ISSN: 1545-679X

Information Systems Education Journal

Volume 8, Number 69 http://isedj.org/8/69/ August 10, 2010

In this issue:

Open Source ERP Applications: A Reality Check for Their Possible Adoption and Use in Teaching Business Process Integration

Minh Huynh
Southeastern Louisiana University
Hammond, Louisiana 70402 USA

Ivan Pinto
Southeastern Louisiana University
Hammond, Louisiana 70402 USA

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Recommended Citation: Huynh and Pinto (2010). Open Source ERP Applications: A Reality Check for Their Possible Adoption and Use in Teaching Business Process Integration. *Information Systems Education Journal, 8* (69). http://isedj.org/8/69/. ISSN: 1545-679X. (A preliminary version appears in *The Proceedings of ISECON 2009:* §3512. ISSN: 1542-7382.)

This issue is on the Internet at **http://isedj.org/8/69/**

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 8 Sep 2003. • Title: Information Systems Education Journal. Variants: IS Education Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: subscribe@isedj.org. • Subscription price: free. • Electronic access: http://isedj.org/ • Contact person: Don Colton (editor@isedj.org)

This paper was in the 2009 cohort from which the top 45% were accepted for journal publication. Acceptance is competitive based on at least three double-blind peer reviews plus additional single-blind reviews by the review board and editors to assess final manuscript quality including the importance of what was said and the clarity of presentation.

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Minh Huynh
Minh.Huynh@selu.edu

Ivan Pinto
ivan.pinto@selu.edu

Southeastern Louisiana University
Hammond, Louisiana 70402 USA

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For years, there has been a need for teaching students about business process integration. The use of ERP systems has been proposed as a mechanism to meet this need. Yet, in the midst of a recent economic crisis, it is difficult to find funding for the acquisition and implementation of an ERP system for teaching purpose. While it is recognized that the use of ERP systems might provide a variety of benefits in a business school curriculum, how could business schools overcome the limited resources in order to bring in and integrate ERP systems into their business core classes? This paper explores the potentials of open source software with a focus on open source ERP applications. It describes the development of the open source movement, the emergence of open source ERP software, and the selection and evaluation of two specific ERP applications. Although one of the major incentives for adopting open source software is the absence of license fees, this paper, however, cautions that there are other costs to be considered in the adoption of open source ERP software and in its implementation process.

Keywords: ERP, Openbravo, xTuple, enterprise system, business process integration, open source, open source ERP applications

1. INTRODUCTION

Over two decades ago, business educators recognized the need for a curriculum change that would allow graduates to gain an integrated understanding of business processes. (Porter and McKibbin, 1988) Accustomed to the traditional view of seeing procurement, manufacturing, and distribution as distinctive functions, students often have trouble in understanding how all different processes from various functions are interconnected into an integrated enterprise system. In response to this need, a number of curriculum redesign ideas were proposed, most aimed at removing the disciplinary silos and achieving a higher level of integration. (Johnson, et al., 2004)

One of the promising ideas is the proposed use of ERP systems as a mechanism for business curriculum integration. It is observed in the business practice that the implementation and use of ERP software force firms to become integrated enterprises. This, in turn, demands that these firms have strong understanding of key business processes. (Hammer, 1999) For years, companies have recognized the importance of enterprise-wide information systems, because enterprise systems are the main enabler for companies to integrate informa-

tion across operations on a company-wide basis. As expected, enterprise systems are deployed by businesses for the purpose of improving efficiency, data sharing, and decision-making process. The effectiveness of ERP systems as an integrating mechanism in business suggests that the use of ERP software in teaching core business courses might help students to achieve a strong understanding of key business processes and the practice of the cross-functional integration. In an educational context, it is observed that students often struggle to understand how all different components and processes of an integrated system fit together. In this respect, the use of ERP software might provide a missing link that could be used as an integrating mechanism in business college curricula. (Johnson, et al., 2004)

In the midst of a global economic crisis, like any other organization, business schools around the country are facing greater demands from various needs and yet the resources to meet those needs are increasingly dwindling. The funding for academic enhancement projects is drying up quickly. While it is recognized that the use of ERP systems might provide a variety of benefits in a business school curriculum, how could business schools overcome the limited resources in order to bring in and integrate ERP systems into their business core classes? More specifically, the challenges to those who want to use ERP as a mechanism for business curriculum integration are (1) which affordable ERP applications to choose from, (2) how to get a selected application up and running, and (3) what to do to integrate its use in core business classes under a severe budget constraint.

