

Surveying Systems of Enterprise Resource Planning

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Abstract

An incredible issue that numerous corporations confront nowadays is a superabundance of information. A few corporations can end up in a sea of information that they essentially do not know how to utilize. Besides, financial disasters has compelled a hefty portion of these corporations to utilize and sort out their information to lessen costs. Shockingly, corporations might cost themselves cash by leaving the fortune trove of information this data may provide. So by what method can corporations utilize this data? The answer is that Business Intelligence particularly combined with an ERP system, which can make this information and data, available and helpful.

I. Introduction

Enterprise Resource Planning system (ERP) are an integrated framework for business controlling, supporting different functional aspects within the enterprise, for example, accounting, financial, marketing, planning, manufacturing, sales, distribution, human resource management, project management, service and maintenance, inventory management and transportation. The significant qualities behind the ERP frameworks is how to integrate all functions, improve traffic of data between all sub-modules inside the framework in flexible way. Corporate computing with ERPs permits corporations to build a unified framework to link and combine their mostly inconsistent systems. ERP product now serving in small, medium, and large enterprises. Many ERP supplier are trying to re-pack ERP product to some effective tools, like Business Intelligence BI, Customer Relationship Management (CRM), and so on.

II. Evolution of ERP Systems

The extraordinary development in the field of software and hardware systems identified the progression of ERP systems. Later, most corporations outlined, and created central framework, mostly managing, and automating their inventory procedures [1].

These were frameworks based on programming languages such as COBOL, ALGOL and FORTRAN. These frameworks have a limited functionality and covering a specific portion of business. In the 1970s, Material Requirements Planning (MRP) framework has been created, which mainly combined

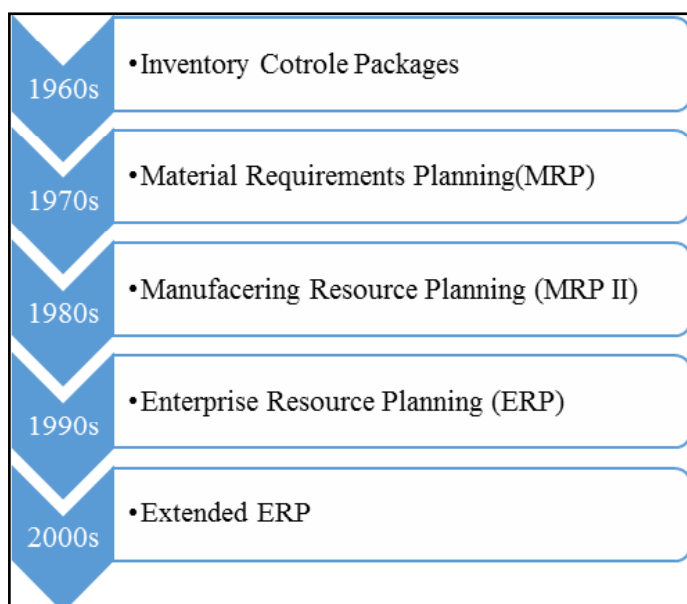


Fig. 1: Evolution of ERP Systems [1]

Parts requirements according to a predefined production schedule. Based on MRP system, new generation called manufacturing resources planning (MRP II) has been generated with an emphasis on optimizing manufacturing processes by synchronizing the materials with production necessities. The new system (MRP II) has opened the way for new modules such as shop floor, distribution management, finance, human resource, engineering, and project management [1].

ERP products appeared in the 1990s with the power of variety and integration of all functional areas of the enterprise. Based on the legacy of MRP and MRP II, ERP systems integrate business procedures including manufacturing, distribution management, finance, human resource, engineering, and project management, providing accessibility, visibility and consistency across the enterprise. Later on, ERP suppliers introduced more features as “add-ons” to the basic modules of ERP framework that described the “extended ERPs.” These ERP extensions include new analytical tools like Business Intelligence (BI), e-business solutions such as customer relationship management (CRM) and supply chain management (SCM). [1]

III. ERP Systems Architecture

ERP suppliers generally experienced from the MRP and MRP II understood the constraints of the old legacy frameworks considered as a part of huge enterprises. Initial attempts to develop these frameworks were initiated without planning based on isolated databases, languages that results in ocean of inconsistent products, information and procedures. New isolated systems were lacking integration and thus failed to combine all procedures. It was very difficult to upgrade these systems to keep pace with development in the organization’s goals [1] [2].

