology of enterprise integration. The introduction of ERP is a first step towards integration but it also brings new challenges in creating a truly integrated enterprise to achieve agility and flexibility in organizations, there should be a greater degree of communication, coordination, and cooperation in human factors as well as information and communication technologies ICT. Companies that have the vision, strategy, and support mechanisms for achieving integration of all applications including ERP systems. Their essence comprises technology changes that will affect (a) business strategy and (b) fundamental ideas as to how better to serve the customer, make and deliver a product or service, and compete more efficiently, effectively, and profitably.

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[9] Liaquat Hossain, Jon David Patrick and M.A. Rashid , Op.Cit, P17.

[10] Material Requirements Planning Systems (MRP) Processes that use bills of materials, inventory data and a master productions schedule to time phase material requirement, releasing inventory purchases in a manner that reduces inventory investment yet meets customer requirements.

[11] Thomas F. Wallace, Michael H. Kremzar, Op.Cit, P06.

[12] Manufacturing Resources Planning (MRPII) Extends MRP by addressing all resources in addition to inventory. MRPII links material requirements planning with capacity requirements planning avoiding over and under shop loading typical with MRP.

[13] John Loonam, Joe McDonagh, "Principles, Foundations & Issues in Enterprise Systems", Idea Group Inc, USA, 2005, P07.

[14] Thomas F. Wallace, Michael H. Kremzar, "ERP: Making It Happen The Implementers' Guide to Success with Enterprise Resource Planning", John Wiley & Sons, Canada, 2001, P12.

[15] Business process re-engineering (BPR) is a business management strategy, originally pioneered in the early 1990s, focusing on the analysis and design of workflows and business processes within an organization. BPR aimed to help organizations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors.

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[17] Kenneth C. Laudon, Jane P. Laudon, Op.Ct, P339.

[18] Anil Kumar Gupta , "Quality Assurance for Dynamics AX-Based ERP Solutions", Packt Publishing, UK, 2008, P09.

[19] Customer Relationship Management (CRM) An approach that manages in an integrated manner all business processes that directly involve customers, in an effort to build long-term and sustainable relationships with customers.

[20] James A. O'Brien, George M. Marakas, Op.Cit, P324.

[21] Business process management (BPM) is a field in operations management that focuses on improving corporate performance by managing and optimizing a company's business processes.

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[26] John Loonam, Joe McDonagh, Op.Cit, P08.

[27] Liaquat Hossain, Jon David Patrick and M.A. Rashid , Op.Cit, P20.

[28] Database management system (DBMS) is a computer software application that interacts with the user, other applications, and the database itself to capture and analyze data. A general-purpose DBMS is designed to allow the definition, creation, querying, update, and administration of databases.

[29] James A. O'Brien, George M. Marakas, Op.Ct, P326.

[30] Efraim T, Linda V, Janice C. Sipior, Gregory R. Wood, Op.Cit, P295;

[31] Larry Bensimhon , Aldo Levy , Georges Pariente, Op.Cit, P19.

[32] Efraim T, Linda V, Janice C. Sipior, Gregory R. Wood, Op.Cit, P297.

[33] Return On Investment (ROI) ROI measures the amount of return on an investment relative to the investment's cost.

[34] Nava Pliskin and Marta Zarotski, "Big-Bang ERP Implementation at a Global Company", Idea Group Publishing, USA,2000, P14.

35 Sumit Chakraborty, Sushil K. Sharma, "Enterprise resource planning: an integrated strategic framework" , Int. J. Management and Enterprise Development, Vol. 4, No. 5, 2007, P 558 .

36 Jinyoul Lee, Keng Siau, and Soongoo Hong, 'Enterprise Integration with ERP and EAI COMMUNICATIONS OF THE ACM', February 2003/Vol. 46, No. 2, P54.

37 Karl Kurbel, "Enterprise Resource Planning and Integration", Encyclopedia of information science and technology, Idea Group Inc, USA, 2005, P 1075.

