Intranet of the future: functional study, comparison of products and practical implementation

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September 2010

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PART 1: CONTEXT AND THEORETICAL ANALYSIS

1 Chapter 1: Introduction and goals

1.1 Project environment

This project comes up as a collaboration agreement between the Master's Degree in Information Technology (MTI) given by the Barcelona School of Informatics (FIB) and Everis. It has been performed as a full-time internship in this company, and tries to satisfy the needs of both parts. In an academic level, the objective is to complement the performed studies with the project. In a business level, the objective is to get a study which provides useful information about a new technology for its future use in other projects.

The personal motivations that have driven me to conduct this project are the opportunity to learn new technologies and emergent systems in the enterprise Intranets field, which is experiencing a constant evolution and facing challenging changes. In addition, I think that it fits well with my education in the Master in Technology Information as well as the Diploma in Computer Software I possess.

The central focus of intranet has traditionally been content. However, this is constantly changing and now the focus of intranets is people, its users. Intranets are putting people at the centre, supported by content, collaboration, social networking and other tools. Analogously to Internet, Intranet 2.0 is becoming really important.

1.1.1 Business environment

This project has been done as an internship in Everis. In order to provide a general vision of the environment where I developed the project, let's have a brief introduction about the company.

Everis is a multinational consulting firm which offers business solutions covering all aspects of the value chain, from business strategy to systems implementation. It is active in the sectors of Banking, Healthcare, Industry, Insurance, Media, Public Sector, Telecom and Utilities.

The company was created in Spain in 1996 as DMR Consulting. The name changed in October 2006. The first offices in Spain were located at Madrid and Barcelona. Then, the expansion was directed to Europe and Latin America. Currently, Everis has offices in the following cities:

- **Spain:** Madrid, Barcelona, Seville, Valencia and La Coruña

- **Portugal:** Lisbon

- **Italy:** Milan, Rome

- **Chile:** Santiago de Chile

- **Argentina:** Buenos Aires

- **Mexico:** Mexico City

- **Brazil:** Sao Paulo, Rio de Janeiro

- **Colombia:** Bogotá
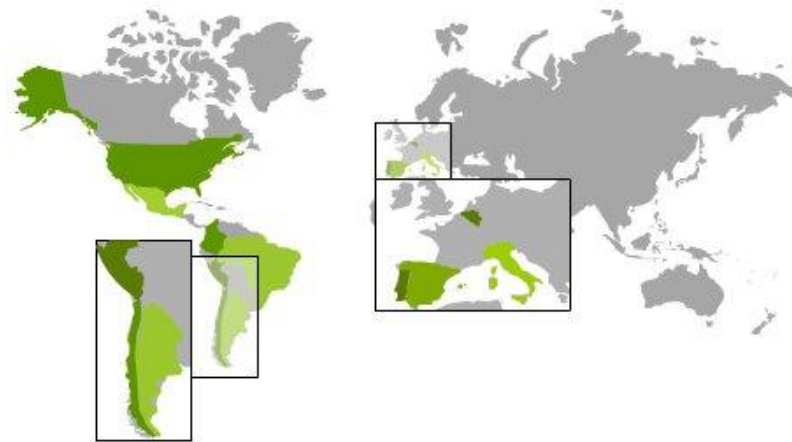
Its annual turnover is currently €240 million and has a staff of over 4,000

1.2 Document structure

After having analysed the environment of the project, this section announces what we will find in this document.

The document is divided in two large parts. The first one exposes the context of the project and performs the theoretical analysis. It exposes the evolution and state of the art of the Intranet topic and contains an ideal and theoretical model of the Intranet of the future. The second part is about choosing a set of concrete technologies, performing tests and analysis about their functionality applied to the theoretical model and extracting conclusions.

One of the goals of this document is to provide a progressive work, which starts analysing the market requirements, defining a type of technology to fit these

requirements, then researching about the current vendors of this technology, choosing a set of these vendors in a reasoned way, performing the tests and evaluation process and finally extracting some conclusions.

In the **first chapter** of the document we will find the introduction and the goals of the project, as well as its planning and cost.

In the **second chapter**, the document defines the concept of Intranet, exposes its evolution among the time and its current state and then takes a more practical approach explaining the deployment process, the management of a professional Intranet team and metrics and methods to evaluate a concrete implementation of an Intranet.

The **third chapter** develops the theoretical and ideal model for the Intranet of the future. It focuses on the interaction models, the vision and goals of the Intranet and exposes the architecture of the model.

The **fourth chapter** presents an overview of several technologies of different vendors which could be candidates for implementing the previously exposed model. The strong and weak points of each candidate are analysed.

The **fifth chapter** is the first chapter of the second part of the document. It shows a delimitation of the theoretical model developed in the third chapter for testing purposes. It presents a choice of key functional groups which will be tested with more detail.

In the **sixth chapter,** three of the technologies exposed in the fourth chapter are chosen to be tested later. The reason for choosing them is explained here.

The **seventh chapter** presents the methodology and criteria used to perform the comparison of the three chosen technologies.

The **eighth, ninth and tenth chapters** explains the results obtained after applying the methodology presented in the seventh chapter to the WebCenter, Liferay and SharePoint technologies, respectively.

In the **eleventh chapter,** the comparison of all the tested technologies is exposed globally. The conclusions of the comparison are presented here.

Finally, the **twelfth chapter** contains the final conclusions of the whole project and analyses the work which could enhance this project in the future.

1.3 Goals

The project has three main goals:

- To perform a study of the functionalities which have to be covered in a modern intranet (web 2.0, unified communication, collaboration, etc)
- To perform a comparison of tools of the market which can be used to implement intranets (commercial and open source products)
- To select three of these tools and test a set of chosen functionalities

However, it is essential to perform an initial task involving a research about the evolution of the Intranets among the time, as well as a work to discover the current state of this kind of platforms over the entire world.

In this introductory research it is also convenient to include other topics which are not strictly technical involving the use of this Intranet. To be more concrete, we will analyse the importance of the human role and management of the Intranet, the process of deploying a new Intranet in an organization and methods to evaluate the performance of this new system.

1.3.1 Goal 1: Study of functionalities

The approach taken to fulfil this goal is to develop a theoretical model describing the relationship between the Intranet and its users, and a complete set of functionalities which could be covered in the Intranet of the future.

These functionalities are categorized in groups. The project will describe these groups and the functionalities included on them.

1.3.2 Goal 2: Comparison of tools

The project will describe and compare several technologies which can be used to develop an Intranet that we have previously modelled. The purpose here is to discover the strong points and weaknesses of each technology if it was used to develop the Intranet we desire.

After having done such a review, the project will focus on three technologies which we consider representative and we will perform an extensive evaluation of them.

Finally, an extensive comparison between these three technologies will be done, highlighting where they offer better solutions and performance compared to the other possibilities.

1.3.3 Goal 3: Prototype

As has been already described in the goal 2, the project will focus on three technologies. One of these technologies will be chosen to develop a prototype which will cover a set of functionalities of the Intranet we are modelling. The other two technologies will be tested as well but without building a prototype.

1.4 Planning and cost

1.4.1 Planning

In general, the project has been performed correctly and adjusted to the periods of time of the estimated planning. The planning was designed with a large margin of error and this has allowed having a satisfactory result.

I found that the learning curve for developing the prototype with WebCenter was higher than expected. It required more time than I expected, but the margin of error of the planning allowed completing it at time. Furthermore, I required more time than expected to obtain the product used to develop the prototype because we tried different approaches and versions. Moreover, the final tested version was based on a virtual machine provided by Oracle. This fact required to organize meetings with Oracle's agent. However, I think that it did not cause a considerable delay. Furthermore, I used this waiting time for developing the documentation.

To sum up, I think that the planning of the project has been correct. If a delay occurred in some stage, we have recovered it in a posterior phase seamlessly. In some way, we have been automatically regulating the planning with our evolution.

The following screenshot shows a Gantt diagram with the planning of the tasks of the project.

		Nombre	Duración	Inicio	Terminado	Prede...
1		Gathering general information	10 days	1/02/10 8:00	12/02/10 17:00	
2		Elaboration of the glossary	120 days?	15/02/10 8:00	30/07/10 17:00	
3		☐Theoretical analysis	30 days	15/02/10 8:00	26/03/10 17:00	1
4		Gathering information	5 days	15/02/10 8:00	19/02/10 17:00	
5		Intranet conceptualization	5 days	22/02/10 8:00	26/02/10 17:00	4
6		Theoretical model	15 days	1/03/10 8:00	19/03/10 17:00	5
7		Overview of technical solutions	5 days	22/03/10 8:00	26/03/10 17:00	6
8		☐Comparative analysis	30 days	29/03/10 8:00	7/05/10 17:00	3
9		Gathering information	5 days	29/03/10 8:00	2/04/10 17:00	
10		Theoretical model delimitation	5 days	5/04/10 8:00	9/04/10 17:00	9
11		Elaboration of the methodology	15 days	12/04/10 8:00	30/04/10 17:00	10
12		Selecting technologies	5 days	3/05/10 8:00	7/05/10 17:00	11
13		☐Testing	55 days	10/05/10 8:00	23/07/10 17:00	12
14		WebCenter prototype	30 days	10/05/10 8:00	18/06/10 17:00	
15		Test and evaluation research	20 days	21/06/10 8:00	16/07/10 17:00	14
16		Conclusions	5 days	19/07/10 8:00	23/07/10 17:00	15
17		Review and finish documentation	5 days	26/07/10 8:00	30/07/10 17:00	8;13

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1.4.2 Cost

In this section I will perform the cost analysis of the project. In order to determine the price per hour, we will use the quantities stipulated by the UPC for the university-enterprise cooperation programmes. So, we can state that they would be the real costs for Everis.

However, we must consider that if this project was directly sold to a customer, its costs would have been greater because the price per hour would increase in a considerable way.

Furthermore, when an agreement is signed, UPC invoices the company 14.7% of the total amount to be paid to the student. I will show this cost supported by Everis, too.

Another expense to consider is the laptop computer which I have been using while developing the project. Its value would be around €1000.

The project has not generated costs of licenses. Oracle provided us a virtual machine with a WebCenter installation for free, for evaluating purposes. Liferay is an open source product that does not require license acquirements. Finally, Everis already had a virtual machine with a SharePoint 2010 installation from another project, so we did not require additional licenses for this product.

Concept	Cost
Student's wage	€1200 per month * 6 = €7200
University management fees	€176 per month * 6 = €1056
Laptop computer	€1000 €
Licenses	€0
TOTAL: €9256	

2 Chapter 2: Intranets

The goal of this chapter is to introduce the main concept which lies around the project: the Intranet. It is necessary to define what we understand when using this term. Moreover, it contains a description of the historical evolution of Intranets from the first ones until the current proposals in order to set the focus on developing a project which will be able to cover future needs.

Finally, the chapter also describes some concepts closely related to Intranets which should not be forgotten when dealing with such a project. Concretely, these concepts are the importance of the role of human professionals in the Intranet, ways and metrics to evaluate the system and deployment methods as well as common issues and troubles which can be found when trying to deploy such a system.

2.1 Definition

The Intranet definition can be something tricky. The concept is quite old now but different sources continue to provide different definitions. A good approach is to take several of these sources and check how they manage to define this concept [1]:

- According to the Intranet Specialist Toby Ward:

    "An intranet is private network, similar to the Internet and using the same protocols and technology, contained within an enterprise or not-for-profit organization. Widely referred to as the home page of the internal website, the intranet also includes many inter-linked local area networks (LANs), desktop computers, websites and portals, and email system(s)."

- According to the American Heritage Dictionary:

    "A privately maintained computer network that can be accessed only by authorized persons, especially members or employees of the organization that owns it."

- According to Wikipedia:

    "An intranet is a private computer network that uses Internet protocols, network

> *connectivity, and possibly the public telecommunication system to securely share a part of an organization's information or operations with its employees. Sometimes the term refers only to the most visible service, the internal website."*

- According to Merriam-Webster thesaurus dictionary:

  "A network operating like the World Wide Web but having access restricted to a limited group of authorized users (as employees of a company)."

2.2 Historical evolution

In order to describe the historical evolution of Intranets, we will use a classification based on the categories created by Patrick Walsh in his blog [2]. These categories are: Intranet Zero, Intranet 1.0 and Intranet 2.0.

2.2.1 Intranet Zero

The first category represents the oldest model. An Intranet of this category may offer two types of contents: transactions and information.

2.2.1.1 Transactions

The transactional part of the intranet allows performing some online procedures to its users. They can perform some action in order to get some kind of result or complete a task. I.e.: booking holidays using an online form or filling online timesheets are good examples of transactions.

2.2.1.2 Information

The informational part of the intranet gives some type of contents to its users.

However, the hallmark of the Intranet Zero is the state of these information contents. The following list contains several negative aspects that may have this kind of intranets:

- Users can see obsolete contents
- It is difficult to determine the obsolescence of some contents
- Some contents have not been reviewed on its due date
- Duplicated contents
- Poor and/or irrelevant contents
- Several typographical errors

- Too much contents

2.2.2 Intranet 1.0

This category is still based on transactions and information, but it has some significant improvements. It is focused on the activities which are really important, these ones which provide business value. There is no point in including these processes that are identified as superfluous and unnecessary.

The following list enumerates some principles which summarize this point of view:

- Discard information which does not provide value to any user
- Identify all the steps across the value stream. Do not specify only the tasks which have to be performed, but also who will do them, when, how and where are the results stored
- Remove obstacles and restrictions between discrete activities. This principle requires transversal organizations which enjoy the benefits of a culture of collaboration between different areas. However, several organizations are not transversal, and their areas do not interact a lot between them.
- Send information according to the user needs, without waiting his request. For example, RSS technology can be used to inform to the user immediately about the information he has marked as interesting for him.
- Examine constantly the intranet processes, reducing progressively all non-value adding activities and removing all low value content.

2.2.3 Intranet 2.0

It is the result of adding the social dimension to the Intranet 1.0 category, putting special emphasis on these functionalities related to making collaboration easy and promoting an agile and effective information exchange between intranet users.

Some of the tools used for these purposes are:

- Wikis
- Discussion forums
- Blogs
- RSS
- Social networks

- Instant messaging systems

- File exchange systems

- Tagging

- Podcasting

- Mash-ups

The following list, elaborated by Jane McConnell [3], contains 6 requirements which should be taken into account by an Intranet 2.0. The priority level of each requirement can vary according to the type of organization where it is implemented:

- Location independent access (accessing the intranet from home, for example)

- Access from mobile devices

- Support for virtual teams, including external partners

- Real time communication tools

- Collaborative tools

- Tools for locating other users

2.3 Current state

It is interesting to study and analyse the state of the intranets being currently used, as a step previous to the building of a model that can be applied in the future. I have used the summary of the report Intranet 2.0 Global Survey [4] in order to get this information.

2.3.1 Organization's profile

The survey included the participation of 561 organizations of all sizes from across the planet. The following graph shows how these organizations are geographically distributed.
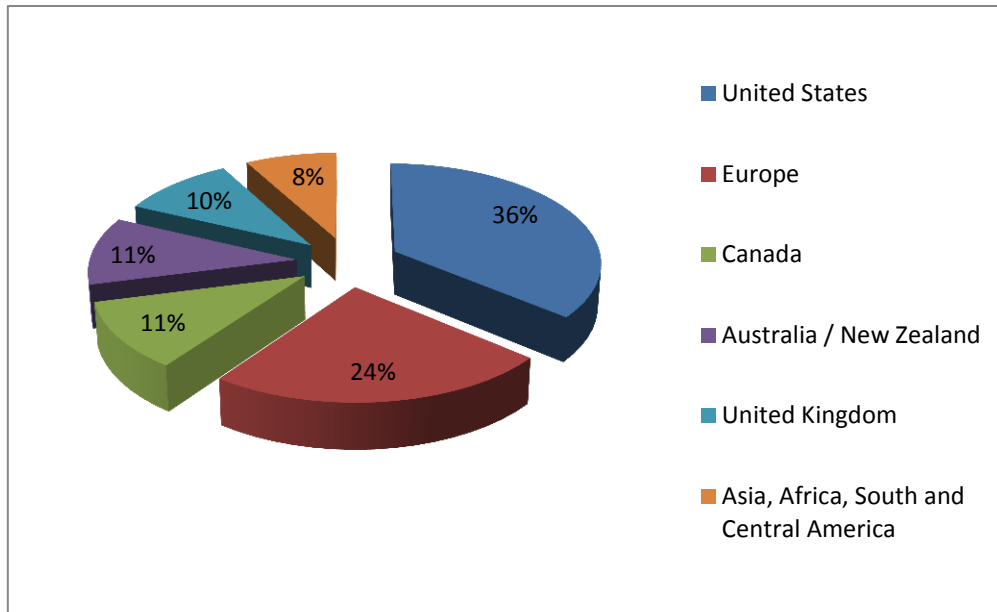
The size of these organizations was variable too:

- 61% of them had more than 1000 employees
- 32% of them had more than 6000 employees
- 39% of them had less than 1000 employees

In addition, these organizations represented different business sectors, as shown in the following graph.
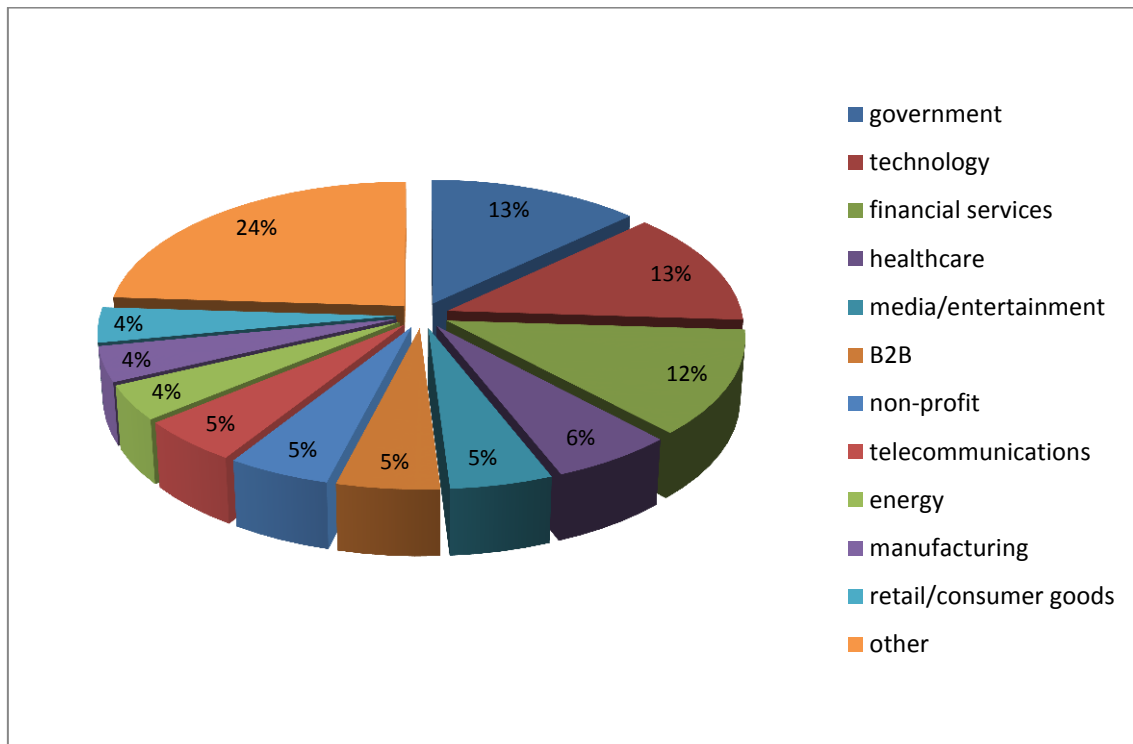
The time that an organization has had an intranet website is a good initial point to analyse the evolution of corporative intranets. The following graphic shows the response obtained in the report.
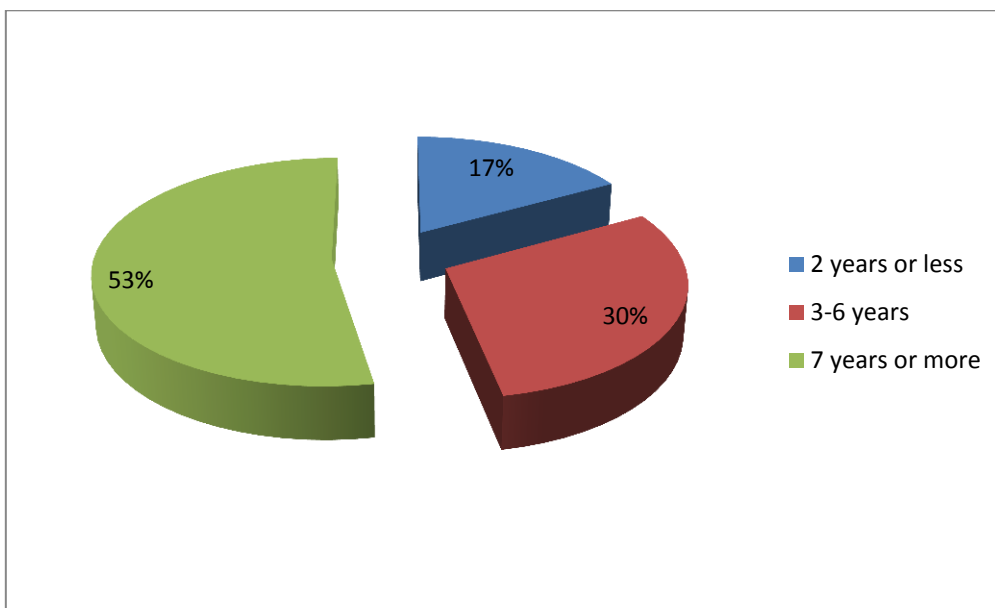
2.3.2 Technology

According to the study, several tools 2.0 have gained importance. Blogs, wikis and discussion forums have become mainstream while other types of tools are still not widely adopted. Concretely, the obtained results were the ones shown by the following graph.
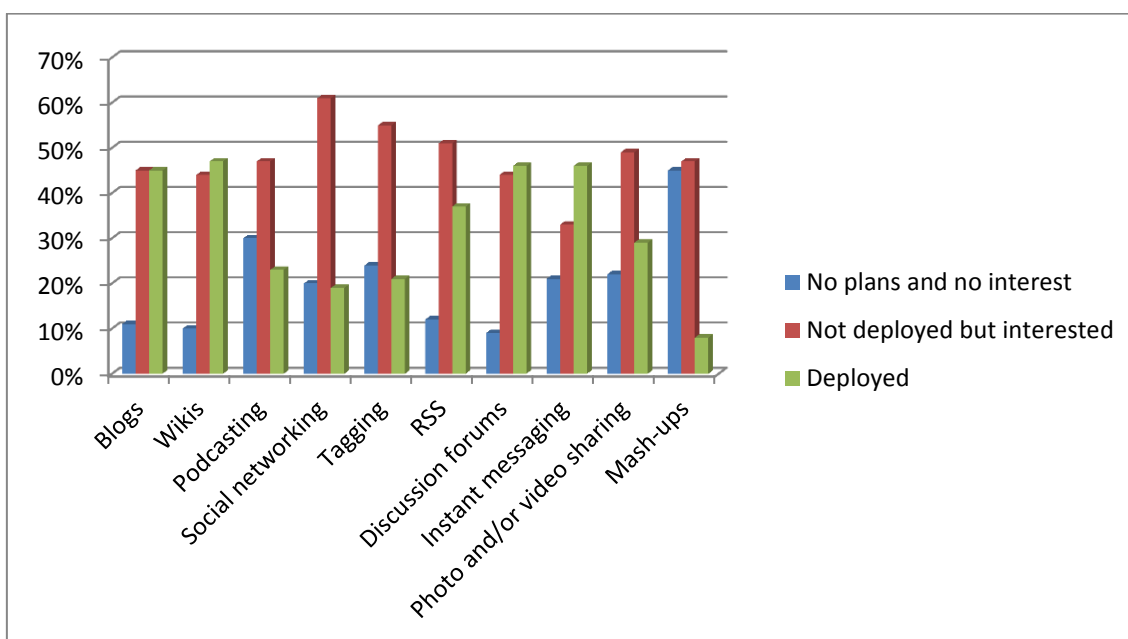
The technology platforms used to manage the intranet varied widely among the organizations. They could be categorized in the following way:
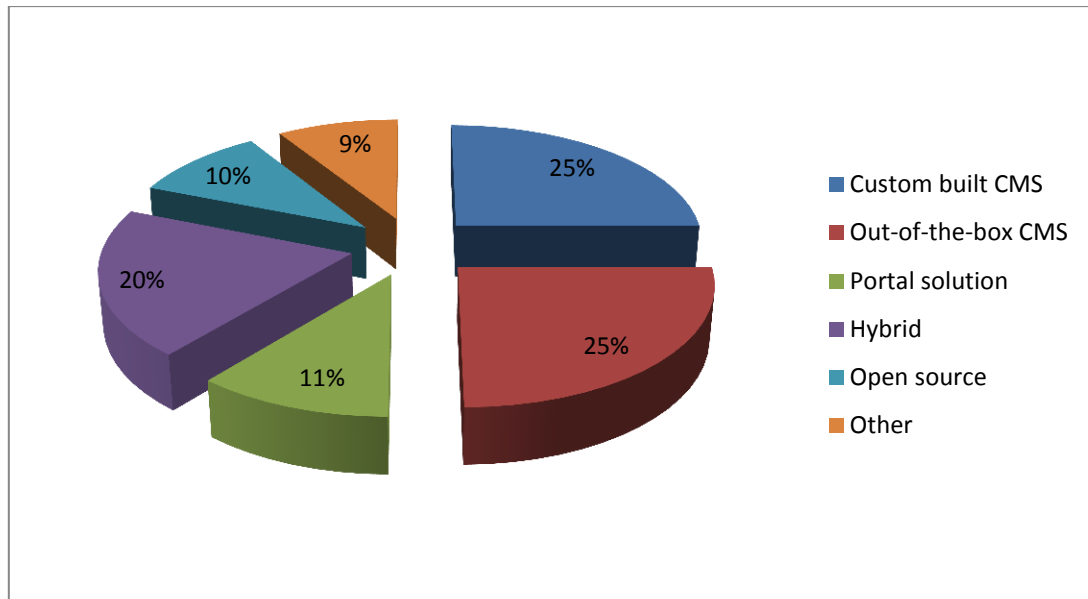
However, an outstanding result was obtained: 20% of the organizations which used any type of CMS solution were using Microsoft SharePoint in some way.

Regarding to the use of collaborative tools, the study detected that Microsoft SharePoint is also leading its usage. The following graph shows the distribution of the usage of different solutions (take into account that some organizations are using more than one solution).
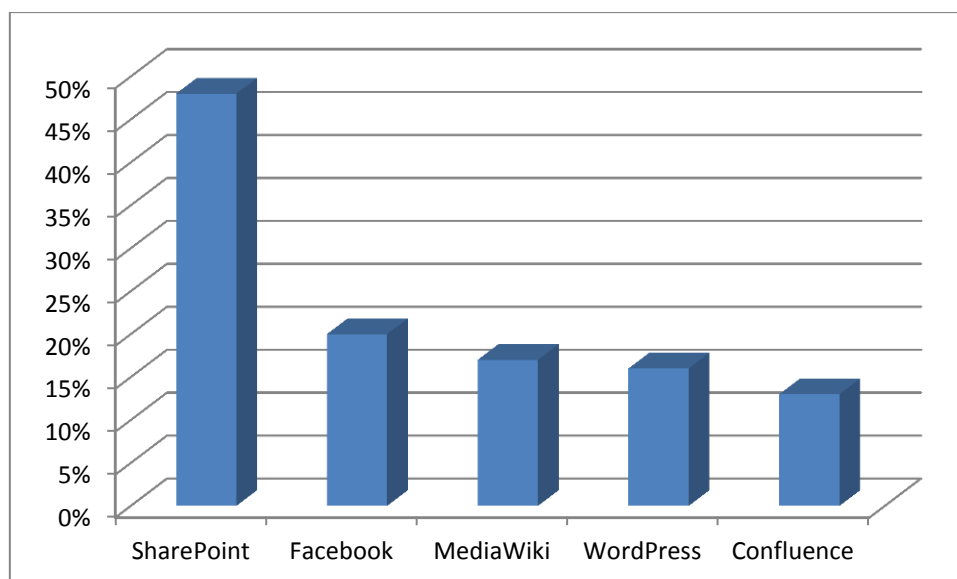
2.3.3 Other considerations

According to the study, Intranet 2.0 technology is cheap. Of those organizations that have implemented 2.0 tools, almost half have spent $10000 or less on these tools:
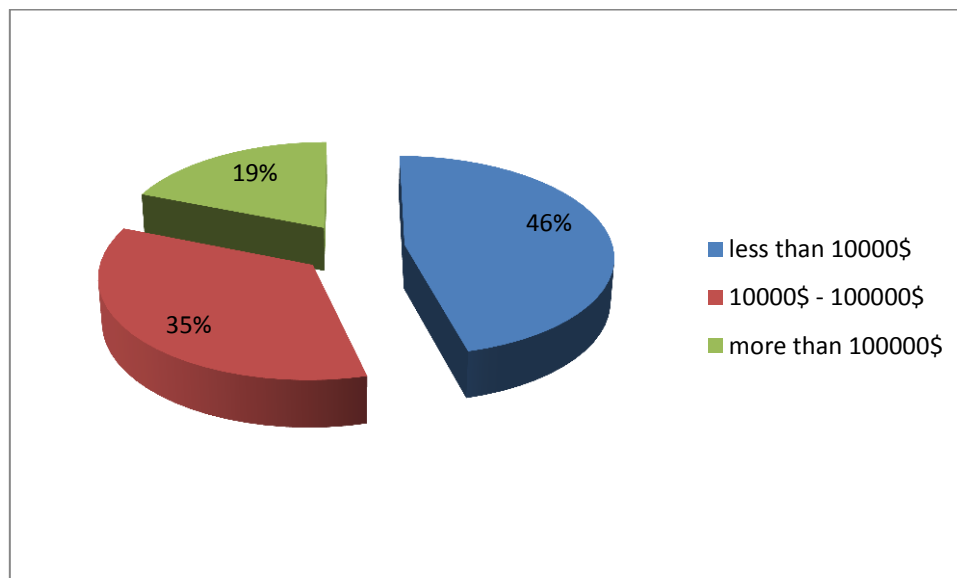
However, in spite of this low cost, the satisfaction levels with Intranet 2.0 tools are low:

Satisfaction level
Only 29% of organizations rate the tools functionality as good or very good
24% rate them as poor or very poor
Only 23% of executives rate the 2.0 tools as good or very good
38% rate them as poor or very poor

When researching about the barriers to implementation, the following ones stand out (these statistics deal with those organizations that have not implemented 2.0 tools):

Barriers to implementation	%
Lack of executive support	33%
Lack of IT support	31%
Lack of business case support	30%

2.4 Intranet management and team

This section analyses the idiosyncrasy, importance and the roles of the human team which is in charge of managing a corporative intranet.

2.4.1 Intranet team

Normally, having a team of just one professional managing all the aspects of the Intranet will not be enough, unless the organization is really small. Actually, the Intranet team must possess skills and responsibilities that concern a wide range of fields: it must be a transverse team. Next, I describe the roles and tasks of different members of an Intranet team [5].

2.4.1.1 Roles

In general, the necessary roles will be a project manager plus a group of professionals that will be in charge of different tasks.

A multidisciplinary approach is needed when establishing an intranet team. The range of responsibilities is very wide, so a large number of skills are required.

The following list enumerates the key roles:

- **Project manager:** given any type of intranet, a full-time intranet manager will be always needed. He should not create web pages or perform development tasks, but instead chase up issues, track jobs and manage the team.
- **Web designer:** creator of the web pages that make up the intranet. In a collaborative intranet, all users are authors, so the task of the web designer is more focused on creating templates and other tools to make user edition easy.
- **Graphic artist:** this role may not be a full-time one, but is nearly sure that the project will need his services in some stages.
- **Developer:** even if future expansions of the intranet will be developed by other teams, it is useful to have internal developers in order to develop some applications and other small technical tasks.
- **Usability specialist:** it is important to have professionals specialized on usability, not only when establishing the intranet, but also for future expansions.
- **Information architect:** performs the tasks of matching the intranet structure with the organization structure.
- **Technical writer:** he is in charge of writing high quality contents and/or reviewing contents written by other authors.
- **Subject matter expert:** it is necessary staff from all the areas of the organization collaborating with the intranet team in order to have a wider view.

- **Professional indexer:** reviews the correct indexing of contents and performs tasks to improve metadata in order to make information easier to find.

- **Journalist:** this professional will gather information that exists in the business environment and can be useful in the intranet. It could happen that without this specialized role no user will add this information.

- **Communications specialist:** he develops the communication plan and manages strategies for promoting the intranet.

- **Business analyst:** the intranet team must deal with all the areas of the organization, to give response and/or support to new business needs which could arise. A business analyst meets requirements and proposes possible solutions.

Note that the association between roles and professionals is not always a 1-1 relationship. Depending on the size of the organization, it is possible to fulfil several roles with just one person (in small companies) or, conversely, more than one professional can be needed to cover one role (in larger companies).

2.4.1.2 Tasks

It is important to have the Intranet team planning how they will spend their time. Otherwise, it is really easy to be dealing continuously with urgent requests and issues, without making any long-term progress.

Essentially, the Intranet team must deal with three types of tasks: day-to-day maintenance, projects and new initiatives, and tasks for managing relationships with staff and stakeholders. A good general rule could be devoting 30% of the time to the first task, a 40% to the second task and another 30% to the last one. Next, I describe these types of tasks.

Day-to-day maintenance:

It includes tasks like: publishing and maintaining content, providing support to publishers, dealing with technical issues, evaluating search logs, maintaining the home page, reviewing contents with the owners, and creating images and graphics

It is important to avoid being excessively absorbed by the day-to-day maintenance. If the Intranet team is experiencing an excessive workload, they should take some measures. For example, they could transfer some tasks about publishing to business areas (outside the Intranet team) and automate repetitive tasks as much as possible.

Projects and new initiatives:

The Intranet should be changing and evolving constantly, according to the pace of change of the organization itself. Most improvements appear as part of a new project or initiative.

Some examples of new projects and initiatives are: adding a new area of content to the Intranet, making redesigns of the information architecture, changing or refining the Content Management System, adding collaboration tools, and improving the search engine

Actually, these projects and new initiatives is where the Intranet team builds their reputation and credibility. So, all changes and innovations have to be communicated and its benefits have to be shown.

Managing relationships with staff and stakeholders:

The success of an Intranet is completely dependent on the satisfaction of its users. Intranet team does not have all the knowledge of the business and they must rely on other experts and contact every area of the business. Furthermore, managing relationships allow them identifying opportunities where intranet can support business activities.

The key to the relationships with staff and stakeholders is to understand the needs of the staff, how the organization works and what the current priorities of the organization are.

The main actors of those relationships are publishers, stakeholders, team managers, site owners and technical teams. The Intranet team should engage all the organization to get the most of the Intranet.

2.5 Deployment

Currently, a lot of organizations have intranets that have a limited usefulness and an unnecessary complexity, at the same time. Deploying successfully an Intranet 2.0 can simplify and improve the efficiency of several tasks, but is a delicate process and some issues can arise. An article of Chris McGrath [5] enumerates 10 essential steps to perform this deployment process.

Step 1: Blow up the old intranet

The process of dissolving the old intranet will be gradual, and it will depend on its current usage by employees. It is not worth trying to fix it, is better to start over and not reuse any part (maybe with the exception of some hardware systems).

Step 2: Turn users into authors

When readers can also write and become authorized editors, the intranet will gradually transform into an auto-regulated and active space (in function of the level of involvement of users, of course).

Step 3: Expose the social context of all content

Given an article or another piece of content, if you know information like who added it, where he works, who work with him and other similar information, the content is wrapped in a social context. And this context makes the information much more interesting and meaningful.

Step 4: Easy and quick search system

If intranet users can not search directly the information they need, or if the returned results are not precise and/or quickly obtained, they will use another method in order to obtain the same information, and the intranet can fall into disuse in a progressive way.

Providing several search methods is a good practice. You could provide a traditional search bar, an intuitive navigation structure and a tagging system, for example.