An ERP system is required to have the following characteristics:

- Modularity: including numerous business modules, for example, manufacturing, financial, distribution, and so on.
- Using of centralized database management system (DBMS).
- Modules should design to increase the consistency.
- Complex frameworks means high cost.
- They are adaptable.
- Time-consuming for modifying and design setups for incorporating with other organization's business procedures.
- They are Internet-enabled.

Many ERP suppliers introduce ERP packages with different features but most of these packages are similar in core functionality.

ERP systems have been built on the principle of modularity so, it consist of subsection called “Module”. Those modules have to cover major and critical areas of the enterprise. It is not necessary to implement all modules at once, enterprises implement only required modules according to their needs, and that what we call “Customized ERP”. Most of current ERP frameworks are sharing the following modules [3]:

- Accounting
- Financial
- Human resources
- Manufacturing
- Sales & distribution
- E-Business
- Production
- Supply chain
- Transportation
- Customer relationship

ERP modules can either run as an isolated systems or some of those modules integrated together to create an integrated framework called “customized ERP”. The frameworks are normally intended to work under a few working stages, for example, MS Windows NT, and Windows 2000.

Enterprise-level frameworks implement thin client-server (C/S) architecture or client/fat server (C/F) architecture. In a C/S architecture, a various customer terminals oversaw by end users, for example, desktop PCs ask for administrations from application servers, which in turn get the related data from the database servers. The solicitations might be straightforward information records, information values, transaction processing or master file updates. Main concept is to have three-level architecture. In this framework the user interface should be running all time in the client terminal. To perfectly run ERP system, a powerful server and effective client are required to perform most of operations. The client/server framework procedures taking following layers of logic [2]:

- Presentation Layer: Where GUI, or any browsing tool are presented.
- Application Layer: Business rules, logic, functions, and programs acting on information got/exchanged from/to the database servers.
- Database Layer: layer where the transactional, or operation data being processed, this layer also data-related standard (RDBMS) with structured query language (SQL) provisions.

This structure ensure that all component of the ERP environment are running in a consistency manner, the preparing component should be running on application server, User Interface component should be running on client terminal, and the BD system should be running on the DB server.

IV. ERP Systems Life Cycle

The information system’s life cycle states the different stages through which an information system goes through. In its normal structure, the system development life cycle incorporates project definition, framework study, outline, programming, installation and implementation phase. Two methodologies for system improvement are [4]:

- Waterfall model: where stages are executed successively and once for every framework.
- Prototyping: where the stages are renewed, tuning a basic model until it can be utilized as the definition for the

framework to be used or as the framework itself.

1) Initial Phase

In this phase, the corporation sets up the basic purpose for a system and records its need. In this phase security arranging ought to be set with the preparing of fundamental security policies to be done in the following phase. All required information should be declared for security purposes, also all stakeholders have to have typical comprehension for same security considerations. One of the main roles that should be declared as well is the Information System Security Officer (ISSO).

