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**What effort does it take to deploy an open source ERP?  
Perceived ease of use and Perceived usefulness**

Master thesis, 15 credits, INFM02, in Informatics

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### **Abstract**

ERP systems are rapidly becoming a de facto standard in business activity. While large and medium-sized companies have the luxury to afford proprietary ERP solutions, small companies are struggling with resource poverty which forces them to consider other solutions. One solution available could be open source ERP products especially since these are without a license cost. However, there is little knowledge available on open source ERP adoption in small companies. That is why the first step is to spread light on open source ERP deployment in terms of knowledge and time. The purpose is accomplished by using the research framework based on Technology Acceptance Model 2 (TAM2), usability testing and user training and education factors. The factors of Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are used to determine the ease of deployment process, and the usefulness of the open source ERP deployed in relation to the made effort. The research method implied a pre-study and an experiment. The pre-study's purpose was to obtain an insight on open source ERP deployment process before any experiments are made. An initial experiment was setup with three IT-related students. The empirical study was then complemented with additional three students with non-IT background in order to build evidence for stronger conclusions. The findings suggest that user with advanced computer skills perceive open source ERP deployment process as easy, and the open source ERP being useful to the business activity.

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# 1. Introduction

Today's business environment is characterized by harsh competition. Therefore, established business actors and start-ups are steadily looking for opportunities and new means to employ in profit making. In other words, companies are interested to gain and retain new customers in order to secure market position and boost profits. Usually, the price for such strategy is investment in resources, research and development projects.

One of the existing resources, information technology (IT), has been paid special attention. Academics and business experts regard IT as a strategic tool (McFarlan, 1984; Benjamin, 1983), which has historically served business interests for more than five decades. Beginning with a small and highly specialized focus, IT applications have evolved to large and extensive functional software packages able to support core and strategic business processes in a company.

A distinct role in business management, planning, administration, and operation is given to Enterprise Resource Planning (ERP) systems because of their impact on firms and business processes (Markus and Tanis, 2000). In this context, Markus and Tanis (2000) explained that ERP systems brought desired integration of business processes, systems and information. The immediate advantages of that integration are common data elements, in-depth analysis of business information, and reduction of organizational and maintenance costs.

However, there are contrary opinions. Wieder et al. (2006) rushed to contradict popular believes; in other words, the researcher suggests that there is no significant performance difference between ERP adopters and non-adopters both on process and overall firm levels. In conclusion, the views on the benefits and advantages of ERP systems adoption are split.

Nevertheless, the market tendency is that ERP adoption is growing and will grow among organizations worldwide. Jacobson et al. (2007) note, in their report on ERP market sizing, that ERP investments in large corporations, small and medium-sized enterprises (SME) are continuously increasing. The ERP systems became in practice an industry standard (Parr and Shanks, 2000) and, as Boykin (2001) argued, an entry price for doing business in the market.

And so grows the ERP products market. Up to recent years, the ERP systems offer has been primarily characterized by proprietary software products. The largest ERP vendors presently are SAP, Oracle, Infor and Microsoft. At the same time, the industry witnessed the proliferation of open source ERP packages as well. The open source ERP packages, and specifically community-based versions, provide a free alternative to commercial ERP packages. Some notable examples are OpenBravo, Compiere, TinyERP, OFBiz, Adempiere, xTuple/PostBook and others, and the majority of them target the SMEs. One would wonder why they are free. Usually, the companies who stand behind these products earn money in a different way, other than traditional. Along

with the community version, which is completely free, there are commercial versions with better support, updates and upgrades. The open source ERPs and open source business paradigm shall be discussed in detail in later chapters.

In brief, open source ERP vendors bring a couple of reasons of why to choose open source ERP. Firstly, there are no upfront licensing fees. Anyone can download the software from vendor's website and try the product for free. Thus, assess whether it suits the company's needs or not. Nevertheless, Johansson and Sudzina (2008) explain that ERP license fees constitute only between one-third and one-sixth of costs associated with ERP adoption. Haddara (2011) summarizes and identifies nine additional main ERP adoption costs, such as maintenance, HR costs and so on.

Secondly, open source offers free control of software customization with support of contributing communities and organizations. There is also professional-quality support available from companies working with that specific ERP. And one of the last arguments is that open source reduces the specification risk, characteristic to custom built software, and loss of vendor risk (Opentaps.org, 2011). Not less important is the promise of "be up and running with a full system in 10 minutes" (xTuple.com, 2011) – this, in particular, makes it very interesting to challenge.

Some support for open source ERP is present among academics. Raphael Valyi, as cited in Fougatsaro (2009), completes the list of reasons of why companies should choose open source ERP:

- Quality –as a result of commitment of vendors and communities to development efforts.
- No hidden costs – as opposed to proprietary ERP systems, where changes scalability issues might be imminent.
- Freedom to upgrade or not.

Despite all the benefits, open source software has its own disadvantages, which have been discussed and presented by Fougatsaro (2009) and others in their articles.

The comparison of proprietary and open-source (community/free) ERP advantages and disadvantages, as well as a total cost of ownership analysis have been rolled out to a limited or no extent in previous research. In addition, the full picture of open source ERP's issues and benefits still has to be covered (De Carvalho, 2006). Therefore, it might be difficult to evaluate which type of ERP brings the most value. In conclusion, in current circumstances where ERP systems are becoming a need, companies are given various options which they might find useful to take in consideration.

## 1.1 Problem discussion

In recent years, ERP systems have become attractive to SMEs also, i.e. the SMEs' interest towards ERP system has increased. This happened for a number of reasons. Firstly, ERP vendors have shifted their development efforts focus from mainly large customers - today a saturated market, to small and medium sized companies – a promising market both in cash and in customers. Consequently, the range of ERP packages offer has considerably increased, adjusting to the needs and pockets of various companies (Bajaj, 2008).

Secondly, it is the highly dynamic business environment which requires ERP adoption in order to gain competitive advantage over rivals (Bajaj, 2008). In the same context, Jacobson *et al.* (2007) mention that ERP adoption among SMEs comes as a response to new customer requirements, as well as to the wish to participate in a highly global market. Finally, ERP systems offer unprecedented advantages over other traditional functional systems of managing business (Holsapple and Sena, 2003). Despite having a growing interest for ERP, the actual rate of ERP adoption in SMEs is low if compared to larger firms (McLaren, 2006; Buonanno et al., 2005).

The reasons for low ERP adoption in SMEs are multiple. Buonanno et al. (2005) suggest that structural and organizational reasons are important factors to ERP adoption. Despite the fact that ERP package is only a software product, it also affects the organizational and structural aspects of an enterprise. The ERP software packages come bundled with predetermined business logic. In other words, an ERP package is an infrastructure itself. Consequently, adoption of ERP systems brings not only various benefits to business activity, but also structural, organizational, cultural and strategy changes (Shehab et al., 2004).

However, before any further statements are made about ERP adoption in SMEs, it is important to differentiate within the group in terms of company size. The reasons regard the constraints and objectives of ERP systems in this group of organizations (Laukannen et al., 2007). Because of the significant differences that exist among those, the study shows that small and medium-sized companies should not be considered as a homogeneous category. To exemplify, Laukannen et al. (2007) explain that in terms of general constraints, small companies in comparison to medium-sized have a lower user IT competence and insufficient information, but are less sensitive to changes enforced by ERP implementation; in terms of ERP objectives, medium-sized companies feel eager to develop new strategic ways of doing business, and are more interested in expanding its business activity. Regarding resource availability, small companies in comparison to mid-size and large enterprises have limited/scarce resources (Laukannen et al., 2007).

Speaking of small companies specifically, Laukannen et al. (2007) point out that financial factor is one of the resources that constrain ERP system adoption. In the same context, Buonanno et al. (2005) mention that small companies do not consider the financial factor as the major barrier to ERP adoption. However the study results cover a larger group of SMEs, while Laukannen et al. (2007) differentiates between the two groups of companies. Somewhat apparent, the financial



factor can be crucial and decisive for small companies. So if small companies are financially poor, then the logical question arises: so why not chose the open source ERP, especially when it is free to acquire, and it is argued, at least by Boulanger (2005), that open source software systems are a feasible alternative to proprietary systems. However, Johansson and Sudzina (2008) state that financial cost is not the only factor affecting the intention to adopt an open source ERP.

The other factors found are knowledge and time. Laukannen et al. (2007) suggest that knowledge is another determinant barrier lying in the way of ERP adoption in small companies specifically, whether it is IT competency, enough information for decision-making in ERP selection or system usage. It is crucial to understand that knowledge requirements change along various stages of ERP life cycle and embrace a large set of skills, experiences, abilities and perspectives (Suraweera, 2007). In other words, type of knowledge required in implementation phase, for example, would be different from what knowledge is needed in the system use phase. Regarding time, d'Amboise and Muldowney (1988) found that small companies allot more attention to adjusting to, and not to controlling and predicting their environment. Thus small companies cannot allocate more time because of the availability of resources.

Taking into consideration the fact that there is an interest and there seems to be a lack of academic support on the subject of open source ERP adoption in small companies, it would both interesting and challenging to spread light and new knowledge in this field. The first step to create new knowledge would be to find out what it takes to deploy a free open source ERP, i.e. find, install and use it, in terms of knowledge and time.

## 1.2 Purpose

The aim of this study is to find the perceived ease of use of open source ERP in the context of its deployment from user's point of view, as well as to find out the perceived usefulness of the open source ERP when deployed.

## 1.3 Research Questions

In order to fulfill the purpose stated above there are two questions this thesis intends to find answers to.

From user perspective in the case of an open source ERP deployment:

- *What is the perceived ease of use in terms of time and knowledge?*
- *What is the perceived usefulness of open source ERP?*

## **1.4 Delimitation**

As this study intends to assess perceived ease of use and perceived usefulness of an open source ERP at deployment stage, the potential structural, organizational and other ERP adoption cost issues lay outside the focus area. In addition, the study will focus on micro or single-man companies.

Focusing on single-man company and open source ERP deployment stage, permits to avoid issues of cost increase, structural and organizational changes related to company size and long term use of ERP systems. However, small companies who are interested in adopting open source ERP should be aware that possible structural and organizational changes could occur; as well as be ready to incur additional ERP adoption costs.

## **1.5 Outline**

The following chapters will discuss the theoretical framework, methods, results, data analysis and conclusions of the study. The literature review part will describe the open source software and ERP concepts, present the existing theoretical framework on open source ERP and Technology Acceptance Model 2, usability testing methods and user training.

The method part will present the research strategy and design. The chapter will elaborate on the setup of ERP deployment-experiment and further tools used for data collection.

The last chapters will build on data presentation and analysis, followed by conclusions and further research recommendations in the area of open source ERP deployment.

## 2. Literature Review and Research Framework

The purpose of this chapter is to provide general information on ERP and Open Source software, as well as to set up the lens for thorough issue investigation. Models and theories are used in order to better interpret the reality and support the answering of the research questions.

### 2.1 Enterprise Resource Planning systems overview and definition

For the sake of clarity and in order to give a clear picture to ERP-interested audience, an ERP description and explanation is given below. The reason is that ERP description will make it easier to determine if the product is what it claims to be; in other words, it will help understand what an ERP system is. A supporting argument for above is the fact that most of respondents in this research study were not acknowledged with the ERP phenomenon. For any small company or business the following description would be useful.

So what is an Enterprise Resource Planning system? According to Shehab et al. (2004, p.359), ERP is merely “a business management system that comprises integrated sets of comprehensive software, which can be used, when successfully implemented, to manage and integrate all the business functions within an organization”. The same definition is supported by, and embraces the views of various researchers and scientists in the domain (Davenport, 1998; Kumar and Hillergersberg, 2000). An ordinary ERP package consists of tools and applications which execute and assist the following business functions: financial and cost accounting, sales and distribution, materials management, human resource, production planning and manufacturing, supply chain, and customer information (Boykin, 2001; Yen et al., 2002).

Moreover, ERP systems facilitate the real-time data flow or instant communication between all supply chain processes – internal and external – in an organization (Wier et al., 2007). In other words, different departments or parts and stakeholders of an organization share the information throughout their activity; and, according to Siriginidi (2000), that in turn affects an organization’s workflow by integrating the entire enterprise with tasks, responsibilities, locations, positions and so on.

Now let us get back to its history so to understand better how ERP systems evolved. According to Markus and Tannis (2000) the ERP phenomenon arose in 1970’s. It all started in the manufacturing industry. This industry has been using computers for better productivity, profitability and information flow across the company for more than 30 years (Shehab et al, 2004).

The roots of the ERP systems stem from simple inventory control packages, material requirements planning (MRP) and material resource planning (MRPII) systems. Inventory control systems were built for inventory management processes; MRPs were designed for manufacturing work and purchase orders handling. However, existing business information systems were redundant, costly and loosely coupled. McKenney and McFarlan describe the systems as “islands of automation” lacking a unifying visionary scope (as cited in Markus and Tanis, 2000).

In the beginning of the 1980s, MRPIIs were developed in an attempt to integrate primary functions, such as production, marketing and finance, and secondary functions – engineering, personnel and purchasing. MRPII’s were capable of handling all resources in an organization. The packages brought the required integration of information and processes. Throughout the 1980s and 1990s, integrated software packages have been developed in US, Germany and Netherlands (for example SAP).

The maturity of ERPs, term coined to highlight the latest versions of MRP II, took place in the middle of 1990s; these packages included enhancements of back-office functions, i.e. order management, warehousing, distribution production, quality control, human resource management etc. In recent years, the functionality of ERP systems has broadened to encompass front-office functions – sales force, marketing, e-commerce, supply chain management system. In order to fully benefit from ERP adoption and operation, Siriginidi (2000) argues that companies are advised to recognize the information needs, as well as to provide appropriate information infrastructure for all stakeholders – employees, customers and suppliers.

Initially, the solutions aimed small companies. Later, ERP packages were developed specifically for the needs of large companies. According to Caldwell and Steing, approximately 40% of the companies with revenues higher than 1 billion dollars implemented ERP systems (as cited in Willis and Willis-Brown, 2002). Nowadays, the ERP market is represented by multiple vendors. The biggest suppliers of ERP software packages are SAP, Oracle, Infor, Microsoft and others (for detailed list see Figure 2.1).

