



ERP systems and open source: an initial review and some implications for SMEs

ERP systems
and open source

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Abstract

Purpose – The purpose of this paper is to further build up the knowledge about reasons for small and mid-sized enterprises (SMEs) to adopt open source enterprise resource planning (ERP) systems.

Design/methodology/approach – The paper presents and analyses findings in articles about proprietary ERPs and open source ERPs. In addition, a limited investigation of the distribution channel SourceForge for open source is made.

Findings – The cost perspective seems to receive a high attention regarding adoption of open source ERPs. This can be questioned and the main conclusion is that costs seem to have a secondary role in adoption or non adoption of open source ERPs.

Research limitations/implications – The paper is mainly a conceptual paper written from a literature review. The ambition is to search support for the findings by doing more research in the area.

Practical implications – The findings presented are of interest both for developers of proprietary ERPs as well as SMEs since it is shown that there are definitely reasons other than costs involved when deciding on proprietary ERPs or open source ERPs.

Originality/value – It can be argued that there is a lack of research conducted and published about why SMEs choose open source ERPs instead of proprietary ERPs. This paper identifies the gap and suggests future research directions about this subject.

Keywords Manufacturing resource planning, Small to medium-sized enterprises

Paper type Research paper

1. Introduction

In the last decade, there has been an explosive interest in enterprise resource planning (ERP) systems as well as in free and open source software (FOSS) systems. In this paper, we aim to describe the combination of these two areas, namely open source ERPs with respect to small and mid-sized enterprises (SMEs). This combination presents three interesting areas of analysis. Firstly, the development model of open source has changed during the recent years, raising the question about how the “new” development model for open source will influence future development of ERPs. This change means that FOSS systems are developed and designed for mass consumption (Boulangier, 2005). It also means that FOSS systems development has increased its focus from low-level infrastructure layer moving up to a focus on middle-level application (Ajila and Wu, 2007) and then focusing on business applications. Secondly, the business environment for SMEs has become more complex through globalization, resulting in a need to implement more advanced information technology (Raymond *et al.*, 2005). Thirdly, software vendors of proprietary ERPs face some challenges that they must address if they are to stay in the business. However, the basic question discussed in the paper is: what could influence SMEs in the adoption of open source ERPs?



The rest of the paper is organized in the following way: Section 2 introduces the subject by giving definitions of ERP systems and Section 3 describes the open source development. Section 4 discusses open source ERPs and describes the status of open source ERPs. Section 5 discusses reasons that organizations could have for adopting open source ERPs. The final section of the paper offers some suggestions for future research related to adoption of open source ERPs.

2. Enterprise resource planning systems

ERP systems have received much attention in the recent years. ERPs are often defined as standardized packaged software designed to integrate an organization's entire value chain (Lengnick-Hall *et al.*, 2004; Rolland and Prakash, 2000). Wier *et al.* (2007) argue that ERPs aim to integrate business processes and ICT into a synchronized suite of procedures, applications and metrics which goes over firms' boundaries. Kumar and van Hillegersberg (2000) say ERPs originated in the manufacturing industry, and development of the first generation ERPs was an inside-out process, changing from standard inventory control packages, to material requirements planning, material resources planning and then expanding to support the entire organization (second generation ERPs). This evolved software package is described as the next generation ERP, labeled as ERP II, which according to Møller (2005), could be described as next generation enterprise systems. This development has increased the complexity both when it comes to usage as well as development of ERPs. The complexity comes from the fact that ERPs are systems that are supposed to integrate the organization – both inter-organizationally as well as intra-organizationally – and its business process in a one suite package (Koch, 2001). This impacts what stakeholders there are in an ERP value-chain (Ifinedo and Nahar, 2007; Somers and Nelson, 2004) and also how these different stakeholders receive competitive advantage from ERPs. It can be clearly argued that an organization no longer receives competitive advantage by just implementing an ERP (Karimi *et al.*, 2007; Kocakulah *et al.*, 2006). One reason could be that ERPs focus on good (unfortunately, often incorrectly called "best") practices. Since open source ERPs seem to provide better possibilities for customization, it could be asked if an organization adopts open source ERPs in order to differentiate from competitors.

A review of existing literature on ERPs such as Shehab *et al.* (2004), Esteves and Pastor (2001) and Botta-Genoulaz *et al.* (2005) shows that the main problem presented is the misfit between ERP functionality and business requirements. Soh *et al.* (2000) describe this as a common problem when adopting software package. The problem of "misfit" means that there is a gap between functionality offered by the package and the functionality required from the adopting organization. The "misfit" problem could also be described by the assumption that implementing ERPs as such is a change project, which demands that either the organization changes or the implemented ERP system is adjusted. This is a fact independent whether the ERP is open source or proprietary. It could be asked whether new delivery models for ERPs and ERP-related services such as application service provision or software as a service solve this problem. Another delivery model worth mentioning is the open source phenomenon – a combination of delivery model and development model, is the open source phenomenon. The next section will describe open source as a phenomenon in order to build up the base for later discussion of the question: what could influence SMEs in the adoption of open source ERPs?