Could open source ERP software provide a solution to these challenges? Exploring a viable answer to this question is one of the motivations for this paper. Our main goal is to help inform those who want to learn about open source software in general and those who are interested in open source ERP solutions in particular with useful facts from our practical research and hands-on experiences with two specific ERP applications.

This paper is organized into six sections. The introduction is followed by an overview of open source software development and growth. The next two sections respectively describe an emergence of open source ERP solutions and explore two specific open source ERP solutions currently available on the market. In the fifth section is the sharing of the authors' experience in the trial implementation of two specific open source ERP applications. The paper is concluded with the author's final thoughts along with practical implications for those interested in adopting and using open source ERP for use in teaching.

2. OPEN SOURCE SOFTWARE DEVELOPMENT AND GROWTH

Open-source software according to Wikipedia refers to computer software available with its source code and under an open source license. Such a license permits anyone to study, change, and improve the software, and to distribute the unmodified or modified software. The idea of open source software can be traced back to the early development of computers in the 1950s. At this time, because the focus was more on making hardware saleable, computer manufacturers such as IBM would give away their software in both source and objective code form virtually for free. (Campbell-Kelly, 2008) The idea was to allow these hardware buyers to use the software code to develop their own applications. To develop software applications, these hardware buyers needed either a team of in-house programmers or outside companies with specialization in programming. The development of software applications was capital intensive, because writing software code required tremendous amount of investment in terms of time, skill resource, and money. (Campbell-Kelly, 2008) Soon, software-product companies were formed and they quickly realized that they could not just give away their software. Because software was relatively easy to duplicate, these software-product companies began to formulate ways to safeguard their intellectual asset and to protect against software duplication. Consequently, the license terms to restrict certain usage and duplication were introduced and later on the copyright laws on software were implemented.

By the mid-1980s, source code disclosure had almost completely ceased. The success of the personal computer revolution and the Microsoft Operating System led to a mislead-

ing perception that proprietary source software should be the norm. (Conlon and Hulick, 2006). Not until the mid-1990s did the free software movement emerge again. The growth for open source software is in part driven by the Hacker ethic. Back in 1961, MIT's AI Lab and Bell Labs were among the first software sharing community in which programmers explored various projects, worked together to fulfill the project goals, and were bonded together by their intense creative and intellectual interests (Johnson, 2001). They promoted the development and use of free software. One of the high points was the development and distribution of the UNIX operating system, which recently celebrated its 40th anniversary. Another important catalyst for the growth of open source movement is the development of ARPAnet. This network provided an environment where people at different universities, research labs, and governmental agencies could exchange ideas and engage in collaboration. The results were the rise of networked groups and eventually the growth of distributed software development. (Raymond, 1999) It was from these networked groups that later evolve into "community", a very important component in the structure and development of today's open source movement.

With the reduced costs and increased performance of PCs together with the widespread availability of the Web, the open source movement began to take shape. The online development communities took root and started to grow. Projects such as Linux and Apache were developed and widely adopted. These projects became successful models for further development of open source software. (Almarzoug, et al., 2005)

At the core of the open source movement is the ideal of "free" software development, distribution, and usage. Yet, to ensure its long term sustainability, the movement needs the support of Fortune 500 companies. Since these companies are for profit oriented, a compromise was eventually reached so that software can be developed for free and at the same time these "free" software still fit well in the business world. As a result, the term "Open Source" was coined by Christine Peterson of the Foresight Institute and the Open Source Initiative organization (OSI) was established in 1998. Although the term "Open Source" does not express explicitly the user's freedom to do whatever they wish with the software, it does promote a platform on which users can participate, contribute, adopt, and use the software at the same time corporations can also buy into this concept. (Almarzoug, et al., 2005)

Perhaps the strongest attraction of open-source software is its absence of license fees. In the midst of a severe economic downturn, funding for information technology is drying up. Open-source software offers an attractive alternative. (Roberts, 2009) As more open-source software are developed by communities of users around the world and they are adopted and used by increasing numbers of businesses, universities, and home users, their importance is hard to ignore. The impact of open-source software as described by Freidman (2005) is one of the 10 contributing factors led to the Globalization 3.0, in which the world has been shrunk from a small to a tiny size at an unprecedented pace.

