A Comparative Analysis and Evaluation of Open Source ERP Systems

Saleh M. Al-Saleem

Department of Information Systems, College of Computer and Information Sciences, King Saud University
Riyadh, Saudi Arabia

Summary
An ERP system is a system that needs to create integrated solutions in order to manage the bulk of operations inside a company or organization. Also ERP system is a critical and important investment that can affect the overall performance of a company. Open source ERP systems are often targeted when the needs of a company are not fully covered by a standard software edition. In this article we are going to compare and evaluate three main open source ERP systems based on certain criteria. Based on these criteria we will draw a conclusion for the best ERP system that can be used to support the business goals and objectives of an enterprise, and to carry and facilitate the group decision process inside a company.

Key words:
Enterprise resource planning (ERP) system, Analytic Hierarchy Process (AHP), Open source.

1. Introduction

ERP systems are those systems that need to create different solutions for managing and operating a series of operations within a company. These systems are more important because of its ability to integrate many components of the company and to support the business goals and objectives of an enterprise [1]. ERP system can be used for any kind of enterprise like medium size, small size or micro size. Medium size enterprises consist of almost 250 people and have profits of around 250 million Euro per year. Similarly small size enterprises have less than 50 employees, while micro enterprises are those enterprises that have less than 10 employees and can generate revenue of almost 2 million Euro per year according to the European standard [2].
The selection of an ERP system is not an easy task because of its complexity in business environment, the limitations that consist in the available resources and last but not least the large number of ERP alternatives available in the market [3]. In this paper we are going to evaluate and compare the three main open source ERP systems i.e. SQL Ledger, TinyERP and ERP5. These ERP systems will be evaluated based on certain criteria and sub-criteria using the MCDM (Multi Criterion Decision making) tool. Using the AHP (Analytic Hierarchy Process) we will draw a conclusion that which is the most suitable open source EPR system for any size of enterprise that can fulfill the business goals and objectives for that enterprise.
The rest of the paper is organized as follows. In section 2 we will shortly discuss the three open source ERP systems. Section 3 will elaborate the related work. In section 4 we will explain the methodology and implementation of the proposed work. Finally in section 5 we will draw the conclusion for our proposed methodology.

2. Background

In this section we will have a short description for each ERP system that will be used in the entire evaluation process i.e. SQL Ledger, TinyERP and ERP5.

2.1 SQL Ledger

SQL Ledger is a web based ERP system that can run on any Mac or windows platform. It is basically a double entry accounting/ERP system that can be used for micro, small or medium size enterprises. The entire system of SQL Ledger is linked through a chart of accounts, while the inventory part is linked to income, expense and tax accounts [4]. It can be customized to a low level code and layout templates. Moreover SQL Ledger supports 38 different languages and 33 different accounting schemes [1]. Also SQL Ledger provides the security by disabling the access to menu items, so that users can be allowed to specific sections of functions only. Similarly SQL Ledger also provides the facility of remote access, so people can remotely access it within a city, country or even around the globe [4].

2.2 TinyERP

TinyERP now a day called OpenERP is one of the most widely used ERP system for medium, small and micro enterprises having up to 150-250 employees [1]. TinyERP provides the facility of different kind of modules that will suite all kind of needs, allowing the enterprise to build their own customized system by simply grouping and configuring the most suitable modules available in

Manuscript received April 5, 2013
Manuscript revised April 20, 2013

hundreds. The package is available in 18 different languages, while 800 developers have worked in the entire project [5].
The architecture of the TinyERP or Open ERP shown in figure 1 consists of three different components i.e. the Postgre SQL database server, that contains all the databases, the OpenERP application server, that contains all of the enterprise logic, and the web server also called the Open Object client-web, that enables you to connect to OpenERP from standard web browser [5].