Step 5: Send signals when content changes

The Intranet 2.0 should include methods to indicate which information is more important, and be able to communicate any change or relevant update. This will free users from having to check routinely any update that could interest him.

Sending signals brings people back to the intranet, the activity flowing and the content fresh.

This feature is easy to include using technologies like RSS or email notifications when a page is edited, added or commented, for example.

Step 6: Provide scaffolding, a framework to support new content

Imagine an intranet which starts just with a blank wiki. It is really tough to start with a blank page. In contrast, providing some kind of framework to guide content creation will make it easy for users.

To get an information architect to help in the definition the initial structure of the new intranet is a good idea.

Step 7: Include initial content

As stated in the previous point, creating contents in an empty section is more difficult than doing it in one section which already has some contents. With some initial contents, users will have a good reason to perform a first exploration of the intranet. Furthermore, when they contribute with their own contents, they will have a model and structure to be followed.

Step 8: Make users prove the new intranet

Most people do not want to learn a new application no matter how easy it is supposed to be. Every member of the organization staff has to use the new intranet at least once, in order to have the opportunity to persuade them about its usefulness.

This can be achieved organizing brief group training sessions. In these sessions, they could edit their profile, add a page, add a comment and perform other similar basic actions.

Step 9: Lead by example

If the management team of the organization participate and get involved with the new intranet, other employees will pay attention and probably imitate them.

Involving one executive in a specially intensive way, getting him adding and editing contents early and often, is a good idea, for example.

Step 10: Do not use the intranet just as a database

The intranet must provide tools for creating and editing contents, and not only for storing them.

Providing tools to integrate external application can be recommendable, but they should be never the only way to create and edit contents.

2.6 Intranet evaluation

The Intranet gets resources and support from its organization. So, its value must be demonstrated.

A good initial approach to demonstrate improvements is to show figures representing the situation before the new intranet and its change after it.

If we do not have the before figures, it is really hard to quantify concrete benefits. Unfortunately, a typical workplace makes it difficult to find time and justify a research before the project actually starts.

However, demonstrating these types of returns will allow us getting more resources in a much easier way.

Depending on the size of the project and the available resources, we can opt for a lightweight approach or a more robust one.

The following list enumerates some lightweight approaches:

- Measure levels of usage before changing to the new Intranet. Use a stats package if required.
- Perform a "user satisfaction survey" before the change. Then, repeat it after having consolidated the new Intranet.
- The Intranet Review Toolkit [6], a toolkit for evaluating core intranet heuristics, is available online.
- Gather anecdotes, examples and complaints of staff frustrations with the current system. Then, demonstrate solutions and increased satisfaction dealing with these situations after having consolidated the new Intranet.
- Prepare a before-and-after "portfolio", so the old designs will not be forgotten and the new designs will not be taken for granted.
- Recording videos of users struggling with the current system, as a part of usability study.

On the other hand, robust approaches allow us having a more concrete evaluation results. Some examples are:

- Measure end-to-end task completion, before and after the new Intranet (e.g.: a task required 30 minutes to be completed in the old system and now can be achieved with just 2 minutes).
- Conduct quantitative before-and-after usability tests, focusing on these tasks that the operational staff uses the intranet for.
- Get quantitative measures of saved money.
- Demonstrate improvements to key business metrics that are already being measured in other areas of the organization.

2.6.1 Evaluation metrics

The previous introduction presented some lightweight approaches as well as some more robust ones which can be used to evaluate an intranet. However, most evaluation methods have one thing in common: they rely on metrics in order to get their assessment results. Note that each organization should work out its own method and metrics for evaluating its intranet, according to the goals they defined. The most critical ones can be referred as KPIs (Key Performance Indicators), too. Next, I am going to describe the most important categories of metrics to apply when evaluating an intranet.

2.6.1.1 Hard costs savings

This category includes the metrics which indicate the benefits related to material savings and improvements of common processes due to the Intranet. For example, reduced paper printing, time saved due to automated installations of software instead of manual installations and other savings resulting from having automated processes are metrics related to hard costs savings [7].

2.6.1.2 Sales increase

Although this association is sometimes difficult to see, an intranet can help an organization increase its sales. The underlying factors that can explain this raising are: the sales team can use critical information for their task quicker and more efficiently and it can improve the way of rewarding employee leads and referrals.

Intranet sales tools could be applications that allow entering and accessing customer's information, track sales volumes, assist in sales and profit forecasting and so on. Some

benefits related to sales which could be translated into metrics could be the increased volume of sales due to the customer service improvement, reduction of time to market for promotions, enhanced communication between sales agents and customers and so on.

The Intranet of Sodexo USA is a good example on how to apply KPI related to sales. Sodexo USA is the leading provider of food and facilities in North America, providing service to more than 6000 companies. Its employees are spread out across and in all the corners of North America. Its Intranet, called SodexoNet, is the system which links all them and provides management functionalities. SodexoNet has more than 14500 users.

SodexoNet has several sections and interesting features, but here we will focus on sales KPI. Because one of the more innovative and successful tools is its SuperSleuth sales lead program. It is an Intranet web page and application which allows and encourages employees to submit sales leads and prospective customers via the intranet. It generates cash rewards of up to $1000 for the submitter. According to Sodexo, this application contributed decisively in the 100% increase of sales leads experimented in the year after the installation of this application [7] [8].

2.6.1.3 Productivity boost

One of the most common goals for an Intranet is boosting the productivity of employees and their ability to find information and tools to perform their tasks. The Intranet can allow having a centralized access to different applications and platforms, from anywhere (include employees' home). When developing metrics for evaluating the productivity boost, a good approach can be calculating the amount of money saved due to the reduced time to perform common tasks [7] [8].

One example is the following. IBM's intranet portal is strongly focused on providing productivity tools to its users. Let's highlight some of the most important ones and how they evaluate them: E-Meetings combines applications of instant messaging, presentations and voice. It allows IBM saving travel and setup costs. They have calculated that this part is used by 36000 employees every month. E-Learning allows providing training via the Intranet. IBM calculated the following metrics: 48% of employee training is delivered on the Intranet; they save about $284 million annually; more than 200000 employees have received training online. E-HR: this part of the Intranet provides health care enrolment, performance measurement, skill and career

development, compensation, stock options, pensions, insurance, time off control, transfers and other social benefits. In general, IBM estimates that they have got a productivity savings of $80,6 million [9].

2.6.1.4 Competitiveness enhancement

If the Intranet allows faster access to large volumes of information and provides more accurate information and knowledge, the organization will be able to adapt and respond more quickly in its marketplace. So, its competitiveness can improve greatly. Some benefits related to this competitiveness boost are having just-in-time access to information, reduced time to access internal data, reduced time to obtain knowledge due to improved information sharing and knowledge management features, etc.

Bank of Montreal (BMO) is an example of an organization which has measured the savings due to the reduced search and processing time related to its Intranet system. They got a result of $700000 being saved per year, approximately [7].

2.6.1.5 Infrastructure savings

Using Internet technology as the foundation for the corporate Intranet can lead to save money compared to using other technologies like mainframes, legacy systems or similar. Special training for it is usually not necessary or greatly reduced. The integration of different systems can be significantly cheaper and development of new applications is simpler. All these benefits can be usually translated into money saving terms. Many analysts agree than changing from an old legacy system to a Intranet using Internet technology can result in having savings of up to 95% [7].

2.6.1.6 Collaboration enhancement

The Intranet system can focus on providing collaboration tools. The value and efficiency of an organization can greatly increase if more connections and collaboration tunnels exist between its users. Some benefits which can be achieved are: reduce time and space limitations for meetings, support virtual teams in geographically dispersed locations, online training, knowledge management, etc. These benefits could be exposed as metrics showing the Intranet impact on them.

The company Cadence Design Systems provides an example which can be useful to illustrate the benefits of a collaboration enhancement. The company organized regular remote training sessions two to four times per year, for more than 400 employees. The

cost of each session was $260000. This happened until they adopted a system to deliver the training via web conferencing, which allowed reducing the huge travel expenses [7] [10].

2.6.1.7 Reduced time to market

Having an effective intranet allows responding faster to the demands of the markets. Concerning this category, the following benefits could be measured: faster development of products and services, optimization of the supply chain cycle involving different agents (partners, suppliers, customers, etc.), sharing information of different locations in real-time, reduced inventory requirements, reduced working capital requirements and possibility to invoice and purchase more quickly [7].

2.6.1.8 Customer service improvement

The use of the Intranet allows more immediate and effective communication between customers' requirements and the agents of the company. It can improve the information flow, the customer satisfaction as well as reduce the cost of this service.

We could translate into metrics the following aspects: fewer employees are required to service our customers, increased availability of support and service information of our products or services (including 24x7 support) and enjoying more precise information (because internal information will match external information, and we can have centrally-managed repositories).

Cisco Systems is an example of the benefits an Intranet could bring to the customer service of a company. Most of the customer service functions of Cisco Systems are channelled through its website and Intranet. Cisco is able to solve 70% of help desk calls online, having saved about $193 million and increased customer satisfaction by 25% [7].

2.6.1.9 Human resources improvements

Business culture, personal compensations and opportunities are very important motivations for employees, as well as having the right tools to perform their job. In this sense, the Intranet can provide several benefits to the staff of a company: a higher retention of our employees, reduced expenses of training, reduced loss of knowledge, reduced competitive threat and reduced downtime due to employee desertions.

The MITRE Corporation is an example of the human resource improvements which can be achieved. They have estimated that are saving about $860000 per year in clerical staff thanks to use an online automated property tracking system. In addition, the Intranet allowed retaining 15 employees because they can be teleworkers now. Otherwise, they estimate that they have had to spend about $300000 in recruiting new employees [7].

2.6.1.10 Level of user satisfaction

The level of satisfaction of the users is really important. Measuring their happiness can be complicated as it is an abstract indicator. We could measure the satisfaction of the users with different parts of the Intranet: design, content, navigation, tools and search.

One example is the following: in order to illustrate some ways to evaluate the level of satisfaction of Intranet users, we will use BT, a British telecommunications company, as an example. BT organizes an annual survey implying its intranet users. This survey is carried out by an external organization, ensuring independency and confidentiality.

They got the following results: 83% of satisfied users; 42% of extremely/very satisfied users; 6% of dissatisfied users; 48% agree the BT Intranet improves everyday working life; 57% agree the BT Intranet saves time in the working day; 59% agree the BT Intranet helps to be more efficient in the job. The survey is taken as a vital part in the plan of BT to improve their Intranet. The first two results measure the general satisfaction of users. It could seem is quite positive, but both results have experimented a decrease of 3%. In the case of unsatisfied users, the survey has to investigate their reasons. It will not solve any possible problems, but this evaluate will allow analyzing which are the best ways to improve the Intranet [7].

2.6.2 Evaluating the effectiveness of intranet teams

Another aspect to evaluate is the performance of the intranet. Measuring it is fundamental. However, Intranet teams are responsible for getting an Intranet that provides business value, is flexible enough to meet changing business needs, easy to use and accepted by staff. So, the Intranet team himself needs to assess their work.

The tasks of an Intranet team can be divided into three categories, as we have previously seen: day-to-day maintenance, projects and new initiatives and managing relationships with staff and stakeholders. Let's outline some basic metrics to assess the tasks developed for each one of these groups.

2.6.2.1 Metrics for day-to-day maintenance

These tasks are fundamental for keeping the Intranet going and in a good health situation. The following list enumerates some basic measures to evaluate them:

- Timeliness of contents updates
- Number of successfully resolved support incidences
- Number of training sessions done for the publishers
- Real adherence to service level agreements
- Number of content pages which have been reviewed
- Time the intranet has been "up" and running

These metrics can be measured in a quantitative way. However, it is also fundamental to focus on quality at the same time, taking qualitative metrics. For example, we should not assess only the number of training sessions done for the publishers but also the quality of these sessions.

2.6.2.2 Metrics for projects and new initiatives

Projects and new initiatives is one of the most interesting as well as challenging duties of the Intranet team.

In this field, we could apply successfully traditional project management metrics like:

- Milestones we have met
- Handing in the deliverables on time
- Results meeting the specifications
- Achieving the staff and business goals

On the other hand, it can be also helpful for the intranet team to take a more process-oriented approach, assessing the general effect of working on new projects and initiatives for the whole Intranet team. Some useful metrics for this purpose could be:

- Number of excessive hours worked to deliver on time
- Effect of projects on the day-to-day maintenance tasks
- Effect of projects on basic tasks (e.g.: publishing)

2.6.2.3 Metrics for relationships

Relationships with staff and stakeholders are very subjective and they are really difficult to assess in a quantitative way. However, some metrics can be used as an indicator. For example:

- Frequency of contact
- Number of ideas, comments and suggestions shared
- Surveys of user satisfaction

3   Chapter 3: Theoretical model

This chapter focus on building the theoretical model that will be the basis of the Intranet of the future that we are designing.

The purpose is developing a model which will be able to cover all the functionalities that can be achieved with an Intranet. I will describe the possible interaction models between the organization and the users through the use of the Intranet (section 3.1). Moreover, a list of concrete goals which can be aimed by this Intranet will be exposed (section 3.2).

Finally, much effort is dedicated to provide an exhaustive list of all the functionalities which can be covered by this theoretical Intranet model, grouping them in functional groups. In addition, I propose an architecture model (section 3.3) which allows mapping these features in a functional architecture supported by an underlying technological architecture. Note that describing exhaustively this technological architecture is out of the scope of this chapter, as it is strongly tied to the technology which implements a concrete Intranet.

The foundation of this model comes from a document of Everis which presents its desired scope for a corporate Intranet [11].

3.1   Possible interaction models

An intranet should provide different interaction models. The intranet should not be considered just as a technological tool but it should be perceived as a change in the common way employees use to interact between them.

In the first interaction model, the company informs employees. The information provided could be general knowledge, training, news or notices, for example.
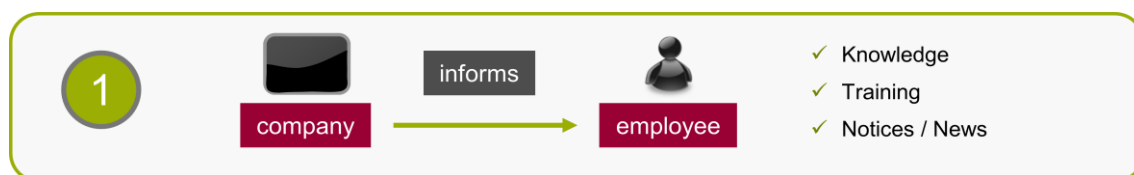
The second interaction model deals with the direct interaction between employees.

The third interaction model refers to tasks performed by the employee related to consulting company information and any management features. I.e.: changing their personal data, asking for payslips, managing incidences, booking resources (computers, rooms, etc.) and so on.
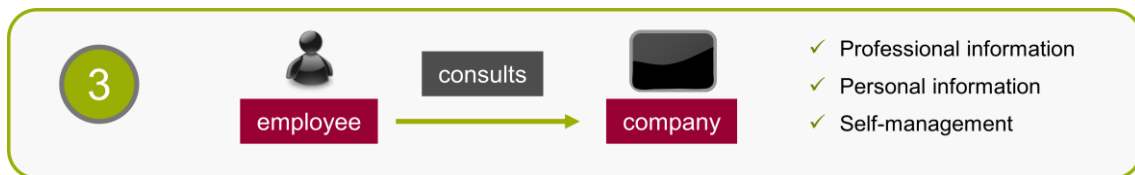
We consider that the Intranet we are modelling should provide the three interaction models.

3.2 Vision and goals

A company should define the vision for its intranet and take it into account to define a set of concrete goals. The range of services and functionalities offered by the intranet depends of the goals that the company pursues.

The following table describes common goals.

Goal	Description
User involvement and satisfaction	A purpose of the intranet is increasing the proximity of the company through an effective and interactive relationship which encourages communication. Finally, it results in a greater sense of belonging and increases motivation.
Spreading a corporative culture	Promotes corporatism and the sense of belonging to the company of the employees because the intranet is a communication channel which is able to reach all the groups of the company.

Information access	It makes the information access and exchange easier, as well as training, providing improvement tools to employees.
Efficiency and productivity	It allows rationalizing costs and increasing productivity as a result of automating administrative tasks and activities of low value added.

The Intranet that we are modelling should fulfil all these goals.

3.3 Reference architecture

The following diagram summarizes the reference architecture for building the Intranet.
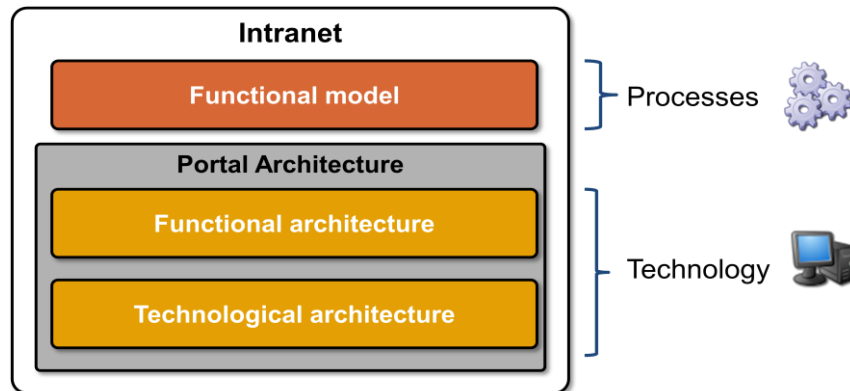
3.3.1 Functional model

The functional model is a structured representation of the functionalities, activities and processes related to the Intranet.

The first step to build the functional model is to define a set of general functional groups, each one enclosing related functionalities.

Functional group	Description
Corporative Information	Information about the company which should be available to the employee (processes manual, organization chart, ...)
Personal Information	Employee personal data (payrolls, work calendar, benefits, ...)
Employee Services	Applications and contents that makes his

	life easier (sick leave/medical discharge, incidences, room reservations, material, ...)
Professional Development	Training contents (self-learning tools, virtual library, online training, ...)
Unified communication	Applications and contents from the user's desktop (email, calendar, ...)
Community	Common interest applications (surveys, polls, discussion forums, chat, ...)
Portal Administration Services	Services for controlling, monitoring and managing accesses.
Management Information	Tracking and reporting services for the management team (management indicators, performance indicators, ...)

Everis performed some studies on this field and got the following list of services required in a corporative Intranet. Note that it refers to the services needed for a general purpose Intranet which will be useful for most organizations. Entities and organizations with a very specific profile (i.e.: hospitals) could have different needs and adjustments should be done when designing a system for them.
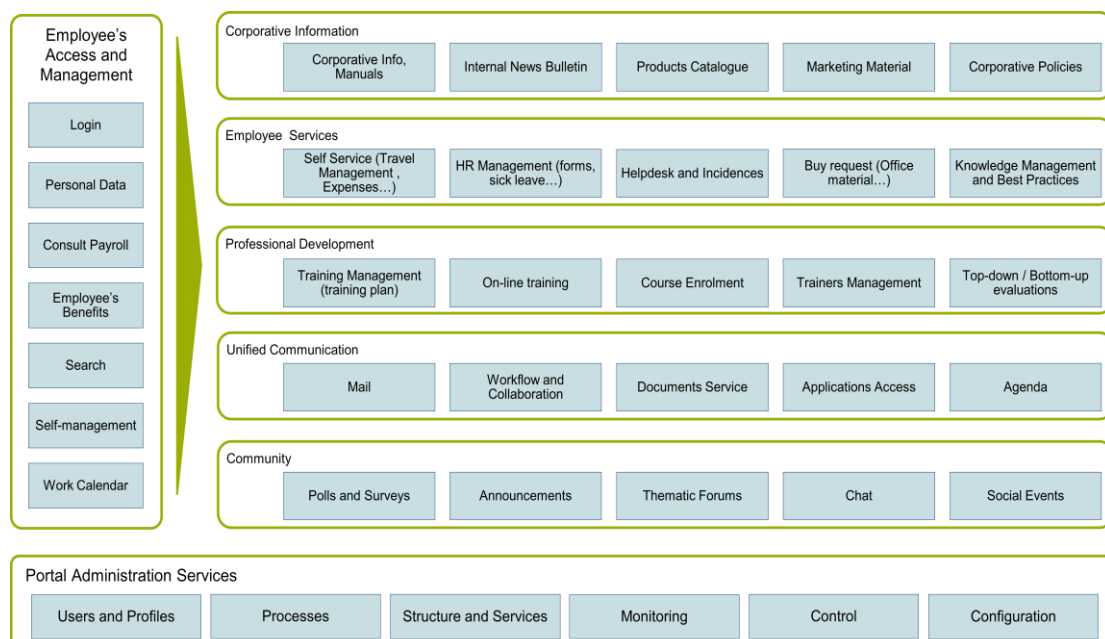
3.3.2 Functional architecture

Having defined the functional model, we are ready to establish a functional architecture which details all the concrete functionalities that could be developed for the Intranet.

We have defined two broad categories which will contain groups encompassing the functionalities for the Intranet 2.0 we are modelling: Features and Presentation.

3.3.2.1 Features

This category refers to the core functionalities of the Intranet. These are the functionalities which deliver business value directly. It defines what can be done in the Intranet. Most users of the Intranet would interact with these features.

The following table describes the functional groups which belong to this category.

Group	Description
Web 2.0	We are modelling an Intranet 2.0. We must use components to enhance information sharing, interoperability, user-centred design and collaboration.
Sales	Includes components which provide technological support and tools for both external and internal sales.
Multimedia	This group includes all the needed components to manage several multimedia formats (audio, video, images, ...)
Content Management	Provides components to manage the contents of the intranet. It must be taken into account that these contents can belong to different types of formats.
Search engine	The system has to provide ways to find easily all the contents.
Social networking	The Intranet has to encourage and promote the relationships between employees.
Geolocation	The identification of the real-world geographic location of Intranet users can be really useful for some types of businesses.

Users	This group includes the components in charge of registering new users and providing access and other functionalities to the existing ones.
Multilanguage	In some types of businesses (e.g.: a multinational one), providing the contents in different languages can be really helpful.
Communication	Components that facilitate communication between different users of the intranet (including asynchronous communication and communication between geographically dispersed participants).
Advertisement	This group provides management of components of advertising like banners, advertisements for videos, etc.

Everis performed some studies on this field and got the following list of services required in a corporative Intranet.
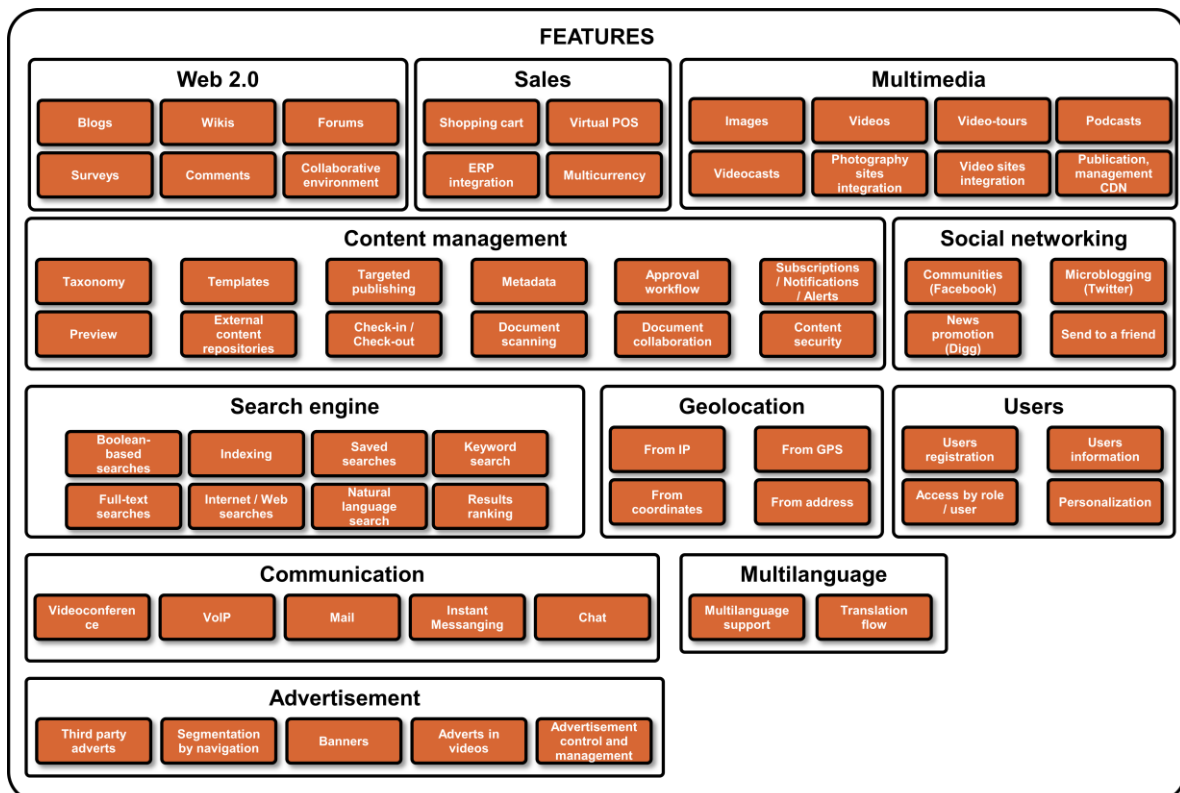
3.3.2.2 Presentation

This category focuses on the way the core functionalities of the Intranet are presented to the user. Basically, it includes the functional groups regarding the channels which can be used to perform Intranet activities and the help provided to the users to make tasks easier.

In general, these groups do not provide directly business value. However, they can be fundamental in certain scenarios (i.e.: an intranet mostly accessed by mobile devices).

Group	Description
Multichannel	Refers to providing several ways to access the intranet: from different browsers, devices (like mobile phones), off-line access, ...
Help	The purpose of this group is to provide components to show helpful information to use the Intranet and to make validations of information easy.

Everis performed some studies on this field and got the following list of services required in a corporative Intranet.
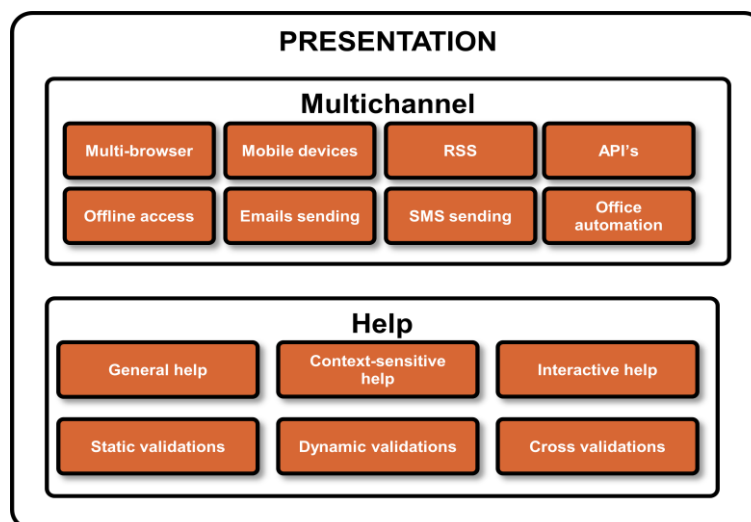
3.3.3 Technological architecture

The technological architecture will describe the structure and behaviour of the technology infrastructure which is underlying our solution.

It is important to highlight that we could have different technological solutions each one fulfilling the previously presented functional architecture and with a different technological architecture.

However, these technological architectures should be characterized according to some common desired functionality. We have structured this level of desired functionality in two broad categories: Infrastructure and Operations.

3.3.3.1 Infrastructure

This category refers to the technical capabilities of the underlying technology which is used to mount the Intranet we are modelling. Its functional groups refer mostly to server functionalities. In some scenarios, these functionalities can drive business value or enhance the performance of the system while other ones will be an indispensable requirement for it.

It is organized in the following functional groups: Integration, Platform, Scalability, Security and Standards.

Group	Description
Integration	The purpose of this group is to provide components which allow integrating the Intranet with other external applications.
Platform	This group refers to the underlying infrastructure (databases, operating systems and so on) supported by the technological architecture. The good point would be to support as many systems as possible in order to improve the flexibility to install and run the Intranet.
Scalability	This group contains components that allow scaling the system: if the size of the system increases, its performance should not be hindered. In addition, it should be improved due to the new conditions,

	when possible.
Security	Security components are in charge of ensuring that proper people have access to the proper information, services and/or applications.
Standards	The standards supported by the technological platform can condition the developments based on it. With the need of integrating heterogeneous systems, having a platform which complies with most standards will make our life easier.

Everis performed some studies on this field and got the following list of services required in a corporative Intranet.
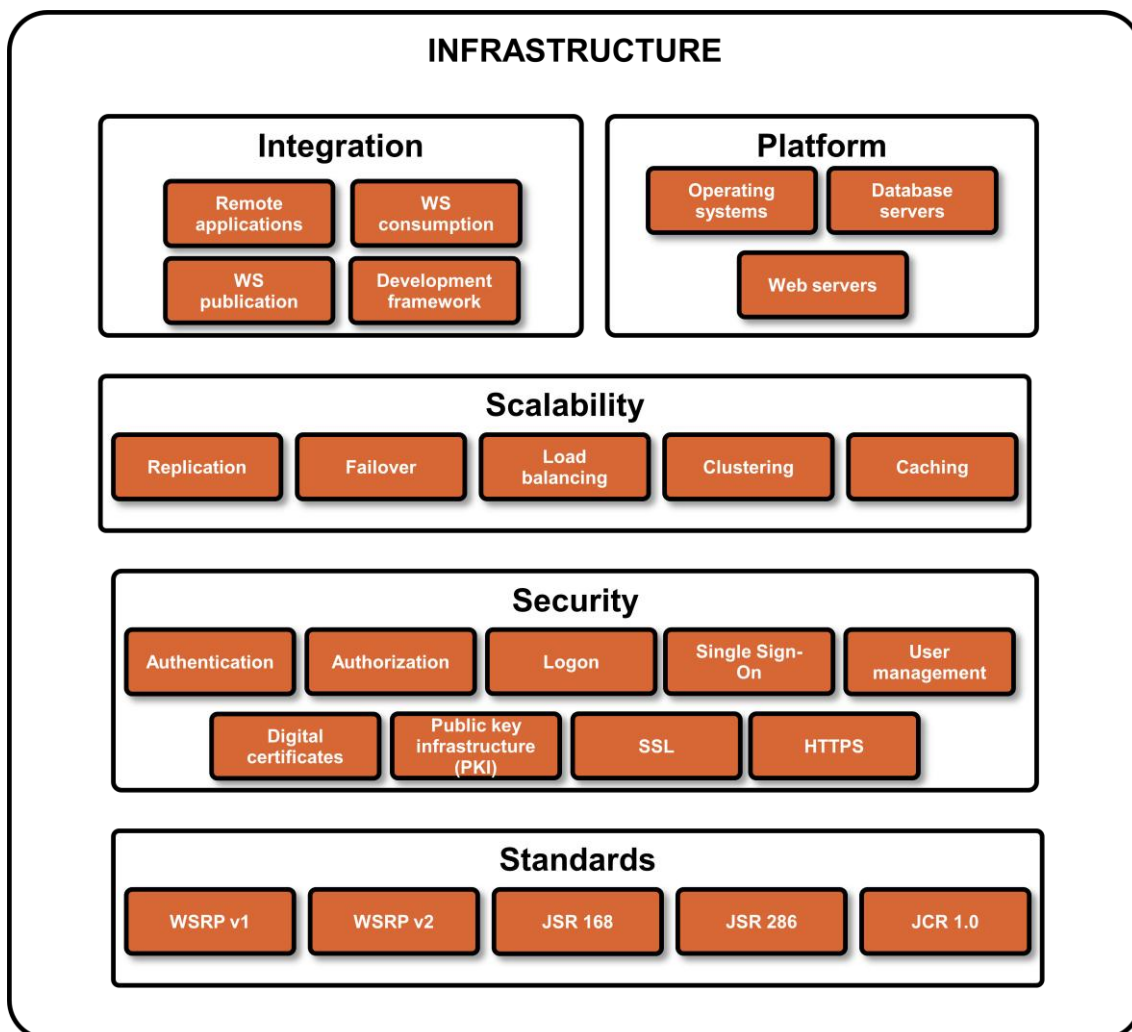
3.3.3.2 Operations

This category focuses on the capabilities of administrating and managing the Intranet and its underlying technology. These capabilities would not be assessed by most users of the Intranet, but they can be critical when choosing a technology according to its ease of deployment and administration. These capabilities are also especially relevant to determine the difficulty of maintenance of the whole system.

It is organized in the following functional groups: Administration, Ease of upgrade and Statistics.

Group	Description
Administration	It refers to administration processes like managing users, communities and general settings. The main goals here should be providing powerful capabilities and a friendly and productive interface.
Ease of upgrade	No product is eternal, and newer versions and extensions will be need or useful in the future for sure. The components of this group are in charge of providing a systematic and easy process to update the whole product.
Statistics	This group contains components which provide useful statistics to monitor the system. Later, this information can be used to fix issues and/or improve its performance. Its components should focus on providing personalized and useful information.

Everis performed some studies on this field and got the following list of services required in a corporative Intranet.

OPERATIONS

Administration

Configuration   Interface

Community management

Ease of upgrade

Upgrade tools   Metadata for customizations

Statistics

From logs   Online visits

Monitoring functions
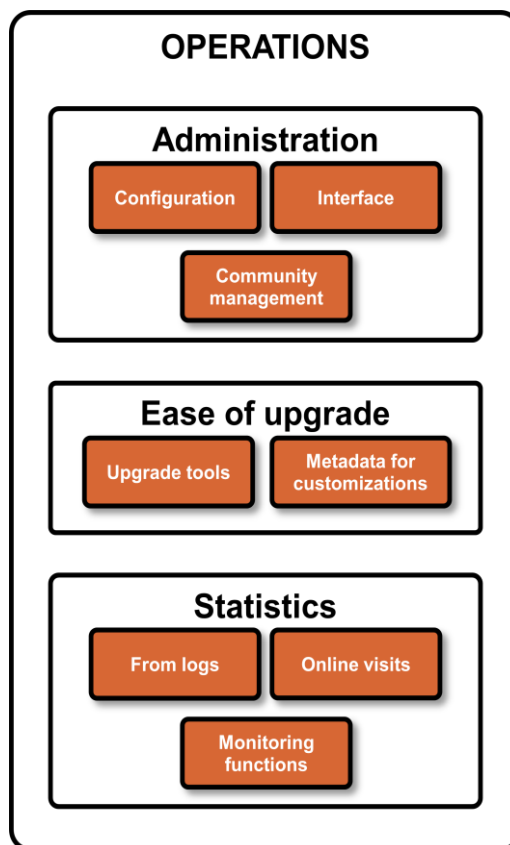
4 Chapter 4: Overview of possible technical solutions

We have built the theoretical model which defines the services that the Intranet of the future has to be able to offer.

Now it is time to think about the technology that can fulfil these requirements. According to those needs, the solution will be framed within the Enterprise Portals technology field.

An Enterprise Portal is a framework for integrating information, people and processes across organizational boundaries. It provides a secure and unified point of access and aggregates different information (usually through portlets).

Generally, an Enterprise Portal provides the following features:

- Personalized access
- Filtering of content based on role
- User-friendly interaction
- Multi-system integration
- Scalability
- Single sign-on
- Content management
- Community support
- Development framework

These features allow fulfilling the services defined previously in our functional model.

In this chapter, we will have an overview of possible technical solutions which allows implementing Enterprise Portals, analysing their main features, advantages and disadvantages. In order to perform this analysis, I have researched how these solutions perform in the services of the functional and technological architectures previously detailed. Specifically, I will describe portal products from these vendors: BroadVision, Covisint, Fujitsu, IBM, Liferay, Microsoft, Open Text, Oracle, Sun Microsystems (recently acquired by Oracle), Red Hat JBoss, SAP and Tibco Software.

4.1 Main Enterprise Portal technologies

We have focused on the Enterprise Portal technologies which are considered as the most important by the information technology research and advisory company Gartner [12].

The Gartner's Magic Quadrant is a graphical representation of a marketplace. The evaluated products are classified in these categories:

- **Leaders:** They have a full range of capabilities and options to support various portal deployment scenarios. Furthermore, they have demonstrated consistent product delivery in meeting customer needs for a considerable amount of time. They have delivered significant product innovation and have successfully sold to new customers across different industries. IBM, Microsoft, Oracle and SAP are the companies which demonstrate leadership.

