

# Impact of Extended Enterprise Resource Planning in the Context of Cloud Computing on Industries and Organizations

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**Abstract**—The Extended Enterprise Resource Planning (ERP II) system usually requires massive amounts of storage space, powerful servers, and large upfront and ongoing investments to purchase and manage the software and the related hardware which are not affordable for organizations. In recent decades, organizations prefer to adapt their business structures with new technologies for remaining competitive in the world economy. Therefore, cloud computing (which is one of the tools of information technology (IT)) is a modern system that reveals the next-generation application architecture. Also, cloud computing has had some advantages that reduce costs in many ways such as: lower upfront costs for all computing infrastructure and lower cost of maintaining and supporting. On the other hand, traditional ERP II is not responding for huge amounts of data and relations between the organizations. In this study, based on a literature study, ERP II is investigated in the context of cloud computing where the organizations operate more efficiently. Also, ERP II conditions have a response to needs of organizations in large amounts of data and relations between the organizations.

**Keywords**—Extended enterprise resource planning, cloud computing, business process, enterprise information integration.

## I. INTRODUCTION

IN recent decades, organizations are facing with very high volume of data for which they need fast and instant processing. Data are valuable assets for organizations. In some cases, organizations do not have an accurate understanding of value of data and cannot use them to improve the organization's performance. Research [1], [2] shows that companies are spending 80% of their time for collecting data on average and just use only 20% of them for analyzing, whilst data are strong support for development and prosperity of the organization. Companies can use ERP II for collecting data and analysing them. Nowadays, organizations have a tendency to use ERP II to become as a smart organization. ERP II helps to make smart business, which is very essential to increase the volume of data in the enterprise management and processing. However, use large amount of data makes major challenges such as limited storage space, limit in processing speed and responding time, and also data dispersion. Using traditional ERP II for collecting and analysing data needs very huge storage space and very expensive software as well, that is

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not affordable for organisations. The current recession creates new experience for all countries around the world to use IT benefits for maximising performance and minimizing the costs. When the recession began, companies had to optimize their budgets for reducing their costs. Most of these companies knew that the cloud computing is a way to reach their goal. Moreover, organisations are looking for some solutions for their activities from the same sources. Cloud computing makes some abilities for organization to analyse faster and more economical the huge volume of data (TB) as compared to the past. In order to understand how ERP II and cloud computing could act as a guideline for organizations, it is important have a look in their meaning and main features. In this paper, we will describe ERP II and cloud computing and then will discuss ERP II structure in the context of cloud computing.

## II. ERP II

Garden Group in a research note in 2000 mentioned that "ERP is dead but ERP II will have long life". In that note, it also has been predicted that vendors can use ERP II to respond to challenges that come on the market. Main vendors realise that using ERP makes integration inside organisations data and they had avoided using finance, administration and manufacturing separate system. However, this process has evolved when they use ERP II. ERP II includes some systems such as Customer Relationship Management (CRM) and Supply Chain Management (SCM) outside organization [1].

### A. ERP II Conceptual Framework

ERP is based on ERP II and has five main elements as below:

1. The role of ERP II
2. Business domain
3. The units involved in the activity
4. System architecture
5. Techniques employing data

Thus, ERP II represents using more ERP in organisation. Also, it can be concluded that ERP II makes achievement to e-business and solidarity in the supply chain [2].

### B. Difference between ERP and ERP II

In general, the differences between these two systems can be seen as below:

1. ERP II design on the web and used
2. ERP includes internal organization relationship, while the ERP II cover both internal and external organization

relationships [3].  
More details are explained in Table I.