38 Larry Bensimhon , Aldo Levy , Georges Pariente, "Organizational Consequences Linked to the Incorporation of ERP into Companies' Service-marketing Activities" , Journal of Internet Banking and Commerce JIBC, December 2009, Vol. 14, No. 3, P03.

39 Hamada H. Ghenniwa, Michael N. Huhns, "Marketplace Architecture for Enterprise Integration", Encyclopedia of information science and technology, Idea Group Inc, USA, 2005, P 1905.

40 Extraction-Transformation-Loading (ETL) A key transitional set of steps in migrating data from the source systems to the database housing the data warehouse.

41 Enterprise Application Integration (EAI) Extranets provide the ERP II system with a portal and a platform for integration with other systems inside or outside the corporation. EAI provides the support for automating processes across various IT platforms, systems and organizations.

42 David Loshin, "Business Intelligence: THE SAVVY MANAGER'S GUIDE", Elsevier. USA, 2003, P37.

43 Karl Kurbel, "Enterprise Resource Planning and Integration, "Encyclopedia of information science and technology", Idea Group Inc, USA, 2005, P 1076.

44 Mark I. Hwang, "Enterprise Resource Planning and Systems Integration" , Encyclopedia of information science and technology, Idea Group Inc, USA, 2005, P 1083.

45 Jinyoul Lee, Keng Siau, and Soongoo Hong, "Enterprise Integration with ERP and EAI COMMUNICATIONS OF THE ACM", February 2003/Vol. 46, No. 2, P56.

46 John Loonam, Joe McDonagh, Principles, ' Foundations & Issues in Enterprise Systems', Idea Group Inc, USA, 2005, P02.

47 Mark I. Hwang, Op.Cit, P 1083.

48 Cindy M. Jutras, 'ERP OPTIMIZATION : Using Your Existing System to Support Profitable E-Business Initiatives', CRC Press LLC, USA, 2003,P145.

49 Supply Chain Management (SCM) The integration of all activities in the value chain that provide products, services and value to customers. These activities include purchasing, materials management, production planning and control, inventory control and distribution and delivery.

50 Product lifecycle management (PLM) is the process of managing the entire lifecycle of a product from inception, through engineering design and manufacture, to service and disposal of manufactured products. PLM integrates people, data, processes and business systems and provides a product information backbone for companies and their extended enterprise.

51 Business Intelligence (BI) are the set of strategies, processes, applications, data, technologies and technical architectures which are used to support the collection, data analysis, presentation and dissemination of business information.

52 Business to Business (B2B) E-procurement systems improves the efficiency of the procurement process by automating and decentralizing the procurement process.

53 Efraim T, Linda V, Janice C. Sipior, Gregory R. Wood, Op.Cit, P292.

54 John Loonam, Joe McDonagh, Op.Cit, P13.

55 Bernard Grabot , Anne Mayère, Isabelle Bazet, "ERP Systems and Organisational Change A Socio-technical Insight", Springer, UK, 2008, P10.

56 E-Business: The use of the Internet along with other electronic means and technologies to conduct within business, business-to-consumer, business-to-business, and business-to-government interactions.

57 Cindy M. Jutras, "ERP OPTIMIZATION : Using Your Existing System to Support Profitable E-Business Initiatives", CRC Press LLC, USA, 2003,P14.

58 James A. O'Brien, George M. Marakas, Op.Cit, P327.

59 John Loonam, Joe McDonagh, Principles, Op.Cit, P09-12.

60 John Loonam, Joe McDonagh , Op.Cit, P15.

61 Anil Kumar Gupta , "Quality Assurance for Dynamics AX-Based ERP Solutions", Packt Publishing, UK, 2008, P10.

62 Critical Success Factors, A methodology for managing projects and firms that concentrates on the areas where things must go right if the endeavor is to flourish.

63 John Loonam, Joe McDonagh, Op.Cit, P19.