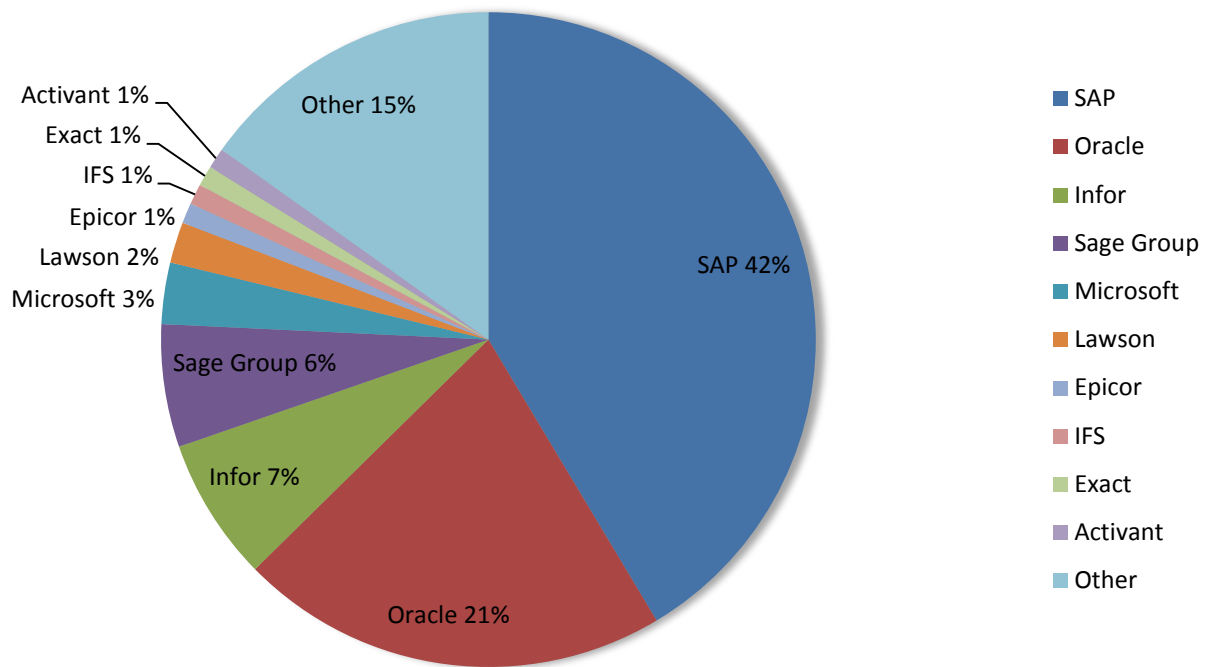


Figure 2.1. Top 10 ERP Vendors by 2006 total revenue share (AMR Research, 2007)

The versatility of ERP vendors and products has skyrocketed in recent years. The complexity of the ERP offers is also highlighted by the existence of TIER classification (see Table 2.1). At present, ERP market is aimed at companies of all sizes and for different pockets. TIER 1-2 satisfy the needs of large companies, or increasing companies. Tier 3-4 ERP packages are designed for the needs of small and medium-sized companies (SME).

Tier	Software	Concurrent Users	Employees	Cost per user (US dollars)
1	mySAP/R3	100 - 1000+	1,000+	80,000
2	Baan, MAPICS	50 – 500	200 – 2000	40,000
3	EFACS, Dynamics GP	30 – 200	50 - 1000	10,000
4	Sage line 50, SAP Business One	1 – 40	20 – 200	2,000

Table 2.1. ERP Tier Classification (BPIC, 2011)

From the table above, it is clear that ERP software supply is rich and meeting different demands. A special interest in the ERP market is given to SMEs. ERP vendors are continuously providing

new solutions, such as Application Service Providing, Outsourced ERP systems, preconfigured ERP applications etc. - to fit the organizational and structural realities of SMEs (Bajaj, 2008).

Generally speaking, the advantages of ERP adoption, such as low operating cost and improved customer service, have been highly promoted by ERP vendors, though with low scientific support. And however promising they sound, there are some major drawbacks with ERP systems. Shehab et al. (2004) managed to summarize the critiques given to ERP systems adoption through literature review. The latter came up with the following major drawbacks: large data storage and networking needs; cumbersome business process re-engineering and customization tasks; high expenses on ERP implementation and associated services which account for at least triple amount of money spent on ERP license, not of least importance is the misalignment/misfit problem. In conclusion, ERP systems place high burden on company resources. Adam and O'doherty (2000) denote that ERP projects are big, expensive, and difficult, requiring substantial investment of capital, staff and time.

The reality of many small companies, which are the focus of this research project, is different. As mentioned above, small companies postpone ERP adoption for two main reasons: lack of financial resources and lack of time and knowledge (Laukannen et al., 2007; Johansson and Sudzina, 2008). Having ERP as a becoming de facto industry standard (Parr and Shanks, 2000), the following problem and question arise: what is the solution? And one possible answer lies not far away. In the following section, the topic of Open Source and Open Source ERP will be covered.

## **2.2 Open Source and Open Source ERP**

The Open Source phenomenon has been present since the 1960's, and its current growing popularity has been influenced by a series of historical events and factors: the institution of Free Software Foundation by Richard Stallman in 1985, the development of Linux operation system, the spread of Internet, and, not the least, the open source community.

So what is Open Source software? According to Open Source Initiative (2011), an organization in charge of promoting open source software, open source means access to software's source code along with 10 additional conditions:

1. Free redistribution
2. Source code
3. Derived works
4. Integrity of the author's source code
5. No discrimination against persons or groups
6. No discrimination against fields of endeavor
7. Distribution of license

8. License must not be specific to a product
9. License must not restrict other software
10. License must be technology-neutral

In summary, the criteria listed above guarantee free distribution of software along with the source code. Modifications to and derived works based on initial code are allowed. In other words, anyone is allowed to access the code, modify and use it for different purposes. The licenses under which the open source software is published must not be specific to a product, nor restrict other software.

This type of movement/initiative has given birth to many projects, and, with the help of Internet development, has involved millions of volunteers. So far open source software products/projects have been very successful. Some of the prominent examples are Apache web server, Mozilla Firefox web browser, database server MySQL, Linux, OpenOffice, Ubuntu and other. The same tendency is followed on the ERP market, where open source ERP software packages have gained substantial popularity.

This fact is confirmed by the large number of downloads (Sourceforge, 2011). However, Johansson and Sudzina (2008) state that the reasons for downloading these packages could be different, and not necessarily imply proper use in business activity. Yet, the number of open source ERP packages is increasing. Some of well-known names in this segment are OpenBravo, Adempiere, TinyERP, Opentaps, Postbooks/xTuple and others. For an extensive list it is enough to search Google.com for ‘open source ERP’ keywords.

Open source software products are developed in various countries around the world: Spain, United Kingdom, Portugal, United States, Austria, Germany, Belgium, India and many more. This fact along proves the success of open source model and its business paradigm worldwide. A better explanation of open source paradigm has been given by Perens (2005) in his article “Open Source”. He explains that “multiple entities (individuals, companies, academic institutions, others) come together to develop a software product”. Therefore, the open source development is seen as a result of a community effort.

However, the initial effort starts with an individual or a single entity, and the source code of the product is released before it is finished. The release usually happens when the software becomes useful to others. With time, the software product gets additional features as a consequence of mass participation. In other words, open source software development and growth depends on the interest of parties involved (Perens, 2005). And as the development occurs, the costs and the risks are shared among the participants.

However, a question still remains: how to earn money with the open source model? Perens (2005) explains that open source software is not the profit-center. Companies involved in this paradigm usually earn money in a different manner, where open source software is the “enabling

technology”. The profit is coming through different means: professional support, customization, differentiation etc. Blankenhorn (2009) identified at least 11 distinct business models:

1. Support Ware—providing technical and customer support for a fee.
2. Product Ware—“the software is free; you just buy the box it runs in. Android phone uses this” (Blankenhorn, 2009).
3. Cloud Ware—providing the software in the cloud; paying for the service (SugarCRM).
4. Project Ware—open source-based projects; fees for work and project (IBM model).
5. SaaS Ware—renting out the software on time basis.
6. Ad Ware—same as SaaS model, except that it is free. Money comes from ads. (Google).
7. Sugar Daddy Ware—“Our software has a sugar daddy. Firefox has Google. Eclipse has IBM. So just use it” (Blankenhorn, 2009).
8. Foundation Ware—open source project with a foundation supported by many companies and parties interested.
9. Beg Ware—projects supported through donations.
10. Tchotchke Ware – selling accessories and things not related to the use of software product (such as t-shirts, cups etc.).
11. Let’s make a deal Ware – the initial costs are supported out of own pockets until any good business opportunity comes (Soundforge, Drupal etc.).

Having understood the open source business model, it would be rather interesting to follow what the most popular open source ERP vendors promise and offer besides the free version. According to Sourceforge.net, the largest open source software promoting website, there are 735 open source ERP projects. The most relevant results are presented in the Figure 2.2. In order to obtain a better view on these packages, a good idea is to visit their websites. The choice fell on the first three: OpenBravo, vtiger CRM and PostBooks by XTuple. OpenBravo ERP is offered as a community version.

OpenBravo is also available as Amazon cloud service. The company with the same name promises “superior user experience by combining web-based simplicity with powerful and practical features that drive productivity and user satisfaction” (Openbravo.com, 2011). The software is supported on multiple computer platforms and operating systems. Along with free product, the company offers OpenBravo professional version, commercial modules, consulting & training services. The quality of the product is backed up by various case study examples available on the website, in the Customer stories section. The company claims to have more than 1,000 customers and more than 12,000 community members.

The vtiger customer relationship management (CRM) system website is less impressive. However, the company offers almost the same services as OpenBravo. The free version is offered along with a professional version and featured services. There is missing information about existing customers; nevertheless, the number of registered community users is slightly over 3,800. The product is available for Linux and Windows supporting platforms.



Sort by: Relevance ▾

<p><b>Openbravo ERP</b> Updated 2011-04-23</p> <p>Openbravo ERP is the web-based ERP for SMEs. Available as a professional open source ERP solution, Openbravo ERP provides unique high-impact benefits: 1) Comprehensive 2) Innovative 3) Cost effective.   IMPORTANT NOTICE. Openbravo ERP project communi</p>	<p><b>Download</b> OpenbravoERP-3.0RC6.1</p> <p>♥ 201 recommendations ↓ 4,571 this week</p>
<p><b>vtiger CRM</b> Updated 2010-11-16</p> <p>vtiger CRM is a complete CRM solution that includes Sales, Service &amp; Marketing modules, and ERP modules for Inventory &amp; Projects. Download it here or sign up for free 30 day trial of its cloud-based version, hosted by vtiger, at <a href="http://ondemand.vtiger.com">ondemand.vtiger.com</a></p>	<p><b>Download</b> vtigercrm-5.2.1.exe</p> <p>♥ 324 recommendations ↓ 9,533 this week</p>
<p><b>PostBooks ERP, accounting, CRM by xTuple</b> Updated 2011-05-19</p> <p>Free open source ERP, accounting, CRM package for small to mid-sized businesses. Runs on Linux, Mac, and Windows (built with open source Qt framework). Business logic resides in PostgreSQL database. Rich API for connecting to third-party apps.</p>	<p><b>Download</b> xTuple-3.7.0-windows-inst</p> <p>♥ 125 recommendations ↓ 2,448 this week</p>
<p><b>ADempiere ERP Business Suite</b> Updated 2011-05-05</p> <p>ADempiere Business Suite ERP/CRM/MFG/SCM/POS done the Bazaar way in an open and unabated fashion. Focus is on the Community that includes Subject Matter Specialists, Implementors and End-Users. We forked and survived Compiere which is now closed.</p>	<p><b>Download</b> ADempiereSUPER1s</p> <p>♥ 226 recommendations ↓ 2,436 this week</p>
<p><b>Dolibarr ERP &amp; CRM</b> Updated 2011-04-13</p> <p>Dolibarr ERP &amp; CRM is an easy to use ERP and CRM software (run as web php or standalone) for small to mid-sized businesses, foundations or freelancers (inventory, warehouse, order, invoice, shipment, POS, members for foundations, bank accounts...)</p>	<p><b>Download</b> dolibrarr-3.0.0.tgz</p> <p>♥ 74 recommendations ↓ 1,510 this week</p>

Figure 2.2 Open source ERP projects (Sourceforge.net, 2011)

And lastly, xTuple Company offers the PostBooks open source ERP. As it is mentioned on the site, PostBooks is “a full-featured, fully-integrated Accounting, ERP, and CRM system, the core of the award winning xTuple ERP Suite” (xtuple.com, 2011). xTuple offers more than 12 products and featured services. The number of customers is somewhat small, up to 10 customers. The community size number was hard to find.

In the real lives of small companies, where the resources and knowledge are limited, open source ERPs seem to be a viable solution. First of all, the product is free, so the license cost problem is solved. Secondly, the problem of knowledge still remains, because it is still not known how much knowledge is required to adopt and use an open source ERP. And generally, it would be interesting to find out how much effort is required to deploy and start using one of these products. In order to address this issue, a theoretical model built on TAM2 model was used.

## 2.3 Knowledge and ERP adoption

As pointed out in the introductory chapter, an ERP adoption process poses different needs and challenges for knowledge requirements. Pan et al. (2006) argue that knowledge needs regard organizational activities, such as planning, as well as ERP specific knowledge in order to be able to customize and configure the ERP system. However, this study will only focus on user's computer skills.

Kramaergaard and Rose (2002) in their paper on ERP implementation have concluded that a wide range of competences are required for complex interactions with ERP systems. This range includes personal, business and technical skills. The same authors observed that the necessary competence mix varies during the whole time of interaction with an ERP system.

The same complexity and difficulty of interacting with ERP systems is highlighted by Boudreau (2003), who mentions that such systems require training, knowledge and time.

## 2.4 Research Framework

Having reviewed the literature and theoretical models available (User Experience, TAM, Contingency theory etc.) the choice fell on Technology Acceptance model 2 and Usability testing. At first sight, usability testing and user experience evaluation models seem to be more appropriate to this topic. Usability testing permits to measure such criteria as learnability, effectiveness, memorability etc. of the software. For example, the amount of knowledge and time could be measured, or the steps of deployment could be counted and measured. User experience evaluation allows investigating the experience one has when using a system over a period of time. In addition, according to Väänänen-Vainio-Mattila et al. (2008), user experience evaluation models are limited to traditional usability perspective, and there is a lack of sharing on what user experience really means.

However, the purpose of this study is to explore rather than to measure the open source ERP characteristics. Secondly, usability testing and user experience evaluation are dependent on software product's characteristics, such as interface, menus etc. This thesis, however, is not concerned with a specific open source ERP product, but rather with the whole process from the very moment of finding, to the very last moment of using the open source ERP installed. That is why TAM2 was used as the main theoretical model to structure the research problem according to two perspectives: Perceived Ease of Use and Perceived Usefulness.

The theoretical model will help assess the experimenters' intention to use open source ERP, a factor which according to previous research affects the actual usage of ERP, which answers the question whether a software product is usable or not.

When assessing the Perceived Ease of Use, five usability factors proposed by Nielsen (2011) were taken into consideration – learnability, efficiency, memorability, errors and satisfaction. While Perceived Ease of Use can help assess the whole experience with the software, the usability factors can help explain how easy it is to use a software product and its interface specifically (Nielsen, 2011) – more information on usability is given on p.24. Regarding Perceived Usefulness of open source ERP, the external factors developed in TAM2 were assessed.

#### *2.4.1 Technology Acceptance Model 2*

TAM2 comes as an extension to the initial Technology Acceptance Model (TAM) developed by Davis (1989). Both of the models or both versions address the subject of system usage. The model helps to understand and evaluate the reasons and factors which affect the use and adoption of new systems or existing systems. Also, the TAM model is viewed as a tool to measure users' willingness and intention to adopt a system. However, in this research, TAM2 will also serve as a structuring tool to assess the perceived ease and perceived usefulness of an open source ERP.

