

A Survey of Open Source Enterprise Resource Planning (ERP) Systems

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ABSTRACT

Enterprise resource planning (ERP) systems have been widely used in business organizations, and are especially ideal for small- or medium-sized businesses. This paper surveys open source ERP systems, using five criteria identified in the literature; namely: readiness for cloud computing as a Web-based system; completeness of commonly required ERP functionalities; ease of configuration on any operating system; existence of an active and large social network for users' community support; and the presence of other non-functional requirements. Using the five assessment criteria, the authors examine six well-recognized open source ERP systems on the market: webERP, Compiere, PostBooks, Opentaps, OpenBravo, and OpenERP. As an example of a simple and intuitive method for assessing open source ERP systems for potential user firms, the authors use star charts to compare the six selected systems. The authors conclude that there are differences among open source ERP systems, and that a good open source ERP system should be highly competitive in terms of the five criteria used in this study.

Keywords: Open source, ERP systems, survey

1. INTRODUCTION

Enterprise resource planning (ERP) systems are business management software – usually a suite of integrated applications – that companies can use to collect, store, manage, and interpret data from many business activities. Such systems have been widely used in organizations [Jalal, 2011]. An ERP system integrates internal and external management information across an entire organization, embracing finance/accounting, manufacturing, sales and service, inventory management, CRM, etc. Its purpose is to facilitate the processes of all business functions inside the boundaries of the organization and to manage connections to outside organizations. An ERP system can run on a variety of hardware and network configurations. A typical ERP system has these characteristics.

- It is an integrated system that operates in real time.
- It has a common database that supports all applications.
- It is a set of modules with consistent appearance.
- It can be used for all types of large business organizations; however, significant work on configuration or even customization is needed in order for the system to fit the specific requirements of individual organizations. For instance, the individualized configuration of an ERP system would allow the client organization to choose a currency system, metric system, techniques for cost accounting [last-in, first-out (LIFO) or first-in, first-out (FIFO)], and so on. Usually, the information system development team should include specialists trained by the ERP system provider for ERP system configuration and customization.

There have been several popular ERP systems in the industry, including SAP (<http://www.sap.com>), Oracle EBS (<http://www.oracle.com>), Sage (<http://na.sage.com>), Microsoft Dynamics (<http://www.microsoft.com/>), and others [Leyh, 2012]. Recently, many open source ERP systems have become available on the Internet. These systems are usually designed for small- or medium-sized organizations, and, in this regard, they often compete with commercial ERP systems, such as Microsoft Dynamics, with respect to lower ownership costs. The competition appears to be intensive. For instance, with a benchmarked performance of up to 2,250 users, Microsoft Dynamics provides a variety of functionalities across financials, supply chain management, and customer relations management. Its database management system is the Microsoft SQL Server. Its certification program offers solutions designed to

meet the needs of specific industries. Since Microsoft Office and Windows are already widely used in many, if not all, organizations, Microsoft Dynamics seems to be an easy way for these organizations to integrate systems. In order to stay competitive, an open source ERP system for small- or medium-sized organizations must possess the basic features of commercial ERP systems for the same sized businesses.

Open source ERP systems are developed in a public and collaborative way, or by an exclusive group of developers. In the long run, open source software adds information technology capital to society and can benefit the software industry [Wang et al., 2012] and economic growth [Kim et al., 2006]. The business model behind open source ERP systems is the win-win relationship among the business community, the partner network, and the software editors. The business community's role is to generate activities and contribute to the growth of ERP systems. The partner network has a dual role: to create the market for open source ERP systems and to create services. The software editors are responsible for quality and vision in the development of ERP systems. In the open source environment, all modules produced by community, partner network, and software editors are open source. The user of an open source ERP system does not automatically receive system support and services directly from anyone. An open source ERP system, however, has its active social network that can create service offers and deals for users. Also, some open source ERP suppliers may provide the initial software for free, but charge the users for upgrades and enhancement services.

The proper selection of an open source ERP system is important to a small or mid-size organization that intends to implement such a system [Johansson and Sudzina, 2008; Poba-nzaou and Raymond, 2011]. For many reasons, including accessibility and low cost, education institutions may find open source ERP systems to be useful in teaching/learning ERP systems; therefore, many management information system (MIS) educators would appreciate seeing a review of these systems.

Despite these important roles of open source ERP systems, however, there is a lack of surveys on this subject in the literature. There are many surveys of open source ERP systems on the Internet, but most of these are posted by private companies, which could be biased. Using the Google and Microsoft search engines, we have found on the Internet only two relatively thorough reviews by academic scholars: Herzog [2006] and Schatz et al. [2011]. The review by Herzog [2006], however, is at least five years old, and needs to be updated, given

the fast pace of development for open source ERP systems and rapid changes in the information technology environment. Although the review by Schatz et al. [2011] provides excellent detailed information on physical aspects such as tools/languages and operating systems, the criteria they use have little support in ERP research literature.

The current study surveys six well-recognized open source ERP systems. Section 2 discusses five major assessment criteria identified in the literature review. Section 3 provides an overview of the six systems selected for this study and compares the systems using the five criteria. Section 4 presents our conclusions.

2. LITERATURE REVIEW:

CRITERIA FOR ASSESSING OPEN SOURCE ERP SYSTEMS

To determine the major criteria for assessing open source ERP systems, we reviewed literature on the evaluation of ERP systems, including both commercialized and open source. Because the history of ERP systems is relatively short, we limited our review to research articles published within the last 15 years. The criteria discussed in this section were extracted from the reviewed literature on ERP systems selection. Clearly, we assumed that those research papers were supported by empirical evidence.

Cloud computing offers several key advantages to organizations, including reduced costs, automation, hardware independence, high availability, and increased flexibility. Use of cloud technology also alters the risk landscape, affecting confidentiality, privacy, integrity, regulatory compliance, availability, and e-discovery, as well as incident response and forensics. A recent development with regard to ERP systems is to go the cloud [Ash and Burn, 2003; Al-Mashari et al., 2008; Gould, 2011]. Cloud computing is a general framework of advanced computing technology on the Internet, and there are several models [Armbrust et al., 2010]. To join the cloud computing environment, a software system must be Web-based so that it can be accessed directly by users over the Internet. It is important for the organization to ensure that the ERP system is fully Web-based and that proper security controls are in place [Percin, 2008; Frimpon, 2011; Grabski et al., 2011; Low et al., 2011]. Thus, the first criterion for assessing open source ERP systems is:

Criterion 1: *Readiness for cloud computing as a Web-based system*

A good ERP system must provide a wide range of functionalities. The taxonomy of ERP system functionalities with regard to system selection has not been established in the literature, mainly because these systems integrate internal and external management processes, and categories of functionalities always overlap each other. Our literature survey indicates that three levels of business functionalities are often discussed in the literature relating to ERP systems selection; namely:

1. *Routine operational functions* such as sales, purchasing, and payment [Bernroider and Koch, 2001; Shehab et al., 2004; Elbertsen et al., 2006; Verville et al., 2007; Frimpon, 2011]
2. *Silo-based managerial functions* such as human resources management, accounting, financing, and marketing data resource management (data warehouse) [Al-Mashari et al., 2008; Baki and Cakar, 2005; Keil and Tiwana, 2006; Finney and Corbett, 2007; Benlian and Hess, 2011]
3. *Inter-organizational functions* such as supply chain management (SCM), customer relations management (CRM), and business intelligence [Wu et al., 2007; Wu et al., 2009; Kale et al., 2010; Grabski et al., 2011; Tsai et al., 2012]

Accordingly, the second criterion for assessing open source ERP systems is:

Criterion 2: Completeness of commonly required ERP functionalities, including routine operational functions, silo-based managerial functions, and inter-organizational functions

Note that an open source system might provide a basic open source version of functionalities, as well as a commercial version with additional functionalities. When open source ERP systems are assessed in this study, only the open source parts of functionalities are evaluated.

An ERP system is not off-the-shelf software; therefore, a tedious, even complicated, configuration process is required for installation [Bernroider and Koch, 2001; Ash and Burn, 2003]. Often, the user organization must be assisted by ERP professionals to configure the ERP system it wishes to implement [Baki and Cakar, 2005; Boersma and Kingma, 2005]. Also, implementating the system in the organization would bring about changes in business processes [Wu and Wang, 2006; Verville et al., 2007; Edwards, 2008; Benlian and Hess, 2011]. It is crucial for the user organization, therefore, to understand how the selected ERP

system should be implemented and how it can be customized to serve its business requirements [Shehab et al., 2004; Elbertsen et al., 2006; Keil and Tiwana, 2006; Tsai et al., 2012]. Hence, the third criterion for assessing open ERP systems is:

Criterion 3: Ease of configuration on any operating system

Implementation and use of a commercial ERP system require the vendor's support [Allen, 2005; Boersma and Kingma, 2005]. Research indicates that Web-2.0-based ERP communities can reduce the cost, improve the quality, and lower the risk of ERP implementation [Wu and Cao, 2009]. Social network support is even more important for open source ERP systems [Santos, 2008] because formal vendor support and active maintenance do not exist in the open source environment, and small- or medium-sized firms have a shortage of technology resources [Hashim, 2007; Inmyxai and Takahashi, 2010]. Accordingly, the fourth criterion for assessing open source ERP systems is:

Criterion 4: Existence of an active, large social network for users' community support

Generic criteria for non-functional requirements of systems, such as usability, reliability, and security, are also important for assessing ERP systems [Elbertsen et al., 2006; Finney and Corbett, 2007; Wu et al., 2007; Ifinedo, 2009; Wu et al., 2009; Hawari and Heeks, 2010; Okunoye et al., 2006; Yeh and Yang, 2010]. These non-functional requirements are applicable to any software systems, and are congregated in this study to assess open source ERP systems:

Criterion 5: Presence of other non-functional requirements, including usability, reliability, and security

Clearly, application of *Criterion 5* is subjective. A meaningful evaluation always depends on the collective judgment of the group participating in the decision process relating to selection of an ERP system.

The preceding five criteria were used as the framework for selection of open source ERP systems in this study.

3. OVERVIEW OF SELECTED OPEN SOURCE ERP SYSTEMS

This section discusses the sample of six open ERP systems selected for the current study and includes a comparison of the six systems.

3.1. Sampling of Open Source ERP Systems

The selection of samples of open source ERP systems for this survey included two stages. In the first stage, we conducted general searches on the Internet to identify 25 open source ERP systems that are well recognized by the industry; for example, Wikipedia (<http://en.wikipedia.org/wiki/>). In the second stage, we examined each of the systems in great detail, based on its demo. If an open source ERP system did not provide an informative demo (demonstration), or if its demo was obviously inferior, that system was not selected for further comparison. This two-stage process resulted in the selection of six open source ERP systems for comparison; namely:

webERP	http://www.weberp.org/
Compiere	http://www.compiere.com/
PostBooks	http://www.xtuple.com/
Opentaps	http://shop.opentaps.org/
OpenBravo	http://www.openbravo.com/
OpenERP	http://www.openerp.com/

To assist discussion through visual illustration, we use screenshots in this paper to demonstrate the characteristics of each of these systems. Of the six, we determined that webERP is the best. Common functionalities are illustrated, therefore, using screenshots of webERP. For each of the other five systems, we display only screenshots with special features.

3.1.1. webERP

webERP (<http://www.weberp.org/>) is a Web-based open source ERP system that supports multiple languages and is implemented using PHP and MySQL. To date, there have been more than 128,000 downloads of the system. Besides its official website, there are two main types of support for webERP.

- (1) Community Support. There are mailing lists that consist of all the developers and users of webERP. These lists can be accessed via the nabble forum (www.nabble.com) and are the best places to inquire about any issue relating to the use or development of webERP. The user

archives and developer archives for the mailing lists contain valuable information.

- (2) **Commercial Support.** Several companies offer commercial support that may be preferable for ordinary business organizations.

webERP is easy to operate. The Main Menu has a standard display of three categories: Transactions, Inquiries, and Reports and Maintenance.

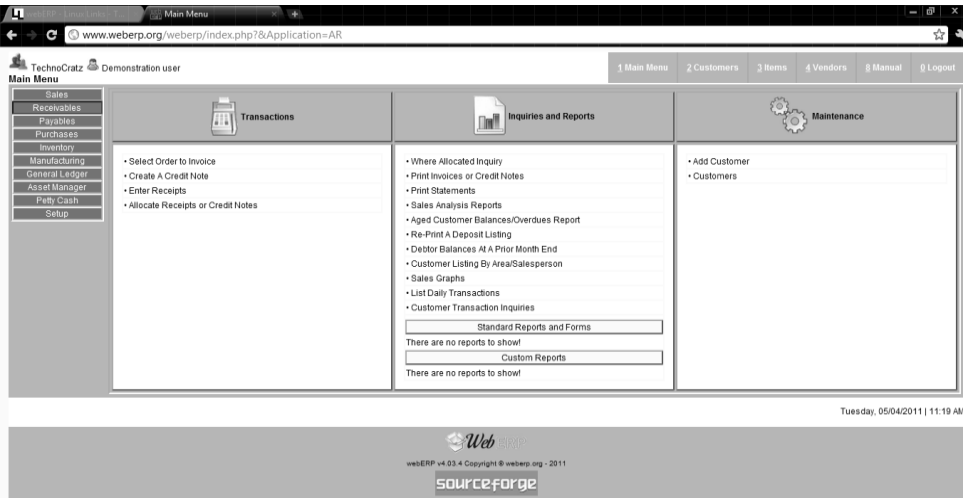
Sales dashboard (Figure 1) – Lists orders, quotations, and summaries of sales orders, invoices, prices, and other report links.

