

FONTYS VENLO HOGESCHOOL  
TECHNIEK EN LOGISTIEK

BACHELOR THESIS

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**Which Enterprise Portal  
Is the Best Fit for the Company?**

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*In fulfilment of the requirements for the degree of  
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## Information Page

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## Declaration of Authorship

I, Pranushan ELANGANATHAN, declare that this thesis titled, "Which Enterprise Portal Is the Best Fit For the Company?" and the work presented in it are my own. I confirm that:

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- Where I have consulted the published work of others, this is always clearly attributed.
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- I have acknowledged all main sources of help.
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## *Abstract*

The aim of the thesis is to provide a recommendation for the IT department of DocMorris N.V. The purpose of the recommendation is to find the most suitable enterprise portal solution for the company. The project started on 6 February 2017 and will last until 7 August 2017. First, the current situation is analysed. The current portal solution used by the company is Liferay Portal 7.0. However, the current implementation offers few possibilities, which leads to dissatisfaction among employees. Therefore, requirements were identified and weighted by the involved stakeholders. Research on the full enterprise portal market analysis was then performed. Methods such as Gartner's Magic Quadrant were taken into account to select leaders for the enterprise portal solution. Three portal solutions were thus preselected for the further steps among the leaders. These are Liferay Portal 7.0, IBM WebSphere Portal 9.0 and Microsoft SharePoint 2016. Afterwards, for the three selected portal solutions, vendors were contacted to determine the feasibility of the requirements. Meanwhile, new collaboration processes were designed in BPMN 2.0 for the two departments which are currently using the portal solution. The contacted vendor for IBM WebSphere Portal has recommended to have a look on IBM Connections 6.0 which is a pure collaboration tool from IBM. Conclusions were then drawn from the answers of the vendors where the focus is on the functionalities of the portal solutions delivered as defaults. Finally, one portal solution was selected which is the most suitable software for the company. IBM Connections 6.0 is the recommended portal solution for the company.



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# Contents

<b>Declaration of Authorship</b>	<b>v</b>
<b>Abstract</b>	<b>vii</b>
<b>Acknowledgements</b>	<b>ix</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Background Information . . . . .	1
1.1.1 Company Description . . . . .	1
1.1.2 Current Situation . . . . .	1
1.1.3 Graduation Thesis . . . . .	2
1.2 Project Information . . . . .	2
1.2.1 Problem Outline . . . . .	2
1.2.2 Expected Results . . . . .	2
1.2.3 Assignment Description . . . . .	2
1.2.4 Project Boundaries . . . . .	3
In Scope . . . . .	3
Might Be In Scope . . . . .	3
Out Of Scope . . . . .	3
1.2.5 Project Phases . . . . .	4
<b>2 Analysis</b>	<b>5</b>
2.1 Stakeholder Register . . . . .	5
2.2 Risk Analysis . . . . .	6
2.3 Current Situation Analysis . . . . .	6
2.3.1 Advantages Of The Current Portal . . . . .	6
2.3.2 Disadvantages Of The Current Portal . . . . .	7
2.3.3 Conclusion For The Current Portal . . . . .	7
2.4 Requirements Management . . . . .	7
2.4.1 Requirements Identification . . . . .	7
2.4.2 Criteria Catalogue . . . . .	7
2.4.3 What Is Actually Needed ? . . . . .	8
<b>3 Research</b>	<b>11</b>
3.1 Enterprise Portal Analysis . . . . .	11
3.1.1 Enterprise Portal Background Information . . . . .	11
Enterprise Portal Definition . . . . .	11
Enterprise Portal Benefits . . . . .	11
Enterprise Portal Weaknesses . . . . .	12
3.1.2 Decision Criteria For The Product Selection . . . . .	12
3.1.3 Enterprise Portal Market Analysis . . . . .	12
Roles in the Gartner's Magic Quadrant . . . . .	14
3.1.4 Cloud-based Portal Solutions . . . . .	16

3.1.5	Enterprise Portal Selection Conclusion . . . . .	17
3.2	Hardware And Software Requirements . . . . .	18
<b>4</b>	<b>Design</b>	<b>19</b>
4.1	Customer Service Department . . . . .	19
4.1.1	Team Leader Publishes Announcement . . . . .	19
4.2	Information Technology Department . . . . .	20
4.2.1	Project Manager Assigns Activities To Project Members . . . . .	20
<b>5</b>	<b>Advice</b>	<b>21</b>
5.1	Approach . . . . .	21
5.2	Advice Outcomes . . . . .	21
5.2.1	Liferay's Fulfilment . . . . .	22
5.2.2	SharePoint's Fulfilment . . . . .	23
5.2.3	WebSphere Portal's Fulfilment . . . . .	24
5.3	Additional Advice Outcomes . . . . .	25
5.3.1	IBM Connections 6.0 . . . . .	25
Hardware And Software Requirements	. . . . .	25
Project Cost Calculation	. . . . .	25
5.3.2	IBM Connections' Fulfilment . . . . .	26
5.4	Conclusion . . . . .	27
5.5	Recommendation . . . . .	30
<b>6</b>	<b>Closing</b>	<b>31</b>
6.1	Results . . . . .	31
6.2	Reflection . . . . .	31
6.3	Further Process . . . . .	32
6.3.1	Contact Vendors . . . . .	32
6.3.2	Get Offers . . . . .	32
6.3.3	Initialization Of Portal Solution . . . . .	32
<b>A</b>	<b>Risk Register</b>	<b>33</b>
<b>B</b>	<b>Enterprise Portal Research Outcome</b>	<b>35</b>
B.1	Oracle Corporation . . . . .	35
B.2	Salesforce.com . . . . .	35
B.3	SAP SE . . . . .	36
B.4	IBM . . . . .	36
B.5	Microsoft Corporation . . . . .	37
B.6	Liferay, Inc. . . . .	37
<b>C</b>	<b>Decision Criteria Outcome</b>	<b>39</b>
<b>D</b>	<b>Enterprise Portal Software And Hardware Requirements</b>	<b>41</b>
D.1	Microsoft SharePoint 2016 . . . . .	41
D.1.1	Hardware And Software Requirements . . . . .	41
D.1.2	Acquiring Costs . . . . .	41
D.2	Liferay Portal CE 7.0 . . . . .	42
D.2.1	Hardware And Software Requirements . . . . .	42
D.2.2	Acquiring Costs . . . . .	42
D.3	IBM WebSphere Portal 9.0 . . . . .	42
D.3.1	Hardware And Software Requirements . . . . .	42

D.3.2	Acquiring Costs . . . . .	43
D.4	IBM Connections 6.0 . . . . .	43
	Hardware And Software Requirements . . . . .	43
	Acquiring Costs . . . . .	43
<b>E</b>	<b>New Collaboration Process For Customer Service</b>	<b>45</b>
E.1	Business Process Modelling . . . . .	45
<b>F</b>	<b>New Collaboration Process IT Project Management</b>	<b>49</b>
F.1	Business Process Modelling . . . . .	49
<b>G</b>	<b>Feasibility Of Requirements - Liferay 7.0</b>	<b>51</b>
<b>H</b>	<b>Feasibility Of Requirements - Microsoft SharePoint 2016</b>	<b>55</b>
<b>I</b>	<b>Feasibility Of Requirements - IBM Portal Solutions</b>	<b>59</b>
I.1	IBM WebSphere Portal 9.0 . . . . .	59
I.2	IBM Connections 6.0 . . . . .	60
<b>J</b>	<b>SWOT Analysis</b>	<b>63</b>
J.1	Strengths . . . . .	64
J.2	Weaknesses . . . . .	65
J.3	Opportunities . . . . .	65
J.4	Threats . . . . .	65
J.5	Look into the future . . . . .	65
	<b>Bibliography</b>	<b>67</b>