The initial model was limited to two factors, which in opinion of its author, affect the intention and use of a system: perceived ease of use (PEOU) and perceived usefulness (PU). Despite its popularity and use, Venkatesh and Davis (2000) suggested an extension of the initial model. The extended features take into consideration the external factors which affect perceived usefulness (for detailed picture see Figure 2.3). Venkatesh and Davis (2000) explain that external factors have social and cognitive character. For a better understanding these shall be explained further.

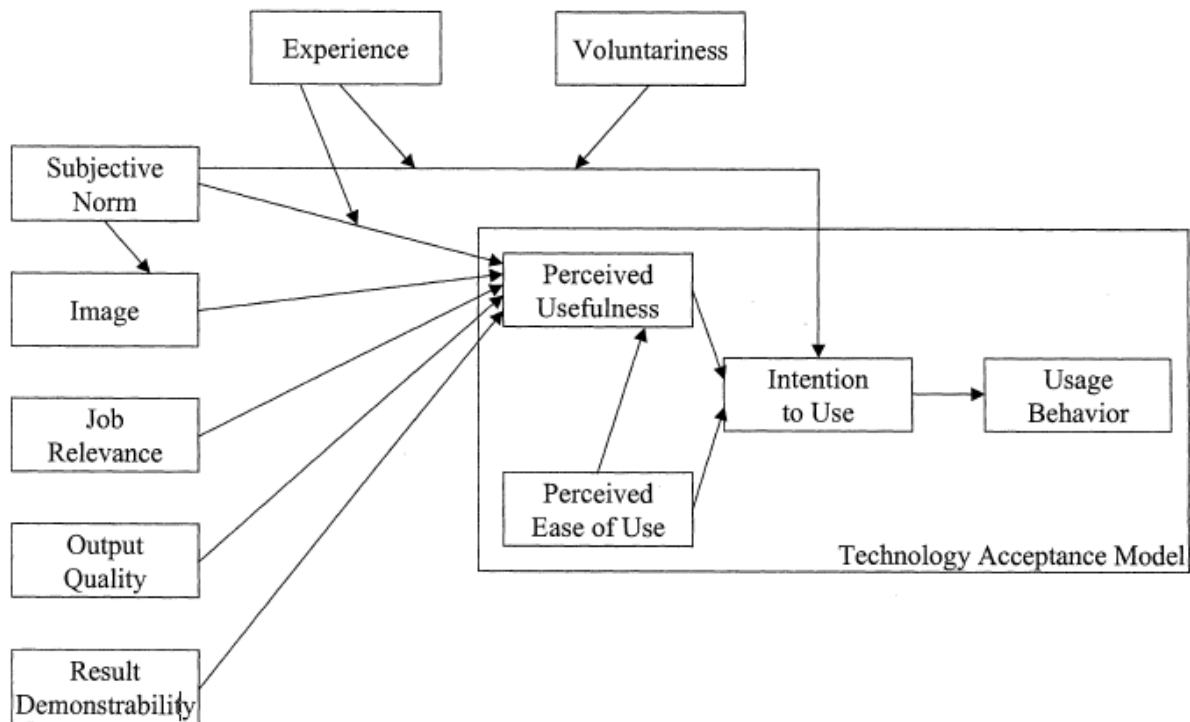


Figure 2.3 TAM2 model (Venkatesh and Davis, 2000)

*Perceived usefulness* is the extent the user thinks the systems helps her or him to perform the tasks, i.e. job activities. *Perceived ease of use* measures the effort required to use a system, i.e. how easy it is to perform the job tasks. PEOU affects the PU and the *Intention to Use*. One user's intention to use affects in turn the actual usage of the systems, i.e. determines the *Usage Behavior*.

Now there are following the external factors. *Subjective norm* is one's perception that closest people consider she should or should not perform certain type of behavior (Venkatesh and Davis, 2000). The key idea behind is that persons are susceptible to other people's ideas and views. That is why some persons perform actions motivated by other people.

*Voluntariness* is defined as the degree to which potential adopters perceive the adoption decision to be voluntary (Venkatesh and Davis, 2000). In other words, voluntariness determines if system use is perceived as obligatory and unwilling or opposite to these.

*Image* has a positive effect on perceived usefulness, if the use of the system is to enhance user's social status or image; otherwise it has a negative effect on perceived usefulness. *Experience* might also have a positive or negative effect on PU. It is considered that a system is most like to be perceived useful if the user is experienced.

*Job relevance*, as defined by Venkatesh and Davis (2000, p.191), is "an individual's perception regarding the degree to which the target system is applicable to his or her job". In other words, job relevance measures whether a system use is important to daily job tasks.

*Output Quality* measures the quality level of the tasks performed by the system. In other words, if the task performed by the system is perfect, then the perceived usefulness of the system is appreciated higher.

And ultimately, *Result Demonstrability* measures the tangibility of the results given by a system. Venkatesh and Davison (2000, p.192) explain that “even effective systems can fail to garner user acceptance if people have difficulty attributing gains in their job performance, specifically to their use of the system”. That is why it is important for users to see direct results of their system use, in order for the system to be perceived as useful.

This thesis’ scope is limited to the deployment of a system, i.e. the installation and first use of an open source ERP package. That is why the use of the TAM2 model would be partial. And namely, the interest lies on perceived ease of use and perceived usefulness of the open source ERP in its installation and first use. In order to assess the usage behavior factor more time is needed, so that relevant behavior patterns have already developed. By finding out what the level of PEOU is, and later discovering the PU, we would also be able to assess the attitude of small companies towards using and adopting an open source ERP in their environment. That is we would be able to predict whether deployment of an open source ERP system would affect positively or negatively company’s intention to use an open source ERP. To support this prediction further research is needed. The TAM2 model shall be completed with relevant theoretical support on necessary knowledge and user training for information systems. These will also help analyze and serve as reference in later discussion.

#### *2.4.2 End-user training and education*

While searching for critical success factors for ERP implementation, much of the attention stumbled upon end-user training and education. This key ingredient is also relevant to this thesis, as it determines the ease of interaction with ERPs. Bueno and Salmeron (2008) collected common beliefs about the role of training and education of ERP users. They emphasized the need of training before, during and after implementation. The reason is that training affects the knowledge ERP systems users have towards these tools, as well as help to fight technical and other nature complexities. Amoako-Gyampah and Salam (2004) share the belief that training and education ultimately affect the perceived ease of use and perceived usefulness – factors mentioned in the Technology Acceptance Model.

#### *2.4.3 Usability testing*

Another factor which can explain the ease of ERP implementation and use is usability. According to Nielsen (2011), usability is “a quality attribute that assesses how easy user interface are to use”. Nielsen explains that usability consists of five components:

1. Learnability – “how easy is it for user to accomplish basic tasks the first time they encounter the design?”
2. Efficiency – “once users have learned the design, how quickly can they perform tasks?”
3. Memorability – “when user return to the design after a period of not using it, how easily can the reestablish proficiency?”
4. Errors – “how many errors do users make, how severe are these errors, and how easily can they recover from the errors?”
5. Satisfaction - “how pleasant is it to use the design?” (Nielsen, 2011)

The resulting research framework includes TAM2 components with integrated usability and education and training factors (Figure 2.4).

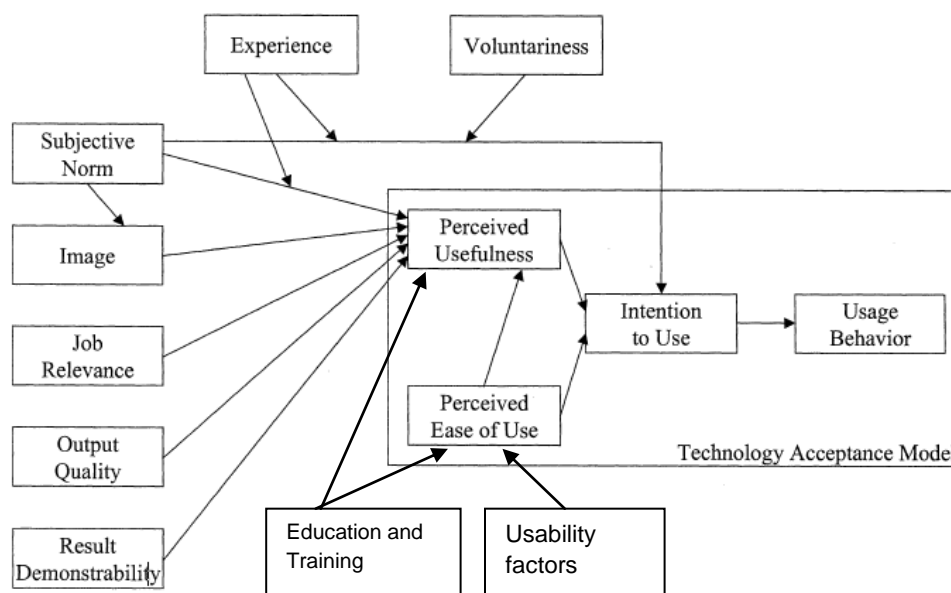


Figure 2.4 Research Framework

TAM model and usability factors compatibility has been already tested by Calisir and Calisir (2004). However, in this thesis the framework composed provides lens to direct, structure and analyze the results.

Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the guiding pillars of this study. PEOU will help assess the ease with which users can deploy an open source ERP. PU is result-oriented and assesses the utility of open source ERP after its deployment. Both PEOU and PU are affected by education and user training. PU is, in turn affected by external factors developed by Venkatesh and Davis (2000). PEOU is influenced by the usability factors identified by Nielsen (2011). The effect of usability factors on PEOU will be studied as a whole, rather than concentrating on each factor specifically.

It is worth repeating that this research framework model is built for structuring and guiding this thesis, rather than testing itself or measuring knowledge and time variables. Moreover, the research framework was successfully implemented as valid data was collected (see Chapter 4).

## 3. Methods

This chapter will present the research strategy, data collection techniques as well as compiling and analysis applied to the findings. The chapter will end with discussion on research credibility.

### 3.1 Research strategy and procedure

In order to build the foundation for problem investigation, a literature research has been rolled out which was used to build the theoretical framework presented in the chapter above.

The initial intention was to spread light on open source ERPs in small companies, which continues to be a topic with little discussion in the academic world. From that point, two main research questions were derived in order to explore the practical knowledge needs for an open source ERP deployment process. In order to investigate the process in depth, a deployment experiment has been set up. The experiment was led by a business case (see Appendix 2), which consisted of guiding tasks. The business case was compiled based on personal experience with open source ERP obtained in the deployment pre-study.

In other words, the first step in compiling the business case was to personally deploy an open source ERP. During deployment, various sources of documentation were used for instructions. Also, the pre-study helped to structure and organize the data collected, thus supporting clear structure and transparency through the results and analysis. The process of deploying an open source ERP is described in the chapter below.

Before the experiment, its participants were handed in a structured questionnaire with closed/restricted form. The purpose of the questionnaire was to establish an accurate profile of experiment participants, in term of computer experience and knowledge regarding computer usage. During and after the experiment, the participants were interviewed in order to get a better insight on the deployment process.

During the experiment, the participants were given questions when different milestones had been achieved. The questions usually related to the easiness of the process. The interview which followed after the experiment finished, were related directly to the theoretical reference used in the research, and assessed PEOU and PU.

The interviews resulted in data which were later analyzed through the theoretical framework lens. Not of less importance is the fact that theoretical framework has been used as foundation for the interview questions, also did it bring structure to the material analyzed later. That is why TAM2



model was used to base the interview upon. The findings and analysis are presented in a descriptive manner, in order to give a detailed picture of the process.

## 3.2 Data Collection

There were two main methods for data collection which involved six students from different universities in Sweden. The first method used in data collecting is a structured questionnaire (see Appendix 1). The questionnaire gathered data on participants' general information profile, as well as data on computer experience and knowledge. One of the purposes of questionnaire was to establish whether experiment participants had any previous experience which resembled the experience required in accomplishing the task, i.e. installing and using software. Key (1997) suggests that a good questionnaire should be as short as possible whilst getting essential data; also the questions should be clear and objective, i.e. non-misleading etc. These factors were considered when compiling the questionnaire.

The other data collection was interview with the participants of the experiment. According to Kvale and Brinkmann (2009) semi-structured interviews are most appropriate for face-to-face meetings. The freedom offered by semi-structured interviews was crucial to findings, as the interviewees were able to express the issues and their thoughts regarding the easiness of deploying an open source ERP. The other reason, of why semi-structured interview was preferred, is the possibility to come with follow up questions, and thus make it more as a discussion, so that a greater level of details would come up, although keeping it centered on the main topic.

Large amount of effort has been put before the interview, in order to be able to thoroughly understand the problem area and correctly grasp interviewees' statements. That has also affected the ability to put follow up questions in the moments where it was felt that additional explanation was needed from interviewees. The questions in the interview have been carefully structured in a guiding manner.

The interviews have been audio recorded, and after completion immediately transcribed. When choosing the recording method – video or audio – preference was given to audio, in order to set up a comfortable environment for participants. Nevertheless, audio recording was most handy for both sides.

### 3.2.1 Deployment Experiment

The deployment experiment partially served as a data collection method through observation. The experiment involved six bachelor and master students (see Table 4.1) who were asked to find and download only one of open source ERP packages available on the World Wide Web; and then proceed with the installing of the package on personal computer. In the next phase, the

participants were asked to print out an invoice. In order to simulate a real business situation, the subjects were handed a business case with enough data to print the first customer invoice (see Appendix 2). And for the case to resemble a real business situation, all data contained were enough to make a valid invoice according to Swedish regulations, i.e. VAT, Address details, Organizational number etc. During the experiment, the participants were continuously asked to assess the knowledge and time required to complete a certain task.

Printing of invoice was not set as the ultimate goal, but rather as a guiding objective which would require some effort and user interaction with the software. Of great interest was the whole process, from its start to its end – printing the invoice. It is important to mention and understand, that this experiment shares features with observational studies and usability tests.

Firstly, the intention of the experiment is to answer the research questions posed by observing its participants in the settings close to reality, i.e. in front of the computer in an office. Lastly, the experiment shares the features of a usability test, where the system is tested for ease of use. However, the focus of this study is not the interface nor the productivity, but rather the whole experience of the participants from the very moment of deciding to look for an open source system to the very last moment of printing the first invoice. Creswell (2007) admits and supports the use of mixed research tools and strategies in order to satisfy the needs and purpose of the research.

### *3.2.2 Sampling*

The sampling technique was influenced by the organizational characteristics of small companies, and namely single-man companies. This tells that there are no strict requirements on choosing participants, and there are no strict requirements for IT skills. However, in order to avoid bias or misinterpretation accurate profiling of participants computer skills have been made. Therefore, six subjects were taken from Lund School of Economics and Management and Stockholm University.

### *3.2.3 Design of Interview*

The questions in the interview were constructed around two important aspects:

1. Perceived Ease of Use
2. Perceived Usefulness

The profiling questions, as previously mentioned, had the purpose of establishing the background of the participant and his or her level of computer skills (see Appendix 1).

The questions related to Perceived Ease of Use had the purpose to assess the level of ease perceived by experiment participants in the open source ERP deployment process. As TAM2 is a quantifiable model, the participants were asked to answer PEOU questions on a scale from 1 to 5,

were 1 was ranked as very easy and 5 – very difficult. Also, clarifying questions followed in order to get better explanation of why participants gave specific grades. The questions related to Perceived Usefulness were designed to assess the positive or negative influence of TAM2 external factors on PU (see Appendix 2).

