

Enterprise Resource Planning

Gustavo Barizon

University of Denver, Daniels School of Business

## ENTERPRISE RESOURCE PLANNING

What is the technology, what are its features, and how does it work?

Enterprise Resource Planning (ERP) software is a business management suite that integrates different departments in an organization. (Klaus, H., Rosemann, M., & Gable, G., 2000)

ERP systems are divided in modules. Those modules are related to a specific area in the business. The modules can be implemented alone or ahead of the others. ERP systems share a single source of information across the company. The information is available in real time, leveraging advantage competitiveness for the business.

Usually Enterprise Resource Planning software architecture is layer-based, (Møller, C., 2010) providing abstraction, so, a change at one level will not impact, or will cause a minimal impact on other layers. Basically there were three layers: data layer, business layer and presentation layer. The modern ERPs systems also incorporated a business service layer to complement the integration in real time with other systems, internal or external to the organization.

Multiplatform is also an important feature for ERP systems. This enables run in a multitude of Operating Systems and Databases. This versatility allows for easy maintenance of information across the network. In many cases, multi-national firms with operations in two or more countries must have their systems adapted globally to the different languages, currencies, taxation rules, and technologies limitations. Therefore, the information is still integrated and the decision makers can respond with more agility to market changes in a global scale.

## ENTERPRISE RESOURCE PLANNING

Securing information is critical for ERP systems. Sensitive information flows through the system. The security sense for ERP it's not limited to external threats. Internal aspects, though, must be defined by the business, such as security policy of segregation of duties, role based authentication, authorization, time restriction, log and trace and finally database security. In some cases a row security policy may be applied, however, the overall system performance may be affected.

Usability features like drag and drop, type ahead, point and click, pages, carousel, composite applications, and portals makes the system friendlier to the user. The usage of web-enabled technologies makes the learning curve significantly smaller than to the built-in custom applications, also known as fat-clients. Moreover, the adoption of mobile technologies expands the interaction level of users; create new ways to use the system in real time either with tablets or smartphones.

Enterprise Resource Planning architecture standardization, works basically in three layers: database, business and presentation. These layers can have different communication protocols, database management systems and hardware operating systems. A middleware residing between the operating system and the business applications is used to facilitate the communication across different platforms. Each different ERP vendor has its own proprietary middleware mechanism. Middleware communication occurs through messages. The middleware messages contain processing requests, such as requests for business functions, batch jobs, or login security. Middleware messages can originate from the client or the server. Thus, application requests can be synchronous or asynchronous. A synchronous message, such as calling a

## ENTERPRISE RESOURCE PLANNING

business function, requires the client to wait for the server to complete the request. An asynchronous request enables the client to continue with another task while the software processes the request.

### Describe the history/evolution of the technology

Enterprise Resource Planning systems started with simple inventory control applications in the sixties. (Wortmann, J., 1998) IBM was a precursor with its IMPACT system to maintain stock levels for large companies. These types of systems also served to make forecast calculations to determine ordering, in case the stock reached some parameters such as safety stocks. The concept of Material Requirements Planning (MRP) has been introduced at the end of sixties and the computational power were used to produce MRP-calculations, based on time-phased planning as well as the sorting of the Bill of Materials (BoM).

In the seventies, the technological innovations fostered the business processes integration via online transaction processing. This allowed a more effective support for decisions, transaction processing and integrated information management applications. The introduction of database management systems allowed the applications to share common sub-set information, permitting now a major visibility of the business operations. The computation power now is not only used in calculations. Uniting the two ingredients: database systems with online processing; we've got the Business Information Systems, which was the base for the Manufacturing Resource Planning (MRP II) systems. The 1980's decade is marked by the introduction of Client Server architecture. The MRP II systems expanded with more functionalities such as fixed assets

## ENTERPRISE RESOURCE PLANNING

management, shop-floor scheduling, distribution, transportation, financial, EDI processing, product data management (PDM), etc. An increase in complexity became evident, causing a longer implementation time. The mainframes were threatened by mini-computers and two-tier client-server architecture, thus the operating systems now are able to run on different types of hardware reducing operation costs. With the advent of Graphical User Interface (GUI), the 1990's Enterprise Resource Planning consolidates as three-tier architecture, the ERP vendors focused in the outside look and feel, usability and tools were added to master the design complexities, implementation and maintenance. Moreover, an important assignment was the introduction of workflow capabilities.