- **Challengers:** They demonstrate significant ability to execute, but they still lack the degree of portal-specific vision demonstrated by leaders. The challengers are Red Hat JBoss and Open Text.

  Red Hat JBoss has demonstrated successful execution across many industries. It has penetrated in a significant way in the markets of North America, Europe and Latin America. However, it has not yet demonstrated a vision similar to the leaders' one.

  Open Text is here because of its acquisition of Vignette, providing them with a strong portal technology. However, portal innovation of Vignette has slowed and Open Text should allocate greater resources to recover it.

- **Visionaries:** In general, visionaries are innovative products which are smaller than the leaders' ones. Or maybe products which have some very special feature which make them really different to any other one. According to Gartner, the current visionaries are Liferay, Tibco Software, Covisint and Sun.

- **Niche players:** Niche players focus on a limited set of portal deployment scenarios, have limited geographic presence outside their home markets or focus on a narrow set of industries.

In the Gartner's Magic Quadrant, the criteria for classifying the products depend of the following criteria:

- **Ability to execute:** It is the Y axis of the Gartner's magic quadrant. The ability to execute depends of factors like supporting different portal deployment scenarios, long-term vendor viability, demonstrated experience of meeting customer needs and an expanding market presence.

- **Completeness of vision:** It is the X axis of the quadrant. It refers to demonstrate a good understanding of the customers evolving needs, incorporate new customer demands into product strategies and showing technological innovation in the products.

4.1.1 BroadVision

BroadVision has focused its efforts on B2C portal deployment scenarios. In the past, this was a source of competitive differentiation, but currently it has been reduced due to the competitors' moves. Their most recent portal functionality is included in Business Agility Suite 8.2.

Strong points

- Strong functionality for B2C portal deployments, especially for the e-commerce component.

- The visual drag-and-drop style of application development delivered by BroadVision's Kukini workbench allows lower skilled developers to build portals easily.

Weak points

- BroadVision's software revenue has been decreasing over the last years.

- It stills lacks portal-specific standards support for JSR 286 and WSRP v.2. And they have not done any special effort in this direction yet.

- Its pace of innovation has slowed significantly, having less portal features added in 2009.

4.1.2 Covisint

Covisint has experimented great benefit due to increased interest in cloud computing models of application and portal-as-a-service offerings. They focus on marketing their SaaS portal.

Strong points

- According to Gartner's experience, SaaS enables faster deployments.

- Integrated security features like user administration, provisioning, user access, identity verification and federation and federated searching using the FAST enterprise search platform.

- Covisint acquires off-the-shelf open source and commercial technology as underpinnings for its SaaS options. With these group of technologies they can reinforce features like federated identity management.

Weak points

- Most of the Covisint's experience relates to four industries: automotive, healthcare, government and financial services. They do not have much experience in other industries. Moreover, it can create competition with Covisint customers who are targeting these markets themselves.

- Enterprise mashup features are not included in their solution. However, some of their customers have created composite applications and Covisint is exploring third-party technologies to cover these features.

- The development of new applications for the portal is challenging due to the Covisint's

> software assembly strategy combined with the SaaS delivery.

4.1.3 Fujitsu

Fujitsu is a large, financially strong and global IT company that enjoys a strong position in its Japanese home market. Their portal product is Interstage Portal.

Strong points

- Their portal strategy is tied to their overall middleware strategy, focusing on the portal as the UI for a SOA environment.

- Recently added support for Ajax and a mashup framework allows building improved UI's and performing rapid composite development.

Weak points

- Interstage product family has achieved little success penetrating markets outside Japan.

- Their annual revenue from portal scenarios remains modest. Gartner estimates it as $5 million, approximately.

- Interstage Portal solution has no support for advanced portal standards (like JSR 286 and WSRP v.2). Moreover, their social software and cloud capabilities are in general less powerful than their competitors' ones.

4.1.4 IBM

IBM is a large and global provider of technology and services. It is a leader of the portals market and continues to invest directly on its product: WebSphere Portal.

Strong points

- WebSphere Portal continues a long history of successful deployments in a wide range of complex and different deployment scenarios, including high-scalability environments.

- It has a full range of portal complementary technologies (like content management, mashups, social computing and collaboration, security and management), and a large network of partners.

- They have created "accelerators" which provide some prebuilt templates, workflows

and default deployment settings adapted to different scenarios, allowing reduced deployment times on them.

- IBM has redesigned its market strategy for small and midsize businesses, using their system of partners to reduce deployment times for these deployment scenarios.

Weak points

- Installation times have improved but configuration for more-complex portal project still result in extended deployment times and WebSphere Portal is still one of the most difficult portal products to deploy.

- WebSphere Portal is based on WebSphere platform. It requires an important investment in that technology and related sets of skills.

- Customers and prospects still report confusion and some misunderstanding with the IBM's Processor Value Unit pricing methodology.

4.1.5 Liferay

Despite of the company's small size, Liferay has a significant market acceptance and visibility, due to its open source licensing model. This is partly due to the perception of the market that open source alternatives represent lower cost means of developing portals during a recession. Furthermore, their agreement with Sun reduced the perception of risk associated to a small open source portal provider.

Strong points

- Liferay Community Edition allows quickly deploying core portal functionality without software license procurements.

- Liferay Portal and Liferay Social Office demonstrate aggressive efforts to provide social-network capabilities integrated with their portal functionalities.

- Liferay Portal has taken an approach for portal services, giving to the users the option to push some portal functionalities into non-portal Web applications.

Weak points

- Personalization features are not especially robust.

- Liferay does not have a lot of demonstrated experiences with large-scale and transaction-focused portals yet. Normally, Liferay deployments focus on B2E and B2C scenarios.

- They still lack an extensive partner network for installing the product.

4.1.6 Microsoft

Microsoft

The Microsoft product for the portals market is Microsoft

Office SharePoint Server (MOSS). It is an integrated portal, content and collaboration

platform which can be used to create and operate a large variety of Web and portal sites.

Strong points

- Microsoft is increasing the number of site templates, speeding up MOSS deployments.

- MOSS MySites can serve as a first step for enterprises toward implementation of social-computing functionalities.

- The SharePoint Online Standard offering represents the first attempt by a portal product leader to provide a SaaS portal. While it still seems inadequate for some portal scenarios, it shows promise for portals which have departmental-level requirements.

Weak points

- The good level of market penetration of MOSS has created a WebPart aftermarket. It allows adding more functionalities due to development of third-party organizations.

- MOSS does not offer full support for enterprise mashups and social network. MySites is useful but is not a full enterprise social networking platform.

- MOSS lacks of content replication features among independent deployments and also lacks of a native backup and recovery system. Microsoft still relies on partners to provide these features.

- The product has not yet been widely deployed in transactional and high-volume portals.

- The users of large enterprise MOSS deployments indicate that the support structures of Microsoft are still experiencing some issues related to documentation and frontline technical support.

4.1.7 Open Text

Open Text acquired Vignette on 21 July 2009. This
acquisition improves the ability to execute of this option
in the market. The Vignette Application Portal is one of
the few areas where Vignette and Open Text's product

VIGNETTE is now
OPEN TEXT
The Content Experts

portfolios did not overlap. So, Open Text is probably interested on continuing this product.

Strong points

- Open Text's Vignette Portal has demonstrated scalability and is the foundation for many B2C portals.

- There are several installed ECM offerings based on different Open Text solutions. This a ready market for cross-selling Vignette Portal to these enterprises.

- Vignette Portal and Vignette Content Management can be fully integrated, providing a strong solution for both content creation and delivering it in a portal-based system.

Weak points

- Vignette provides support for mashup creation, RESTful services and some social-computing features (like blogs, wikis and tagging, for example). However, it seems that several competitors are a step ahead from them.

- Before the Open Text acquisition, Vignette was suffering a decrease on his market share.

- While the Vignette marketing focus before Open Text acquisition was focused on externally facing portals, now the Open Text's Vignette Portal is oriented to B2E scenarios. Open Text should assess and trace a good marketing strategy to obtain success with its portal.

4.1.8 Oracle

Oracle has obtained a great market presence in the portal space and has become a leader partially thanks to the acquisition of BEA Systems. They offer several technologies that can be used for developing portals: Oracle WebLogic Portal, Oracle WebCenter Framework, Oracle WebCenter Interaction and Oracle Portal. In general, they are offered in two bundles: Oracle WebCenter Suite and Oracle WebCenter Services.

Strong points

- Oracle WebCenter Framework vision for developing portal and non-portal Web applications is based on a common infrastructure which is based on JSF. It has proved to be a robust approach and provided value to the enterprise.

- Oracle WebCenter Spaces supports team collaboration environment (Group Spaces),

individual portals (Personal Spaces) and some attribute-based personalization.

- Oracle WebCenter Composer and Oracle Business Dictionary offers interesting capabilities related to the growing interest in enterprise mashups.

- Oracle WebCenter Framework provides an unified environment to interact with Oracle Fusion Middleware applications and integrates with Oracle Metadata Repository (MDS). It can be done through different channels like Ajax, MS Office and mobile devices.

- Oracle is an aggressive adopter of portlet-related standards, like JSR 301, JSR 286 and WSRP v.2 and will continue this strategy.

Weak points

- Oracle WebCenter Framework performance has not been significantly proved for transactional portals or portals which have a large number of concurrent users.

- According to some customers' opinion, Oracle has not yet communicated clearly how the four portal technologies will evolve.

- Oracle has committed to support products for a minimum of nine years from the BEA acquisition. However, several customers who are currently using BEA portal products are considering the migration to some competitors' product rather than migrating to WebCenter Framework, because this last option is not seen as natural and easier migration.

4.1.9 Sun Microsystems – recently acquired by Oracle

Sun Microsystems was a long-standing, business-critical systems and software company. They were challenged on both hardware and software sides. Then, their vision changed to a commitment with open source technologies. In this context, they thought on Liferay portal as the basis for its product: WebSpace Server. This product enhances and adds functionalities compared to Liferay Community Edition.

Recently, Sun Microsystems has been acquired by Oracle, adding its portal product to its already wide range of portal solutions.

Strong points

- The partnership between Sun and Liferay has achieved positive results: a strong, full of features and well supported offered with some innovations in social computing.

- Sun WebSpace Server has already demonstrated scalability in a lot of high-demand portal deployments.

- They provide strong support for Java and portal standards.

Weak points

- The partnership between Sun and Liferay has yet to show significant new sales of Sun WebSpace Server.

- Sun WebSpace Server's future is uncertain, because Oracle already offers several portal solutions.

4.1.10 Red Hat JBoss

Red Hat is the most powerful open-source vendor and can rival other vendors regarding market presence and stock market capitalization. They offer a wide range of software infrastructure products under open source licenses. One of these products is JBoss Enterprise Portal Platform (EPP): a Java Platform Enterprise Edition (Java EE) application server and portal. However, EPP has not achieved a level of success comparable to other Red Hat products. But they announced the merger of JBoss and the open source initiative eXo Portal. This operation could enhance in a significant way the portal capabilities of their offer.

Strong points

- Red Hat has a strong brand and enjoys market presence among large enterprises.
- An open source licensing model reduces perceived investment risks.
- There is potential synergy between JBoss EPP and eXo Portal. Especially in the areas of UI and social computing.

Weak points

- JBoss EPP is presented as a custom development platform rather than as an out-of-the-box portal solution. This can be a drawback for those companies looking for a simpler portal product which can be rapidly implemented rather than flexibility features. However, eXo portal could address some of these issues.
- JBoss Application Server is required to operate JBoss EPP.
- Several competitors are one step ahead on collaboration, integrated Web Content

4.1.11 SAP

SAP is a large and global provider of application, infrastructure technology and services. Their portal strategy consists of providing access to SAP applications and extending them. Some SAP customers use SAP Portal to support Web content management and collaboration scenarios. The portal product of SAP is NetWeaver Portal, bundled in NetWeaver Platform.

Strong points

- NetWeaver Portal is the best UI for providing web access to SAP applications.

- The Composite Application Framework of NetWeaver Portal provides the ability to quickly build Web-Services-centric composite applications.

- SAP has a broad UI strategy in order to provide access to SAP applications with tools like NetWeaver Portal, Web Dynpro, SAPGUI, Business Client, Duet and Alloy.

Weak points

- SAP has changed its original strategy of NetWeaver Portal being the only portal necessary across large enterprises. Now they are accepting the need of other portal technologies. However, a lot of customers had the original strategy in mind when they made their commitment.

- SAP Portal deployment focus on providing access to SAP applications. It has been reported that SAP Portal UI rigidity has limited use cases for SAP Portal. And very few non-SAP businesses applications customers use SAP Portal.

- It does not provide support for REST and SAP does not have public plans to implement WOA principles in their product.

4.1.12 Tibco Software

The offer for portal development of Tibco Software is PortalBuilder 5.3. The product is mainly based on mashups and Ajax.

Strong points

- Strong Ajax and mash-up related capabilities.

- Tibco has played an important role in widget standards definition.

- They have shown success meeting the needs enterprises in complex integration portals and portal-BPM projects.

Weak points

- Their strong Ajax capabilities have yet to attract large numbers of new customers.

- Tibco PortalBuilder suffers limited market penetration and visibility.

- In general, Tibco competitors are one step ahead in social computing and collaboration functionalities.

4.2 Summary

The following tables summarize the previously exposed information about the strong and weak points of each vendor's product.

	BroadVision	CoviSint	Fujitsu
Product	Business Agility Suite	CoviSint Exchange Link Platform	Interstage Portal
Gartner's position	Niche player	Visionary	Niche player
Related products	-	-	-
Strong points	• B2C focused • Easy development of custom features	• Fast deployment • Good security features • Federated search • Very adaptable to the customer's needs	• UI and composite development • Integration features
Weak points	• BroadVision's software revenue is decreasing • No support for JSR 286 and WSRP v2 • Slowed innovation	• Very focused on four industries. Lack of experience in other ones. • Mash-up applications are not supported • Development of custom features is very complex	• Few presence out of Japan • Fujitsu's revenue from portal software is very modest • No support for JSR 286 and WSRP v2 • Weak social networking features

	IBM	Liferay	Microsoft
Product	WebSphere Portal	Liferay Portal	SharePoint
Gartner's position	Leader	Visionary	Leader
Related	Other WebSphere	Liferay Social Office	-

products	products		
Strong points	• Successfully deployed in several scenarios • Several complementary technologies • Large network of partners • Several prebuilt components makes deployment faster • Redesigned IBM's strategy to improve support for small and midsize companies	• Core portal functionality is quick to deploy • Free licensing costs • Good social networking features • Portal services can be offered into non-portal applications	• Site templates accelerate deployment • SaaS services offered for small scenarios
Weak points	• Difficult deployment in complex scenarios • Needs an important investment and training in the WebSphere platform • Complex pricing methodology	• Personalization features • Lack of experience in large-scale transaction-focused portals • Not extensive network of partners	• Several third-party additions available • Weak mash-up features • Weak replication, backup and recovery system • Lack of experience in large-scale transaction-focused portals • Problems with support services have been reported

	Open Text	**Oracle**	**Sun Microsystems**
Product	Vignette Portal	Oracle WebCenter Suite	WebSpace Server
Gartner's position	Challenger	Leader	Visionary
Related products	Other Open Text products	Other WebCenter products	-
Strong points	• Scalability • B2C experience • Powerful content management features	• Powerful features for custom development • Out-of-the-box deployment available for some scenarios (WebCenter Spaces) • Enterprise mash-ups • Very good standard compliance	• Innovation in social computing features • Scalability in high-demand portal deployments • Strong standards and Java support
Weak points	• Weak mash-up, web services and social networking features • Its orientation towards B2E scenarios is very	• Performance not tested in large scenarios • Oracle offers several portal technologies and its evolution is	• Low level of sales • Uncertain future, as Sun has been acquired by Oracle

recent		not clearly communicated	

	Red Hat JBoss	**SAP**	**Tibco Software**
Product	JBoss Enterprise Portal Platform + eXo Portal	NetWeaver Portal	PortalBuilder
Gartner's position	Challenger	Leader	Visionary
Related products	-	Other SAP and NetWeaver applications	-
Strong points	• Strong market presence • Open source licensing • Good synergy between JBoss and eXo in UI and social computing	• Best UI for accessing SAP applications • Good framework to build composite applications	• Strong AJAX and mash-ups features • Support for widgets standards • Successfully deployed in several integration scenarios
Weak points	• Lack of out-of-the-box features • Weak collaboration, content management and personalization features	• Weak integration with non-NetWeaver technologies • Limited usefulness in non-SAP scenarios • Weak web services support	• Limited market penetration and visibility • Weak social networking and collaboration features

After having analysed all these products, we can extract some conclusions. All the products supported the JSR-168 and WSRP v1 standards. However, the same is not true for the most recent versions of these standards (JSR-286 and WSRP v2). These standards are essential to develop our model. Therefore, we have discarded all the products which do not support them at all. This decision affected directly the products Business Agility Suite (BroadVision) and InterStage Portal (Fujitsu).

On the other hand, the products which had weak social networking and/or collaboration features are also inappropriate an Intranet 2.0. The products JBoss Enterprise Portal Platform (Red Hat JBoss), Vignette Portal (OpenText) and PortalBuilder (Tibco Software) have been discarded for this reason.

The WebSpace Server is a product that could be interesting to test but its very uncertain future has discarded its candidature. Furthermore, the NetWeaver Portal (SAP) was

discarded due to its high level of dependence of other SAP products to be used as the portal platform for the Intranet we have modelled.

So, after this analysis the products which presented better conditions to implement the Intranet of the future were: Covisint Exchange Link Platform, IBM's WebSphere Portal, Liferay Portal, Microsoft SharePoint and Oracle WebCenter Suite. Finally, Covisint's product is too tied to some sectors and industries while the other products have a more generic approach which is more appropriate for the corporative Intranet model we are interested on. Regarding the four remaining products, Liferay, SharePoint and WebCenter have recently released new versions which include several new interesting features, while IBM's WebSphere Portal remains as a very stable product but that has been thoroughly tested in the past. So, it was the last solution to discard.

PART 2: ELABORATION OF PROTOTYPES AND COMPARISON OF PRODUCTS

5   Chapter 5: Delimiting an Intranet model

We have seen in the chapter 3 the functional model of the Intranet we are interested on.

A functional architecture derived from this model was also presented. It defined some categories which contained functional groups, each one with some components providing services related to the area of the group. However, each organization developing and deploying an Intranet will have different needs, focusing more on some of these functionalities, while not needing other ones.

In order to perform tests and build prototypes and evaluate them later, we should choose representative components for each functional group. It is a list containing those components which we have considered as essential to cover by any technical solution. Note that the technology architecture, also presented in the chapter 3, is not included in this delimited model. Firstly, this is because we want to focus on the features of the product and especially on its web 2.0 capabilities. In addition, most of the capabilities of the technology architecture would be very complex to test in a real environment (i.e.: scalability of the system, integration with many external systems, large scale security, etc.) and it is out of the scope of this project.

These essential components will be considered among all the prototypes we will build. Tests regarding these features will always be done. However, it does not mean that the other components will not be tested. If a product is specially featured to offer a good performance in some other component, it should be tested as well. Otherwise, if we ignore it, we will not be making a fair evaluation with that product. For example, if one of the evaluated product promises to offer very powerful multi-language capabilities, this will be exhaustively tested as well, even if that components are not considered essential in this delimited intranet model.

Then, other components which are not considered essential here and do not represent a special feature of the product will be tested if feasible, taking into account time and complexity restrictions. However, at least some research about these components will be always done even if the involved features are not thoroughly tested due to the reasons previously exposed.

The following diagram shows the basic components of the functional groups of Features highlighted in a green background:
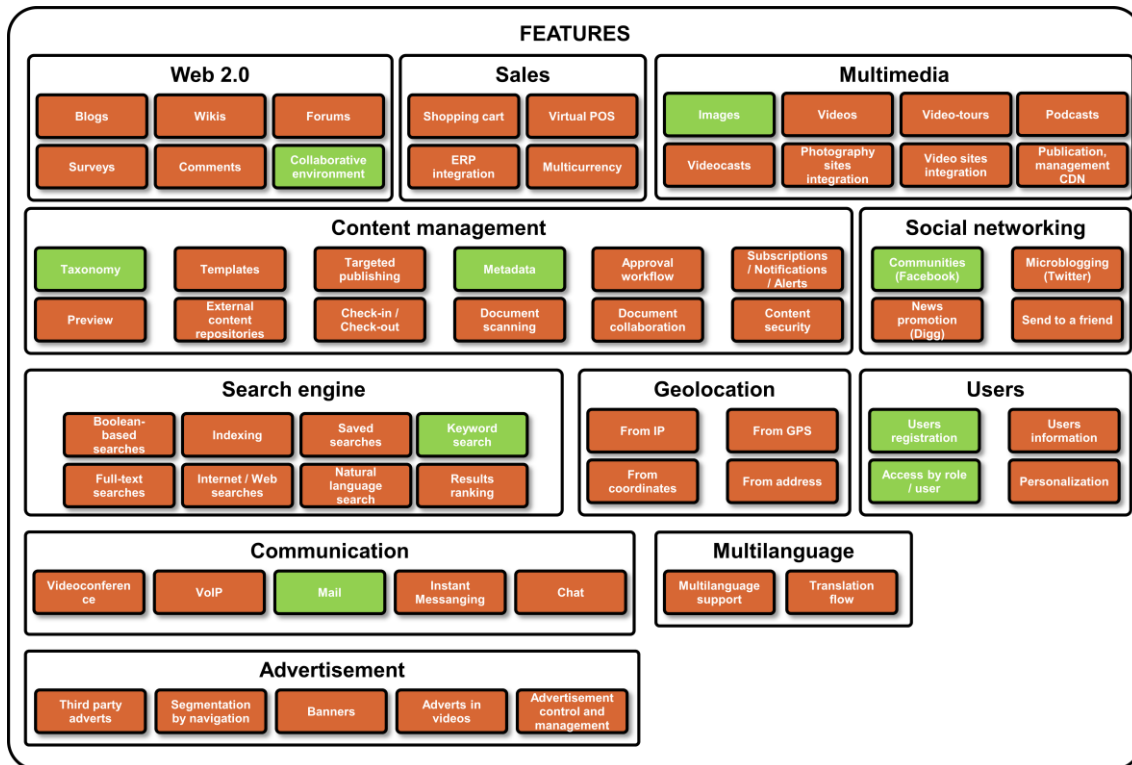
Let's now provide the reasons to choose each essential component:

- **Collaborative environment:** One fundamental characteristic of the Intranet of the future is that it should enhance and encourage cooperation and collaboration among different and transversal members of the organization. Web 2.0 technologies are the cornerstone to achieve this goal. We have considered that a collaborative environment is the most representative component among the functionalities related to Web 2.0 although we will test other features like wikis, blogs, forums and so on if possible.

- **Images:** This component has been chosen because is considered the most basic and essential from the multimedia functionalities.

- **Taxonomy:** The Intranet we are designing could not be understood at all without contents. So, it is necessary to test always how the product manages both structured and not structured content.

- **Metadata:** This feature allows wrapping the contents of the Intranet with metadata making them more meaningful. We consider this feature quite necessary to get better results when querying information.

- **Communities:** Social networking is also a fundamental concept for our Intranet model, as it relates directly to Web 2.0 features. The capability to create

Communities allows building professional groups which will have a virtual space to enhance their tasks. I considered that Communities (similar to some Facebook concepts) it is the most important component regarding professional social networking.

- **Keyword search:** Regarding search engine, I have considered that having the option of performing queries based on keywords is the most essential form of offering search capabilities.

- **Users' registration and Access by role/user:** It is obvious that any product which could be a candidate to implement the Intranet of the future we are designing must be able to manage users. The features related to the process of registering them and the way it manages the access in function

- **Mail:** It is not the most advanced method of online communication but nowadays most employees and users still rely heavily on it. However, we will try to test other less usual but powerful communication methods (videoconference, VoIP, etc) when offered by the tested products.

The following diagram shows the basic components of the functional groups of Presentation highlighted in a green background:
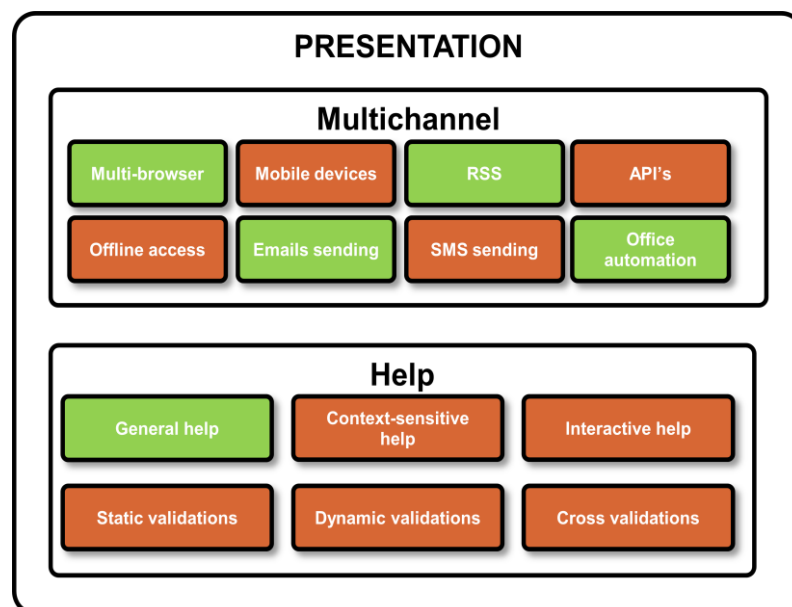
Let's now provide the reasons to choose each essential component:

- **Multibrowser and RSS:** When evaluating the multichannel capabilities of a given product, these two features are considered nearly a must-have. Having limitations on them or not implementing them at all do not incapacitate the product as a candidate to implement the Intranet of the future (especially if it has other powerful characteristics), but implies several restrictions which can make the product not recommendable for certain types of organizations.

- **Emails sending:** As previously stated, it is not the most advanced method of online communication but nowadays most employees and users still rely heavily on it. Notifications and contents distributed internally among corporate email will reach many users.

- **Office automation:** Day-to-day tasks of the employees of an organization usually relies on the use of some desktop and software applications like word processors, spreadsheets and similar. These applications enjoy a very spread use, and integrating Intranet contents with them can be a must-have for many organizations.

- **General help:** Evaluating the documentation and help provided by the product is basic to analyse its ease of use and how easy is to learn to use it. General help is the most fundamental feature regarding this characteristic.

6 Chapter 6: Choosing technical solutions

In chapter 4, we have analysed several solutions/products which could be used to develop an Intranet with the features we desire. Now, we want to choose three of these products and develop one prototype for each one in order to test extensively their features.

The chosen products are:

- Oracle WebCenter
- Microsoft Office SharePoint
- Liferay

Let's explain now the reasons for choosing each product.

6.1 Oracle WebCenter

Oracle WebCenter is a set of components that allow creating social applications, enterprise portals, collaborative communities, composite applications and intranet and internet web sites. This product put special emphasis on bringing Web 2.0 technologies into the workplace.

Oracle WebCenter Spaces is one of the components of the group. It is a ready-to-use and out-of-the-box application that pulls together the capabilities of all the Oracle WebCenter Services. It should allow preparing very quick deployments and Everis is especially interested on testing its real performance.

At a first glance, it seems that it could be a very appropriate product to develop the Intranet of the future we are designing.

6.2 Liferay

Liferay Portal is an enterprise web platform for developing business portal solutions. It comes with packaged applications as well as an enterprise application framework.

Liferay Social Office is packaged solution which put special emphasis on offering social networking and content management capabilities. We would like to test it and evaluate how much it reduces deployment time.

Moreover, in order to perform a complete comparison, we wanted to include a solution with a licensing model different to the other two solutions. Liferay is based on an open source licensing model.

6.3 Microsoft Office SharePoint

Microsoft Office SharePoint Server is a set of integrated server functionalities which provides content management, search services and allows sharing information coming from different sources. The main purpose of SharePoint is to integrate all the systems of a company, including any intranet, extranet or web application it could already have.

At a first glance, this solution seems especially suitable for those situations where starting from scratch is difficult or nearly impossible, and the only suitable approach is integrating and redesigning the current systems of the organization.

We would like to test how well it performs to build the kind of Intranet we want to design.

7 Chapter 7: Methodology

This chapter describes the methodology which has been used to evaluate each product and that will be the basis for the comparison which we will perform later.

To organize the comparison we have created the following broad categories:

- General information
- Market
- Support
- Infrastructure
- Operations
- Features
- Presentation
- Issues

The theoretical model that we presented before defines the Intranet we want to design. However, when evaluating different products we must take into account other factors (for example, the importance of the vendor in the market or practical issues that have been encountered).

All the components of the functional architecture can be found at the Infrastructure, Operations, Features or Presentation categories. In addition, these categories contain other subcategories which are not present in the functional architecture but which are relevant when evaluating different products.

A general description and evaluation is provided for the categories General information, Market, Support and Issues. Positive and negative aspects will be exposed but a numeric evaluation will not be provided due to the difficulties related to convert these aspects into concrete numbers.

The remaining categories, Infrastructure, Operations, Features and Presentation are subdivided into some criteria. Then, several sub-criteria are provided for each criteria factor. These sub-criteria are evaluated in a percentage form. The following table summarizes the basis to mark each sub-criterion:

Percentage based evaluation	
Percentage	**Description**
0%	The evaluated feature is not provided by the product at all.
25%	The evaluated feature is not naturally provided by the product, but it is possible to cover through some tricky procedure.
50%	The evaluated feature is provided by the product but is has been proved that has several restrictions and/or issues. Normally, we may expect better coverage in future versions of the product.
75%	The evaluated feature is provided by the product without any general issues. However, some very concrete problems have been discovered. I.e.: issues with concrete versions of a product, bugs of minor importance and so on.
100%	The evaluated feature is provided by the product and no issue has been detected at all.

It is possible to obtain a percentage evaluation for criteria calculating the average percentage of all their sub-criteria. Equally, it is possible to obtain a percentage evaluation for a given category calculating the average percentage of all their criteria.

The following sections describe in detail all these categories and the subcategories they contain.

7.1 General information

7.1.1 Product

In this point we will provide a brief description of the product. We will present its name, vendor and the exact version of each component. It is the starting point for benchmarking the product.

Furthermore, we will describe the source of the product: it could be an evaluation distribution, an acquired license, a product borrowed from the provider or other sources.

Finally, we will provide any general information we considerate useful about the product.

7.1.2 Components

Here we will describe each part of the product. Some parts will be indivisible, while other could be optional, resulting in some functionality loss or maybe can be replaced by other third party products.

7.1.3 Requirements

This point will describe everything we have needed to evaluate the product. We will divide these needs into hardware and software requirements.

7.2 Market

7.2.1 History

In this point we will explain the history of the product. It is interesting to know its past and what are the future plans of its vendor.

7.2.2 Experience

We will explain the time that the vendor has been distributing this product or any predecessor. This can give us an idea of the level of maturity of the product.

7.2.3 Market share

A good starting point to evaluate if a product can have a healthy future is analysing its current market share, and how can it evolve.

7.2.4 License

We will describe how the licenses are managed in the product. We are not referring only to the type of license, but other factors involving it (like the number of machines involving one license, for example).

7.2.5 Business type

In this section we will explain if the product is specialized in some field or some specific type of business.

7.2.6 Price

It refers to the price of the components and licenses of the product.

7.3 Support

7.3.1 Type

This section describes how support is offered. We consider that support is specialized information which we can use for the following purposes:

- **Configure the product:** Including the installation of the product and configuring advanced options.

- **Increase efficiency:** to make the most of the product.

- **Troubleshooting:** gives us information about common mistakes that we can do and errors which can appear. It tries to detect, avoid and solve problems.

We can find several types of support. Let's enumerate some of them:

- **Face to face:** it is possible to request the presence of a technical expert in order to install, configure and/or solve any issue that we could have with the product. Normally, it is the most expensive type of support but also the most effective one.

- **By phone:** the support is provided through phone conversations. Normally, it is also a quite expensive support.

- **Online:** it refers to professional online support. The information we need can be found in corporative web page, forums moderated by experts, corporative wikis, etc. On the other hand, it also includes getting remote support (via remote desktop, VoIP phone, etc.). These options are much more economical than the face-to-face or phone support.

- **Community:** this source of support refers to the non-corporative community which is behind the product. These communities usually create wikis, forums and other repositories with useful information, providing a disinterested collaboration and support. This type of support is normally used to solve small issues.

- **Embedded support:** it is the support offered directly through the program interface. It could be a help file, some wizards to perform common tasks or other similar tools.

- **Training:** it is not rare to offer training courses for the future users of the system.

- **Books:** this point refers to books and publications which provide extra information about the product.

7.3.2 Zones

We will find out in which areas of the world the support is effective. Some providers offer different types of support depending on the customers' city, country or continent.

7.3.3 Installation

For installation we understand all the steps which are needed in order to activate all the available functionalities of the product.

7.4 Infrastructure

7.4.1 Integration

This subcategory comes from the functional architecture of the Intranet that we have modelled.

Integration refers to the ability to take data from external system and being able to use and display it in our Enterprise Portal. Apart from providing native integration with some common external systems (like MS Exchange, Lotus Notes, MS Office and other desktop applications, for example), this subcategory also evaluates if the solution provides developers the ability to custom-build integration with other less common external systems.

Furthermore, it also analyses the ability to integrate with other portal technologies and the depth of this integration.

The following table describes the evaluation points related to Integration:

Evaluation point	Description
Remote applications	Offers an option for integrating many different enterprise applications.
Web Services consumption	It can consume web services.
Web Services publication	It can publish web services.
Development framework	It has a suite of development tools that allows building or extending the product.

7.4.2 Platform

It refers to the operating systems and other software systems which are supported by the product.

The greater the number of supported systems, the more flexible you can be in installing and running the product.

Evaluation point	Description
Operating systems	If the product extends across the enterprise and maybe to customers and suppliers it may have to interact with different operating systems. Having this ability allows the product to reach all the enterprise and increases its scalability.
Database servers	It is positive to provide support to as many database systems as possible, in order to have a product which will be compatible and useful in several scenarios.
Web servers	Support for all leading web servers allows having more flexibility and can increase the ability to access all relevant content of the enterprise.

7.4.3 Scalability

It is the ability of the product to continue to function well even if its operation context changes in size or volume.

Scalability also refers to the ability to function well in the re-scaled situation but also to actually take full advantage of the new situation. For instance, if the product moves from a smaller to a larger operating system it should take full advantage of the larger operating system in terms of performance and capacity.

The performance of the product should remain acceptable if the user base increases or scales up.

Evaluation point	Description
Replication	It refers to dedicating additional hardware and/or software resources to a given activity in order to provide greater processing capability. The goal is to offer faster response times for end users.
Failover	It is detecting automatically an unresponsive or overloaded server and then redirecting the requests to other servers. Failover ensures uptime and increases reliability of the Intranet.
Load balancing	It means evenly distributing the demand of a service through all the used servers. It helps to minimize response times and optimize performance during peak usage.
Clustering	Combination of failover and load balancing.
Caching	The caching of data allows not having to regenerate a page or a set of data that has not changed since the last time it was requested. Caching

is one of the main methods to improve performance, especially when the system scales to handle more users.

7.4.4 Security

It refers to ensuring that proper people have access to the proper information, applications and services.

Evaluation point	Description
Authentication	Ensures that only authorized users of the system gain access to it.
Authorization	Ensures that only authorized users gain access to information appropriate to their role and level.
Logon	Logon passwords are a method to allow users accessing the system and be authenticated.
Single Sign-On	It refers to providing users the option to log on once to the product and be automatically authenticated to all components and applications to which they have access.
User management	It refers to basic functions that should be present at any solution: adding/removing users, grouping users, assigning roles to users and assigning different security to users/groups.
Digital certificates	A digital certificate establishes user credentials when doing business or other activities on the Web. It is an additional layer of security to ensure that only authorized users can access restricted content.
Digital signatures	It is an electronic stamp used to authenticate the sender or signer of a message and can be used to ensure that the message is unchanged. Moreover, the sender cannot easily repudiate the message later.
Public Key Infrastructure (PKI)	A public key is designated by an authority and combined with a private key allows encrypting messages and digital signatures, improving security. It enables users from an unsecured network (e.g.: Internet) to securely and privately exchange data with the Intranet. Provides an high level of security across different types of users (employees, customers, suppliers, partners, ...)
Secure Sockets Layer Protocol	It is a protocol for secure communication. Allows secure

	transmission of data between clients and servers.
Secure Hypertext Transfer Protocol (HTTPS)	It is a web protocol for secure transmissions, using SSL as sub-layer.