TABLE I  
DIFFERENCE BETWEEN ERP AND ERP II

	ERP	ERP II
<b>Role</b>	Optimization organization	Participation in the value chain and enable collaborative commerce
<b>Domain</b>	Manufacturing and distribution	All parts and devices
<b>Operation</b>	Manufacturing, sales, distribution	Cross-industry, industry sectors and industrial processes
<b>Process</b>	Internal and hidden	External links
<b>Architecture</b>	Closed internal network	Web-based and open
<b>Data</b>	Production and domestic consumption	Production, consumption, publishing and sharing of internal and external

### C. Characteristics of ERP II

1. Use CRM in business process management: CRM by using the Business to Business (B2B), Business to Consumer (B2C) and Business to Employee (B2E) causes simplification interaction between customers with marketing, sales, and after-sales.
2. Focus on project activities ERP was basic of Material Requirement Planning (MRP) and expanded by Manufacturing Resource Planning (MRP II) that created and spread based on products, while ERP II not only makes continuous production but also produces the project under its coverage.
3. Use IT to reduce user dependency
4. Appropriate framework for integration
5. Use Decision Support System (DSS) form making effective decisions
6. Make direct communication between customers, suppliers and investors: companies to deal with the pace of change in market and business should have enough knowledge and skill in business and also enough awareness in customer's demand and supplier's conditions. Today's, manufacturers use ERP II for sharing their products design by customers, suppliers, investors and industrial experts and in this way to ensure survival companies.
7. Support for investment management and human resources
8. Utilize historical data to analyse the future of business [4].

### D. ERP II Is Best Way to Indicate Organisation

ERP II features has led this system to be as one of the top ways to update the organizations and its causes as below:

1. Create business with new and updated features
2. Pay special attention to the promotion of business, such as the implementation of a new project
3. Unity among the members of the core team
4. Create an organization's monitoring for infrastructure hidden costs
5. Create custom views
6. Organization's future dependency on ERP II

So, we can say that ERP II is seen as a business project, not an IT project [5].

### E. ERP II Project's Problems

1. The large area projects
2. Interference Activities
3. Heterogeneous shareholders
4. High Risk

### F. ERP II Layers

As shown in Fig. 1, ERP II constituent layers are:

- Supply Chain Management (SCM)
- Customer Relationship Management (CRM)
- PLM, or Product Lifecycle Management
- Human resource management or HRM
- Corporate Performance Management or CPM
- B2B, B2C, B2E

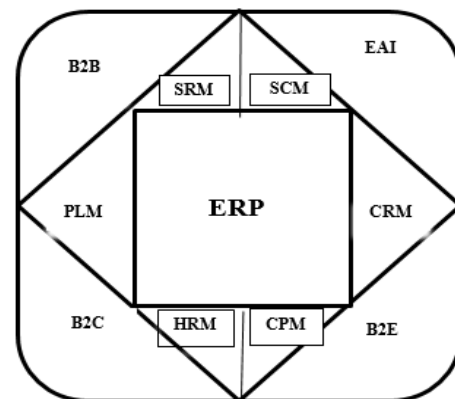


Fig. 1 ERP II constituent layers

## III. CLOUD COMPUTING

Cloud computing was formed in 2007 and has been growing rapidly until today. Many organizations have turned to the use of cloud computing and have massive investment on it. Many researchers work in this field from different countries and many definitions of cloud computing according to different views there. But, the most comprehensive definition of cloud computing is presented by America Institute for Research and Technology (NIST). According to this definition, cloud computing is a model based on user demand for easy access through a network of computing resources that can be changed, and configuration (e.g., networks, servers, storage, applications and services) that can be accessed with minimal need to manage resources or need for direct intervention or service provider to be released quickly [1].

### A. Cloud Computing Model Structure

#### 1. Architecture

Architecture software systems involved in cloud computing presentation generally consists of elements with each other via application programming interfaces, usually web services to communicate addressing. This design is similar to the UNIX philosophy where several different applications work well with each other through the International mediators. The complexity has been controlled, and these systems are more manageable compared to the other integrated counterparts.

[3].

## 2. Layers

- i) Users: Cloud computing elements consist of hardware and software that are used to deliver applications or specially designed for cloud services that users cannot do anything without cloud in above-mentioned designed.
- ii) Applications: The services of cloud applications or "software as a service" software as a service delivery relationship between the Internet and thereby eliminate the need to install software on clients' computers, as a result, maintenance makes the support easier. The main features of these services include:
  - Access and manage commercial software through the network
  - Change the model of software from one-to-many model (one application of multi-tenant-model) to one-to-one model
  - Central place office can update and upgrade software and it does not need any special system for upgrading [1].

