

# Evolution of Modern Enterprise Resource Planning (ERP) Systems on Technological Background

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**Abstract:** In order to understand dynamic behavior of Enterprise Resource Planning system, it is highly essential to study the evolution of modern ERP systems on time and technology axes. This paper critically analyses how the changing need of industries changed nature of ERP technologies. Especially evolutions of hardware, software and integration aspects are critically studied in this paper.

**Keywords:** Enterprise Resource Planning(ERP),Material Requirement Planning(MRP),Cloud Computing ,Information Systems (IS),Supply Chain Management(SCM),Customer Relationship Management(CRM)

## 1. Early Systems in Mid of 20<sup>th</sup> Century

In mid of 20<sup>th</sup> century various departments within organisations used to function independently. These departments are often termed as functional silos. Naturally these systems were deprived of several benefits of coordination. There was lot of scrap, rework. Many times design needs to be changed when product was completely manufactured. This put lot of burden on financial and human resources of firm.

In such type of systems various business functions worked independently. Naturally benefits of cross functional coordination were not enjoyed by organizations.

## 2. Computerized Reorder Point Systems

In next decade computerized reorder systems were evolved. These systems were simple computer programs which can be used to decide reorder points, economic order quantity. This program used to care of stock levels.

Once inventory of items reached to reorder point these programs will generate purchase order automatically and was capable of giving alert messages to users. However these systems were not able to overcome the drawbacks of earlier systems.

## 3. Material Requirement Planning-I (MRP-I)

In next decade Material Requirement Planning systems were evolved. Material Requirement planning is the software architecture that facilitates material requirement and planning (Refer-Figure 1). Like every software it takes following inputs:-

- Bill of Material stating details of the materials, components and sub-assemblies required to make each product.
- Master Production Schedule. When the quantities are required to meet demand.
- Shelf life of stored materials.
- Inventory status records.
- Manufacturing lead time data
- Purchase lead time data
- Process Planning Data. This includes whole range of data

required for process planning like routings, process plans, quality testing methods, labour standards, machine standards

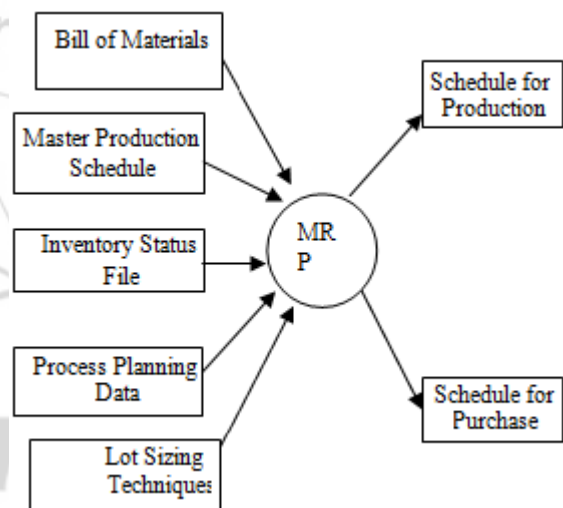


Figure 1: Architecture for MRP software

This software produces following output:

- Details about what to produce and when to produce. That means everything about start as well as finish time of each process. It also throws lights on quantities and generates necessary reports.
- Detail schedule of purchase. What to purchase and when to purchase –both questions are answered here. It generates purchase orders automatically.

Above MRP programs were not flexible enough if something goes wrong on shop floor like break down of machines or delay in delivery of purchased items. This created some inconvenience to user. As said need is mother of invention, next era of closed loop MRP system was involved. These closed loop systems were capable of accommodating feed back elements of uncertainty.

## 4. Manufacturing Resource Planning-II (MRP-II)

Though closed loop MRP systems were capable of including feedback elements which can take care of uncertainty issues such that system can adjust themselves as per sudden

unexpected changes in input parameters these systems were majorly focusing on manufacturing areas only.

As complexity of organization was growing at faster rate, users expressed sheer need of integration of existing systems with elements of financial planning and were interested in simulation capability of systems. Manufacturing Resource Planning –II system exactly served the purpose. These systems also included details of financial planning aspects including costing. Simulation feature helped users to simulate what if scenarios

Also it was necessary to have good computing capabilities to run these programs. These programs were run on mainframes. Baan, SAP, Oracle, PeopleSoft, JD Edwards were major players in ERP market.

### **5. Transition from Manufacturing Resource Planning-II (MRP-II) to modern Enterprise Resource Planning Systems**

As technology grew up and boundaries of business crossed regional barriers user felt sheer necessity of tightly integrated programs which can integrate all aspects of business in real time manner. It was highly essential not only to integrate all functionalities in one unit but also to integrate different parts or units of firms having national or global presence.

These essentially evolved modern ERP systems which can take care of these issues. These systems can be easily coupled with old systems. Though transition from legacy system to modern system was involved with lot of challenges, firms were able to transit same.

Now information was available to right person at right time with right authority to change to right person in real time environment.

Availability of real time data across each functional modulation and simulation capabilities were few of important characteristics of these systems.

Moreover it is possible to extend the capabilities of firm to include business technologies like E-commerce, SCM, CRM using modern ERP system [1][2][3].

### **6. From Modern Expensive ERP to Cloud Computing**

Scale (2009) defined- *Cloud computing as technology enabling the sharing and use of applications and resources of a network environment to get work done without concern about ownership and management of the network resources and applications* [4].

Mladen A. Vouk(2008) defines- *“Cloud computing” is important step in the evolution of on-demand information technology services and products. Cloud computing is based on virtualized resources. It implies a service oriented architecture, reduced information technology overhead for the end-user, greater flexibility, reduced total cost of ownership, on demand services and many other things.*

*Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources* [5]

Cloud based system was well appreciated by users due to scalability, flexibility, pay as use structure. Due to these features such systems are useful to small and medium enterprises as well as large firms also

### **7. Discussion about evolution of ERP & its Future**

According to E.W.T. Ngai, C.C.H. Law and F.K.T. Wat, (2008) latest generation ERP are more advanced and more effective and deals with multiple business [6]. Paolo Quattrone and Trevor Hopper (2006) states that Information Systems tries to combine the apparent homogeneity of Information Technologies (IT) with the heterogeneity of their use .Paolo Quattrone, Trevor Hopper, (2006) labels this paradox as ‘heteromogeneous’ [7].

According to Nabil A.Sultan(2011) cloud computing is going to be most viable and popular options in near future for SMEs due to its flexibility and pay per use structure[8].

Thomas F.Gattiker and Dale L.Goodhue(2004) suggested that tightly coupled systems produce significant benefits, including better coordination among subunits and administrative efficiencies. There is other group of researchers who thinks that loosely coupled systems are better [9]. Whatever the case may be cloud computing system proves to eliminate the drawbacks of both systems.

Evolution of Modern ERP/Cloud system from old legacy system clearly indicates that as the need of organizations changed in competitive environment, the system also changed their nature. This compelled organizations to adopt newer system to remain in competition. It is essential to study this evolution not only from macroscopic view but also from microscopic view for particular organization in order to obtain appropriate benefits from such systems.

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