Figure 1: webERP Sales Dashboard

The screenshot shows the webERP Sales Dashboard interface. At the top, there is a browser window with the URL www.weberp.org/weberp/index.php?&Application=orders. Below the browser window, the user is logged in as 'TechnoCratz' (Demonstration user). The main navigation bar includes links for 'Main Menu', 'Customers', 'Items', 'Vendors', 'Manual', and 'Logout'. The dashboard is divided into three main sections: 'Transactions', 'Inquiries and Reports', and 'Maintenance'. The 'Transactions' section includes links for 'Enter An Order or Quotation', 'Enter Counter Sales', 'Print Picking Lists', 'Outstanding Sales Orders/Quotations', 'Special Order', 'Recurring Order Template', and 'Process Recurring Orders'. The 'Inquiries and Reports' section includes links for 'Sales Order Inquiry', 'Print Price Lists', 'Order Status Report', 'Orders Invoiced Reports', 'Daily Sales Inquiry', 'Order Delivery Differences Report', 'Delivery In Full On Time (DIFOT) Report', 'Sales Order Detail Or Summary Inquiries', 'Top Sales Items Report', and 'Sales With Low Gross Profits Report'. The 'Maintenance' section includes links for 'Select Contract' and 'Create Contract'. A sidebar on the left contains a 'Main Menu' with categories like 'Sales', 'Receivables', 'Payables', 'Purchases', 'Inventory', 'Manufacturing', 'General Ledger', 'Asset Manager', 'Petty Cash', and 'Setup'. The footer displays the webERP logo, version information, and the SourceForge logo.

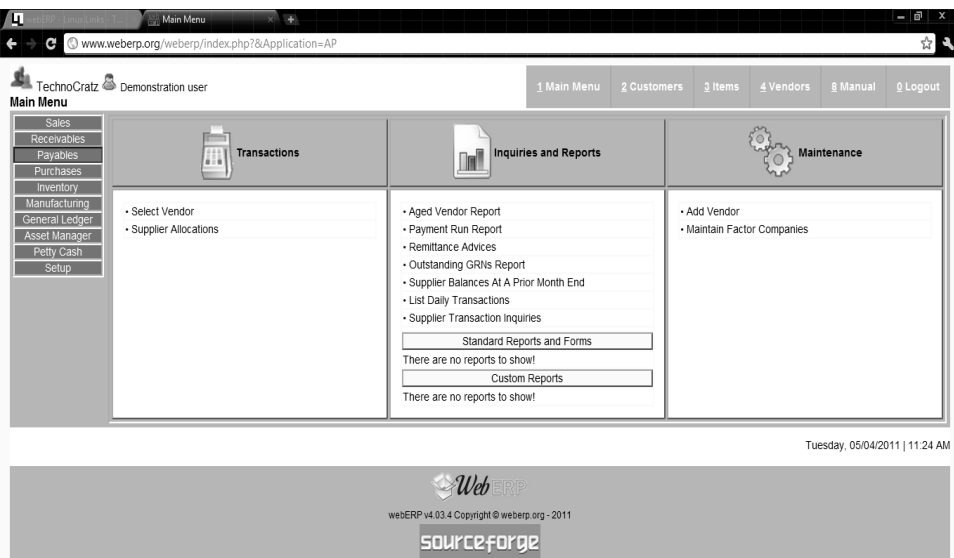
Receivables dashboard (Figure 2) – Links to receipts, invoices, statements, overdue records, daily transactions, and others.

Figure 2: webERP Receivables Dashboard



Payables dashboard (Figure 3) - Contains vendor-related links similar to the receivables dashboard (Figure 2).

Figure 3: webERP Payables Dashboard



Purchases dashboard (Figure 4) - Shows the status of various purchase orders and shipment entries.

Figure 4. webERP Purchases Dashboard

Inventory dashboard (Figure 5) – Sows inventory-related transactions and reports, and allows the user to add, update, or delete inventory items.

Figure 5. webERP Inventory Dashboard

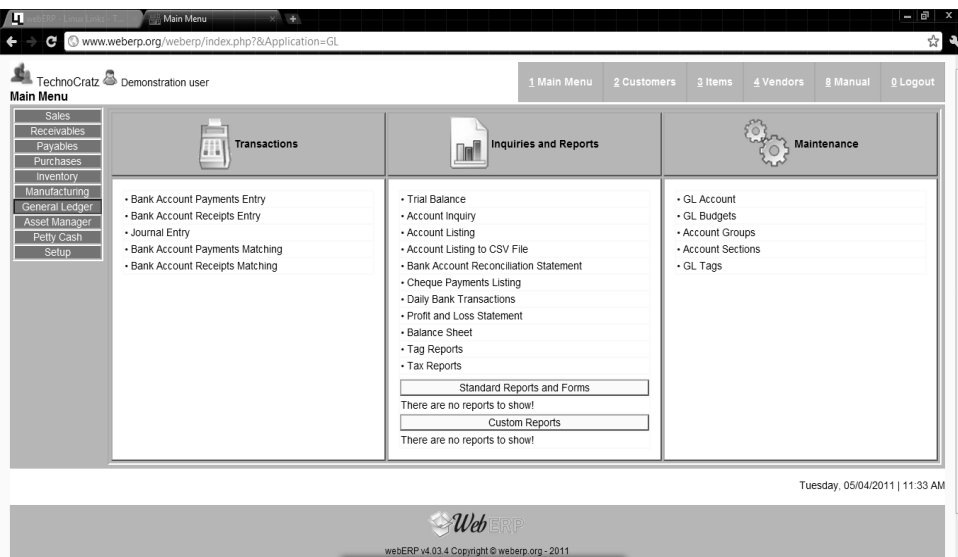
Manufacturing dashboard (Figure 6) - Links to work order entry, materials inquiries, and other reports, and allows the user to perform MRP calculation.