Modern ERP systems nowadays run in a distributed architecture, relying on the new technologies to integrate diverse systems and platforms using business services or Service Oriented Architecture (SOA).

What benefits does the technology provide/promise for business?

Many are the benefits for a company implementing Enterprise Resource Planning applications. An integrated environment is the most noticeable and perhaps the most valuable. (Introduction to JD Edwards EnterpriseOne Benefits, (n.d.)) Moreover, the most modern ERP's in the market offers a rapid deployment by leveraging business accelerators, assisting the core operation, reducing risks, providing a faster return of investment in a single platform. Thus, options for different languages and localizations, delivers a streamlined business process flow in a global scale bringing real-time information. Multi-currency operations handle international financial operations, with the

## ENTERPRISE RESOURCE PLANNING

elasticity to adapt to local demands such as diverse taxation systems and government policies. (Oracle | JD Edwards World Multi-Currency. (n.d.))

Does it offer disruptive opportunities? If so, how?

Enterprise Resource Planning software has been disruptive since its inception. Permitting companies do business and control their operations in such way there's never been done before. Nowadays, with the mobile technologies, most of ERP vendors are showing its disruptive power their full application suite to tablets and smartphones. Those solutions are built for specific purposes to rapidly execute critical tasks from any location.

With the rise of cloud as a deployment option, the majority ERP suppliers are providing faster, reliable and secure alternatives for cloud computing. According to the official National Institute of Standards and technologies (NIST) definition, "*cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.*" Enterprise Resource Planning in the cloud bring benefits such as keeping the software current, through regular updates and patches. It allows the business to take advantage of new application functionalities, user interfaces capabilities, even though a secure and stable cloud environment.

What infrastructure or complementary technologies are needed to use this technology?

As a multi-platform product, ERP systems are supposed to work with a variety of hardware and software products, maximizing the existent infrastructure of a company.

## ENTERPRISE RESOURCE PLANNING

Ranging from a variety of operating systems such as IBM OS/400, UNIX, Windows, Linux and Solaris, ERP systems also supports various database applications as well as Oracle, Microsoft SQL Server and IBM DB2. In the application layer, the foundation technology can be diverse, based in Microsoft Visual C++, Java, RPG, etc. However, the most ERP systems have their own Application Programming Interface (API). To extend the communication and integration with other systems in real-time, a business services layer has been integrated supporting both JAX-RPC and JAX-WS based business services complimentary technologies as standards for the most ERP's on the market. Virtualization is another technology available in several flavors to ERP. In some cases, virtual machine templates, a set of pre-built and pretested templates are configured for a rapid implementation.

Describe several businesses that currently use it, how, and the outcomes of such use.

(Oracle JD Edwards Reference Booklet., 2012)

Sunrise Medical LLC. Consumer goods, USA. Accelerates Order-to-Cash and improved operational efficiency.

Jurlique. Consumer goods, Australia. Automates online ordering and completes skincare product transactions 50% faster during peak periods.

Avon Cosmetics Ltda. Consumer goods, Brazil. Improved field service to more than 1 million sales representatives through integrated finance and supply chain system.

Clarins Canada Inc. Consumer goods, Canada. Ships 99% of orders within 24 hours with improved warehouse management system.

## ENTERPRISE RESOURCE PLANNING

Ardo. Consumer goods, Belgium. Employed rapid and transparent reporting to support daily and strategic decision making.

C&U Group. Retail, China. Reduced inventory costs by US\$22 million a year, improved goods turnover by 25%.

West Coast Reduction Ltd. Industrial Manufacturing, British Columbia. Improved supply chain visibility, enabled mobile fleet management, and automated administrative process.

Altec Beissel Needles Limited. Industrial manufacturing, India. Increased sales by 50%, reduced reporting time to two days.

Compare the key vendors of this technology (or a direct competitor), their solutions, and cost.