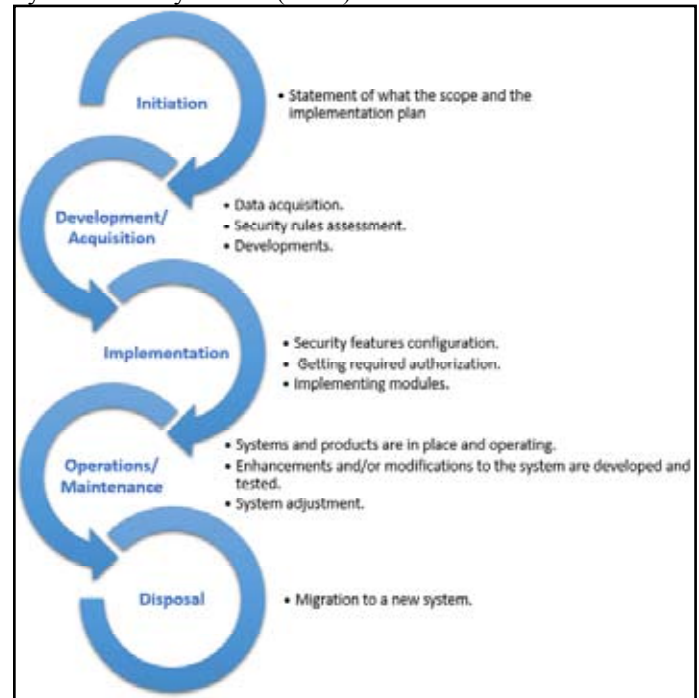


Fig. 2: ERP System Life Cycle

Security considerations are very critical to the early implementation of security, and threats assessment. Government organizations ought to apply Standards for Security Categorization of Federal Information and Information Systems, the roles of Federal Information Processing Standard (FIPS) 199, and FIPS 200, Minimum Security Requirements for Federal Information and Information Systems. These standards push the organizations to sort their systems as (low, moderate or high) affect for the security considerations, trustworthiness, and accessibility and to choose suitable security controls. Any information security prerequisites ought to be resolved also [5]. Early arrangement and enough information lead to save time, expenses and staff time through proper risk management. In this phase, the corporation determines its scope and information security required, and additionally the security schema.

2) Development/Acquisition Phase

The assessment of risk qualifies the corporation to characterize the danger identifying with operations, resources, and people emerging from the other related procedures. After modeling the system as per FIPS 199 and 200, organizations have to apply basic security rules, so that they have to meet the right assurance requirement, security control, and other requirements that are mentioned in NIST SP 800-5 [5].

Security plans is one of the important consideration that have to be improved in this phase. Security plans state the required security necessities for the information system, and characterize

the selected security roles. Security plans also state the proper methodology to execute the controls, and how to operate and utilize the framework in risk situations. Security plans report the choices made in the determination of controls, and are affirmed by approved authorities. The proper check will be produced for every module, and an online help desk will be made to help clients in their communications with the framework [6].

The procedural assurance is required in this phase to ensure that security roles, and functions of the system are performing as planned.

3) Implementation Phase

In this phase, the corporation shapes and guarantees system security attributes, checks the usefulness of these elements, introduces or implement the system, and acquires a formal approval to run the new system. Audits and framework tests ought to be done before working the framework to affirm its similarity with predefined security criteria. In case of any modifications such as adding controls to implementation system, the required acknowledgment must be performed to state new functions. This methodology guarantees that new roles meet security schema and don't conflict with or nullify existing capacities. The results of the outline surveys and framework tests ought to be completely recorded, updated as new audits or tests are performed, and saved in the official registers [5].

4) Operations/Maintenance Phase

In this phase, the applied systems are in operation, refinements and acclimations are required, and other related elements like hardware and software also included in the refinement process. The enterprise ought to always check processes of system execution to avoid any conflicts, shortage, and to guarantee that it meets client satisfactions and security prerequisites, enterprise also ought to guarantee that the system is consolidated even with any alterations. Configuration management (CM) ought to be performed to record any normal or real adjustments in the security plans of the system. New system should be keep pace with evolution of hardware, software, firmware, and likely modifications in the framework. During the life cycle of any system, the Operations and Maintenance Phase is the longest and probably most costly as the information system gives the most utility to the corporation in this stage. After system practically gets to be out of date, the system is prepared to move to the last stage, the Disposal Phase [7].

5) Disposal Phase

In this stage, plans are made for disposing of system, hardware, and software and making the move to another framework. If new system executed improperly, the disposal phase can result in the unauthorized reveal of critical data. While archiving data, organizations ought to consider the necessities and techniques for future recovery [5].

Usually, there is no extreme end to any framework. Frameworks upgrade or move to the next generation to keep up to date with changing in strategic objectives or upgrades in technologies. System security criteria ought to constantly develop with the framework. One of the most critical considerations that the organization has to consider in the transition process is the operational data, the transited data should be relevant, consistent, and helpful to the new system. The disposal processes hold the vital data about the framework so that a few or the greater part of the data might be reactivated later on, if necessary. there is no doubt that the

appropriate keeping of the information prepared or generated by the system is very critical so that the information is viably transformed into another system or documented as per applicable registers management system and policies for future use. The disposal of data from a storage, for example, a hard disk, ought to be done as per the project's security necessities [7].

