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COMPARISON OF OPEN SOURCE CUSTOMER RELATIONSHIP MANAGEMENT SOFTWARE FOR SMALL AND MEDIUM ENTERPRISES

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Comparison of Open Source Customer Relationship Management Software For SMEs

Abstract

Organizations have to manage their customer relationship by a more measurable and observable way if they want to face the changing nature of customers. Thus, CRM has become a compulsory for companies to prosper. Yet, in order to satisfy customers, to keep them loyal and retrieve information about them, the use of dedicated software has become a necessity.

SMEs are the most important organizations in every economy. In spite of the fact that CRM is an obligation for them as well, to develop and implement a CRM in such organizations is difficult as they lack budget. Therein, open source software is a potential solution. However, one can deem this type of software as solutions for specialists. Therefore, SMEs have a strong need of guidance as they often lack expertise regarding open source software.

In this study, a new method to evaluate software is proposed. Yet, it is applied to evaluate the top 10 open source CRM software which constitutes a useful tool for SMEs to select the best solution which match their needs.

Keywords: CRM–Customer Relationship Management, SME–Small and Medium Enterprise,OSS–Open Source Software, Software evaluation.

Özet

Organizasyonlar müşterilerin doğasındaki değişimle yüzleşebilmek istiyorlarsa, müşteri ilişkilerini daha ölçülebilir ve gözlemlenebilir şekilde yönetmelidirler. Bu yüzden Müşteri İlişkileri Yönetimi (MİY) şirketlerin başarısı için zorunlu hale gelmiştir. Müşteri memnuniyeti, müşteri bağlılığı ve bilgilerin müşterilerden toplanması için, özel yazılımların kullanımı artık bir gereklilik halini almıştır.

KOBİ'ler her ekonomide en önemli organizasyonlardır. MİY'in, KOBİ'ler için bir zorunluluk haline gelmiş olması gerçeğine rağmen, MİY geliştirilmesi ve uygulanması, KOBİ'lerin bütçe yetersizliği nedeniyle zordur. Bu hususta açık kaynak kodlu yazılımlar potansiyel çözümlerdir. Ancak bu tip yazılımların uzmanlar için bir çözüm olduğu sanılabilir. Bu nedenle KOBİ'ler açık kaynak kodlu yazılım konusunda ki tecrübe eksiklikleri nedeniyle, güçlü bir desteğe ihtiyaç duymaktadırlar.

Bu çalışmada, yazılımları değerlendirebilmek için yeni bir metodoloji sunulmuştur. Bu metodoloji, KOBİ'lerin kendi ihtiyaçlarını karşılayabilecek en iyi açık kaynak kodlu MİY yazılımlarını değerlendirebilmeleri için, açık kaynak kodlu en iyi 10 MİY yazılımına uygulanmıştır.

Anahtar Kelimeler: MİY–Müşteri İlişkileri Yönetimi, KOBİ–Küçük ve Orta Boylu İşletmeler, AKKY–Açık Kaynak Kodlu Yazılımlar, Yazılım Değerlendirme.

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To Ayşe and Cengiz Yılmaz

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List of Abbreviations

AJAX	Asynchronous JavaScript and XML
API	Application Programming Interface
B2B	Business to Business
B2C	Business to Consumer
CPU	Central Processing Unit
CRM	Customer Relationship Management
CSV	Comma Separated Values
EU	European Union
IDE	Integrated Development Environment
IE	Internet Explorer
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
IT	Information Technologies
JDBC	The Java Database Connectivity
J2EE	Java 2 Platform, Enterprise Edition
MS	Microsoft
MSSQL	Microsoft Structured Query Language
MYSQL	My Structured Query Language
OS	Open Source

OSI	Open Source Initiative
OSS	Open Source Software
PHP	Personal Home Page
POSIX	Portable Operating System Interface for Unix
RAM	Random Access Memory
SDK	Software Development Kit
SFA	Sales Force Automation
SMB	Small and Medium Businesses
SMEs	Small and Medium Enterprises
SQL	Structured Query Language
SSL	Secure Socket Layer
UML	Unified Modeling Language
WBI	World Bank Institute
XML	Extensible Markup Language

Chapter 1

Introduction

Globalization has started to erase boundaries between countries and a growing number of companies compete today on a global market. The increasing competition has led companies to realize that customers are the nucleus of the business world and the success of companies depend on their ability to manage their relationship with their customers. Due to the increase competition, companies have abandoned the transactional-based point of view (Palmer, 2001; Robertson & Kellow, 2001).

Within the information age, customers with "old habits" are gradually replaced by customers who are more stringent, better informed and can buy from various places such as a web site. Today's organizations have to make frequent changes to keep up with the business realities. To keep up with new technologies, new demands from customers are not easy for a large number of companies because they have traditional structures and are cumbersome. Many companies which still did not enter into the information age could not succeed to catch new customers and even lost many existing customers (Uygun & Uslu, n.d.). This happened as they did not consider the needs of customers or not enough. Until recently in Turkey, companies were only considering how they could maximize their production. In any case, they would sell their products regardless of customers' needs. As Hisarcıklıoğlu (2008) mentioned, this behavior can no longer exist in this business world which proffers to be global and toward hyper competition. Yet, thanks to globalization, customers' desires have become more important. Thus, we have moved from a push to a pull system.

In this new era, customers have started to substitute products for others providing a higher quality level. Bose (2002) explained the evolution of the business orientation as a transformation from production to a customer-centric model (see Figure 1.1).

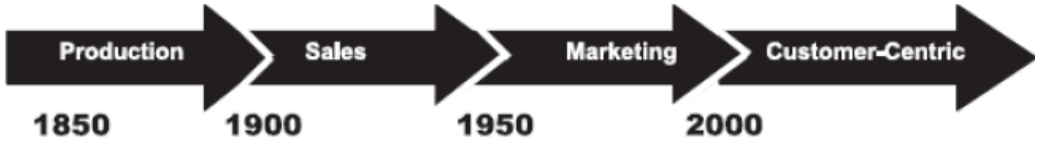

Figure 1.1: Business orientations of the last 150 years (Bose (2002))

The development of Information Technologies (IT) has increased the competition. From the release of word document to e-commerce, IT has become a leading force in the business world. As Lester and Tran (2008) stated, one of the most important components of Small and Medium Enterprises (SMEs) operation in today's competitive environments is IT. To face the increased competition, firms can lower prices, develop new products, increase promotion, add new distribution channels and improve organizations' internal processes. IT can help SMEs to create business opportunities and overcome pressures from the competition. Yet, IT has the potential to help SMEs to develop new products and to better promote them. IT can supply a competitive advantage to organizations if it is used effectively by choosing appropriate software. In order to obtain a competitive advantage, companies' managers have to keep considering how they can reach, retain and satisfy their customers. Thus, companies are forced to make structural changes. The biggest change has been obviously the customer relationship because a company cannot survive without customers (Nguyen, Sherif, & Newby, 2007). This explains the rapid rise of customer relationship management (CRM).

1.1. Research Objectives

The objective of the thesis is to propose a method to compare open source (OS) CRM software, which are potential solutions for SMEs. Firstly, the theoretical study will sum up the previous literature and research about CRM, SMEs, open source software (OSS) and software evaluation criteria. Thereafter, the OS CRM selected will be compared and evaluated (empirical study). Thus, the study aims to **provide a**

better understanding of CRM especially for SMEs and a way to select OS CRM for them to be able to develop CRM into their organization.

1.2. Thesis Structure

This thesis is divided into 2 parts: theoretical study and empirical study.

Part I (Theoretical study) sums up the literature about the subject which includes five chapters as follow:

Chapter 2 presents a literature review that provides to the reader a CRM overview. It includes the definition of CRM, objectives and benefits of CRM and why the customer relationship is important.

Chapter 3 presents a literature review that provides to the reader information about SMEs. In this chapter, the different existing definitions of SME are given according to EU, World Bank and Turkey. This chapter answers to some questions such as: Which enterprises need CRM? What is the cost of CRM? What are the reasons for implementing CRM into an SME?

Chapter 4 presents a literature review that provides to the reader information about OSS. In this chapter, we define open source and the market status for open source software. Yet, we answer to such questions: Why using open source software? Why OOS are especially interesting for SMEs?

Chapter 5 presents the evaluation methods which are the ISO/IEC and Chaffey and Wood's criteria.

In chapter 6, we present some open source CRM software. These software were selected as they are deemed as the best open source CRMs by some authors, developers and researches.

Part II is the empirical study and Chapter 7 depicts the study. In the light of the previous chapters, the comparison of the selected open source customer relationship management software is done. In this chapter, the reader can easily understand the differences between the selected 10 OS CRM software.

Chapter 2

Customer Relationship Management

2.1. Objective of the Chapter

The objective of the chapter is to provide a wide view of CRM and underline relevant issues of CRM.

2.2. Defining Customer Relationship Management

Understanding and meeting customers' needs is a very important weapon to be competitive. Following Wilson, Daniel and McDonald (2002), today's customers are more educated, live longer, and more influenced by the global culture than those of the 60s and 70s when our view of marketing was formed. That is to say, customers are more conscious and they know what they want. If a company can handle that, they might prosper. It is evident that the management of customer relationships is very important for organizations.

A CRM system aims to save all types of information about customers in databases which are designed in order to provide an organized mechanism for storing, managing and obtaining information. Typical information can be customer names, addresses, what did they buy, when, how much and the problems they faced eventually. The aim of this system is to generate reports and to supply valuable information to marketing and customer service departments in order to give better and faster service.

As Yun, Wen and Yen (2003, p.39) mentioned, the Sweeney Group definition of CRM as "all the tools, technologies and procedures to manage, improve, or facilitate

sales, support and related interaction with customers, prospects, and business partners throughout the enterprise." In the literature, there is not a universal definition of CRM. According to Zablah, Bellenger and Johnston (2004), there are approximately 45 distinct definitions of CRM. Below, there are some different definitions.

According to Wilson et al. (2002, p.193)

> CRM is a concept that enables an organization to tailor specific products or services to each individual customer. In the most advanced scenario, CRM may be used to create a personalized, one-to-one experience that will give the individual customer a sense of being cared for, thus opening up new marketing opportunities based on the preferences and history of the customer.

Yet, Dyche (2001, p4) has stated that "the infrastructure that enables the delineation of and increase in customer value, and the correct means by which to motivate valuable customers to remain loyal – indeed, to buy again."

Day and Van Den Bulte (2002) has defined

> CRM as a cross-functional process for achieving a continuous dialogue with customers, across all their contact and access points, with personalized treatment for the most valuable customers, to increase customer retention and the effectiveness of marketing initiatives.

Kincaid (2002, p.34) gave a broad definition "CRM is the strategic use of information, processes, technology and people to manage the customer's relationships with your company (marketing, sales, services, and support) across the whole customer life cycle."

According to Peelen (2005, p.6) "CRM is a business strategy and therefore more than a functional strategy alone. It affects the organization as a whole: marketing, IT, service, logistics, finance, production and development, HR, management etc."

Bose and Sugamaran (2003, p.4) mentioned that

> CRM is about managing customer knowledge to better understand and serve them. It is an umbrella concept that places the customer at the center of an organization. Customer service is an important component of CRM; however

> CRM is also concerned with coordinating customer relations across all business functions, points of interaction and audiences.

According to Magaña and Whitehead (2010), a CRM is: a system that manages information and processes pertaining to the relationship and interactions with your customers.

Ghahfarokhi and Zakaria (2009) stated that CRM is a business philosophy that supplies a vision to your organization in order to deal with your customers.

All the above definitions prove that, CRM is an immaculate concept to reach, understand and meet customers' needs by tailoring specific products or services to each singular customer, and also thanks to CRM, organizations can show importance to customers by including them at the center of the system. Moreover, CRM provides organizations the chance to use data to realize the needs of customers by a cross-functional process.

The world and technology have been changing day by day; organizations must take into account customers' behaviors which have been changing year over year. The ancient Greek philosopher Heraclitus (n.d.) said that "the only thing that is immune to change is change itself." Thus, CRM is not a static concept. Greenberg (2001) stated that in order to understand CRM, you must also understand the changing nature of the customers because customers are not what they used to be.

As seen formerly, the power definitely belongs to customers, therefore organizations especially small and medium enterprises should pay more attention to customer relationship.

2.3. Overview of Customer Relationship Management

One of the world's most respected thinkers on management – Peter Drucker (1993) said that "the purpose of business is to create and keep a customer." It is similar to the objectives of CRM. At this point it is worth mentioning the objectives and possible benefits of CRM. The following presents a brief look of the objectives and possible benefits of CRM.

By using CRM, an organization can achieve five main goals. ("*Customer Relationship*," 2002). These goals are listed below.

1. Customer identification: Thanks to CRM, organizations can ascertain gainful customers. When organizations isolate the gainful customers from the others, one can make sure that organization can focus on them and profitability can be increased.
2. Data management: CRM makes the data management easier. CRM software warrants compatibility among distinct types of software that are used in different departments in organizations. Therein, someone who is authorized to login into the system can login and reach the data.
3. Success measurement: CRM supplies a right way of measuring success. Organizations which obtain new customers cannot determine who or what assured the customers to do business with them. By using CRM, organizations can get this information.
4. Analysis speed: CRM facilitates processing, analyzing and reviewed. This speed allows companies to make a response quickly to the changes into the market.
5. Return on investment: Another objective of CRM is to have high return on investment. As Tie (2003) mentioned, a CRM solution ensures a better ROI prediction.

According to Nguyen et al. (2007), the possible benefits in terms of competitive advantages are increases in customer loyalty, superior service, superior information gathering and knowledge sharing supplied by using CRM system. Swift (2001) adds the following benefits that increased customer profitability and evaluation of customer profitability.