7.4.5 Standards

Compliance with standards is an important requirement for enterprise portal products. As these products rely heavily on integrating different internal and external systems, the more fully a portal complies with standards, the easier it will be to integrate such systems.

Evaluation point	Description
WSRP v1	It is an approved network protocol standard designed for communications with remote portlets. Supporting should make the use of portlets from several sources easy.
WSRP v2	WSRP v1 provides limited interoperability features. WSRP v2 will try to enhance it with cross-portlet coordination and access management features.
JSR 168	The Java Porlet Specification defines a contract between the portlets and their container while providing a convenient programming model for Java portlet developers.
JSR 286	An improvement of JSR 168 adding important features like inter-portlet communication, better AJAX support and other.
JCR 1.0	JCR is a specification for a Java Platform API for accessing content repositories. It is an important standard for managing different content technologies.

7.5 Operations

7.5.1 Administration

It refers to the process of creating and configuring groups, communities and other settings. Administration is usually handled through a web page which is protected by password or via a stand-alone client application. Some areas of the Intranet can have their own administration.

Evaluation point	Description
Configuration	This points evaluates how easy is to configure different settings for the

	portal (like appearance, services, managing external applications, etc.)
Interface	An intuitive and easy to use interface will make the life of any administrator easier. This point evaluates how the different administration features are presented to an administrator.
Community management	It is the ability to manage several communities, departments or groups of interest within the Intranet.

7.5.2 Ease of upgrade

This category refers to the ease with which a product can be upgraded to a newer version (which typically contains additional features and improvements).

Measuring ease of upgrade is somewhat subjective because future upgrades cannot be predicted in all aspects. However, the core architecture of the product and the tools that it provides can make the product easier to manage, maintain and upgrade.

Evaluation point	**Description**
Upgrade tools	If the product provides tools for assisting the upgrade process, we will evaluate them here.
Metadata for customizations	When evaluating the ease of upgrade, it is very important to analyse where the customizations of the users are stored. If customizations are stored in metadata repositories, the upgrade will be generally easier.

7.5.3 Statistics

The product can provide ways to record statistics and monitor the Intranet. This information can be very useful for detecting issues as well as for preparing improvements.

Evaluation point	**Description**
From logs	The product has the ability to create logs which store useful statistical information.
Online visits	The product can record automatically the number of online visits it has. Some products can provide the option of recording the number of visits of different sections of the Intranet.
Monitoring functions	The product provides option to monitor its performance.

7.6 Features

7.6.1 Web 2.0

This essential category comes directly from the functional architecture.

Evaluation point	Description
Blogs	We will evaluate if the product offers to the users the possibility to build blogs.
Wikis	Having the option of creating wikis can be very useful for some communities and projects.
Forums	Forums allow direct collaboration between different users, enhancing their productivity.
Surveys	A good tool which can be used for catching the opinion and feeling of users of the Intranet about different topics.
Comments	We will check if the product allows users putting comments on different contents of the Intranet. Comments can make contents more meaningful.
Collaborative environment	A collaborative environment supports users in their individual and cooperative tasks. We will evaluate here any other tools that the product offers to enhance collaboration between users.

7.6.2 Sales

This essential category comes directly from the functional architecture.

Evaluation point	Description
Shopping cart	We will evaluate if the product offers the possibility of adding shopping cart functionality to the site.
Virtual POS	It allows authorizing card transactions.
ERP integration	The ability of the product of being integrated with ERP systems.
Multicurrency	It refers to the ability of the product to recognize, operate and display multiple currencies.

7.6.3 Multimedia

This essential category comes directly from the functional architecture.

Evaluation point	Description

Images	This point evaluates how the product deals with images.
Videos	This point evaluates how the product deals with videos.
Video-tours	If the product offers video-tours which help to present its use and features, this subcategory will be evaluated here.
Podcasts	A podcast is a set of digital media files (usually audio or video) which are released episodically and usually downloaded via web syndication. We will check if the product offers natural support for this multimedia feature.
Videocasts	Videocast refers to the online delivery of video on demand via web syndication.
Photography sites integration	We will evaluate if the product integrates easily with photography sites.
Video sites integration	We will evaluate if the product integrates easily with video sites.
Publication, management CDN	A Content Distribution Network (CDN) is a system of computers containing different copies of relevant data that has the purpose to maximize bandwidth.

7.6.4 Content management

This essential category comes directly from the functional architecture.

Evaluation point	**Description**
Taxonomy	It is the hierarchical organization where contents are stored. These categories may be associated with security by users, groups and roles.
Templates	Templates allow separating the presentation layer from the content. The product usually supplies a pre-defined set of templates and may be a template editor to change these ones and/or create new templates.
Targeted publishing	The ability to expire content or post the content at a future time.
Metadata	It is possible to add information describing the contents, like title, author, date submitted, date created, keywords, ...
Approval workflow	After submitting contents, workflow allows a process of approval before publishing the contents.
Subscriptions / Notifications / Alerts	The product allows its users to specify contents to which they wish to be notified when new content is published.
Preview	It is the ability to view what the inputted content will look like

	within a selected content template, or within the context of the portal environment.
External Content Repositories	The product has the ability to integrate external information (which could be written and maintained by a third party).
Check-in / Check-out	Check-in and check-out are the actions that protect a content from being underwritten while a user is modifying it. Checking out content is taking it and placing a lock on it. Checking in reallocates the contents and unlocks it. Actually, it is a version control process.
Document scanning	The product offers an option to transform non-electronic documents into an electronic format which can be displayed in the Intranet.
Document collaboration	It refers to the ability of having multiple users collaborating in the edition of a given document.
Content security	The product provides security features around the contents or group of contents. Only authorized users have access to restricted content.

7.6.5 Search engine

This essential category comes directly from the functional architecture.

Evaluation point	Description
Boolean-based searches	The product offers a search engine which can handle queries expressed in Boolean logic.
Indexing	The product has the ability to create a quickly searchable catalogue of information derived from or describing the data being searched.
Saved searches	The product provides to the user the option of saving his searches, keeping the associated results well indexed in order to provide accurate results at any time.
Keyword search	The product has a search engine which is able to collect metadata, information describing other information, for indexing purposes. It increases the degree of relevance of the obtained results.
Full-text searches	The product is able to index all the words of a document, allowing a user to search for documents based upon their contents.

Internet / Web searches	The product has search engine which is able to reach Internet and search directly on it.
Natural-language search	It is possible to use natural language to perform searches in the product (for example, expressing questions).
Results ranking	The product has a search engine which uses a ranking system or algorithm to display the results of the searches.

7.6.6 Social networking

This essential category comes directly from the functional architecture.

Evaluation point	Description
Communities	The product offers to the users the possibility of taking advantage of online communities formed by people who share some common interest.
Microblogging	The product offers some microblogging features (a type of blog where the content is much smaller, like a short sentence or image, for example).
News promotion	The product provides the option of promoting news according to some criteria (similar to Digg, the popular social news website where people can vote stories up or down).
Send to a friend	The product allows users recommending some pieces of information of the whole system to other users.

7.6.7 Geolocation

This essential category comes directly from the functional architecture.

Evaluation point	Description
From IP	Users, machines and/or other resources can be located automatically via IP addresses.
From GPS	Users, machines and/or other resources can be located automatically via a GPS system.
From coordinates	Users, machines and/or other resources can be located automatically through some provided coordinates.
From address	Users, machines and/or other resources can be located automatically through some provided address.

7.6.8 Users

This essential category comes directly from the functional architecture.

Evaluation point	Description
Users registration	It is possible to configure a self-registering option for potential users of the system.
Users information	The product makes available to its users relevant information about other users.
Access by role/user	The product offers the option of accessing the system taking into account the provided user and/or his role.
Personalization	It is the ability to intelligently create the user experience based on the identity of the user. It can involve the displayed content, functionality, navigation and/or user interface.

7.6.9 Multilanguage

This essential category comes directly from the functional architecture.

Evaluation point	Description
Multilanguage support	The product provides support for multiple languages. Some text aspects of the product have already been translated to these multiple languages and a system for categorizing contents according to the language is provided.
Translation flow	The product has some feature which organizes the task of translating the contents into a workflow.

7.6.10 Communication

This essential category comes directly from the functional architecture.

Evaluation point	Description
Videoconference	The product offers some videoconference system which allows two or more locations to interact via two-way video and audio transmissions simultaneously.
VoIP	The product offers some Voice over Internet Protocol (VoIP) system, allowing voice communications which are integrated in the Intranet.
Mail	The product allows integrating e-mail systems easily.
Instant messaging	The product contains some instant messaging system which allows communicating instantly the users which are connected at the same moment.
Chat	The product offers some online chat system which allows real-time meeting involving users which are simultaneously connected.

7.6.11 Advertisement

This essential category comes directly from the functional architecture.

Evaluation point	Description
Third party adverts	The product allows adding and managing adverts coming from third party sources.
Segmentation by navigation	The product has the ability to display advertisement which is tailored to the user's preferences, according to his navigation patterns.
Banners	The product has the ability to display and manage banners.
Adverts in videos	The product offers some system which makes including adverts in videos easier.
Advertisement control and management	The product offers some system which can manage and control its advertisement features.

7.7 Presentation

7.7.1 Multichannel

This essential category comes directly from the functional architecture.

Evaluation point	Description
Multibrowser	The product is compatible with all the major browsers of the market.
Mobile devices	The Intranet can be displayed in mobile devices correctly.
RSS	The contents of the Intranet can be obtained via RSS subscriptions.
API's	The product offers some API which make multi-channel development possible (like specific applications for mobile devices, for example).
Offline access	The product allows accessing some contents of the Intranet without being connected.
Emails sending	It can send notifications, announces and other messages via email.
SMS sending	It can send notifications, announces and other messages via SMS.
Office automation	The product has the ability to convert and integrate its contents with some common office automation tools (i.e.: Microsoft

Office, OpenOffice, PDF documents, etc.)

7.7.2 Help

This essential category comes directly from the functional architecture.

Evaluation point	Description
General help	There is a high-level overview and online assistance for the product. This might include assistance for all the features of the product and may be categorized and organized accordingly.
Context-sensitive help	The product provides online assistance regarding the specific section, page, action or content in which the user is involved.
Interactive help	The product offers a natural language based search facility which provides assistance based on the user's request or query.
Static validations	The product offers some option which allows validating the correctness of data when the user actively indicates he wants to conduct a validation process.
Dynamic validations	The product offers some option which allows validating the correctness of data while the user is inputting it.

7.8 Issues

7.8.1 General

In this section we will comment all these features of the product which we think that present some problems. If some desired functionality cannot be covered by the product, the problem and possible solutions will be described in this section, too.

7.8.2 Practical

Here we will include any other issue we have found when developing the prototype.

7.9 Summary

The following table summarizes all the previously exposed criteria.

SUMMARY TABLE		
CATEGORY	CRITERIA	SUB-CRITERIAS
General information	Product	-
	Components	-

	Requirements	-
Market	History	-
	Experience	-
	Market share	-
	License	-
	Business type	-
	Price	-
Support	Type	-
	Zones	-
	Installation	-
Infrastructure	Integration	Remote applications, Web services consumption, Web services publication, Development framework
	Platform	Operating systems, Database servers, Web servers
	Scalability	Replication, Failover, Load balancing, Clustering, Caching
	Security	Authentication, Authorization, Logon, Single Sign-On, User management, Digital certificates, Digital signatures, Public Key Infrastructure (PKI), Secure Sockets Layer Protocol (SSL), Secure Hypertext Transfer Protocol (HTTPS)
	Standards	WSRP v1, WSRP v2, JSR 168, JSR 286, JCR 1.0
Operations	Administration	Configuration, Interface, Community management,
	Ease of upgrade	Upgrade tools, Metadata for customizations
	Statistics	From logs, Online visits, Monitoring functions
Features	Web 2.0	Blogs, Wikis, Forums, Surveys, Comments, Collaborative environment
	Sales	Shopping cart, Virtual POS, ERP integration, Multicurrency

	Multimedia	Images, Videos, Video-tours, Podcasts, Videocasts, Photography sites integration, Video sites integration, Publication – management CDN
	Content management	Taxonomy, Templates, Targeted publishing, Metadata, Approval workflow, Subscriptions / Notifications / Alerts, Preview, External Content Repositories, Check-in / Check-out, Document scanning, Document collaboration, Content security
	Search engine	Boolean-based searches, Indexing, Saved searches, Keyword search, Full-text searches, Internet / Web searches, Natural-language research, Results ranking
	Social networking	Communities, Microblogging, News promotion, Send to a friend
	Geolocation	From IP, From GPS, From coordinates, From address
	Users	Users registration, Users information, Access by role/user, Personalization
	Multilanguage	Multilanguage support, Translation flow
	Communication	Videoconference, VoIP, Mail, Instant messaging, Chat
	Advertisement	Third party adverts, Segmentation by navigation, Banners, Adverts in videos, Advertisement control and management
Presentation	Multichannel	Multi-browser, Mobile devices, RSS, API's, Offline access, Emails sending, SMS sending, Office automation
	Help	General help, Context-sensitive help, Interactive help, Static validations, Dynamic validations

Issues	General	-
	Practical	-

Issues	General	
	Practical	-

8 Chapter 8: Oracle WebCenter

This chapter describes the aspects tested for the first chosen technology: Oracle WebCenter. Most of the processes conducted to prove the features of the products have been learnt through the guidance provided by the following Oracle Fusion Middleware documents: Tutorial for WebCenter Developers [13], Tutorial for WebCenter Spaces [14], Installation Guide for Oracle WebCenter [15], Administrator's Guide for Oracle WebCenter [16], Developer's Guide for Oracle WebCenter [17]. Moreover, additional Oracle documentation has been also consulted to learn how to customize WebCenter Spaces [18].

8.1 General information

8.1.1 Product

We have tested Oracle WebCenter 11g PS1 through a virtual machine for VMware Server (v2) provided by Oracle.

The virtual machine is compound of:

- Linux based on Ubuntu Server 9.10 (Karmik Koala)
- Oracle DB 10g XE
- Oracle WLS 11g PS1
- Oracle WebCenter 11g PS1
- Oracle Content Server
- Apache 2

The Oracle WebCenter 11g PS1 virtual machine installation contains the following interesting components:

- **WebCenter Spaces**
- WebCenter Services
- WebCenter Composer

These last two components are integrated in the first one (WebCenter Spaces).

In addition, we have also partially installed Oracle Fusion Middleware 11.1.1.2.0 in the laptop computer which runs the virtual machine with the following components:

- **JDeveloper Studio 11.1.1.2.0**
- WebCenter Framework
- WebCenter Services
- WebCenter Composer

These last three components are integrated in the first one (JDeveloper).

8.1.2 Components

The main components of Oracle WebCenter are: WebCenter Spaces, JDeveloper Studio, WebCenter Framework, WebCenter Services and WebCenter Composer [19]. Next, I describe them in detail.

8.1.2.1 WebCenter Spaces

It is an out-of-the-box WebCenter application which provides social networking, communication, collaboration and personal productivity features.

It is designed to get quick deployments. You should be able to deploy instantly community portals, team sites and collaborative applications.
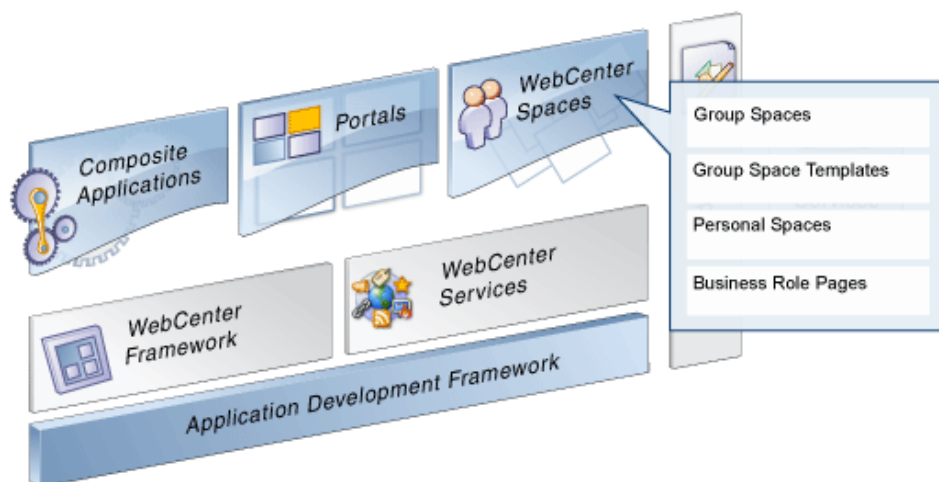
It is organized through three types of sites:

- **Personal Spaces:** provides each user with a private network area for storing personal contents, writing notes and to-do lists, viewing and responding to

business process assignments, scheduling events, maintaining a list of online buddies and performing other day-to-day work tasks. It is possible to integrate here external services like email accounts, Internet content (like Google gadgets, for instance), RSS feeds, etc.

- **Business Role Pages:** provides a tool for specific types of users of an organization to communicate across the company. It is based on providing a space to attach pages to a specific enterprise role, to have relevant users kept up-to-date with information specific to them and their role.

- **Group Spaces:** they are designed for providing support to communities of any size which are organized around an area of interest or a common goal. They provide a range of Web 2.0 services and tools to enable social networking capabilities. It is possible to configure and use Group Spaces Templates to provide a consistent look and feel and components usage.

8.1.2.2   JDeveloper Studio 11.1.1.2.0

Oracle JDeveloper is a free integrated development environment (IDE). It puts together development features for Java, SOA, Web 2.0 applications, databases, XML and web services.
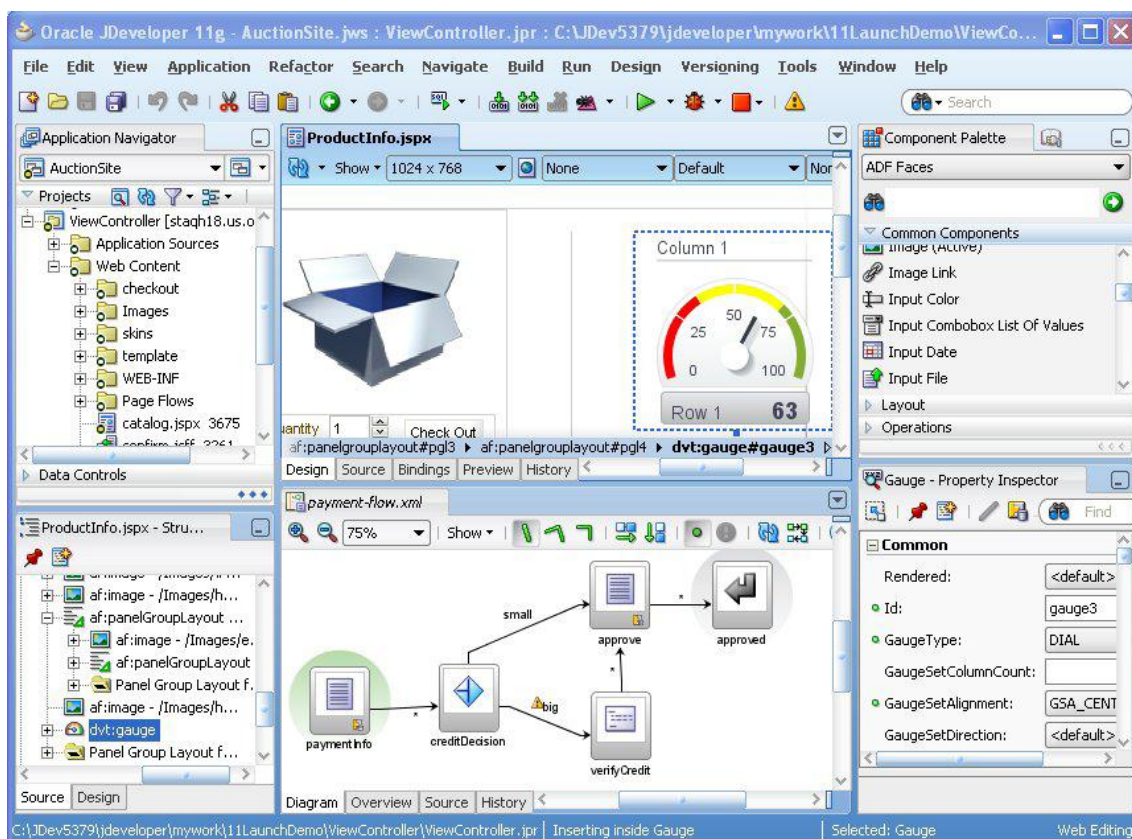
8.1.2.3 WebCenter Framework

It is an extension for JDeveloper framework which has the purpose of integrating the development methods of web based portals and enterprise applications. It allows embedding AJAX components, portlets, services and contents into a customizable applications and enterprise portals.

Content Integration	Customizable Components	Oracle JSF Portlet Bridge
Portlet Container	Portal Framework	Portlet Runtime
Resource Catalog	Search Framework	
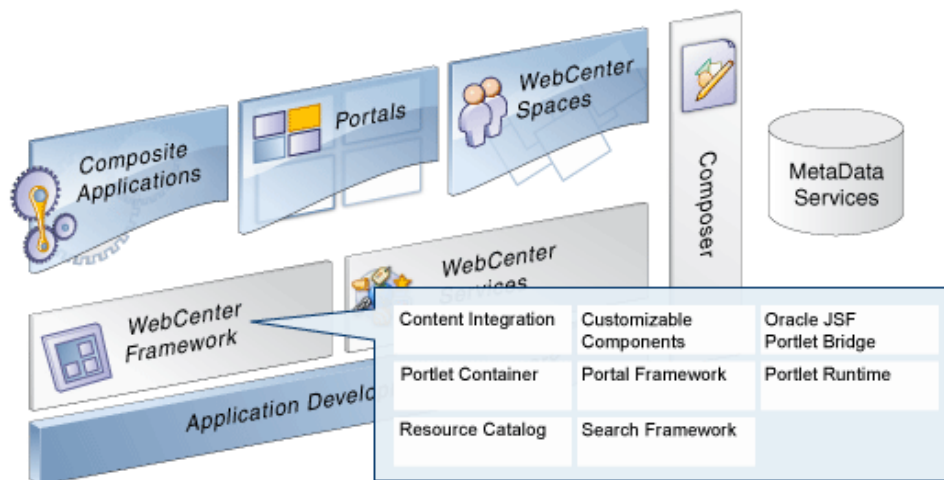
8.1.2.4 WebCenter Services

This component provides the components which are in charge of providing Web 2.0 services and personal productivity features for Oracle WebCenter. All services have ready-to-use task flows and portlets in order to accelerate its use and adoption.

Announcements	Blogs	Discussions
Documents	Events	Instant Messaging & Presence
Links	Lists	Mail
Notes	Oracle WebCenter Analytics	Oracle WebCenter Ensemble
Recent Activities	RSS	Search
Tags	Wiki	Worklist
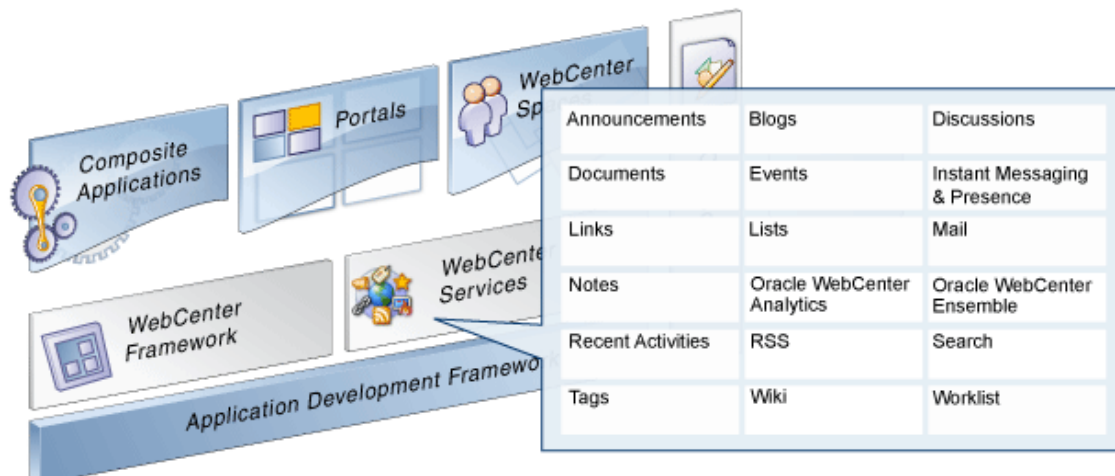
8.1.2.5 WebCenter Composer

It is a declarative and browser-based platform which enables users to customize and personalize applications at runtime as well as adding relevant contents through mashups.
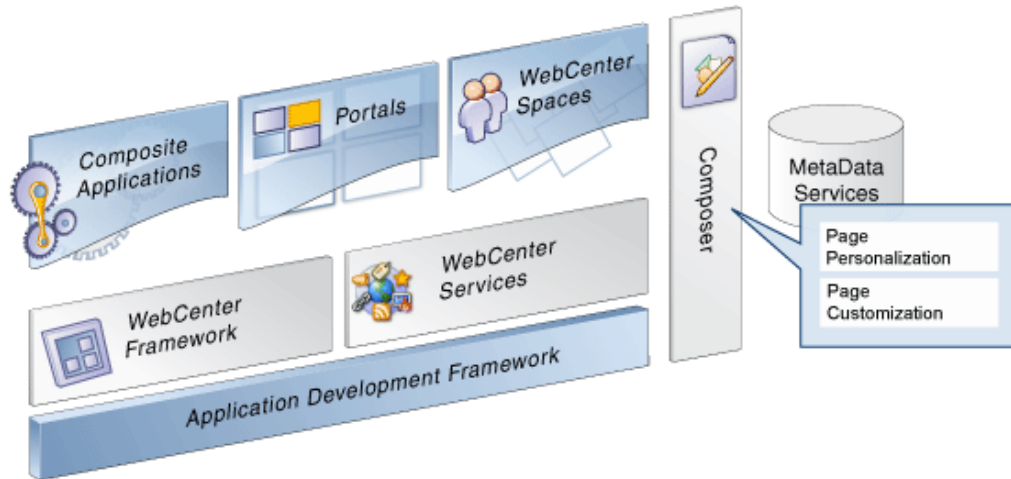
8.1.3 Requirements

WebCenter can be installed on a Linux, UNIX or Windows system. It has to meet some memory requirements:

- **Minimum physical memory required:** 2 GB
- **Minimum available memory required:** 1 GB

Moreover, Oracle WebCenter requires having an Oracle WebLogic Server installed.

8.2 Market

8.2.1 History

Oracle WebCenter 10g was released on January 2007. Then this product had several version enhancements but the turning point was the release of the new version, Oracle WebCenter 11g Release 1, on July 2009.

Now, Oracle defines his strategy for WebCenter as the product being its "next-generation user interaction environment".

The functionality of the product overlaps Oracle Portal somewhat, but it has been re-engineered from the ground up as pure Java product.

Furthermore, Oracle has announced that WebCenter will be at the center of Oracle Fusion Applications. This means that any Oracle Fusion Applications user will be using Oracle WebCenter as the starting point.

The last release (11g) comes with the pre-build application called WebCenter Spaces which allows setting up a collaborative workspace. The features of these application play an important role in the evaluation performed here.

Oracle WebCenter is part of Oracle Fusion Middleware. The last version is 11.1.1.2.0.

8.2.2 Experience

As we have previously mentioned, Oracle WebCenter 10g was released on 2007. It is a relatively new product and is evolving constantly. However, the current release is completely stable and fully functional.

8.2.3 Market share

According to Oracle, there are more than 3500 customers which are providing unified access to essential information and applications from personalized portals through Oracle's portal technologies.

However, it is difficult to determine current customers of Oracle WebCenter because Oracle has categorized them like *Oracle WebCenter Suite and Portal Customers*, including customers of other portal products which are not part of WebCenter. A list of these customers can be found online [20].

8.2.4 License

Oracle categorizes its licensing model around two concepts: metric and term.

The customer can choose between two different metrics: by processor or by Named User Plus.

- **By processor:** this metric is normally used in environments where the users of the product cannot be easily identified or counted (e.g.: internet-based applications) or when it is more cost effective than Named User Plus licenses. All the processors where the product is installed and/or running must be licensed.

- **By Named User Plus:** this metric is used in environment where users can be identified and counted. It includes both humans and non-human operated devices. All the users that are accessing the program, both humans and non-humans, must be licensed. Note that if a device is operated by a person, then the person and the device must be licensed. A licensed Named User Plus can access the program on any instance where it is deployed.

Furthermore, the license can be contracted for different term options: from just 1 year to a Perpetual option.

8.2.5 Business type

WebCenter is intended for enterprise level customers. The budget for licensing the product is considerable. Smaller businesses should look at other products (like Oracle Portal, for example) instead.

8.2.6 Price

The price of the product depends of the type of the metric and term used for the license (as has been previously described) [21].

Term	Metric: By Processor	Metric: By Named User Plus
1 year	€17938	€359
2 years	€31391	€628
3 years	€44844	€897
4 years	€53813	€1076
5 years	€62781	€1256
Perpetual	€89688	€1794

8.3 Support

8.3.1 Type

Oracle Support Services (OSS) offers different support programs [22]:

- **Software Update License & Support:** provides right to upgrades and a 24x7 support for the product.
- **Oracle Advanced Customer Support:** for additional services which are designed to provide an enhanced level of support.

8.3.1.1 Software Update License & Support

It provides customers with the right to product upgrade and 24x7 technical support. It is available for five years from the release date of the product.

Product upgrades include upgraded versions of the licensed software, some maintenance releases and patches. Customers can access directly Oracle experts to formulate specific questions about the installation and operation of the product.

Furthermore, Web based support is provided through Oracle MetaLink. This web platform offers proactive notifications, customized home pages, technical libraries, forums, product life-cycle information, a database of bugs and the option to log technical assistance requests.

It is the basic type of support provided by Oracle to all its products, including WebCenter.

The following list describes the services of this type of support:

- **Product enhancements and updates:** the customer has access to major product and technology releases, critical patch updates, tax, legal and regulatory updates and back port of fixes.

- **Global support infrastructure:** support is provided in 27 languages and by your time zone business hours. Customers can benefit from secure Web conference technology. The basic support infrastructure consists of:

  o *MetaLink:* a web-based platform providing 24x7 real-time support. This web platform offers proactive notifications, customized home pages, technical libraries, forums, product life-cycle information, a database of bugs and the option to log technical assistance requests.

  o *Oracle Global Support Center Hubs:* these centers offer support anytime and anywhere. There are 18 major hubs distributed among 5 continents.

- **Proactive automated support:** a support portal, called My Oracle Support, is provided as a single point of entry to access some tools and resources which have the goal of providing proactive and automated support. The tools included in My Oracle Support are:

- o *Configuration management:* an automated configuration management allows linking the environment of the customer with the knowledge base of Oracle.

- o *Knowledge management:* a system to locate relevant articles and information.

- o *Health checks:* proactive health checks can be done in order to avoid unplanned system downtimes.

- o *Personalization:* PowerView is a component which behaves like a dashboard which allows tracking, managing and supporting systems in a centralized location.

- o *Service request management:* a support service can be request through the web platform.

- o *Patch recommendations:* the system can send notifications of potential system issues and gives recommendations which help to improve the performance of the product.

- o *Collaborative communities:* contains several best practices and industry knowledge due to the interaction between industry peers and Oracle support experts.

- **Lifetime support:** Oracle offers lifetime support for its products. This is achieved categorizing support in three stages: Premier, Extended and Sustaining Support. Premier Support provides maintenance and support for five years from the general availability date of the product. Then, for an additional fee, Extended Support provides an extra three years of support for new releases, under the same conditions than the Premier Support and having the option of expanding the product if desired. After that, Sustaining Support provides technical support for as long as the customer operates the product, including access to online support tools, knowledge bases, pre-existing fixes and assistance from experts. So, the offered support services vary on function of these categories:

Service	Premier Support	Extended Support	Sustaining Support
Major product and technology releases	Yes	Yes	Yes
Technical support	Yes	Yes	Yes
Access to support portal	Yes	Yes	Yes

Update fixes	Yes	Yes	Pre-existing
Security alerts	Yes	Yes	Pre-existing
Critical patch updates	Yes	Yes	Pre-existing
Tax, legal and regulatory updates	Yes	Yes	Pre-existing
Upgrade scripts	Yes	Yes	Pre-existing
Certification with existing third-party products/versions	Yes	Yes	No
Certification with most new third-party products/versions	Yes	No	No
Certification with most new Oracle products	Yes	Yes	No

8.3.1.2 Advanced Customer Support

It is designed to provide an enhance level of support. It delivers tailored and flexible solutions which are designed to meet the customers' specific business requirements. The customers of this service have the flexibility to purchase standard or combine standard services with specific offering to provide a full solution.

Oracle Advanced Customer Support offers different levels of annualized services:

- **IMPACT:** this option is designed to allow customer weighing the investment they want to perform and the services they really need. It is six-month package containing different services providing from the others Advanced Customer Support types of services. After that, the customer will have more information to decide which other package of services he needs.

- **Solution Support Center:** it provides continual operational improvement along with onsite or remote experts to support the product environment. It is the recommended option for mission critical operations. The customer gains access to a virtual center of excellence which provides a service delivery manage (SDM) and a team of expert engineers. Furthermore, the customer gets a dedicated toll-free technical support hotline, proactive software advice, assessment of patches and reviews of the performance of the product.

- **Business Critical Assistance:** the customer has access to a pool of expert service delivery engineers dedicated to improve the availability and performance

of the system. Moreover, it offers access to a team of experts specialized on other non software-related factors.

- **Priority Service:** the focus of this type of service is the speed when solving issues. The customer gets access to a dedicated service delivery manager who provides expert guidance. Moreover, the customer gets a faster resolution of problems, because his requests receive priority. Finally, the customer also gets a preferred access to technical resources: subject-matter experts, IT professionals and developers via Webinars.

- **Advanced Support Assistance:** this type of service provides a service delivery manager who has knowledge of the customer environment, business and timelines. The focus of these services is on providing maximum system availability for the long term.

8.3.1.3 Cost

The following table summarizes the support cost for one year, for the option Software Update License & Support:

Metric: By Processor	Metric: By Named User Plus
€19731,25	€394,63

We have not got the price for Advanced Customer Support because they are tailored services and their cost is based on a concrete business scenario.

8.3.2 Zones

Oracle offices are scattered around the entire world. We can found Oracle offices at the following countries:

- **North America:** United States and Canada.
- **Latin America:** Argentina, Belice, Bolivia, Brasil, Caribbean Islands, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, México, Nicaragua, Panamá, Paraguay, Peru, Puerto Rico, República Dominicana, Trinidad, Uruguay, Venezuela and Netherlands Antilles.
- **Asia Pacific:** Australia, Bangladesh, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Nepal, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam.

- **Europe, Middle East and Africa:** Albania, Armenia, Austria, Bahrain, Belgium, Bosnia and Herzegovina, Bulgaria, Cameroon, Russia, Ukraine, Belarus, Kazakhstan, Uzbekistan, Armenia, Azerbaijan, Georgia, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Gabon, Germany, Greece, Hungary, Israel, Italy, Ivory Coast, Jordan, Kenya, Kuwait, Latvia, Lebanon, Lithuania, Macedonia, Malta, Mauritius, Morocco, Netherlands, Nigeria, Norway, Oman, Poland, Portugal, Romania, Saudi Arabia, Senegal, Serbia and Montenegro, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Tanzania, Turkey, United Arab Emirates, United Kingdom, Republic of Ireland and Zimbabwe.

In Spain, there are offices in Madrid, Barcelona, Bilbao, Seville and Valencia.

8.3.3 Installation

The installation process has not been evaluated as the product has been evaluated from a VMWare image which contained the product already installed.

8.4 Infrastructure

8.4.1 Integration

Oracle WebCenter is a product which is categorized in a larger family of middleware products. An advantage of this is that much emphasis has been put to enable integration with other applications and web services.