V. ERP Implementation Issues and Challenges.

There is no doubt that the ERP industries will keep growing, based on this evolution enterprises ought to be more flexible to apply new information systems, this process likely to involve several issues and challenges. Some of these are:

- 1) **Awareness:** There is a low level of cognizance among Enterprises for ERP vendors, ERP systems and so forth, furthermore, they don't comprehend the key features behind the ERP system, they think that once they implement the ERP system the business issues will be resolved, and quality will be increased. So the key players should be aware what is the exact requirements of the organization, and what they exactly expect from the ERP system.
- 2) **Perception:** Enterprises have the idea that ERP is implied just for big companies mainly owing to the high expenses of acquisition, investment, operations and maintenance as additionally the intricacy. A portion of the Enterprises even feel that they don't have to apply ERP.
- 3) **Earlier Implementations:** If the enterprise has a bad experience in previous attempts of ERP implementation, this is may be the biggest challenge of the new system implementation as the enterprise belief that this process is a waste of cost, time, and effort.
- 4) **Approach to implementation:** System providers recommend Enterprises to push their business towards ERP. Many enterprises that their business is not straight forward business can't apply the ERP solution, until required modifications have done to the system. Customization process is required, but it may increase the execution budget, so keeping customization to minimum is the proper approach.
- 5) **Cost:** Limited budget is one of the main challenges, so small companies often turn to simple solutions.
- 6) **Change management:** One of the primary reasons for implementation failure is the mentality of individuals, they simply do not accept the new system as they believe that they will be replaced by new system. Administration is responsible for this problem, they have to explain to the staff that the new system is just a tool to help them to accomplish tasks more effectively.
- 7) **Limited resources:** Resources limitation especially in IT staff, so most of enterprises turn to outsourcing to support them, this procedure increase the total cost of implementation process.

VI. Success Factors Affecting ERP Implementation.

In addition to the challenges that have been mentioned earlier, there are many success factors that must be considered to ensure that the ERP system has been applied properly, The factors are can be listed as follows: [8]:

- 1) **Data provided:** Right and enough information should be supplied, it had to be gathered from the distributed Servers, had to be reconciled, transferred into the prober format and finally the data had to be uploaded into the system. A strong management way is needed for the directors at each of the

- sections so that sufficient and appropriate information is duly supplied.
- 2) **Replacing Old Systems:** At the point when problems start arising after usage of new ERP system, they completely dismiss those problems, they switch to the old system. This curb the suitable integration of current information and led to data conflicts in other modules as well as outcome, backup order provided by the system provider became neglect and hard to implement. Hence, the old systems ought to be progressively stopped.
 - 3) **Training and Testing:** Testing considered as one of the most sensitive processes in ERP implementation phase. It is usually start before an enterprise deploys an ERP system and it also continues after the stage where the software goes live. Practicing and testing of the system should be totally done by the ERP Expert. The team has been supplied by the vendor as part of the implementation procedure to only a 30% combination of people from the customers' side known as the Basic Team. This basic team in turn trains a rest of people who are actually responsible for day-to-day transactions called the End Users. It was noticed that the 50% second leg of training which is provided to the customers was not implemented fundamentally due to short of computer experience, not will to be accepted the liability this triggered a powerful resistance to alteration for the modern system being installed and caused reduction in employee stimulus.
 - 4) **Early-Define of Requirements:** Visibility in organization targets and anticipations from the ERP System are clearly stated to the vendors. This led to a belief of the systems' power to combine the organization actual procedures. According to the vendor, organization expect a fast return on investment, which is not applicable since it may take around six to eight months to notice any significant returns. Hence, top management ought to be patient with the new ERP and any fear of fail should be done with for a successful implementation.
 - 5) **Controlling Employee's Reactions:** Normally after the completion of ERP training provided to the staff and during some days of the system going live, many of the trainees from the enterprise start resisting the new ERP system causing great losses to enterprise in the form of shortage of key resources i.e. trained staff. Those reactions ought to be controlled and staff should be aware that the new system is mainly to increase the productivity no to reduce the labor.
 - 6) **Design & Testing:** One of the most critical factors that is truly affect ERP implementation, is software testing and should not be neglected, the computer work stations are set up in a proper place to make a real scenario for each of the main tasks and procedures. A simplified data should be loaded and the company operations run through. The data is progressively increased as first the project team, then directors and finally end users get more familiar with the system. This is conducted just before the ERP system becomes live in the enterprise.
 - 7) **Customization:** Implementation of (ERP) systems has been a source of pain for most of organizations since the inception of ERP system. One of the main reasons of pain is customization. Customization Services involves any adjustments or extensions that change how the out-of-the-box ERP system works. Customization influences the enterprise in an on-going manner through increased maintenance costs, increased complexity, and reduce flexibility of the system

[10]. Customization work is usually pledged as software development on a materials and time basis. However, ideally, experts in the ERP implementation field recommend that customization process ought to be less than 30%. If the level of customization in the case of Multiplex exceeded this limit, both ERP vendor and IT team should report the top management immediately.