### 3.3 Compiling and Analysis

Having collected empirical evidence, the next step in the research process was analyzing the data. Creswell (2007) suggests that analysis should start when enough primary information is collected. However, enough is a relative measure. It was decided to stop with three participants when same behavior tendency was observed, in other words, same results were coming out. However, the empirical evidence was completed with three more experiments with the focus on participants with non-IT related educational background.

Kvale and Brinkmann (2009) suggest that coding of the data should be rolled out. Narrative structuring meaning coding has been applied; collected data was structured according to deployment process stages: choosing and downloading an open source ERP, installing and configuring, business case solution, PEOU, and PU. This was done for two reasons: the relatively short size of transcripts, and the ease to follow the statements respondents made; the other reasons is the wish to present the data in a narrative manner, where actions and events are presented in chronological order, so that to get a better grasp of the issue. The same structure is kept when data is presented and analyzed in the later chapters of the thesis.

The participant responses were coded in order to have a better traceability. Each response was given a number and the initial of the participant's name. The actions of experiment participants between their oral responses are presented in italics style. This was done in order to give a clear picture of what happened during the deployment experiment. An example of transcript coding follows below.

Example: **1C:** *Reading about one of the ERP sites he found...* Cloud ERP, that's an advantage for future.

This example shows that before giving his first response, (C)hristopher was reading about one of the ERP sites he found.

### 3.4 Research credibility

The reliability, validity, bias and ethics of the thesis are discussed.

### *3.4.1 Reliability and Validity*

Importance of reliability has been stressed by many scientists (Creswell, 2007). In order to adhere to this criterion, the research process has followed scientific methods, when it comes to sampling or interviewing. As well, the thesis was attempted to be written in great detail in order to provide transparency and traceability from the moment of discussing the problem area to formulating the research conclusions. Thus, if same research is embarked on, the probability of getting same results if same conditions are met is very high. Thus, it is very reliable.

Validity refers to measuring correctly what was intended to be measured. Trochim (2006) suggests that in order to assure validity, one must ask himself or herself whether the measures used in the research brought to valid results. The research questions of this thesis have been formulated through the lens of theoretical framework (TAM2).

### *3.4.2 Bias*

According to Bennett (2011), bias could particularly touch many aspects of a research paper and namely: the research design, the research measurement, and not least the research sampling. In order to address these issues, this research process has been kept objective till the last moment. However, it is very difficult for researchers to find bias in their studies. One of the solutions was peer reviewing and supervisor assistance and guidance. Another possible bias problem could be the sample used in this research. However, careful profiling has been done, and thus conclusions made in this study will be linked to the pre-existing computer knowledge and skills the interviewees had.

### *3.4.3 Ethics*

Kvale (1996) suggests that the core issues in research ethics are beneficial consequences, consent and confidentiality. The experiment participants were informed about the purpose of the study beforehand, thus they wanted to participate in the study. Also, the interviewees were left to read the thesis and comment. However, no negative remarks have been given from their side. The experiment participants were notified about their right to be anonymous in this study, however everyone gave the permission to present their names.

## 4. Empirical Findings

In this chapter a summary of the empirical results will be presented. The structure of the presentation is arranged into the following parts: Deployment Pre-study, Profiling, Perceived Ease of Use, and Perceived Usefulness. Perceived Ease of Use will cover subtopics: Finding and choosing, Installing and Configuring, Getting the first invoice tasks. The primary data is covering the knowledge and time aspects.

### 4.1 Deployment Pre-study

The purpose of the deployment pre-study was to obtain an insight on open source ERP deployment process before any experiments were made. The results of the pre-study were used for setting up the experiment and interviews.

#### *4.1.1 Finding, choosing and downloading the open source ERP*

The process started with finding information about available open source ERPs on the World Wide Web. Having taken the suggestion of Johansson and Sudzina (2008), the first source to look for open source software was [www.sourceforge.org](http://www.sourceforge.org), which is the largest project promoting open source software. Using this portal's search function, the keywords "open source ERP" were queried. Over 13,000 hits came up, however not all of the results were relevant to the search.

According to [sourceforge.org](http://sourceforge.org), the two most popular and downloaded open source CRM & ERP solutions were OpenBravo and PostBooks. So the next logical step was to check out the website of respective projects, and the information provided.

Both of the websites made a professional impression. OpenBravo impressed by the number of customers, and both of the open source ERPs have a large community of users. With no previous experience related to ERP and its activity, the deciding criteria for choosing one was the technical criteria and requirements. It was relatively easy to find the download page and proceed to downloading. Both software products offered solution for cloud, Linux and Windows platforms, however PostBooks/xTuple offered also for Apple/MAC OS users.

#### *4.1.2 Installing and configuring the open source ERP*

Having consulted the available documentation, first difficulties appeared. OpenBravo promised a very simple, one-click installation for Linux users, but more complicated installation paths for other platforms, i.e. advanced computer skills are needed. xTuple software promised easy installation on all platforms. Having available only Linux and Windows operating systems, it was

decided to try out OpenBravo on Linux and xTuple on Windows XP. Indeed, the installation process was very easy for OpenBravo, but with no transparency whatsoever. Only, advanced computer users could be able to follow the installation procedure. After installing, OpenBravo on Linux/Ubuntu the software ran in web browser successfully.

Regarding, xTuple the installation procedure was as easy, plus the level of procedure transparency and clearness was quite high. The user is guided by explanatory instruction with options of choosing elements to be installed. By default, all elements are being installed. The software also ran with no errors on Windows XP. The approximate time for both installations was ten to fifteen minutes, with high speed internet available. At this point, it is important to mention that from the technical standpoint, the requirements are not high. The computer properties available were 1GB RAM, 10GB free space on hard drive, and Windows XP. The basic needs for installation are mentioned on the vendors' websites.

It was decided to proceed with xTuple. The argument behind is the availability and spread of Windows operation systems, since theoretically the majority of small companies would have a computer running Windows. The next step was to get acknowledged with xTuple open source ERP.

#### *4.1.3 Getting the first invoice with open source ERP*

The logging in procedure is very easy. However, potential users have to pay attention to details while installing, because important information is given, such as credentials, which would be of use later.

After logging in, as an experienced user of computer and software products, the first thing was to get accustomed with menus available in the software. xTuple offers a very pleasant user interface, with large buttons and well organized modules, such as sales, inventory and other. For screenshots please visit [www.xtuple.com](http://www.xtuple.com).

After getting to know the software, the decision was to consult available documentation and tutorials on how to work with the ERP. There are many videos available; some of the videos are introductory, and some of them give detailed instructions on the internals and functions of the system. From the video tutorials ([www.xtuple.com](http://www.xtuple.com), 2011), it was found out that following steps were required in order to get a valid invoice:

1. Register a new user for the company
  - a. Create separate account
  - b. Enter details such as address, company info, logo etc.
2. Register the new customer with according details
3. Create a new product/item
4. Configure the taxation settings

5. Create a new sales order containing the product created
6. Ship and print out the invoice.

These steps were enough to print an invoice valid for Swedish standards, i.e. having required information. Generally speaking, the process was quite easy if the instructions are followed, but instead it is time-consuming. In other words, for better job performance time is needed to master the ERP.

## 4.2 Profiling

The interviewees who took part in the deployment experiment are bachelor and master students within Information Systems (3), Business (1) and Education (2) fields. The general information about the interviewees is summarized in the table below (Table 4.1).

<i>Group</i>	<i>Respondent</i>	<i>Age</i>	<i>Gender</i>	<i>Occupation</i>	<i>Level</i>	<i>Type</i>	<i>Experience</i>
First	1	23	Female	Student	Master	IT	5 <
First	2	24	Female	Student	Master	IT	5 <
First	3	26	Male	Student	Master	IT	5 <
Second	4	25	Male	Student	Master	Business	5 <
Second	5	20	Female	Student	Bachelor	Education	5 <
Second	6	20	Female	Student	Bachelor	Education	5 <

Table 4.1 General information on interviewees

The interviewees' computer experience has been assessed as between intermediate and advanced levels, with computer experience being over five years on average. Having been asked on the purposes they use their computer, the respondents commonly replied that internet and studies are the main reasons. Only two of the respondents used computer for work and multimedia also.

All of the interviewee respondents confessed that they have tried to install software on their computer and succeeded at least once. Regarding software usage, all respondents have been using one or more software products for a long time, five years or more; and all of them have advanced skill level with the product they have been using over that period of time.

All respondents have been provided with a business case (see attached Appendix 2), used as a guide in deployment experiment. In brief, the experiment participants were asked to choose, install, configure and accomplish the task of printing the first invoice. During all stages, the respondents were continuously asked to evaluate the process from knowledge and time perspectives.

### **4.3 Deployment Experiment**

In this part of the chapter the stages of the deployment experiment will be described along with the empirical findings.

#### *4.3.1 Finding, choosing and downloading the open source ERP*

Having been asked to find and choose an open source ERP, all of the respondents tried to search for one on the World Wide Web. The most common search keywords used were “open source ERP”, “free ERP” and “open source ERP download”. Asked to explain the logic behind the search actions, respondents clarified that they were willing to evaluate the search results given by Google web search engine according to their relevance. Google has been referred as the main source for new information. In other words, the respondents chose the first results on the Google’s webpage, after having queried for open source ERP. The usual results webpage included OpenBravo, xTuple, Compiere, Opentaps and other results (for details see Figure 4.1).



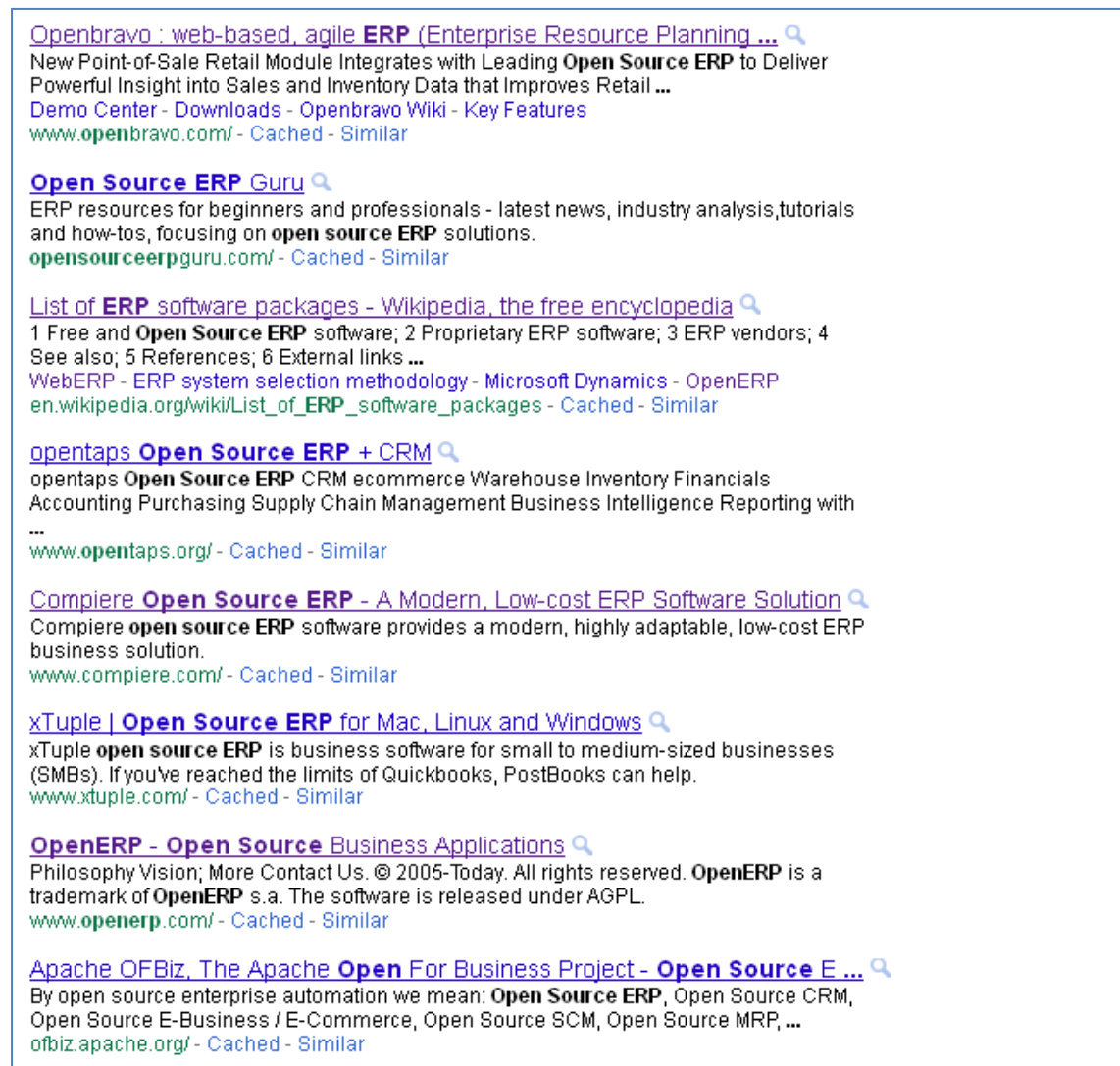


Figure 4.1 Google results on open source ERP (Google.com, 2011)

To the question on how easy it was to find an open source ERP, four out of six respondents agreed that finding one was very easy, both in knowledge and time.

The respondents proceeded with looking at the websites available in the search results. Asked how the respondents evaluated different OS ERP choices, they gave different answers. Some took into consideration the professionalism of the website. In other words, they considered the looks and the design of the website. The rest of participants did not have any explanation for the choice. Ultimately, the users selected to proceed with xTuple/PostBooks open source ERP, as a final choice. Respondent 4 chose initially Compiere, as an option, but gave up on it as he was not able to find the download link for Windows 7 operation system. Compiere provides a solution for other than Windows platforms.

However, it is crucial to mention that none of the respondents took into consideration the technical parameters and requirements of the open source ERP.

The findings on this stage of the experiment were that respondents did not have difficulties with finding an open source ERP system. It is also important to mention that 4 out of 6 respondents could not motivate the reasons behind choosing that specific open source ERP.

#### *4.3.2 Installing and configuring the open source ERP*

Most of the experiment participants have shown same behavior during the installation process, meaning that the actions respondents took did not vary. None of them gave too much consideration to installation and configuring information. All of them made the choice to proceed with preconfigured elements.

The respondents explained that this behavior is due to lack of knowledge about certain parts of software, such as databases offered and other elements; one of the respondents mentioned that “sometimes this is scary just because there are things configured you don’t know anything about it” (27C, Appendix 3A). But in order to be on the safe side, the respondents chose to install all elements suggested. Also, the rush can be explained by the wish to run and try out the software at once, skipping the configuration and installation details.