Figure 6. webERP Manufacturing Dashboard



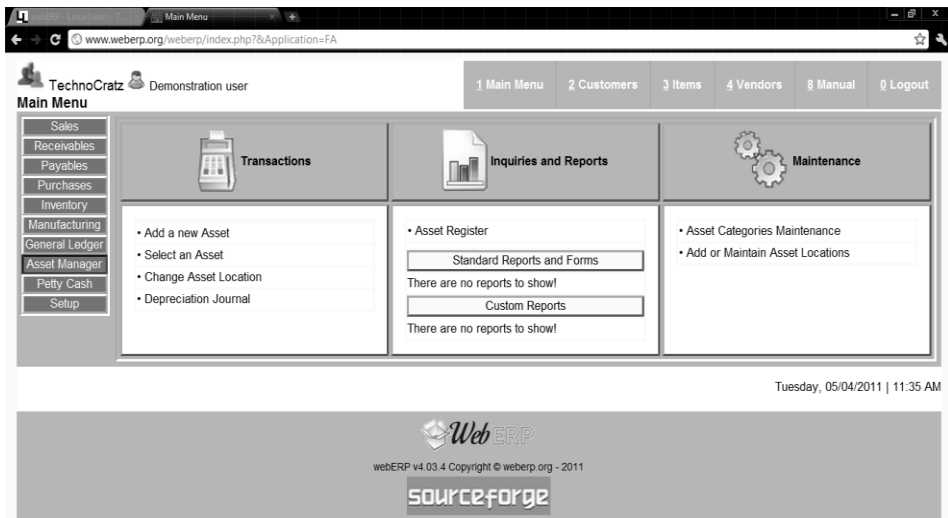
General ledger dashboard (Figure 7) - Links to all entries of customer and supplier invoices, refunds, payments, bank statements, account inquiries, etc.

Figure 7. webERP General Ledger Dashboard



Asset manager dashboard (Figure 8) - Has asset-related links that allow the user to add or delete assets, change asset location, and perform other operations.

Figure 8. webERP Asset Manager Dashboard



Before an ERP system can operate, configuring must be done to set many attributes or parameters of the system in order for the organization to meet its specific needs in the best possible way. webERP has a central dashboard for links to configuring functions. Figure 9 shows the setup dashboard, with links for all ERP settings, and Figure 10 is the webERP Installation Wizard.

Figure 9. webERP Setup Dashboard

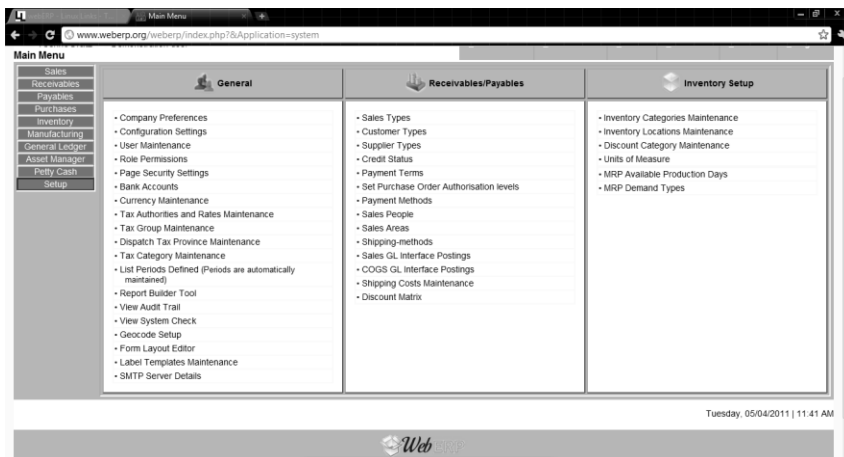


Figure 10. webERP Installation Wizard



3.1.2. Compiere

Compiere (<http://www.compiere.com>) is a Java-based, Web-based open source ERP system, with more than 1.35 million downloads. There is a free community version without support, as well as commercial editions that provide complete support and guarantee, training resources, and other services. Figures 11, 12, and 13 are samples of the user interface.