# List of Figures

1.1	Milestones . . . . .	4
3.1	Magic Quadrant . . . . .	13
3.2	Enterprise Portal Decision . . . . .	17
3.3	Enterprise Portal Analysis Outcome Visualization . . . . .	18
A.1	Risk Register . . . . .	34
G.1	Feasibility Of Requirements - Liferay 7.0 . . . . .	53
H.1	Feasibility Of Requirements - Microsoft SharePoint 2016 . . . . .	57
I.1	Feasibility Of Requirements - IBM WebSphere Portal 9.0 . . . . .	62
J.1	SWOT Analysis Outcome . . . . .	64



# List of Tables

2.1	Stakeholders . . . . .	5
2.2	General Requirements . . . . .	9
2.3	Usability Requirements . . . . .	9
2.4	To Do's Requirements . . . . .	9
2.5	Project Management Requirements . . . . .	10
2.6	Social Interaction Requirements . . . . .	10
2.7	Remaining Features Requirements . . . . .	10
3.1	Oracle WebCenter . . . . .	14
3.2	Salesforce Force.com . . . . .	15
3.3	SAP Hana Cloud Portal . . . . .	15
3.4	IBM WebSphere Portal . . . . .	15
3.5	Microsoft SharePoint . . . . .	16
3.6	Liferay . . . . .	16
3.7	Enterprise Portal Software and Hardware Requirements . . . . .	18
5.1	Liferay Fulfilment 1 . . . . .	22
5.2	Liferay Fulfilment 2 . . . . .	22
5.3	SharePoint Fulfilment 1 . . . . .	23
5.4	SharePoint Fulfilment 2 . . . . .	23
5.5	WebSphere Fulfilment 1 . . . . .	24
5.6	WebSphere Fulfilment 2 . . . . .	24
5.7	IBM Connections Software and Hardware Requirements . . . . .	25
5.8	IBM Connections Software and Hardware Requirements . . . . .	25
5.9	IBM Connections Fulfilment 1 . . . . .	26
5.10	IBM Connections Fulfilment 2 . . . . .	26
5.11	Advice Outcome Summarization . . . . .	29



# List of Abbreviations

<b>SWOT</b>	<b>S</b> trengths <b>W</b> eaknesses <b>O</b> pportunities <b>T</b> hreats
<b>IT</b>	<b>I</b> nformation <b>T</b> echnology
<b>HOD</b>	<b>H</b> ead <b>O</b> f <b>D</b> epartment
<b>ADF</b>	<b>A</b> pplication <b>D</b> evelopment <b>F</b> ramework
<b>HCP</b>	<b>H</b> ana <b>C</b> loud <b>P</b> ortal
<b>N.V.</b>	<b>N</b> aamloze <b>V</b> ennootschap
<b>SaaS</b>	<b>S</b> oftware <b>a</b> s <b>a</b> <b>S</b> ervice
<b>IaaS</b>	<b>I</b> nfrastructure <b>a</b> s <b>a</b> <b>S</b> ervice



## Chapter 1

# Introduction

This chapter provides general information on the project entitled “Which Enterprise Portal Is the Best Fit for the Company?” It includes a brief company description, the current situation and information about this thesis. The chapter is also about the project itself, including the goal of the project, expected results, background information about my assignment, project boundaries and the seven phases of this project.

### 1.1 Background Information

The following sections provides general information on the project “Which Portal Solution Is the Best Fit for the Company?”. It includes a brief company description, the current situation and general information about this graduation thesis.

#### 1.1.1 Company Description

DocMorris N.V. is a corporation located in Heerlen, the Netherlands. It is a subsidiary company of Zur Rose Group which is based in Steckborn, Switzerland. DocMorris N.V. was founded in 2000 by the pharmacist Jacques Waterval and the information scientist Ralf Däinghaus. They started the company with five employees, and at present 500 employees work for DocMorris N.V. The company is the largest shipping pharmacy within Europe, mostly supplying German customers. In 2012 the company updated its IT landscape to move more into digital pharmacy services (DocM, 2017). The IT department is responsible for information system support and finding solutions for problems faced by employees. If any business processes need to be changed or new business processes need to be added, the responsibility lies within the IT department. In total, 30 employees work for the IT department.

#### 1.1.2 Current Situation

The staff of DocMorris N.V. perform many daily tasks in which a variety of information must be communicated to the department. At the moment two agencies use the current portal solution: Customer Service and the IT department. The portal is used only for document storage in the IT department. Customer Service uses the portal for total information flow, but with some restrictions. In this case, total information flow means work instructions, blog entries, marketing information, internal event planning and checking order volume while the IT department uses the portal only for document management.

### **1.1.3 Graduation Thesis**

DocMorris N.V. wants to have a proper enterprise portal solution for better usage of the portal in the departments. This is an internal IT project, and the task is to develop a recommendation to improve support for the total information flow. This in turn should lead to more sustainable communication within the departments than currently exists.

## **1.2 Project Information**

The following sections briefly describes the goal of the project, is followed by the expected results and assignment description. It also includes the project boundaries and an overview of the project phases.

### **1.2.1 Problem Outline**

The reason for this project is that the Liferay portal solution used currently in the company offers few possibilities for interaction. The question is whether Liferay can be used further by extending its functionalities or whether it would make more sense to switch to another portal solution such as Microsoft SharePoint. Another possibility is for Liferay's portal solution to satisfy further requirements from both departments or if the alternative portals can fulfil these demands better than Liferay. The conclusion is that the employees who are using the portal are not satisfied with the current implementation of the portal and would like to have more capabilities. As already mentioned, the portal solution used and other alternative portal solutions must be properly analysed before giving a recommendation. The company is looking for a solution that will allow employees to work more closely and dynamically together.

### **1.2.2 Expected Results**

At the end of this project, the main result should be a recommendation regarding which enterprise portal solution is the best fit for the company. Value benefit analysis and project cost calculation are also among the expected outcomes. The last expected result is the design of the new collaboration process before the project comes to an end. More details about the deliverables can be found in the ensuing chapters. The goal is to have a clear understanding of the requirements which need to be fulfilled, what is possible with which enterprise portal and what will bring the most benefit for the company in the future.

### **1.2.3 Assignment Description**

My main assignment is to analyse the current Liferay enterprise portal solution and to analyse alternative portals such as Microsoft SharePoint and other solutions from different vendors. Afterwards, I must identify requirements with support from the involved parties. The next step is to define the decision criteria from the information which has been gathered through requirements engineering processes. Afterwards, I analyse the features and opportunities which need to be related to the decision criteria defined in order to fulfil the requirements. It is also essential to think about the benefits of the portal in the future. Finally, I conclude my research on these related topics and present a recommendation. After presenting this advice, my assignment

is to think about how the interaction with the enterprise platform should be for the employees and to create the new business process. My job also includes risk analysis in order to identify and address the risks.