When asked to share the first impression about the installation, the respondents thought that the process was very easy and took little time and knowledge effort. However, five respondents shared the impression that it was difficult to configure the software due to no previous knowledge of the open source ERP product. Respondent 3 mentioned that there was no need to configure the software and she felt comfortable with preconfigured settings. It is also important to point out that one of the respondents had difficulties with English version of the software (Respondent 5). She did not feel comfortable with English, since she was accustomed to Spanish user interface language. The respondent tried to set up the Spanish language for the xTuple ERP system, but the setting missed both in the installation part and the settings menu of the product. This issue was the reason the respondent failed to complete the whole task.

The findings on this stage of the experiment were that installing and configuring the open source ERP was an easy task, with respondents choosing preconfigured settings due to lack of knowledge. Not of least importance is the fact that the open source ERP product (xTuple) did not have a language setting in the software, thus making it difficult to interact with its interface.

#### *4.3.3 Getting the first invoice with open source ERP*

This part of assignment was the most challenging and most complex for all participants. Some of the issues happened right at the beginning of the task, when users could not find the credentials needed to login to the enterprise resource system. Four out of six participants found the interface of the software very “handy” and pleasant; in the same time, one respondent did not feel comfortable with interface language and another respondent mentioned that “[f]or the first time it is a bit complicated, but I guess it needs some time to get used to”.

Having familiarized themselves with the look and menus, they proceeded with the task. During the task, five out of the six participants confessed that the software was intuitive and helped them in achieving their goal. However, it also created partial confusion for multiple reasons such as lack of knowledge, lack of supporting help, and no process transparency from the software. The last reason specifically is related to the save function of the software which was not notifying about its results, thus creating confusion whether the data was saved or not.

Before accomplishing their task, only two of the participants decided to turn to available help on World Wide Web and video tutorials & ERP documentation on the vendor's website. It is interesting to mention that these respondents used the same technique, Googling, for solving issues whenever a problem appeared. One of them used "print invoice xTuple" and "tutorial print invoice xTuple" keywords to search for any available solution which would help accomplish the task. However, none of the results provided a guide or explanation for the matter. The other respondents used their intuition and the menus available in the software in order to accomplish the task. All of the respondents tried to understand the process of getting an invoice. However, the respondents mentioned that the main difficulty with mastering the product was no previous experience with it.

Ultimately, half of the experiment participants (1, 2, 3) were able to print out the first invoice. Nevertheless, it is crucial to mention that the resulted invoices lacked all data required in the business case, such as VAT, correct address and so on. For detailed picture of resulted invoices please see Appendix 4 – from the appendix it can be seen that the invoice has a default logo generated by the software. The respondents who were able to print out the invoice did not manage to configure the appropriate settings for the invoice.

The other half of respondents were not able to get an invoice. One of the respondents (4) has been able to successfully create and ship an order; however, he was not able to find the saved invoice. The other two respondents had difficulties of getting the invoice; both were not able to create even an order. The reasons stated by these respondents were complex user interface and lack of comfortable language – the last respondent is a native speaker of Spanish. She explained that she is used only to software which is only in Spanish.

The findings from this stage suggest that the respondents with IT-related background were able to get an invoice, and the other group of non-IT respondents did not succeed to get the invoice due to reasons mentioned above. Another interesting finding is that only four participants tried to use video tutorials and other guiding materials available on the product's website.

#### *4.3.4 Perceived Ease of Use*

The average grade, on a scale of one (very easy) to five (very difficult), was three. The most difficulties were faced when configuring and working with the ERP in order to type in necessary

data and print out the invoice. Finding, downloading and installing the open source ERP was a very easy task for our respondents. However, more transparency is required.

	<i>Respondent 1</i>	<i>Respondent 2</i>	<i>Respondent 3</i>	<i>Respondent 4</i>	<i>Respondent 5</i>	<i>Respondent 6</i>
<i>Find</i>	1	1	1	1	2	2
<i>Download</i>	1	1	1	1	2	3
<i>Install</i>	2	1	1	1	2	1
<i>Configure</i>	1	3	2	2	3	5
<i>Get Invoice</i>	3	3	3	4	5	5

Table 5.1 PEOU on 1(very easy) to 5 (very difficult) scale

The respondents mentioned that in order to accomplish the tasks of finding, downloading, installing the open source ERP not much knowledge is needed. Although, they believe that more knowledge is required with learning the system.

The findings show that the tasks of finding, downloading and installing were perceived as easy to handle; whereas configuring and getting the invoice are tasks which require time and knowledge.

#### 4.3.5 Perceived Usefulness

The experiment participants perceived the open source ERP as useful. All of the respondents believed that the software would enrich and help perform the job tasks, as well as reduce useless paperwork. They thought that this is possible due to the integration of multiple functions in single software.

However, respondents believed that in order to get better output quality, one should get to learn the system first. The beliefs about result demonstrability were shared. Some of the respondents believed that at the moment the results are very limited because of the amount of work done. However half were satisfied to see tangible results, in the form of a printed invoice. One of the respondents (4) was curious to learn the system as he thought that it is interesting to learn new software which might be of help in business activity. Two respondents (5, 6) did not have a definite opinion on the usefulness of the software; nevertheless, they believed that xTuple has the capacity to help them in their tasks if having proper education and training.

Regarding the image, Respondent 3 mentioned that adopting an open source ERP is becoming a necessity, as well as affect the status and the image of the company in general.

One of the respondents (2) stated that open source ERP, xTuple, is perceived as of higher value over basic applications like Word, or Excel which could do the same task of invoicing. She believed that open source ERP, xTuple, will help her automate the process thus reduce time on repetitive tasks.

In this particular study, the perceived usefulness of the open source ERP has been received as positive. That is why five out of six the respondents stated that if were to choose freely, and then they would certainly use such software in their company. The left respondent hesitated to give an answer, explaining that it depends on the company and its activity.

The findings show that the open source ERP used in the experiment was perceived as useful, even though none of the respondents succeeded in printing out a valid, by Swedish standards, invoice.

#### *4.3.6 Differences between the two groups of respondents*

Surprisingly or not but there has been observed a difference between the two groups of students participating in this research. The respondents with IT-related background were able to get better results in the experiment, whereas the respondents with other than IT background were not as successful. Mainly, the students in Information Systems field have been able to achieve the ultimate goal of printing out an invoice, regardless its content. The students in Education and Business fields seemed to be not confident enough in their actions. The two students from Education background (5, 6) have decided to quit the experiment, and the Business student has lost the track of the invoice shipped.

## 5. Discussion

This chapter discusses the findings collected. The data is analyzed in relation to usability and user training where applicable. However, most of the data is analyzed in relation to findings collected, as the character of the study is explorative.

### 5.1 Perceived Ease of Use

In this particular study, the deployment process of the open source ERP has been assessed as normal with an average grade of three on a five grade scale, meaning that it took less than one hour to deploy the open source ERP; and the computer knowledge the experiment participants had before the experiment was enough to deploy the open source ERP successfully. There are multiple reasons for that. That shall be clarified step by step.

#### *5.1.1 Finding, choosing and downloading the open source ERP*

First of all, respondents mentioned that finding an open source ERP was very easy, as they could google and pick the most relevant results. The key to finding relevant results were querying the right keywords.

When it comes to ERP selection, respondents mentioned that it was very easy to choose among available software options. Some of them judged the quality of the software by Google search results. However, some of the respondents had difficulties of deciding and choosing an appropriate package, thus they preferred choosing the first option given in the business case, which in turn might have affected the objectivity of easiness level of finding an open source ERP.

Moreover, none of the participants has thoroughly assessed the advantages and disadvantages of an open source ERP comparing to other open source ERPs; nor did they evaluate the product's technical requirements. Such decisions could affect the overall performance of any open source ERP, if the minimum technical requirements are not met.

#### *5.1.2 Installing and configuring the open source ERP*

Most of respondents mentioned throughout the experiment that the software had a very “handy” and good user interface comparing it to regular software products like Microsoft etc. Also did they mention that during the installation and configuration procedure was intuitive and guiding. In other words, they could get clear instructions. Generally, these indicate clear signs of good usability practices suggested by Nielsen (2011) such as learnability, memorability, effectiveness, errors and satisfaction.

However, some of the respondents felt lack of transparency and information during installation. Also did the state they felt that more knowledge is required to understand all installation and configuration details. Despite that, none of the experiment participants/respondents tried to search for explanation in available documentation or World Wide Web. This can be explained by participants' feeling of rush of trying out the software, rather than understanding the installation process.

Moreover, one of the respondents felt that the option of having a language setting in the process of installation would be appropriate. She mentioned that she could not proceed with the experiment as long as the interface was in English – a language she could not master. Therefore, developers'/communities' attention should also concentrate on that issue.

Nevertheless, all six participants succeeded with the installation, being able to run the application. That in turn indicates that the knowledge which experiment participants had was enough to install the software, and the role of the user becomes as assisting the process or monitoring, rather than obliged to decide. Important to mention is the fact that respondents believed that even inexperienced users could complete the same task.

### *5.1.3 Getting the first invoice with the open source ERP*

The first knowledge difficulties came when literally working with the ERP user interface. After having familiarized themselves with available menus, five of the respondents proceeded immediately with the task using the trial-and-error method. Only one of the respondents tried to get better informed about the available functions and workflows. That is why the former two had consumed more time and committed more errors while executing the task. The latter has used information available on World Wide Web and on the vendor's site particularly.

Consequently, the appropriate use of software documentation and tutorials might have helped participants perform their task faster and qualitatively. That also supports the idea that users with appropriate training find systems easier and relevant to their job performance. However, Nielsen (2011) supports the idea that easy to use system should support learnability, i.e. accomplishing task easily at first encounter with the application.

On one hand, the problem might lie not specifically in the interface design, but rather in the complexity of the ERP software systems. The respondents confessed that for better usage more knowledge and training with the ERP software is required. On the other hand, the poor performance of some respondents in terms of time and errors might be also explained by the rush of trying out the system.

Nevertheless, half of respondents have succeeded to place a sales order, ship and print out the invoice (see Appendix 4). The resulted invoices do miss important parts of data or have incorrect data, i.e. not the one suggested in the business case assignment. That suggests that the printed

invoices are not valid for day-to-day business operations in Swedish standards. Thus, the actual usefulness of the open source ERP can be questioned. The problems appeared at creating a customized user for the company, i.e. register the company profile, and adding a product to the sales order. In one case, the respondents blamed the interface of the software, as they could not track the changes to the system.

These problems resulted due to lack of training and proper education of the users. As Bueno and Salmeron (2008) mention training and education are necessary before, during and after the system implementation. Consequently, the last task of getting the first invoice was rather hard even for our participants, despite their large experience with other software and high levels of computer skills. Thus, relevant amount of knowledge of the ERP system is a key to perform better job. In terms of time, the assignment was accomplished in less than one hour. However, comparing the results with the pre-study findings, it can be suggested that if a user carefully studies the available online documentation such as video tutorials and community forums, then better results could be achieved, i.e. the invoice would have correct information and meet the standards. Nevertheless, a longer period of time is required for learning the software.

## 5.2 Perceived Usefulness

The perceived usefulness of the ERP system tested was evaluated as positive. In other words, the open source ERP system has delivered the expected benefits, and all of the respondents find its use advantageous for any small company as it helps to business operation activities. In addition, the failure to print a valid invoice has been seen as a result of lack of training and education, rather than open source ERP fault.

All respondents find the ERP system used as beneficial to their job performance, even though they have encountered it for the first time. One of them mentioned that this particular ERP brings more benefits than just rather using Microsoft Office Excel software or doing paperwork, meaning that the open source ERP had integrated functionalities. Of course, it is hard to assess the benefit of a system in such a short time. Rather usefulness is a variable of time, and needs a longer period of time. The same idea is expressed by many scientists in the domain, who claim that majority of company cannot realize the benefits in the first period of time.

The image, voluntariness, result demonstrability factors – in the case of Information Systems students - have also affected positively the perceived usefulness. This can be explained by the background of the respondents who are all studying information systems. Thus, their general knowledge about ERP and their benefits might have affected their perceived usefulness of the product. However, the respondents claimed that in comparison to the effort input, they could see clear results in the end. It is important to mention that in case of Respondent 5 and 6 it was difficult to evaluate the Perceived Usefulness as they quit the experiment. Also, essential is the fact that Perceive Usefulness factor requires a longer time of product usage in order to be



assessed properly. Thus, respondents shared the first impression, rather than assess the real usefulness of the system tested.

The resulted invoices are a clear indicator of what can be achieved in shorter than one hour with an open source ERP. In other words, the experiment participants have succeeded to process and order and print out an invoice in less than one hour, which was the duration of the experiment.

Although, the invoices lacked much of the important data, such as VAT, logo, correct address, correct product. This, in turn, affects negatively the perceived usefulness as the invoices could not be used in business activity. However, in respondents opinion, with a certain amount of knowledge and training more benefits to the company and overall performance can be gained.

### **5.3 Differences on the level of respondents' background**

Regardless the clear distinction between the two groups of students, IT-related and non-IT-related, the reasons for this discrepancy can be speculated. Nevertheless, the perception was that IT-skilled students were more eager to try out the product. In the case of non-IT students, there was hesitation in testing the product. However, as two of respondents mentioned language was the main problem in interaction with the open source ERP product. Both did not feel comfortable with English as user interface language.

The difference between students in relation to their background was the main factor for existing discrepancies in the experiment findings. In other words, respondents' background might have been the main factor in determining respondents' perception of ease of use and usefulness of the software tested. There was no discrepancy observed in the empirical findings in relation to years of computer experience, level or the age.

## 6. Conclusions and Further Research

The research has shown that in order to deploy an open source ERP a relatively short amount of effort – time and knowledge - is needed. In other words, the perceived ease of use of the process has been evaluated as relatively easy, with main difficulties appearing in interacting with ERP workflow due to lack of training and little amount of knowledge. However, if appropriate user training and education is applied, greater job performance and output quality can be achieved. In terms of time, the research showed that the range can vary from 20 minutes up to undetermined period of time.

The study has also shown that the open source ERP was perceived as beneficial to business activity. Half of the experiment participants have succeeded to print out an invoice with the open source ERP; however the invoices were not suitable in business activity. The other half of respondents did not succeed to achieve the ultimate goal. However, both groups believed that with relevant training and time the software could serve as a great tool in running a business activity.

The respondents evaluated the perceived usefulness as positive. The factors of job performance, output quality, result demonstrability, voluntariness and image have positively affected the perceived usefulness of the open source ERP system. However, the assessment of Perceived Usefulness requires a longer time of interaction with the software. That is why TAM2 did not fit the software evaluation on first time use. In other words, the value of the model is undisputable; however it needs to be refined in order to fit the research questions posed in this thesis.

With regards to small companies, the underlying conclusion is that there are many open source ERP products available on the market. These products, in their commercial version, are free for downloading and installing, and are suitable to any computer settings available, i.e. operating system, technical characteristics etc. From this research, it stems that an open source ERP product can be easy to deploy in the settings of single-man companies – the least time spent on finding, downloading, installing and printing out a correct invoice was 20 minutes. Regarding finding, downloading and installing the open source ERP, a potential user should have minimum knowledge and experience in installing and configuring a software product. In other words, a person which has any previous experience in installing a software product would succeed with open source ERP installation within the same circumstances as in this research. However, special attention should be paid to the choice of the ERP product. One of the reasons is that such settings as language have a high influence on the user experience with the software, i.e. open source ERP. This research also suggests that in order for a single-man company to fully benefit from open source ERP advantages, one time interaction with this type of software is not enough, i.e. a user should study and learn the open source ERP which might imply longer time and education.