Figure 11. Compiere User Interface

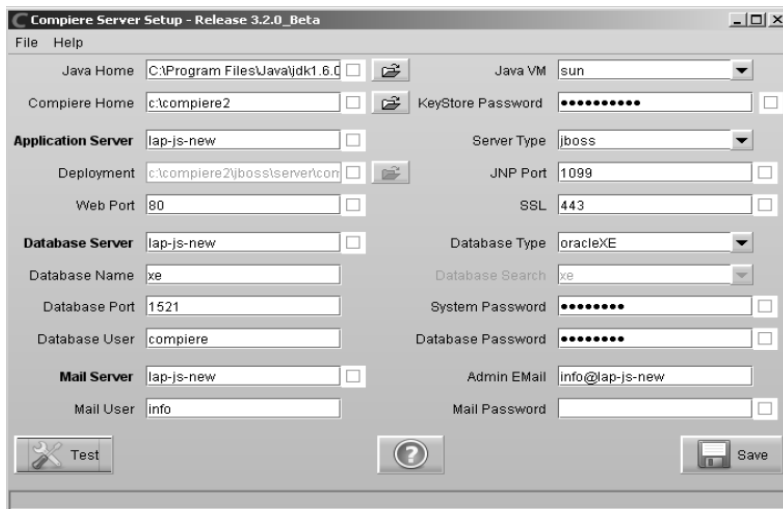


Figure 12. Compiere User Interface

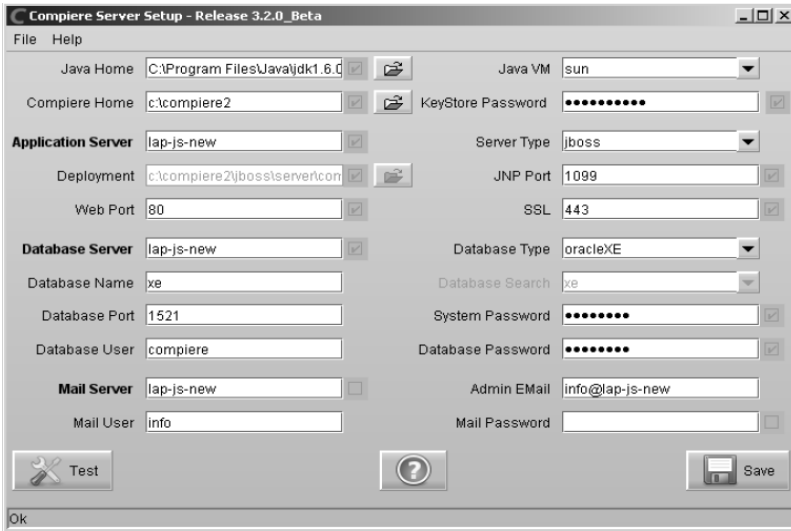


Figure 13. Compiere User Interface

Account	Organization	Product	Business Partner	Account Date	Period	Accounted Debit	Accounted Credit
11130 - Checking Unallocated Receipts						296.00	347.73
12110 - Accounts Receivable - Trade	HQ		Joe Block	02/04/2005	Feb-05	0.00	50.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	01/01/2005	Jan-05	100.00	0.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	01/05/2005	Jan-05	150.00	0.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	01/26/2005	Jan-05	200.00	0.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	02/04/2005	Feb-05	0.00	200.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	01/25/2005	Jan-05	300.00	0.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	01/25/2004	Jan-04	250.00	0.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	02/04/2005	Feb-05	0.00	50.00
12110 - Accounts Receivable - Trade	HQ		Joe Block	11/01/2003	Nov-03	251.74	0.00
12110 - Accounts Receivable - Trade						1,251.74	300.00
21610 - Tax due	HQ		Joe Block	11/01/2003	Nov-03	0.00	14.25
21610 - Tax due						0.00	14.25
14120 - Product asset	HQ	Azalea Bush	Joe Block	12/30/2003	Dec-03	0.00	100.00
14120 - Product asset						0.00	100.00
41000 - Trade Revenue	HQ	Azalea Bush	Joe Block	11/01/2003	Nov-03	0.00	237.49
41000 - Trade Revenue	HQ		Joe Block	01/01/2005	Jan-05	0.00	100.00
41000 - Trade Revenue	HQ		Joe Block	01/26/2005	Jan-05	0.00	200.00
41000 - Trade Revenue	HQ		Joe Block	01/25/2005	Jan-05	0.00	300.00
41000 - Trade Revenue	HQ		Joe Block	01/25/2004	Jan-04	0.00	250.00
41000 - Trade Revenue	HQ		Joe Block	01/05/2005	Jan-05	0.00	150.00
41000 - Trade Revenue						0.00	1,237.49
						1,999.47	1,999.47

3.1.3. PostBooks

PostBooks (<http://www.xtuple.com/>) is based on the award-winning xTuple ERP Suite. Its foundation is the open source PostgreSQL database and the open source Qt framework for C++. It supports multiple

languages. Its ERP functions are quite typical. Figures 14, 15, and 16 are samples of the user interface.

Figure 14. PostBooks User Interface

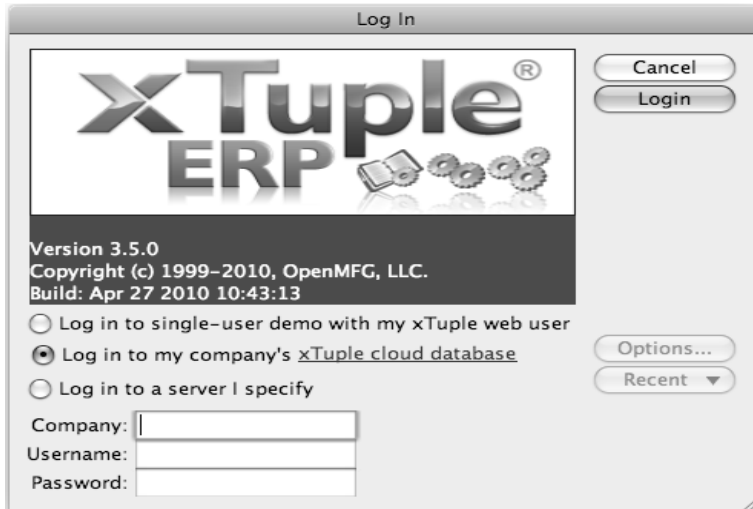


Figure 15. PostBooks User Interface

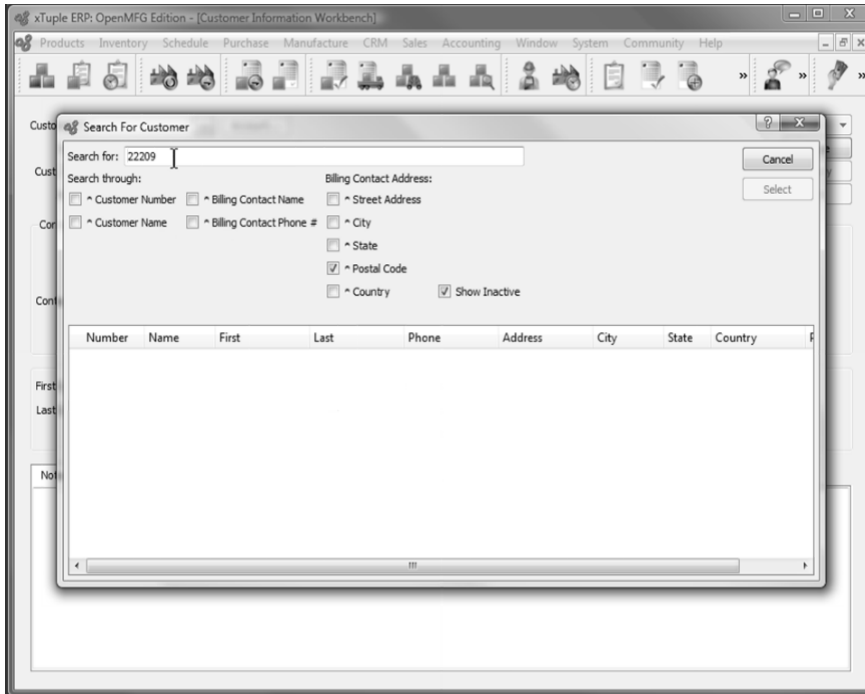
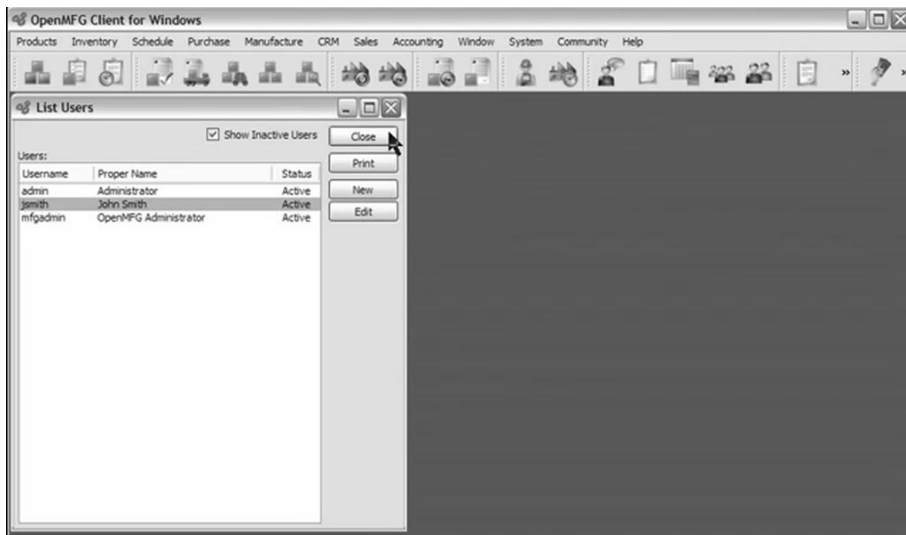