2.3 ERP5

ERP5 is a full featured open source software solution published under the license of GPL providing the industry solution for an organization having more than 300 employees on 5 different globally distributed sites [1,6]. The package provides the facility of mass customization which means that many variants of the product are possible. ERP5 are normally used for mission critical ERP with many modules like PDM (Product Data Management), CRM (Customer Relationship Management), MRP (Manufacturing Requirements Planning), CMS (Content Management System), Accounting, Human Resource, E-commerce and Groupware etc [1].

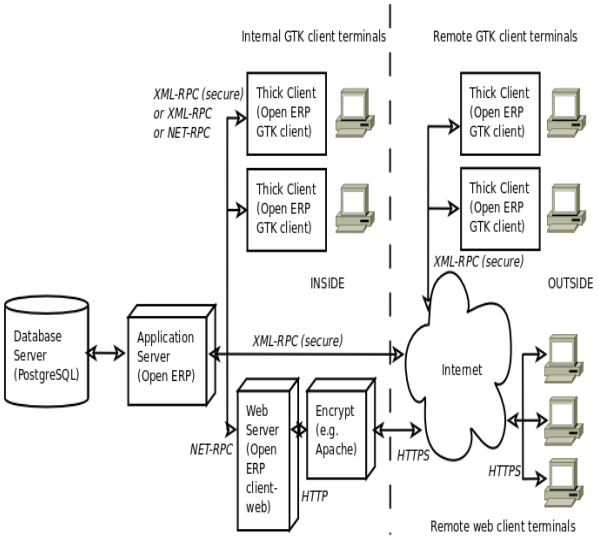

Fig. 1 The Architecture of OpenERP [5]

3. Related Work

The work done by Chun-Chin Wei, Chen-Fu Chien, Mao-Jiun J. Wang [3] seems more similar to our work. In their study they presented a comprehensive framework for selecting a suitable ERP system by following 7 different steps. The steps involves the creation of a team that will collect the information about ERP systems and vendors, identification of the ERP system characteristics, construction of a structure of objectives, extraction of attributes for the evaluation process, filtering out unqualified vendors by asking certain questions, evaluation of ERP systems by using AHP, and discussion of results in order to make the final decision [3]. Finally they also concluded some of the advantages for their proposed framework.
Similarly the work done by Thomas Herzog [1] is more similar to our work. In his work he discussed the suitability of current open source ERP systems for those enterprises whose requirements are not fully covered by standard software and who needs continues changes in their software with the changing process and needs [1]. Moreover Thomas also evaluated a number of open source ERP systems based on certain criteria in order to find out the strengths, weaknesses and differences of these open source systems. Based on his evaluation he concluded that different ERP systems can be used according to the needs of an enterprise [1].

4. Methodology and Implementation

The research work in this article is carried out by using the MCDM tool (MakeItRational). MCDM is basically a decision-making tool that derives the results based on certain steps [7]. The main steps for finalizing the decision are goal selection, alternatives, criteria, sub-criteria, building hierarchy, preferences (assignment of priorities), calculation of weights, and consistency test, as shown in Fig. 2.

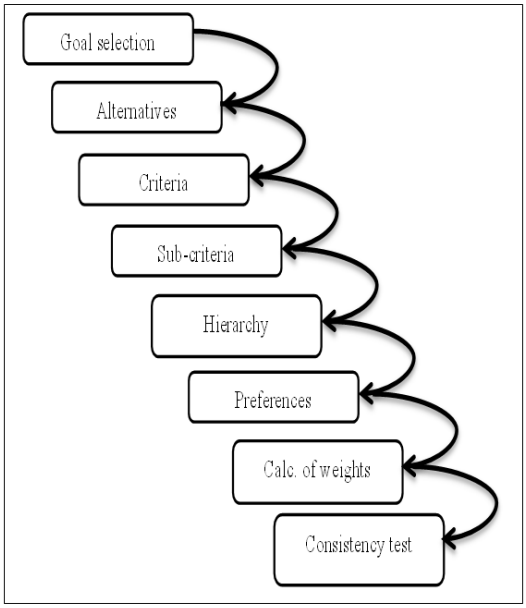

Fig. 2 Methodology

Details about each step in the methodology are given below.