A survey aiming to know why companies adopt CRM has been achieved in North America and Europe in August 2009, by Forrester Research (Band, 2010). It includes 200 survey participants for Business to Business (B2B) and 82 survey participants for Business to Consumer (B2C). For B2B, transaction about products and services consists between organizations; as opposed to it, B2C consists between organization

and a consumer. B2B and B2C enterprises stated that they use CRM in order to firstly improve the customer loyalty and attract new customers (see Figure 2.1)

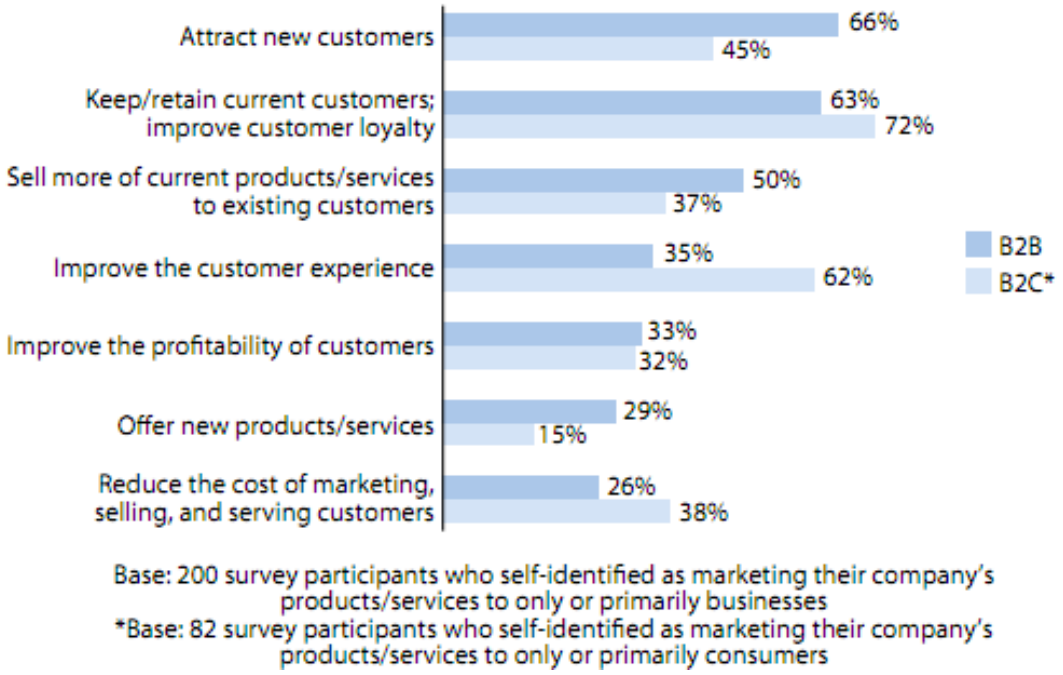

Figure 2.1: Customer management goals (Band, 2010)

Chapter 3

Small and Medium Enterprises

3.1. Objective of the Chapter

The objective of the chapter is to supply definitions (by EU, WBI and Turkey) of SMEs and general information.

3.2. Defining Small and Medium Enterprise

The definition of SMEs enhances differences among countries. The most determinant variable is the number of employees.

3.2.1. The European Union Definition

SMEs play a central role in the European economy. They are a major source of entrepreneurial skills, innovation and employment. In European Union (EU) of 25 countries, some 23 million SMEs supply around 75 million jobs and represent 99% of all enterprises. (European Union [EU], 2003)

The EU Commission has published a user guide in all community in order to facilitate the application of the definition. In this guide, enterprises are categorized in three parts that are about staff, headcount and financial ceilings determining enterprise categories. (European Union Commission Recommendation [EUCR], 2003)

1. The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.

2. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million.
3. Within the SME category, a microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

Enterprises	**Persons**	**Turnover**	**Balance sheet total**
Medium-sized	< 250	≤ 50 million €	≤ 43 million €
Small	< 50	≤ 10 million €	≤ 10 million €
Micro	< 10	≤ 2 million €	≤ 2 million €

Table 3.1: Definition of SMEs of the EU

There are three criteria which help to determine whether accompany is medium sized or small or micro enterprise. These are

- staff headcount,
- annual turnover,
- annual balance sheet.

One of the priorities of the European Commission is to support SMEs in order to overcome the unemployment and to supply economic growth. Many of these SMEs have lots of difficulties in obtaining money, especially when they are started up.

3.2.2. The World Bank Institute Definition

The definition provided by the World Bank Institute (WBI) (2004), is below:

Enterprises	**Persons**	**Turnover**	**Balance sheet total**
Medium-sized	< 300	≤ 15 million US$	≤ 15 million US$
Small	< 50	≤ 3 million US$	≤ 3 million US$
Micro	< 10	≤ 100.000 US$	≤ 100.000 US$

Table 3.2: Definition of SMEs of the WBI

3.2.3. In Turkey

In Turkey, according to the regulation which was published in the Turkish Official Journal (2005), SMEs are defined as:

- Micro Enterprise: There are less than 10 persons and turnover value and balance sheet value are less than 1.000.000 TL
- Small Enterprise: There are less than 50 persons and turnover value and balance sheet value are less than 5.000.000 TL
- Medium Sized Enterprise: There are less than 250 persons and turnover value and balance sheet value are less than 25.000.000 TL

Enterprises	**Persons**	**Turnover**	**Balance sheet total**
Medium-sized	< 250	≤ 25 million TL	≤ 25 million TL
Small	< 50	≤ 5 million TL	≤ 5 million TL
Micro	< 10	≤ 1 million TL	≤ 1 million TL

Table 3.3: Definition of SMEs of Turkey

3.3. Overview of Small and Medium Enterprise

Recently, SMEs have become a common form of business organization and the main creators of jobs in the world. SMEs account for more than 95 percent of all firms in many countries and they play a major role in world economies (Chiao, Yang, & Yu, 2006, p.475). Thus, SME are accepted as centers of employment, innovation and growth.

According to Günter Verheugen who is Member of the European Commission, the engine of the European economy is SMEs. Verheugen (EU, 2003, p.3) said that "They are an essential source of jobs, create entrepreneurial spirit and innovation in the EU and are thus crucial for fostering competitiveness and employment."

In order to understand the performance of SMEs in Turkey, we can look at the survey from the Turkish Statistical Institute (as cited in Hurriyet Daily Newspaper, 2011). In 2009, Turkey's overall exports' 60 percent carried out by SMEs and 40 percent of imports were brought into the country by SMEs.

Wright, Bisson and Duffy (2011) have founded surprising results about the technology support and IT systems in Turkey (206 SMEs answered to this question). Wright et al. (2011, p.5) have stated that "52.4% stated that they did not use any systems at all to manage their competitive information, saying that it was in their minds and they relied on their memory." According to their survey, the status of technology support is "Simple Technology Support" which means "the company is just using the free web such as a search engine or looking at some web sites which require no specific knowledge. Also use general office software such as spreadsheet." In addition to this, the status of IT systems is "Dismissive" which means "does not use any IT system to manage competitive information". In the light of this survey, the status of SMEs in Turkey is obvious, the awareness and use of technology is very low. This strengthens the importance of this thesis topic.

3.4. Which Enterprises Need CRM Software?

For very small companies that have less than ten employees, it is possible to know customers but for larger companies, definitely a software support is needed to store the necessary information that can be about customer's product choice, the price of sold products, etc. Unfortunately in Turkey, according to Wright et al. (2011), 52.4% of respondents of their study to manage their competitive information, they relied on their memory.

Therefore, if SMEs want to survive and retain their customers and want to know customers individually, organizations have to implement a CRM system.

3.5. Why are CRM Software Important for SMEs?

In Turkey, for SMEs, having all rights of commercial CRM software (such as Microsoft CRM) is too expensive. For example the cost of Microsoft Dynamics CRM server which is recommended for companies with more than five users is $5.823 (Purchase Microsoft CRM, 2010). At the same time, the OS sector has become more credible. The OS CRM can be preferred especially by start-up organizations and SMEs. As Lang and Calantone (1997) pointed out, SMEs differ from large companies mainly in their limited financial abilities affecting their information-seeking practices.

To survive in the local and global market, focusing on customers is a key factor for organizations which are small, medium and large. In addition, acquiring a new customer is five times more than the cost of retaining an old customer (Payne, 2002). That's why customer retention is important for SMEs because of their limited resources (Baumeister, 2002).

As Ramdani, Kawalek, and Lorenzo (2009) have underlined if SMEs want to compete effectively and beyond that survive in the global market, they have to implement CRM. There are six reasons to implement CRM (Xu & Walton, 2005).

Reasons for implementing CRM
Improving customer satisfaction level
Retaining existing customers
Improving customer lifetime value
Providing better strategic information to sales, marketing, finance etc.
Attracting new customers
Cost savings

Table 3.4: Reasons for implementing CRM (Xu & Walton, 2005, p.959)

A study done by Kimiloglu and Zarali (2009) shows that over 72 businesses in Turkey, companies that succeed in adapting CRM into their companies, have shown significant improvement on the issues below:

- Reliability of business process
- Speed
- Customer satisfaction
- Brand image
- Revenue
- Effectiveness
- Technology utilization

Considering all the information in this chapter, in my opinion there are three important characteristics that CRM system can offer to an organization.

1. The system tracks every interaction and transaction that describes the customer's purchase, interest and demands for an organization. Also the

system can report the changing needs of the customer, so one will be aware of the needs of customer and by this way will let the organization to react effectively to the change.

2. CRM systems collect data about the service requests, customer information, order entry, billing etc.
3. Thanks to CRM, organizations can measure the performance.

While CRM software is vital for SMEs, due to limited budget a large number of SMEs have difficulties in implementing such solutions. Thus, a potential solution is open source software.

3.6. Different Types of CRM Software

OSS has the capacity to compete with traditional commercial software.

3.6.1. Commercial

According to Parsons and Oja (2010, p.149) "commercial software is typically sold in computer stores or at Web sites. Although you buy this software, you actually purchase only the right to use it under the terms of the software license." When one purchases commercial software, everything is designed in respect to general needs. Moreover, purchasing commercial software makes organizations dependent on the vendor for the maintenance (Hall, 2008).

3.6.2. Open Source

According to Parsons and Oja (2010, p.150) "open source software may be sold or distributed free of charge in compiled from, but it must, in every case, also include the source code." When one obtains OSS, one can customize everything according to the organization's needs.

In the next chapter, we provide background information about OSS and the market status.

Chapter 4

Open Source Software

4.1. Objective of the Chapter

The objective of the chapter is to supply information about OSS by illuminating relevant issues of OSS.

4.2. Defining Open Source Software

According to Hansen, Köhntopp, and Pfitzmann (2002, p.461), OSS means that "the source code is distributed along with the executable program. It is free to use. It includes a license allowing anyone to modify and redistribute the software."

Today, there is no strict definition of open source but many accept that one software can be declared as open source software if it follows the ten criteria in the definition of open source which is published by Open Source Initiative (OSI, 2002). As Hedgebeth (2007) and Hansen et al. (2002) underlined the OSI is a non-profit industry recognized approval authority and the aim of OSI is to enhance the awareness about OSS.

According to OSI, OSS is not only free access to the source code, it is more than that. OSI prefers a set of specific criteria instead of one definition. As Kuehnel (2008) has mentioned, a software program can only be considered open source, if it fulfils all of the ten prerequisites of the open source definition. There are some versions of open source definition which are published by OSI but the latest version is 1.9.

The 10 criteria for being an OSS (for the details, see Appendix 1) are:

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

These prerequisites show the main differences between open source and commercial software.

OSS provides users free rights to run programs for any purpose. You do not have to pay royalties to another developer. Yet, you can modify the programs. The power of OSS has been coming from that point. You can modify the programs for your special needs. Open source software can be modified in terms of needs and can be simplified by software developers. In addition, OSS can be used on mobile phones and computers as well and in many other technological areas. There is no limitation. OSS can be used by single and all types of corporations.

We define OSS as software whose source codes are opened to public and be modified according to the demand. The characteristics are that is it is free, fast and secured.

4.3. Overview of Open Source Software

OSS has existed since the 1960's (Weber, 2004) but only in the last 10 years, it has started to be known into the market. In 1983, the Free Software Foundation was built by Richard Stallman (Hars & Ou, 2002) and the 'Open Source' (OS) term was introduced in 1998 (Raymond, 1998). After that, more and more companies started to be interested in OSS.

4.3.1. Market Status

While open source is mature in many areas, we cannot say the same thing for its applications. The operating systems, application servers and security systems can be deemed as mature. The Netcraft web server survey was achieved in May 2010.

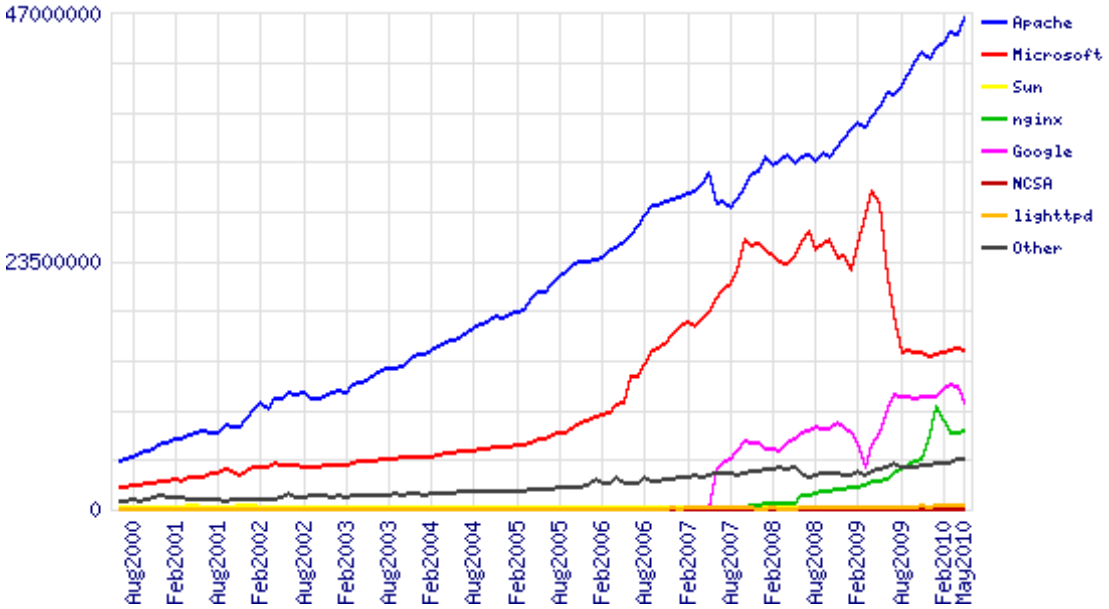

Figure 4.1: Total for Active Servers Across All Domains (June 2000 - May 2010) (Netcraft's survey, 2010)

Developer	April 2010	Percent	May 2010	Percent	Change
Apache	44,965,707	53,38%	46,608,654	55,36%	1.98
Microsoft	15,211,533	18,06%	14,977,560	17,79%	-0.27
Google	11,544,903	13,71%	10,064,872	11,95%	-1,75
nginx	7,293,935	8,66%	7,387,460	8,77%	0.11
lighttpd	330,506	0,39%	339,862	0,40%	0.01

Table 4.1: Internet Web Server Market (Netcraft's survey, 2010)

According to Netcraft's survey (2010), there are five major web servers and the survey shows that the Apache Web Server is dominant in the Internet web server market. Microsoft's web server is commercial and the others are OS.

On the other hand, Eclipse (2010), which began as a Java integrated development environment (IDE) but has evolved into larger and more diverse open source

community which is well-established, made a survey about primary operating systems for software development. In this survey, one can see three periods (2007, 2009 and 2010). Again, it shows the increase of open source. OSS is being enthroned because of the cost of commercial software and most importantly commercial software make organizations and individuals dependent on vendors.