Point	Evaluation
Remote applications	100%. WebCenter applications, including WebCenter Spaces, can integrate naturally the following types of remote applications: • Other custom WebCenter applications • Applications from the following products (possessed by Oracle): E-Business Suite, Siebel, PeopleSoft and JDEdwards. Moreover, it can also integrate non-Oracle applications if they are compatible with at least one of the following technologies:

	• WSRP • Oracle JSF Portlet Bridge • ADF Task Flows
Web Services consumption	100%. WebCenter applications can consume web services which are compatible with WSRP or Oracle JSF Portlet Bridge.
Web Services publication	100%. Oracle JDeveloper is able to produce web services which can be consumed by external applications through WSRP.
Development framework	100%. WebCenter includes the Application Development Framework (ADF), which is designed to be used for developing your custom WebCenter applications. It is based on JSF. I would like to highlight the following features: • A set of 150 rich components with AJAX functionality. • ADF extends the basic JSF controller to provide page and operations flow control, state management and reusability of flows as components • The process of building User Interfaces is decoupled from implementing business layers. • ADF provides some out-of-the-box business components.
AVERAGE: 100%	

8.4.2 Platform

WebCenter 11g runs on WebLogic Server. So, we must evaluate it in order to evaluate the platform features of WebCenter.

Oracle commercializes three offerings for the Oracle WebLogic Server: a Standard Edition, an Enterprise Edition and the Suite. All of them can run WebCenter but with different performance levels. The choice of one of them depends directly of the needs of the organization where it will be installed.

The Standard Edition is the basic server product. It provides tools and technologies to allow developers writing enterprise applications and services quickly.

The Enterprise Edition has the same services than the Standard Edition but offers a better performance for scenarios where a higher availability of the system is required.

Finally, the Suite is focused on improving the scalability and monitoring of the system.

Point	Evaluation
Operating systems	100%. WebLogic Server can run on Unix, Linux and Windows.
Database servers	100%. WebLogic Server and WebCenter can be naturally integrated with Oracle databases, IBM DB2, Microsoft SQL Server, MySQL, Sybase.
Web servers	100%. WebLogic Server has a built-in web server able to run HTTP, servlets, JSP, CGI and other. Furthermore, it can be configured to use other web servers: Apache, Microsoft IIS and Sun Java System Web Server.
	AVERAGE: 100%

8.4.3 Scalability

The scalability features of WebCenter depend on the WebLogic Server characteristics. Note that the WebLogic Server Standard Edition is far more limited in this point compared to the Enterprise Edition and the Suite.

Point	Evaluation
Replication	100%. The Enterprise Edition and the Suite can take advantage of replication in several ways: • Compatible with all types of networks (LAN's, MAN's and WAN's). • Offer asynchronous HTTP session replication • Offer in-memory replication of EJB states • Offer in-memory replication of the session state of servlets
Failover	100%. All editions have integrated application failover to database through a JDBC connection pooling. Furthermore, the Enterprise Edition offers more failover features: • Failover capabilities in MAN's and WAN's networks • Failover for EJB dynamic sessions Finally, the Suite offers all the previous features plus: • In-memory data grid pools • Shares memory across environment (full failover support)

Load balancing	100%. All editions provide these load balancing mechanisms: • Integrated application load balancing through a JDBC connection pooling. • Thread pooling • Connection pooling • Multi-pools
Clustering	100%. The Standard Edition does not offer clustering capabilities. However, the Standard Edition and the Suite do it, providing automatic failover and load balancing features for the cluster.
Caching	100%. WebLogic server has implemented several caching capabilities. To be more concrete, all the editions implement: • Web caching (HTML, servlet, JSP, full page, etc.) • JSP tag caching Furthermore, the Standard Edition and the Suite add more caching abilities: • EJB caching

AVERAGE: 100%

8.4.4 Security

The following figure shows the basic architecture for a WebCenter application which has to be secured.
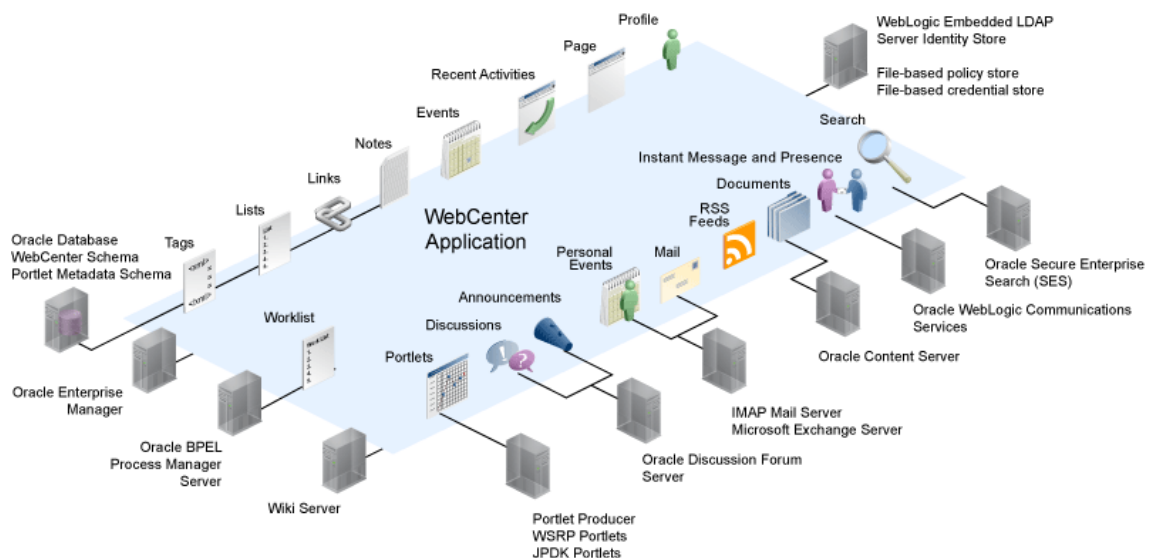
The Application Development Framework (ADF) provides security features based on the Java Authentication and Authorization Service (JAAS). JAAS is a standard security framework added to the Java language via the Java Community Process.

Security in WebCenter is configured in different layers. The lowest one is the security configured in the WebLogic Server, while the upper layer would be located in the WebCenter Spaces Application Layer.
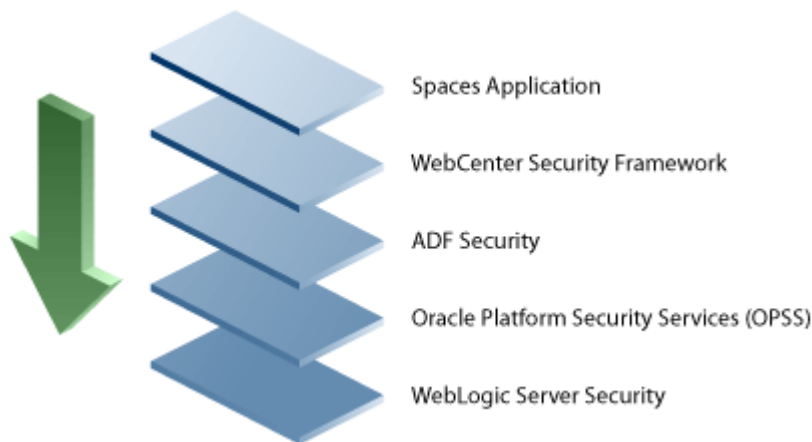
Each layer offers different security services.

The Spaces Application security layer can allow abstracting from the other layers (only if the application does not need advanced features and is an Spaces application). This layer provides support for:

- Application role management and mapping of privileges
- Self-registration
- Management of the security of different Group Spaces
- Management of personal accounts
- Management of credentials of external applications

However, if the application needs more advanced features and/or it is a WebCenter application not based on Spaces, it must use features provided by the other layers.

The WebCenter Security Framework provides support for:

- Authorization based on permissions
- Mapping roles based on authorization
- Management and mapping of credentials from external applications

Going in a lower level we can find ADF Security. It provides support for:

- Page authorization
- Authorization for task flows

- Management of secured connections

- API's for mapping credentials

- Logout

- A secured login URL

Then, we find the Oracle Platform Security Services (OPSS) providing support for more security features:

- Anonymous-role

- Authenticated-role

- Storing identities, policies and credentials

- Management of Web Services security

Finally, the lowest level of this security model lies on the WebLogic Server which runs the WebCenter deployment. Its features are:

- Authentication for WebLogic Server administration and management

- J2EE basic security

- SSL support

Point	Evaluation
Authentication	100%. Provided by all the layers.
Authorization	100%. Provided by all the layers.
Logon	100%. Logon passwords can be stored in a relational database or in the LDAP store which is built-in in the WebLogic Server.
Single Sign-On	100%. WebCenter can achieve Single Sign-On through 4 different ways: - Using Oracle Access Manager (OAM) - Using Oracle SSO (OSSO) - Using SAML - With Microsoft systems (SPNEGO, KERBEROS)
User management	100%. Spaces Application and WebCenter Security Framework layers provide user management capabilities including roles and mapping privileges.
Digital certificates	100%. Supported by WebLogic Server.

Digital signatures	100%. Supported by WebLogic Server.
Public Key Infrastructure (PKI)	100%. Supported by WebLogic Server.
Secure Sockets Layer Protocol (SSL)	100%. WebLogic Server supports SSL on a dedicated port (normally 7002).
Secure Hypertext Transfer Protocol (HTTPS)	100%. All editions of the WebLogic Server, which runs below WebCenter, offer full HTTPS support.
	AVERAGE: 100%

8.4.5 Standards

WebCenter supports, among others, the following main standards:

- J2EE
- JSR 168
- JSR 286
- WSRP 1.0 and 2.0
- JCR 1.0
- JSF
- JSR 116

Point	Evaluation
WSRP v1	100%
WSRP v2	100%
JSR 168	100%
JSR 286	100%
JCR 1.0	100%
	AVERAGE: 100%

8.5 Operations

8.5.1 Administration

WebCenter can be administrated through different tools:

- Oracle Enterprise Manager Fusion Middleware Control Console
- Oracle WebLogic Server Administration Console
- Oracle WebLogic Scripting Tool (WLST)

In addition, there is another tool which can be used to administrate WebCenter Spaces:

- WebCenter Spaces Administration Pages

Let's analyse these tools deeply.

8.5.1.1 Oracle Enterprise Manager Fusion Middleware Control Console

It is the main administration tool for WebCenter. It is a browser-based application. It offers the following administrative features:

- Control to deploy, re-deploy or undeploy WebCenter applications

- Configuration of back-end services

- Management of security

- Accessing log files and managing log configurations

- Management of data migration

- Monitoring the performance of the system

- Diagnosis of runtime issues

- Management of related services like metadata repositories and portlets producers
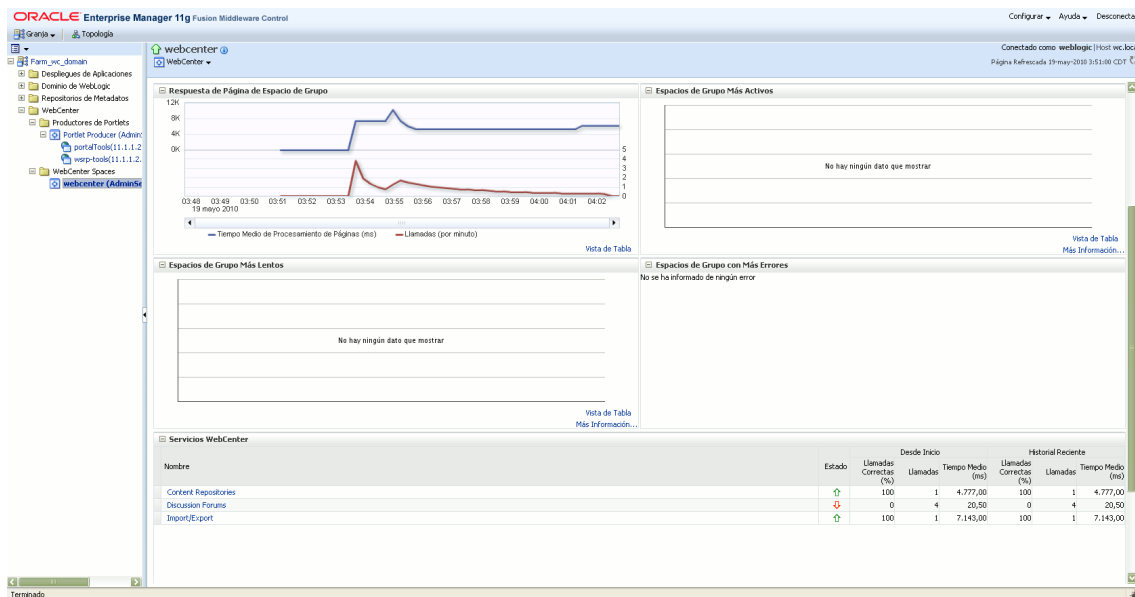
8.5.1.2 Oracle WebLogic Server Administration Console

It is a browser-based administration tool for the WebLogic Server. It has to be used to configure services and options of the server which cannot be managed through the Oracle Enterprise Manager Fusion Middleware Control Console.

It offers the following administrative features for the WebLogic Server:

- Start, stop and manage WebLogic Server instances

- Manage WebLogic Server clusters

- Configuration of services like databases connections (JDBC) and messaging (JMS).

- Configure security at server level

- Configuration and deployment of applications

- Monitoring performance of the server and hosted applications

- Accessing server log files
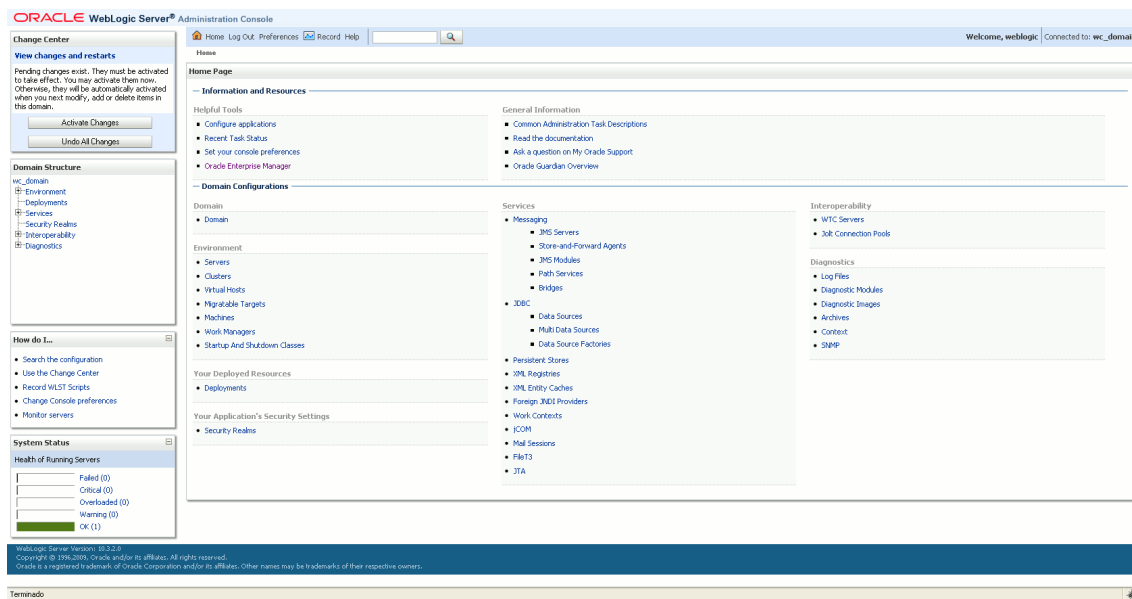
8.5.1.3 Oracle WebLogic Scripting Tool (WLST)

It is a command line tool which can be used to manage both WebLogic Server and WebCenter. Any administrative function can be performed through this tool, but is graphical interface is not as friendly and intuitive like the other browser-based tools.

8.5.1.4 WebCenter Spaces Administration Pages

WebCenter Spaces provides its own administration tool through Administration Pages. These pages are only displayed to those users who have logged in to the application as administrators.

They allow performing the following administrative functions:

- Customizing WebCenter Spaces

- Management of users and roles

- Management of services for WebCenter Spaces

- Management of group spaces and templates for them

- Management of business role pages

- Management of personal pages

- Export and import group spaces
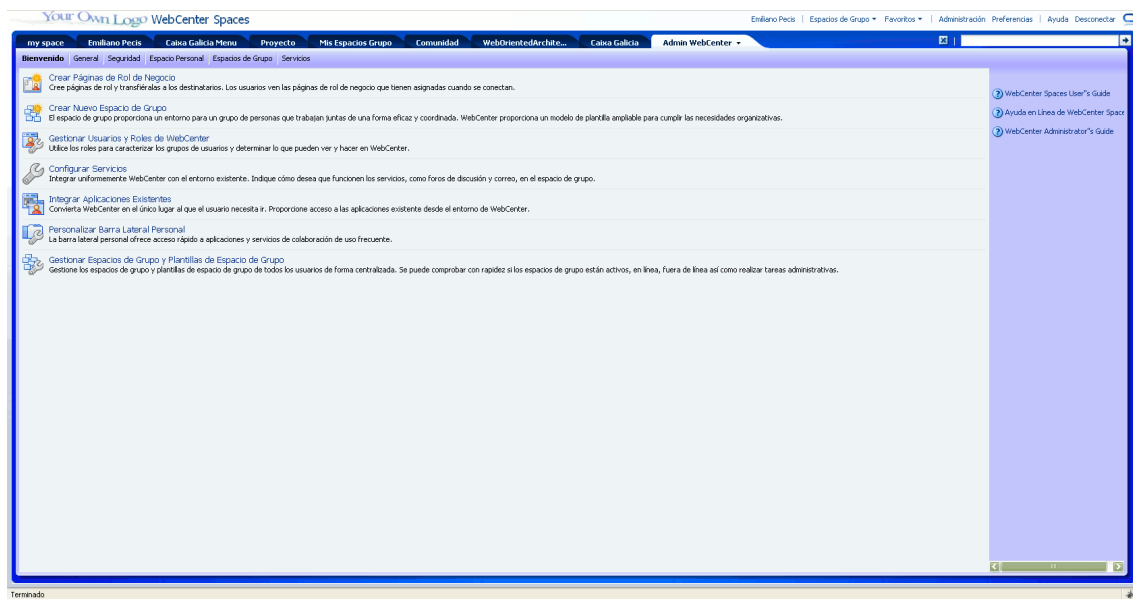
Point	Evaluation
Configuration	75%. In order to cover all the administrative functions, an administrator must use more than one tool. All these functions can be performed through the command line tool but it has a more pronounced learning curve and is less intuitive.
Interface	75%. Fine aesthetics for all the browser-based tools. However, as stated in the previous point, the only tool which can achieve alone all the administrative function is command line tool which is not as friendly as the browser-based tools.
Community management	100%. WebCenter Spaces Administration Pages offer full support for administrating communities.
AVERAGE: 83%	

8.5.2 Ease of upgrade

Unfortunately, the process of upgrading WebCenter is not a straightforward task. Upgrading the version implies upgrading several components and the process involves the administrator reinstalling all components and remaking some configurations manually.

Essentially, the WebLogic Server, Application Development Framework (ADF), SOA services and WebCenter must be upgraded separately. Moreover, any applications running on the previous WebLogic Server must be redeployed (including WebCenter applications) and any adjustments of the server must be redone manually.

The following flow chart summarizes the upgrade process:

Point	Evaluation
Upgrade tools	50%. Some upgrade tasks are supported by assistant tools, but not all of them. Moreover, there is not a unique tool providing general assistance. The tools provided to assist the upgrade process are the following ones: • Oracle Fusion Middleware Metadata Repository Creation for creating database schemas for the new version • Upgrade Assistant for upgrading Web Tier components (HTTP server and Web Cache) • JDeveloper to recompile current applications for the new version • Oracle Enterprise Manager to redeploy applications and monitor the result of the process
Metadata for customizations	100%. In Oracle WebCenter, metadata is stored in MDS repositories. These repositories can be imported and exported using the Enterprise Manager or the WebLogic Scripting Tool.
AVERAGE: 75%	

8.5.3 Statistics

WebCenter generates several log files which record many types of events in order to assist solving issues. These log files record the following information:

- Startup and shutdown information
- Error messages
- Warning messages
- Access information on HTTP requests

Furthermore, WebCenter offers the option of configuring logging options (number of logs recorded, giving more priority to the events of a given date, etc.)

On the other hand, the administration tool Oracle Enterprise Manager has the ability to provide useful statistics of the usage of the WebCenter system. It can show the following statistics:

- About Group Spaces: its level of activity, its response speed and number of errors

- For WebCenter Services (like Announcements, Content Repositories, Discussion Forums, etc.): its state (up or down), errors, average time of response, quantity of calls, etc.

- Average time of response when a page is requested
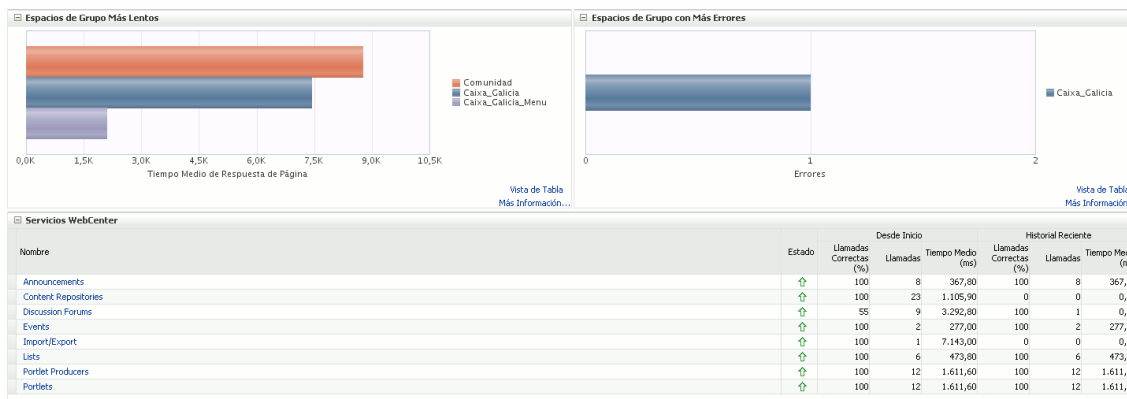
In addition, one of the WebCenter Services is the Oracle WebCenter Analytics. It allows creating reports of usage for a WebCenter application. It can e used to determine the most important pages of the system, the most used content items, number of visits of the different services and pages and so on.

Point	Evaluation
From logs	100%. WebCenter stores several log files which provide information that can be useful to solve issues. Moreover, these logging capabilities can be customized.
Online visits	100%. Provided by the WebCenter Analytics service.
Monitoring functions	100%. Provided by the Enterprise Manager and the WebCenter Analytics service.
AVERAGE: 100%	

8.6 Features

8.6.1 Web 2.0

Oracle WebCenter Services have several components that provide Enterprise 2.0 capabilities. All these services are presented through task flows or portlets which are ready to be used immediately. These services can be added when developing a WebCenter application or at runtime through Oracle Composer.

The included services are:

- **Announcements:** a mechanism to communicate information about group activities, processes and events.

- **Discussions:** this service allows a community discussing about topics and provides a knowledge base which could be searched.

- **Blogs:** this service implements both personal blogs of individual users and community blogs to allow sharing points of view about certain topics.

- **Instant Messaging and Presence:** this service enables users to check who is online in their community. Moreover, it allows interacting with them: sending an instant message, an e-mail or seeing his profile. In addition, a user's list of buddies can be added to a WebCenter application (through a portlet or task flow).

- **Wikis:** this service provides wiki features to the WebCenter application, allowing working simultaneously on certain documents and sharing some ideas. To perform editions, the users can use wiki syntax or edit the wiki pages as if they were using any word processor. Changes and versions are constantly tracked.

- **Documents:** this service provides a content repository of documents and files. For these contents, a portlet or task flow offers features like versioning, tagging, checking in/out and linking to other services and author connection. This service is compatible with JCR and other third-party adapter to connect with backend document repositories.

- **Events:** this service consists of group calendars which can be used to schedule meetings, appointments and other team events.

- **Links:** this service allows users connecting items together. Other users will also receive the benefit of this task, being able to see connections between different items established by other users.

- **Lists:** this services implements several types of lists. These lists can be used to keep track of planned actions, record issues or ideas, update the status of different projects, etc. The types of data supported are person, string, number, Boolean and date time.

- **Tags:** provides a method to mark items with metadata information. It will allow finding them quickly when searched. Moreover, tagging allow users to find items according to their own labels and not only by using the corporate metadata. This service is integrated with the Search service.

- **Activity graphs:** this service allows tracking the activities performed by the user in order to improve the results and recommendations issued by other services. It provides a system to log, track, analyse and recommend items and actions which can be considered helpful for the user. For example, if a user is trying to solve a customer complaint, it can be helpful for him finding any other user of the organization who has dealt with a similar problem before.

- **People Connections:** this service allows users building business networks. It includes task flows or portlets to display user's profile, the user's list of connections, pending invitations and a wall to display relevant information about oneself. It is part of the Activity Graphs service. So, it includes filters to determine which activities are of interest.

- **Analytics:** allows users developing reports for custom WebCenter applications. It is capable of determining the most important pages of the portal, the most used content items, the most active Group Spaces and the number of users who visit different pages. Furthermore, the service also provides automatic recommendations based on this information.

- **Ensemble:** this is a mash-up service. It allows using portlets developed on one platform in another more, getting more content into existing portals and extending the ability to use generic features (like Analytics) to any Web application.

- **Mail:** this service allows integrating email from IMAP mail servers in the WebCenter application. Users can perform basic email interactions like viewing, reading, deleting and creating messages, manage attachments, replying, forwarding and so on.

- **Worklist:** this service allows having a control of tasks and notifications which have to be performed in a given business scenario, and enabling users to take action on them.

- **Notes:** this service provides the ability of managing simple personal notes which are useful to retain quick bits of personal information.

- **Recent activities:** allows users to view the most recent discussions, documents, feeds, announcements and other activities which occur in the Group Spaces where they are members.

- **RSS:** this service is able to get content from many different web sites and display it in the WebCenter application through a feed viewer. Moreover, it is also capable of creating an RSS feed about the information of the WebCenter application to be consumed outside as well. It is quick way to publish internal information out and consume external information in.

- **Search:** the Search service implements a search engine capable of locating documents, data, profiles, experts and other information of the WebCenter application.

Point	Evaluation
Blogs	100%. Provided by WebCenter Blog Service
Wikis	100%. Provided by WebCenter Wiki Service
Forums	100%. Provided by WebCenter Discussions Service
Surveys	0%. Feature not provided
Comments	25%. Only the users profiles can be commented through natural WebCenter features.
Collaborative environment	100%. WebCenter is focused on this point, providing several tools which enhance the collaborative experience: instant messaging, presence service, activity graphs and people connections.
	AVERAGE: 71%

8.6.2 Sales

Nowadays, WebCenter is not focused on offering sales features but in providing an easy to deploy collaborative environment. So, in order to implement these features an organization must find and rely on external applications and integrate into WebCenter.

Point	Evaluation
Shopping cart	0%. This feature is not provided.
Virtual POS	0%. This feature is not provided.
ERP integration	75%. WebCenter provides natural integration with JD Edwards Enterprise One, the ERP commercialized by Oracle. However,

components coming from other ERP technologies can possibly be integrated through other integration mechanisms provided by WebCenter (WSRP, JSF Portlet Bridge and ADF Task Flows). Moreover, the product Oracle BPEL Process Manager can convert processes from several external sources which can be integrated into WebCenter later. However, this product is not part of WebCenter and has to be acquired separately at a high price.

Multicurrency	0%. This feature is not provided.
AVERAGE: 19%	

8.6.3 Multimedia

Currently, WebCenter is not focused on offering powerful multimedia capabilities. In general, it deals with multimedia files (images, video, audio, etc.) like a type of content which can appear in the portal. However, it does not offer powerful tools for editing, improving or working with these kind of files.

Point	Evaluation
Images	50%. It can display images and offer some basic editing features (like applying margins, changing width and height, etc.)
Videos	25%. It treats videos as any other type of file. It does not offer special features for dealing or editing videos.
Video-tours	0%. This feature is not provided.
Podcasts	0%. This feature is not provided.
Videocasts	0%. This feature is not provided.
Photography sites integration	0%. This feature is not provided.
Video sites integration	0%. This feature is not provided.
Publication, management CDN	0%. This feature is not provided.
AVERAGE: 9%	

8.6.4 Content management

Oracle Content Server (OCS) comes embedded with Oracle WebCenter Suite and is delivered as part of the integrated install of Oracle WebCenter.

OCS manages content through all the phases of its life cycle: from its creation, approval, publishing, searching and expiration to its archival or disposition. Content can be contributed through the native applications which manage the format of the uploaded content. Then, the same set of services is offered for all types of content (emails, discussions, reports, etc.).

OCS is compound of some key components:

- **Desktop Integration Suite:** this component provides direct access to the Content Server from some common desktop applications (e.g.: MS Word, MS Excel, MS Outlook, Lotus Notes).
- **Dynamic Converter:** allows converting any document into a Web page for a specified audience. In order to define how to show this web page, the component provides the option of using and creating templates.
- **Content Integration Suite:** provides an API which can be used to access the Content Server services from custom WebCenter applications.

The WebCenter Documents service provides extensive features for managing documents. The goal of this service is providing components (via portlets or task flows) to consume documents and contents from Oracle Content Server.

Point	Evaluation
Taxonomy	100%. Documents can be categorized hierarchically and be associated to Group Spaces.
Templates	100%. Templates for different contents are provided both in the Oracle Content Server (by the Dynamic Converter component). Moreover, WebCenter and WebCenter Spaces provides some standard templates (for a blog page, a wiki page, some common layouts, ...) and provide the option of creating new templates.
Targeted publishing	100%. The contents managed by Oracle Content Server can be configured with a date for publishing as well as a date for an automatic expire. Furthermore, WebCenter Spaces provides targeted publishing features for the Announcements services.
Metadata	100%. This feature is fully supported by the WebCenter Documents service.
Approval workflow	0%. WebCenter Spaces provides some pre-configured workflows

	to manage group space membership notifications, group space subscription requests and other ones. But to develop custom workflow (including approval workflow for WebCenter contents) a BPEL server should be used. And this component is part of the product Oracle BPEL Process Manager. However, this product is not part of WebCenter and has to be acquired separately at a high price.
Subscriptions / Notifications / Alerts	100%. Several services (e.g.: discussions, announcements, events ...) have a pre-integrated RSS feed which allow any user to subscribe to that service and receive notifications when new content is published or changed.
Preview	100%. A preview is offered while editing the contents.
External content repositories	100%. Oracle Content Server provides full support for Java Content Repository (JCR), which is a specification for accessing content repositories in a standardized way. Any other content repository which supports this standard can be connected with OCS and be accessed by WebCenter.
Check-in / Check-out	100%. This feature is fully supported by the WebCenter Documents service and Oracle Content Server.
Document scanning	0%. WebCenter does not offer this feature directly. However, Oracle has other products which can be integrated to offer this feature.
Document collaboration	0%. The product does not offer any document collaboration feature different than allowing different users editing the same document at different moments.
Content security	50%. The rights possessed by a user over all the documents can be associated to its role. However, it is not possible to give different rights for managing different documents (e.g.: you cannot configure that a user can delete the documents of one folder, but not the ones coming from another different folder).
AVERAGE: 71%	

8.6.5 Search engine

In this category, we are evaluating the WebCenter Search service. This service has the ability to perform basic search processes in tags, services, applications or the entire site. The following table summarizes its features.

Point	Evaluation
Boolean-based searches	0%. This feature is not provided.
Indexing	0%. This feature is not provided.
Saved searches	100%. After having performed a search, the user has the option to save it for reusing it in the future, if desired (with updated results).
Keyword search	100%. This is the method used by the search engine to perform its process.
Full-text searches	0%. This feature is not provided.
Internet / Web searches	0%. This feature is not provided.
Natural-language search	0%. This feature is not provided.
Results ranking	0%. This feature is not provided.
AVERAGE: 25%	

8.6.6 Social networking

Much emphasis has been put in WebCenter to provide collaborative and social networking features.

Point	Evaluation
Communities	100%. The WebCenter People Connections service allows creating business networks. Moreover, in WebCenter Spaces we can create Personal Spaces, Business Role Pages and Group Spaces which work as business communities.
Microblogging	0%. This feature is not provided.
News promotion	0%. This feature is not provided.
Send to a friend	100%. Several contents are surrounded by an option which allows sending an email to other users to comment it.
AVERAGE: 50%	

8.6.7 Geolocation

Currently, WebCenter does not provide any geolocation feature.

Point	Evaluation
From IP	0%. This feature is not provided.
From GPS	0%. This feature is not provided.
From coordinates	0%. This feature is not provided.
From address	0%. This feature is not provided.

	AVERAGE: 0%

8.6.8 Users

WebCenter offers a full range of features to improve the experience of its users.

Point	Evaluation
Users registration	100%. There is an option to provide self-registering capabilities to potential users.
Users information	100%. Users can have their own profile which can be consulted by other users.
Access by role/user	100%. Content which will be displayed in a given page can be configured to take into account the role of the user which is logged in. Moreover, in WebCenter Spaces, Business Role Pages show different information depending on the user who checks it.
Personalization	100%. Users can change its preferences which control several aspects of their interaction with the product.
AVERAGE: 100%	

8.6.9 Multilanguage

The language of the shown menus in WebCenter Spaces can be chosen among several options.

Point	Evaluation
Multilanguage support	50%. In WebCenter Spaces, any user can choose several languages to see the menus, settings and any text aspect of the product. However, there is not any system for categorizing contents according to its language. This has to be achieved just preparing different pages for each required language.
Translation flow	0%. There is not any workflow to organize the process of translating contents.
AVERAGE: 25%	

8.6.10 Communication

The Services of WebCenter which are in charge of providing communication features are Instant Messaging and Presence, and Mail.

Point	Evaluation
Videoconference	0%. Not provided by Oracle WebCenter. However, it can be added through the integration of another Oracle product: Oracle Communications Presence (OCP).
VoIP	0%. Not provided by Oracle WebCenter. However, it can be added through the integration of another Oracle product: Oracle Communications Presence (OCP).
Mail	100%. Provided by the WebCenter Mail service.
Instant messaging	100%. Provided by the WebCenter Instant Messaging and Presence service.
Chat	100%. Provided by the WebCenter Instant Messaging and Presence service.
AVERAGE: 60%	

8.6.11 Advertisement

Currently, WebCenter does not provide any features to manage advertisements in an explicit way.

Point	Evaluation
Third party adverts	0%. This feature is not provided.
Segmentation by navigation	0%. This feature is not provided.
Banners	0%. This feature is not provided.
Adverts in videos	0%. This feature is not provided.
Advertisement control and management	0%. This feature is not provided.
AVERAGE: 0%	

8.7 Presentation

8.7.1 Multichannel

WebCenter Anywhere is a set of wireless services that provides multichannel delivery and a unified environment to several types of mobile technologies. Moreover, users can access WebCenter applications directly from their Windows Desktop tools.

Point	Evaluation
Multibrowser	75%. Internet Explorer, Firefox, Safari. However, the product

	does not ensure full support for Internet Explorer 6, which is a pretty old version of the browser but still installed on several organizations.
Mobile devices	100%. It is possible to access WebCenter applications from PDA's, Smart Phones and Windows Desktop tools. In addition, ADF Mobile allows taking advantage of the features of the JSF technology to develop for mobile devices.
RSS	100%. Wikis, Blogs, Announcements and Discussion Forums provide pre-integrated RSS feeds associated to its content. Moreover, it is possible to include external RSS feeds through a WebCenter component.
API's	100%. ADF Mobile adds some mobile-specific ADF Faces components, each one rendered appropriately for the small screens of mobile devices. The goal is allowing programmers to reuse their Model and Controller layers of their desktop applications and simply develop an additional View layer for mobile devices.
Offline access	0%. The product does not offer any special feature regarding offline access.
Emails sending	0%. It is not possible to configure the system to send automatic emails notifying changes and additions.
SMS sending	0%. It is not possible to configure the system to send automatic SMS notifying changes and additions.
Office automation	50%. WebCenter intregrates with Microsoft Office shared document management functionality, allowing working with Microsoft Word, Excel and Powerpoint files. The backend repository must be the default one (Oracle Content Server). However, it is not possible to use any office automation tools to work with web contents created and managed by WebCenter.
AVERAGE: 53%	

8.7.2 Help

WebCenter provides extensive help to the user through different tools.