3. Open source software

According to Hars and Qu (2002), the origin of open source software can be traced back to the 1950s and 1960s. They describe open source software origins as when software was sold, macros and utilities were freely exchanged in user forums. However, the real take-off of open source software was probably when Richard Stallman founded the Free Software Foundation that provided the conceptual foundation for open source software. Bruce *et al.* (2006) suggest that open source is mature and industry-strength in many areas. Their examples include operating systems, application servers and security tools. When it comes to applications, they state open source is not a mature area, with exceptions such as customer relationship management, ERP, content management, and business intelligence. Bruce *et al.* (2006) describe this as the third wave of open source adoption. The first wave being the adoption of open source as operating systems and the second wave then adoption of open source as infrastructure systems (middleware, browsers and databases).

According to Vidgen *et al.* (2004), the fact that OSS works at all may seem surprising. Superficially, it appears that traditional management has been eliminated and near-anarchy reigns. They propose that, on closer inspection, OSS is a triumph of organization, although much of this is self-organization rather than hierarchical regulation. Riehle (2007) states that there are two different types of open source software, community open source and commercial open source. Community open source software is developed by a community while commercial open source software owned and developed by for-profit entity. These types differ in who decides on the future direction of the software. In the community case, individual developers, often in the form of a broad community of volunteers, decide on which contributions that should be accepted in the source code base. The “community” also decides where the software is heading. In the commercial case a company decides on what should be accepted into the software code base. In this case, the company also maintains the copyright and decides what to implement next. This means that in the commercial open source there are market-entry barriers. In the community open source situation no market-entry barriers exist, and therefore anyone can, given the right license, set up a company providing software (Riehle, 2007). However, in the commercial open source case, the interest is not in selling the software as such but in selling its provision, maintenance, and support to end-users.

Riehle (2007) describes costs as one reason why organizations adopt open source. However, he states that the open source cost perspective is mainly a reason for solution providers. The reason for this is that the customer pays for the software he or she uses from a market perspective. This means that customers pay the fee that the market demands. If then the solution provider can produce the software solution cheaper by using open source, they can increase their profit or increase the cost for delivered services to each customer. According to Riehle (2007), the result of this is that solution providers gain the most from open source software because they increase profits through direct cost savings and the ability to reach more customers through improved pricing flexibility. Economides and Katsamakos (2006) stipulate that open source, despite the fact that it can be used for free, has costs related to the usage, such as costs of learning, costs for installing, and costs for maintaining. It can also be higher support costs than for proprietary software.

Although it may seem that there are many benefits for companies stemming from adopting and using open source software, there are not too many companies which

adopt it. Goode (2005) conducted research on a sample of 500 Australia's top companies in order to figure out why their managers rejected open source software. The main reasons reported are that managers perceive no relevance in its offerings, are concerned about unreliable or transient support sources, lack available resources, or perceive no requirement for open source technology in their businesses. The smallest groups noted that they did not have time to implement it; they were already using commercial closed source software. This suggests that at least some respondents see the adoption of and migration towards open source software as a significant undertaking, with a long and steep learning curve.

4. The status of open source ERPs

There is no doubt that there is a great interest in open source. However, the question remains if this could be said also about open source ERPs. In order to get some kind of answer, we made an investigation of the distribution channel Sourceforge (2007), which hosts open source projects and is described as:

SourceForge.net is the world's largest Open Source software development website. SourceForge.net provides free hosting to Open Source software development projects with a centralized resource for managing projects, issues, communications, and code.

The get a grasp of the status over open source ERPs, a search was made in September 2007 and the same search was then made in November. The search showed that there were 336 open source ERP projects registered in September and in November, there were 356 open source projects registered. This means that in ten weeks there had been an increase of 20 new open source ERP projects. An interesting finding is that the new projects are to a high extent connected to existing projects, what means that they have a focus on developing ERPs for specific industries and so on.

Another way of showing the interest in open source ERPs is to look into downloads of the software as such. However, it is important to remember that downloads do not say anything about actual adoption and usage as such. But, it can be assumed that if the downloads increase the adoption rate probably also increases. To have some idea about this, we looked into downloads of six different open source ERPs. These open source ERPs were chosen from a recommendation made by a consultant working in the open source ERP sector, from his personal experience about market share. He also stated that these are the open source ERPs that are most interesting for SMEs to adopt at the moment. In Table I, we show the statistics about downloads from these six open source ERPs projects.