#### **1.2.4 Project Boundaries**

This section presents information about the project boundaries. It defines what is in the scope, what might be in the scope and what is out of the scope of this project.

##### **In Scope**

Analysis: Analysis of the current enterprise portal and alternative enterprise portal solutions

Research: Market analysis for the existing enterprise portal solutions, affected system & tools analysis, project cost calculation

Advice: Decision-making on which technology should be taken

Design: Business process modelling of the new collaboration process

##### **Might Be In Scope**

New business processes: The integration of new business processes is not part of this project

Implementation preparation: Implementation plan on milestone level

##### **Out Of Scope**

Implementation: The implementation of the enterprise portal solution is not part of this project

Support: Support on my part during or after “going live” is not taken into account for this project

### 1.2.5 Project Phases

This section describes the planning of the project. First, the project milestones are introduced, followed by an illustration to explain the project activities for each specific stage, along with the stage deadlines.

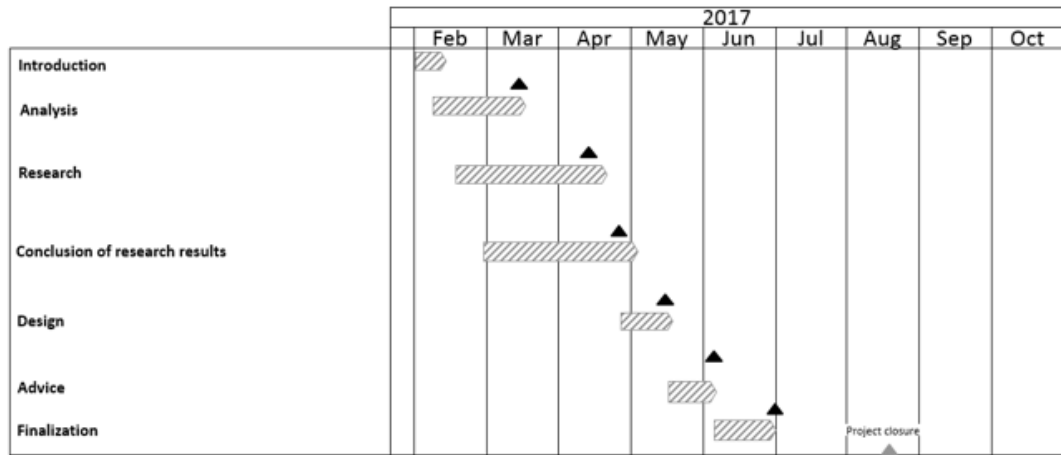


FIGURE 1.1: Project Milestones(own illustration)

The first stages are the introduction and brainstorming about the project. The result of this activity is a general understanding about the project and what is expected of me. In the analysis phase, a project plan is then developed, followed by stakeholder analysis and risk analysis, and later by the current situation analysis. Therefore interviews are conducted in order to obtain information about the advantages and disadvantages of the current portal. The final result of this stage is the definition of requirements. The next stage is the research in which the different enterprise portals, affected tools/systems and the software architecture are analysed and, finally, the project costs are calculated. The following stage is the conclusion of the research, where the recommendation is delivered. In the design phase use cases, user stories are compiled and business process modelling is performed for the new process. This period is followed by an optional phase for implementation preparation, where the implementation plan on a milestone level is created. Finally, all the expected deliverables are finalised.

The ensuing chapter contains detailed information about the affected stakeholders, the current situation, project risks and identification of requirements. Chapter six includes all the outcomes from the research phase. The following chapter presents the recommendation based on the research results. Chapter eight concerns the design of the new business process and includes use cases. The final chapter concludes the thesis with a summary of the outcome of this project, followed by a reflection on the project and its future.

## Chapter 2

# Analysis

This chapter begins with the affected stakeholders, followed by the risk analysis and then the current situation analysis. The last section presents the defined requirements.

### 2.1 Stakeholder Register

Stakeholder role	Type of stakeholder	Level of Interest	Level of Power	Classification
Head of IT Department	internal	high	high	Key player
Project Manager	internal	high	high	Key player
Software Development Team	internal	high	high	key player
Users	internal	high	high	Key player
External IT specialists	external	High	high	Key player
Government	external	low	high	Keep satisfied

TABLE 2.1: Stakeholder Register(own illustration)

A stakeholder is a person who has interest in or influence on the business processes. A stakeholder register contains information about all project stakeholders. This register contains many useful details about the stakeholders, such as which type of stakeholders they are, their level of interest and power (WikiA, 2017). The relationship between the level of interest and the level of power determines the classification to which they belong. This includes many internal stakeholders. For this project, Dutch and German rules and regulations must be checked; these are represented here as the government.

The head of the IT Department may have a preference from the beginning regarding which portal solution could be adopted, so I must present qualitative proof for the compared tools. The requirements of the HOD should be taken into account when identifying the requirements. Many employees are annoyed by the current portal solution because they find it not to be user-friendly.

The Project Manager is also one of the most important key players for this project because of the high degree of responsibility to come up with a good recommendation. The Software Development Team also wants to explore the new possibilities of an enterprise portal. What may become problematic is the lacking variety of programming languages.

Key users are disgruntled with the current portal solution and hope for more from such an enterprise portal. This being the case, I need to deliver the benefits of such a portal to them.

External IT specialists are in a neutral position and it comes interesting for the different pricing model.

Government rules and regulations must also be taken into consideration. There are restrictions regarding how to handle sensitive data. When developing the various enterprise portal solution options, I must respect these rules and regulations.

## 2.2 Risk Analysis

This risk register contains all identified risks which may arise as the project is implemented. The accompanying risk register can be found in Appendix A. In this risk register each risk contains a description, the bearer of the risk, the likelihood of the risk, the severity of the effect, the status of the risk, mitigation of the risk and response actions (WikiB, 2017). Some of the risks are divided into sub-risks. Risk No. 1 concerns the scope, which is one of the major risks of the project. This risk consists of three parts: the unclear formulation of expectations, scope change during the research phase and lacking business process scenarios when identifying the scope. Mostly, therefore, the mitigation actions are the regular interviews and meetings with the stakeholders, and the outcome from these activities is recorded in the Requirement Specification Document. Risk No. 2 is that the cost forecasts developed are incorrect, and the corresponding mitigation actions are to have the cost estimates validated by stakeholders with the received cost estimation from vendors used as evidence. Risk No. 3 concerns the stakeholders, who are divided into two parts. This includes the fact of there being no regular information exchange with the interested parties and the low quality of input from stakeholders during meetings. Here, as mitigation actions, the company supervisor is contacted and the questions are formulated in more detail for the second interview. Risk No. 4 is that the wrong recommendation may be made based on lacking analysis elements, and to mitigate this regular risk meetings are held with company supervisor to determine whether any parts are missing. The last risk, Risk No. 5 is that the designed process may not be suitable for the main problem. To mitigate this risk regular feedback sessions are once again held with stakeholders.

## 2.3 Current Situation Analysis

Before starting to identify the requirements or further steps, it is important to analyse the current situation very deeply. This section presents information regarding what the employees think about the current Liferay implementation. This information has been collected through interviews. The questions and outcomes from the interviews are found in the appendixes.