For further research suggestions, it would be interesting to find out if the user experience of open source ERP deployment is the same with other open source ERP packages available. Thus, it would suggest if PEOU and PU of open source ERP are product-specific. Another aspect of interest is the difference between the IT-related and non-IT related respondents. It would be interesting to find out if IT skills are a defining factor in open source ERP deployment.

# Appendix 1 – Questionnaire – Profiling

1. Name \_\_\_\_\_
2. Age \_\_\_\_\_ Male Female
3. Occupation \_\_\_\_\_ (student/employed/unemployed)
4. Education \_\_\_\_\_
5. Field of education \_\_\_\_\_
  
6. What is your level of experience with computers?  
Beginner            Intermediate            Advanced
  
7. How many years of computer experience do you have? \_\_\_\_\_
  - a. Where did you get the experience, if any?  
Home      Work    School            University            Other environment
  
8. What are you using your computer for, if any?  
Internet    Studies            Work            Multimedia
  
9. Have you ever tried to install any software on your computer? Yes No
  - a. Have you succeeded once? Yes No
  
10. Is there any software you used for a long period of time, such as Word or Firefox? Yes No
  - a. What is that period of time (years)?  
0      1      2      3      4      5
  - b. What is your skill level with that software (you think)?  
Beginner            Intermediate            Advanced

Any other relevant information to share?

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## Appendix 2 - Business Case and Interview

Imagine there is a company, Sweet Pie AB, VAT SE 123456789077, registered in Lund on the following address: Källarekroken 25, PO Box 22647. The company has 4 employees: Marina, Christopher, Maria and Gordana. Everybody is busy with something every day. There is not much business going on, but this paperwork just makes everybody tired. Plus, tomorrow they must ship the invoice for their customer, Pie Lover AB, which is registered in Stockholm, on the address: Svante Arrhenius väg 19, PO Box 10691.

However, Sweet Pie LTD has heard of ERP systems and the advantages they bring – some sophisticated software which helps a company to manage its business, with less paper and much faster; well at least everybody tries to have one. Marina, Christopher, Gordana and Maria got so happy when they heard this news. So they decided to research the market.

Sweet Pie LTD researched the market, asked other companies and found out that there are ERP vendors which sell ERP systems, but being very poor and small company it is hard to afford one. Fortunately for all, Gordana heard about open source ERPs which are free. So they googled and found a couple: xTuples, OpenBravo, WebERP, OpenERP etc.

But nobody has the courage to get their hands on installing and trying it out one of the available open source ERPs, that is why they asked for your help because you are the brightest person on this planet. Please help poor guys from Sweet Pie LTD.

Your task:

Please find available open source ERPs on the internet, select one for your consideration, install it, and try to print out the first invoice for Pie Lover LTD. The details for invoice are the following:

Product sold: *12 Carrot pies*  
 Price per product: *19.95 US dollars*  
 Value Added Tax: *25%*  
 Bank-giro: *5568-8982 (where the money shall be transferred)*

Any other data or details can be made up (such as email, phone number, shipping costs etc.)

Thanks in advance,  
 Sweet Pie LTD

### Perceived Ease of Use

- |  |                  |
|--|------------------|
| 1. How easy was it to find the software on internet? 1-5 | Why? Any issues? |
| 2. How easy was it to download the software?1-5          | Why? Any issues? |
| 3. How easy was it to install the software?1-5           | Why? Any issues? |
| 4. How easy was it to configure the software for use?1-5 | Why? Any issues? |
| 5. How easy was it to get the first invoice?1-5          | Why? Any issues? |

### Perceived Usefulness

1. Subjective Norm
2. Image
3. Job relevance
4. Output Quality
5. Result demonstrability
6. Experience
7. Voluntariness

## Appendix 3A – Interview Transcripts

Interview Christopher – 17th May, 2011

Vadim (V)

Christopher (C)

### Finding, choosing and downloading the open source ERP

*Christopher is looking for an open source ERP.*

1C: <i>Reading about one of the ERP sites he found...</i> Cloud ERP, that's an advantage for future.
2V: What do you think about the first site, is it clear? Is it clear how to download?
3C: Yeah, it is easy to download, very easy. And the next one, webERP. It is like a student made it, and the other looks so profession, I would take that. And the last one is OpenERP, I think...
4V: Maybe you can try something else to see?
5C: If I could choose... I just checked the suggested ones. But pretty much, the names you could search for are like "open free ERP", so I mean I could check Free ERP and check what is the first result. Yeah it is a bit nasty, I open ERP... <i>some search result</i>
6V: <i>referring to results...</i> So which one would you go for?
7C: I mean my favorite would be, under first impression, xTuple and OpenBravo, because they look most professional, but openERP is a bit like, I don't know... I mean I can download it but it's not... you have to subscribe for one month free trial, it sounds as it's not really free, maybe it is, then I have to go into detail. But I would try then the xTuple one.
8V: Ok, so maybe you would proceed with actually downloading it?
9C: I mean, what I like about this.. 181 MB, takes some time to download.
10V: Was it easy to find the software?
11C: Yeah it was very easy to download it, I mean 180 MB, is of course a requirement to have good internet, it is something you probably have to have, otherwise, I don't know... this one was like 1,2,3,4 minutes.
12V: There is needed much knowledge to get that (software)?
13C: No, nothing, everybody can do that. I think you don't have to be a student at Informatics, I think my mom could do that.

### Installing and Configuring the open source ERP

14V: So now we are going to talk more about the installation process?
15C: So far, I mean probably normally you, if you install something, you don't read through everything, right? So the basic thing should be stated there, so I mean here like, License Agreement..., I don't read through all that. For a company, probably, it becomes interesting. Ok, what is this? Select component...
16V: Is it clear for you enough, like transparent enough... the installation process?
17C: So far, yes. Ok, here, now it becomes a little more advanced, selecting components. Just in case I would install everything because I am not sure about what is necessary and not, because this is like a bit, let's say, not clear. I mean there is "PostgreSQL" – I don't know what this means and "tsvWimp", probably, I mean you have to have knowledge about what is this..SQL, and I don't know... Most of the times the installation folder you take what they suggest. Ok, please enter the ports...ok, this is already advanced let's say.
18V: Do you think you would consult the documentation available or maybe some...?

19C: Well, I am the type “First try”. I mean, of course if it is not working, this would be the next step. It’s like an approach, and my approach is first you try, then you can see if you have a certain question then you can go to the documentation, look for certain steps but I don’t read the installation process first and then do it. So it’s most of the things are like... they suggest to do this, and they suggest one thing because, otherwise I wouldn’t be able to say “please use this port”. I have no idea of ports. I would be able to read about it and understand it, but not be able to select one port. Just like that. And here it says “Please leave the default value of...” so if you are advanced you would change it. <i>Talking about admin password on PostgreSQL...</i> so the password is 123. “Select the database that you would like to load”, ok, I just take it preselected. I just take it like it is. <i>Talking about new user registration...</i> Ok, I have to probably have to do that first.
20V: Why do you think so?
21C: Because on one hand you have to register new account or already have one. And as I don’t have one, probable have to do now. This is quite logical. Registering his account on xTuple community. By the way, I should have noted all this information...the password and the username.
22V: So up to this moment, how do you feel... how easy was it? How much knowledge is needed?
23C: It’s easy but there is potential confusion... I am not 100% sure that everything is working well. Well, good question. In fact, I mean it’s the first time I’m trying this. There was nothing I wasn’t sure what to click and I just randomly clicking something. Actually, it is true, everything is clear so far, just not 100% sure that everything works like expected. I expect the software to work immediately. The account is created.
24V: So basically what do you think how long it is to install?
25C: It took me 5 minutes, but with skipping what we were talking. Maybe it took 10 minutes, but the actual doing was 5 minutes.
26V: So how much knowledge, would one require installing, do you think?
27C: I mean you should have basic knowledge to... be not confused. I mean they do preselect things talks about default values. Sometimes this is scary just because there are things configured you don’t know anything about it. I think for example with my experience it is not an issue at all.
28V: But what do you think if a person has no knowledge, and would just follow the instructions...
29C: Then it is easy of course. Actually you cannot make a mistake. If this is the question: if it’s easy to make a mistake, then no.
30V: What’s happening right now?
31C: I think it’s working. It completed with a windowed popping up Successful installation window. To be honest, I would skip this, but I am lucky that I read. There was information on login credentials on the last window. On the other side for experienced person, this is like default for DB2 or MS SQL Server. Someone else would skip. I am like that. I think it’s not good that they leave it for the last page.
32V: Ok, so what do you have now?

### Getting the first invoice with the open source ERP

33C: Ok, there is a login to server. Ok, now it is good that the readme file pops up in the same time as you press “finish” button. Probably this cancels the issue reference to login credentials. It could be improved.
34V: So what do we have now starting up the ERP for first time? <i>Meaning the interface</i>
35C: Here is window with a lot of things.
36V: What is the first impression of the interface? Why?
37C: It’s quite handy, I would say. It’s not very technical. Everything is pictured somehow. So the menu... it’s better than “Word” actually, but we will see.
38V: So what are you first thoughts about the business case and what you have to do?

39C: If you think of what I actually have to do here the software interface, but everything is like with clicks. What can I say? I can open here for example when I go to CRM menu,... trying the interface. It seems to be quite straight to the point.
40V: So why would you choose "Sales" immediately? Referring to menu and his actions. Do you find it intuitive?
41C: Yeah.
42V: Ok, so let's start the case. What are your first thoughts?
43C: Actually, what I am wondering is whether I need to say who I am, but I start with what I know.
44V: Just imagine this is a real business case for today, for example you have a customer tomorrow and you have to invoice him. So what would you do first?
45C: I would first add the customer. <i>Trying to add the customer.</i>
46V: So what do you think, how's the interface at this point when typing in a new customer?
47C: It's not perfect, but it's okay. But I wouldn't say it's brilliant, not more than what I am used to when I use "Word". <i>Trying to register a new customer.</i>
48V: So what happens now?
49C: I try to add a contact and then suddenly, it took me some minutes, I had to write it again, somehow it was lost, it didn't ask me whether I want to save it, I don't know. So I have to type in again the address, I don't know why. It makes me a bit nervous. <i>Adding the customer and saving it.</i>
50V: Now you created a customer. What are your next thoughts?
51C: Then there is to create an invoice. I think this is what I would do next. It depends where I start. It's probably you have to know the whole system, like manufacture and inventory. The only thing I could do is create inventory. Let's start with. I am not sure so I try first to create something, an invoice and this is not working. I probably will check out whether there is an introduction video. <i>Trying.</i> I probably check this out now video. I watched certain parts of the video and it helped me to find that I have to start with new sales order and then it becomes clear what I actually have to do. <i>Proceeding with task. The invoice is printed.</i>
52V: What about the other details? Some details were missing from invoice
53C: Well, I think that is actually missing. I should have entered it somewhere.
54V: Can you just try?
55C: Yeah. I tried to. I mean it's possible to add it, but I don't know where to put in the VAT. I saw it once, but I don't remember where it is. So I probably I need to consider more documentation to find these details.
56V: Generally was it easy to get the first invoice?
57C: Yeah, but is just easy if you try to do it structured. You can be lost in that software if you are not aware of what exactly you have to do. The best is just following the video, and just try. I tried to google how to fill in the VAT, but it seems to be ... it doesn't have too many hits, no explanation. I probably have to go to the documentation, but this takes longer time than I have now. So probably that would be the next step.
58V: So what do you think: is training required to learn this system? Or you can learn it by yourself?
59C: I think you can do it by yourself, but it is not so intuitive you can do without documentation.

### Perceived Usefulness

60V: What do you think is this software useful for you? Does it bring any use?
61C: Well, of course if you want to print just one invoice it is easier to use Word. But if this is like supposed to be a business, you need more structure and order in doing this, and here you can manage all your items and you can also manage for example inventory, especially for small businesses it can support, and what they need.
62V: Do you think that the system is relevant to complete your job?
63C: Yes, I think so. In case that I would be in that situation, it helps me exactly at least with what the business case says to do this. Especially helpful if you look into the future.



64V: What about the output quality?
65C: I think it is basic invoice. It is not exceptionally good, and not exceptionally bad. I have my company address on it.
66V: Do you think that this ERP will increase the quality.
67C: Yeah it helps to structure the work, internally and the whole processes, like manufacturing. On the other side also, it depends on the invoice, it has everything you need printed.
68V: Do you think that there are tangible direct results of you work?
69C: Yeah, here and there yes. But I knew what I was doing.
70V: If you have the choice to work with the system or not, what would you do?
71C: I think I would use, but I would use a bit more time to get familiar with that. Otherwise, I would be afraid to lose the overall overview. It takes more time to get familiar with it, and then it gets useful.
72V: What about knowledge, how much knowledge does it take?
73C: I think technical knowledge not so much, more getting familiar with how the system works. What kind of button, little things to configure like VAT.
74V: So do you think it is suitable to have some training?
75C: Actually it depend on how the business big is. If there is training available, I think it is worth to do that.
76V: What about the existing materials on the website current ERP?
77C: They have lots of videos available, so it's probably a good starting point, and after this you can decide whether you need training.
78V: Did they help you the videos to get the first invoice?
79C: In that way yes, but I am not sure how far it will help me. I cannot judge it now.

### Perceived Ease of Use

80V: Now there are some questions regarding the ease. Please rank the easiness on a scale of 1 to 5, where 1 is very easy and 5 is very difficult.
81V: How easy was it to find the software?
82C: One.
83V: How easy was it to download the software?
84C: One.
85V: How easy was it to install the software?
86C: I would say two, comparing to the other tasks.
87V: How easy was it to configure the software?
88C: One.
89V: How easy was it to get the first invoice related to the time you had?
90C: Two – three.
91V: Thank you.

## Appendix 3B – Interview Transcripts

Interview with Gordana, 17th of May, 2011

Gordana (G)

Vadim (V)

### Finding, choosing and downloading the open source ERP

1V: So how are you going to find an ERP?
2G: I am going to write “open source ERP download” in google. This one?
3V: Yeah maybe, but you have to choose. Maybe you could go to different websites and evaluate them somehow.
4G: I am not going to do that. I will choose the first one.
5V: Was it easy to find it?
6G: Yes. Meanwhile it is downloading; I can look at the other one. Maybe I will consider OpenBravo and OpenERP.
7V: So why did you choose xTuple?
8G: It’s the first thing I see. <i>Laughing.</i>
9V: So there is no reasoning behind. <i>Laughing.</i>

### Installing and configuring the open source ERP

10G: We are running the installation. And then I go just next, next, next ... I never read the install procedures.
11V: Why?
12G: I don’t know why. I just want to see how it works. Most of the times I don’t read the agreement.License agreement. Next, I see what things I can install, but I check everything. <i>Laughing.</i> Configuring the installation process.
13V: How much time did it take to install?
14G: Fast and easy.
15V: How much knowledge does it require?
16G: For installing, any knowledge. I mean if you have previous knowledge on software installing, anything works like this. <i>Counting the details.</i> It’s easy, even for those who don’t have experience. I guess you need guidelines, tutorial, how it works. Most of time I am not looking at tutorials, I am trying to understand by myself, that is the better way of learning.

