PREPROCESSING SELECTION OF ENTERPRISE RESOURCE PLANNING APPLICATION IN SMALL MANUFACTURING INDUSTRY AND ITS IMPACT ON BUSINESS PROCESS AGILITY

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ABSTRACT:
In today’s globalized economy, enterprises are facing ever increasing competitive pressures. A commonly adopted strategy for gaining new adequate technologies and remaining competitive is to acquire needed technology from external sources. In today’s business environment, competition between companies and complexity of market network is growing at a fast pace, making efficient use of resources and thus integrating different departments in planning and executing becomes more and more strategic. As a result ERP applications are being implemented at an increasing speed in different scale firms. ERP is a way to integrate data and processes of an organization into a centralized system that aims at having a single software solution where the information needed for decision making is shared across different departments. The selection or elimination of technology is a multi-criteria, multi-attribute, decision making problem, which involves both tangible and intangible factors. Given availability of technology and relatively inexpensive hardware, more and more small/medium size organizations are making use of ERP solutions. Due to the vast variety of available products, designing and executing the product selection process in an efficient and optimal manner is critical. The objective of this paper is to propose proper selection methodology as per the company’s workflow and to identify selection criteria for ERP technology selection in the manufacturing industry which help them to determine their profitability and accelerating delivery process. The case study aims to assists small manufacturing industries.

Keywords: ERP, SAP, Technology Selection.

I. INTRODUCTION
ERP or Enterprise Resource Planning has been referred to as a business operating system that enables better resource planning and improved delivery of value-added products and services to customers. ERP describes a specialized software package used to manage multiple business functions, specifically, software that is used to connect many aspects of a business together. They automate core corporate activities such as manufacturing and the management of financial, and human resources and the supply chain. Major business drivers behind ERP implementations are: improving productivity, providing competitive advantage, and satisfying customer demands. ERP software will update modules as changes are made within other modules. For example, when a purchase is made in a company’s procurement department, the asset management module is updated to reflect the purchase and accounting is updated to reflect the disbursement.

Although ERP applications have been widely adopted by a variety of industries worldwide, the challenges faced during and post-implementation remain a growing concern. ERP systems are complex pieces of software, consequently, many such implementations have been lengthy and over budgeted and were terminated before completion, failing to achieve their business objectives. Researchers and practitioners alike are still in the process of studying and understanding the causes of these hurdles. As part of this research, an in-depth literature review highlighted numerous project challenges and based on the Risk Factors of ERP, one of the risks identified in project management and control, is a lack of effective pre-processing selection.
methodology. Based on the primary author’s in-depth experience in ERP implementations, predominantly SAP, he recognizes that some pre-processed selection methodologies are not detailed enough. Regardless of how effective a methodology may appear, should it lack the relevant detail, the project in question may not yield the anticipated success. In order to achieve a successful implementation, this paper proposes the Effective Planning Approach (EPA) for implementing ERP in the small manufacturing industry. This area requires significant attention. Due to the advancement in computer hardware, software and network capability, ERP systems have grown into integrated software solutions which are capable of running every function of an organization. ERP is a method for effective planning, and control for all resources needed to take, make, ship and account for customer orders in a manufacturing, distribution and service company (APICS Dictionary, 1998). As a result of the complexity of the business environment, the limitations in available resources and the diversity of alternatives, software selection is tedious and time consuming (Wei and Wang, 2004) and remains crucial in the early phase of an ERP project.

This paper includes details about the ERP software/system and a procedure and workflow indicating actual modules to be implemented & deployed in the ERP software in Indian Manufacturing Industry and also the proposal for identifying the self-gratifying features of the ERP package.

Major brands such as SAP, Oracle and Oracle's PeopleSoft have dominated the market since the 1990s. The following section describes the ERP software available today in the market.

SAP ERP:
Software application made by the German company, SAP and part of the SAP Business Suite whose components include Financials, Human Capital Management, Corporate Services and Operations. These can together act as an end-to-end solution and manage an entire company. Because one application can manage an entire business, ERPs can create a more efficient work environment and reduce warehouse and inventory costs. Additionally, management can get a real-time global view of a business and can react quickly to market challenges.