Table I implies that open source ERPs have existed for several years. It also shows that the interest seems to have increased, since there have been an intensive

Open source ERP	November 27	September 13	Downloads during ten weeks	Start of the project
Compiere	1,296,098	1,267,160	+28,938	June 8, 2001
OpenBravo	401,262	300,716	+100,546	March 9, 2006
Opentaps	311,964	284,429	+27,535	August 10, 2005
Facturalux	235,897	231,031	+4,866	September 1, 2006
WebERP	149,010	138,064	+10,946	January 7, 2003
TinyERP	21,116	6,953	+14,163	March 25, 2005

Table I.
Downloads of open
source ERPs

amount of downloads lately. As mentioned earlier, downloading an ERP does not equal to ERP adoption. Unfortunately, it is not possible to see any demographic data on who downloaded the software. However, an interesting observation that could be made is that the software showing the highest amount of downloads is OpenBravo, which is the only system that clearly describes itself as having a focus on SMEs. One suggestion could be that it is SMEs that downloads open source ERPs. Support for this could be that SMEs according to Raymond (2005) are highly flexible and adaptable to change. Another support could be that SMEs not have the necessary resources for adoption of critical applications such as ERPs (Brown and Lockett, 2004) and it can be suggested that open source ERPs allow SMEs at least to use them as a source of supply, which according to Levenburg (2005) is a crucial usage of internet at least for micro-firms. According to Serrano and Sarriegi (2006), OpenBravo ERP has been successfully installed in 12 SMEs. It is a bit unclear how they define “successfully.” What they state is that the SMEs, which installed OpenBravo, did so after evaluating proprietary ERPs, and the interesting fact is that the adopting SMEs were not interested in the open source license. From this it can be suggested that it was not the fact that it was open source as such that made them install the specific ERP system. An interesting question arises from the note – what are the reasons for adoption of open source ERPs.

5. Discussion

Although many large corporations experience cost savings from implementing ERPs, an implementation may cost millions of USD (Jutras, 2007). According to Smets-Solanes and de Carvalho (2003), the high cost has prevented ERP systems from spreading to SMEs. In their opinion, after ERP deployment, its “blackbox” nature prevents from understanding and eventually improving the business processes it implements, leaving some important business decisions to the software publisher rather than to the corporate manager, preventing scientific researchers from getting involved in management innovation. It is possible to agree with the statement to some extent since most of ERPs cannot be customized by end-users. MS Dynamics AX could be used as counter example, since it is a proprietary ERP but comes with almost the whole source code, which theoretically means that it could be customized by end-users.

Deciding on deploying a specific system includes questions such as usability, compatibility, features, support costs and software quality and reliability (Boulanger, 2005). Boulanger (2005) argue that FOSS-developed systems are a viable alternative to proprietary systems when taking software quality and reliability into consideration. The question is then if adopting organizations see this as a reason for adoption of OSS ERPs. Another influencing reason for why OSS ERPs adoption could be of interest for SMEs is the fact that SMEs, at least according to Raymond (2005), are highly flexible and adaptable to change.

Serrano and Sarriegi (2006) state that the benefits of applying OSS are greater for ERPs than for other kinds of applications, for three main reasons:

- (1) *Increased adaptability.* ERPs are not plug-and-play. They always need an implementation project to match the business processes and local regulations. Having full access to the ERP source code can facilitate this unavoidable customization.
- (2) *Decreased reliance on a single supplier.* Businesses that acquire a proprietary ERP are highly dependent on the product builders and distributors – that is,

the source code's owners. If one, or even both, of these agents disappears, upgrading and maintaining the ERP can pose significant problems.

- (3) *Reduced costs.* Proprietary ERP licenses are expensive. A rule of thumb puts them at between one-sixth and one-third of the implementation project costs. OSS ERPs avoid this cost. Furthermore, they usually do not need expensive hardware to run.

Regarding the first reason, discrepancies between the software and organizational practices can be, according to Chiasson and Green (2007), a combination of functionality, which is "too far" or "too close." The software can be "too far" from the specific needs of the organization, thus requiring extensive configuration and development. The software functionality can also be "too close," because of irrelevant or inappropriate functionality that often cannot be modified.

Therefore, ease of adaptation is definitely of certain importance. McCormack *et al.* (2006) propose that open source and proprietary code show a difference in modularity, and open source is more modular than proprietary software. The reason is that this development often involves a huge amount of developers. It could be stated that if development does not have a high level of modularity, the open source project would result in software with a high level of problems. However, there are indications that the amount of developers, at least developers that influence the direction of the software not are higher in open source development than it is in proprietary ERP development, at least in commercial open source software. A benefit of having modularity is that further development does not have to take the full code into consideration. But, a major benefit often suggested with open source is the fact that the code is accessible. On the other hand, almost the whole source code is shipped also with Microsoft Dynamics. The license politics is different. But in case a person programs in X++ (or at least has prior experience with C#), it is possible to modify MS Dynamics AX code. There are some advantages of having a developer's license for doing so but even without one, an end-user is still able to modify the code.