### Getting the first invoice with the open source ERP

17G: I guess I have to read it. When the <i>README window pops up in the end of installation process.</i> For credentials. But I guess you can find that online. I would be stuck here, if I didn’t read it. <i>Entering credentials and logging in.</i>
18V: So what do you see in front of you?
19G: Nice picture. <i>Getting down to invoicing task.</i>
20V: What is the first impression of the interface?
21G: First I am going to take a look at the menus. <i>Trying to register the new customer and proceeding with the invoice task. Some problems with currency settings.</i>
22V: Would want the software to be more intuitive?
23G: Yes... But it must have a “Help” button, if you’re stuck and don’t know what it means.

24G: About some category I don't know what that means, but whatever I press it.
25V: If you need any help, where you would find that from?
26G: I guess I need some tutorial. But if they have small description or a "help" button - it helps much. <i>Continues with the invoicing.</i> I am in the part where you have to put the tax VAT, but it guess it should be somewhere in the settings. I need more time to understand how it works, because it is the first time I look at it. Could not enter the new product, continues with a random product. <i>Finishing and printing the first invoice.</i>
27V: So what is happening now, can you describe your actions?
28G: I guess I have to ship the order now. <i>Intuitively.</i> Ok, in the invoice you have all the information. This was pretty easy.

### Perceived Ease of Use

29V: Now there are some questions regarding the ease. Please rank the easiness on a scale of 1 to 5, where 1 is very easy and 5 is very difficult.
30V: How easy was it to find the software?
31G: One.
32V: How easy was it to choose between the software different ERPs?
33G: I mean it depends. If you are a company who cares, first of all you will make an evaluation, but right now I just took the first one. One.
34V: How easy was it to download the software?
35G: One.
36V: How easy was it to install the software?
37G: One.
38V: How easy was it to configure the software the system?
39G: Three.
40V: How easy was it to get the first invoice related to the time you had?
41G: Three.
42V: How much knowledge do you need for overall process?
43G: I mean you have to have understanding of this product and how they work. I mean if you are person who first time sitting here, and you don't know anything about this business then it will take time. And I think it doesn't require much knowledge if right people are put in this place.

### Perceived Usefulness

44V: How do you think the system helped you to perform your job?
45G: I think it depends of what kind of company you are in, and what you need.
46V: What about the quality of the output of what you get?
47G: I mean it is quite easy and quite good.
48V: Do you think your work will improve with the software?
49G: Yeah sure. For sure it will help your job.
50V: Were you able to see direct tangible results after using this software?
51G: Right now no. Only the invoice. You don't have to spend time with papers, and it is good that everything is automatically connected.
52V: What if you were to choose to use it or not? What would you choose?
53G: As a company it depends on the company.

54V: Thank you very much.

## Appendix 3C – Interview Transcripts

Interview with Marina, 17th of May, 2011

Marina (M)

Vadim (V)

### Finding, choosing and downloading the open source ERP

1V: What is your logic behind looking for open source ERP?
2M: Well, what pops up first on Google. I presume that the ones that have been used multiple times, or have good position in Google will pop out first. <i>Downloading it.</i>
3V: So what are your actions now? What are you trying to understand?
4M: What are they offering me, and what can I install.

### Installing and configuring the open source ERP

5M: Ok, I'll load all of it installation options.
6V: Why would you do that?
7M: To insure that I have everything that I might need, because I'm doing it for the first time and I have no idea of how it is going to work, so better to have all.
8V: Do you think of any other options of finding what you need?
9M: Well, I presume I could google about this software and maybe read on some forum the experiences of this software.
10V: How do you feel about the installation process so far?
11M: Well, it's easy if you... there is nothing confusing.
12V: How much knowledge do you think somebody needs?
13M: I think average knowledge.
14V: Any special skills?
15M: To read. <i>Laughs.</i> I think that everyone with average knowledge of internet, and anyone who tries to download anything at least once.
16V: So what is happening now, Marina?
17M: I need to read about the login credentials. <i>Enters the password and username.</i>

### Getting the first invoice with the open source ERP

18V: What do you feel about the interface? What is your first impression?
19M: It looks interesting, I mean nice like I would like to work with and not boring. <i>Looking at the business case. Checking menu.</i> I don't know, I don't like to use the community help, so I'll check Google maybe how to make an invoice. <i>Googling.</i> I don't know which one to use, so I'll go on their website open source ERP's website, to check if they have somehow. <i>Checking the training videos.</i> I'm trying to read what they are offering. Ok, I found a tutorial. <i>Watching the video tutorial. Proceeding with business case tasks.</i>
20M: I've created my product but now in the items list I can't find it. Seems it is like not saved. I'll try again. I can't find the product, so I will try to find on Google for any help or explanation for what I am doing wrong.
21V: What is the problem do you think? Does it have to do anything with the software or something else?

22M: I don't understand the problem here, and I don't understand why I make mistakes, maybe there is not enough information. Or maybe the user interface is not very friendly. It should be logical how to do this. And I am making a mistake twice already.
23V: So what are you doing now?
24M: I am checking the website for tutorial that they have offered, for how to create a product. <i>Checking.</i> I'm giving up on that so I will just try to print any other item. <i>Trying.</i>
25V: So what do you think about the software till this moment? Do you have any issues or thoughts about it? About the usage? What do you think is missing? Do you see any benefits at this moment?
26M: Well I think that this Search Pricing a little bit complicated and they have products on two places which I don't understand at the moment why. Well, the user interface in a way leads you; it doesn't allow you to skip certain steps, which is maybe ok if you want to enter all the necessary data. <i>Proceeding with printing the invoice. The invoice is printed.</i>

### Perceived Ease of Use

27V: Now there are some questions regarding the ease. Please rank the easiness on a scale of 1 to 5, where 1 is very easy and 5 is very difficult.
28V: How easy was it to find the software?
29M: It was very easy. One.
30V: How easy was it to download the software?
31M: One.
32V: How easy was it to install the software?
33M: One. Very leading.
34V: How easy was it to configure the software?
35M: That was a little bit more difficult, because I haven't had a chance to work with this kind of software, but when I googled it – it was easy. Maybe two.
36V: What would any other person need to be able to complete the task? Skills? Should be there training?
37M: Maybe a little bit more instructions on the website, more tutorials.
38V: How easy was it to get the first invoice?
39M: Three, because several times I had to search for help on internet, google, on the website. And I had to repeat some steps several times.
40V: How much knowledge do you need to accomplish such a task?
41M: No any special skills, most of the tasks are related to the job itself... to sales. And the rest is basic knowledge of internet use, software downloading, and installation.

### Perceived Usefulness

42V: How do you think that this ERP would affect the image of the company?
43M: Well, today it seems that every company has an ERP to manage its own business so in that sense it seems there is some pressure to have it.
44V: Is it relevant to your job tasks?
45M: Well, it makes paper work easier and integrates a lot of functions. So it is relevant to the job.
46V: Do you think it increases or decreases the quality of the work?

47M: Well, definitely increases because leaves more space to do the core business and not the all those supporting activities.
48V: Can you see tangible results after working with the system?
49M: Well, this invoice. You right away see the end product of the actions of the system.
49V: If you were to chose to use or not?
50M: I think I would choose it, because it covers necessary functions, while such as Excel tools are superficial.

## Appendix 3D – Interview Transcripts

Interview Wladimir – 3<sup>rd</sup> of October, 2011

Vadim (V)

Wladimir (W)

### Finding, choosing and downloading the open source ERP

1W: Ok, I am ready.
2V: So what are your first thoughts? What do you want to do now?
3W: Install an open ERP system first.
4V: How do you want to find it?
5W: Do I choose from the list here?
6V: You can do it if you want to.
7W: Ok, I am going to google first.
8V: So you used “top open source ERP” as a keyword.
9W: Yes.
10W: After he googled and found some results. Ok, so for example I choose this one.
11V: Which one?
12W: Compiere.
13V: Why?
14W: Because it was mentioned two times on different websites.
15V: So what is your next step?
16W: I am going to download it and install it on my computer.

### Installing and configuring the open source ERP

17V: After a while. So what is happening?
18W: Trying to find a Windows client for Compiere. It seems like I can't find the download link for this system, so I will choose the one from the list. Let's say xTuple.
19V: Why do you choose xTuple?
20W: Because it was the first one in the list.
21W: Ok, I found the download link and I am going to download it now.
22V: Was it easy to find the download link? Do you think this website is better than the previous website?
23W: Yes, the previous website was kind of messy.
24V: Now what are you doing?
25W: I am installing the software. Let's see.
26V: Can you describe the process not in details but in general.
27W: It opened the installation, there are components to choose but I will press Next button, because I don't know what they mean.
28V: Do you think if you get more information on components it would be better?
29W: Yes, for sure. Installing. They ask me to create an account.



30V: So what happened?
31W: I have been registered on the website. The installation process is almost finished.
32V: Was the installation process easy?
33W: Pretty straightforward.
34V: How much time do you think the installation lasted?
35W: Two or three minutes. Installation is in progress (extracting data to local database).
36W: I am launching the application. I am logging in using my profile credentials. I see a window with many buttons, central screen. I must create an invoice. Let's see. I don't know what to do now, but let's check. I am trying to understand what I need to do.

### Getting the first invoice with the open source ERP

37V: What do you think about the menu?
38W: For the first time it is a bit complicated, but I guess it needs some time to get used to.
Wladimir is continuing with creating an order and adding order information to it.
39V: What are you doing?
40W: I am trying to add VAT, but I am not sure how. But let's see what happens. Trying to print but failed. Wladimir is editing the order and reintroducing the data.
41V: What are you doing right now?
42W: It says the order is not posted. So I will try to post it. Issues the order, but cannot print it. The invoice gets lost.
43V: So what is happening right now?
44W: I issued the invoice for shipping but I can't find where it is in the system. Maybe it is in Accounting – nothing here. I have no idea.
45V: What happened right now?
46W: I lost the invoice. I think I shouldn't have shipped it before printing the invoice.
47V: So you basically lost it somewhere. We should stop. Can you summarize what happened?
48W: I created the customer first, then I created the items (products) in the database, then I created the sale order, then I created the invoice, at least I tried to, but I couldn't add the VAT; and I issued the order to shipping but I couldn't print it because it disappeared somewhere.
49V: You have succeeded to create the order, but you didn't print it out.

### Perceived Ease of Use

50V: How easy was it to find the software?
51W: I guess it's one, very easy.
52V: How easy was it to download the software?
53W: Also very easy. The download button was on the main page so one.
54V: How easy was it to install the software?
55W: Also one.
56V: Was the installation process transparent enough?
57W: Yes it was.
58V: How easy was the configuration of software?
59W: I don't know, I didn't try because it was preconfigured for my needs. So I think it is two.
60V: How easy was it to get the invoice?

61W: I didn't get it. Well, I had a chance so let's say it is 4.
--

**Perceived usefulness**

62V: How do you think the system helped you to perform your job?
--

63W: I didn't succeed. Maybe if I had more time.
--

64V: What about the quality of the output of what you get?
--

65W: I didn't get any invoice.
--------------------------------

66V: Do you think your work will improve with the software?
---

67W: Yeah I think so, by automation.
--------------------------------------

68V: Were you able to see direct tangible results after using this software?
--

69W: No.
----------

70V: What if you were to choose to use it or not? What would you choose?
--

71W: I would use it definitely. I like to discover new stuff.
---

72V: Thanks.
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73W: Bye bye.
---------------

## Appendix 3E – Interview Transcripts

Interview with Nere, 3<sup>rd</sup> of November, 2011

Nere (N)

Vadim (V)

### Finding the software and downloading it

1V: So what are you first thoughts?
2N: Search for the software for my business. Chooses the first option from the list.
3V: So what are you doing now?
4N: I am looking for xTuple on google to download it.
5V: Why do you choose xTuple and not anything else?
6N: Because it sounds Ok. So now that I have found it, I am going to download it.
7V: Did you find the download page?
8N: Yes.
9V: The downloading is almost done. Was it fast?
10N: Yes it was quite fast.

### Installing and configuring the open source ERP

11V: What is happening right now?
12N: I am installing the program.
13V: And now?
14N: I have to create an account. She proceeds with installation.
15V: What do you feel about the installation process? Is it transparent enough? Do you understand what you do?
16N: Yes, it is easy.
17V: What is happening right now?
18N: The program is installed.

### Getting the first invoice with the open source ERP

19V: We continue. So you managed to log in. What do you see?
20N: I am in the home page. And now I have to make an invoice.
21V: What are you first thoughts?
22N: I don't know. I have to search for it.
23V: So what do you want to do first?
24N: Enter a new customer maybe (in the program).
25V: Did you manage to?
26N: Yes I think.
27V: What happened?
28N: I think I added a new customer, but I don't know where it went (disappeared). Yes, I have a new customer (found it). Now I have to make an order maybe? Nere is trying to look in the menus.

29V: What is happening?
30N: I have to write the address for the customer to send the bill.
31V: So you can't add the address? What is the problem?
32N: There is no place to add it.
33V: What are you doing right now?
34N: Listing the items (products). Nere is trying to add products and order information to order in creation. But I can't save it. Now I am a bit lost, and I am going to try to... I put something in the list...So now the sale (order) is saved and I can create the invoice.
35V: What is happening?
36N: I saved the invoice, and I think I can send it.
37V: What is happening right now?
38N: I am having problems, because I don't understand what the program is asking me. At this point I don't know how to continue. Stopped her task.

### Perceived Ease of Use

39V: How easy was it to find the software?
40N: Two.
41V: How easy was it to download the software?
42N: Also two.
43V: How easy was it to install the software?
44N: Two.
45V: How easy was it to configure it?
46N: Three, because I am not sure.
47V: How easy was it to get the invoice?
48N: Five, because I didn't get it.

### Perceived Usefulness

49V: How did the system help you to perform your job?
50N: No, it didn't help me because I didn't get the invoice.
51V: What about the quality of the output? It's not really applicable.
52V: Do you think your work will improve with this software?
53N: Yes, if you learn it.
54V: Where able to see tangible results of using this software?
55N: Yeah, maybe.
56V: What if you were to choose to use it or not?
57N: Yes, because it is better than excel or other simple applications I think.
58V: Thanks.
59N: Thank you.

## Appendix 3F – Interview Transcripts

Interview with Mireia, 11<sup>th</sup> of November, 2011

Mireia (M)

Vadim (V)

### Finding the software and downloading it

1V: What do you want to do now?
2M: Hesitating...
3V: Did you understand what an open source ERP is?
4M: Yes, more or less, because I think it is a bit difficult.
5V: What are you doing right now?
6M: Googling...
7V: What have you found?
8M: I found xTuple.
9V: Why did you choose xTuple?
10M: It was the first option in the list. Then I press Download. I prefer, when I download a program/software, to use “download free ERP” and choose the first option.
11V: Was it easy to download the software?
12M: Yes.

### Installing and configuring the open source ERP

13V: Now you have the installation window. Do you ever read the installation instructions?
14M: No, I never read. Regarding the installation components, I want all the components. Installation is in progress.
15V: Was it easy to install the software?
16M: Yes, it was easy.