SAP R/3 and B1
R/3 uses a client/server architecture that runs on a variety of platforms, including UNIX, Windows Server and OS/400. It can be implemented using a number of database packages, including Oracle, SQL Server, or DB2. B1 is targeted more at small and medium-sized businesses and offers pre-built modules for finance, warehousing, customer relationship management (CRM), e-commerce, purchasing and reporting.

LN/Baan
Created by The Baan Corporation in The Netherlands and purchased by Infor Global Solutions in 2003. Designed for manufacturing industries working on products with complex supply chains that involve different methodologies. Baan is especially suited for large made-to-order and engineering-to-order companies. Baan is used by companies like The Boeing Company, Ferrari, Solectron, Fiat, Flextronics, Evenflo and Navistar.

Microsoft Dynamics NAV and AX 2009
Microsoft offers two ERP software packages. Microsoft NAV is targeted toward small and medium-sized businesses and offers modules for analysis, e-commerce, CRM, supply chain management, manufacturing and finance. Microsoft AX 2009 is designed for medium to large organizations and has functions that are useful for companies doing business in multiple countries. It is focused on improving individual productivity and is best suited for service organizations, manufacturing companies, wholesalers and retail-oriented companies. AX 2009 is more customizable than NAV.

JD Edwards EnterpriseOne
Oracle-based ERP system offers pre-designed modules that focus on standards-based process engineering and deep understanding of different business processes and requirements. Available modules include, among others, analytics, capital asset management, CRM, finance management, human capital management, manufacturing, ordering systems and project management.

Oracle E-Business Suite Financials and PeopleSoft Enterprise
Oracle’s two other ERPs are E-Business Suite Financials and PeopleSoft. E-Business Suite Financials is an easy to use package targeted to the financial services industry. It supports distributed organizations and offers modules for financial and operational information, dynamic planning, and budgeting, forecasting and multidimensional profit analysis. PeopleSoft is a highly customizable suite that can support complex business requirements.
II. SOFTWARE QUALITY MODEL

Figure 1: ISO 9126 standard

McCall et al. (1977) earliest proposed a prototype of software quality model which contains 11 criteria. Boehm et al. (1978) enlarged the characteristics of software and incorporates 19 criteria. Grady and Caswell (1987) defined five major factors containing 24 attributes for software quality and named FURPS model. Therefore, ISO 9126 standard (1991) standardized these quality models and drawn on the various quality models to produce a small set of six consistent characteristics. The ISO 9126 software quality model is also been chosen to describe the software quality characteristics in our procedure and it identifies the six main software quality characteristics.

- **Functionality**: It is accessed by evaluating the features & capabilities of the delivered programs and overall security of the system.
  
  Factors: *Suitability, Accuracy, Interoperability, Security*
  
  Example: The Material Management module must have the capability features of showing the purchased material, material in stock, waste material and material on demand. This module must have secured link with all other modules.

- **Efficiency**: It is the amount of computing sources and code required by a program to perform its function.
  
  Factors: *Time behavior, Resource behavior*
  
  Example: The time taken by any functional module to perform its specific task.

- **Usability**: It is defined as the ease with which a user is able to navigate to the system.
  
  Factors: *Understand ability, Learnability, Operability*
  
  Example: The simple and robust graphical nature of the module to help any user in navigation.

- **Reliability**: It is defined as the extent to which a program can run to its specification defined.
  
  Factors: *Maturity, Fault tolerance, Recoverability*
  
  Example: The ERP module defined for any department should run to its defined specification.

- **Maintainability**: It is defined as efforts required for fixing and testing the error.
  
  Factors: *Analyzability, Changeability, Stability*
  
  Example: If any changes are required in the business process then the software can be easily modified to reflect the changes.

- **Portability**: It is the effort required in porting an application from one system to another.
  
  Factors: *Adaptability, Installability, Conformance, Replaceability*
  
  Example: The software can be migrated from one environment to another, i.e., if the business location changes then it can be easily portable.

III. PROCEDURE TO IMPLEMENT ERP IN A SMALL MANUFACTURING FIRM

1. Define your business and select the software vendor
2. Define the areas of your business
3. Review the proposal and explore the possibility of re-engineering your business
4. Select ERP Provider
5. User has to form the team to generate codes and collect required data from each dept.
6. Start the ERP training
7. Install hardware & networking components
8. Install ERP software
9. Configure ERP software department-wise
10. Employee Training
IV. HOW TO IMPLEMENT ERP SUCCESSFULLY AND AVOID COSTLY FAILURES

Enterprise resource planning software can either make or break your company, depending on how well you implement it. ERP programs such as PeopleSoft or Microsoft Dynamics AX or SAP ERP are meant to facilitate communication throughout every rung of your organization. The following steps can be used to successfully implement enterprise resource planning systems.