- 8) **Key-players identification:** All stakeholders have to be specified in the initial phase, stakeholders may include users, customers, or suppliers. Also relationships and responsibilities should be consider in the initial phase to avoid any failure or drop-back.

VII. Extended ERP.

The uprising of the Internet has indicated incredible impact on each side of the IT field including ERP prodeucts turning out to be increasingly "Web-based". This framework of getting data from anyplace at any time has helped ERP industries to extend their legacy ERP frameworks to link with more up to date external business modules, for example, SCM, CRM, BI, and e-business capacities. Those new modules enhanced core modules especially in top managerial level. [1][11].

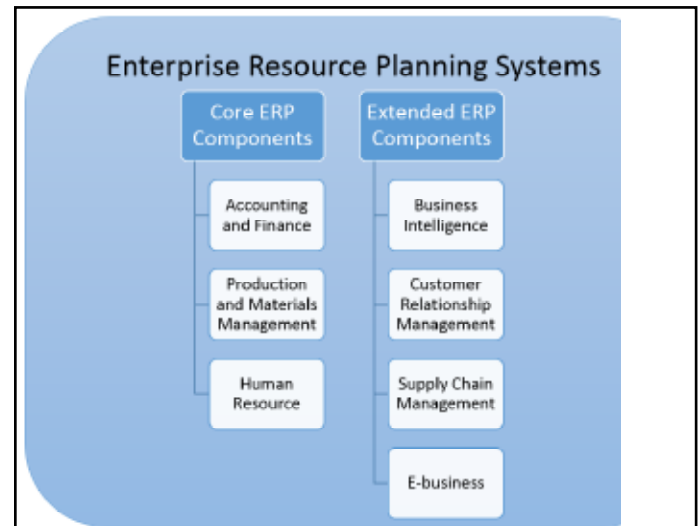


Fig. 3: Core ERP vs Extended ERP [1] [11]

Really, ERP is turning into the e-business basis for organizations doing online services over the Internet. Web based softwares are developed to enhance consumer loyalty, increment advertising, open doors for new investments, duplicate distribution channels, and create new effective techniques for billing and payment. The amplification to CRM and SCM empowers viable tri-party business connections between the organizations, the clients and suppliers. A SCM solution has sub-modules for procurement of materials, conversion of the materials into products and delivering of products to clients [1].

E-commerce is the main link of business processes within organizations with a great support of new communication technologies, particularly using Internet-based frameworks, for example, the Web and email, successfully interfacing worldwide clients. Nowadays, most small, medium and big vendors are depending on e-commerce and e-business products as an add-on especially business-to-business products. The Web-based applications are incorporated with the back-office ERP-based applications, empowering business processes, for example, online requests, online payments, stock updates, representative

advantages, and so on to happen between the clients, suppliers and the corporations depending on reliable information immediately in a border-less domain [1].

VIII. Turning from ERP To E-Business

ERP products have detonated into the worldwide business scene. Thus there is a lot of competition between the ERP Vendors to provide the best Packages, ERP system should guarantee to supply the required backbone for enterprise. E-business has changed the meaning of big business systems. ERP concentrates on basic function and procedures of business, while E-business pushes the ERP from inside core of the corporation to the network edge [13]. The integrated framework introduced by ERP systems are the after-effect of a balancing control amongst standardization and precision from one perspective, and adaptability and lightness on the other. This parity is being tipped by the expanding assurance on front-end, client-gear applications, and by the developing significance of E-Commerce and local environment of enterprise. Subsequently, ERP players ought to change their strategy from inward focus to E-Business. *Larry Ellison*, bluntly stated it as follows:

“We blew it in the 1990s. By running applications on the client, client/server was meant to put information at your fingertips. However, all we did was to create distributed complexity and fragmented data. CEOs have come to hate IT, because they cannot get what they want from it. Burger King put an SQL Server database in every hamburger store, but they still could not answer the question, “how many Whoppers are we selling each day?” ERP as an industry missed the boat. It focused on automating processes, not on getting information to key decision-makers... So how do we do it now? We have learned from the Internet that you do not put shared applications on the client and that you centralize complexity. You consolidate your data. The unchanging appliance accesses the dynamic applications of the network.” [14]

Incorporating ERP with E-business pushes all processes inside the organization to the Extremes and aides in extending their market opportunities, association with their clients and suppliers. Nowadays more and more enterprises understand that they ought to open themselves to their clients and suppliers over the web, incorporation with ERP framework turns into a basic issue. Integration process involve many critical challenges, how integrate with local ERP framework? What's is the security arrangement they have to consider? And what are the tools that must be provided by companies to customers? [12].