### 2.3.1 Advantages Of The Current Portal

The employees use the current portal mainly as a document storage platform, which works well. With the Liferay portal solution the users can upload or download different versions of the documents. The users like the revision security function which the Liferay portal offers. Another advantage is that the current version of Liferay is free. The implemented version of Liferay also has a “tagging” feature allowing users to mark the document with a tag so that others can find the text by searching for the name of the tag. The Liferay portal helps for a standardised communication within the department. The developer states that the Liferay portal is coded in a popular programming language, Java, which has facilitated the implementation work for him.

### 2.3.2 Disadvantages Of The Current Portal

The current portal solution also has drawbacks. The employees face problems with the current implementation of the Liferay portal. There is no user-friendly overview of the current portal. Furthermore, the operation of the portal is not intuitive for most employees. For example, there is no “back to the last page” or “back to home” button in the portal. Other examples include the complex folder structure and the poorly readable thumbnail view. The most unfortunate situation happened was when the Liferay portal needed to be upgraded. After the update, several problems occurred, including compatibility issues, missing documents and document versions, which lead to a less trustworthy portal in the eyes of the users.

### 2.3.3 Conclusion For The Current Portal

If we look one step ahead of the current situation, we must ask ourselves what will happen if Liferay is no longer open-source. The next problem is that having no licensing means limited or no support if problems occur. The performance influence factor must also be taken into consideration for open-source tools. Through the interviews, I found out that respondents would like to have certain features which could improve their daily business. For example, self-customizing in which the employees can choose the portal layout themselves. Another desired feature is a Dashboard function in which employees see an overview of their tasks, the statistics and current status of the project on which they are working. Outlook and Microsoft Office integration are also functions desired by the employees. Another function is an internal chat to enable faster exchange of information within the department or throughout the organization.

## 2.4 Requirements Management

This section presents the identified requirements, which is necessary for the value benefit analysis. The value benefit analysis, which is the basic element of my recommendation, is presented in the advice chapter. This section also includes the criteria catalogue, describing how the requirements are prioritized. The requirements are then described in more detail.

### 2.4.1 Requirements Identification

The requirements were identified through several meetings and interviews with a number of users and the IT project managers who represent the interests of the two departments in question. By analysing the current situation further, requirements have also been identified. The identified requirements are presented in the following pages.

### 2.4.2 Criteria Catalogue

The identified requirements are then evaluated and extended with the help of the IT project managers. The requirements are then re-arranged and put into groups. Finally, the requirements are prioritized based on the MoSCoW Prioritization method, which stands for Must have, Should have, Could have and Won't have but would like (WikiC, 2017). This prioritization method provides an easy understanding of

the importance of requirements among the stakeholders. Thus the criteria catalogue is developed.

### 2.4.3 What Is Actually Needed ?

DocMorris N.V. needs an enterprise portal solution which support the collaboration within the Information Technology and Customer Service departments as well a solution which is more user-friendly. Does it make sense to invest more resources in the current Liferay portal solution or can other enterprise portal solutions fulfil these requirements better than Liferay does now? The analysis of the enterprise portal solutions should at least cover the existing functions of the currently used portal.

As noted in the previous chapter, the current portal solution covers few functions, which include download and upload, revision security for the documents and a folder structure where the documents can be saved. More or less few document management functions are used by the IT department. The Customer Service department uses the Liferay Portal as well, but for total information flow. One of the additional features which they use is the news feed function in form of blogs and wikis. The “tagging” feature and search function also support communication of information within Customer Service. The full list of the identified requirements for the planned enterprise portal with prioritization based on importance can be found in the following pages.

It must be possible to have a central information system which allows the user to be at the same information level. The users must be able to see the changes and also the details regarding who made the changes. The system must be able to save all the data and documents without loss. To make it easier for the employees, it must be possible for them to create their own document templates. It is also important that the users can limit visible content to what is relevant to them and that users can decide for themselves with whom they want to share content. It must be possible to administrate a To-Do list for the user himself and also for the team. Additionally, it must be possible to interact with other employees through the portal in the form of internal chatting and mail communication. The portal solution must support project management in several ways. Because not only the IT department, but also the Customer Service department, will use the portal, it must be designed in a very user-friendly way and be understandable for employees.

In the next two pages you may find the identified and prioritized requirements.

Requirement ID	Requirement name	Requirement description	Type	Priority
General				
✓ 1	Central information system	The system shall provide users the same level of information	functional	Must have
✓ 2	Document revision safety	The system shall allow users to see the recent changes made by the involved teammates	functional	Must have
✓ 3	Traceability	The system shall track all the activities for the specific work item	functional	Must have
4	Data integrity	The application shall save the data faultless	non-functional	Must have
✓ 5	Document template creation	The application shall provide users with document templates so that they know how to document within the department	functional	Must have
✓ 6	Security issues	The system shall not provide access to sensitive data for every user	non-functional	Must have
7	Availability	The application shall be available 99%	non-functional	Must have
8	Security	The software shall perform actions within the company network	non-functional	Must have
✓ 9	Self-administration	The system shall allow users to decide themselves with whom they want to share content	functional	Must have
✓ 10	Role concept	The system shall only show relevant content for the users	functional	Must have
11	Manageability	The software shall allow users to manage the content themselves	non-functional	Should have
12	Maintainability	The application shall be coded in such a way that it is easy to maintain for the intern staff members	non-functional	Should have

TABLE 2.2: General Requirements

Requirement ID	Requirement name	Requirement description	Type	Priority
13 Usability				
13.1	Usability	The application shall be designed user-friendly	non-functional	Should have
13.2	Search	The system shall allow users to search after specific document	functional	Should have
13.3	Navigation	The system shall allow navigating through the sidebar menu	functional	Should have
13.4	Rule-based document saving	The system shall save the documents automatically fitted to the meta data	functional	Could have
14	Language preference	The application shall be available in three languages: English, German, Dutch	non-functional	Should have
✓ 15	Single Sign - On	The system shall connect the user automatically without extra log-in	functional	Should have
✓ 16	Issue Tracking System	The application shall allow users to check the status of the customer request	functional	Could have

TABLE 2.3: Usability Requirements

Requirement ID	Requirement name	Requirement description	Type	Priority
17 To Do's				
17.1	Tasks	The system shall allow users to see their assigned tasks and to update their task status which should be visible for involved parties	functional	Should have
17.2	Group tasks	The system shall allow users to see the assigned tasks and status of the tasks within a group	functional	Should have
17.3	Deadline for tasks	The system shall allow users to fix a date when the assigned tasks should be finished	functional	Should have
17.4	Tasks reminder	The system shall remind the users if they have not started to perform activities for the specific task	functional	Should have
17.5	Pass tasks	The system shall allow users to pass task to another person	functional	Should have

TABLE 2.4: To Do's Requirements

Requirement ID	Requirement name	Requirement description	Type	Priority
18	Project Management			
18.1	Project status	The application shall allow users to have an overview about the status of the project	functional	Could have
18.2	Plan project status meeting	The application shall have the possibility to plan automatically project status meetings	functional	Could have
19	Resource management	The system shall provide capabilities for the user to manage project resources in a more efficient way	functional	Could have
20	Document Workflows	The application shall allow users should be able to start workflows which start activities for the project	functional	Could have