Figure 16. PostBooks User Interface



3.1.4. Opentaps

Opentaps (<http://shop.opentaps.org/>) has an Asterisk PBX integration and incorporates several open source projects, including Apache Geronimo, Tomcat, and OFBiz for the data model and transaction framework; Pentaho and JasperReports for business intelligence; Funambol for mobile device and Outlook integration. Opentaps applications provide user-driven applications for CRM, accounting and finance, warehouse and manufacturing, and purchasing and supply chain management.

Figure 17. Opentaps User Interface

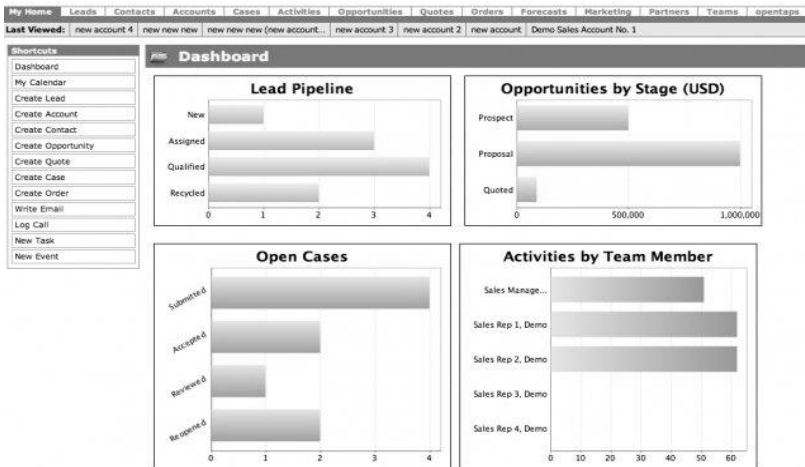
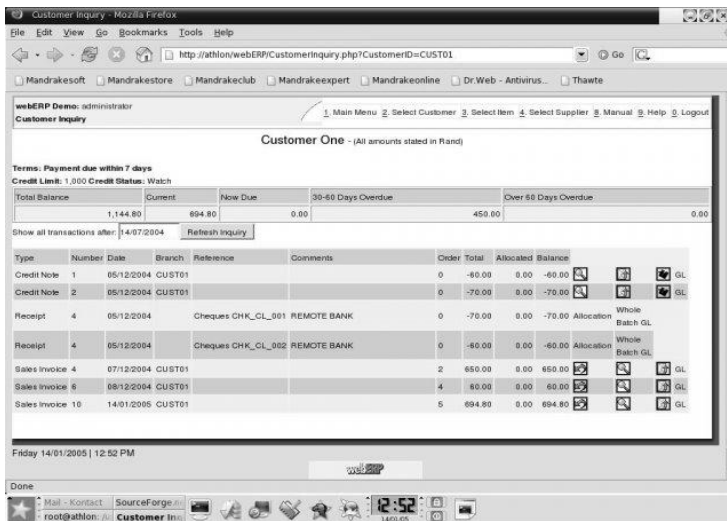


Figure 18. Opentaps User Interface



3.1.5. OpenERP

OpenERP (<http://www.openerp.com/>) is an open source ERP suite supporting enterprise modules, logistics, accounting and finance, HRM, customer relations management, project management, and other business processes. It is a complete package with a commercial version available.