### Getting the first invoice with the open source ERP

17V: Now you logged in. What happened next?
18M: Now it is open (the software) and I need to print out my first invoice.
19V: What are your thoughts now? What do you feel and think?
20M: I don't know the program and I am looking for the option to print out an invoice.
Mireia is trying to figure out how to perform the task.
21V: Do you feel confused?
22M: Yes, because it is in English. All programs in my computer are in Spanish. I am going to “Help” menu to change the language. I am not sure if I can change it. Trying to configure it in the menu bar.
23V: So what has happened?
24M: I don't know where it is (Language configuration). So I will google to find if I can change the language in xTuple. I am opening different links and different tabs, and I am looking for a solution.
25V: However, it is important to understand whether it was easy to understand the task in English?

26M: Yes.
27V: So the problem is that you don't want to use the software in English as you are more comfortable with Spanish.
28M: Yes. Mireia is still searching for a solution.
29V: Do you remember if the software installation had an option of choosing the language?
30M: No. I am looking for a tutorial to create and print out an invoice in xTuple. She is searching on google.com
31V: Did you find anything relevant to the task?
32M: No.
33V: How did you look for it? Any keywords?
34M: Tutorial "print invoice xTuple". Now I will write only "invoice xTuple". I don't know how I can do it. She couldn't find anything relevant.
35V: What do you think?
36M: I am just trying different buttons. I don't know.
37V: You feel like giving up? Finish?
38M: Yes.

### Perceived Ease of Use

39V: How easy was it to find the software?
40M: Two.
41V: How easy was it to download the software?
42M: Three, because I needed to go to different pages.
43V: How easy was it to install the software?
44M: Oh, easy. One.
45V: How easy was it to configure the software?
46M: Five.
47V: How easy was it to get the invoice?
48M: Five, because I couldn't print out the invoice. It is a new program and I don't know anything about it.

### Perceived Usefulness

49V: Was the software useful for you? Does it bring any use?
50M: No, because I cannot use it and I can't know if it is useful for me.
51V: Do you think that the system is relevant to complete your task/job?
52M: I don't know.
53V: Do you think this software would improve your work or business?
54M: If I knew the program – maybe.
55V: If you were given an option to use it or not use it – what would you choose?
56M: To use it. I would want to learn it.
57V: Thank you so much.
58M: Thank you.

# Appendix 4A – Invoices from experiment

ProDiem Toys  
 Accounts Receivable  
 12100 Playland Way  
 Norfolk VA 23100  
 United States



## Invoice

Invoice Date: 05/17/11  
 Due Date: 06/16/11  
 Discount Date: 05/27/11  
 Terms: 2% Discount in 10 Days - Net 30 Days  
 Order Date: 05/17/11  
 F.O.B.

Order #: 50220  
 Invoice #: 60111  
 P.O. Number:  
 Customer #: 9604

Bill To: Mr Berger  
 Nachtigallegrund 41  
 Munster 48301  
 Sweden

Ship To:

**Shipment Details**

Ship Date	Carrier	Tracking #
05/17/11	UPS-GROUND-UPS Ground	

Qty. Shipped	UOM	Item Number Item Description	Invoice Currency:	\$	Unit Price	Ext. Price
12.00	KG	09090 pie		\$	123.0000	1,476.00

Notes:

Serial #/Lot Information:

Subtotal:	\$	1,476.00
Freight:	\$	0.00
Misc. Charge:	\$	0.00
Sales Tax:	\$	0.00
Pre-Allocated Credit:	\$	0.00
<b>Total Due:</b>	<b>\$</b>	<b>1,476.00</b>

# Appendix 4B – Invoices from experiment

**ProDiem Toys**  
 Accounts Receivable  
 12100 Playland Way  
 Norfolk VA 23100  
 United States



## Invoice

**Invoice Date:** 05/17/11  
**Due Date:** 06/16/11  
**Discount Date:** 05/27/11  
**Terms:** 2% Discount in 10 Days - Net 30 Days  
**Order Date:** 05/17/11  
**F.O.B.**

**Order #** 50217  
**Invoice #:** 60111  
**P.O. Number**  
**Customer #:** 178787

**Bill To:** pie Lover

**Ship To:** pie Lover

**Shipment Details**

Ship Date	Carrier	Tracking #
05/17/11	UPS-GROUND-UPS Ground	

Qty. Shipped	UOM	Item Number Item Description	Invoice Currency:	\$	Unit Price	Ext. Price
12.00	EA	CTRUCK1 Custom Tough Truck Type 1 I-COLOR=Bright Yellow, I-FINISH=Flat, I-DECAL=PUSCH Racing Logo		\$	32.0000	384.00
Notes:		Serial #/Lot Information:				

Subtotal:	\$	384.00
Freight:	\$	7.50
Misc. Charge:	\$	0.00
Sales Tax:	\$	0.00
Pre-Allocated Credit	\$	0.00
<b>Total Due:</b>	<b>\$</b>	<b>391.50</b>



# Appendix 4C – Invoices from experiment

**ProDiem Toys**  
 Accounts Receivable  
 12100 Playland Way  
 Norfolk VA 23100  
 United States



## Invoice

**Invoice Date:** 05/17/11  
**Due Date:** 06/16/11  
**Discount Date:** 05/27/11  
**Terms:** 2% Discount in 10 Days - Net 30 Days  
**Order Date:** 05/17/11  
**F.O.B.**

**Order #** 50217  
**Invoice #:** 60111  
**P.O. Number**  
**Customer #:** 15

**Bill To:** Pie Lover AB  
 dgsgsdg  
 dbfgsdgubsd  
 dasfasf Berkshire 111111  
 Afghanistan

**Ship To:** Pie Lover AB  
 dgsgsdg  
 dbfgsdgubsd  
 dasfasf Berkshire 111111  
 Afghanistan

**Shipment Details**

Ship Date	Carrier	Tracking #
05/17/11	UPS-GROUND-UPS Ground	

Qty. Shipped	UOM	Item Number Item Description	Invoice Currency:	\$	Unit Price	Ext. Price
12.00	EA	BTRUCK1 Blue Tough Truck Collectors I-COLOR=PL126		\$	10.9900	131.88

Notes:

Serial #/Lot Information:

Subtotal:	\$	131.88
Freight:	\$	21.00
Misc. Charge:	\$	0.00
Sales Tax:	\$	0.00
Pre-Allocated Credit	\$	0.00
<b>Total Due:</b>	<b>\$</b>	<b>152.88</b>

## References

- Adam, F. and O'Doherty, P. (2000): Lessons from enterprise resource-planning implementations in Ireland: towards smaller and shorter ERP projects, *Journal of Information Technology*, Vol. 15, pp. 305-16.
- Amoako-Gyampah, K. and Salam, A.F. (2004): An extension of the technology acceptance model in an ERP implementation environment, *Information&Management*, 41(6), 731-745.
- Bajaj, A. (2008): ERP for SMEs, Retrieved on February 1<sup>st</sup>, 2011 from <http://knol.google.com/k/erp-for-sme-s#>
- Benjamin, R.I. (1983): Information Technology: a strategic opportunity, *Center for Information Systems Research*, Sloan School of Management, Retrieved May 21<sup>st</sup>, 2011 from <http://hdl.handle.net/1721.1/48170>
- Bennett, L.W. (2011): Research Bias, Retrieved April 1<sup>st</sup>, 2011 from <http://tiger.uic.edu/~lwbenn/jacswcourses/socw360/week14.htm>
- Blankenhorn, D. (2009): 11 open source business models, *ZDnet*, Retrieved on May 1<sup>st</sup>, 2011 from <http://www.zdnet.com/blog/open-source/11-open-source-business-models/5371>
- Boudreau, M. (2003): Learnig to Use ERP Technology: A Causal Model, *Proceeding of the 36<sup>th</sup> Hawaii International Conference on Systems Sciences*
- Boulanger, A. (2005): Open-source versus proprietary software: is one more reliable and secure than the other?, *IBM Systems Journal*, Vol. 44 No.2, pp.239-48.
- Boykin, R.F. (2001): Enterprise resource-planning software: a solution to the return materialauthorization problem, *Computers in Industry*, Vol. 45, pp. 99-109.
- Buonanno, G., Faverio, P., Pigni, F.,Ravarini, A., Sciuto, D. &Tagliavini, M. (2005): Factors affecting ERP system adoption: A comparative analysis between SMEs and large companies, *Journal of Enterprise Information Management*, Vol. 18 Iss: 4, pp.384 - 426
- Bueno, S. and Salmeron, J.L. (2008): TAM-based success modeling in ERP, *Journal Interacting with Computers*, Vol. 20 (6).
- Creswell J W (2007) *Qualitative inquiry and research design: choosing among five traditions*. 2nd ed., Sage: Thousand Oaks, CA.

d'Amboise, G. and Muldowney, M. (1988): Management theory for small business: attempts and requirements, *The Academy of Management Review*, Vol. 13 No. 2, pp. 226-40.

Davenport, T. (1998): Putting the enterprise into the enterprise system, *Harvard Business Review* 76(4), 121-133.

De Carvalho, R. A. (2006). Issues on Evaluating Free/Open Source ERP Systems. *Research and Practical Issues of Enterprise Information Systems*. Springer-Verlag 667-676

Fougatsaro, V.G. (2009): A study of open source ERP systems, *School of Management, Blekinge Institute of Technology*.

Haddara, M. (2011): ERP adoption cost factors in SMEs, *European, Mediterranean & Middle Eastern Conference on Information Systems*, p.130-141, Retrieved on May 15th, 2011 from <http://www.iseing.org/emcis/EMCISWebsite/EMCIS2011%20Proceedings/SCM14.pdf>

Holsapple, C.W. and Sena, M.P. (2003): ERP plans and decision-support benefits, *Decision Support Systems*, Retrieved on May 15th, 2011 from <http://www.sciencedirect.com/science/article/pii/S0167923603001258>

Jacobson, S., Shepher, J., D'Aquila, M. & Carter, K (2007): The ERP Market Sizing Report, 2006-2011, *AMR Research 2007*.

Johansson, B. and Sudzina, F. (2008). ERP systems and open source: an initial review and some implications for SMEs. *Journal of Enterprise Information Management*, vol. 21(6), 1741-0398.

Key, J. (1997): Questionnaire and interview as data gathering tools, *Research Design in Occupational Education*, Retrieved May 1st, 2011 from <http://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage16.htm>

Kraemmergaard, P. and Rose, J. (2002): Managerial Competences for ERP Journeys, *Information Systems Frontiers*, Vol. 4:2, 199-211

Kvale, S. (1996): *Interviews: An introduction to qualitative research interviewing*, Sage: Thousands Oaks, CA

Kvale, S. and Brinkmann, S. (2009): *Interviews: Learning the Craft of qualitative research interviewing*, 2nd ed. Sage: Thousand Oaks, CA

Kumar, K. and Hillegrersberg, J.V. (2000): ERP experiences and evolution, *Communications of the ACM*, Vol. 43, 4, 23-6

Laukkanen, S., Sarpola, S., and Hallikainen, P. (2007): Enterprise size matters: objectives and constraints of ERP adoption. *Journal of Enterprise Information Management*. vol.20, no.3, pp.319-334

Markus, ML and Tanis, C (2000): The Enterprise Systems Experience - From Adoption to Success, in *Framing the Domains of IT Management: Projecting the Future through the Past*, ed. RW Zmud, Pinnaflex Publishing, Cincinnati, OH, pp.173-207.

McFarlan, F.W. (1983): Information Technology Changes the Way You Compete, *Harvard Business Review*, Retrieved May 20<sup>th</sup>, 2011 from [http://www.forofca.com/temas/Technology\\_Changes.pdf](http://www.forofca.com/temas/Technology_Changes.pdf)

McLaren, T. (2006): Why has the adoption of ERPs by SMEs lagged that of larger firms?, *Ryerson University*, Retrieved on May 19<sup>th</sup>, 2011 from <http://www.ryerson.ca/~tmclaren/erpsme.html>

Nielsen, J. (2011): Usability 101: Introduction to Usability, Retrieved May 1<sup>st</sup>, 2011 from <http://www.useit.com/alertbox/20030825.html>

Pan, S.L., Newell, S., Huang, J. and Galliers, R.D. (2006): Overcoming knowledge management challenges during ERP implementation: The need to integrate and share different types of knowledge, *Journal of the American Society for Information Science and Technology*, 58(3), p.404-419.

Parr, A. and Shanks, G. (2000): A Taxonomy of ERP Implementation Approaches, *Proceedings*, 33<sup>rd</sup> Hawaii International Conference on Systems Sciences, Sprague, R.H., University of Hawaii.

Perens, B. (2005): The Emerging Economic Paradigm of Open Source, *Cyber Security Policy Research Institute*, George Washington University, Retrieved May 1<sup>st</sup>, 2011 from <http://perens.com/works/articles/Economic.html>

Shehab, E.M., Sharp M.W., Supramaniam, L. & Spedding, T.A. (2004): Enterprise Resource Planning: An Integrative Review, *Business Process Management Journal*, 10, No.4, 359-386

Siriginidi, S.R. (2000): Enterprise resource planning in re-engineering business, *Business Process Management Journal*, Vol. 6 No. 5, pp. 376-91.

Suraweera, T., Remus, U. and Wakerley, S. (2007): Dynamics of Knowledge Leverage in ERP Implementation, *ACIS Proceedings*, 58, Retrieved on May 10<sup>th</sup>, 2011 from <http://aisel.aisnet.org/acis2007/58>

Trochim, W.M.K. (2006) Internal Validity, Retrieved April 4<sup>th</sup>, 2011 from <http://www.socialresearchmethods.net/kb/intval.php>

Väänänen-Vainio-Mattila, K., Roto, V., and Hassenzahl, M. (2008): Towards practical user experience evaluation models, Retrieved on May 10<sup>th</sup>, 2011 from <http://research.nokia.com/files/VaananenVainioMattila-VUUM.pdf>

Venkatesh, V. and Davis, F.D. (2000): A theoretical extension of the technology acceptance model: Four longitudinal Field Studies, *Management Science*, Vol. 46(2), 186-204.

Wier, B., Hunton, J., and HassabElnaby, H.R. (2007): Enterprise Resource Planning Systems: Non-financial performance incentives: The joint impact on Corporate Performance, *International Journal of Accounting Information Systems*, 8(3), 165-190.

Wieder, B., Booth, P., Matolcsy, Z., & Ossimitz, M. –L. (2006): The impact of ERP Systems on Firm and Business Process Performance, *Journal of Enterprise Information Management*, 19(1), 13-29.

[www.opensource.org](http://www.opensource.org)

[www.opentaps.org](http://www.opentaps.org)

[www.xtuple.com](http://www.xtuple.com)

Willis, H.T., and Willis-Brown, A.H. (2002): Extending the value of ERP, *Industrial Management & Data Systems*, Vol. 102 Iss: 1, pp.35 - 38

Yen, D.C., Chou, D.C. and Chang, J. (2002): A synergic analysis for Web-based enterprise resources-planning systems, *Computer Standards & Interfaces*, Vol. 24 No. 4, pp. 337-46.