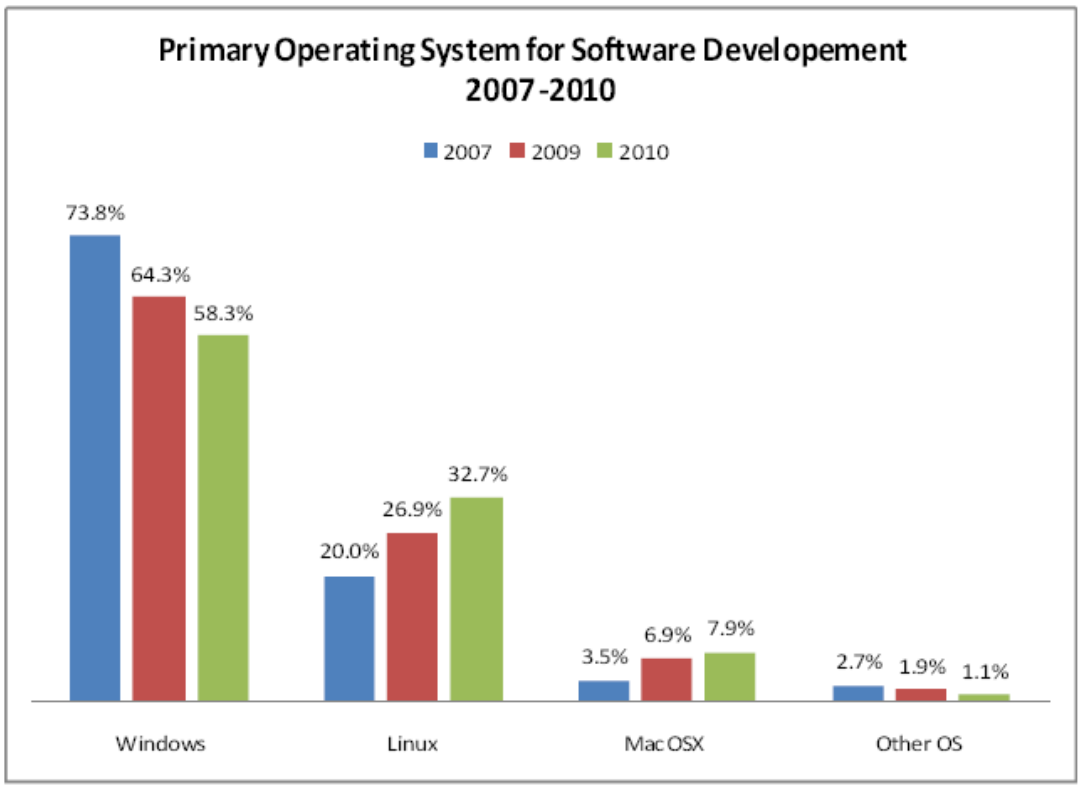

Figure 4.2: Primary Operating System for Software Development
(Eclipse (2010, p.10))

In total there were 1,948 responded and 1,696 completed the whole survey. The survey's scope was from 2007 until 2010. There were two countries that had higher rates than other countries: Germany which had 25.7% rate and France which had 15.4% rate. In 2007, approximately 74% of the selected developers were using Windows as their primary development operating system. After 3 years, it dropped to 58%. Thus, developers try to shift from Microsoft Windows to Linux.

According to Hammond (2010), organizations plan to implement or expand the use of following software technologies. The research question was: “What are your firms plans to implement or expand its use of the following software technologies in the next 12 months?”. 2227 software decision-makers in the North American and European enterprises and Small and Medium Business (SMB) participated to the survey. And the results show the importance of OSS (see Figure 4.3).

- Expand / Upgrade – 13%
- Implementing / Implemented – 17%
- Piloting – 10%
- Interested / Considering – 25%
- Not Interested / Don’t know – 34%
- Decreasing and Removing – 1%

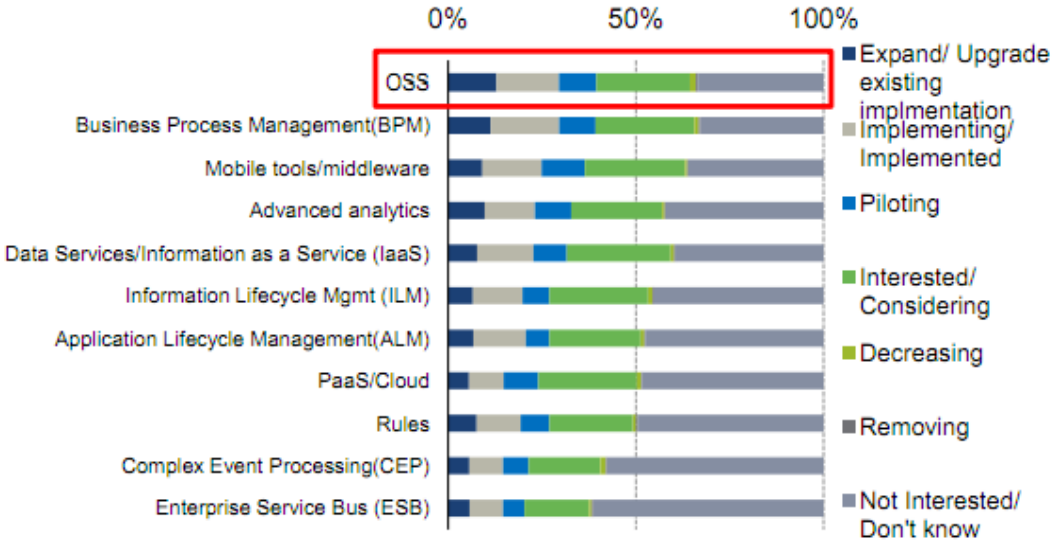

Figure 4.3: Adopting OSS was an important technology goal

According to this study, the interest in OSS has been growing. In the light of growing open source sector, we provide some popular open source software and their purpose.

Name	Purpose
Linux	Operating System
Apache	Web Server
GCC	C and C++ compiler
Mysql	Relational Database System
Mozilla Firefox	Web Browser
Perl	Programming Language
Open Office	Office Productivity Suites
Tomcat	Application Server
Pidgin	Instant Messenger

Table 4.2: Popular open source software

Below, one can see the ranges of their market shares globally.

Open Source Software	Type of Application	High Estimate	Low Estimate
Apache	Web Server	65%	55%
Sendmail	Email Client	76%	42%
Linux Server	Server Operating System	35%	28%
MySQL	Database	33%	29%
Firefox	Internet Browser	27%	10%
Linux Workstation	Client Operating System	3%	1%
Open Office	Office Productivity Suite	4%	2%

Table 4.3: The market shares of OSS into the global market
(Nagy, Yassin, & Bhattacherjee, 2010)

Table 4.3 shows that the OS market is large and grows for some applications such as Web servers (such as Apache), server operating systems (such as Linux Server) and database servers (such as MySQL) etc. On the other hand, it is behind its commercial substitute in other domains such as office productivity software (such as Open Office) and client operating systems (such as Linux Workstation).

As Long (2006) mentioned an organization could invest in an OSS project and use the freely available software to increase their market share in a particular business sector.

4.3.1.1. In Turkey

Many countries such as Germany, Spain, Mexico, Brazil, China, Korea, and India have adopted OSS and are part of their information society strategy. For reasons of security and saving, the European Union, UNESCO and World Bank suggest the development of OSS.

In Turkey, there are sporadic examples open source projects. In 2007, the part of the Ministry of Defense - the Military Recruitment Division – announced that it was switching to the Pardus Linux on all of their 4.500 desktops and exactly more than five hundred servers (Lewis, 2008).

Instead of importing ready solutions, using OSS in Turkey means that one invests in Turkey. Firstly, OSS reduces the cost since there are no licenses, supports the local developers and then companies; yet, it increases the competitiveness of Turkey.

Under these circumstances, the knowledge of OSS has been understood day by day in Turkey. According to Şule (2009) who is the assistant general manager of Sun Microsystems, in Turkey there have been active communities about OSS day by day.

There is a worldwide survey that is made by Red hat which is the world's leading open source technology solutions provider. This survey aims to create a tool to quickly compare countries based on their open source activities and environment (Redhat, 2009). According to Redhat (2009) activity is defined as "an index which measures the amount of open source happening today. It tends to be made up of concrete factors, such as existing open source and open standards policies and number of OSS users or producers, such as Linux and Google Summer of Code." and the other one environmental factors are" more speculative. Even a country that does not have a high degree of current penetration of open source may have a high number of internet users and information technology patents. These factors may indicate a favorable environment for open source software to take hold. Still, the correlation between a country's score on the activity and its environment is quite high."

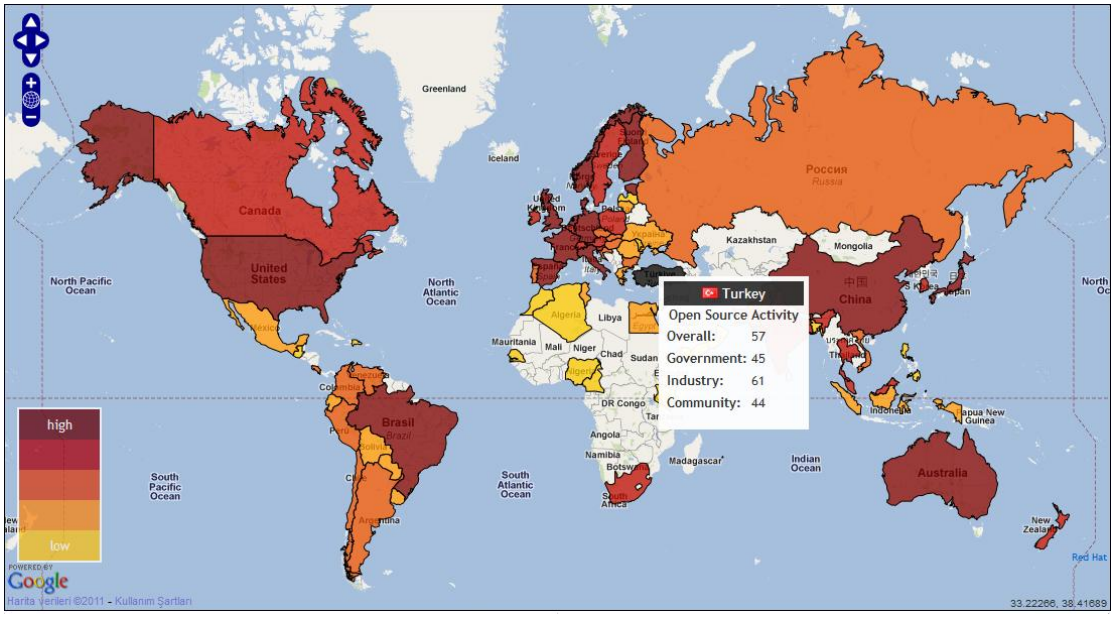

Figure 4.4: Activity Map (RedHat, 2009)

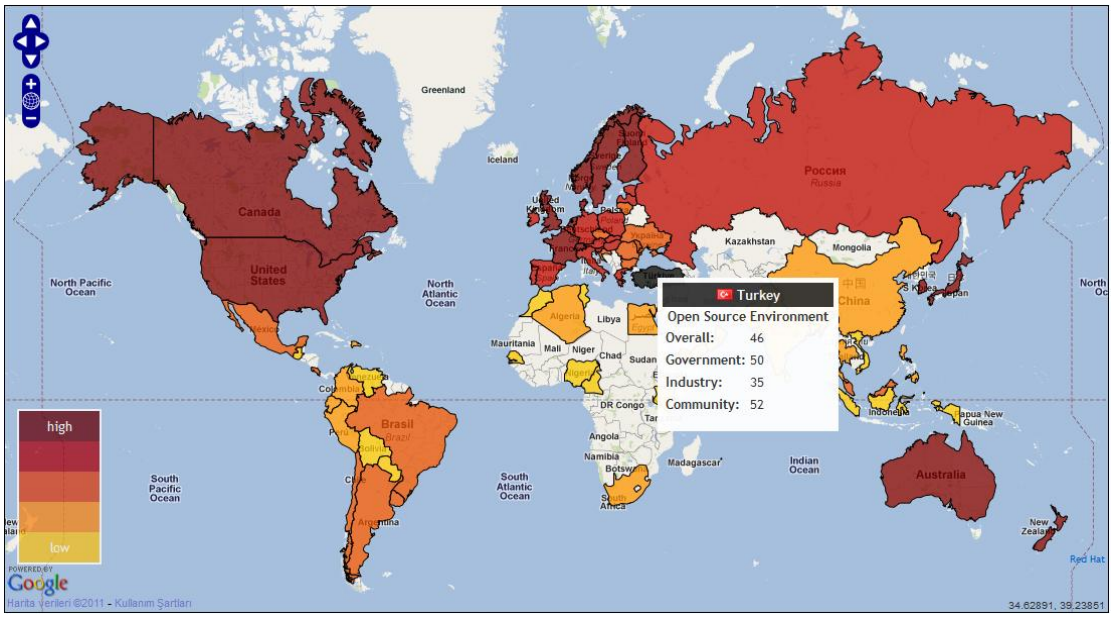

Figure 4.5: Environmental Map (RedHat, 2009)

From these 2 figures, one could see there are still rooms for improvements in Turkey as for activities Turkey is ranked 57 over 74 countries and concerning the environment it is ranked 46. In this survey the activity overall score of Germany is 3 and environment is 16. France is 1 for activity and it s environment is the 15th.

4.4. Why Should One Develop Open Source Software?

Users and software developers pay attention to OSS because it gives them economic advantages. Yet, an OSS can have many developers from different cultures and countries so the development and the spreading of software are easier. Computer Economics (2005) released a survey. They conducted a survey of visitors to its website regarding the perceived advantages in the use of OSS. The results are surprising although there is not a scientific sample. They collected the answers to one question which had five possible answers about the advantages of open source. The question was "What is the most important advantage in the use of open source among these items below?"

- Lower total cost of ownership
- Reduced dependence on software vendors
- Easier to customize
- Higher level of security
- Do not see a significant advantage

The results of the survey are shown in the chart below (see Figure 4.6).

This survey reported that:

- 3% of respondents chose "higher level of security".
- 17% of respondents chose "easier to customize".
- 14% of respondents thought that open source had no significant advantages.
- 22% of respondents chose "lower total cost of ownership".
- 44% of respondents chose "reduced dependence on software vendors".