4.1 Goal selection

This part is basically concerned with the selection of a goal. The main goal in our case is to compare and evaluate open source ERP systems available in the market , and to come up with a conclusion that which systems is more suitable for fulfilling the business goals and objectives of an enterprise.

4.2 Alternatives

This portion of the methodology part is mainly concerned with the alternatives to be evaluated. In our case, we have three main alternatives: SQL Ledger, TinyERP, and ERP5.

4.3 Main criteria

In this part, we have to identify the main criteria. In our case, we have identified five main criteria: Functionality, Flexibility, Continuity, Support and Maturity. Based on these criteria, we will carry out our evaluation Process for the entire ERP systems.

4.4 Sub-criteria

This portion of the methodology is mainly concerned with sub-criteria that are extracted from the main criteria. In our case, we have sub-criteria for criterion Functionality and criterion Continuity. The functionality criterion consists of E-commerce, Accounting and MRP (manufacturing resource planning) sub-criteria, while the continuity criterion consists of Project Structure and Transparency sub-criteria.

4.5 Hierarchy

The hierarchy is built on the basis of criteria, sub-criteria, and alternatives. The goal "Selecting the best Open source ERP System" is at the top of the hierarchy, while the criteria and sub-criteria are at the second and third levels of the hierarchy, respectively [7]. The block diagram of the hierarchy process is shown in Fig. 3.
The alternatives that are at the bottom of the hierarchy are not shown due to complications in the figure.

4.6 Preferences

Preference is basically concerned with the assignment of priorities. Priorities are assigned based on pairwise comparison. This pairwise comparison is carried out by using Table 1 that summarizes the priorities against their importance on a scale from 1 to 9, where 1 represents equal importance and 9 represents extreme importance respectively.

Table 1: Priorities with their importance

Intensity	***Importance***	***Intensity***	***Importance***
1	Equal importance	6	Strong importance
2	Weak importance	7	Very strong importance
3	Moderate importance	8	Very strong importance plus
4	Moderate importance plus	9	Extreme importance
5	Strong importance		

The priorities that we have assigned to each criteria and sub-criteria in our methodology are summarized in Table 2.

4.6 Calculation of weights

The global and local weights of each node (criterion, sub-criterion) are calculated on the basis of assigned priorities [8]. A summary of the weights against each criterion and sub-criterion is given in Table 3.

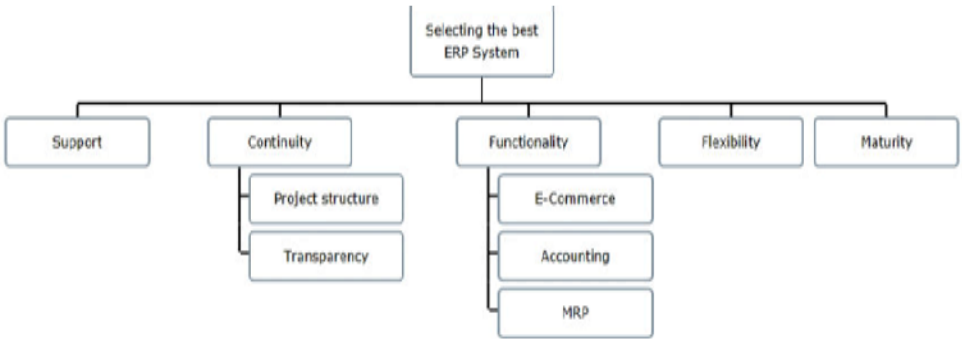

Fig. 3 Hierarchical block diagram

Table 2: Priorities assigned to each criteria and sub-criteria

Criteria	*Ratio*	*Criteria*	*Ratio*
Support vs. Continuity	3 : 1	Functionality vs. Maturity	5 : 1
Support vs. Functionality	4 : 1	Flexibility vs. Maturity	4 : 1
Continuity vs. Functionality	2 : 1	Support vs. Maturity	5 : 1
Functionality vs. Flexibility	4 : 1	Continuity vs. Maturity	5 : 1
Support vs. Flexibility	5 : 1	Functionality vs. Maturity	5 : 1
Continuity vs. Flexibility	3 : 1	Flexibility vs. Maturity	4 : 1