Step 1: Evaluate your organization as to whether or not its operation and workflow are compatible with ERP systems as a whole.

Step 2: Choose ERP software that's customizable. However, the more you have to customize, the more troublesome upgrades can be.

Step 3: Map your business processes in detail. ERP failures happen because those doing the planning don't actually know what the workflows are used in the organization.

Step 4: Implement new security measures along with your ERP. Enterprise resource software increases security risk as departments now communicate with those they were formerly isolated from, data-wise. Failure may occur due to unsecure data.

Step 5: Engage staff in the system changes. Ensure that they have proper training and are at ease with use of the software.

V. A PROPER SYSTEM SELECTION METHODOLOGY

To address the common mistakes that lead to a poor system selection. It is important to apply key principles to the process. This section will provide the formulation of the research questions, the details on data collection, and demographics of the respondents.

As a result of the literature review, we modified the questions with which we started, with the following results:

1. What types of technologies organizations are acquiring today?

2. What attributes do manufacturing companies use to evaluate ERP technology?

3. What evaluation methodologies do companies use?

4. How do organizations implement a technology once it is selected?

5. What are the impacts?

The following section describes the selection methods to be used.

Structured approach: The first step in selection of a new system is to adopt a structured approach to the process. The set of practices are presented to all the stakeholders within the enterprise before the system selection process begins. Everyone needs to understand the method of gathering requirements; invitation to tender; how potential vendors will be selected; the format of demonstrations and the process for selecting the vendor. Thus, each stakeholder is aware that the decision will be made on an objective and collective basis and this will always lead to a high level of co-operation within the process.

Focused demonstrations: Demonstrations by potential vendors must be relevant to the business. However, it is important to understand that there is considerable amount of preparation required by vendors to perform demonstrations that are specific to a business. Therefore it is imperative that vendors are treated equally in requests for demonstrations and it is incumbent on the company to identify sufficient demonstrations that will allow a proper decision to be made but will also ensure that vendors do not opt out of the selection process due to the extent of preparation required.

Objective decision process: Choosing which ERP to use is a complex decision that has significant economic consequences, thus it requires a multi-criterion approach. There are two key points to note when the major decision makers are agreeing on selection criteria that will be used in evaluating potential vendors. Firstly, the criteria and the scoring system must be agreed in advance prior to viewing any potential systems. The criteria must be wide-ranging and decided upon by as many objective people as possible within and external to the enterprise. Under no circumstances should personnel associated/affiliated to one or more systems be allowed to advise on the same.
VI. KEY SUCCESS FACTORS FOR GAINING PROFITABILITY & ACCELERATING DELIVERY AFTER ERP INTEGRATION

The company can achieve profit and can accelerate the delivery process after integrating ERP. The following are key advantages:

- Single solution for Batch as well as Continuous manufacturing companies.
- Web-enabled systems enable to take quick manufacturing decisions based on customer delivery schedule, material disposition and resource availability.
- Helps to plan monthly production in line with customer requirement, Material Requirement Plan (MRP), machine and manpower utilization plan.
- The reports like Enquiry & Order status, Daily/shift wise production & rejection status, work in progress, inventory, finished products stock, sales & status of products at vendors/subcontractor can be generated online.
- Various application modules like Marketing, Production, Material, Stores, Quality, Sales, Accounts and HR can be functionally integrated.
- Workflow in the company gets automated with cost and operational controls.
- Maximum utilization of resources like Material, Machines and Manpower.
- The self-configurable design utility is suggested to be implemented in ERP system to design valves as per required parameters so as to minimize the product design time.

VII. PROCESS-FLOW DIAGRAM OF INTEGRATED ERP SYSTEM

[Diagram showing the process flow of integrated ERP system]
CONCLUSION

The implementation of an ERP system takes a significantly longer time and level of resource than the selection process. However, the extent of the implementation will be profoundly influenced by the level of resource and objectivity within the selection. Companies that use a proper System Selection Methodology reap the benefit not only during the implementation phase but also and most significantly during the life of the ERP System.

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