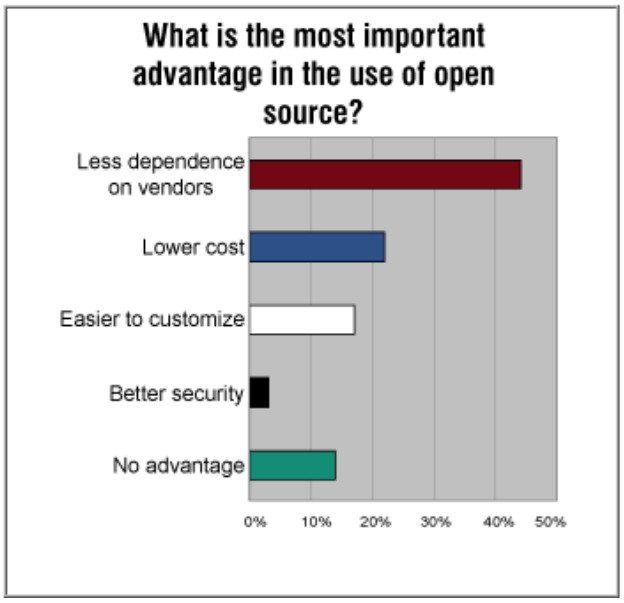

Figure 4.6: What is the most important advantage in the use of open source? (Computer Economics, 2005)

According to this survey, IT decision makers gave importance to "reduced dependence on software vendors". Because everyone wants to be free and organizations want as well. If organizations are independent, there is no edge except for them. Therefore, most of respondents chose "the reduced dependence on software vendors".

4.4.1. Comparison of Commercial vs. Open Source CRM Software

As mentioned before, OSS has a large number of advantages for SMEs. Below, the table summarizes the differences between commercial and OS ones.

OPEN SOURCE	COMMERCIAL
Free licensing	Pay for licensing
Ability for full customization	Customization on client pattern
Retaining control of user's data	Control over clients
Many features for free	Best features or all features for pay
Support free	Hand-holding and follow-up
Used by the developer for advertising	Used by the developer for profit
Improvement along with good communication with users	Spying on the users
Full access	Restricting access
Free will upgrades	Imposed upgrades
Lack of project support	Full support
Projects may "die on the vine"	Contractual obligations and schedules

Table 4.4: Open Source vs. Commercial (Piroscâ et al., 2009)

In order to appraise the user-side evaluation of open source software systems, Forrester Consulting (2007) made a survey which includes 486 firms. Yet, another was made by Gartner (as citied Gyula & Andras, 2009, p.913) which includes 300 firms. According to these surveys the main benefits of OSS are:

- Cost of ownership is lower
- Use without constraints
- Rapid implementation of new projects
- Lower dependence to the vendors

Yet, the figure below enhances the differences between OSS and commercial software.

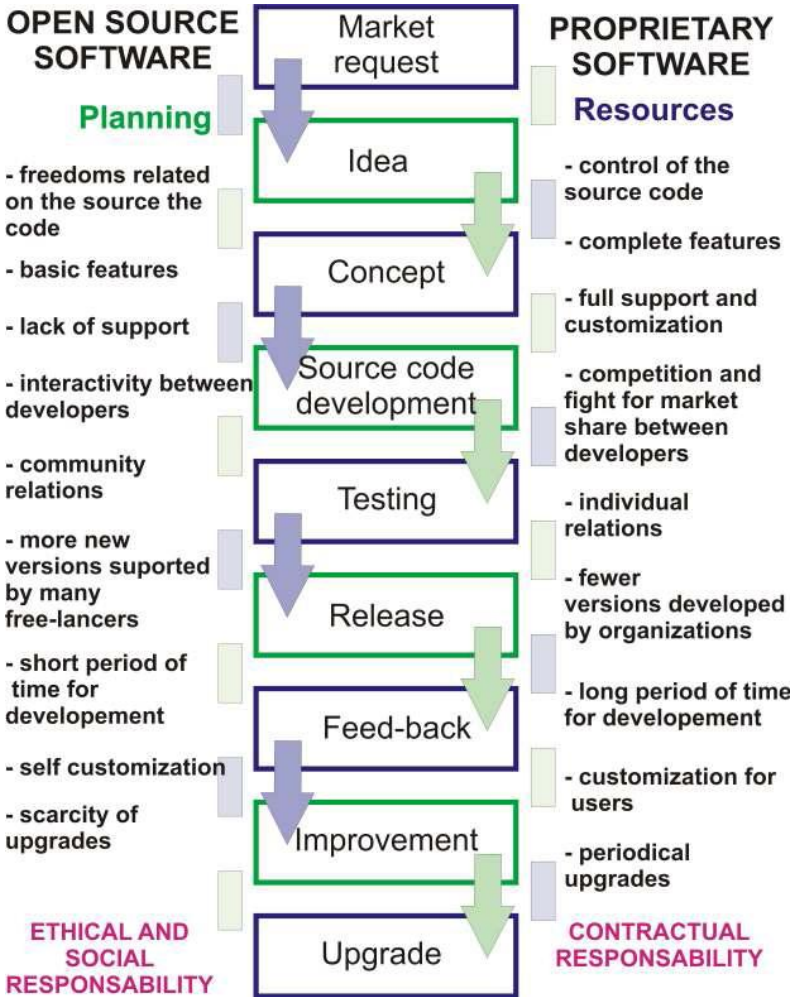

Figure 4.7 Software development between open source and proprietary (commercial) projects (Piroscâ et al., 2009, p.68)

4.5. Open Source Software and Small and Medium Enterprises

It is evident that today companies have started to pay attention to reduce the licensing fees of commercial software. As mentioned before, there are many benefits of open source CRM for companies especially for the SMEs. Many companies realized the OSS stunning cost savings and benefits. For example years and years ago, Amazon.com cut technology spending from $71 million to $54 million (it is approximately $17 million) only by switching to open source applications (Redhat, 2001). Another fascinating story is the F5 story. F5 is the market share leader in Application Delivery Controllers (Skorupa & Nhat, 2010), with revenues of over $882 million in 2010. The customers of F5 include 41 of the top 50 Fortune 500 companies, more than 16,000 organizations and 15 of the world's top 15 commercial banks. According to Mr. Butterfield who is a development manager of F5 using MySQL with partitioning, they were able to take their products from a maximum of 3,500 records per second to 22,000 records per second. This is basically 6 times more performance. Last example is a financial institution in Japan. Shinsei standardized its CRM system on MySQL and used one OS CRM which is SugarCRM. As a result, Shinsei successfully developed an entirely new enterprise system in one fourth of the time and by saving 90% of the cost of using legacy mainframes and commercial packaged software.

In Turkey, SMEs are very important for the economy like other countries (Wright et al., 2011). Although SMEs are the engine of Turkey's economy, they have still technological problems. In order to indicate the increase of SMEs in Turkey, there are two statistics done by Türkiye İstatistik Kurumu (TUIK) on 2002 and 2009. On 2002 statistics, there were 1.858.191 organizations and approximately 1.856.340 of them were SMEs. That is to say, SMEs form 99.6% of whole organizations. On 2009, there were 3.222.133 organizations. SMEs were representing 99.9 % of all organizations in Turkey. From 2002 to 2009, the number of organizations increased 1.75 times.Below, the table 4.5 shows the proportion of enterprises which have access to the internet and their usage of computer.

	Reference Period	Size group							
		Total		10-49		50-249		250+	
		Computer (%)	Internet access (%)	Computer (%)	Internet access (%)	Computer (%)	Internet access (%)	Computer (%)	Internet access (%)
General	**2005**	**87,8**	**80,4**	**86,0**	**78,0**	**96,3**	**92,3**	**99,8**	**99,2**
	2007	**88,7**	**85,4**	**87,0**	**83,3**	**95,0**	**93,6**	**99,3**	**99,2**
	2008	**90,6**	**89,2**	**89,3**	**87,5**	**95,3**	**95,0**	**98,4**	**98,1**
	2009	**90,7**	**88,8**	**89,5**	**87,5**	**97,7**	**96,9**	**99,3**	**99,0**

Table 4.5 Proportion of enterprises which have internet access and use computer by economic activity and size group - I (TUIK, 2010)

In this table, "general" integrates the following types of companies: manufacturing, construction, wholesale and retail trade, hotels-camping sites and other provision of short-stay accommodation, transport, storage and communication, real estate, renting and business activities, motion picture and video activities- radio and television activities, other monetary intermediation and other credit granting, life insurance and non-life insurance and these titles from economic activity (Statistical Classification of Economic Activities in The European Community [NACE], 2002)

	Reference Period	Size group							
		Total		10-49		50-249		250+	
		Computer (%)	Internet access (%)	Computer (%)	Internet access (%)	Computer (%)	Internet access (%)	Computer (%)	Internet access (%)
General	**2010**	**92,3**	**90,9**	**91,3**	**89,7**	**97,0**	**96,9**	**98,5**	**98,4**

Table 4.6 Proportion of enterprises which have internet access and use computer by economic activity and size group - II (TUIK, 2010)

In 2010, "general" corresponds to manufacturing, electricity, gas and steam, water supply, sewerage and waste management, construction, wholesale and retail trade; repair of motor vehicles and motorcycles, transportation and storage, accommodation and food service activities, information and communication, real estate activities,

professional, scientific and support activities, administrative and support activities, repair of computers, financial and insurance activities and these titles from economic activity. (NACE 2, 2008)

As one can see, the rates of using computers and having access to the internet have increased. If one knows that the majority of these companies use commercial software, there is a tremendous budget that companies allocate for purchasing IT products and services. According to Bulmuş, Oktay, and Törüner (1990) the source of problems is behind the SMEs' capital in Turkey. Kyaw (2008) has underlined that the financing problem of SMEs is one of the biggest constraints. Although Bulmuş et al. mentioned this problem 21 years ago, the situation is almost the same all around the world. Entrepreneurs start their business with a little capital and they have to use this capital for investments and marketing studies. At least, for financial budgeting problem, SMEs can choose OS CRM software.

Let's have a look at a research that shows that the percentage of companies of minimum $50 million of turnover which use OSS. Yet, they state their reasons for using the OSS (see Table 4.7).

Reason	**Percentage**
Reduce cost of commercial packaged software	74 %
Reduce cost of custom software	66 %
Lower support and maintenance costs of commercial packaged software	49 %
Higher-quality, ore secure software	47 %
Reduce computer hardware costs	44 %
Reduce dependence on commercial packages software	44 %
Build custom systems faster	38 %
Create software standards across departments, functions, and/or business units or divisions	38 %
Need for functions not available in commercial packaged software	37 %
Interest buy technologists in gaining new knowledge and skills	32 %

Table 4.7 Why organizations are using OSS (Walli, Gynn, & Rotz, 2005, p.6)

IT became more important for organizations in order to do their business. The cost of software is the biggest part of the IT budget for organizations. It includes initial costs, upgrades, maintenance, support, consultant and other services (Walli et al.,

2005). Unlike big companies, SMEs did not choose open source software to reduce the costs.

My personal experience showed that many SMEs in Turkey do not know even what OS CRM software is. Some of these SMEs do not know how to choose the software. In addition, some of these SMEs have traditional management, so there is no chance to be able to change the process of doing business. Some SMEs do not know the benefits of open source CRM and CRM as well. This strengthens the importance of this thesis topic.

As mentioned before, SMEs are very important for economies as they are the most important job creators. At the same time, customers are more stringent, the competition is global. And, they often do not have the skills and/or budget to acquire the resources on the market to analyze customers' needs scientifically. That's why OS can be a solution.

Chapter 5

Methods to Evaluate Software

5.1. Objective of the Chapter

The objective of the chapter is to supply information about evaluation methods of software by illuminating relevant issues of such methods. This chapter is organized as following. General information about evaluation methods such as Rowley's criteria, Dengate's criteria, ISO/IEC and Chaffey and Wood's criteria. Moreover, the selection of suitable criteria for OSS evaluation will be handled.

5.2. Evaluation Methods

According to Rowley (1993), general criteria for software selection was about cost, lifetime and life history, originator, supplier, support, maintenance, technical considerations and compatibility, ease of use, interface and integration. From Dengate's (2009) point of view, in order to choose a suitable CRM solution, the general factors are functionality and characteristics of solutions such as support and documentation, the recording of inventory, the campaign of sales and marketing support and customization can be considered. The most accepted definition is the ISO/IEC 9126 standardization. The ISO/IEC 9126 defines a quality model for software products. The ISO/IEC 9126 standard helps to clarify quality attributes and provides guidance for revising the standard (Jung, Kim & Chung, 2004).

There are different types of software quality models in software engineering such as McCall's quality model, Boehm's quality model, ISO/IEC 9126 quality model etc. Jamwal (2010, p.23) said that "the ISO 9126 quality model is the most useful one since it has been built based on an international consensus and agreement from all

the country members of the ISO organization." Theoretically, the ISO/IEC 9126 seems well suited for software quality (Suryn, Georgiadou, & Ing, 2006). Yet, Chua and Dyson (2004) proposed the ISO / IEC 9126 Model as a useful tool for evaluating system. The ISO/IEC 9126 outlines a uniform framework well-suited for the evaluation of quality features (Carvallo & Franch, 2006). Therein, I have chosen the ISO/IEC 9126 to evaluate OS CRM systems. It includes six main criteria; functionality, reliability, usability, efficiency, maintainability and portability. Yet, the study sought to extend that model by gathering suitable criteria from Chaffey and Wood's (2005).

5.2.1. ISO/IEC 9126

In order to make a standard to have a common language in 1985, they developed the ISO/IEC 9126. The ISO/IEC 9126 was issued in 1991 and revised in 2001 in four parts (ISO/IEC 9126-1 to 9126-4) ISO/IEC 9126 is the software product evaluation standard from the International Organization for Standardization / the International Electrical Technical Commission.

Four main parts of the ISO/IEC 9126 standard

Part 1 – Software Engineering – Product quality – "Quality model"

Part 2 – Software Engineering – Product quality – "External metrics"

Part 3 – Software Engineering – Product quality – "Internal metrics"

Part 4 – Software Engineering – Product quality – "Quality in use metrics"

The quality model is mentioned in the first part of the ISO/IEC 9126. This part contains two quality models for the internal/external quality and quality in-use.

The external / internal software quality model contains six main characteristics (see Figure 5.1)

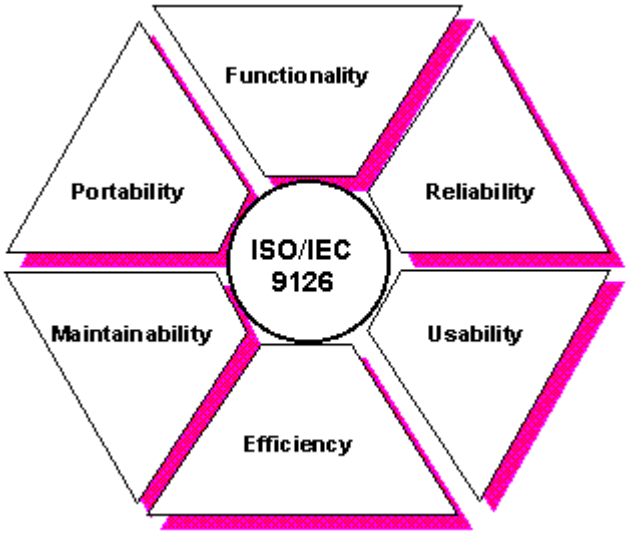

Figure 5.1 ISO / IEC 9126 (ISO, n.d.)