Figure 19. OpenERP Screenshot

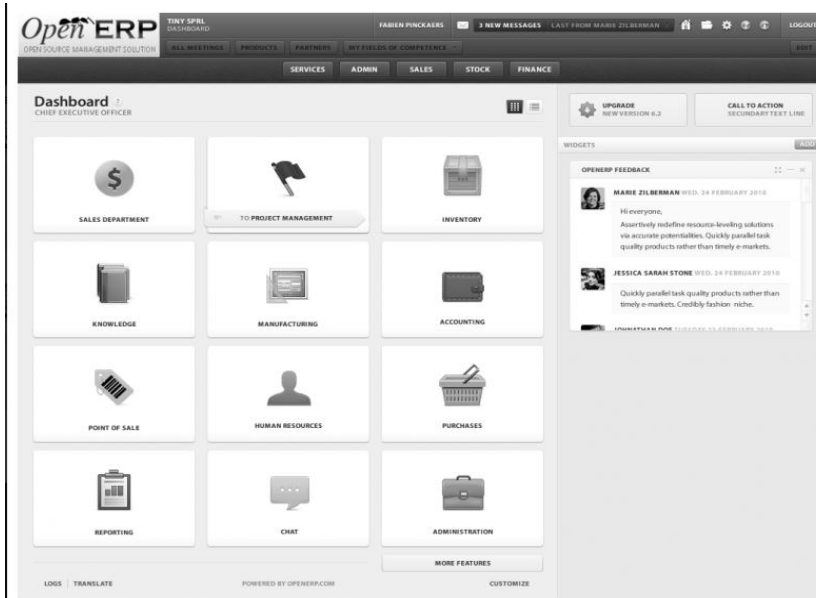


Figure 20. OpenERP Screenshot

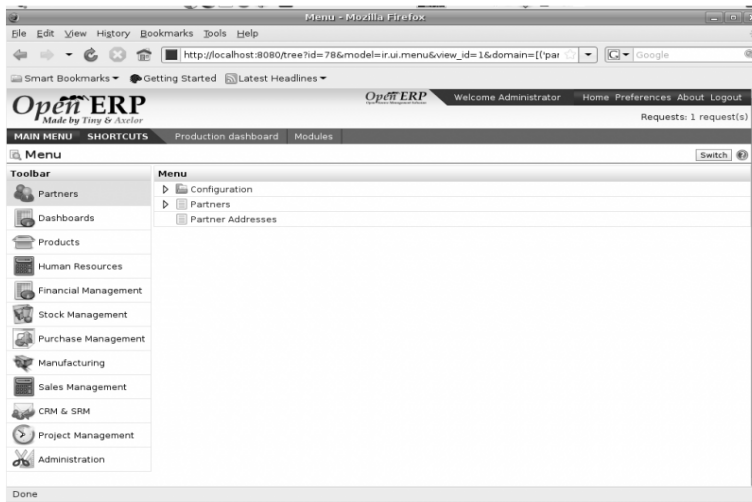
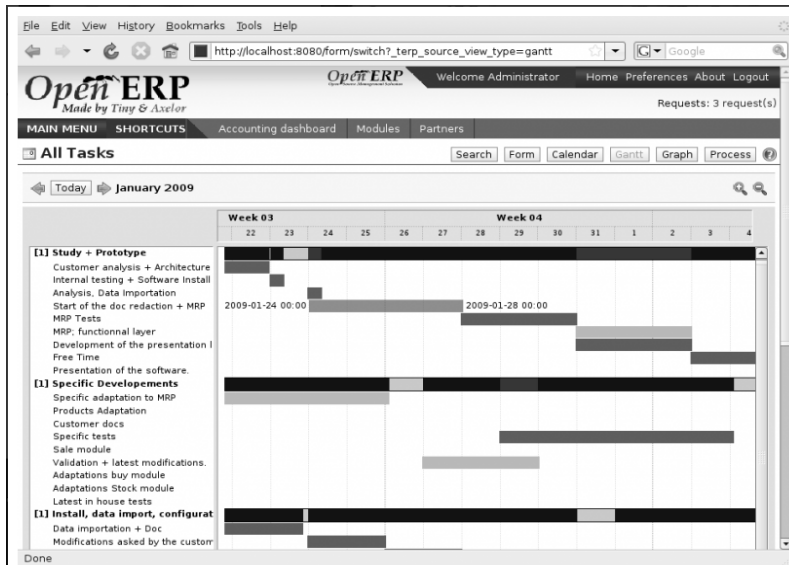


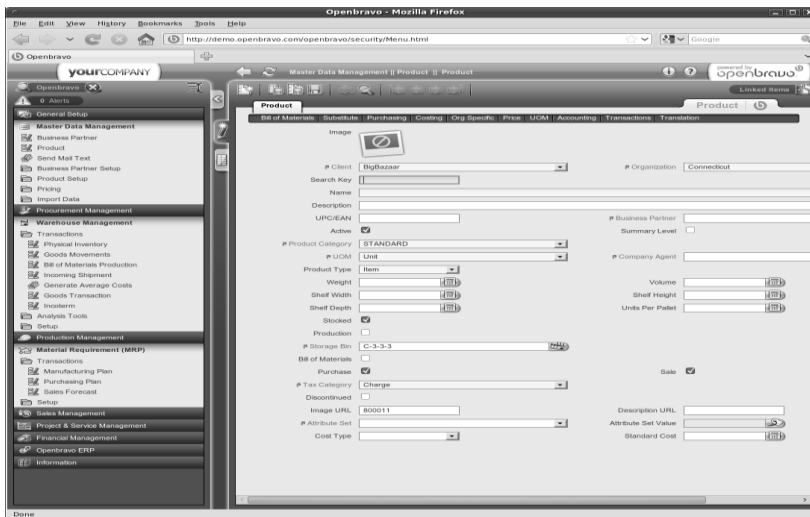
Figure 21. OpenERP Screenshot



3.1.6. OpenBravo

OpenBravo (<http://www.openbravo.com/>) is a Web-based ERP solution that was originally based on Compiere. It supports standard ERP features like production information, inventory, customer information, order tracking, and workflow information.

Figure 22. OpenBravo Screenshot



3.2. Comparison of the Selected Open Source ERP Systems

A comparison of ERP systems is actually a multiple-criteria decision-making problem. The typical multiple-criteria decision-making techniques of the analytical hierarchy process (AHP) and data envelopment analysis (DEA) have been used to assess ERP systems [Ahn and Choi, 2008; Lall and Teyarachakul, 2006; Stensrud and Myrtveit, 2003]. However, because the decision hierarchy for assessing these systems is difficult to generalize for all organizations, AHP is not useful for general comparisons of open source ERP systems. Also, since the ratio of the number of candidate open source ERP systems to the number of criteria is small, DEA is not effective for comparisons of open source ERP systems. Since the typical users of these systems are small- or medium-sized businesses, the method used to select an open source ERP system for these firms should be simple, flexible, and intuitive.

In this study, we used a simple contrast tool to compare the six open source ERP systems discussed above. Specifically, these six systems were evaluated based on subjective examination, using the five criteria previously defined. The relative ranks were depicted in star charts in order to better visualize the results. A star or radar chart [Chambers et al., 1983] is a graphical method of displaying multivariate data. The relative position or angle of the axes is typically equal. Star charts make it easier to see patterns in the multivariate data if the observations are arranged in some non-arbitrary order, as shown in Figure 23, on the following page.

Our research team consisted of five people, including the authors and three MBA students who participated as part-time research assistants. The context of this project was the selection of an open source ERP system for teaching and learning ERP systems for small businesses in a university business program. The authors evaluated each of these open source ERP systems from the teaching perspective, while the MBA students evaluated each of the systems from the learning perspective. The simple average-score method was used to determine the ranks of each of the ERP systems with regard to each of the five criteria dimensions, based on the opinions of the five researchers. Each of the five reviewed the features of the six open source ERP systems on their Web-sites independently. They also visited the Web-sites for social networks for the open source ERP systems, but did not make contact with any user. The subjective judgments of the research team were summarized, and a comparison of the selected open source ERP systems was reached, as shown in the star charts in Figure 23 on the following page.