Table 3: Priorities assigned to each criteria and sub-criteria

Criterion	*Global weight [%]*	*Local weight [%]*
Selecting the best ERP System	100	100
Support	46.31	46.31
Continuity	22.5	22.5
Functionality	18.02	18.02
Project structure	16.87	75
E-Commerce	11.26	62.5
Flexibility	8.77	8.77
Transparency	5.62	25
Maturity	4.41	4.41
MRP	4.3	23.85
Accounting	2.46	13.65

4.7 Consistency test

The consistency ratio is calculated based on weights. If the ratio of each criterion and sub-criterion is less than 10, then inconsistency is acceptable, otherwise the subjective decree needs to be revised [7,8]. In our case, the consistency ratio against each criterion and sub-criterion is less than 10, so there is no inconsistency.

4.8 Results

This section is mainly concerned with some graphical representations of the comparative process carried out in this article using the MCDM tool. A number of results are derived from these graphical representations.

The graph in Fig. 4 indicates the overall ranking of criteria against each alternative. Based on this graph, it is concluded that ERP5 is the most appropriate open source system for an enterprise to fulfill their business needs and objectives. Moreover ERP5 is the most suitable system for a company having more than 300 employees and have 5 internationally distributed sites.

Similarly, the graph in Fig. 5 illustrates the comparison of each criterion against each alternative. From this graph, it is clear that ERP5 is the most suitable system for large size companies or enterprises. Further, if one has a small enterprise having less than 150 employees, then TinyERP is the perfect choice for their enterprise in order to carry out their business objectives.

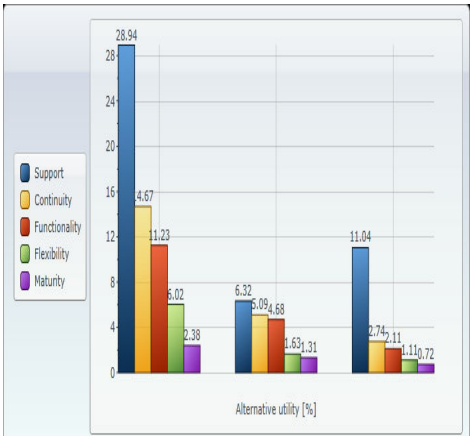

Fig. 4 Ranking in the context of: Selecting the best software development process model

Moreover the graph in Fig. 6 displays the overall weighting of each criterion. The weighting of a criterion indicates its importance. For example, during the selection process for an open source system, we will more concentrate on support, continuity, and functionality, rather than flexibility and maturity, as shown in Fig. 6.