3. AN EMERGENCE OF OPEN SOURCE ERP SOLUTIONS

In recent years, open source software has been increasingly recognized and eagerly embraced by businesses and organizations who are interested in an alternative to proprietary software. Its wide adoption has been in part fueled by the availability of operating system software such as Linux, OpenBSD, Ubuntu, etc., popular application software such as the Firefox web browser, OpenOfice office suite, etc., KDE and Gnome desktop environment, database management systems such as MySQL, PostgreSQL, etc., and most importantly, the web server software Apache (Conlon and Hulick, 2006; Conlon 2007). These applications are among the examples of successful open-source software. Although more and more applications have been developed based on open-source platform, the area of enterprise systems remains relatively untouched by open source. Specifically, the market of ERP is still dominated by SAP and Oracle, two of the major proprietary ERP software developers. Their revenues are in billions of dollars as compared to a few hundred thousand dollars of the revenues from all the open source ERP vendors combined (Lemos, 2008).

Although the open source ERP is still in its infancy, its emergence and potential growth are quite promising. First of all, the open source ERP vendors bring competition to the market where price is often not negotiable. Secondly, under the severe economic downturn, many companies are increasingly under pressure to cut costs in order to survive. As they reexamine the high cost of the proprietary ERP in terms of license, support, implementation, and maintenance, it is natural that they are attracted to open source ERP because of no license fees.

Popularized by the growth of open source, open-source ERP was developed with the open-source spirit. Unlike their proprietary counterpart, the open source ERP solutions allow anyone to view, audit, change, and distribute the source code freely. This is a significant breakthrough in the market that is dominated by mainly the proprietary software from two main sources: SAP and Oracle. As often reported, the commercial ERPs are costly because buyers have only two choices. The buyers of the proprietary software have little leverage in controlling their overall costs. The overall costs do not include just the initial purchase of license and set-up. Even after the system rollouts are done, companies find themselves locked into costly support and maintenance agreements. Thus, in the market of proprietary ERP software, there is limited choice and limited price leverage for the buyers. (Lemos, 2008)

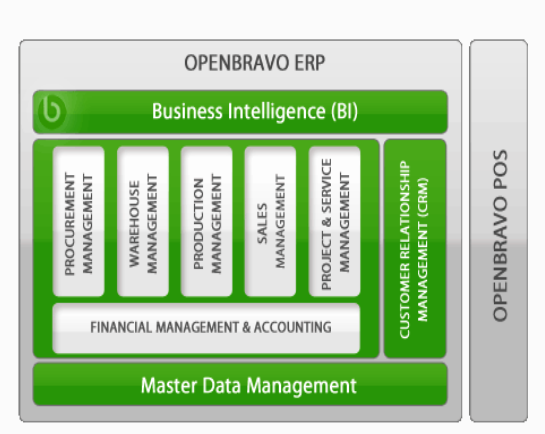
Since ERP systems require a great deal of customization, having an open-source ERP seems like a good fit. (Lemos, 2008) At the present time, there are only a handful of open source ERP vendors. Among the best known are Openbravo, xTuple, and Compiere. Because of the limited resources and time constraint, we will examine closely the two leading open source ERP applications from Openbravo and xTuple. At a number of conferences, there are workshops and presentations of these software. Increasingly, they are recognized by growing number of users. Although the websites of these open-source ERP vendors boast significant breakthrough in the number of their adopters, including even large companies, the accurate data on adoption rates are unavailable.

4. A CLOSE LOOK AT TWO SPECIFIC OPEN SOURCE ERP SOLUTIONS: OPENBRAVO AND XTUPLE

4.1 OpenBravo

Openbravo is a company that specializes in open-source ERP. It started as an university management project during the mid-1990, but later turned into a company known as Tecnicia in 2001, and today known as Openbravo. In 2006, Openbravo received $6.4 million in venture capital funding. In 2008, it received an additional $12.5 million investment fund. With the infusion of money, the company has aggressively expanded its reach to the potential ERP buyers around the world. It estimates a significant increase in revenues as more users purchase and adopt its software. The size of the company has grown from 70 employees in 2008 to 100+ employees and management team today.