### B. Key Features of Cloud Computing

Cloud computing hardware has three new aspects compared to similar technologies:

- Creating the impression and illusion access to IT resources in the demand time. As a result, the users do not need any logistic planning for IT resources in the future.
- Eliminating the investment in advance for IT resources. Thus, commercial companies can work as a small company and also can increase or reduce their hardware resources required at any time.
- Ability to pay for using IT resources in the short period of time

#### 1. The Main Benefits of Cloud Computing

Agility: users can increase or decrease the amount of resources in the time of required.

Cost: this technology decreases the costs and also can convert the capital expenditure to operational expenditure. Thus, it reduces the barriers for entering into markets. It also reduces the cost of software development, and more scalable process is stopped [6].

Device and location independency: users can have access to systems at anywhere and with any device through an internet Web browser.

Multi-tenancy: This feature allows users to share resources and costs between each other and thereby increases the efficiency.

Reliability: using multiple sites increases reliability.

Maintenance: as there is no need to install any software-applications for any user, the maintenance is done more easily and also has lower cost. Those companies that implement their own platforms, need to purchase for maintaining their hardware and software and hire some staff to take care of the system, all of those can be costly and time-consuming, while cloud computing does not need these things. Each simple device has the ability to connect and communicate with the server. Also, cloud computing is a sufficient service to

collaborate and share the results with others [4].

## 2. Implement Cloud Computing Models

1. Public cloud: public cloud or external cloud describes cloud computing in traditional and original meaning. In this type of cloud, services supply via the Internet and in small units from a given third-party logistics and sources have been rented to users as a share [7].
2. Group cloud: it has been used where several organizations have the same needs and to seek to share infrastructure with the benefits. As group cloud is divided between a few users, group cloud is more expensive than public cloud. But, group cloud has more confidentiality, security and it is consistent with the policy.
3. Hybrid cloud: The hybrid cloud consists of several internal or external, is the best option for most businesses. By combining multi-service cloud, allowing users to find the transition to public cloud without any issues such as standards compliant "payment card data security standards council" more convenient [8].
4. Private cloud: this cloud is an infrastructure cloud computing that is made by an organization to use internal organization.

The main factors that make isolated private clouds from public cloud business are place and maintenance of hardware. Private cloud has more control on all levels of implementation (such as hardware, network, operating system, software). But, private clouds have maintenance problems. One solution that avoids problems of private clouds and have benefits at the same time is to use virtual private cloud. Virtual private cloud is one part of public cloud that uses for one company and can have an access to it just through a virtual private network [5].

## IV. MORE EFFECTIVE USE OF ERP II IN THE CONTEXT OF CLOUD COMPUTING

In Table II, how cloud computing can be appropriate in terms of architecture and process for developing and implementing effective ERP II in organizations is briefly explained.

TABLE II  
 ERP II IN THE CONTEXT OF CLOUD COMPUTING

	ERP II	Cloud Computing
<b>Architecture</b>	The main objective of ERP II is integration of enterprise information	Structure of cloud computing model is covered by integrity of information with more information manageable
<b>Process</b>	ERP II has main focus on business processes and capital management	Cloud computing framework based on agility, reduce costs, independent of the equipment and features and reliability can support business processes

If we examine the context and features of ERP, we will be see that it is implementation in the context of private cloud but the perfect platform for implementations of ERP II cloud can be created by hybrid that is necessary to provide integration conditions to achieve business process standards [9].

## V. CONCLUSION

In this paper, the impact of ERP II on business process development and integration of information has been introduced. It was noted that the hybrid cloud as a cloud computing models can be more effective use of ERP II conditions provided in organizations and has a response to needs of organizations in large amounts of data and relations between the organizations.

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