The second, third and fourth parts of the ISO/IEC 9126 contains huge sets of metrics.

5.2.2. Chaffey and Woods Criteria

Chaffey and Wood (2005) states that when selecting a software which will be installed into an organization, there are lots of criteria to be considered. Yet, they use nine main criteria that are used to compare software from different vendors:

1. Functionality
2. Ease of use
3. Performance
4. Scalability
5. Compatibility or interoperability
6. Extensibility
7. Stability or reliability
8. Security
9. Support

5.3. Selection of Criteria

In light of the ISO/IEC 9126, Chaffey and Wood's study and other studies that I we mentioned above such as McCall's quality model, we determined below criteria to build the most robust and exhaustive model to evaluate the CRM OSS. While we were choosing criteria, we gathered ISO/IEC 9126 and Chaffey and Wood's criteria together and chose the criteria which does not change relatively according to user's computer capabilities and made the below list.

5.3.1. Functionality

Functionality is about the attributes of the software. This criterion describes how well the application meets business needs; in other words the capability of the software in order to provide functions that meet business needs.

A CRM should include Sales Force Automation, Marketing Automation, Customer Service and Support, Reporting.

Sales Force Automation (SFA) is an information system used in CRM systems in order to help mechanize sales functions. SFA tools chasing contacts and activities that automatically record all the stages in a sales process. It helps the managers in terms of understanding the strengths and weaknesses of organization, creating competitive advantage by reducing costs, increasing sales revenue and increasing market share, identifying the customers, understanding customers and even developing new products.

Marketing Automation allows the design, execution and management of campaigns.

Customer Service and Support supplies the organization understanding the demand and complaint, and the process of these services is supplied.

Reporting is another powerful ability of CRM. Thanks to reporting and analytics, organizations can view and analyze customers' activities. One of the main success factors is reporting. So the data captured by the system should be chosen correctly.

According to Davies et al. (2009), feature sets are focused on delivering a suite of core SFA, marketing automation and service automation tools.

5.3.2. Ease of Use

Chen and Barnes (2007) have empirically found that ease of use and usefulness significantly affects adaptation intentions. Ease of use is one of the most important factors in determining the acceptance and use of information systems. Every information system requires time to know how to use it, but a useful system should require a minimum of time (Chaffey & Wood, 2005). Also McGovern (2011) has claimed that ease of use supplies competitive advantages to organizations.

5.3.3. Performance

According to Chaffey and Wood (2005), performance can be measured by how long the user waits to retrieve data, calculate or screen display. In fact, performance depends on the power of the computer. Also, efficiency criteria are related to the capability of the software product to supply suitable performance. That is to say, performance and efficiency criteria are relative and they depend on user computer's capability. The value of Random Access Memory (RAM) which supplies space for one's computer to read and write data to be accessed by the Central Processing Unit (CPU) and the speed of CPU can directly affect to performance. Thus, this criterion cannot be effective for this software comparison.

5.3.4. Scalability

Scalability describes how a system can work in higher workloads when the company's size grows. In this study scalability is up to company's size. According to Williams and Smith (2004), scalability is one of the most important quality attributes of today's software systems.

5.3.5. Compatibility

This term refers to how easy it is to integrate the software with other applications. For instance does the CRM have import / export features?

5.3.6. Extensibility

Extensibility describes adding new functions or features to the software. This criterion is about adding new modules that can be from the original vendor or other vendor.

5.3.7. Stability or Reliability

The whole software applications from a calculator to huge automation applications can have errors or bugs. Applications vary in the number of times they fail, depending on how well they have been tested since they were first introduced. To learn the stability or the reliability of software, it should be installed on some computers to see the incidents and one should get the feedback of several users. So, this criterion isn't within the scope of this study.

5.3.8. Security

Security is about the capability of the software to prevent one unauthorized person to be able to reach information and data. Different types of users can be at different levels of access rights.

5.3.9. Support

Support includes documentation, training, bug fixing, general help and discussion. The developers and the users of communities who communicate over the Internet, share requests and developments of the software. Yet, according to Golden (2005, p21), "one of the most important aspects of open source is the community."

5.3.10. Portability

The capability of the software to be transferred from one environment to another. Generally, users demands same functionality on the whole spectrum of systems available (Bell, 1998). Portability can be examined in terms of operating system dependence, system requirements and supported browsers.

5.3.11. Customization

Product configuration supplies users to customize products to the organization's requirements. Customizable products have vital place in markets because of the changing nature of customers' needs. In order to meet the expectations of customers, customizable products are needed.

5.3.12. Internationalization

Internationalization is an important unit while comparing software because it provides multilingual software which means that the software can be understood by more users. However, Hussein, Engelmann, Schroeter, and Meinzer (2004, p.133) have stated "the importance of internationalization comes from its benefits such as addressing a broader audience, making the software applications more accessible, easier to use, more flexible to support and providing users with more consistent information." Considering the importance of internationalization, we have decided to examine the internationalization of OS CRM software.

Therein, we have selected the following criteria to be able to compare the OSS:

1. Functionality
2. Ease of use
3. Security
4. Extensibility
5. Customization
6. Compatibility
7. Portability
    7.1. Operating System Dependence
    7.2. System Requirements
    7.3. Supported Browsers
8. Scalability
9. Support and Continuity
10. Internationalization

Chapter 6

Existing Open Source CRM Software

6.1. Objective of the Chapter

The objective of the chapter is to supply information about open source CRMs and to give an idea to readers about the selected top open source CRMs.

6.2. Overview of Open Source CRM

In markets, with the rise of open source software, the number of OSS for CRM has increased. Under these circumstances, to select suitable software for organizations is being more and more complicated.

According to Hippel and Krogh (2002), Sourceforge.net is a single major supplier and repository for open source software projects, Yet, in 2002 Sourceforge.net is listing approximately 10.000 projects and had 300.000 registered users. Sourceforge.net is a hosting provider that is the largest open source software development dedicated web site in the world. That is to say, sourceforge.net provides free hosting for open source software development projects. As Robles and Gonzales-Barahona (2006) mentioned Sourceforge.net is the largest free software development web-based platform. And, CDNetworks (2009) has claimed that the largest OSS development website is SourceForge.net. In February 2009, it included more than 230.000 software projects and had more than 2 million registered users. Currently, it includes more than 300.000 projects. At the same time, according to Alexa (2011) which is the well-known web information company's statistics, Sourceforge.net is 152th among 500 top sites all around the world (Top ten is: Google, Facebook, Youtube, Yahoo, Live, Baidu, Wikipedia, Blogger, MSN,

Twitter). In order to determine the top 10 CRM OSS, Sourceforge.net was the evident source.

According to Bruce, Robson and Spaven (2006), there were 89 CRM OSS in 2006. In the first quarter of 2011, when I searched about CRM on Sourceforge.net, there were exactly 687 results. The number of open source CRM software and its related packages increased approximately 8 times in 5 years.

6.3. Top Ten Open Source CRM Software

When I have started to research the top 10 open source CRM, I have eliminated the articles that were written before 2006 as in the IT field, it evolves very quickly (Chaffey & White, 2011). Certainly, IT has been quickly changing and it will continue (Benemati & Lederer, 2010). The following selections are below ordered by date i.e.2006, 2007, 2009 and 2010.

6.3.1. Selection by Bruce et al

In the study of Bruce et al., (2006) a list of the most popular open source CRM projects is provided by using Google page rankings and Sourceforge.net activity measures.

- Anteil
- CentraView
- Centric
- Compiere
- Daffodil
- Hipergate
- Ohioedge
- Open For Business
- OpenCRX
- OpenSourceCRM
- SourceTap
- SugarCRM
- Vtiger

They list 13 OS CRM which are the most popular in 2006 and at the same date according to this journal, Sourceforge.net lists 89 projects about open source CRM.

6.3.2. Selection by Hakala

In the article of Hakala (2007), there are 10 top open sources CRM which are selected from SourceForge. In 2011, Sourceforge.net lists 369 projects about open source CRM.

- SugarCRM
- Splendid CRM
- Centric CRM
- Hipergate
- Compiere
- vTiger
- CentraView
- XRMS CRM
- Cream CRM
- Tustena CRM

6.3.3. Selection by Dengate

According to Dengate (2009), the most popular OS CRM software are the following:

- SugarCRM
- vTiger
- Daffodil CRM
- Centric CRM
- Anteil CRM
- SellWin CRM

6.3.4. Selection by Bucholtz

Bucholtz (2010) has selected the top 10 open source CRMs, according to utility, developer communities, history and business models.

- SugarCRM
- vTiger
- SplendidCRM
- Xtuple
- Concursive
- Compiere
- OpenTaps
- CentraView
- XRMS
- CiviCRM

6.4. Determining the Top Ten Open Source CRM

6.4.1. Selected Software

In order to determine the top 10 open sources CRM to be compared, I have made a research on online resources (especially on sourceforge.net) and I listed all CRM software in terms of being the most 10 popular and the 10 most downloaded. Thus, according to those operations and in the light of previous researches as mentioned, I determined below the top 10 open source CRMs software:

1. vTiger
2. SugarCRM
3. Splendid
4. CentraView
5. Daffodil
6. Centric
7. Hipergate
8. Compiere
9. Tustena
10. OpenCRX

After selecting the top 10 open source CRM software, we need to compare them for the needs of organizations especially for SMEs. In order to choose a suitable CRM solution, there are some general factors that have to be considered. Next chapter, the comparison and evaluation will be done.

Chapter 7

Evaluation and Comparison of Selected Software

7.1. Objective of the Chapter

In this chapter, we compare the CRM software by evaluating their functionality, ease of use, security, extensibility, customization, compatibility, portability (operating system dependence, system requirements, and supported browsers), scalability, support and continuity and internationalization. Yet, we provide a comparison table to allow a quick view of the main elements at a glance about selected 10 OS CRM. Thus, we provide a detailed comparison of these software. Thereafter, one can find the right approach to make the implementation easier.

7.2. Evaluation of Selected Software

In order to retrieve appropriate information about the selected software, we referred to official web sites and their sourceforge.net pages. In every CRM section, there is a "useful information" part to supply the reader with a quick understanding about that CRM.

7.2.1. Vtiger CRM

7.2.1.1. Overview

According to Vtiger's web site, "vtiger CRM is a free, full-featured, 100% Open Source CRM software ideal for small and medium business, with low-cost product support available to production users that need reliable support."

The aim of the Vtiger CRM is to provide one of the best, free OS CRM solution with the lowest total cost of ownership and low support and customization costs to SMEs.

Vtiger seems to be a professional OS CRM solution at first glance. After providing the useful information, the value of each evaluation criteria is given.

Useful information
Web site: http://www.vtiger.com/
Sourceforge: http://sourceforge.net/projects/vtigercrm/
Sourceforge registration date: 23.08.2004
Live demo: http://demo.vtiger.com/
User Interface: Web-based
Programming Language: JavaScript, PHP, Visual Basic
***Statistics*:**
Sourceforge downloads: 2.665.986 (From registration date)
Top Country: United States **(**11% of downloader)
Top OS: Windows (75%)

7.2.1.2. Evaluation

1. Functionality

The features of Vtiger CRM that supplies functionality listed below:

- Sales Force Automation
- Marketing Management Features
- Customer Support and Service
- Inventory Management
- Activity Management
- Security Management
- Product Customization
- Reports and Dashboards

2. Ease of use

Vtiger CRM supplies to users natural and comfortable interface. Every module is placed in the menu tool bar carefully. At the same time, user can see the main modules and the related modules. The Vtiger CRM user interface gives user confidence because of being simple. One can deem it as easy to understand.

3. Security

Vtiger CRM supplies security and limited information sharing that depends on a hierarchy. Moreover, in Vtiger CRM, there are some levels to define users.

Profile Level
Field Level
Module Level
Sharing Level Access

4. Extensibility

There are sets of add-ons for Vtiger CRM; these sets are developed by both the Vtiger team and the Vtiger community. Below there is a list which shows add-ons.

Vtiger Outlook Plug-in
Vtiger Office Plug-in
Vtiger Thunderbird Extension
Vtiger Customer Portal
Vtiger Firefox Toolbar

Thanks to APIs (Application Programming Interface), Ginn (2011, p.46) has defined "a particular set of rules and specifications that software programs can follow to communicate with each other" that made by Vtiger, the integration with other applications or to add new functionality is allowed in order to meet the organization needs.

5. Customization

Vtiger CRM offers freedom to organizations in order to modify their installation in terms of their needs. In the download section on the web site, there is the source code of every edition and one can download it and customize it in order to meet one's organization needs.

6. Compatibility

Vtiger CRM system can export all records related process of CRM such as contacts, accounts. And the salesforce.com to Vtiger CRM, dynamics CRM to Vtiger CRM, SugarCRM to Vtiger CRM data migration is possible.

7. Portability

7.1. Operating system dependence

It is portable on 32-bit MS Windows, All Portable Operating System Interface for Unix (POSIX) (Linux / BSD / UNIX), Apple Mac OS Classic, OS X, Windows Server 2003

7.2. System requirements

Databases: MySQL: version 4.1.x through 5.1.x

Web Server: version 2.0.40 or higher or Microsoft IIS 5 or higher

PHP: version 5.0.x through 5.2.x

7.3. Supported browsers

Firefox 2.x and above Internet Explorer (IE) 6 and 7, Google Chrome up to 4.1, Safari

8. Scalability

According to Vtiger Team, Vtiger CRM software is ideal for small and medium businesses. That is to say, according to the definitions of SMEs, the maximum limit of Vtiger users is 250.

9. Support and continuity

In terms of training and documentation support, Vtiger is very accomplished. On Vtiger's web site there are some resources that are about: How To's, installation manuals, user manuals, admin manuals and add-on manuals. In terms of community support, there are blogs and forums. There are installation support, language packs, general discussions, feature requests and help forums.

Continuity is related with community activities and update frequencies. Below there is the last 3 updates and their release dates.

Vtiger CRM 5.2.1 Release Date - November 16, 2010
Vtiger CRM 5.2.0 Release Date - September 28, 2010
Vtiger CRM 5.1.0 Release Date - July 22, 2009

The community concept of Vtiger is very advanced. There are blogs, community portal, forums that are about help forums, installation support, general discussions and feature requests. That is to say, the community of Vtiger is active. Indeed, in the Vtiger forum there are 1590 topics and 4653 posts for 5.2.1 edition on the other hand for the 5.1.0 there are 5076 topics and 16910 posts.

10. Internationalization

The Vtiger CRM supports multiple languages such as English, French, German, Chinese (Simplified), Italian and Spanish. Vtiger CRM is used widely in lots of countries such as United States, Russia, India, China and Germany with localization available in over 15 languages. According to Sourceforge.net Vtiger statistics among 213 countries which downloaded Vtiger CRM, Turkey is 28th.