Figure 1. Illustration of all the modules available in Openbravo ERP.



Openbravo provides a web-based, open source ERP solution for businesses. Through its ERP software, clients can gain an integrated view of their business operation including many aspects such as production, inventory, customer information, order, purchase, and workflow, etc. The application also supports report generating in PDF and Microsoft Excel. According to the claim on the company's website, its web-based ERP and Point of Sale solutions have been downloaded more than a million times and are used in over 50 countries.

Openbravo ERP is designed with a comprehensive set of modules. As shown in Figure 1 above, among the major modules are Fi-

nancial Management & Accounting, Procurement, Warehouse, Production, Sales, Project & Service, Customer Relationship. All of them are integrated to support variety of core activities as well as support activities of an organization.

4.2 Pricing of Openbravo

Openbravo's business model is to offer the software free. There is no license fee. Instead, users can subscribe for support, services, and product enhancements via an annual support subscription. Table 1 gives the pricing information based on the information from Openbravo website.

Table 1: "For Professional" subscription pricing as of August 2009.

	Annual Subscription Fee	Per Concurrent User
SMB Edition	1500 EUR ($2110 US)	400 EUR ($563 US)
Enterprise Edition	750 EUR ($1055 US)	400 EUR ($563 US)

*These costs include licenses, support, and extended bug fixing guarantees for all the stacks.

In addition, Openbravo offers other services for end customers. For instance, the implementation consulting service is designed to help users with the implementation of the software and to train users. This implementation consulting service helps users to obtain the application and get it up and running. Getting the software downloaded is one part of the implementation. Other parts include installation and setting up. As shown on the website, the implementation may involve the following major steps: project preparation (installation of software and initial training), definition (requirements definition, functional design, migration strategy), prototype development, final preparation (integrated testing, data migration, and final user training), and go live.

Another source of revenue for Openbravo is through providing maintenance. Through subscription, Openbravo offers users with various support plans at different levels of technical support, product support, availability (24x7x365 vs. 5x8), contact means (phone, chat, support portal). The price for subscription is ranging from 3000 EUR ($4232 US) to 35000 EUR ($50,000 US).

Openbravo's business model targets not just end customers but also business partners. While end customers refer to those who adopt Openbravo ERP, implement and use it, business partners refer to those who integrate Openbravo ERP, customize, and add value to their customized services. Business partners include three categories: (1) system integrators who deliver implementation and integration services to larger companies, (2) independent software vendors who embed their own solution into the package, and (3) value added resellers who provide implementation and customization services to SMEs (small medium enterprises), distribute their own modules, etc. Among the services that Openbravo offers to its business partners are: specialized training, certification (through exams), 2nd level support, specialized consulting, and outsourcing.

4.3 xTuple

xTuple formerly OpenMFG began with the development of OpenMFG in 2000. The company specializes in developing ERP applications for small business of all kinds. Among the features that it offers are financial, CRM, sales and purchasing, reporting, inventory, manufacturing and distribution.

Its business focus is to offer a lower cost open-source ERP solution to small medium enterprises (SME), in particular the market niche of those in the area of manufacture. Its flagship product is xTuple ERP Manufacturing Edition, a fully-integrated end-to-end software system to support core activities from manufacture to sale to inventory. Another commercially licensed ERP solution from xTuple is the Standard Edition. The Standard Edition is the midrange commercial offering, which adds advanced inventory control, warehousing, and other features to the core package but does not have features such as discrete and batch process production, make to order, make to stock, or mixed-mode, job shops and engineer-to-order present in the Manufacturing Edition. These two products are developed and sold based on the "community code" model, where the code was not made publicly available but was accessible only to those customers who purchase or subscribe to licenses.