Point	Evaluation
General help	100%. Every component of WebCenter provides an access to a general help file (WebCenter Spaces, Oracle JDeveloper, Oracle

	Enterprise Manager, ...).
Context-sensitive help	100%. When applicable, WebCenter provides context-sensitive help. Generally, the method used is providing information when navigating with the mouse over a certain button or component.
Interactive help	0%. WebCenter does not provide natural language assistance for requests or queries of users.
Static validations	0%. WebCenter does not provide any validation mechanism.
Dynamic validations	0%. WebCenter does not provide any validation mechanism.
AVERAGE: 33%	

8.8 Issues

8.8.1 General

We think that the product presents the following issues:

- **Not many success cases yet:** Oracle WebCenter is a very new product and, in addition, the last version includes several new features and represents a change in the focus of the product. For this reason, there are not many real cases where the product has been deployed and it is not possible to get any feedback from any customers yet.

- **Costly:** the licenses for the product have a very considerable cost. WebCenter is intended for enterprise level customers who want to make extensive use of most of the features of the product (a perpetual license costs nearly €90000 per CPU).

8.8.2 Practical

After having used the product and performed some tests, we have faced some practical issues:

- **ADF Components styling:** there is documentation which explains how to customize the ADF components of the WebCenter Services (buttons, tables, icons, bars ...). It is a very interesting feature but when testing it we found that there is not a clear methodology to perform this task and that it relies too much in manual operation (like having to check manually the name of the CSS styles applied to the components through a tool like Firebug, for example).

- **Learning curve:** we consider that the learning curve for using most advanced features is quite large. Programming and deploying new templates for

WebCenter pages, adding external portlets to a WebCenter Spaces application, integrating a WebCenter application in WebCenter Spaces and other advanced tasks require editing manually several configuration files (most of them XML files) and redeploying them. However, Oracle is aware of this fact and WebCenter Spaces is designed to provide an out-of-the-box application which can be deployed and used for production very quickly.

9 Chapter 9: Liferay

This chapter focuses on describing the evaluated features of the second chosen technology: Liferay.

Most of the processes conducted to prove the features of the products have been learnt through the guidance provided by the document Liferay Portal Administrator's Guide [23].

9.1 General information

9.1.1 Product

In order to evaluate the product, I downloaded Liferay 6 Community Edition from the Liferay official website, as it is provided with an Open Source License.

The product can be obtained as stand-alone package which can be installed in your own application server or as a bundle which already contains an integrated server. Many bundle options are provided, including several common used servers like JBoss, Geronimo, Glassfish, Tomcat, etc.

I opted to download and install the option which comes bundled with Tomcat, because it is one of the most common environments we can found. So, the complete scenario was:

- Microsoft Windows XP Service Pack 3
- Tomcat 6.0.26
- Liferay Portal 6 RC 2 Community Edition

On the other hand, Liferay also offers an out-of-the-box application based on Liferay called Social Office which we want to evaluate, as it can provide some interesting features related to quick deployments and some very concrete scenarios. So, I downloaded Social Office Community Edition from the Liferay official website, as it is provided with an Open Source License too. In this case, the scenario was:

- Microsoft Windows XP Service Pack 3
- Tomcat 6.0.26
- Liferay Social Office 1.5 Community Edition (BETA)

9.1.2 Components

In order to perform the evaluation, we have been using the following components: Liferay Portal, Liferay Social Office, Tomcat server, HSQL database, Jackrabbit content repository and the Lucene search index.

Next, I describe them in detail.

9.1.2.1 Liferay Portal

It is a web platform which allows building enterprise portals providing out-of-the-box functionalities as well as a framework for developers.

Note that we evaluated the version 6 of the product (the last one) and this is a preview version (at the moment of the evaluation the last stable version was 5.2.3). However, the version 6 offers several new features and takes a much more collaborative and social approach. Moreover, Everis was more interested on evaluating this new version as they have been working a lot with the previous one, having already a good level of knowledge on it.

9.1.2.2 Liferay Social Office

It is an out-of-the-box application based on Liferay Portal which is focused on offering collaboration features and a very quick and easy deployment as an enterprise portal. Its base functions are: creating and managing intranet sites, share documents, content management, workflow and collaboration features.

I downloaded the version 1.5 Community Edition which is a BETA product. We must take it into account when performing the evaluation.

9.1.2.3 Tomcat

Apache Tomcat is an Open Source container of servlets which is developed by the Apache Software Foundation. It implements the Java Servlet and the JavaServer Pages (JSP) specifications. It is a web server capable of running Java code.

We will be running the version 6.0.26 which is integrated in the bundles for both Liferay Portal and Social Office.

9.1.2.4 HSQL

HSQLDB (Hyper Structured Query Language Database) is a management system for relational databases which is available under a BSD license (a free software license).

In the bundles we will use for evaluating the product, this database comes embedded in the same server than Liferay Portal or Social Office. This approach would not be acceptable in a real enterprise environment due to the provided performance when having multiple users accessing the system simultaneously. In this case, the environment should be configured to use a separate server for the database (based on HSQL or another compatible database system). However, the emphasis of this evaluation is put on the features provided by Liferay Portal and Social Office and not in benchmarking its database usage. For this reason, we have considered that the embedded HSQL database is enough good to perform this evaluation.

We will be running the version 1.8.0.10 which is integrated in the bundles for both Liferay Portal and Social Office.

9.1.2.5 Jackrabbit

Apache Jackrabbit is a content repository for the Java platform which is available under an Open Source License. It is a fully conforming implementation of JCR (Java Content Repository). It allows storing contents in a hierarchical structure which supports structured and unstructured content, full text search, version control, transactions and more.

We will be running the version 1.6 which is integrated in the bundles for both Liferay Portal and Social Office.

9.1.2.6 Lucene

Apache Lucene is a text search engine library which is written in Java. Its goal is to provide a high-performance and full-featured search index. It is available under an Open Source License.

We will be running the version 3.0.1 which is integrated in the bundles for both Liferay Portal and Social Office.

9.1.3 Requirements

According to the Liferay official website, the requirements for both Liferay Portal and Social Office are the following ones [24] [25]:

- Linux, Unix or Windows
- Mininum of 1 GB of RAM
- Java 5 or later

9.2 Market

9.2.1 History

Liferay was found in 2000 by the Chief Software Architect Brian Chan. It was originally developed as a portal product for non-profit organizations. Currently, this is no longer the case, or at least is not exclusively so. However, the company still donates each quarter to certain causes decided by their employees. In the past, they have contributed to AIDS relief campaigns and the Sudan refugees' crisis.

Liferay, Inc. was founded in 2004 to respond the growing demand for Liferay Portal. At that time, it was gathering spread acclaim and adoption across the entire world.

In 2006, they created its German subsidiary: Liferay GmbH. One year later, in 2007, they opened a new Asian headquarters in China and the Spanish subsidiary: Liferay S.L. Finally, in 2009 they created a new office in Bangalore, India.

Liferay has received the following awards and recognition:

- **Gartner Magic Quadrant:** it was one of only two open source providers who fulfil the conditions to be included in the Gartner's report.
- **EContent 100:** since 2006 Liferay Portal appears in EContent 100 (a list of the 100 most influential companies in the digital content industry).
- **eWeek:** Liferay has got very good reports from eWEEK, which is considered a very reliable technology information source for enterprise infrastructure.
- **InfoWorld:** considered Liferay Portal the winner of their "Best Open Source Portal" award.

9.2.2 Experience

Liferay is considered the leading open source portal for the enterprise. It is a product which has been adopted across several types of industries and services and with a worldwide scope.

The product has proved successful when being deployed into scenarios related to different scenarios. The company "Comercio Electrónico B2B 2000, S.A.", a Liferay partner, reported several success cases [26]. The following list shows some of the most important ones:

- **Industry and Services:** AutoZone, Smart Fixture, BMW, United Nations, O2, United Colors of Benetton, Universal Music Group, Lufthansa Flight Training.
- **Education:** EducaMadrid, EducaCantabria, Lluirex.
- **Govern:** French Ministry of Defense.

Furthermore, a full list of Liferay customers can be found in the company's official website [27].

9.2.3 Market share

The company states they have got about 2.7 million downloads and 250000 deployments until now, approximately. Moreover, the product has been adopted by Fortune 500 customers (Fortune 500 is a list of the top 500 American companies published by the Fortune Magazine) [28].

9.2.4 License

For ten years, Liferay has been available under the MIT license. However, the version 6 of the product will be distributed under the GNU Library General Public License (LGPL).

 The purpose of this change is to defend against a small set of Liferay users who were able to freely modify the core of the product and re-distribute it making their own profit but without contributing, financially or in source code, in any way to the Liferay's company and its community.

The LGPL license is an open source license which is a variant of the GNU General Public License (GPL). Any software can use a LGPL licensed program without restrictions as long as that software is not considered a derivative work of the LGPL

licensed program. Normally, software which dynamically links to the LGPL program is not considered a derivative work. [29]

9.2.5 Business type

Liferay is very flexible and has been adopted by several small, medium and large businesses. Moreover, the product has demonstrated to be able to be used in different scenarios. Concretely, the most common scenarios are:

- Corporate Extranet
- Company Intranet
- Content Management and Web Publishing
- Collaboration
- Infrastructure portal

9.2.6 Price

The version 6 of the product (whose BETA version we are evaluating) will be issued under an open source license. So, it will not have any cost.

9.3 Support

9.3.1 Type

We have evaluated the Liferay Community Edition. However, the product is also offered as an Enterprise Edition which adds professional support. Actually, organizations which plan to use Liferay in production and requires a Service Level Agreement as well as other support services should opt for the Enterprise Edition.

Support for Liferay Enterprise Edition is available in three different levels: Basic, Gold and Platinum. These levels provide different services for all the stages of a given version of Liferay Portal: set-up, installation, configuration and deployment. All levels provide patch updates, consolidated service packs and a web-based repository of updates.

The following table summarizes the differences between these services [30]:

	Basic	Gold	Platinum
Emergency Hot Software Fixes	No	Yes	Yes

Web-based Incident Tracker	No	Yes	Yes
Number of customer contacts	0	2	3
Web-based support	-	24x7	24x7
Max Web Response Time	-	1 Business day	1 Business day
Phone Support	-	8x5 (Business Hours)	24x7
Max Phone Response Time	-	4 Hours	2 Hours
Emergency Response Time	-	-	1 Hour
End of Version Support	Basic	Extended	Extended
Software indemnification: Injunctive Relief	No	Yes	Yes
Software indemnification: Legal Defense and Damages	-	Optional	Optional

As we can see, the End of Service Life policy can be Basic or Extended, depending on the level of the contracted support. The Basic policy includes access to Consolidated Services Packs and Patch Updates for 4 years. The Extended policy includes the benefits of the Basic one plus 5 additional years of support beyond the last ship date of the specific Liferay version. These 5 years are divided into two phases: a Phase 1 with full support and a Phase 2 with limited support (not being able to receive new patches) [31].

9.3.2 Zones

Liferay Service Partners provide professional services for Liferay Portal in several areas of the world. We can find Liferay Partners in the following countries: Australia, Belgium, Brazil, Canada, Chile, Colombia, Czech Republic, Ecuador, Estonia, Finland, France, Germany, Hungary, India, Italy, Japan, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Singapore, Slovakia, Spain, Sweden, Switzerland, United Kingdom and United States.

The following ones are the Spanish partners: Germinus, ASAC Comunicaciones, CDTEC, Comercio Electrónico B2B 2000, Everis, GMV, Informática El Corte Inglés, IN2, iSOCO, openTrends, Teccon, TGI, VASS and Zylk.net. [32]

9.3.3 Installation

The installation processes of the bundles have been straight forward and did not cause any trouble. In order to install them, it was enough downloading the bundles and executing the file startup.bat of the corresponding Tomcat servers. Then, a web-browser window appeared showing Liferay Portal. [33]

9.4 Infrastructure

9.4.1 Integration

As a portal solution, Liferay has been designed with the ability to integrate external systems.

Point	Evaluation
Remote applications	100%. Liferay can access remote applications through WSRP.
Web Services consumption	100%. Liferay can consume web services which are compatible with several WS protocols. Concretely, the list of compatible protocols is: JSON, Hessian, Burlap, REST, RMI, Spring HTTP, WSRP (both versions 1.0 and 2.0) and WebDAV.
Web Services publication	100%. An external application can consume Liferay web services if that application supports the WSRP protocol. Liferay portlets can adhere to the JSR-168 and JSR-286 standards.
Development framework	100%. Liferay provides several tools to assist developers which can be freely downloaded. Let's enumerate the most important ones: • **Liferay Plugins SDK:** it is one of the primary ways to extend the functionalities of the product. It allows customizing and creating new portlets, themes, layout templates and web modules. • **Source code:** the source code of the product can be downloaded from its website. Having the option of seeing it can make the developers work easier. • **Integrated Development Environment (IDE):** any IDE for Java development can be used for Liferay. However, a specific IDE for Liferay (based on Eclipse) has been

released for the last version of the product: Liferay IDE 1.0.

- **Community tools:** the large community behind Liferay produces several tools which can be helpful for developing although they are not official. They can be obtained from several sources (like the Liferay website or Sourceforge, among others).

- **Alloy UI Framework:** Liferay Portal 6 provides this framework to assist building advanced user interfaces.

AVERAGE: 100%

9.4.2 Platform

Liferay can run on several servers. This fact provides a very good compatibility with different systems.

Point	Evaluation
Operating systems	100%. Liferay can run on Linux, Unix and Windows.
Database servers	100%. Liferay is compatible with the following databases: Apache Derby, IBM DB2, Firebird, Hypersonic, InterBase, JDataStore, MySQL, Oracle, PostgresSQL, SAP MaxDB, SQL Server and Sybase.
Web servers	100%. Liferay is compatible with several servers which provide web features. The following list summarizes them: Apache Geronimo, Sun GlassFish 2 UR1, JBoss, JOnAS, OracleAS, SUN JSAS, WebLogic and WebSphere.
AVERAGE: 100%	

9.4.3 Scalability

Liferay can be run on different servers. It has been designed to be able to take advantage of the scalability features of all them. In general, the administrator will have to configure the Liferay portal after having configured the server in order to perform in the desired way.

Furthermore, Liferay Portal has been deployed in and designed for scenarios which require support for critical missions, redundancy and/or 24/7 up times [23].

Point	Evaluation
Replication	100%. Liferay allows splitting the sources used for reading and writing in two sets. It enables to optimize one set for reading and the other one for writing. Furthermore, all databases supported by Liferay offer their own replication methods. Moreover, Liferay also supports database sharding (horizontal partition of databases which replicates their contents to enhance the scalability of the system).
Failover	100%. This capacity depends on the server where Liferay runs. In the case of a Tomcat server, Liferay recommends the use of one of the two following open source load balancer products [34]: • **Mod_jk:** a connector for the Tomcat server which implements failover and load balancing features. • **Pen:** is a load balancer for TCP based protocols, like HTTP or SMTP. It is simpler to install and operate than Mod_jk [35]
Load balancing	100%. As described for the Failover case, Liferay can use the load balancers Mod_jk or Pen.
Clustering	100%. It is possible to install the portal in more than one node of the chosen application server and achieve clustering features through Liferay configuration. This configuration is detailed in the Liferay Portal Administrator's Guide [23].
Caching	100%. Liferay uses Ehcache to support distributed caching support. Ehcache is an open source cache implementation which aims to improve performance, offload the database and enhance scalability [36]. It allows having a cache for each Liferay node but also distributing the cache across multiple Liferay nodes which are running concurrently, improving even more the performance of the system.
AVERAGE: 100%	

9.4.4 Security

Liferay provides several security features. Note that some of these features depend on the server where Liferay runs on. In these cases, we have evaluated the server which comes with the bundle we installed: Apache Tomcat.

Point	Evaluation
Authentication	100%. Liferay supports different authentication methods: via an email address, a screen name or a user ID. The

	first method is the default one. Alternatively, it is also possible to connect with a LDAP store to authenticate users.
Authorization	100%. It is possible to assign different roles and privileges to users and/or groups of users.
Logon	100%. Logon passwords can be stored in a relational database or in a LDAP store.
Single Sign-On	100%. Liferay can achieve Single Sign-On through integration with one of the following solutions: • **Central Authentication Service (CAS):** it is a widely used open source Single Sign-On solution. • **NTML:** a Microsoft Single Sign-On protocol which uses Internet Explorer. • **OpenID:** a Single Sign-On solution implemented by multiple vendors. A user having an OpenID account can use it to access any system which supports OpenID without having to register a new account. Liferay implements this feature and can be an OpenID consumer. • **Atlassian Crowd:** a Single Sign-On solution similar to CAS but implementing an OpenID producer. • **OpenSSO:** an open source access management and federation platform providing Single Sign-On capabilities. • **SiteMinder:** a Single Sign-On implementation solution from Computer Associates. Liferay has a built-in integration with this system.
User management	100%. In both Liferay Portal and Liferay Social Office is possible to create and manage users and groups of users.
Digital certificates	100%. Supported by Apache Tomcat.
Digital signatures	100%. Supported by Apache Tomcat.
Public Key Infrastructure (PKI)	100%. Supported by Apache Tomcat.
Secure Sockets Layer Protocol	100%. Apache Tomcat fully supports the SSL protocol.

(SSL)	
Secure Hypertext Transfer Protocol (HTTPS)	100%. Supported by Apache Tomcat.
AVERAGE: 100%	

9.4.5 Standards

The main standards supported by Liferay are the following ones [23]:

- AJAX
- iCalendar and Microformat
- JSR 168
- JSR 268
- JSR 127
- JSR 170
- JSF 314 (JSF 2.0)
- JCR 1.0
- OpenSearch
- JSON
- Hessian
- Burlap
- REST
- RMI
- WSRP v1 and v2

Point	Evaluation
WSRP v1	100%
WSRP v2	100%
JSR 168	100%
JSR 286	100%
JCR 1.0	100%
AVERAGE: 100%	

9.5 Operations

9.5.1 Administration

Many of the administration and configuration tasks of Liferay can be performed through its portlet-driven user interface. Concretely, it can be achieved through its Control Panel.

However, in order to perform advanced configuration tasks (i.e.: changing some out-of-the-box defaults, security configuration, plugin management, web services configuration, etc.) we must use other methods. This is mostly done through the edition of text files.

Point	Evaluation
Configuration	75%. The product allows a high-level of customization through changing its configuration. However, there is not a standard method to perform them and the administrator is forced to use different tools for handling it (e.g.: the Control Panel for basic configurations, editing databases, editing XML files, installing plugins, etc.).
Interface	50%. Fine aesthetics for the Control Panel (a browser-based tool). However, several heterogeneous procedures must be learned to perform configuration tasks and they are not very friendly-user (i.e.: manually editing files which have different formats).
Community management	100%. Liferay Control Panel allows configuring communities.
AVERAGE: 75%	

9.5.2 Ease of upgrade

The difficulty associated to upgrade Liferay depends on how much a concrete deployment has been customized. If Liferay Plugins SDK has been used to extend the product, then the process will be more complicated because API changes in the new version will probably break some parts of your code. However, there is guidance to help developers to fix it. Custom developed portlets will not suppose a problem as long as they adhere to the JSR-168 or JSR-286 standards. Customized themes are likely to require some tweaks to work properly in the updated version.

The first time a new version is started, Liferay detects if the database also requires an upgrade and, if necessary, performs it automatically.

Point	Evaluation

Upgrade tools	0%. The product does not offer any tool to assist updating. All the process relies on installing the new version, replacing files and re-deploying applications manually.
Metadata for customizations	100%. In Liferay metadata is stored in the database, which is automatically updated to the new version.
AVERAGE: 50%	

9.5.3 Statistics

Liferay is built-in with two tools to monitor and obtain information about the performance of the system: Google Analytics and Log4j. In addition, the Control Panel shows some information about the performance of the system.

- **Google Analytics:** Liferay has built-in support for this Google's tool. This free service allows getting detailed statistics about the system.

- **Log4j:** it is an open source library developed by the Apache Software Foundation which provides a logging system. Its output can be highly configured in function of the administrator's needs. This logging system is integrated in Liferay and can be configured through the Control Panel.

- **JMX:** Java Management Extensions (JMX) is a technology which provides web-based and modular monitoring functions. It comes integrated with Liferay and allows identifying the slowest portlets of a concrete scenario as well as getting some information about the general performance of the system.

Point	Evaluation
From logs	100%. Provided by Log4j.
Online visits	100%. Provided by the built-in Google Analytics service.
Monitoring functions	100%. The built-in Google Analytics service provides several options to monitor the website traffic while the Control Panel allows monitoring the performance of the system. In addition, JMX provides advanced monitoring features.
AVERAGE: 100%	

9.6 Features

9.6.1 Web 2.0

Liferay has put a lot of emphasis on providing web 2.0 features.

Point	Evaluation
Blogs	100%. A built-in portlet for Blogs is provided.
Wikis	100%. A built-in portlet for Wikis is provided.
Forums	100%. The Message Board built-in portlet provides all the common features related to forums.
Surveys	100%. Liferay allows configuring polls through the Control Panel and displaying them via a Poll Display portlet. This functionality allows also building surveys.
Comments	100%. A built-in portlet allows adding comments to any page, if desired.
Collaborative environment	100%. Liferay provides several built-in portlets which enhances collaboration between different users.
AVERAGE: 100%	

9.6.2 Sales

Liferay provide some built-in portlets which provide features related to enhance the sales functions of a portal.

Point	Evaluation
Shopping cart	100%. The built-in portlet called Shopping provides this functionality.
Virtual POS	100%. The Shopping built-in portlet can be configured for accepting card transactions.
ERP integration	25%. Liferay does not provide built-in integration with any ERP. Such integration must be achieved through developing portlets which adapts to the needs of the desired integration. However, it is possible to found some portlet developed by the community which suit our needs.
Multicurrency	100%. The Shopping built-in portlet can be configured to perform the transaction in multiple currencies.
AVERAGE: 81%	

9.6.3 Multimedia

Liferay 6 does not focus on multimedia capabilities. It deals with multimedia files like if being any other type of content. It does not offer tools for editing this type of files.

Point	Evaluation

Images	25%. It can display images and treat them like a standard content. It does not offer special features for editing them.
Videos	25%. It treats videos as any other type of file. It does not offer special features for dealing or editing videos.
Video-tours	0%. This feature is not provided.
Podcasts	0%. This feature is not provided.
Videocasts	0%. This feature is not provided.
Photography sites integration	0%. This feature is not provided.
Video sites integration	0%. This feature is not provided.
Publication, management CDN	0%. This feature is not provided.
AVERAGE: 6%	

9.6.4 Content management

Both Liferay Portal and Social Office integrate a built-in content management system (CMS). Its features can be accessed and configured through the Control Panel.

Point	Evaluation
Taxonomy	100%. The Control Panel has a Categories section which allows organizing hierarchically any content of the portal.
Templates	100%. Liferay allows creating Site Templates and Page Templates. Site Templates allows preparing a set of pages, portlets and contents which will be the basis for new sites. Page Templates allows adding a set of portlets which will appear in any page created using this template.
Targeted publishing	100%. Contents can be configured with a date for publishing as well as a date for an automatic expire. A review date can also be configured.
Metadata	100%. It is possible to associate metadata to contents in order to improve their usefulness.
Approval workflow	100%. Liferay 6 comes with an integrated workflow engine. It allows creating new workflows, can be applied to any type of content and provides some predefined workflow for the most common situations.
Subscriptions /	100%. RSS features allow any user to receive notifications when

Notifications / Alerts	new content is published or changed.
Preview	100%. There is an option to preview any contents before publishing them.
External content repositories	50%. Currently, Liferay can be integrated with Documentum and Alfresco. In addition, Liferay 6 has added support for the CMIS standard (Content Management Interoperability Services) which will allow developing custom integrations with other repositories which are compatible with that standard. However, Liferay relies strongly in its built-in content management system.
Check-in / Check-out	100%. This feature is supported by the built-in content management system of Liferay.
Document scanning	0%. This features is not provided.
Document collaboration	0%. The product does not offer any document collaboration feature different than allowing different users editing the same document at different moments.
Content security	100%. The rights possessed by a user over all the documents can be associated to its role.
AVERAGE: 79%	

9.6.5 Search engine

Let's now evaluate the search engine of Liferay. The following table summarizes its features.

Point	**Evaluation**
Boolean-based searches	0%. This feature is not provided.
Indexing	0%. This feature is not provided.
Saved searches	0%. This feature is not provided.
Keyword search	100%. This is the method used by the search engine to perform its process.
Full-text searches	0%. This feature is not provided.
Internet / Web searches	0%. This feature is not provided.
Natural-language search	0%. This feature is not provided.
Results ranking	0%. This feature is not provided.
AVERAGE: 13%	

9.6.6 Social networking

The last version of Liferay, which is the one we are evaluating, put much emphasis on offering social networking capabilities.

Point	Evaluation
Communities	100%. Liferay allows grouping users through Organizations, Communities and/or User Groups.
Microblogging	0%. This feature is not provided.
News promotion	0%. This feature is not provided.
Send to a friend	0%. This feature is not provided.
AVERAGE: 25%	

9.6.7 Geolocation

Currently, Liferay does not provide any integrated geolocation feature.

Point	Evaluation
From IP	0%. This feature is not provided.
From GPS	0%. This feature is not provided.
From coordinates	0%. This feature is not provided.
From address	0%. This feature is not provided.
AVERAGE: 0%	

9.6.8 Users

Liferay offers a full range of features to improve the experience of its users.

Point	Evaluation
Users registration	100%. New users can create themselves their account.
Users information	100%. Users have their own profile which stores relevant information (i.e.: birthday, gender, email address, full name, organizations, communities, address, phone numbers, etc.) and can be displayed to others.
Access by role/user	100%. The visibility of pages and their components can be configured to be based on the role of the user who is seeing it.
Personalization	25%. Regular users do not have many options to personalize how they see the pages. They will see any content as it was designed by their creator. However, they can configure in their own personal information their favourite language, time zone and personal greeting. Some components will display different content according to the value of these settings.
AVERAGE: 81%	

9.6.9 Multilanguage

Liferay provides some multi-language features. The product has been designed to offer internationalization features and to be able to adapt to different user's languages. It ships with built-in translations for 22 languages. In addition, it is easy to install many other languages provided by the community.

Point	Evaluation
Multilanguage support	75%. User can choose several languages to see the menus, settings and any text aspect of the product. In addition, it is possible to indicate localization properties for a given page, indicating in which language is written (and that page will not appear when the website is surfed in another language). However, there is not a mechanism to allow writing different versions of a given content according to different languages. This has to be achieved building one different community for each language and providing their own contents.
Translation flow	0%. There is not any workflow to organize the process of translating contents.
AVERAGE: 38%	

9.6.10 Communication

Liferay provides some communication and collaboration features through built-in portlets.

Point	Evaluation
Videoconference	0%. Not provided by Liferay.
VoIP	0%. Not provided by Liferay.
Mail	100%. Liferay provides a Mail built-in portlet which can be configured to use any IMAP or Gmail account.
Instant messaging	100%. Several built-in portlets offer instant messaging and social capabilities.
Chat	100%. Provided by the Chat built-in portlet.
AVERAGE: 60%	

9.6.11 Advertisement

Liferay does not include advertisement features. However, third party portlets can be found which allow managing banners and provide some advertisement control features.

Point	Evaluation
Third party adverts	0%. This feature is not provided.
Segmentation by navigation	0%. This feature is not provided.
Banners	0%. This feature is not provided.
Adverts in videos	0%. This feature is not provided.
Advertisement control and management	0%. This feature is not provided.
AVERAGE: 0%	

9.7 Presentation

9.7.1 Multichannel

The following table summarizes the multichannel capabilities of Liferay.

Point	Evaluation
Multibrowser	100%. Liferay is compatible with most browsers, including Internet Explorer, Firefox, Safari, Opera and Chrome. Some not official themes do not render properly in some of these browsers (Internet Explorer 6 causes much pain, as usual). In addition, Liferay provides two out-of-the-box browser compatibility tools: Browser Selectors and 24-bit PNG support for Internet Explorer 6. The first one allows styling for concrete browsers and versions, while the second one solves a common issue that appears when rendering transparent images in Internet Explorer 6 [37].
Mobile devices	100%. Liferay integrates some out-of-the-box themes which are designed to display in mobile devices. In addition, it is possible to develop custom themes for them. They are shown correctly to this type of devices due to its adhesion to the WAP protocol [38].
RSS	100%. Wikis, Blogs, Pages and Message Boards provide pre-integrated RSS feeds associated to its content. Moreover, it is possible to include external RSS feeds through the built-in RSS portlet.
API's	0%. At this moment, Liferay does not provide any API specifically designed to develop mobile applications.

Offline access	0%. The product does not offer any special feature regarding offline access.
Emails sending	100%. A user with an administrator's role can configure the system to send automatic emails notifying changes and additions on Liferay general contents and news.
SMS sending	100%. A user with an administrator's role can configure the system to send automatic SMS notifying changes and additions on Liferay general contents and news.
Office automation	100%. Liferay CMS has built-in integration with Microsoft Office. A user can update and work with files in his local drive and they will be automatically updated in the Liferay's repository. Liferay CMS uses the public Microsoft SharePoint protocols which allow opening, saving, versioning and locking documents directly between Liferay and Microsoft Office. In addition, web contents from a Liferay's portal can be exported to Microsoft Word, OpenOffice Writer, PDF, RTF, SXW and TXT formats.
AVERAGE: 75%	

9.7.2 Help

Liferay provides help to the users through different methods.

Point	Evaluation
General help	25%. Any help to perform activities must be actively found at Liferay's website, wikis, blogs or community. You can be sure that you will be able to find help regarding common activities and procedures. However, it is possible to find complex and/or not common activities to be not documented at all. In addition, there are not direct links allowing access to help files from a Liferay developed application.
Context-sensitive help	25%. Sometimes, Liferay provides very short context-sensitive tips and brief help. However, it does not happen with every component.
Interactive help	0%. There is not any natural language assistance for requests or queries from users.
Static validations	0%. Liferay does not provide any validation mechanism.
Dynamic validations	0%. Liferay does not provide any validation mechanism.

AVERAGE: 8%

9.8 Issues

9.8.1 General

After having evaluated Liferay, we consider that the product presents the following general issues:

- **Lack of a long track of built portals based on transactions:** according to Gartner [12], many deployments support B2E or B2C scenarios with a content-centric approach. It seems that there are not many experiences of deployments involving large-scale scenarios with a large number of transactions. However, I think it would not be fair to consider this fact as an issue: in my opinion, it should be considered as a warning to be careful and cautious. Moreover, the Liferay engineering team performed a test report about the performance of the system in scenarios involving infrastructure portal, collaboration and content-centric deployments. The key findings of the study supported the use of Liferay in all these enterprise scenarios [39].

9.8.2 Practical

After having used the product, we found the following practical issues:

- **Learning curve:** we consider that the learning curve for extending Liferay (as it is an open source product) is large. Most documentation to perform these extensions has been done by the community. In spite of having the option of getting support by official Liferay staff in the forums, the lack of official documentation in this area is considerable. We found that the features offered by the web-based Control Panel concerning server configuration are quite limited. Most custom advanced configurations of Liferay relies on manual modifications of text and XML files.
- **Beta version:** we have faced some complications related to being testing the last version of the product, which is a Beta version. Sometimes we had to dealt with documentation of the previous version and figuring how a concrete feature has to be used in the Beta version (in general, this has not caused major pain although sometimes increased the time needed for research). However, trying to

figure out how to use the new features of the Beta version was sometimes more painful, as this new version does not have consistent documentation yet. We have missed an administrator's guide like the one for the version 5.2 (although it is already planned). However, in order to be fair we cannot complain about that as we choose to test this version and not the previous stable release. After all, it is a beta version but I found worth to mention it here.

10 Microsoft SharePoint

This chapter focuses on describing the evaluated features of the last chosen technology: Microsoft SharePoint.

10.1 General information

10.1.1 Product

To evaluate this product, I downloaded Microsoft SharePoint Server 2010 Trial software from the TechNet Evaluation Center of the official Microsoft website.

10.1.2 Components

To perform the evaluation of this product, I have used the following components: SharePoint Server 2010, SharePoint Designer 2010 and Microsoft Search Server 2010.

Next, I describe them in detail.
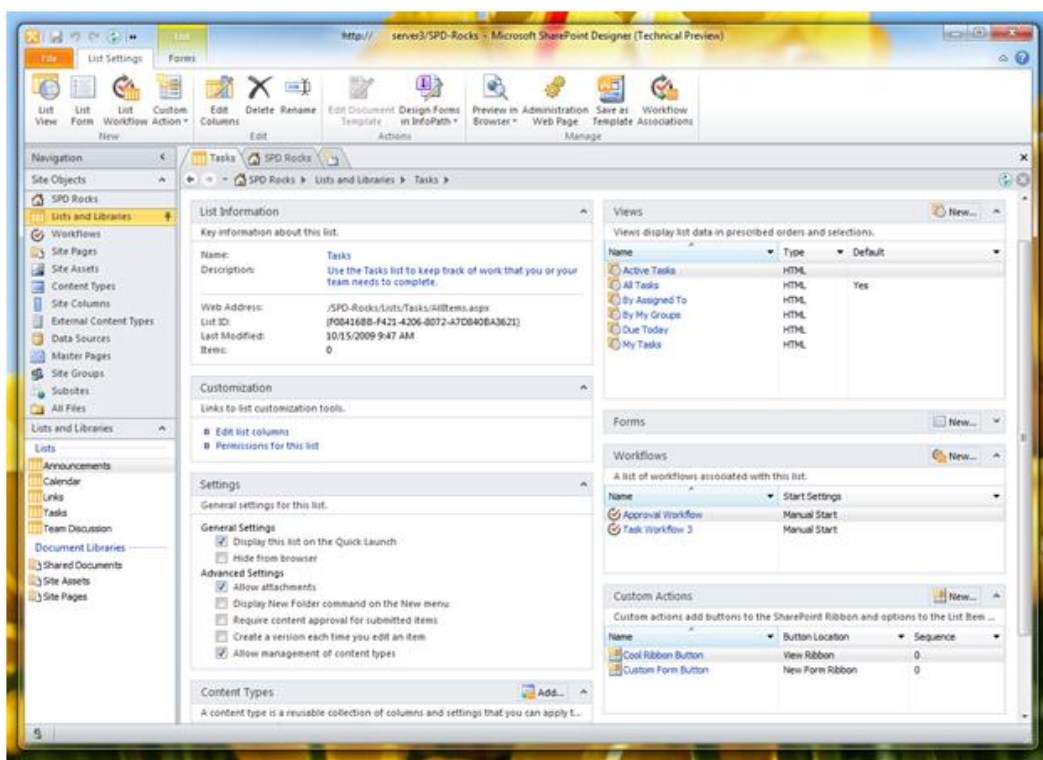
10.1.2.1 SharePoint Server 2010

It is the core element of SharePoint, providing most of services. Their characteristics are organized around six capabilities: Sites, Composites, Insights, Communities, Content and Search.

- **Sites:** services regarding the organization of business Web sites. It provides document sharing, project management and information management features.
- **Composites:** tools which let users create their own business sites following a no-code approach.
- **Insights:** services regarding information access. It provides information about the underlying database, produces reports and so on. It focuses on aiding decision making processes.
- **Communities:** tools which provide collaboration features and a platform to manage business communities.
- **Content:** services regarding content management. It features a full integration with Microsoft Office.

- **Search:** services which allow users performing searches. Regarding the underlying search engine, it is possible to choose between two options: the out-of-the-box SharePoint search or the more powerful FAST Search Server 2010 for SharePoint.

10.1.2.2 SharePoint Designer 2010

It is a tool for develop rapidly SharePoint applications without having to write any code, in a WYSIWYG mode. It can integrate with the Microsoft Visual Studio 2010 IDE for developing more complex applications and it is considered the reference complement for designing websites using this IDE.