TABLE 2.5: Project Management Requirements

Requirement ID	Requirement name	Requirement description	Type	Priority
21	Social Interaction			
21.1	Multi document editing	The application shall allow users to edit one document at the same time	functional	Should have
21.2	Lock/ unlock document	The application shall allow users to lock and unlock document for parallel editing	functional	Should have
21.3	Mail Integration			
21.3.1	Mail integration	Significant changes, notifications and tasks shall be sent to the users per mail	functional	Should have
21.3.2	Open tasks from mail	The application shall allow users to open the assigned tasks over the mail account	functional	Should have
21.4	Commenting	The application shall allow users to write comments for the document version and also for the tasks.	functional	Should have
21.5	Intern chatting	The system shall allow employees to chat with other staff members	functional	Could have

TABLE 2.6: Social Interaction Requirements

Requirement ID	Requirement name	Requirement description	Type	Priority
22	Features			
22.1	Microsoft products integration	The application shall allow users to upload, download, edit and delete Microsoft documents from their desktop and those changes shall be automatically visible on the portal	functional	Should have
22.2	Group calendar	The system shall allow users to see upcoming events within the department in the calendar	functional	Should have
22.3	Generating statistics & reports	The system shall generate different reports with the data for different interest groups	functional	Could have
22.4	Dashboards	The dashboard shall provide the users an overview of relevant content as their home page	functional	Could have

TABLE 2.7: Remaining Features Requirements

## Chapter 3

# Research

This chapter first presents an enterprise portal analysis at a general level. This is followed by the an in-depth systems analysis of the software products which are among the final candidates. The chapter then provides a closer look at the software and hardware requirements for the final candidates. Finally, the chapter presents an acquiring cost calculation for all of the final candidates.

### 3.1 Enterprise Portal Analysis

This section starts with the enterprise portal background information, followed by a full enterprise portal market analysis and the important role of cloud computing in this case. The chapter concludes with the conclusion from this research outcome and a brief explanation of further steps.

#### 3.1.1 Enterprise Portal Background Information

This section explains in general what an enterprise portal is. After this, the strengths and weaknesses of various enterprise portals are explained.

##### Enterprise Portal Definition

The intention is to build a portal that allows users to personalise, to search, to integrate with existing systems if possible and to conduct documentation management, content management and business process management. All the applications, information and processes should be centrally located, accessible and understandable through one portal for all users (Techo, 2017).

##### Enterprise Portal Benefits

In an article from “Atlantic WEB FITTERS” posted by James Robertson, managing director of Step Two Design, an Intranet and content management consultancy based in Sydney, Australia, the author describes the benefits of the portal solution. One of the advantages of having a portal is the access to business systems, including integration with email systems, for example. Another advantage is the integration of all information into one single, central location. Furthermore, every user has nearly the same user experience with the portal and the combined information system. A further advantage is the customising function of the portal, which allows the user to reduce the information to the needs of individual staff by filtering the relevant information and tools. It is possible to reduce the number of logins to other systems because of the integration between the end user and the source system. Portals make it possible to sustain deployment on an application server environment, which

supports further development of the portal. The last benefit to mention here is the effective delivery of the data processing, for example visualisation of relevant statistical data (Robertson, 2017).

### **Enterprise Portal Weaknesses**

In the same article, the author lists the shortcomings of portal solutions. One of the weaknesses is the inflexibility of the portal design because it requires a lot of time and resources to customise the standard interface to one's own needs. This customization can also become problematic when updates for the standard interface are released. Another disadvantage noted in the article is that the standard user interface is not usable and must be tailored to individual needs. This problem also applies to the fact that regular users do not take the time to personalise the standard portal sites to their needs (Robertson, 2017).

### **3.1.2 Decision Criteria For The Product Selection**

To find suitable products St. Galler Decision Methodology has been used. This methodology helps to identify the suitable decision criteria (Mana, 2017). Finally, it has been decided that portal solution, customization, performance, operator model, customer support, cost and condition are the most important criteria to be taken into account for the high-level portal solution product evaluation.

For the portal solution criterion, it will be determined whether the portal meets the general description of what an enterprise portal should do.

For the customization criterion, the possibility, degree of difficulty and cost-benefit ratio will be determined.

For the performance criterion, the performance of the portal solutions will be checked. For the operator model criterion, the different operator models will be checked based on what is most important for DocMorris N.V.

For the customer support criterion, the support level of the portal solution supplier itself will be checked, based, for example, on the public support website.

For the cost and condition criterion, the relationship between the invested costs and the benefits will be determined.

### **3.1.3 Enterprise Portal Market Analysis**

Gartner, Inc. is a research and advisory company in the field of information technology. The company regularly publishes technical insight knowledge for its clients and the general readership. This knowledge could help make decisions in our case as well. Gartner works with its customers to research, analyse and interpret the business of IT. In total, they have nearly 10,000 employees, and operate in more than 90 countries (GartA, 2017).

Gartner states that a portal is a central application where the users have access to relevant information and business processes and where they are connected with other people. Anyone from a particular organisation can be part of the portal, including employees, customers, partners and support providers. Many vendors in the enterprise portal market offer suitable capabilities for specific needs. The requirements of the digital business increase continuously, and thus more new vendors enter the portal market, which makes it difficult to reach a decision regarding which enterprise portal best meets the requirements of the company. An article published by Gartner in October 2016 lists the strengths and weaknesses of known portal

vendors. The position of each portal provider in the portal market can also be seen in the illustration below (Murphy et al., 2016).



FIGURE 3.1: Magic Quadrant for Enterprise Portals((Murphy et al., 2016))

This figure presents Gartner's Magic Quadrant in practice. Gartner's Magic Quadrant provides a wide-angle view of the position of the market's competitors. The preconditions for this market to work are a specific market which is equal to all vendors, high growth, and clear differentiation of the providers (GartB, 2017) The Magic Quadrant has four equal-sized areas which represent the four competition roles in the market. The horizontal axis describes the completeness of vision and the vertical axis describes the ability to execute.

### Roles in the Gartner's Magic Quadrant

The four types are niche players, visionaries, challengers and leaders, and their positions can be seen in the above illustration. The definition of each type was taken from Gartner, Inc.

"Leaders execute well against their current vision and are well positioned for tomorrow.

Visionaries understand where the market is going or have a vision for changing market rules, but do not yet execute well.

Niche Players focus successfully on a small segment, or are unfocused and do not out-innovate or outperform others.

Challengers execute well today or may dominate a large part, but do not demonstrate an understanding of market direction."(Murphy et al., 2016)

The portal which DocMorris currently uses in the company is Liferay, which is one of the reasons why we focus on the leaders category in Gartner's Magic Quadrant. The next reason is the huge customer base, focusing on large companies and the fact that these leading portal vendors worked hard to achieve good reputation in the market. The leaders also have influence on the market so that they can affect market trends. The final reason is the desire for an enterprise portal which comes from a leading vendor. Consequently, our task is to analyse the competition in that specific category(Robert, 2017). Gartner Inc., states in this article that the leaders have maximum capabilities to support different deployment scenarios and have also demonstrated in recent years that they have delivered sustainable portal solutions, including for new customers. Additionally, the leaders are successful in meeting customer needs(Murphy et al., 2016). Every technology, portals included, has their strengths and weaknesses, and these strengths and weaknesses need to be understood before making decisions regarding which of the portal solutions fit best for the business.