7.2.2. Sugar CRM

7.2.2.1. Overview

According to the SugarCRM web site, "SugarCRM is the world's leading provider of open source customer relationship management (CRM) software."

Sugar CRM allows the organizations independence of platform. Also business processes, business applications and other solutions what the organization choose to integrate to CRM is supported by Sugar CRM. After searching OS CRM on the web, one can notice that Sugar CRM is one of the most known OS CRM. According to us, the reason of this recognition is due to its design and facilities dedicated to be web-based for SMEs.

Useful information
Web site: http://www.sugarcrm.com/crm/
Sourceforge: http://sourceforge.net/projects/sugarcrm/
Sourceforge registration date: 23.04.2004
Live demo: http://www.sugarcrm.com/crm/demo
User Interface: Web-based
Programming Language: PHP
***Statistics*:**
Sourceforge downloads: 396.692 (From registration date)
Top Country: China **(**14% of downloaders)
Top OS: Windows (76%)

7.2.2.2. Evaluation

1. Functionality

The features of Sugar CRM that supplies functionality listed below:

- Sales Force Automation
- Marketing Management Features
- Project and Activity Management
- Customer Support
- Collaboration
- Administration
- Reporting

2. Ease of use

The appearance of Sugar CRM seems very professional. Indeed, thanks to the shortcut bar, users are allowed to perform some common task in one click. Users can assign tasks to short cut bar without ever leaving the existing screen. With the new edition Sugar CRM is designed for a fast and simple learning. In our opinion, users who work with this CRM software since many years might be affected.

3. Security

Sugar CRM supplies security which depends on access permissions. The administrator can enable or disable the access to any sugar module. Yet, the user cannot edit it. Moreover, on the access page the roles that have been assigned to the user can be viewed.

4. Extensibility

There are sets of add-ons for SugarCRM. Below there is a list which shows add-ons:

Word Plug-in (2003, 2007)

Outlook Plug-in (2003, 2007, 2010)

Excel Plug-in (2007)

Lotus Notes 7.0, 8.0, 8.5

5. Customization

Sugar CRM enables you to tailor your installation according to your business needs. The extension framework in Sugar CRM was created to help to implement the customization of the existing modules or to create entirely new modules. In the Sugar

administrator screen which will appear if one enters the system with full authorization, to expand the functionality of Sugar CRM, one can build new modules, adding, removing, and changing themes and language packs. Customized fields can be created and it is possible to edit dropdowns. Yet, the configuration of tabs allows one to customize.

6. Compatibility

Sugar CRM system can import the records which are about CRM process such as contacts, accounts and users.

Yet, Sugar CRM allows exporting transaction in Comma Separated Values (CSV) formats to your machine. In order to open CSV format Open Office, Notepad and some text editors can be used. In order to transport large amounts of data between organizations or software applications which are not directly connected, CSV files are generally used.

7. Portability

7.1. Operating system dependence

XP, 2003, 2008, Vista, Red Hat 4.x, 5.x (Advanced Server, Enterprise Server);
Oracle Enterprise Linux 5.1; Cent OS 4.x, 5.x
Mac OS x

7.2. System requirements

Databases: My SQL 5.0x, 5.1, MSSQL-2005, 2008, 2008 R2, Oracle-9i, 10g (Oracle is supported only for Sugar Enterprise)

Web Server: Apache 2.0, 2.2, IIS 6.0, 7.0, 7.5

PHP: 5.2.1-5.2.6, 5.2.8-5.2.12, 5.2.13, 5.3.0 – 5.3.2

7.3. Supported browsers

Firefox 3.5, 3.6, IE 7.0, 8.0, Google Chrome 12, Safari 5.0

8. Scalability

According to a study by Sun Microsystems that is focused on showing the scalability of Sugar CRM, the largest number of possible users is approximately 700. (Sun Microsystems, 2008)

9. Support and continuity

On the Sugar CRM web site, there are some resources that are about getting started documents which introduce software, training documents, documentation about all editions and documents about plug-ins. In terms of community support, there are blogs and forums. There are installation support, language packs, general discussions, feature requests and help forums. Below there are the last 3 updates and their release dates.

Sugar Community Edition 6.2.0 Release Date – June 6, 2011
Sugar Community Edition Version 6.2.0 - Release Candidate 3 – May 26, 2011
Sugar Community Edition Version 6.2.0 - Release Candidate 2 – May 13, 2011

Concerning the community concept, there are forums that include installation and upgrade, help topic, general discussions, feature requests and help for developers. The community of Sugar CRM is active. Indeed, in the Sugar CRM forum there are 81.924 posts and 23.934 topics for only help thread. For the developer's help, there are 50.004 posts and 13.346 topics.

10. Internationalization

The Sugar CRM supports multiple languages such as English, French, German, Italian, Spanish and Chinese Simplified. Sugar CRM is used widely in lots of countries such as China, United States, India, Germany, Brazil and Netherlands. With localization Sugar CRM is available in over 22 languages. According to Sourceforge.net Sugar CRM statistics among 166 countries which downloaded SugarCRM, Turkey is 22d.

7.2.3. Daffodil CRM

7.2.3.1. Overview

Daffodil CRM is a web-based solution that enables the coordination between sales, marketing, customer service and support. It supplies the automation of everyday tasks, mission critical and time important issues.

Useful information
Web site: http://crm.daffodilsw.com/
Sourceforge: http://sourceforge.net/projects/daffodilcrm/
Sourceforge registration date: 20.01.2005
Live demo: N/A
User Interface: Web-based
Programming Language: JSP, Java, JavaScript
***Statistics*:**
Sourceforge downloads: 26.863 (From registration date)
Top Country: India **(**18% of downloaders)
Top OS: Windows (87%)

7.2.3.2. Evaluation

1. Functionality

The features of Daffodil CRM that supplies functionalities are listed below:

- Sales Force Automation
- Sales Forecasting
- Marketing Automation
- Efficient Opportunity Tracking
- Performance Management

2. Ease of use

According to the Daffodil CRM team, it is very user-friendly. However, in our opinion it is the back of the age, so it is not user friendly anymore. One could deem that an ordinary user can learn to use it in one or two days. On the other hand, for professionals it seems to be basic to use it.

3. Security

Daffodil CRM 1.5 allows administrators to set the access right of the users. Rights can be modified by the administrator.

4. Extensibility

The extensibility of the Daffodil CRM is poor, because one cannot add plug-in feature (sometimes it makes the work of users while using for example outlook and excel).

5. Customization

The customization is only about the views of the Daffodil CRM.

6. Compatibility

It is possible to create different views of available data and to print them by using the button of Export to Excel. Daffodil achieved the compatibility with the CRM package of Compiere.

7. Portability

7.1. Operating system dependence

OS Independent (Written in an interpreted language): any operating system with a Java 2 Runtime Environment - 1.3 or higher

7.2. System requirements

Databases: One$ DB, Currently database scripts are available for SQL Server, My SQL, Firebird and Daffodil DB.

7.3. Supported browsers

Firefox, IE

8. Scalability

For the Daffodil CRM team, it is an ideal CRM solution for the SMEs' needs. That is to say, according to the definition of SMEs, the maximum limit of Daffodil CRM is 250.

9. Support and continuity

On the internet, there is no documentation or training lessons among others. At the same time there is no forum. On sourceforge.net, there is a forum section and the statistics of the Daffodil CRM are provided on Figure 6.1. As one can see, there is no post and no community activity.

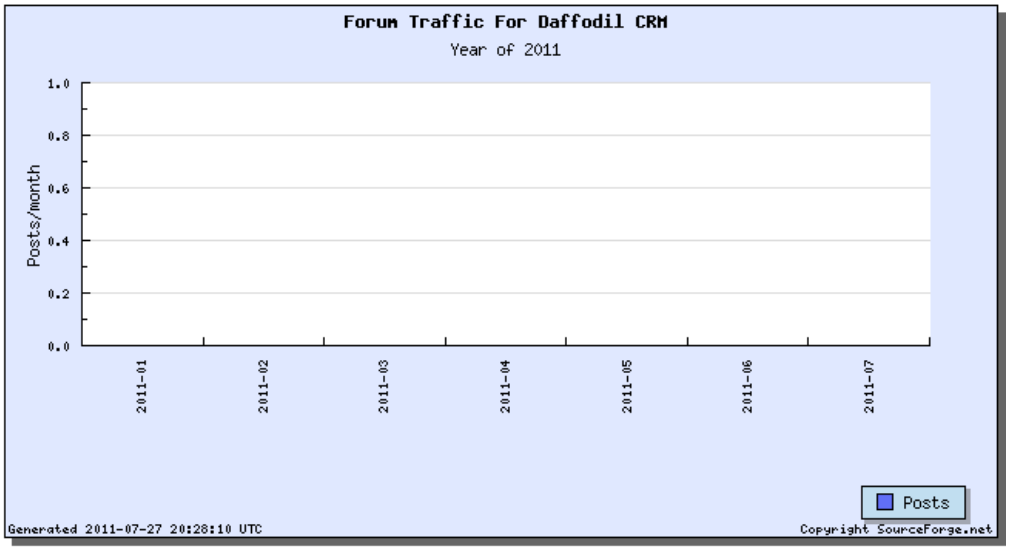

Figure 6.1: Forum Traffic For Daffodil CRM

The Daffodil CRM's first registered date on Sourceforge is the 20th of January 2005. The release date was 01/18/06 of the Version 1.5. And the last update date is 07/17/09. The frequency of updates is too low for the Daffodil CRM. Indeed, according to sourceforge.net, there were only four given version of the Daffodil CRM between 2005 and 2011.

10. Internationalization

The Daffodil CRM does not support multi language.

7.2.4. Tustena CRM

7.2.4.1. Overview

The Tustena CRM team claims that "winning new clients is more expensive than maintaining existing ones; therefore Tustena CRM will help you to not only gain new ones but make your current clients more loyal." In this context, Tustena CRM tries to supply power to organizations thanks to its functionalities and ease of use among others. However, the OS version of Tustena CRM is no longer provided since 2008. So at the selecting point, this should be considered.

Useful information
Web site: http://www.tustena.com/crm/
Sourceforge: http://sourceforge.net/projects/tustena/
Sourceforge registration date: 04.09.2005
Live demo: N/A
User Interface: Web-based
Programming Language: ASP.NET, C#, JavaScript
Statistics:
Sourceforge downloads: 51.234 (From registration date)
Top Country: China **(**51% of downloaders)
Top OS: Windows (97%)

7.2.4.2. Evaluation

1. Functionality

The features of Tustena CRM that supplies functionalities are below:

- Sales Force Automation
- Companies/Leads/Contacts Manager
- Reporting
- Orders
- Services Management

2. Ease of use

According to the Tustena Team, it offers a simple and intuitive user interface. One can agree with them. Yet, even if a user does not use it anytime, when the user logins to the Tustena CRM, one can feel as if one was using it for one year. There is a logical layout and we think that the left part of screen evoke a sense of using Windows XP because it seems like the left bar of windows explorer in Windows XP. So, using Tustena CRM is easy and one can learn it in a very short time.

3. Security

For Tustena CRM, security is about the connection to the system with the Secure Socket Layer (SSL) technology which protects the information of organization, and it is available only for the registered users into the organization thanks to domain which is a sub network made up of a group of clients and servers under the control of one central security database (Indiana University, 2010). Yet, each activity is saved and made available to anyone who is authorized.

4. Extensibility

Outlook can be used with Tustena CRM that makes one be able to import messages directly from Outlook to keep track of email activity thanks to the synchronization plug-in. Also, it is possible to integrate Tustena CRM with any application already in use into organizations.

5. Customization

There are no limits to customize Tustena CRM. The software development kit (SDK) of Tustena CRM includes lots of useful libraries for developing, customizing and for configuring Tustena CRM. Yet, any software programmer who has the ability of using Tustena SDK can easily customize the software according to the organization needs. The sources allow the developers to modify the interface, logics and integration with other existing applications used by organizations. So Tustena CRM is extremely customizable.

6. Compatibility

As mentioned before Tustena SDK integration to third party software written by individuals or another companies is possible. Also you can import any data into the standard CSV. If your CRM is able to export data in this format, Tustena will be able to import them.

7. Portability

7.1. Operating system dependence

32-bit MS Windows (NT/2000/XP), operating systems portable (Source code to work with many operating systems platforms)

7.2. System requirements

Database: Microsoft SQL Server

On the document of Tustena CRM, the provided explanation of system requirements are “an internet connection and a modern web browser is all it takes.”

7.3. Supported browsers

Firefox, IE, Chrome, Safari

8. Scalability

Tustena CRM guarantees that it can be developed and integrated into organizations of any type, industry or size.

9. Support and continuity

There is no documentation of Tustena CRM. As illustration, in the sourceforge.net forums some people ask “how can I get the documentation of Tustena CRM” and nobody can answer.

For Tustena CRM, there is a forum on the web site but after the registration there is nothing.

10. Internationalization

Tustena CRM is available only in few languages such as English, Italian and Spanish but the team argues that new languages will be implemented according to the requests.

7.2.5. Compiere CRM

7.2.5.1. Overview

According to the documents of Compiere, the organization will have a 360 degree view of the customers and products. Compiere CRM enables the SMEs to manage business operations more effectively by taking care of day to day operational details. Compiere also has ERP functionality but in this study ERP functionalities are ignored. The separation between ERP and CRM is clear for Compiere (see Figure 6.2). Previously, Compiere CRM was dependent to Oracle database and it was bringing extra cost to organizations; but as a result of a 3 years work, a team succeeded to deploy it on Postgres SQL. Therein, Compiere CRM can be considered as a solution for organizations and especially for SMEs. On the other hand, Compiere CRM has only CRM standard functionalities and it is not fully developed.

Figure 6.2: Distinction of ERP and CRM

Useful information
Web site: http://www.compiere.com/
Sourceforge: http://sourceforge.net/projects/compiere/
Sourceforge registration date: 09.06.2001
Live demo: N/A
User Interface: Gnome, KDE, Web-based
Programming Language: Java, JavaScript, PL/SQL
Statistics:
Sourceforge downloads: 1.643.673 (From registration date)
Top Country: China **(**30% of downloaders)
Top OS: Windows (84%)

7.2.5.2. Evaluation

1. Functionality

It includes the features below:

- Sales Force Automation
- Service Automation
- Order Management

2. Ease of use

The interface of Compiere CRM is very usable. The Compiere solution uses Asynchronous JavaScript with XML (AJAX) technology in order to create

responsiveness and personalization. Balani and Hathi (2005) have defined “AJAX enables a dynamic, asynchronous Web experience without the need for page refreshes.” In our opinion, the most valuable thing in terms of usability is these two items:

- Zoom down to view detail
- Zoom across to view related documents

Yet, with the above items Compiere expands accessibility. In every module or screen, you can click to a label and go to the page. The usage of Compiere can take some time to learn it.