Regarding the second reason, it is true that businesses acquiring proprietary ERPs are highly dependent on the product builders and distributors and if any of these agents disappears, upgrading and maintaining the ERP can become a significant problem. But till the vendor exists, it can make sure that the help, which its consultants provide, is professional. Vendors of proprietary software often offer certification programs. It is quite hard to provide anything like this for OSS ERPs since there can be several versions of any given system, as it can be seen also at: www.SourceForge.net, and it may be harder to find an expert of a certain subversion of an OSS ERP. Moreover, when it comes to OSS ERPs, it is usually assumed that companies implement the newest versions. The assumption is based on the fact that the new version is for free, so why should there be anyone, who would not install the newest version. But upgrading consumes some time and especially when a company is satisfied with the current version, there is no real need to install a new one and spend someone's time by doing so. On the other hand, vendors of proprietary ERP systems often support several last versions of their ERPs.

Regarding the third reason, it is not so obvious whether most proprietary ERPs for SMEs really need more expensive hardware to run. As a rule of thumb, hardware costs are only one-tenth of the implementation costs (ERP FAQ's, 2007). In some case,

existing hardware (e.g. previously used by a legacy system) can be utilized, so additional costs would be minimal regardless whether an OSS or a proprietary ERP is used. When it comes to new hardware, it is possible to buy only current versions of it, so even if an OSS ERP would run smoothly of a Pentium 120MHz processor and a proprietary would need a Pentium II 233MHz processor *ceteris paribus*, it may not be possible to buy anything slower than a Dual Core processor.

It is also true that licenses for proprietary ERPs are not for free and may account for one-sixth to one-third of the implementation project costs. On one hand, OSS ERPs avoid this cost. On the other hand, fees paid to a consultant for a specific OSS ERP may overweight the zero cost of the license. According to Danielsson (2007), nowadays in Sweden, a consultant for OSS can charge even 1,500 Swedish corona per hour, while a consultant specialized in Microsoft products only about half of the figure. So, in case a company cannot customize an OSS ERP itself and has to pay the same fee not only for consultations but also for customization, savings are not so obvious anymore. In addition to that, maintenance fees paid to a proprietary ERP vendor ensure that the vendor will implement, at least, all legal requirements on time. If not or if the ERP system does not comply with all of them, a company may sue a vendor. But there is nobody to sue in case that not implemented legal requirements in an OSS ERP will get a company into trouble.

6. Concluding remarks and future research

Open source ERPs seem to be of an increasing interest at the moment. It could be asked if this interest is a result of dissatisfaction with proprietary ERPs or if it is a result of maturity in the open source phenomenon. Another possible factor impacting SMEs' interest in open source ERPs could be that ERP adoption was very resource-demanding for SMEs before ERPs started to exist as open source and as Brown and Lockett (2004) say, SMEs normally do not have needed resources available. It could also be that open source ERPs meet up the challenges, which proprietary ERP vendors face. If these challenges are similar to issues that proponents of open source focus when developing open source ERPs, software vendors of proprietary ERPs could probably earn a lot of by looking closer into open source ERPs development.

Another assumption on impact on adoption of open source ERPs could be that it is the same reason that makes organizations adopt open source as it is that makes individuals engage in open source projects. It would definitely be of interest to conduct more research about social influences since it can be stated that decisions in organizations are made by individual decision makers.

The former is also related to what degree is actually a given ERP used in a given organization. As Raymond and St-Pierre (2005) suggest that when dealing with SMEs, one must not only look at the extent of implementation but also into assimilation (i.e. perceived level of proficiency in system used). So, a future research should take the level of proficiency in ERP usage into consideration as well, since there may be a connection between assimilation and deciding whether to implement a proprietary or an open source ERP.

In the more and more global environment that ERPs operate, it could also be of interest to investigate whether there are any differences in open source ERP systems adoption in developed and under developed/developing countries. One statement when it comes to proprietary ERP systems, according to IEMC (2002), is that most of the ERP software is developed in technically advanced countries, standards are often too high for

under developed or developing countries. In an effort to bring the global organization to a common platform, different countries would need different levels of upgrades.

Another interesting area for future investigation is post-implementation of open source ERP systems because according to Botta-Genoulaz *et al.* (2005), only a very few authors focus on the ERP maintenance activities. The reason for why this is of especially importance in open source ERPs is that it is not that clear who the adopting organizations should approach when they have problems or want to have further development of the ERP system.

The main conclusion from the discussion is that there seems to be several other factors than cost involved in the decision-making process when organizations decide on adoption of open source ERPs. By focusing less on cost an interesting framework for suitable questions for investigation of why SMEs decide to adopt or not to adopt open source ERPs could be achieved.

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