10.1.2.3 Microsoft FAST Search Server 2010 for SharePoint

In 2008, FAST was acquired by Microsoft. It is the first Microsoft product based on the FAST technology. SharePoint 2010 includes an out-of-the-box search engine but using this component adds several search capabilities

10.1.3 Requirements

SharePoint must meet the following requirements [42]:

- A 64-bit quad core processor

- 4 GB of RAM for developer or evaluation use, 8 GB for a production environment
- At least 80 GB for system drive

10.2 Market

10.2.1 History

The history of SharePoint began in 2001. Initially, Microsoft offered two SharePoint products in two different groups (Office and Exchange). One of them was SharePoint Team Services (STS). Its main purpose was to operate as a departmental Intranet being backed by a SQL Server database. It provided collaboration features like libraries of documents, task lists and calendars. On the other hand, the other product was SharePoint Portal Server (SPS). It has a different approach and both products were not very compatible. Exchange was used as a backend database and provided federated search. At this point, many administrative operations could only be done via a command line tool.

In 2003, both products were redone using the .NET framework. STS was renamed to Windows SharePoint Services (WSS) while SPS kept its name. New features were included in both products: managing of high secure documents, improved record management, templates for using SPS in Internet sites and connection with Microsoft Content Management Server (MCMS) in order to provide content management services. Some incompatibility issues between WSS and SPS were addressed but many other remains there.

In 2007, WSS 3.0 and Microsoft Office SharePoint Server 2007 (MOSS) were introduced. MOSS 2007 was redesigned as an extension of WSS 3.0 which extended many capabilities of ASP.NET sites. This allowed ASP.NET developer to re-use their skills to improve SharePoint sites. Office SharePoint Designer appeared to assist in the quick creation of sites and there was the option of using Visual Studio 2005 to develop new components. The products included workflow features as well as Web 2.0 tools like blogs, wikis, RSS feeds, etc.

Finally, in 2010 Microsoft released the current version evaluated in this document. The emphasis is put on providing more Web 2.0 and collaboration tools, enhancing the

content management features of the product and making style customization easier, among other features [43] [44].

10.2.2 Experience

SharePoint is a product which evolved from being a small product offered with a very concrete purpose to be a portal building product. So, it has suffered great transformation. As a result, it is a very stable product as many issues have been solved through this evolution process.

10.2.3 Market share

The SharePoint's market share for enterprise scenarios is large and is growing even more. According to Forrester, Microsoft sold about 85 million licenses of SharePoint and has predicted that it will dominate the collaboration software for years to come [45].

10.2.4 License

The licensing model of SharePoint is complicated. The specific licenses which will be need depend on three factors: the capabilities which will be used, who will use it and where the system is hosted.

Regarding the capabilities which will be used, there are three levels of functionality: SharePoint Foundation 2010, SharePoint Server 2010 plus Standard CAL and SharePoint Server 2010 plus Enterprise CAL (and Standard CAL). Each level has a set of corresponding licenses. The following table summarizes the features associated to each level of functionality.

Level	Functionalities
SharePoint Foundation 2010	Collaboration and Web-based applications
SharePoint Server 2010 plus Standard CAL	The core capabilities of SharePoint: Sites, Communities, Content, Search (but not FAST search) and Composites
SharePoint Server 2010 plus Enterprise CAL (and Standard CAL)	The full capabilities of SharePoint: includes FAST Search and Insights.

In addition, SharePoint has two licensing models in order to accommodate the two possible groups of users: Server plus CAL for internal users and Server-only for external users. A server license is required for each instance of the software.

Regarding the CAL's (Client Access Licenses), Microsoft offers two options: a device-based CAL or a user-based CAL. When choosing the first one, one Device CAL is required for every device which accesses SharePoint 2010 Server regardless the number of users. On the other hand, if the second model is chosen one User CAL is required for every person accessing the SharePoint 2010 Server regardless the number of devices [46].

10.2.5 Business type

According to Gartner, SharePoint has been adopted widely by the enterprise. Adoption of SharePoint for portal purposes has been normally adopted for enterprises which had fewer than 15000 employees and for B2E purposes. However, in 2009 there were more examples which met a wider range of portal use cases and larger enterprises (with the 2007 version) [12].

10.2.6 Price

Getting the price of SharePoint is a complex matter. There are multiple possible configurations and the price of the license also depends on other factors like the type of organization, the relationship with Microsoft and/or the licensing retailer and so on.

The following table displays some indicative prices for SharePoint 2010 in the UK. However, exact price must be always checked with a Microsoft Licensing Specialist [47].

License	Price (£)	Price (€ conversion)
SharePoint 2010 Server	3100	3827
SharePoint 2010 Standard CAL	60	74
SharePoint 2010 Enterprise CAL	53	65
SharePoint 2010 Internet Sites Standard	7500	9260
SharePoint 2010 Internet Sites Enterprise	27000	33333
FAST Search Server	14000	17284

10.3 Support

10.3.1 Type

The offered SharePoint's support is based on the Microsoft Support Lifecycle policy. These lifecycle contains three different phases of support: Mainstream, Extended and Self-help online support. The Mainstream phase applies on the first 5 years. After that, the Extended phase

applies on the following 5 years. The Self-help online support phase applies simultaneously to the previous phases as well as after the expiration of the Extended phase. The following table summarizes the different support services offered by each type of phase [48].
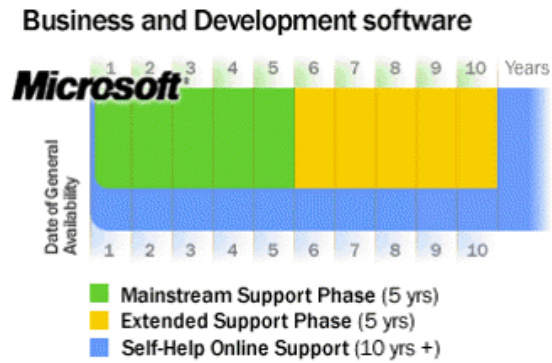
Type of support	Mainstream support phase	Extended support phase	Self-help online support
Request to change the design of the product and its features	Yes	No	Free access to online content
Security updates	Yes	Yes	
Other non-security fixes	Yes	*	
Complimentary support	Yes	No	
Paid support	Yes	Yes	

*: only with purchase of Extended Hotfix Support Agreement

Let's now describe each type of support.

- **Request to change the design of the product and its features:** a
- **Security updates:** these updates are released regularly and its purpose is to remove detected security issues and vulnerabilities.
- **Other non-security fixes:** these updates are released to address bugs and errors which are not related to security. In the Extended support phase, these fixes are not offered if a Extended Hotfix Support Agreement has not been purchased.
- **Complimentary support:** when acquiring licenses, the customer also acquires the rights of using complimentary support (only in the Mainstream support phase). These could be represented by several forms: a package of included

incidents which can be solved without an additional cost, additional online support, support related with the warranty, etc. This type of support also includes the option of contracting Software Assurance for Volume Licensing which provides 24x7 telephone and web support, among other benefits. The availability of these services and its price are not standard and depends of an agreement with the Microsoft agent.

- **Paid support:** this refers to request support for a given incident which is not included in the already contracted support. Microsoft will charge a given amount or using an hourly basis.

10.3.2 Zones

Microsoft offers support to several world locations. Let's provide a list with that locations categorized by zones.

- **Africa:** Algeria, Egypt, Morocco, South Africa, Tunisia
- **Asia:** China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, Vietnam
- **Europe:** Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom
- **Middle East:** Israel, Middle East, Saudi Arabia, United Arab Emirates
- **North and Central America:** Canada, Costa Rica, Dominican Republic, El Salvador, Guatemala, Mexico, Panama, Puerto Rico, United States
- **South America:** Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela
- **South Pacific:** Australia, New Zealand

10.3.3 Installation

The installation process has not been evaluated as the product has been evaluated from a VMWare image which contained the product already installed.

10.4 Infrastructure

10.4.1 Integration

SharePoint 2010 has the ability to communicate with external systems.

Point	Evaluation
Remote applications	100%. The product integrates smoothly with other Microsoft products, especially with those belonging to the Office family. In addition, the Business Connectivity Services (BCS) of SharePoint 2010 is a set of services which allows using data from external applications (like CRM, ERP and other business applications) in SharePoint and Office products [49] [50].
Web Services consumption	100%. SharePoint 2010 uses ASP.NET Web Services allowing the consumption of external web services [51] [52].
Web Services publication	100%. ASP.NET Web Services also provide the capability of publishing web services. SharePoint provides several default web services but is also possible to create custom web services [51].
Development framework	100%. SharePoint Composites is the component of SharePoint which provides tools for developers. It allows performing different types of development [53]: • **Browser-based:** there is a set of building blocks allowing the creation of custom solutions through the web browser. • **SharePoint Designer:** a tool for creating more advanced applications without having to write any code. Apart from Composites, the Microsoft Visual Studio 2010 IDE provides tools for developing advanced components for SharePoint through development [54].
AVERAGE: 100%	

10.4.2 Platform

SharePoint is designed to run on a platform which is based on Microsoft components. The provided Business Connectivity Services (BCS) allows connecting with several external sources but requires some development tasks with SharePoint Designer 2010.

Point	Evaluation
Operating systems	0%. Microsoft SharePoint 2010 can only be installed one operating system: the 64-bit edition of Microsoft Server 2008 R2. There is not any other possible choice.
Database servers	25%. SharePoint is designed to work with Microsoft SQL Server as its database server. However, it can connect with ODBC databases through the Business Connectivity Services and some work around.
Web servers	0%. SharePoint is only designed to run on the Web Server integrated with Microsoft Server 2008 (Web Server Edition) through its Internet Information Services IIS).
AVERAGE: 8%	

10.4.3 Scalability

The scalability features of SharePoint depend basically on the capabilities of the server where it runs and its database system: Microsoft Windows Server 2008 and Microsoft SQL Server.

Point	Evaluation
Replication	100%. Windows Server 2008 implements the Distributed File System (DFS) which provides several replication features [55].
Failover	100%. SharePoint 2010 provides native support for SQL Database Mirroring. This is a method which addresses failovers using different SQL Server instances [56] [57]. In addition, the Failover Clustering service of the Windows Server 2008 has put much emphasis on providing failover capabilities among the cluster equipments [58].
Load balancing	100%. Network Load Balancing (NLB) is an optional component of the Windows Server 2008 that allows load balancing the network traffic among multiple servers [59].
Clustering	100%. Windows Server 2008 provides the Failover Clustering service which allows building redundancy through clustering the system [58].
Caching	100%. Windows Server 2008 provides the BranchCache service which allows improving the performance of the HTTP, HTTPS and SMB protocols [60]. In addition, SharePoint 2010 provides a cache for disk-based binary large objects (BLOB). It applies to objects like multimedia files, auxiliary web files (like .css and .jsp files), documents files, etc. It reduces the database load and increases the performance of the user's

browsers [61].	

<div align="center">

AVERAGE: 100%

</div>

10.4.4 Security

SharePoint offers several security features. Some of these features depend on the server which runs the product: Windows Server 2008. A whitepaper of Bamboo Solutions regarding SharePoint security, a company providing additional components for SharePoint, has been very useful to get an overview of the security features of the product although I had to be careful and contrast changes as the paper is based on the 2007 version [62].

Point	Evaluation
Authentication	100%. SharePoint 2010 supports several authentication methods. The technology is logically divided into three layers: the front-end Web server, the application server and the back-end database. Each layer requires an authentication provider. There are three authentication providers [63]: • **Windows:** IIS provide several standard authentication methods (anonymous, basic, encrypted, certificates, NTML and Kerberos). However, using this provider will impede using third-party authentication providers. • **Forms-based authentication:** it provides support for systems which are not based on Windows. Concretely, it allows SharePoint using LDAP, SQL database, other databases and other third-party authentication providers. • **SAML token-based authentication:** this provider allows using the Active Directory Federation Services 2.0, Windows Live ID and other third-party identity providers.
Authorization	100%. It is possible to assign different roles and privileges to users and/or groups of users.
Logon	75%. As has been previously described, SharePoint relies on external components (even if using a default

	Microsoft solution) to manage authentication and store user's passwords. While most of these components will use secure stores and encryptions for these passwords, this cannot be completely assured. If using a third-party authentication provider, we should check how it stores passwords.
Single Sign-On	100%. The Secure Store Service of SharePoint 2010 provides Single Sign-On features. This service is a secure database for storing credentials and application IDs in a secure way. These applications IDs can be used to authorize access to external applications [64].
User management	100%. The management of user accounts in SharePoint 2010 is simple and complete but it has some peculiarities due to its use of external authentication providers. For example, users are not created in SharePoint but in those external providers, and then added to SharePoint zones. In addition, the operation delete in SharePoint 2010 does not actually remove a user account but marks it as deleted [62].
Digital certificates	100%. Features provided by the Windows Server 2008.
Digital signatures	100%. Features provided by the Windows Server 2008.
Public Key Infrastructure (PKI)	100%. Features provided by the Windows Server 2008.
Secure Sockets Layer Protocol (SSL)	100%. Features provided by the Windows Server 2008.
Secure Hypertext Transfer Protocol (HTTPS)	100%. Features provided by the Windows Server 2008.
	AVERAGE: 98%

10.4.5 Standards

In general, the functionalities of SharePoint are not based on the common standards we seen on other portal products. Instead of this, they rely on their own technologies which are not commonly used by other products, as they are proprietary technologies. However, some workout has been done in order to be able to communicate with other portal products through these standards, due to the customers' requirements.

The most visible result of this effort is the WSRP Toolkit for SharePoint 2007 [65]. This toolkit allows using a WSRP producer to expose SharePoint components in other

systems. Furthermore, it contains a WSRP Consumer Web Part which allows consuming JSR 168 portlets in a SharePoint portal. In spite of being designed for the 2007 version, this toolkit is also valid for the last version we evaluate here. In addition, a new version of the toolkit will be probably released soon [66].

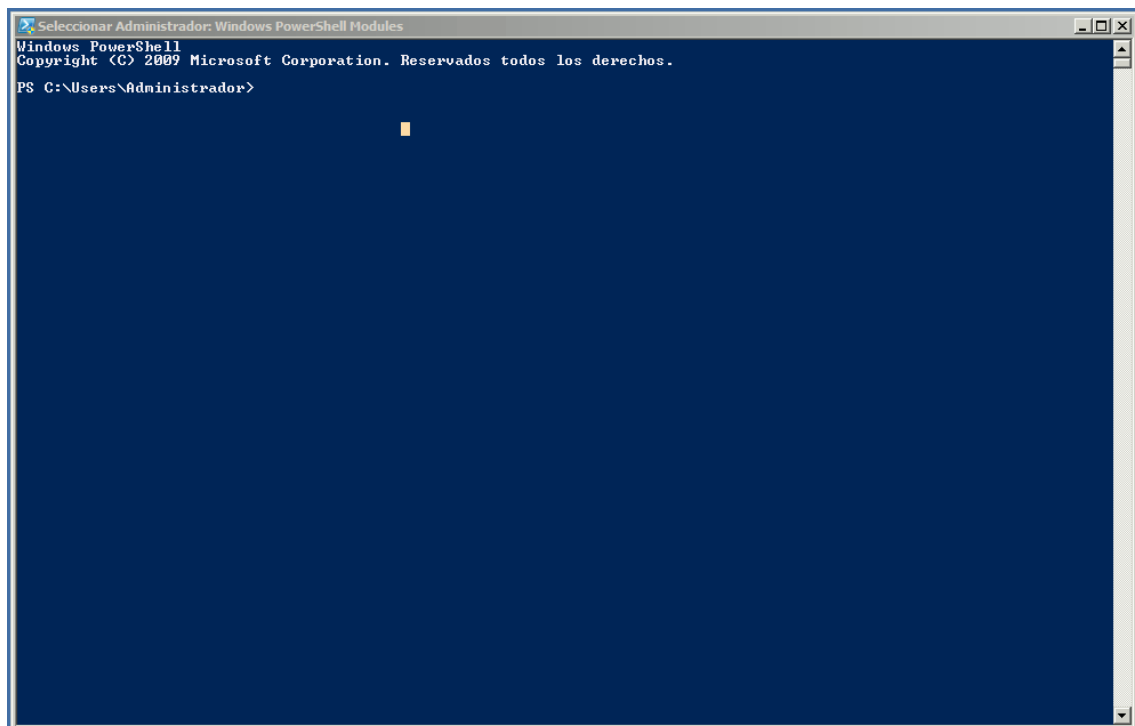| Point	Evaluation
WSRP v1	50%. Support for WSRP v1 is not supported out-of-the-box but can be achieved through the WSRP Toolkit for SharePoint 2010.
WSRP v2	0%. Support for this standard is not supported out-of-the-box neither in the toolkit. Some tweaks should be developed from scratch or third-party products used in order to achieve its usage.
JSR 168	25%. The components of SharePoint are based on Web Parts, the Microsoft technology to represent portlets. However, external JSR 168 portlets can be used through the WSRP Toolkit for SharePoint 2007.
JSR 286	0%. Support for this standard is not supported out-of-the-box neither in the toolkit. Some tweaks should be developed from scratch or third-party products used in order to achieve its usage.
JCR 1.0	0%. Not supported by SharePoint 2010.
AVERAGE: 15%	

10.5 Operations

10.5.1 Administration

In SharePoint 2010, most of the administration tasks are performed through the Central Administration Web Site. It allows managing web applications, site collections, databases, settings of the system, security configuration, backup functionalities and other common administration tasks [67].
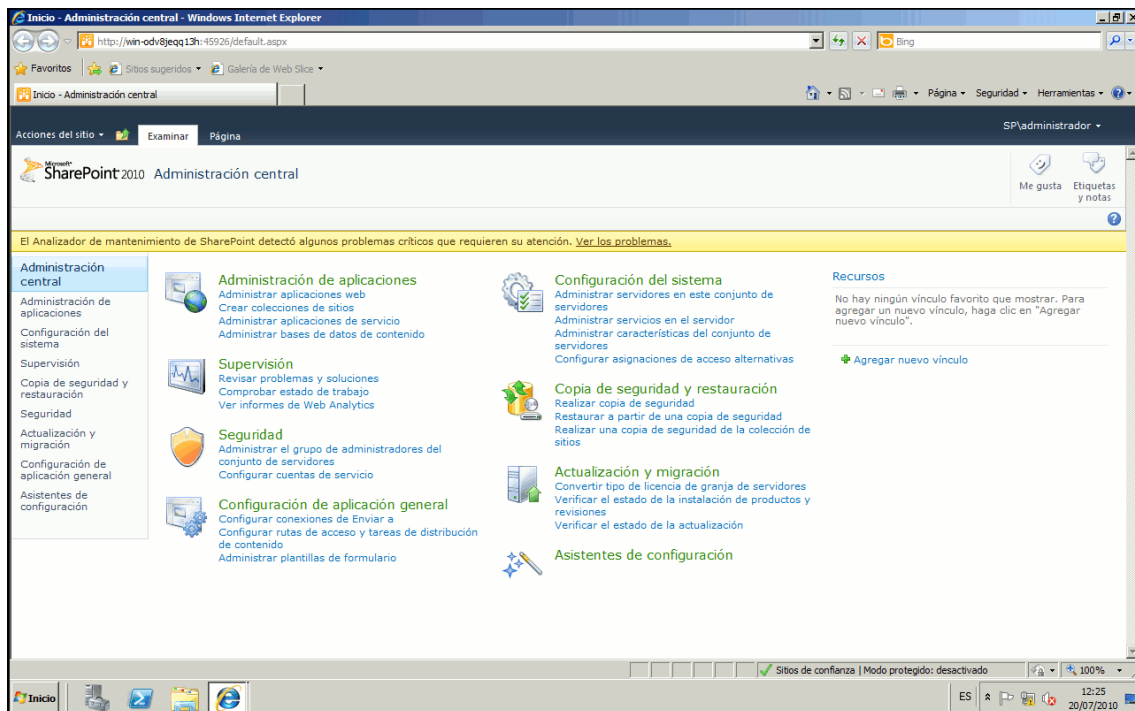
In addition, SharePoint 2010 provides another administration tool: Windows PowerShell. It is a command-line interface and scripting language which allow performing advanced administration tasks. In general, any administration task can be achieved through the Central Administration Website. However, the Windows PowerShell allows performing these tasks with more options and refinements [67].

Point	Evaluation
Configuration	100%. Any administration task can be done through the easy-to-use Central Administration Website. The command-line tool purpose is to provide additional and advanced options for these tasks.
Interface	75%. The Central Administration Website is the tool which would be used nearly always by the administrator. Its browser-based interface is easy to use, configurable and has fine aesthetics. However, the Windows PowerShell tool is less user-friendly and demands hand-written commands to perform advanced tasks.
Community management	100%. The Central Administration Website allows configuring communities.
AVERAGE: 92%	

10.5.2 Ease of upgrade

SharePoint 2010 provides different tools to assist all the stages involved in an upgrade and/or update process. In general, there are two main methods for upgrading SharePoint: in-place and database attach.

In the first one, the new version is installed on the same hardware. Any previously made customization is not lost, but manual operations can be needed to adjust them. The main disadvantages of this method are that the system must be offline while the process is in progress and the process is continuous (administrators must allocate enough time to upgrade everything sequentially).

On the other hand, the database attach method performs the upgrade process in a separate environment. Databases can be upgraded in any order and different databases can be upgraded simultaneously. In general, this produces a faster upgrade process compared to the in-place method. However, server settings and previously made customizations are not updated and they must be redone manually [67] [68].

Point	Evaluation
Upgrade tools	75%. Most upgrade tasks are supported by assistant tools, but not all of them. In general, some manual work is required to keep previously made customizations. The Central Administration Website provides tools for performing the upgrade process as well as for checking the upgrade suitability. In addition, the Windows PowerShell tool offers commands to test possible database issues

	which can arise in the upgrade process and that could be solved before.
Metadata customizations for	75%. SharePoint 2010 provides Managed Metadata Services which allows configuring the metadata used in the system. With the database attach upgrade process the old metadata can be reused although some manual configuration using these services will be need.
AVERAGE: 75%	

10.5.3 Statistics

SharePoint 2010 provides some tools for monitoring the status and the performance of the system [67]:

- **Unified Logging Service (ULS):** It diagnoses and tracks events and issues, creating log files. Administrators can configure the contents which will be written in these logs.

- **Usage and Health Data Collection service:** This service produces logs monitoring the following events: page requests, use of features, usage of search queries, usage of site inventory, timer jobs and rating usage.

- **Developer dashboard:** This tool is capable of tracing every event occurring in the amount of time elapsed since a page is retrieved from the SQL database until it is rendered and displayed in the browser.

- **SharePoint Health Analyzer:** When this tool detects a problem, it automatically displays a message on the home page of the Central Administration Website. Furthermore, if possible it will provide automatic ways to solve related issues.

- **Web Analytics:** This tool allows creating reports and graphs related to the status and usage statistics gathered by the previously mentioned tools or services.

Point	Evaluation
From logs	100%. SharePoint stores several log files which provide information that can be useful to solve issues. Moreover, these logging capabilities can be customized.
Online visits	100%. Provided by the Usage and Health Data Collection service.

Monitoring functions	100%. Provided by the Unified Logging Service, the Usage and Health Data Collection service and the Developer Dashboard..
AVERAGE: 100%	

10.6 Features

10.6.1 Web 2.0

SharePoint 2010 has put a lot of emphasis on providing Web 2.0 features for the enterprise.

Point	Evaluation
Blogs	100%. SharePoint 2010 provides a template for creating blogs.
Wikis	100%. Wikis are one type of page which can be created with SharePoint 2010.
Forums	100%. Discussion Boards can be used in any SharePoint 2010 site. They have all the common features of forums.
Surveys	100%. SharePoint 2010 allows creating and managing surveys in its sites.
Comments	100%. Notes can be posted at any page. This allows authorized users posting notes as comments.
Collaborative environment	100%. SharePoint 2010 provides several features to build a tailor-made collaborative environment like an element to contact users, an element to check the users of a site and their connection status and other similar services.
AVERAGE: 100%	

10.6.2 Sales

SharePoint 2010 is not especially focused on sales capabilities.

Point	Evaluation
Shopping cart	0%. This feature is not provided.
Virtual POS	0%. This feature is not provided.
ERP integration	50%. SharePoint provides natural with the Microsoft Dynamics ERP. Integration with other ERP's is not a straight forward tasks and requires developing custom web parts or using third-party integration suites.

Multicurrency	0%. This feature is not provided.
AVERAGE: 13%	

10.6.3 Multimedia

SharePoint 2010 offers some limited multimedia features, which allows the use of images and videos. However, an external software should be used for proper edition and advanced usage.

Point	Evaluation
Images	50%. It can display images and offer some basic editing features (like applying margins, changing width and height, etc.)
Videos	25%. It treats videos as any other type of file. It does not offer special features for dealing or editing videos.
Video-tours	0%. This feature is not provided.
Podcasts	0%. This feature is not provided.
Videocasts	0%. This feature is not provided.
Photography sites integration	0%. This feature is not provided.
Video sites integration	0%. This feature is not provided.
Publication, management CDN	0%. This feature is not provided.
AVERAGE: 9%	

10.6.4 Content management

SharePoint 2010 has been designed to provide extensive features of enterprise content management.

| Point	Evaluation
Taxonomy	100%. SharePoint can organize the contents of the system through Terms and Managed Terms. It is possible to create groups of terms and structure them hierarchically. This is managed from the Term Store Management Tool [69].
Templates	100%. SharePoint provides several Sites Templates which contain different basic structures of contents for new sites.
Targeted publishing	0%. This feature is not provided.
Metadata	100%. It is possible to associate metadata to contents in order to

	improve their usefulness. Metadata is managed through the Term Store Management Tool, like taxonomy terms [69].
Approval workflow	100%. SharePoint 2010 includes an out-of-the-box workflow which allows configuring an approval process for a given document or content where multiple users can participate with different roles.
Subscriptions / Notifications / Alerts	100%. RSS features allow any user to receive notifications when new content is published or changed. In addition, the system can be configured to send notifications via email when contents change.
Preview	100%. The Live Preview capability allows checking the appearance a site would have while editing it.
External content repositories	100%. SharePoint 2010 provides the option of creating a document repository feed from an external library. It adheres completely to the CMIS standard to enhance its interoperability with external content repositories.
Check-in / Check-out	100%. SharePoint 2010 offers the capability to lock and unlock documents and sites while they are edited.
Document scanning	0%. This feature is not provided.
Document collaboration	100%. SharePoint 2010 allows deactivating the lock of a document in order to allow the edition of a document by multiple users. In addition, the owner and/or administrator of the document can decide to discard the changes done while the document was in this unprotected mode, if necessary. Furthermore, the product integrates naturally with the Microsoft Office suite, allowing the use of their collaboration features (i.e.: review by multiple users feature).
Content security	100%. The rights possessed by a user over all the documents can be associated to its role.
AVERAGE: 83%	

10.6.5 Search engine

The search capabilities have been one of the main improvements of SharePoint 2010 compared to its previous version due to the acquisition of the FAST technology and its integration with SharePoint through the Microsoft FAST Search Server 2010. Let's highlight its main capabilities [40]:

- **Content processing pipeline:** FAST technology allows creating custom search applications where the developer can prepare different stages which process the obtained results. In these stages, we could improve the visibility of the most relevant results; relate results concerning common topics and so on [41].

- **Extraction of metadata:** documents which are not structured are often devoid of metadata. FAST technology is able to automatically extract metadata from unstructured documents.

- **Searching structured data:** it can perform searches on structured data according to dates, numbers, and codes and so on. FQL (FAST Query Language) is provided in order to provide developers with the ability to prepare very sophisticated queries.

- **Faceted search:** delivers faceted search options across the obtained results, allowing a better refinement of those results.
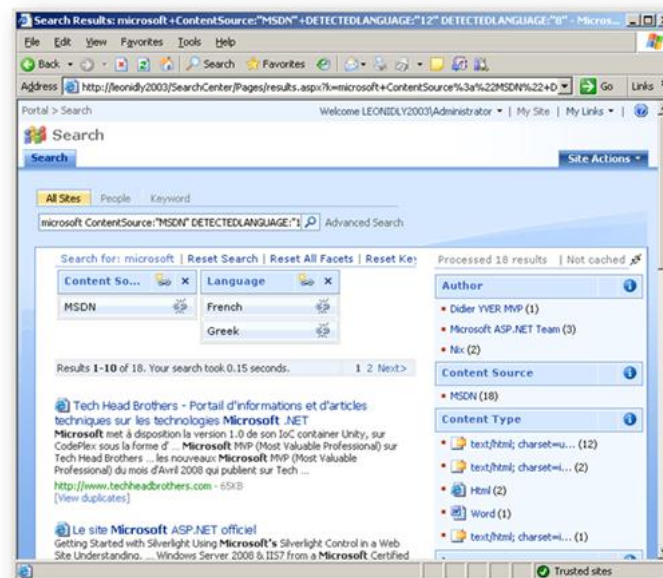
- **Visual search:** it is possible to preview a document which appears in the set of results, allowing users judge quicker if a result is relevant for them or not. This includes a feature which allows previewing a PowerPoint presentation to try to find quickly a concrete slide.

- **Advanced linguistics:** FAST technology includes advance language processing techniques to improve the search process in function of the language being used.

- **Best bets:** they are keyword terms which can be defined by an administrator in order to enhance search results. When a user performs a query which includes the keyword, the configured Best Bets results are displayed prominently in the results page.

- **Development platform:** it is possible to extend and/or customize the search capabilities through SharePoint Designer. It allows re-configuring the out-of-the-box search behaviour as well as the control of the user's interface.

Note that the search engine capabilities of SharePoint differ in function of the edition of the product. The Foundation edition provides only basic search features and does not include the FAST technology. The Standard edition provides more search capabilities but still does not include FAST technology. The best search capabilities are obtained when using the Enterprise edition and the FAST technology.

Point	Evaluation
Boolean-based searches	100%. Query syntax can be used in the search engine in any SharePoint edition, which allows writing Boolean queries.
Indexing	100%. Indexing features are included in the search engine in any SharePoint edition. However, FAST technology provides a much more powerful indexing capability, getting the results in a very few time. This feature can be especially interesting in sites which have a huge amount of contents to be searched.
Saved searches	0%. This feature is not provided.
Keyword search	100%. This is the main method used by the search engine of any SharePoint's edition to perform its process.
Full-text searches	75%. The search engine included in the Standard and Enterprise edition as well as the one provided by the FAST technology is able to search inside documents if they belong to some Microsoft format. However, some tweaks or custom developments must be made in order to be able to perform these searches in other format (for example, the commonly used PDF) [70].
Internet / Web searches	0%. This feature is not provided.
Natural-language search	0%. This feature is not provided.
Results ranking	100%. All the editions of the product sort the obtained results according to its relevance. The FAST technology provides a more accurate ranking method.

AVERAGE: 59%

10.6.6 Social networking

SharePoint 2010 has put a lot of emphasis on providing social networking features for the enterprise.

Point	Evaluation
Communities	100%. SharePoint's Team Sites allows organizing professional teams and brings a common work space to share their documents and contents and communication tools.
Microblogging	0%. SharePoint does not include microblogging features yet. However, Microsoft is performing some research in this field and has got OfficeTalk, an enterprise microblogging tool which would be possibly integrated in SharePoint in the future. At this moment, they are just testing it internally [71].
News promotion	0%. This feature is not provided.
Send to a friend	0%. This feature is not provided.
	AVERAGE: 25%

10.6.7 Geolocation

Currently, SharePoint does not provide out-of-the-box geolocation features.

Point	Evaluation
From IP	0%. This feature is not provided.
From GPS	0%. This feature is not provided.
From coordinates	0%. This feature is not provided.
From address	0%. This feature is not provided.
AVERAGE: 0%	

10.6.8 Users

In this section I evaluate the features of SharePoint 2010 regarding management of users.

Point	Evaluation
Users registration	0%. There is not an out-of-the-box feature allowing users' self-registration. The creation of new accounts of users must be done entirely by administrators. This can produce a bottleneck in large organizations. Some organizations have solved it adopting third party solutions, but it is not provided out-of-the-box by SharePoint [72].
Users information	100%. Users have their own profile which can store a lot of relevant information: their position in the organization chart of the company, recent activities, his shared documents, personal information, etc. In addition, any user can configure the information he wants to show to other users.
Access by role/user	0%. For each page, it is possible to distinguish between three types of users: visitors, members and owners. However, this distinction must be configured manually for each page, and does not take into account automatically the role of the user in the organization to display information fitted for him. It is more about administrating rights (view, edit or total control) than displaying the information more relevant to a certain type of user.
Personalization	100%. Every user has the option of personalizing any page he can see, adding new designs, components, changing its style, etc. The resulting page will be his personal view and will not affect the way others users will see the same page.
AVERAGE: 50%	

10.6.9 Multilanguage

SharePoint 2010 has been designed taking into account international scenarios, where the users of the system do not always speak the same language. Currently, Microsoft has published language packs for the following languages: Arabic, Chinese (simplified), Chinese (traditional), Czech, Danish, Dutch, English, Finnish, French, German, Hebrew, Hindi, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese (Brazil), Portuguese (Portugal), Russian, Spanish, Swedish, Thai and Ukrainian [73]. Furthermore, there are plans to release the following language packs in the future: Basque, Bulgarian, Catalan, Croatian, Estonian, Galician, Greek, Kazakh, Latvian, Lithuanian, Romanian, Serbian, Slovak, Slovenian and Turkish [74].

Point	Evaluation
Multilanguage support	100%. For SharePoint 2010, Microsoft has created the Multilingual User Interface (MUI). This tool can be applied to any type of site. It allows users selecting their language and viewing the following contents translated: site title, site description, out-of-the-box menus, actions and columns, navigation bar links and the managed metadata services. It requires the installation of the corresponding language packs [75]. In addition, there is a mechanism to allow writing different versions of a given content suited to different languages: Variations. This feature allows making content available in different languages [76] [77] .
Translation flow	100%. In SharePoint 2010, it is possible to create a Translation Management Library. This library allows organizing multiple language versions of documents. It provides file versioning and check-in/check-out capabilities. Moreover, it also provides a Translation Management Workflow which allows creating copies of the documents to be translated and assigning the corresponding tasks to the different translators [78].
AVERAGE: 100%	

10.6.10   Communication

SharePoint provides different communication tools. However, its out-of-the-box communication tools are not very powerful. The product has been designed to be easily integrated with another product when strong communication features are required:

Microsoft Office Communications Server. It is an enterprise real-time communications server which provides services like instant messaging, chat, presence, file transfer, videoconference, VoIP and so on. But it is a different product which needs an additional significant investment [79].

Point	Evaluation
Videoconference	0%. SharePoint does not provide this feature. Microsoft Office Communications Server must be installed to get it.
VoIP	0%. This feature is not provided. Microsoft Office Communications Server must be installed to get it.
Mail	100%. SharePoint is designed to be integrated seamlessly with Microsoft Exchange. However, the integration with other email system can also be easily configured.
Instant messaging	0%. SharePoint does not provide an out-of-the-box instant messaging system. Microsoft Office Communications Server must be installed to get it.
Chat	0%. SharePoint does not provide an out-of-the-box chat system. Microsoft Office Communications Server must be installed to get it.
AVERAGE: 20%	

10.6.11   Advertisement

Currently, SharePoint does not provide advertisement management features.

Point	Evaluation
Third party adverts	0%. This feature is not provided.
Segmentation by navigation	0%. This feature is not provided.
Banners	0%. This feature is not provided.
Adverts in videos	0%. This feature is not provided.
Advertisement control and management	0%. This feature is not provided.
AVERAGE: 0%	

10.7 Presentation

10.7.1 Multichannel

The following table summarizes the multichannel capabilities of SharePoint.