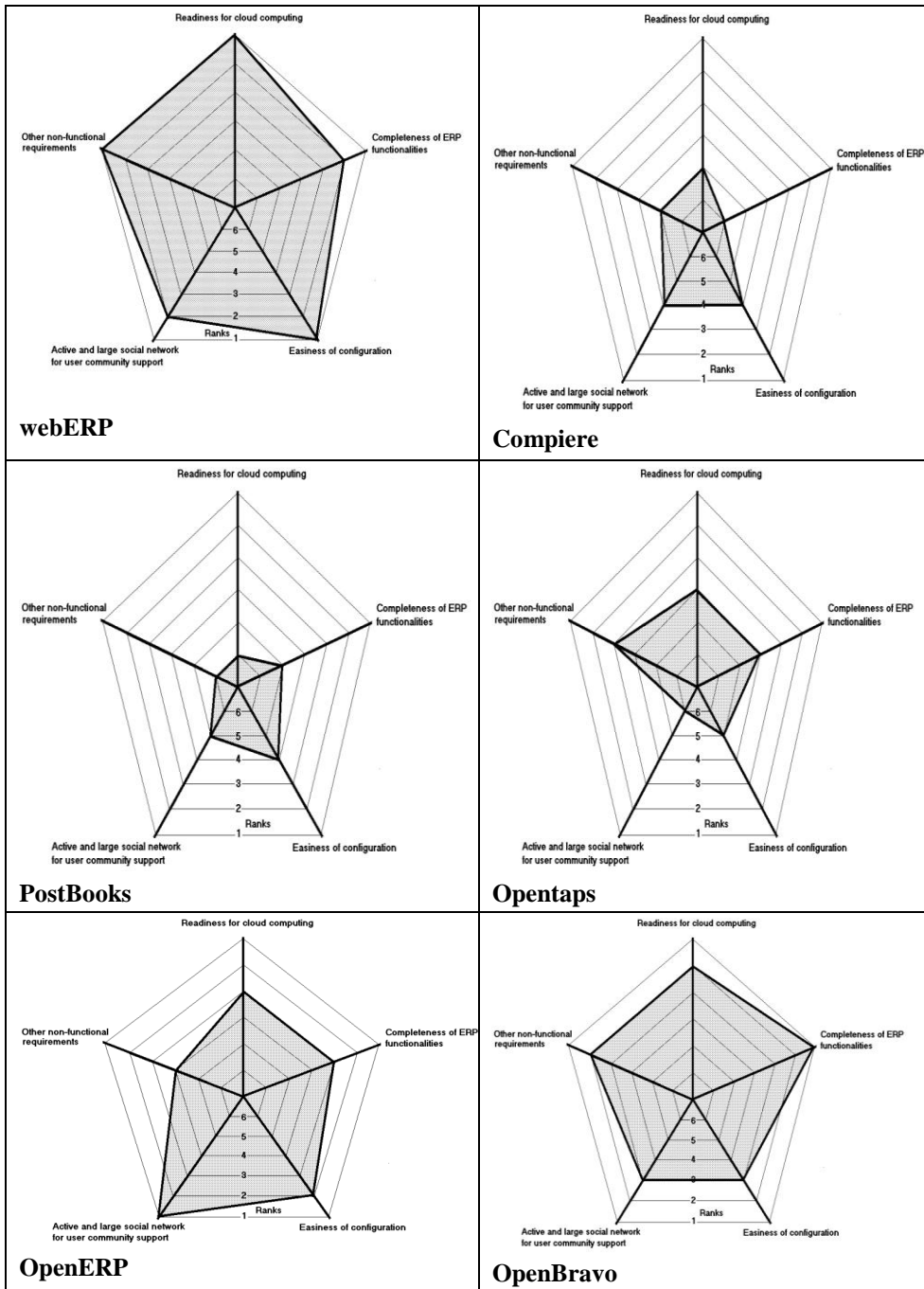


Figure 23: Star Charts for Six Popular Open Source ERP Systems

Clearly, this comparison was based on limited information provided by the Web-sites that were searched by the small research team in the context of teaching and learning ERP systems for small businesses. For a thorough evaluation, more scientific figures (e.g., reliability performance) and real users' opinions must be collected. Also, a particular type of business may have its own requirements and special preferences for features of an ERP system. In this study, the ERP systems are considered to be generic. The topic of industry-specific ERP systems is an emerging issue beyond the scope of this study.

Open source ERP systems have been around for quite a long time, and many small- and medium-sized organizations have used these systems. Compared with commercial ERP systems, open source ERP systems are more difficult for small businesses to select. IT literature on the success factors of technology adoption is abundant, but the literature falls short with regard to methodological frameworks for specific technology adoption. The current study provides a survey of open source ERP systems. The survey was expanded to include a set of evaluation criteria for selecting these systems, as well as demonstrations of a practical approach to assess such systems. In these ways, the current study contributes to current understanding and adoption of open source ERP systems.

Our review of six popular open source ERP systems with various features indicates that webERP seems to be the best among the six with regard to the five criteria identified: Web-based and readiness for cloud computing, completeness of ERP functionalities, ease of configuration, existence of a users' community network, and the presence of other generic non-functional requirements.

Our study has limitations in several respects. First, the context of this survey was to select an open source ERP system for teaching and learning ERP systems for just small and mid-size businesses. Second, the comparison involved our subjective judgments, drawn from our limited experience with, and knowledge of, the six open source ERP systems. Third, the information source for the survey was Web-sites, which might be incomplete or biased. Our comparison is merely an example demonstrating use of the proposed evaluation criteria and methods for potential users of open source ERP systems. We believe that, given the competitive nature of such systems, there is no proprietary open source ERP system that is best for all small- or medium-sized firms.

4. CONCLUSIONS

The major advantage of open source software over commercial software is that open source software is free to use. Free use makes open source ERP systems attractive to small businesses. On the other hand, open source ERP systems have distinct disadvantages, such as lack of support and lack of active maintenance. While providing common ERP functionalities, each open source ERP system has its own characteristics. Nonetheless, based on our review of six popular open source ERP systems with various features, we conclude that webERP seems to be the best, based on the five critical criteria used in this study; namely, Web-based and readiness for cloud computing, presence of ERP functionalities, ease of configuration, existence of a users' community network, and the presence of other generic non-functional requirements.

In the context of multiple-criteria decision-making, the result of assessing open source ERP systems can depend on the model used for the evaluation. In this study, we use the simple contrast method of star charts to display our subjective judgments regarding the six open source ERP systems. Our conclusion is not a simple answer to the question of which open source ERP system is the best choice. We conclude, instead, that there are differences among well-recognized open source ERP systems and that a good open source ERP system must meet the following important evaluation criteria:

1. A good open source ERP system must be a pioneer of cloud computing where the application can take place anywhere on the Internet and be delivered to the business through "the cloud." Such a system would require only a Web browser and PDF reader to use. The system must be easily available online and even the download size and other system requirements must be comparatively less.
2. A good open source ERP system must provide common ERP system functionalities, with emphasis on accounting, and must support the various business processes of wholesale, distribution, and manufacturing in order entry, taxation, general ledger, accounts payable/receivable, inventory, purchasing, banking, production, contract costing, fixed assets management, etc.
3. A good open source ERP system must build up a good network for users' community support. (Ideally, several software companies should offer commercial support for the system.)

4. A good open source ERP system must be easily configured on any operating system, and the computer processing requirements must be light. A good system can be run over an internal LAN, and can also be run on a third-party web-hosting server external to the business, which needs only a router and connection to the Internet to use the open source ERP system.
5. A good open source ERP system must meet the non-functional requirements of the user organization.

The major users of open source ERP systems are small- or medium-sized businesses. This survey study of open source ERP systems provides a framework for selecting such systems. This framework is simple and flexible to apply for small businesses. We conclude that our survey study contributes to the current understanding and adoption of open source ERP systems.

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