In July 2007, xTuple became the official company's name. It was also during this

time xTuple launched the PostBooks Edition. Unlike the Manufacturing and Standard Edition, the PostBooks Edition of xTuple ERP is the free and open source software application available for download from SourceForge. PostBooks is developed from the same code base as the other two commercially licensed editions. As described on the website http://www.xtuple.com/postbooks, PostBooks was built from the open source technology including PostgreSQL database, and the open source Qt framework for C++. It is a full-featured, fully-integrated accounting, ERP, and CRM system. Its capabilities include the following modules: Accounting (general ledger, accounts receivable and payable, bank reconciliation, financial reporting), Sales (quotes, order entry, sales reporting, shipping), CRM (universal address book, incident management, opportunity management, to-do lists, project management), Purchasing (purchase orders, receiving, vendor reporting), Product Definition (items, infinite-level bills of material), Inventory and Distribution (multiple locations, other advanced warehouse features), Light Manufacturing (work orders, strong support for make-to-order), OpenRPT open source report writer.

Like all xTuple products, PostBooks runs equally well on Windows, Linux, and Mac - and is fully internationalized (multi-currency, support for multiple tax structures, and multilingual translation packs maintained by our global community). PostBooks is licensed under CPAL, the OSI-certified Common Public Attribution License. (website http://www.xtuple.com/postbooks)

Since its introduction of open source ERP solutions, xTuple has been quite successful. Successful cases include a frozen food maker Cedarlane who used xTuple. xTuple ERP help Cedarlane saved a couple of hundred thousands dollars, saw an increase of revenue from $40 to $600 million, and while the business has gone up, the paperwork has reduced, and the operation becomes more efficient.

4.4 Pricing of xTuple

Similar to Openbravo, xTuple's PostBooks Edit is an open source ERP application. There is no license fee or subscription option because it is freely available and distributed without any support. Hence, the pricing of xTuple provided here is applied mainly to Standard and Manufacturing Editions. The software subscription for the Standard Edition ranging from $280/user for 200+ users to $800/user for 5-19+ users and $350/user and $1000/user respectively for the Manufacturing Edition. In term of services, like Openbravo, xTuple offers an implementation consulting package that includes an initial site visit, project plan, and thirteen total days of implementation assistance to get the system up and running. The 13 total days package costs $18,000. In addition to implementation consulting, xTuple also provides other network services including automatic upgrade, data cleanup, offsite backup, and database optimization at the price ranging from $2000/year for basic to $7500/year for full service.

5. OPENBRAVO'S VMWARE VS. XTUPLE'S MANUFACTURING EDITION: PERSONAL EXPERIENCE

With the arrival of a supply chain management as a new major at our school, we are in search of an ERP application for use in the support of our supply chain management curriculum. The cost of SAP is beyond our department's budget. Under the pressure of recent budget cut, we have no choice but look for open source ERP application as an alternative to the proprietary ERP. Our task is to explore, find, and evaluate a possible ERP application that could be adopted for use in teaching supply chain management related courses.

5.1 Our Experience with Openbravo's VMware Implementation:

A colleague told us about Openbravo. This was where we started with our exploration of open source ERP. We first filled out the form on Openbravo's website. Then, we got a phone call from a representative. This person asked us about our needs and then assigned us to a partner. A representative from Openbravo partner called us. He gave us some instruction to obtain the software and provided us some tips to set up a demo version of Openbravo. All we needed to do is to follow the process of running Openbravo ERP on a virtual appliance. This included download and install VMware Player and then download the latest version of the

Openbravo VMware image and unpack the files. After the installation, we were able to get it up and running.

This community appliance is a minimally preinstalled application and operating system. The appliance is designed to run under VMware. After Openbravo was installed and was running, we encountered another challenge. We did bring Openbravo up, get into the application, and access to different modules, but we did not know what to do and where to start. Although Openbravo provided a sample database client called BigBazaar, we could not find much documentation or guide in how to use it. Furthermore, the ERP application consists of many modules and they are linked to one another. One needs to have knowledge of the entire business cycle in order to set up and use ERP.

Below are what we realized after a trial implementation of the Openbravo VMware.

- The installation procedure was not intuitive.
- The documentation was vague and difficult to follow.
- There was little help available online.
- The only source of reliable assistance and technical information came mainly from the Openbravo partner.
- Without proper training and help from the vendor, it seems difficult to set up and implement the Openbravo ERP application.
- Even after a successful installation, there is another major hurdle to figure out how to use the sample database BigBazaar.