Point	Evaluation
Multibrowser	50%. SharePoint works better when using Internet Explorer 7 and 8. The following browsers can be used too, but with reported limitations: Firefox 3.6 and Safari 4.04. In addition, Internet Explorer 6 is not supported [80].
Mobile devices	100%. It is possible to configure a SharePoint 2010 system to be rendered in mobile devices. In such a mode, some changes are made in order to provide a good mobile experience: use of a more lightweight interface, web complements for Office components (like Word, Excel, Access, etc.), Mobile MySite and so on [81].
RSS	100%. Most components can be configured to provide their contents via RSS. In addition, it is possible to add contents from external RSS feeds to a SharePoint site.
API's	100%. SharePoint includes a Mobile SDK (Software Development Kit) which provides components and API's that can be used to customize a mobile solution.
Offline access	100%. The component SharePoint Workspace 2010 provides offline access to the system. This component allows working on documents and contents even if the SharePoint site is offline. Later, it manages automatically the synchronization of online and offline work. Updates are sent immediately when an offline client comes back online [82].
Emails sending	100%. The system can be configured to send automatic emails notifying changes and additions of contents, news and similar contents.
SMS sending	100%. The system can be configured to send automatic SMS notifying changes and additions of contents, news and similar contents.
Office automation	100%. SharePoint is seamlessly integrated with Microsoft Office. In addition, the component SharePoint Workspace 2010 allows working with most desktop applications and synchronizing its work with the SharePoint site [82].
AVERAGE: 94%	

10.7.2 Help

The following table summarizes the methods used by SharePoint to provide help and assistance to its users.

Point	Evaluation
General help	100%. SharePoint provides a general help library for all its parts (Central Administration, Sites, Designer, etc.). It provides complete and extensive information about any aspect of the product. In addition, it allows extending and customizing the default help contents [83].
Context-sensitive help	100%. When applicable, SharePoint provides context-sensitive help. Generally, the method used is providing information when navigating with the mouse over a certain button or component.
Interactive help	0%. There is not any natural language assistance for requests or queries from users.
Static validations	0%. SharePoint does not provide any validation mechanism.
Dynamic validations	0%. SharePoint does not provide any validation mechanism.
AVERAGE: 33%	

10.8 Issues

10.8.1 General

After having evaluated SharePoint, we consider that the product presents the following general issues:

- **Hardware requirements:** SharePoint 2010 requires 64-bit quad core processors, large amounts of RAM memory and hard drive space, as described in the section 10.1.3. Most hardware systems containing the previous SharePoint version will be insufficient to run SharePoint 2010. It will demand additional investment tailored to the new product. In addition, the required hardware cost is not going to be negligible. This can be a real barrier for small businesses which have traditionally adopted SharePoint as their Intranet solution.

- **Performance on large systems:** SharePoint has not been deployed widely in high-traffic scenarios. Furthermore, some performance issues have been reported in the past for the previous versions of the product. The performance of the very recent 2010 version in these high-volume scenarios is still unknown [12] [84] [85].

- **Complex price calculation:** Getting the exact cost for a SharePoint deployment seems to be a quite obscure matter. There are many possible configurations and an organization will be probably unable to perform their own estimations when evaluating the adoption of this technology.

- **Reported support issues:** Large organizations have reported that Microsoft's support for their complex SharePoint systems is sometimes problematic. Documentation and technical support do not always cover properly and quickly issues for these large scenarios. However, Microsoft has admitted this fact and is trying to solve it (creating a Customer Advisory Team for large customers, for example) [12].

10.8.2 Practical

After having used the product, no practical issues have been found.

11 Comparison of products

After having evaluated the three products, we will analyse the obtained results comparing the categories of the evaluation model. In order to perform this process, we will compare the results of the functional groups. Then, we will present a global comparison. Finally, we will present the conclusions of this comparison process.
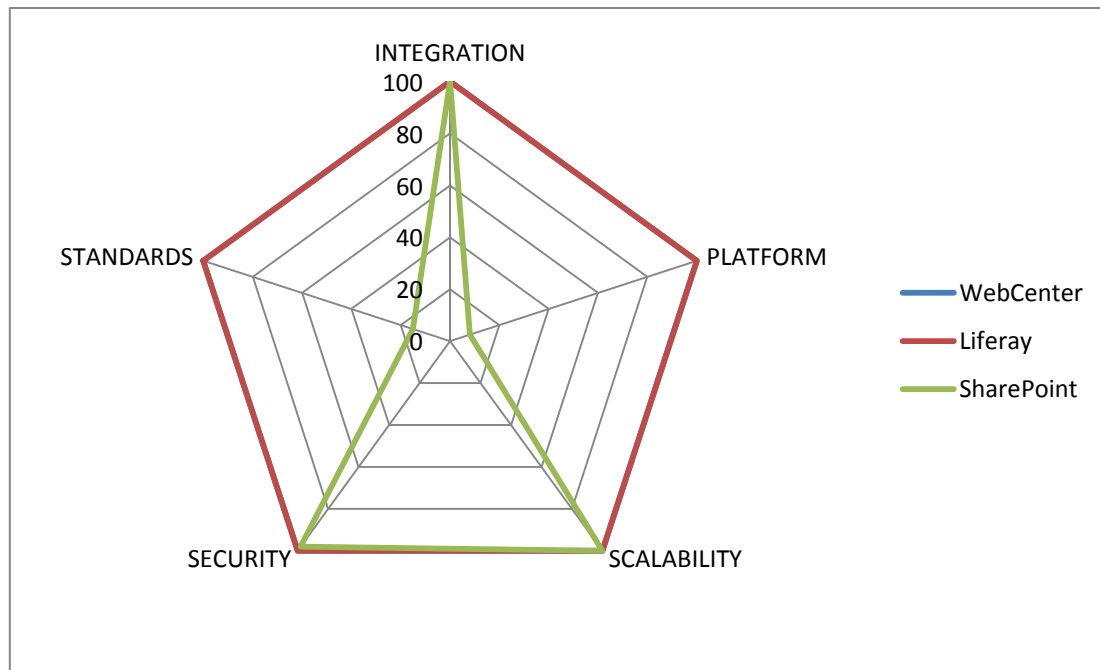
11.1 Infrastructure comparison

The following table displays the evaluation results for each functional group of the Infrastructure's category.

Group	WebCenter	Liferay	SharePoint
Integration	100%	100%	100%
Platform	100%	100%	8%
Scalability	100%	100%	100%
Security	100%	100%	98%
Standards	100%	100%	15%

The following graphs illustrate these results.
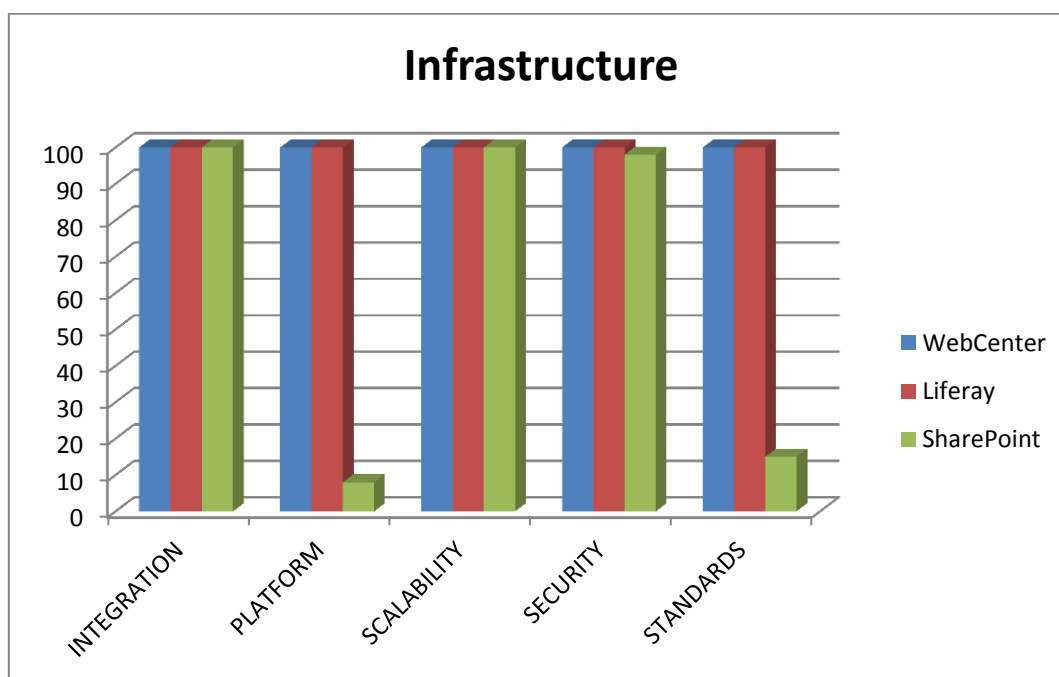
The bar graph shows how WebCenter and Liferay get the maximum value in their evaluation for all the groups of the Infrastructure category. In addition, SharePoint also gets the maximum value in its evaluation for the Integration and Scalability groups. However, the bar graph also shows that SharePoint got a slightly inferior evaluation value in the Security group (due to its frequent dependence of third party solutions for managing user accounts, as explained in the section 10.4.4).

The bar graph and especially the radial graph shows the poor evaluation results obtained by SharePoint in the Platform and Standards groups. A SharePoint deployment has to be deployed in a very concrete Microsoft platform, not being compatible with some other common ones. In addition, the product uses its own portal standards and do not adhere to other common ones (although with some work around is possible to achieve some results). See the sections 10.4.2 and 10.4.5 for a more detailed description.

11.2 Operations comparison

The following table displays the evaluation results for each functional group of the Operations category.

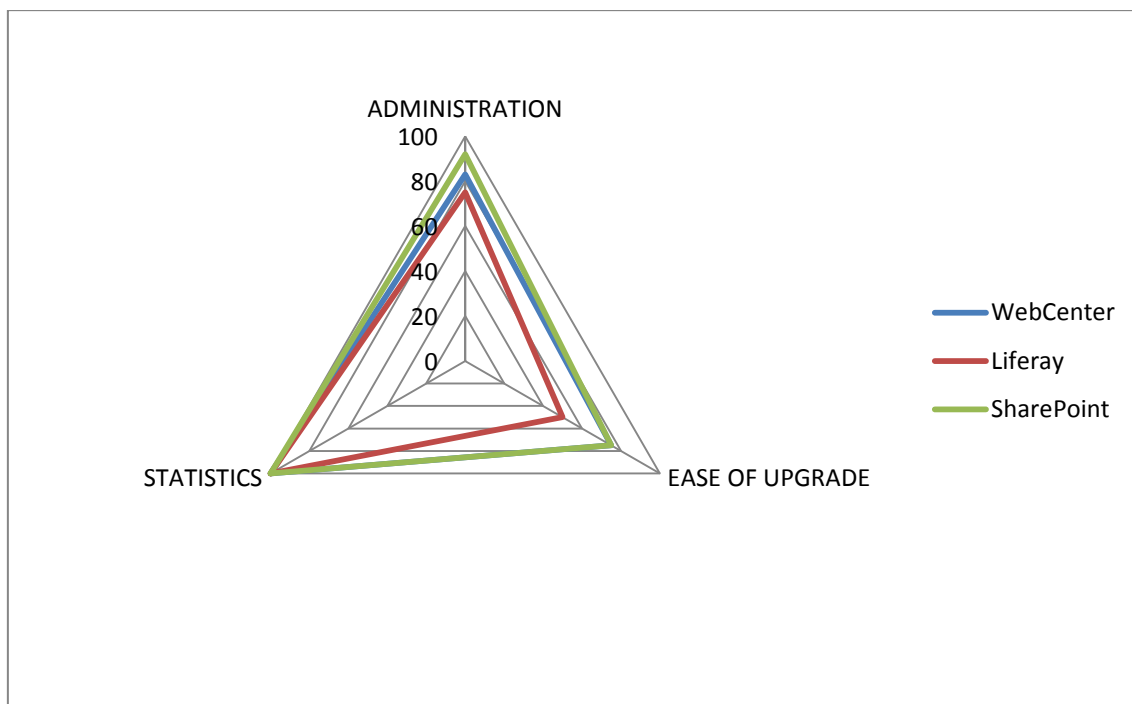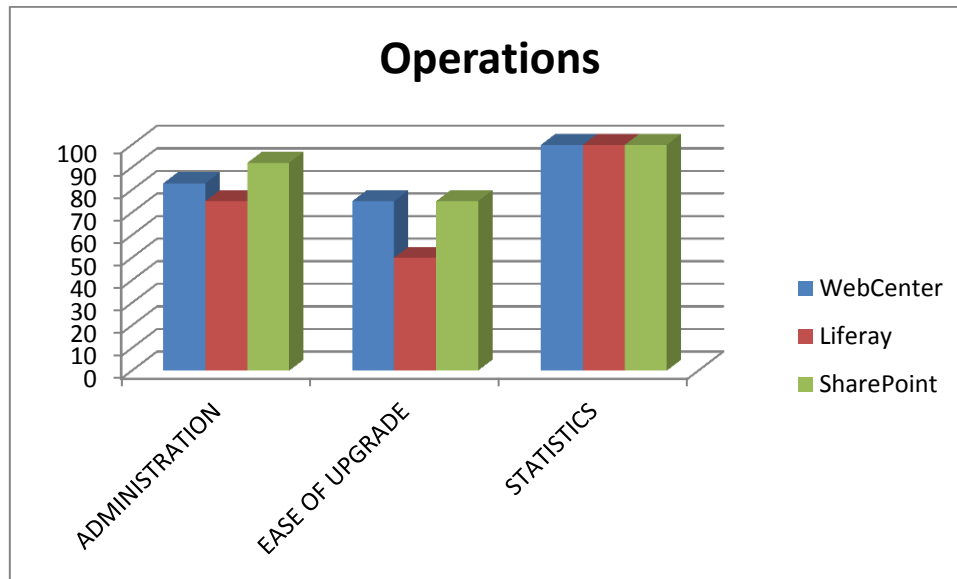| Group	WebCenter	Liferay	SharePoint
Administration	83%	75%	92%
Ease of upgrade	75%	50%	75%

| Statistics | 100% | 100% | 100% |

The following graphs illustrate these results.

The graphs show that all the products include powerful monitoring and reporting tools and obtained the maximum results in the Statistics group. Furthermore, they also show clearly that upgrading a Liferay deployment is a considerable more complex task than performing the same process in WebCenter or SharePoint, due to its lack of assisting tools and the need of adapting manually some custom components developed in previous versions (see the section 9.5.2).

The radial graph is especially useful to see that all products performed well in the Administration group. However, SharePoint seems to provide the best experience in this field, while Liferay got the lowest mark (but without a considerable difference).

11.3 Features comparison

The following table displays the evaluation results for each functional group of the Features category.

Group	WebCenter	Liferay	SharePoint
Web 2.0	71%	100%	100%
Sales	19%	81%	13%
Multimedia	9%	6%	9%
Content management	71%	79%	83%
Search engine	25%	13%	59%
Social networking	50%	25%	25%
Geolocation	0%	0%	0%
Users	100%	81%	50%
Multilanguage	25%	38%	100%
Communication	60%	60%	20%
Advertisement	0%	0%	0%

The following graphs illustrate these results.
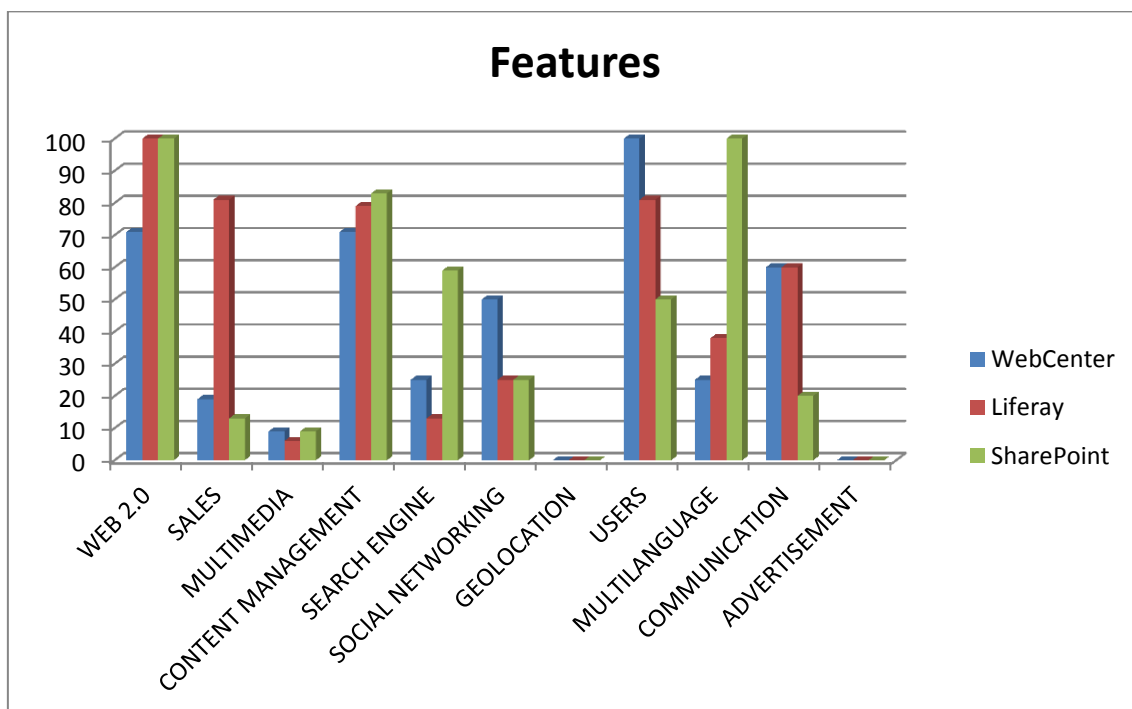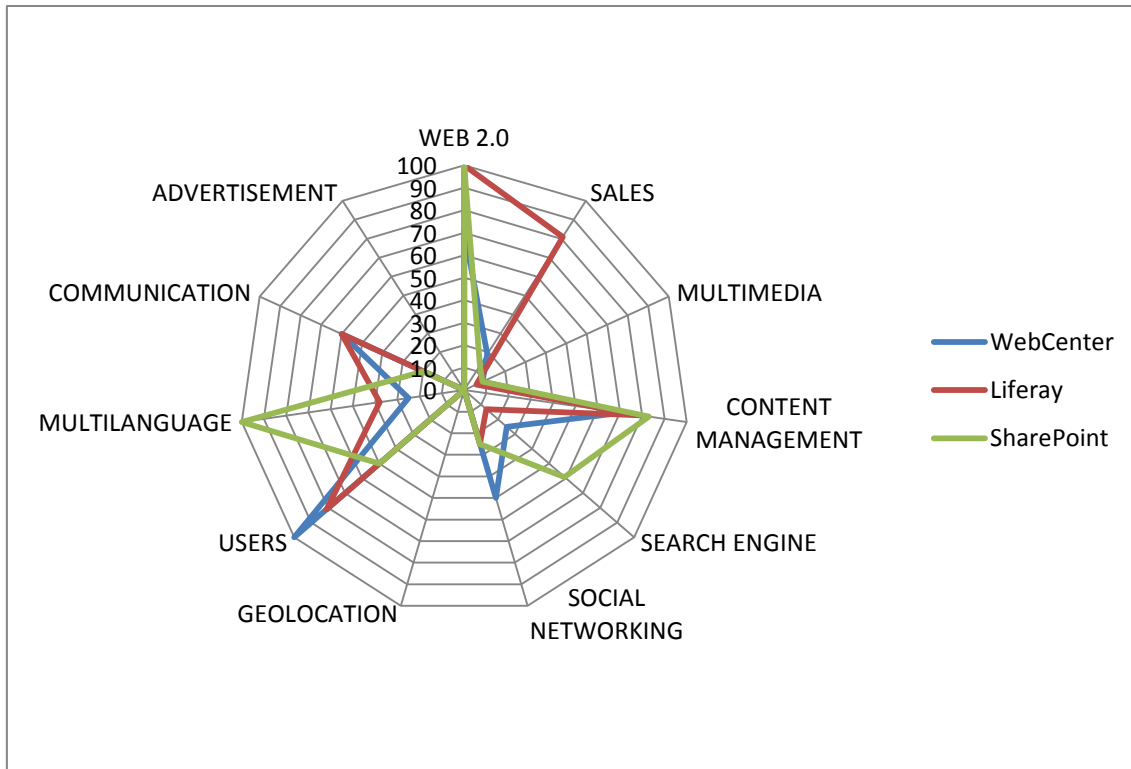
The irregular shapes obtained in the radial graph shows that the results obtained by the three evaluated products were very heterogeneous. According to these results, it seems that there is not a product which is superior to the other ones in all features.

In both graphs we can appreciate the fact that no product covered Geolocation and Advertisement features at all. Third party complements and add-ons would need to be used to provide these features.

Similarly, all products obtained poor results regarding their Multimedia features. It seems natural than the scope of these products should not be providing edition and creation features for multimedia assets. There are some professional software suites that have an excellent performance in this field. However, many improvements should be expected in the future regarding video, audio and their seamless integration with other contents.

All the products obtained very good results regarding Web 2.0 features. However, Liferay and SharePoint had excellent results. Probably, the reason is that these products have been in the market for many years and currently are able to provide more out-of-the-box Web 2.0 complements than the very recent WebCenter. However, the Oracle's product showed a lot of potential.

Both graphs show how all products obtained similar evaluation results regarding their content management features.

The bar graph shows that Liferay stands out in the Sales feature. All products have some type of ability to integrate with ERP products. But, in addition, Liferay offers out-of-the-box components which allow building quickly a virtual shop, including many useful configuration options (like multicurrency). See the section 9.6.2 for more details.

The graphs also highlight the features where WebCenter stands out: Social networking and Users. WebCenter allows a high level of user personalization and organize them in communities which can interact between them. See the section 8.6.6 for more details.

SharePoint stands out in two features: Search engine and Multilanguage. The adoption of FAST Search technology and the out-of-the-box workflows and sites for managing translations are behind these positive results. See sections 10.6.5 and 10.6.9 for more detailed descriptions.

On the other hand, SharePoint gets the worst results regarding Communication features. The main cause is the lack of out-of-the-box components for chats and instant messaging systems. The strategy of Microsoft is to provide communication features through the integration with Office Communications Server (a different product which requires an additional considerable investment and increased complexity). See the section 10.6.10 for more details.

11.4 Presentation comparison

The following table displays the evaluation results for each functional group of the Presentation category.

Group	WebCenter	Liferay	SharePoint
Multichannel	53%	75%	94%
Help	33%	8%	33%

And the following picture shows that results graphically.
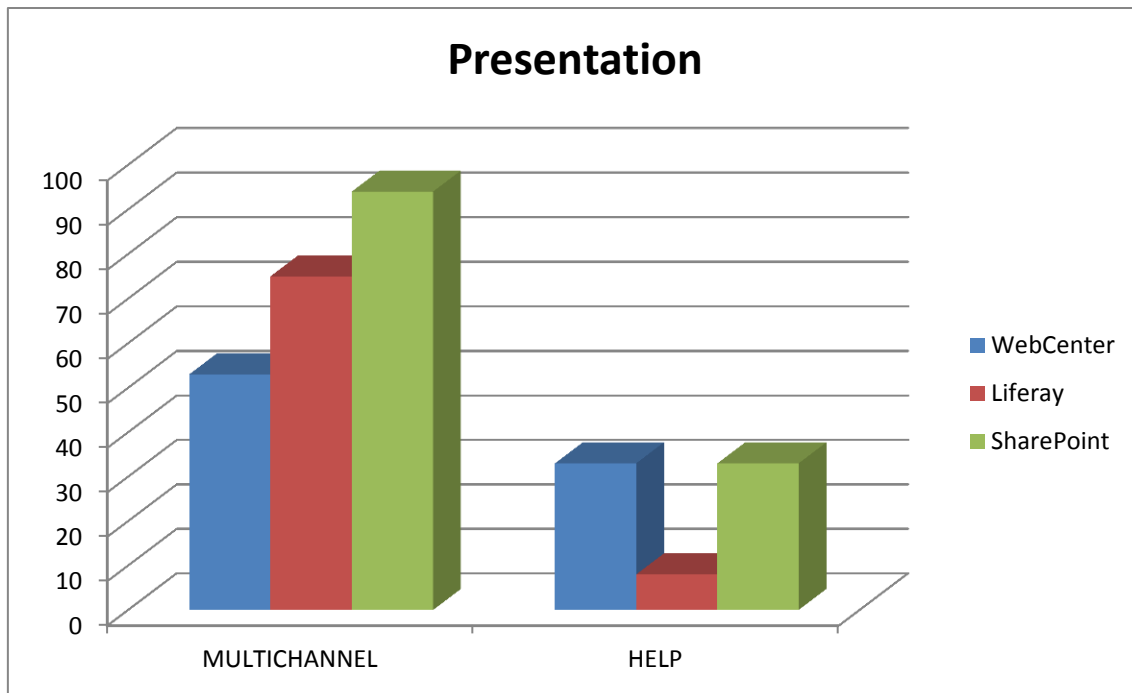
All products obtained good or excellent results regarding its Multichannel capabilities. All have good support for mobile devices and RSS. The graph shows that SharePoint, in spite of its Internet Explorer browser dependence, is the product which has obtained the best results in this field.

Liferay has obtained the worst results concerning the Help group. This is easy to understand because I tested a very recent and beta version. It is an Open Source product, and the community behind it will expand its support and documentation. It is pretty sure than better documentation and help will be accessible in the future.

11.5 Global comparison

The following table shows the global results obtained for each category.

Category	WebCenter	Liferay	SharePoint
Infrastructure	100%	100%	64%
Operations	86%	75%	89%
Features	39%	44%	42%
Presentation	43%	42%	64%

And the following pictures show that results graphically.

Global comparison
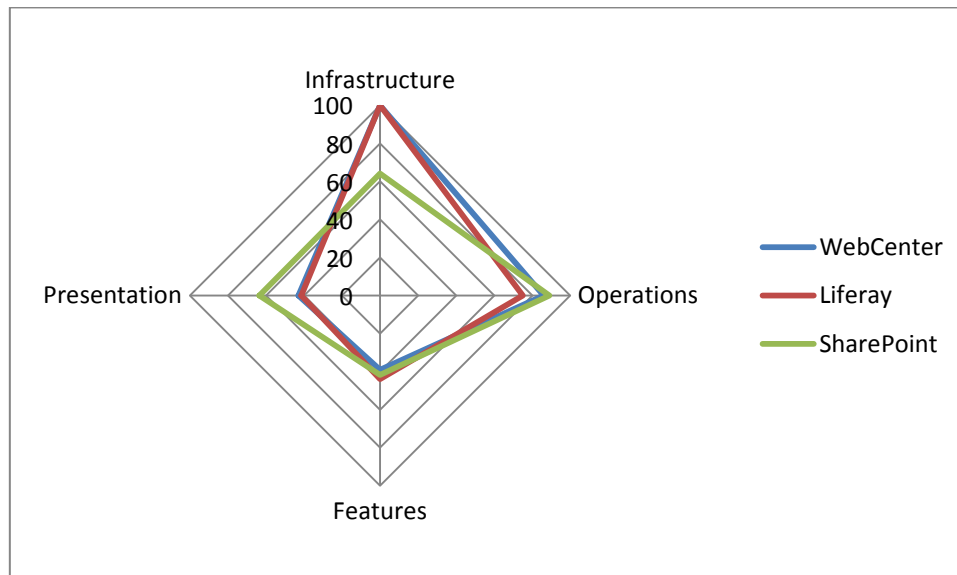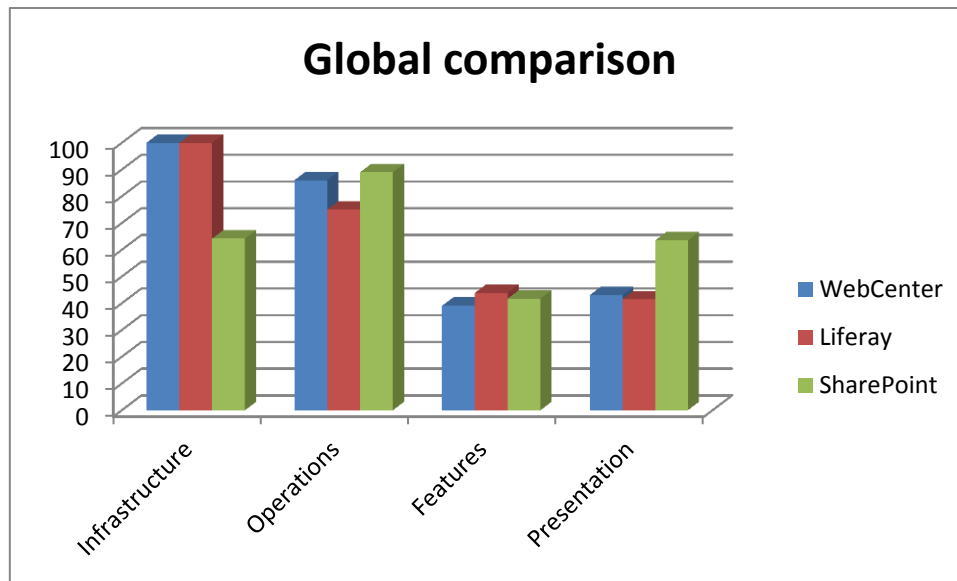
These graphs show that no product is clearly superior to the other ones in all aspects. Both graphs show how SharePoint is superior regarding the Presentation category evaluation, but it obtained results lower than WebCenter and Liferay in the Infrastructure category.

Note that one could get the impression that the three products provides similar performance and options regarding Features. This is not true at all. As I described in the section 11.3, the three products got considerable different in the evaluation of the different functional groups of this category. However, similar results have appeared when averaging these functional groups.

11.6 Conclusions of the comparison

One of the conclusions we can extract after having performed this evaluation process is that building the Intranet theoretical model developed in the chapter 3 is impossible with any one of these three technologies, unless you use complementary add-ons.

On the other hand, I have been pleasantly surprised with the capabilities of these products regarding infrastructure and hardware compatibility. As portal products, they have been designed bearing interoperability in mind. So, the necessary integration with other complementary technologies to build the theoretical model is very feasible and nearly unlimited.

SharePoint is an exception because their support and hardware compatibility is much more limited. However, it is more a Microsoft's strategy than a real limitation of the product. An organization wanting to deploy a portal using SharePoint must use Microsoft technology for the platform. Furthermore, they can obtain more business value through the integration of other Microsoft products or SharePoint's partners. This integration is easy and natural. However, integrating technologies from other vendors not related with Microsoft can become a real nightmare and requires a lot of work to adapt to SharePoint.

In contrast, WebCenter and Liferay strategy is to provide extensive interoperability capabilities. They support several platforms and ways to integrate very heterogeneous technologies. My personal opinion is that they are very impressive frameworks which can be the foundation for developing portals with heterogeneous requirements. However, it will nearly always necessary to make custom development, customizations and extensions of the products to cover these requirements in a satisfactory way. They are prepared to assume and assist this task. In spite of providing some out-of-the-box solutions (WebCenter Spaces and Liferay Social Office) that speed up deployment times, I think they are too rigid and are only adequate for very concrete and small scenarios.

So, my final conclusion would be to use SharePoint in small or medium size scenarios. It will get quick deployments and a range of easy to plug complements can be added (but with an additional and negligible cost).

On the other hand, I think Liferay is currently the best solution for large scenarios. However, it will require a lot of time for customizing and extending the product to fit the concrete requirements of a given scenario. In addition, Liferay would be also the best solution for organizations which need a simple and small portal and have important budget restrictions.

Finally, I feel that WebCenter has a lot of potential to become the best framework to build any type of portal. However, I think it has serious drawbacks that advise against using it for enterprise large scenarios: it is too recent and has to enhance some of its basic features yet and it has a prohibitive cost. I think that it is a technology that we should not lose sight as it can become a key product in a not so far future but it is not mature enough yet.

12 Conclusions and future work

This chapter provides the general conclusions related to the whole project and analyses and propose some additions and tasks which could be done in the future.

12.1 Conclusions

Firstly, I would value the business scenario where I developed the process: Everis. It is my second final project because I developed the final project of the Computer Software Diploma. So, I can compare the execution of a homemade project to the execution of a project in business scenario.

Personally, I really prefer the experience of developing the project inside a business scenario. You have the opportunity of observing other professional working on large challenging projects. This allows you observing their daily work and their attitudes. In my opinion, it is a very good method to perform the transition from university to the business world. The project is an intermediate stage.

Regarding the contents of the project, it has been very interesting to have the opportunity to test products which had a high cost and are not easy to access out of a business environment. These products are not used in the university while they are really important in business scenarios. Having the option of using them in the master's project adds value to my professional experience.

I found very interesting the main topic of the project: enterprise intranets. I think that currently the concept is evolving and experiencing several changes. Intranets focus has been changing from content to people, analogously to Internet. The technologies in charge of implementing those systems must face challenging changes.

Finally, I think that it has been a project which has required the use of many capabilities obtained in the Master's course because it had a broad scope and dealt with different fields, having to analyse different platforms, requirements, features, etc.

It has been a project somewhat different to other projects and works that I had done in the past. It was focused on analysis and research and has not required a lot of programming tasks.

I think it has been a very productive period of time, where I have dedicated much effort and dedication. The project has challenged me to show my best capabilities as engineer and allowed me learning and improving different skills. Analogously, I hope Everis found my task and project useful and business valuable.

12.2 Future work

Firstly, we could extend the comparison process with more products. We have chosen three very relevant technologies, but there are other vendors which have different proposals which could offer different and valid points of view. The IBM's product, WebSphere Portal, would be a natural choice for its current level of adoption in the business world. Furthermore, the Open Text Vignette portal would be another very interesting addition for their content management capabilities.

Another possible enhancement would be expanding the evaluation model to test more features. The delimited model described in the chapter 5 could be expanded to test more features in a practical way.

On the other hand, testing the software and related technologies which complements the main products would probably provide relevant information. As I described in the section 11.6, these products rely strongly in third party and complementary technologies to offer additional functionality.

In this project, the focus has been put on building a very wide and generalist theoretical model which would be ideal for an enterprise scenario. In contrast, another possible improvement would be designing different models for more concrete scenarios, and testing the products on them. For example, we could design scenarios for organizations who deal with emergencies, large international enterprises, organizations dealing with high confidentiality requirements, etc.

13 Glossary

B2B (Business to Business): Refers to one business communicating or selling to another [87].

B2C (Business to Consumer): Refers to a business communicating with or selling to an individual rather than a company [88] .

CDN (Content Distribution Network): A system of distribution on the Internet that enhances the delivery of Web pages, audio, video and other Internet-based content to different users around the world. Most CDNs are third-party services but large companies may develop their own enterprise CDN [89].

ECM (Enterprise Content Management): It refers to the management of unstructured information in an organization. ECM technologies can be applied to traditional content like Office documents or printed graphics but also to Web pages, e-mail and rich media [90].

ERP (Enterprise Resource Planning): An integrated information system which provide service to all departments within an enterprise. ERP modules may connect with other software of the organization with different degrees of effort and sometimes the ERP modules can be customizable through specific tools or standard programming languages. It can include software for manufacturing, order entry, accounts receivable and payable, general ledger, purchasing, warehousing, transportation and human resources, among others [91].

Metadata: Data that describes other data. It may refer to detailed compilations like dictionaries of data and repositories which provide a considerable amount of information about each data element. It can also refer to descriptive items like a title, a group of key words or tags for a Web page [92].

Portal: A Web site which provides different heterogeneous services like Web search, news, blogs, discussion groups, shopping options, links, access to other software, etc. [93]

Portlet: A component of a portal page providing a concrete service and functionality to the user. Portlet technology allows a portal page to be customized either internally by a development team or by its end user [94].

POS (Point Of Sale): Refers to the location where a sale is performed and related data can be captured. Physical point of sale systems can use computers or specialized terminals for capturing relevant information about the transaction. A virtual point of sale performs the same function but in a Web environment [95].

ROI (Return On Investment): Refers to the monetary benefits that are derived from having spent money on developing or revising a given system. The intangibles are sometimes the most important benefits but they are also the most difficult to quantify, usually [96].

RSS (Really Simple Syndication): A format for syndication that is very popular for aggregating updates to blogs and sites. Lets users view this information within their RSS reader. The process of developing feeds is automated and many publishing applications offer automatic feed creation [97].

SOA (Service Oriented Architecture): It is the modularization of business functions for getting better flexibility and reusability. SOA organizes business software in a way that common function can be used interchangeably by different departments and partners. The more granular the components, the more they can be reused [98].

Taxonomy: Refers to the categorization of contents. These categories can be organized in a hierarchical structure [99].

VoIP (Voice over IP): It is a digital telephone service that uses Internet for transporting calls. In addition, support for the public telephone network can be provided, too [100].

Workflow: It is the study of the operational aspects of a business process: how to organize its tasks, how to perform them, its order, synchronization and flow. Workflow is concerned with providing the information required to support each step of the business process [101].

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