The following tables describe the advantages and disadvantages of the selected enterprise portal products based on research through the internet and reading through the user's and IT specialists' experiences. Detailed information can be found in the Appendix B.

Oracle WebCenter	
Advantages	Disadvantages
increasing efficiency by acquiring additional products	high acquisition costs
stable portal solution	complexity & communication of the portles not implemented in the standard
wide variety of different approaches	uncertain customer base
successful with their portal strategy & customer experience strategy	high acquiring costs for less functions
full-stack suite for development	necessitiy of specialised developers
expanding its cloud platform offerings	

TABLE 3.1: Oracle Webcenter Research Outcome

Salesforce Force.com	
Advantages	Disadvantages
software's lifetime	private cloud solution --> impossible to change the provider
increased payback for customers	necessity to acquire separate products --> multi-vendor issues
positive customer relationship	poor performance due fewer international data centres than their competitors
consumer-related user interface	dependent on other Salesforce products
all advantages of a cloud architecture	insufficient web content management
mobile capability for portals	

TABLE 3.2: Salesforce Force.com Research Outcome

SAP Hana Cloud Portal	
Advantages	Disadvantages
integration and compatibility of many SAP systems	only offer IaaS portal solutions
high customer responsiveness	own standards for cloud management
portal solution can be used instantly	weak content management
highly customizable	frustrating customer base
large customer base	
real-time data access	

TABLE 3.3: SAP Hana Cloud Portal Research Outcome

IBM WebSphere Portal	
Advantages	Disadvantages
stable portal solution	high acquisition costs
high performance	no simple portal solution
continuous improvements based on user experiences and feedback	necessity of Java Enterprise experts
customer-friendly portal solutions	
smart-machine capabilities in a portal solution	

TABLE 3.4: IBM WebSphere Portal Research Outcome

Microsoft SharePoint	
Advantages	Disadvantages
multi-accessibility from any device	general customization problems
mobile access features	extensive user training
social networking	necessity of third party vendors to solve problems
Microsoft Office integration	third-party tools, enhancements and solutions required for proper usage
available as on-premise and cloud	
being a suitable portal solution for many customers	
low acquisition costs	
user-friendly interface	

TABLE 3.5: Microsoft SharePoint Research Outcome

Liferay Portal	
Advantages	Disadvantages
low total cost of ownership	weak security
out-of-the-box functionalities	fewer configuration opportunities
improved business agility	behind some leaders in web content development
open-source	
growing Liferay community	
solid performance	
partnership program and development teams	

TABLE 3.6: Liferay Portal Research Outcome

### 3.1.4 Cloud-based Portal Solutions

This subsection first describes the purpose of this service, followed by the disadvantages and advantages of cloud computing. Finally, we examine in more detail why this is an important topic for the company. Most of the portal vendors are moving into the cloud with their portal solutions, that is also the reason behind the following section.

Cloud computing helps to tailor the necessary IT resources to a company's needs with the support of the technologies and business models offered by cloud vendors. Such a solution leads to low investment costs, but later costs paid annually, monthly or for a particular time, as operations are billed per user, which can lead to high maintenance costs (Gabl, 2017).

On the website "LevelCloud" an article about the advantages and disadvantages of cloud computing was published. As an obstacle, the article cites downtime. If too many requests are sent within a particular time from many clients of the systems, the system may not be able to handle all the requests. Meanwhile, if the technology with which one is using the cloud becomes outdated, then the service may be temporarily unavailable. The biggest problem which could occur is that one might have no access to applications, server or data if the internet connection is lost. Another disadvantage is the security problem. Storing personal or confidential data or files in the cloud is always hazardous, even if cloud service providers try to have the best protection for their clients. And if one views the issue of storing personal data in the cloud from the perspective of the clients, one sees that the service providers have access to your personal and confidential information at all times. Another disadvantage is lock-in by cloud service providers because it is hard to implement a complete change from

one provider to another with the capabilities of the services used. The migration of personal company data stored in the cloud from one vendor's cloud environment to another provider's cloud environment is difficult to achieve. The last disadvantage mentioned in this article is the fact that the client has less control over the back-end infrastructure, as the service providers predefine the infrastructure. The customer has control only over the decision concerning which applications, data and services to use (Leve, 2017).

One advantage mentioned in this article is the cost savings, which is cited as the most significant cloud computing benefit. One can save a lot of money by avoiding investment in server capacity and applications, and only paying for what one uses, which applications and in which amounts. Another advantage is the reliability and consistency of the cloud computing platform. With a Service Level Agreement, the providers guarantee their clients 24 hours 7 days a 365 and 99% availability of their services. Another advantage mentioned here is manageability, which is achieved entirely through the cloud computing service providers, with the clients facing no problems with upgrades or maintenance. The last advantage mentioned in this article is the benefit derived from being able to fully concentrate on business activities and objectives, with all technical support, including implementation of newer applications and services, handled more quickly by the cloud service providers.

We can conclude that cloud portal solutions are generally less expensive than on-site portal solutions at present. However, DocMorris N.V. remains of the opinion that the cloud is off limits because the company works with medical data and sensitive data from clients. It has therefore been also decided that this will be one of the decision criteria when determining which solution options are offered. If a software company offers only a cloud solution, then that product will be not included in the more narrow selection.

### 3.1.5 Enterprise Portal Selection Conclusion



FIGURE 3.2: Enterprise Portal Decision (Murphy et al., 2016)

Through this research, we can narrow the focus to three portal vendors. This does not mean that the top corners from the leaders are the best, as Gartner, Inc.

already mentioned in the article, but in this case they seem to be most suitable for the company because of the issues with the cloud computing. Salesforce and SAP only have cloud-based solutions. Additionally, the Salesforce portal solution has further weaknesses, as mentioned before, in the area of customization, performance and costs and conditions. Oracle offers two operator models for the WebCenter portal solutions, on-site and SaaS. Because of their rapid shift to the cloud, there is less customer support for the on-site version, which has led to an irritated customer base. Needless to say, DocMorris does not want to become a frustrated customer. The finalists in the narrow selection are therefore the SharePoint, Liferay and WebSphere portals. Further information can be found in the Appendix C.

Criteria/ Vendor	Oracle WebCenter	Microsoft SharePoint	Liferay Portal	Force.com Salesforce	IBM WebSphere Portal	SAP Hana Cloud Portal
Portal solution						
Customization						
Performance						
Operator model	OnPremise & SaaS	OnPremise & SaaS	OnPremise	SaaS	OnPremise & SaaS	IaaS
Customer support						
Costs & condition						

Deletion of the provider from the list because of the outcome
 Excellence
 Good
 Satisfactory
 Poor
 Very poor

FIGURE 3.3: Enterprise Portal Analysis Outcome(own illustration)

## 3.2 Hardware And Software Requirements

The following table briefly summarizes the hardware and software requirements for the preselected three candidates. Further details can be found in the Appendix D.