5.2 Our Experience with xTuple Manufacturing Edition Implementation:

One of the reasons that we were attracted to xTuple was the readily available demo and very detailed documentation. When we visited xTuple website: www.xtuple.com, the link took us immediately to the free demo of xTuple ERP page. Here, we registered for a free hosted demo and followed the given instruction. To register, a valid email address was needed. Shortly after we filled out the application online, we received an email message from sales@xtuple.com that provided us with the username and password along with a link to log in at http://www.xtuple.com/user. Here, we logged in to verify the information that we provided. After this initial verification, it took a day or two for xTuple to evaluate and approve the demo request.

Once, our request was approved. We received a message from demo@xtuple.com. It provided us with further detailed instruction on what to do next. Once the installation was completed, we launched the application by clicking an icon xTuple ERP appeared on the desktop. A log in screen shown up and we tried to log in with the information given in the message from demo@xtuple.com.

Figure 2. The log in screen of xTuple ERP free hosted demo

At this point, we were able to test use of the application. One of the distinctive features that we observed and experienced with xTuple is the company's openness. It did not withhold any information unnecessarily or tried to make it difficult for users to access its applications. We found that the documentation and online guide from xTuple were very helpful. To use the demo and to learn about ERP as well as the business process adapted for ERP, we followed the online companion to the xTuple ERP demo (http://www.xtuple.org/DemoGuide). The xTuple guide provided us with easy-to-follow information not only to access the application but also to run a scenario to make sense of the example. While we were in xTuple Manufacturing Edition application, we

also discovered a wealth of supports that was accessible right from the menu. By clicking "Community" on the menu, we could reach xTuple.org, online customer support (only for authorized users and paid customers), and other non-paid support options. We did check the discussion forum. The information was quite well organized. In addition to the discussion forum, there was a FAQ page to cover support type topics.

Based on our evaluation of xTuple Manufacturing, we observed the following:

- The installation procedure for the demo was very straightforward.
- The documentation was comprehensive, informative, well-organized, and easy to follow.
- There were a lot of resources available online.
- It was relatively easy to obtain help online via the discussion forum, FAQ page, and documentation.
- The example available in the demo was very informative. It helped to showcase what the xTuple ERP is like and how it could be used to integrate different processes in a business.
- The application was easy to use, well-designed, and very appropriate for small- to medium-sized enterprises.

6. CONCLUSION AND PRACTICAL IMPLICATIONS

From the result of our trials as described above, we determined that Openbravo turned out to be more difficult to install, implement, and use for the purpose of teaching, although it appears to be a good and solid ERP application. For evaluation and teaching purposes, we would recommend xTuple because of its easy-to-use features, its well-written documentation, its available technical support from various resources, and its good example for reference. From our experience, xTuple is a very promising open source ERP application that can be integrated easily and effectively for teaching about enterprise systems in core business classes.

The use ERP systems can provide a variety of benefits in teaching core business classes. Among the most important benefits is the ability of ERP applications to serve as a mechanism to integrate knowledge across functional areas. The proprietary ERP solutions are costly and at the present are beyond the reach of many business schools. Open source ERP applications offer an attractive alternative. Although one of the major incentives for adopting open source software is the absence of license fees, the discussion of Openbravo and xTuple does raise an important fact about other costs such as support, training, implementation, and maintenance costs that should be taken into consideration.

Those who might be interested in open source ERP face several issues. Because open source ERP applications are still at the early development stage, there are only few products available to choose from. For most ERP vendors, their main clients are businesses not educational institutions. Hence, few open source ERP vendors and distributors have a clear model when dealing with educational institutions. For instance, should the educational institutions be treated as end-user clients or partners? The use of ERP applications at educational institutions is for teaching and learning purposes not for revenue generating as in the case of businesses. Hence, the existing pricings are out of reach for many schools. One other issue when dealing with open source software is the fact that there are only few developers and few resources available to rely on, and hence there is uncertainty on whether a chosen open source ERP would be around in the long run.

Therefore, a decision to adopt an open source ERP software should not be based mainly on the license cost. Although it is free to download the software, there are many other costs including: training, maintenance, roll-out costs, and the potential costs of risk. All of these add up and may offset the license savings. One needs to evaluate open-source ERP software the same way as any other commercial software applications. It is important to know what the needs are and how they are met. A scripted scenario could be useful to test functional fit. Furthermore, it is important to take a careful look at the vendor who will support it. Vendor's viability and product's development roadmap will be important for the support, enhancement and upgrade down the road. (Roberts, 2009)

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