The major ERP player worldwide is the German SAP with 24.6% of the market share. Oracle had 3.12B in ERP software revenue and comes in second with 12.8% market share. The top ten vendors own 64% of the market. However, the ERP industry growth was just 2.2% during 2012. (Columbus, L., 2013)

SAP with their ERP solutions focused in diverse industries like automotive, banking, consumer products, health care and more, shows a wide variety of lines of businesses such as asset management, finance, human resources, supply chain, sales, procurement, etc. Also provides services and products related to big data, rapid deployment and solutions for small and medium enterprises. (Industries & Solutions | SAP, (n.d.)) Oracle offers an entire ecosystem for Enterprise Resource Planning, due to its high volume of acquisitions. The most distinguishing characteristic Oracle has is the presence of a broader range of products such as Oracle E-Business Suite, Oracle Fusion



## ENTERPRISE RESOURCE PLANNING

Applications, Oracle JD Edwards, Oracle PeopleSoft Enterprise and others. (Oracle - ERP Software - Overview | ERP Modernization: A Top Priority for Midsize Companies | Oracle, (n.d.))

Regarding to total cost of ownership, a TCO case study, SAP versus Oracle JD Edwards on Biotechnology firm is presented. After two biotech firms merged, Nucleus Research born with a special quality: it has both Oracle JD Edwards and SAP together in a dual ERP environment. The research concludes SAP is more than four times more costly than Oracle JD Edwards EnterpriseOne. (Nucleus Research, Research Note, 2010, July)

What are the risks or challenges in implementing this technology?

Implement an ERP system is not an easy task. Depending on the company size and needs, a business can spend millions and millions of dollars in an implementation project. A new system in place represents not only a paradigm shift to the company; therefore the cultural behavior of users and stakeholders must be well managed. Business processes remapping, change management in place, addition of new modules and business rules are direct challenges faced by an organization willing to implement an ERP system.

There are several risks implicit in such projects. A risk analysis should be undertaken to determine project risks such as resource contention, go-live strategy, system configuration and setup, database tuning, system and networking load parameters and other metrics.

What are the competing technologies, if any?

## ENTERPRISE RESOURCE PLANNING

Software as a service (SaaS) model is the main technology competitor. (Mäkilä, T., Järvi, A., Rönkkö, M., & Nissilä, J., 2010) In fact some ERPs are deployed according to the SaaS business model, however, the main difference is SaaS provide standardized software for all customers in a single multi-tenant instance whereas ERPs can be customized and may have separate instances for each customer.

### References

- Columbus, L. (2013, May 12). 2013 ERP Market Share Update: SAP Solidifies Market Leadership - Forbes. *Information for the World's Business Leaders - Forbes.com*. Retrieved July 30, 2013, from <http://www.forbes.com/sites/louisicolumbus/2013/05/12/2013-erp-market-share-update-sap-solidifies-market-leadership/>
- Industries & Solutions | SAP. (n.d.). *SAP Business Management Software Solutions, Applications and Services | SAP*. Retrieved July 31, 2013, from <http://www54.sap.com/solution.html>
- Introduction to JD Edwards EnterpriseOne Benefits. (n.d.). *Oracle Documentation*. Retrieved July 25, 2013, from [http://docs.oracle.com/cd/E16582\\_01/doc.91/e15091/ge\\_st\\_wi\\_jde\\_beft.htm](http://docs.oracle.com/cd/E16582_01/doc.91/e15091/ge_st_wi_jde_beft.htm)
- Klaus, H., Rosemann, M., & Gable, G. (2000, January 2). What is ERP?. *Information Systems Frontiers*, 2:2, 141-162. Retrieved July 18, 2013, from <http://www.library.du.edu>
- Mäkilä, T., Järvi, A., Rönkkö, M., & Nissilä, J. (2010). How to Define Software-as-a-Service - An Empirical Study of Finnish SaaS Providers. *Software Business*, 1, 239.
- Mã, ller, C. (2010, January 1). Next-Generation Enterprise Systems. *CREDO reference*. Retrieved July 19, 2013, from [http://www.credoreference.com.bianca.penlib.du.edu/entry.do?ta=igibis&uh=next\\_generation\\_enterprise\\_systems](http://www.credoreference.com.bianca.penlib.du.edu/entry.do?ta=igibis&uh=next_generation_enterprise_systems)
- Nucleus Research, Research Note. (2010, July 1). *Oracle | Hardware and Software, Engineered to Work Together*. Retrieved July 28, 2013, from [http://www.oracle.com/webapps/dialogue/ns/dlgwelcome.jsp?p\\_ext=Y&p\\_dlg\\_id=10749526&src=7020688&Act=260](http://www.oracle.com/webapps/dialogue/ns/dlgwelcome.jsp?p_ext=Y&p_dlg_id=10749526&src=7020688&Act=260)
- Oracle - ERP Software - Overview | ERP Modernization: A Top Priority for Midsize Companies | Oracle. (n.d.). *Oracle | Hardware and Software, Engineered to Work Together*. Retrieved July 31, 2013, from <http://www.oracle.com/us/solutions/midsize/enterprise-resource-planning/overview/index.html>
- Oracle JD Edwards Reference Booklet. (2012, January 1). *Oracle*. Retrieved July 28, 2013, from [www.oracle.com/us/corporate/.../jde-oow-2012-booklet-1842754.pdf](http://www.oracle.com/us/corporate/.../jde-oow-2012-booklet-1842754.pdf)
- Oracle | JD Edwards World Multi-Currency. (n.d.). *Oracle | Hardware and Software*,