Criteria	Liferay 7.0	SharePoint 2016	WebSphere Portal 9.0
Application servers	GlassFish Jboss, Tomcat, Weblogic	Microsoft IIS Server	IBM WebSphere Application Server
Operating system	Any major operating system	Microsoft Windows only	Linux based system or Windows 8.1
Database	MySQL, Oracle or PostgreSQL	Microsoft SQL Server 2014	Microsoft SQL Server 2014, Oracle Database 12.1
Supported software	Web browsers, MS Office 2013	Web browsers, Office 365, MS Office 2016	Web browsers
Scripting language support	Java, PHP, Ruby, Groovy, Python	Microsoft .NET	Java

TABLE 3.7: Enterprise Portal Software and Hardware Requirements

## Chapter 4

# Design

The intention of this chapter is to present a clear understanding of how the new portal solution will support collaboration within the departments. One could, of course, adapt the new collaboration process organization-wide. However, for the time being, two departments are using the current Liferay portal and this is why we will closely examine one use case for each department for the new portal solution. For the new collaboration process one requirement per department will be chosen from the requirement catalogue and out of the selected requirement, a use case will be created. The new collaboration process will be designed in Business Process Modelling Notation 2.0 (WikiD, 2017), which is followed by an explanation of the activities from the collaboration processes.

### 4.1 Customer Service Department

Employees from Customer Service currently use the Liferay portal for the total information flow. On the current portal most of the employees from Customer Service are authorized only to read announcements, advertisements, blog entries and work instructions. The team leader and the senior agents are the only persons able to post announcements and further relevant information on the Liferay portal. This includes important announcements from other departments. Finally, the Customer Service employees get notifications regarding recent entries for use in their daily business as needed. For example, if a customer wants to order medicines or a discount has been announced for a particular medicine.

#### 4.1.1 Team Leader Publishes Announcement

One of the required functions is the “Commenting” feature, which can function as an example to present one of the new collaboration processes for the Customer Service department. It remain the case that in general the Customer Service employees are not allowed to post anything on that specific page in order to limit information to that which is important and structured. However, these employees should be able to comment on these announcements, blog entries or on the work instructions if any questions arise. They must be able to start a conversation through the portal with their team colleagues and with the person responsible for the post.

The complete collaboration process designed for this use and the explanation can be found in Appendix E.

## **4.2 Information Technology Department**

At present the IT Department employees use the portal only for document management. Core functions used by the IT Department are document upload, download, edit, comment, save from desktop and delete. They are also able to download the previous document version.

### **4.2.1 Project Manager Assigns Activities To Project Members**

Another required function which we will now examine is task allocation, which shows the collaboration within the project team for project management. First of all, a new team site is created by the IT Project Manager and he invites other project members to the team site. He then creates a project plan and adds activities and tasks to this plan. After this, he starts the work flow, which sends the first task to the assigned project member and the other involved project members are notified that a work flow to start the specific phase has begun. These tasks have a predefined deadline and an assigned employee who is responsible to perform that specific task. When he finishes the assigned task, he can approve the task, which starts the next task for another project member. Meanwhile, every project member can check the status of the project by checking the progress of the activities. If the assigned project member is not able to perform the task, then he can reject the task and the project member is informed of this. The project manager can then find a solution for the issue. The project members are also informed if they have exceeded the deadline to finish the task and this notification is sent to the project manager.

As noted above, the designed collaboration process for IT project management and the explanation can be found in Appendix F.

## Chapter 5

# Advice

The aim of this chapter is to present a recommendation regarding which of the three preselected portal solutions is the best fit for DocMorris N.V. As already mentioned, after the vendor meetings the team is more aware of what the specific portal solution is able to deliver as a default and for which requirements customization is required to deliver that solution. Recommendations were also provided by the vendors themselves regarding which add-on or tool could fulfil some of the requirements better than the selected portal software.

### 5.1 Approach

It has started with an analysis on the current situation, followed by the identification of the requirements. Then the portal solution supplier's position in the enterprise portal market has been evaluated. After the research on six software manufacturer, three portal software solutions have been selected based on the product criteria. The vendor has been contacted who are capable of meeting the requirements for the portal solution. The opinion of the vendors is included in the following sections regarding the outcome. First the outcomes for each of the three portal software solutions has been examined. Then there has been a close look at the winner for each of the categories. Finally, this chapter will present a recommendation regarding which of the selected portal solutions is the best fit for the company.

### 5.2 Advice Outcomes

This chapter is divided into three parts and each part focuses on the fulfilment of the requirements by the selected portal solution. Therefore it will be looked at each requirement group in the same order presented in the Requirements Management chapter.

### 5.2.1 Liferay's Fulfilment

In the past, DocMorris N.V. started with Liferay 6.1. They now use Liferay Portal 7.0 because of the absence of support for the older versions. DocMorris N.V. uses the Community Edition, which has lower security standards and a lower support level than the Enterprise Edition. After upgrading the portal to Liferay 7.0, some functions are missing and this must be taken into consideration when developing a recommendation if these functions are expected in the requirements of the new portal. The feasibility check and more details can be found in the Appendix G. The following tables show the feasibility of the identified requirements for Liferay 7.0

Req. ID	Requirement name	Fulfil	Partially fulfils	Not fulfilled
<b>General</b>				
✓ 1	Central information system	+		
✓ 2	Document revision safety	+		
✓ 3	Traceability	+		
✓ 4	Data integrity		○	
✓ 5	Document template creation			■
✓ 6	Security issues	+		
7	Availability	+		
8	Security	+		
✓ 9	Self-administration	+		
✓ 10	Role concept	+		
11	Manageability	+		
12	Maintainability	+		
<b>13 Usability</b>				
13.1	Usability		○	
13.2	Search	+		
13.3	Navigation		○	
13.4	Rule-based document saving		○	
✓ 14	Language preference	+		
✓ 15	Single Sign - On	+		
✓ 16	Issue Tracking System		○	
<b>17 To Do's</b>				
17.1	Tasks			■
17.2	Group tasks			■
17.3	Deadline for tasks			■
17.4	Tasks reminder			■
17.5	Pass tasks			■

TABLE 5.1: Liferay Requirements Fulfilment 1

Req. ID	Requirement name	Fulfil	Partially fulfils	Not fulfilled
<b>18 Project Management</b>				
18.1	Project status			■
18.2	Plan project status meeting			■
✓ 19	Resource management			■
✓ 20	Document Workflows			■
<b>21 Social Interaction</b>				
21.1	Multi document editing			■
21.2	Lock/ unlock document	+		
<b>21.3 Mail Integration</b>				
✓ 21.3.1	Mail integration			■
✓ 21.3.2	Open tasks from mail			■
21.4	Commenting			■
✓ 21.5	Intern chatting			■
<b>22 Features</b>				
22.1	Microsoft products integration		○	
22.2	Group calendar	+		
22.3	Generating statistics & reports	+		
22.4	Dashboards	+		

TABLE 5.2: Liferay Requirements Fulfilment 2

### 5.2.2 SharePoint's Fulfilment

Here the focus lies on the SharePoint 2016 on-site version. The following visualization includes the opinion from the vendor which presented its solution in the company. More information can be found in the Appendix H. The following tables illustrates the feasibility of the identified requirements for SharePoint 2016.