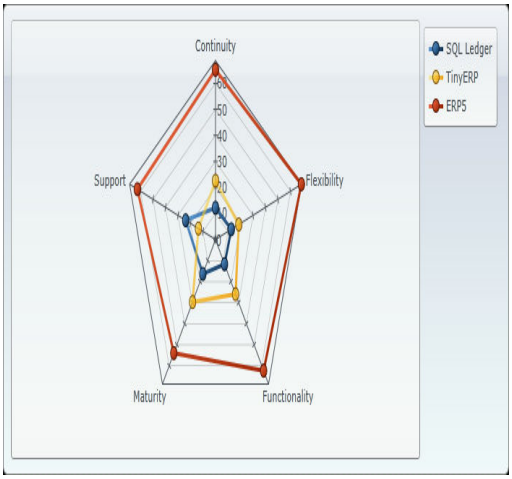

Fig. 5 Alternatives comparison

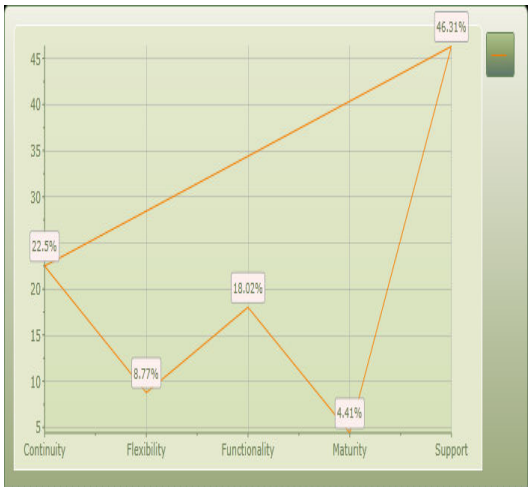

Fig. 5 Alternatives weights

The weightings against the support, continuity, and functionality are 46.31%, 22.5%, and 18.02%, respectively, while the weightings against flexibility and maturity are 8.77%, and 4.41%.

5. Conclusion

Based on the facts and figures drawn from the above graphs we have concluded that ERP5 is one of the best open source ERP tool that could be used by any organization around the globe for their business transactions and other purposes ranging in size from medium to large. Similarly TinyERP and SQL Ledger can also be used by some enterprises ranging from small to medium in size. The best thing about ERP5 is that it can be used for mission critical ERP systems providing all the facilities of other two tools i.e. TinyERP and SQL Ledger.

References

[1] Thomas Herzog," A Comparison of Open Source ERP Systems", Institute of Information Systems and Operations, Department of Business Management and Information Systems, Vienna University of Economics and Business Administration and Institute of Software Technology and Interactive Systems, Business Informatics Group, Vienna University of Technology, June 2006.

[2] httpec.europa.euenterprisepoliciessmefacts-figures-analysissme-definitionindex_en.htm accessed online on 5/12/2013

[3] Chun-Chin Wei, Chen-Fu Chien, Mao-Jiun J. Wang, An AHP-based approach to ERP system selection, International Journal of Production Economics, Volume 96, Issue 1, 18 April 2005, Pages 47-62.

[4] http://www.sql-ledger.com/cgi-bin/nav.pl?page=about.html&title=About accessed online on 5/1/2013

[5] Fabien Pinckaers, Geoff Gardiner, Els Van Vossel," Open ERP, a modern approach to integrated business management", Open Source management Solution, Jan 2011.

[6] http://www.erp5.org/ accessed online on 09/01/2013

[7] Abdullah S. Alghamdi, H.U., Iftikhar Ahmad, Evaluating Encryption Techniques for C4I System, in ISCA 23rd International Conference on Computer Applications in Industry and Engineering2010: Imperial Palace Hotel, Las Vegas, Nevada, USA.

[8] Abdullah Sharaf Alghamdi, H.U., Syed Usman Ali. Evaluating Chaos-based vs. Conventional Encryption Techniques for C4I System. in International Conference on Computer Communications and Networks (ICCCN 2011). 2011. Lahaina, Hawaii, USA.

Dr. Saleh Al-Saleem is an Associate Professor in the College of Computer and Information Science, King Saud University, Riyadh, Saudi Arabia. He received his PhD degree from Wayne State University, Michigan, USA, in 2001, in the field of computer science (Evolutionary Computation). He received his Master degree in computer science from Ball State University, USA in 1996, and his BS degree in computer science from College of education, King Saud University, Saudi Arabia in 1991 respectively. He served as the dean of admission & registration as well as the head of IT and e-Learning in Shaqra University. Previously he worked as head of Information Technology department at Arab Open University. Before that he worked as the head of Computer Technology department and faculty member in Riyadh College of Technology. Dr. Al-Saleem current research interest includes: evolutionary computation, Text Classification, ERP, BPM, and e-Learning.