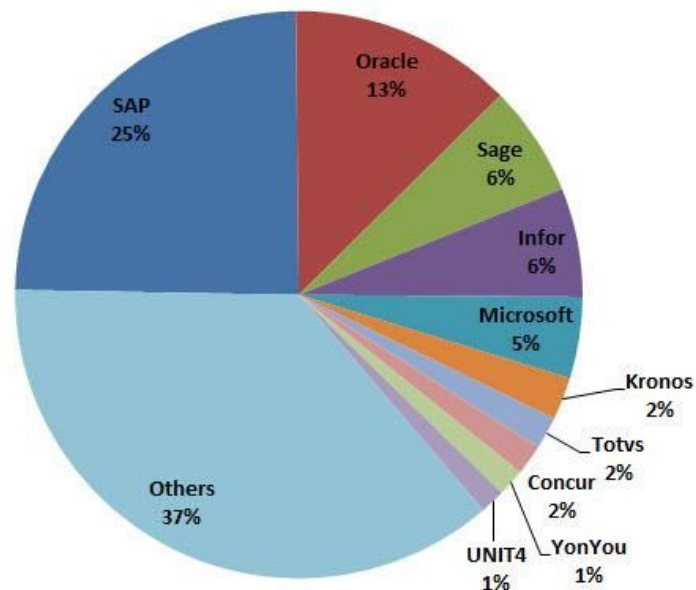
## ENTERPRISE RESOURCE PLANNING

*Engineered to Work Together*. Retrieved July 25, 2013, from <http://www.oracle.com/us/products/applications/jd-edwards-world/financial-management/053600.html>

Wortmann, J. (1998, January 1). Evolution of ERP Systems. *Springer Link*. Retrieved July 21, 2013, from [http://0-link.springer.com.bianca.penlib.du.edu/chapter/10.1007/978-0-387-35321-0\\_2](http://0-link.springer.com.bianca.penlib.du.edu/chapter/10.1007/978-0-387-35321-0_2)

## Appendix A1

**Worldwide ERP Software Market Share, 2012**  
 Market Size: \$24.5B; 2.2% Growth Over 2011



Source: Forbes (2013)

<http://www.forbes.com/sites/louiscolombus/2013/05/12/2013-erp-market-share-update-sap-solidifies-market-leadership/>

## ENTERPRISE RESOURCE PLANNING

Appendix A2  
SaaS Revenue Within Enterprise Software Sizing, 2011-2016 (Percent)

	2011	2012	2013	2014	2015	2016
Business Intelligence	5	6	7	8	10	11
Customer Relationship Management	35	39	42	44	46	48
Digital Content Creation	6	7	9	11	15	17
Enterprise Content Management	6	8	10	11	11	12
Enterprise Resource Planning	8	10	12	14	15	17
Office Suites	2	3	3	4	5	6
Project and Portfolio Management	17	20	26	29	31	32
Supply Chain Management	16	18	21	23	26	28
Web Conferencing, Teaming Platforms and Social Software Suites	70	69	69	68	67	65
Other Application Software	7	8	9	10	11	13
Total	12	13	15	17	18	20
Note: Dark green equals high level of SaaS adoption, and dark red equals low level of SaaS adoption.						

Source: Gartner (October 2012)