IX. Main ERP Vendors

1) SAP

In the year 1972s five IBM employees established SAP. It launched its first product (financial accounting software). SAP grew at first around ERP and cemented its initiative by being a pioneer in the change from centralized framework to client-server architecture with its R/3 ERP product presented in the 1990s. From that point, the company extended into a much more extensive series of products for different modules in the organization: supply chain management (SCM), customer relationship management (CRM), and supplier relationship management (SRM), product life-cycle management (PLM). By organizing and integrating these separate modules, the organization shifted to advanced level of high quality, huge enterprise solution. [15].

SAP R/3 is a client-server application, based on a 3-layered model,

the presentation layer, the application layer, and the database layer. Exclusive language called ABAP (Advanced Business Application Programming) has been used to develop SAP R/3. ABAP, or ABAP/4 is a fourth generation of this programming language 4GL. SAP R/3 additionally shows a complete improvement environment where software engineers can either edit existing SAP code to change existing functions or make their own particular functions, whether reports or full transactional application inside the SAP environment. ABAP's primary interaction with the database system is via Open SQL queries. These SQL Queries allow developers to interact with stored data, they can simple add, delete, retrieve, and update the data in database. Another advanced aspects like GUI design and integration with different frameworks. SAP ERP redesigns ERP – introducing role-based access to sensitive information, applications, and analytical tools. With SAP ERP covers many sectors of business, these sectors include [15]:

- End-user service delivery
- SAP ERP Financials
- SAP ERP Human Capital Management
- SAP ERP Operations
- SAP ERP Corporate Services
- Performance management

2) Oracle

In 1977, Oracle was founded as Software Development Laboratories. The first Oracle system was created by assembly language ran on PDP-11 and with 128k of memory. The system was never “officially” released. First system to be released was version 2, it was in 1979. Business grew and by 19887s, they had changed their name to Oracle, and the organization opened up to the world. Nowadays, Oracle became one of the main players in the ERP field. Because of its relational database, Oracle was formerly best known for the world, it was for many years the database of choice for SAP ERP applications [16].

An Oracle database framework is a perfect stage to store data and combine it with Graphical User Interface (GUI), that proper combination enables user to retrieve data easily from database. Data is organized and stored logically as tables and physically as data records. The enhanced structure for an Oracle database is the (RAC) Real Application Clusters. To offer better quality, versatility, integrity and redundancy for the clients, various instances, usually on multiples servers, combined together to a unified storage array. There are numerous forms of the Oracle DBMS. Also, Oracle parts its products into different releases to gauge market [12].

- Enterprise Edition.
- Standard Edition.
- Oracle Personal Edition.
- Oracle Database Lite.

Oracle Business Suites include more than 140 different applications. These include:

- Financial Management Solutions
- Human Capital Management
- Enterprise Performance Management
- Business Process Outsourcing
- Customer Relationship Management
- Project Management
- Procurement
- Customer Self-Service Solutions

3) Microsoft Dynamics.

Microsoft Dynamics is mainly geared towards Tier II customers in the ERP field. Microsoft Dynamics is a complete framework of business administration that provides a set of modules and functionalities that cover all sectors of business. Microsoft Dynamics also offers reporting and analytical tools used mainly by top managerial level for strategic planning and decision making [15] [16].

Microsoft Dynamics contains a set of applications, which can be applied to their platform. These include:

- Financial Management
- Business Intelligence and Reporting
- Human Resource Management
- Project Management
- Customer Relationship Management
- Manufacturing
- Supply Chain Management
- Collaborative Workspace
- Configuration and Development

X. Conclusion

ERP products are receiving predominant use. The Major Information Systems Manufacturers that arise from the beginning of 1980s and early 1990s determined the history of the development of ERP systems. ERP system provides and involve set of primary functions and modules that integrates every department of the business around the world by providing real-time control of your data and processes. ERP also streamline every module workflows for better decision-making and outgrowth. ERP products are not only applied to large enterprises, but also small to medium enterprises (SMEs), most vendors nowadays are repackaging the ERP packages to fit SMEs. Migration process and implementation process are evolving many critical considerations that may have a positive or negative impact on the ERP system. Finally, the player who resolves the previously mentioned consequences, and creates systems that are smarter will take the lead in The ERP field.

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