3. Security

For Compiere, security is supplied by role based authentication. A single user can have many roles. For instance, by applying the rules of an organization, one can prevent a user to access some tasks, forms and menu items. Yet, one can restrict as well the view accounting information, reporting, exporting etc. features are adjustable in accordance with the role based.

4. Extensibility

Adding new fields and functionalities require software specialists since it uses Java language.

5. Customization

Compiere CRM allows customization without coding. It allows adding new windows, changing field names, adding fields into windows, defining default values / user and changing the window layout.

6. Compatibility

Compiere CRM can be integrated with some other systems. It depends on Compiere installation type such as community edition and enterprise edition, if the edition is suitable for compatibility the following third party software written by individuals or another companies may be included in your product: various Apache Projects, Jboss,

Xdoclet, Google Web Toolkit, Qoppa PDF, Oracle The Java Database Connectivity (JDBC) Driver.

7. Portability

7.1. Operating system dependence

Operating System software that supports Java such as Linux or Microsoft Windows

7.2. System requirements

Database: Oracle XE, Oracle10gR2, Oracle 11g or Enterprise DB Postgres Plus Adv. Server 8.3.

7.3. Supported browsers

Firefox 3.0 is recommended for the web user interface.

8. Scalability

Thanks to the ability of deploying multiple application servers, the scalability of Compiere CRM is very good, it can be adjusted according to organization's needs.

9. Support and continuity

The Compiere CRM support is thorough. There are installation guides, getting starting documents which introduce to software and videos on how to customize. In terms of community activities Compiere CRM has community support forums allowing users to interact with one another on various topics from product features to future requests. Community support forums of Compiere are excellent way to get help from others. Below there are last three editions:

R3.3.0 2010-06-01
R 3.2.0 2010-01-19 (Major release for community)
R 3.1.0 2008-08-06

10. Internationalization

The Compiere CRM supports multiple languages. Compiere CRM is used in lot of countries such as China, United States, India, Indonesia, Taiwan and Canada and proposes more than 10 languages such as Chinese (Traditional), English, French,

German, Italian, Portuguese and Spanish. According to Sourceforge.net Compiere statistics among 192 countries which downloaded Compiere CRM, Turkey is 29th.

7.2.6. Open CRX

7.2.6.1. Overview

According to the Open CRX team, "open CRX is an open CRM solution that meets the needs of organizations requiring multifunctional, enterprise-wide coordination of sales generation, sales fulfillment, marketing and service activities to customers, partners, suppliers or intermediaries." After reviewing the Open CRX, one can easily notice that it has a large number of advanced features which are beyond the main functionalities of standard CRM software.

Useful information
Web site: http://www.opencrx.org/
Sourceforge: http://sourceforge.net/projects/opencrx/
Sourceforge registration date: 18.11.2003
Live demo: http://www.opencrx.org/demo-opencrx-core.htm
User Interface: Web – based
Programming Language: Groovy, Java, JavaScript
***Statistics*:**
Sourceforge downloads: 312.792 (From registration date)
Top Country: China **(**15% of downloaders)
Top OS: Windows (72%)

7.2.6.2. Evaluation

1. Functionality

The features of Open CRX that supplies functionalities are listed below:

- Sales Force Automation
- Customer Service and Support
- Bug Tracking / Incident Management
- Groupware Features
- Product and Service Management
- Marketing Automation

2. Ease of use

The user interface is not usable as there is no special interface for Open CRX and one could say it is the weak point. It has an ordinary interface and it can be learned in little time.

3. Security

OpenCRX supplies a role based user access control. There is advanced authentication that is about CRXIP corporation which offers advanced security plug-in for OpenCRX. Yet, OpenCRX supplies the record of level authentication. So, the information is under the protection. OpenCRX is even secured for financial institutions.

4. Extensibility

All interfaces are modeled with the Unified Modeling Language (UML), interfaces are easy to extend. UML is the OMG's (is a not-for-profit computer industry specifications consortium) most-used specification.UML is the way to model not only the application structure and the architecture but at the same time the data structure and the business process (Mike, 2011). That is to say, one can write its own workflow which is a sequence of connected steps to describe the process of an organization.

5. Customization

The customization of Open CRX is really easy. There is a document to teach how to customize Open CRX which is named open CRX Basic Customizing Guide. Workflows, Menus, Fields, appearances and more features can be customized by organizations in order to fit the solution to their needs.

6. Compatibility

The architecture of Open CRX enables easy integration with the organization's existing applications, for instance it can be SAP or individual solutions based on an IBM host.

7. Portability

7.1. Operating system dependence

64-bit MS Windows, All 32-bit MS Windows (95/98/NT/2000/XP), All BSD Platforms (FreeBSD / Net BSD / Open BSD / Apple Mac OSX), All POSIX (Linux/BSD/UNIX-like OS), OS Independent (Written in an interpreted language), OS Portable (Source code to work with many OS platforms)

7.2. System requirements

Databases: My SQL v5.0, Postgre SQL 8.3+, MS SQL 2005, Oracle 9, IBM DB2

Open CRX runs on any platform with a Java 2 Platform, Enterprise Edition (J2EE) compliant AppServer.

7.3. Supported browsers

Any recent version of IE, Opera, Mozilla, Firefox, Safari, Chrome, etc.

8. Scalability

Open CRX supplies a wide view. That is to say, from one single user who is working on a laptop to enterprise class with tens of thousands of concurrent users can work with Open CRX.

9. Support and continuity

On the OpenCRX web site, there are resources about the installation guide, user guide and how to customize.

In terms of community support, there are blogs and forums. There are opened discussions, support requests, feature requests and help forums.

Also, there are OpenCRX mailing lists:

- OpenCRX-announce
- OpenCRX-developers
- OpenCRX-users

One can subscribe these mailing lists and can learn everything what happened, what will happen, and the answers of some questions.

The community looks small but on the other hand there are regular updates and very well defined road-map. The last 3 versions and their release dates are below:

OpenCRX 2.8.5 Release Date – May 8, 2011
OpenCRX 2.8.0 Release Date – December 29, 2010
OpenCRX 2.7.0 Release Date – September 9, 2010

10. Internationalization

OpenCRX supports multiple languages. OpenCRX is used widely in lots of countries such as China, United States, Germany, India and France with localization available in over 16 languages such as English, French, Italian, Spanish, Swedish and Turkish. According to Sourceforge.net OpenCRX statistics among 173 countries which downloaded OpenCRX, Turkey is 26th.

7.2.7. Splendid CRM

7.2.7.1. Overview

Splendid CRM's aim is to address small or medium sized organizations, mid-sized organizations, and larger organizations. Therefore splendid CRM has three editions: Splendid CRM Community Edition, Splendid CRM Professional Edition, and Splendid CRM Enterprise Edition.

Useful information
Web site: http://www.splendidcrm.com/
Sourceforge: N/A
Sourceforge registration date: N/A
Live demo:
http://demo.splendidcrm.com/Users/Login.aspx?Redirect=~%2fdefault.aspx
User Interface: Web-based
Programming Language: C#, ASP.NET
***Statistics*:**
Sourceforge downloads: Unknown
Top Country: Unknown
Top OS: Unknown

7.2.7.2. Evaluation

1. Functionality

The Splendid CRM Community Edition that is the current open source version of the Splendid CRM has limited features; it has only core CRM features, including accounts, contacts and leads but it excludes advanced features such as reporting, order management. Yet, it includes also activities and project management.

2. Ease of use

It seems to be complex. The user can configure the dashboard according to his/her preferences but it is still unattractive. The buttons on the top of the page are unelaborated. Yet, user can lose himself/herself in the main page. Although it seems complex, one can learn in acceptable time if one has a usage ability of computer.

3. Security

In Splendid CRM the security feature allows a fine control over who sees which fields. But only enterprise users can apply field level security to control which fields were seen by whom.

4. Extensibility

For the Community Edition there is no plug-in.

5. Customization

Customization is possible for Splendid CRM. Splendid CRM team says that "our goal is to encourage our partners in order to create some new things uniquely to their own". Organizations can add customized fields and edit any layout which makes it convenient to tailor.

6. Compatibility

The Splendid CRM Community Edition does not have import / export features and also the integration with other applications is not valid.

7. Portability

7.1. Operating system dependence

The recommendation of Splendid CRM team is that Windows Vista and Windows XP should be used only to evaluate Splendid CRM. With Windows Vista and Windows XP the organizations should not use it for a production environment.

Windows Vista, Windows XP, Windows 2000 Server, Standard Edition,
Windows Server 2003, Web Edition, Standard Edition 32-bit & 64-bit, Enterprise Edition 32-bit & 64-bit

Windows Server 2008, Web Edition, Standard Edition 32-bit & 64-bit, Enterprise Edition 32-bit & 64-bit

7.2. System requirements

Databases: SQL Server 2005 Express, Standard 32-bit & 64-bit, Enterprise 32-bit & 64-bit, SQL Server 2008 Standard 32-bit & 64-bit, Enterprise 32-bit & 64-bit

7.3. Supported browsers

All modern browsers such as Firefox, Chrome.

8. Scalability

As mentioned before, there are three versions of Splendid CRM, so the scalability is changing according to the edition. The Splendid CRM Open-Source Edition is designed for the use of small or medium-sized organizations to support a maximum up to 100 users. The Splendid CRM Professional Edition is designed to midsized organizations to support maximum up to 500 users. The Splendid CRM Enterprise Edition is designed to be used in larger organizations that intend to integrate Splendid CRM into their existing applications. It is intended for large-scale deployments supporting up to 1,000 users.

9. Support and continuity

The documentation of how to use it, is very limited but the training of how to use it with video training is good. On the official web site, there are lots of videos. For instance, one can watch the subject listed; admin impersonation, Google apps sync, reporting rules, installing Splendid CRM, etc.

The community of Splendid CRM is small. There is a forum and it includes general discussions, feature requests, help, and announcements. Yet, a blogs exists on the official web site. The last 3 versions and their release dates are below:

Splendid CRM 5.5 Release Date – June 16, 2011
Splendid CRM 5.0 Release Date – December 3, 2010
Splendid CRM 4.7 Release Date – December 7, 2010

10. Internationalization

The Splendid CRM supports multiple languages. Splendid CRM supplies localization available in over 7 languages. For professional and enterprise editions Splendid CRM supports 53 languages such as English, Turkish, French, Portuguese and Chinese. (Splendid CRM, 2009)

7.2.8. Hipergate CRM

7.2.8.1. Overview

Hipergate CRM indicates itself as "the most complete open source Java CRM." For Hipergate CRM, there is not enough information to explore it in details.

Useful information
Web site: www.hipergate.org/
Sourceforge: http://sourceforge.net/projects/hipergate/
Sourceforge registration date: 10.09.2003
Live demo: N/A
User Interface: Web-based
Programming Language: JSP, Java
***Statistics*:**
Sourceforge downloads: 136.960 (From registration date)
Top Country: China **(**15% of downloaders)
Top OS: Windows (85%)

7.2.8.2. Evaluation

1. Functionality

Hipergate CRM supplies the features below:

- Sales Force automation
- Customer support and service
- Content management
- Project management

2. Ease of use

It seems old today but one can be sure that everyone can use it in a very little time.

3. Security

Hipergate CRM supplies role based security.

- Security can be implemented in a company and/or department basis.
- Can be integrated with a LDAP directory.

4. Extensibility

There is no plug-in. New functions can be added according to needs of organization.

5. Customization

There is limited customization for Hipergate CRM. The default page layout of Hipergate CRM can be changed by manual editing and the appearance can be changed as well.

6. Compatibility

Import from Windows Address Book

- Import from data files (text, Excel).

7. Portability

7.1. Operating system dependence

32-bit MS Windows (NT/2000/XP), All 32-bit MS Windows (95/98/NT/2000/XP), All POSIX (Linux/BSD/UNIX-like OSes), Linux, Win2K, Win XP, OS Independent (Written in an interpreted language)

7.2. System requirements

Database: Microsoft SQL Server, My SQL, Oracle, Postgre SQL

7.3. Supported browsers

Internet Explorer

8. Scalability

According to the Hipergate team the mission of Hipergate CRM is to cover full range of technical requirements in any organization.

9. Support and continuity

There is no documentation and training tools as the official web site is unavailable and other resources are linked to the official web site. On Sourceforge.net in order to help, one can send an email to project administrators. On Sourceforge.net, there is a section for Hipergate forums email archive. Now subscription to mailing list is unavailable. Last 3 versions and their release dates are below:

Hipergate 6.0.0 11.12.2010
Hipergate 5.5.2 06.09.2010
Hipergate 5.5.1 28.06.2010

10. Internationalization

There are more than 10 languages such as Chinese (Simplified), English, French, German, Italian and Spanish.

7.2.9. CentraView CRM

7.2.9.1. Overview

According to CentraView team, their primary objective is "to develop and distribute world-class Open Source business software products and services that provide our customers and channel partners with a solid foundation on which to build their business." CentraView CRM addresses to SMEs as well.

Useful information
Web site: www.centraview.com
Sourceforge: http://sourceforge.net/projects/centraview/
Sourceforge registration date: 27.04.2005
Live demo: N/A
User Interface: Web-based

Programming Language: JSP, Java
***Statistics*:**
Sourceforge downloads: 47.423 (From registration date)
Top Country: China **(**38% of downloaders)
Top OS: Windows (88%)

7.2.9.2. Evaluation

1. Functionality

CentraView CRM supplies the features below:

- Contact Management
- SFA
- Project Management

2. Ease of use

CentraView provides easy to be used with the similar appearance. One can learn it in a little time.

3. Security

There is a role-based security. For example, administrator who is fully authorized for accessing application can configure the software but the others cannot.

4. Extensibility

Adding new function is possible. According to organization's needs, a JAVA coder can code and add.

5. Customization

With the administrative modules, the software can be configured for the organizations' requirements.

6. Compatibility

Synchronization with MS Outlook, Outlook Express can be supplied.

7. Portability

7.1. Operating system dependence

OS X, Linux, Windows XP, OS Portable (Source code to work with many OS platforms)

7.2. System requirements

Database: My SQL

7.3. Supported browsers

All standard web browsers such as Internet Explorer and Firefox.

8. Scalability

CentraView claims that they supply limitless scalability and its power has been coming from JAVA (J2EE) platform. According to the Sun Developer Network (n.d.), J2EE simplifies building enterprise applications that are scalable. That is to say, CentraView offers a scalable architecture that you can build on.

9. Support and continuity

There is only the sourceforge.net forum. In order to emphasize the lack of support and continuity, the dates of last two posts are: One of them is 2009-05-15 and the other one is 2007-06-11.

The last 3 versions and their release dates are below:

CentraView 2.1.4 31.10.2005
CentraView 2.1.3 07.10.2005
CentraView 2.1.2 03.10.2005

There is no documentation about CentraView.

10. Internationalization

CentraView does not support multi-language. There is only an English version.

7.2.10. Centric CRM

7.2.10.1. Overview

Centric CRM was acquired by Concursive in 2007 which is a software company. The slogan of Centric CRM is “we help you manage customer relationship.” According to Centric CRM (Concursive CRM) team, Centric CRM streamlines organizations’ sales process, improves customer’s experience and generating qualified reports. It can be realized, after acquiring Centric CRM has started to be more stable solution in terms of documentation, support and security etc.

Useful information
Web site: https://www.concursive.com/
Sourceforge: N/A
Sourceforge registration date: N/A
Live demo: N/A
User Interface: Web-based
Programming Language: Unknown
***Statistics*:**
Sourceforge downloads: Unknown
Top Country: Unknown
Top OS: Unknown

7.2.10.2. Evaluation

1. Functionality

Concursive CRM (formerly Centric CRM) supplies the features below:

- Marketing
- SFA
- Customer service

2. Ease of use

Thanks to the Web 2.0 technologies, Concursive CRM is more usable because with the evolution of Web 2.0 design and usability continue to merge (TechSmith, 2006). Thus, it can be learned in few days.

3. Security

Security is supplied the features below:

- LDAP Authentication
- SSL logins as well as encrypted passwords.
- Single session sign-on per user.
- Client browser auto logout.
- Action Level Permissions / User Hierarchy

In addition to these security features everything in this product is logged and monitored.

4. Extensibility

The license allows modifications in order to integrate some third party software but any distribution or reselling of modified code is forbidden. So this situation makes it hard to integrate other software. With the Flex module, users can add custom functionality through the industry standard Portlet architecture. According to the Portlet specification,

> Portlets are web components--like servlets--specifically designed to be aggregated in the context of a composite page. Usually, many portlets are invoked in the single request of a portal page. Each portlet produces a fragment of markup that is combined with the markup of other portlets, all within the portal page markup. (Community Development of Java Technology Specifications, 2009)

5. Customization

The customization can be done via porlets web application that runs inside of a special container. The architecture of Concursive CRM with porlets can be combined with APIs, so Concursive CRM is highly customizable. Also, all customization can be done with the administrative module.

6. Compatibility

Products can now be imported from a CSV file.

7. Portability

7.1. Operating system dependence

Linux, Mac OSX, Microsoft Windows, Sun Solaris

7.2. System requirements

Databases: Apache Derby, Daffodil DB, Firebird SQL, IBM DB2, Interbase, Microsoft SQL Server 2000/2005, My SQL 5, Oracle 10g Express, and Postgre SQL.

Web Server: Centric CRM can be installed on Apache Tomcat 5/5.5, Apache Geronimo, and IBM Websphere Application Server Community Edition.

7.3. Supported browsers

All standard web browsers such as Internet Explorer and Firefox.

8. Scalability

According to the documents, the clients of Centric CRM include many small organizations (less than 25 employees) as well as big companies.

9. Support and continuity

After being acquired by Concursive, they made many documents. It deals with the product information, case studies, how to you use it such as getting started to use. Also, there is a discussion section on the web site, users can ask questions or request some features from there.

10. Internationalization

Concursive CRM allows more than 10 languages such as English, German, and Italian.

7.3. Comparison Table

	Vtiger	Sugar	Daffodil	Tustena	Compiere	OpenCRX	Splendid	Hipergate	CentraView	Centric
Functionality										
SFA	+	+	+	+	+	+	+	+	+	+
Marketing Automation	+	+	+	+	√	+	√	√	-	+
Service Automation	+	+	+	+	+	+	-	+	-	+
Ease of use	+	+	+	+	+	√	√	√	+	+
Security	+	+	+	+	+	+	+	+	+	+
Extensibility	+	+	√	+	+	+	√	√	+	+
Customization	+	+	√	+	+	+	+	√	+	+
Compatibility	+	+	√	+	+	+	-	√	√	√
Portability										
Operating System Independence	+	+	+	-	+	+	-	+	+	+
System Requirements	+	+	+	-	+	+	+	+	-	+
Supported Browsers	+	+	√	+	-	+	+	-	+	+
Scalability	+	+	+	+	+	+	+	+	+	+
Support and Continuity	+	+	-	-	+	+	+	-	-	+
Internationalization	+	+	-	+	+	+	+	+	-	+

+ Has
- Does not have
√ Partially has

Table 7.1: Comparison Table

As we mentioned before, the objective of the comparison table is to provide a quick view of selected software in terms of evaluation criteria.

Thus, below we provide a detailed comparison allowing one SME to adopt the most suitable software to its needs.

First of all, **functionality** plays a key role for CRM software to be selected by someone. Considering functionality, SFA, marketing automation and customer service are the main features. In terms of these three items, Vtiger, Sugar, Daffodil, Tustena, Open CRX and Centric are accomplished. Compiere and Hipergate have SFA, service automation and partial marketing automation. They lack: customer segmentation, customer data integration or campaign management in terms of marketing automation. For Splendid, the service automation was not included and it has partially marketing automation although it possesses SFA. CentraView has only SFA.

As we have seen formerly, the **ease of use** is one of the most important factors in determining the acceptance of a CRM solution (especially as an IT system). At this level, Vtiger, Sugar, Daffodil, Tustena, Compiere, Open CRX, CentraView and Centric are easy to use. Splendid and Hipergate are partially easy to use. Hipergate can be learned quickly. Yet, Splendid has a bit more complex interface than others.

Security should be an indispensable feature of software. Each OS CRM solution selected has security options such as role based or field level or is user based.

Extensibility is about adding new functions or features to the software. For OSS, one powerful feature is extensibility to meet organizations' needs. Vtiger, Sugar, Tustena, Compiere, Open CRX, CentraView and Centric provide the ability to add new functions or features. Daffodil, Splendid and Hipergate have partial extensibility. Indeed, there is no plug-in for them but since they are OSS, the code source can be reached and is extensible in accordance to organizations' needs.

Customization is important for meeting organizations' needs. If an organization can customize the software according to its needs, it will require less time to be learned

and will create a sense of ownership. In this respect, Vtiger, Sugar, Tustena, Compiere, Open CRX, Splendid, CentraView and Centric can be customized. On the other hand Daffodil and Hipergate can be partially customized (only views have this option). Like the extensibility, customization is allowed by the nature of OSS.

Compatibility is about to import / export features and integration with other applications. Sometimes exchanging data between applications or systems can be desired. Therein, one should import or export the necessary file to maintain its operation. Vtiger, Sugar, Tustena, Compiere and Open CRX have compatibility features such as exporting / importing CSV files and spreadsheet files and they can be integrated with other applications. Daffodil, Hipergate, CentraView and Centric have compatibility feature but relatively less than the others in terms of exchanging data; however, Splendid does not have any compatibility feature.

Portability was divided into three sub categories in this study. These are operating system independence, system requirements and supported browsers. Vtiger, Sugar, Open CRX and Centric have the ability of being portable in terms of sub categories. Daffodil has a weakness in terms of only being supported by few browsers. Tustena and CentraView are incomplete. Tustena is dependent to MSSQL, CentraView is dependent to MySQL. At the same time Tustena is dependent to operating systems like Splendid. In terms of supported browsers, Firefox is recommended for Compiere and Internet Explorer is recommended for Hipergate. The other CRMs can be used with all the modern browsers such as Chrome, IE and Firefox.

Scalability is about working in higher workloads when the organization's size starts to grow. This feature is certainly one of the most important items of today's software systems. For all the selected OS CRM solutions in this study, scalability is one of the common points with SFA and security.

Support and continuity is important for OSS. Indeed, even if the selected CRM solution is the best, if there is not support and continuity, it does not mean anything to SMEs. In this respect, Vtiger, Sugar, Compiere, Open CRX, Splendid and Centric deserve recognition. They have a huge documentation to make the implementation and the use easier. On the other hand, Daffodil, Tustena and CentraView have

nothing concerning the support and continuity. For Hipergate there is nothing about the support and the last 3 versions were released last year.

In order to be understood by different cultures and people, **internationalization** is an important factor. Internationalization is one of the keys because if someone understands what he / she uses, application will be more accessible, easier to use, more flexible from user's point of view. Except for Daffodil and CentraView, the other 8 OS CRMs achieved to be multilingual and international.

Important note: After the acquisition of Centric CRM by Concursive, its development has been accelerated; in this study, the values shown are after its acquisition.

In the light of above comments, one can choose OS CRM software to meet its organization's needs.

7.4. CRM Implementation

After choosing the suitable CRM software for an organization, the most important thing is to have the ability to make the implementation. Chaffey and Wood (2005) underlined some results about the failure rate of CRM implementation projects:

- Butler Group found 70 percent of CRM implementations fail.
- A Gartner study found that 55 percent of all CRM projects failed to meet customers' expectations.

According to researches, more than half of the organizations which have implemented CRM have difficulties during and after implementation.

According to Dorsey (2000), each project can be viewed as a tripod. Whole legs have to be at the right place in order to stand solid. These three legs are support of top management, development methodology and leadership. Below there is a list:

1. Support of top management: Without the full support from the top management, when a problem happens on a project, the project will be broken down.

2. Development methodology: A large number of systems are built with little concern toward processes. Thus, there is little chance to complete the project.
3. Leadership: If a project has a solid leadership by someone who has worked with similar projects and has successfully completed them, there will be much more chance to complete the project.

Without each of them, one can be sure that the tripod will tumble and the project will fail. Thus, by following this tripod, one organization will be able to increase its chances of implementing a robust CRM system.

Chapter 8

Conclusion

8.1. Objective of the Chapter

The objective of this chapter is to conclude the thesis with research perspective and implication and suggestion for further research.

8.2. Research Perspective and Implication

The objective of this thesis is to provide to SMEs a better understanding about CRM and a way to select OS CRM for organizations to create value. In the first 4 chapters, the theoretical part, relevant literatures were reviewed in order to clarify on the CRM approach, SMEs and OSS. The first 4 chapters form the main theme of this thesis.

Thanks to CRM, organizations can tailor specific goods and services to each individual customer by using customer identification. In order to satisfy customers, CRM is an indispensable technology enabler. Although SMEs play a major role in the world economy (in Turkey as well), they have some budget limitations, especially regarding IT. OSS are then potential solutions for SMEs. Recently, many OS CRM software were disclosed on the web especially on Sourceforge.net. In order to find out which OS CRM is one step beyond, match the needs of organizations, an evaluation method is given in the chapter 5. In the light of quality measurements such as the ISO/IEC 9126 and Chaffey and Wood's criteria, the suitable software evaluation criteria were selected. In chapter 6, the top 10 OSS were listed by considering their popularity and number of downloads from Sourceforge.net.

In chapter 7, in order to investigate which one is one step beyond, functionality, ease of use, security, extensibility, customization, compatibility, portability (operating

system dependence, system requirements, and supported browsers), scalability, support and continuity and internationalization criteria are processed. After obtaining information about the selected top 10 OS CRM, a comparison table was done, allowing a quick view of the main elements and to compare them at glance. In order to find an alternative way of commercial software, this thesis aims to create awareness among SMEs about CRM, OSS and OS CRM. Thus, helping SMEs to develop CRM and be more competitive!

As limitation, one can underline that the evaluation of the ease of use is a subjective fact. Thus, an evaluation done by a sufficient number of persons would be more suitable.

8.3. Suggestion for Further Research

It is suggested that further research should implement OS CRM into SMEs in order to introduce new evaluation criteria i.e. the performance and stability.

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Appendix A: The Open Source Definition

The Open Source Definition (Annotated) (OSI, n.d.)

Version 1.9

Introduction

Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following criteria:

1. Free Redistribution

The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

Rationale: By constraining the license to require free redistribution, we eliminate the temptation to throw away many long-term gains in order to make a few short-term sales dollars. If we didn't do this, there would be lots of pressure for cooperators to defect.

2. Source Code

The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer

would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

Rationale: We require access to un-obfuscated source code because you can't evolve programs without modifying them. Since our purpose is to make evolution easy, we require that modification be made easy.

3. Derived Works

The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

Rationale: The mere ability to read source isn't enough to support independent peer review and rapid evolutionary selection. For rapid evolution to happen, people need to be able to experiment with and redistribute modifications.

4. Integrity of The Author's Source Code

The license may restrict source-code from being distributed in modified form *only* if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

Rationale: Encouraging lots of improvement is a good thing, but users have a right to know who is responsible for the software they are using. Authors and maintainers have reciprocal right to know what they're being asked to support and protect their reputations.

Accordingly, an open-source license must guarantee that source be readily available, but may require that it be distributed as pristine base sources plus patches. In this way, "unofficial" changes can be made available but readily distinguished from the base source.

5. No Discrimination Against Persons or Groups

The license must not discriminate against any person or group of persons.

Rationale: In order to get the maximum benefit from the process, the maximum diversity of persons and groups should be equally eligible to contribute to open sources. Therefore we forbid any open-source license from locking anybody out of the process.

Some countries, including the United States, have export restrictions for certain types of software. An OSD-conformant license may warn licensees of applicable restrictions and remind them that they are obliged to obey the law; however, it may not incorporate such restrictions itself.

6. No Discrimination Against Fields of Endeavor

The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

Rationale: The major intention of this clause is to prohibit license traps that prevent open source from being used commercially. We want commercial users to join our community, not feel excluded from it.

7. Distribution of License

The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

Rationale: This clause is intended to forbid closing up software by indirect means such as requiring a non-disclosure agreement.

8. License Must Not Be Specific to a Product

The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the

program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

Rationale: This clause forecloses yet another class of license traps.

9. License Must Not Restrict Other Software

The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

Rationale: Distributors of open-source software have the right to make their own choices about their own software.

Yes, the GPL v2 and v3 are conformant with this requirement. Software linked with GPLed libraries only inherits the GPL if it forms a single work, not any software with which they are merely distributed.

10. License Must Be Technology-Neutral

No provision of the license may be predicated on any individual technology or style of interface.

Rationale: This provision is aimed specifically at licenses which require an explicit gesture of assent in order to establish a contract between licensor and licensee. Provisions mandating so-called "click-wrap" may conflict with important methods of software distribution such as FTP download, CD-ROM anthologies, and web mirroring; such provisions may also hinder code re-use. Conformant licenses must allow for the possibility that (a) redistribution of the software will take place over non-Web channels that do not support click-wrapping of the download, and that (b) the covered code (or re-used portions of covered code) may run in a non-GUI environment that cannot support popup dialogues.

Curriculum Vitae

Ertürk Yılmaz was born in August 13th, 1985, in Istanbul. He received his BS in Mathematics and Computing in 2009 from Beykent University, where he graduated second in his class from the Faculty of Science and Letters. From 2008 to 2010, he worked as a project specialist in a company. Since the beginning of 2011 he is software specialist in a company.