Req. ID	Requirement name	Fulfils	Partially fulfils	Not fulfilled
<b>General</b>				
1	Central information system	+		
2	Document revision safety	+		
3	Traceability	+		
4	Data integrity	+		
5	Document template creation	+		
6	Security issues	+		
7	Availability	+		
8	Security	+		
9	Self-administration	+		
10	Role concept	+		
11	Manageability	+		
12	Maintainability	+		
<b>13 Usability</b>				
13.1	Usability	+		
13.2	Search	+		
13.3	Navigation	+		
13.4	Rule-based document saving	+		
14	Language preference	+		
15	Single Sign - On	+		
16	Issue Tracking System			-
<b>17 To Do's</b>				
17.1	Tasks	+		
17.2	Group tasks	+		
17.3	Deadline for tasks	+		
17.4	Tasks reminder	+		
17.5	Pass tasks	+		

TABLE 5.3: SharePoint Requirements Fulfilment 1

Req. ID	Requirement name	Fulfils	Partially fulfils	Not fulfilled
<b>18 Project Management</b>				
18.1	Project status			-
18.2	Plan project status meeting			-
19	Resource management			-
20	Document Workflows			-
<b>21 Social Interaction</b>				
21.1	Multi document editing	+		
21.2	Lock/ unlock document	+		
<b>21.3 Mail Integration</b>				
21.3.1	Mail integration	+		
21.3.2	Open tasks from mail	+		
21.4	Commenting	+		
21.5	Intern chatting		o	
<b>22 Features</b>				
22.1	Microsoft products integration	+		
22.2	Group calender	+		
22.3	Generating statistics & reports	+		
22.4	Dashboards	+		

TABLE 5.4: SharePoint Requirements Fulfilment 2

### 5.2.3 WebSphere Portal's Fulfilment

Here the focus lies on IBM WebSphere Portal. This information also includes the opinion of the vendor. It is important to mention here that the IBM WebSphere Portal vendor advises to consider IBM Connections because most of the requirements are fulfilled by IBM Connections as default functions. The problem with IBM Connections is that it is less customizable than the IBM WebSphere Portal and does not fulfil some of the specified requirements. Some of the requirements can be reached through IBM WebSphere Portal, but requires many customization processes, which means a lot of investment. IBM WebSphere is also more expensive than IBM Connections. The selected vendor has directly contacted IBM staff members who also say that 90% of the requirements fit with IBM Connections. With the IBM WebSphere Portal itself, users cannot choose with whom they want to share content. More information can be found in Appendix I. The following tables show the feasibility of the identified requirements for IBM WebSphere Portal 9.0

Req. ID	Requirement name	Fulfils	Partially fulfils	Not fulfilled
<b>General</b>				
✓ 1	Central information system			■
✓ 2	Document revision safety			■
✓ 3	Traceability			■
✓ 4	Data integrity	+		
✓ 5	Document template creation			■
✓ 6	Security issues	+		
✓ 7	Availability	+		
✓ 8	Security	+		
✓ 9	Self-administration		○	
✓ 10	Role concept	+		
✓ 11	Manageability	+		
✓ 12	Maintainability	+		
<b>13 Usability</b>				
13.1	Usability		○	
13.2	Search	+		
13.3	Navigation			■
13.4	Rule-based document saving			■
✓ 14	Language preference	+		
✓ 15	Single Sign - On	+		
✓ 16	Issue Tracking System			■
<b>17 To Do's</b>				
17.1	Tasks			■
17.2	Group tasks			■
17.3	Deadline for tasks			■
17.4	Tasks reminder			■
17.5	Pass tasks			■

TABLE 5.5: WebSphere Requirements Fulfilment 1

Req. ID	Requirement name	Fulfils	Partially fulfils	Not fulfilled
<b>18 Project Management</b>				
18.1	Project status			■
18.2	Plan project status meeting			■
✓ 19	Resource management			■
✓ 20	Document Workflows			■
<b>21 Social Interaction</b>				
21.1	Multi document editing			■
21.2	Lock/ unlock document			■
<b>21.3 Mail Integration</b>				
✓ 21.3.1	Mail integration			■
21.3.2	Open tasks from mail			■
21.4	Commenting			■
21.5	Intern chatting		○	
<b>22 Features</b>				
22.1	Microsoft products integration			■
22.2	Group calendar			■
22.3	Generating statistics & reports			■
22.4	Dashboards			■

TABLE 5.6: WebSphere Requirements Fulfilment 2

### 5.3 Additional Advice Outcomes

This section addresses IBM Connections 6.0 because this collaboration tool, which was recommended by the vendor and by an IBM staff member, must be also analysed before presenting a recommendation. By combining other IBM products or integrating suitable add-ons for IBM Connections, the platform becomes more efficient. Some of the identified requirements can be only met by doing this.

#### 5.3.1 IBM Connections 6.0

IBM Connections 6.0 is the collaborative tool from IBM and this tool is recommended by the contacted vendor as already mentioned before. More information can be found in the Appendix D.

#### Hardware And Software Requirements

Criteria	IBM Connections 6.0
Application servers	IBM WebSphere Application Server
Operating system	Any major operating system
Database	MS SQL Server 2016, Oracle Database 12.1,
Supported software	Web browsers, MS Office 2013, 2016 & Office 365
Scripting language support	Java

TABLE 5.7: IBM Connections Software and Hardware Requirements

#### Project Cost Calculation

This estimated project cost calculation has been send by the contacted vendor for IBM Connections 6.0.

Price composition	Description	Incurring costs
Implementation	8-10 days planned → per day 1080€	10.800€
Licensing	For 150 users	19.900€
Intern project costs	20% of the calculated costs	6.200€
Tax	21% VAT from 30.700€ (Impl. + Licensing)	6.447€
<b>Total costs</b>		<b>43.287€</b>
Renewable costs	Around 22% of the initial acquiring costs for the following years	3.980€

TABLE 5.8: WIBM Connections Software and Hardware Requirements

### 5.3.2 IBM Connections' Fulfilment

IBM Connections is a pure collaboration tool and it is less expensive than IBM WebSphere Portal, according to the selected vendor. The following sections explain which of the identified requirements are fulfilled by IBM Connections. The disadvantage of IBM Connections is that it is less customizable than IBM WebSphere, in the opinion of the vendor. More details can be found in the Appendix I. The following tables show the feasibility of the identified requirements for IBM Connections 6.0

Req. ID	Requirement name	Fulfil	Partially fulfils	Not fulfilled
<b>General</b>				
1	Central information system	+		
2	Document revision safety	+		
3	Traceability		●	
4	Data integrity	+		
5	Document template creation			■
6	Security issues	+		
7	Availability	+		
8	Security	+		
9	Self-administration	+		
10	Role concept	+		
11	Manageability	+		
12	Maintainability	+		
<b>13 Usability</b>				
13.1	Usability	+		
13.2	Search	+		
13.3	Navigation	+		
13.4	Rule-based document saving	+		
14	Language preference	+		
15	Single Sign - On	+		
16	Issue Tracking System			■
<b>17 To Do's</b>				
17.1	Tasks	+		
17.2	Group tasks	+		
17.3	Deadline for tasks	+		
17.4	Tasks reminder	+		
17.5	Pass tasks	+		

TABLE 5.9: IBM Connections Requirements Fulfilment 1

Req. ID	Requirement name	Fulfil	Partially fulfils	Not fulfilled
<b>18 Project Management</b>				
18.1	Project status			■
18.2	Plan project status meeting			■
19	Resource management			■
20	Document Workflows			■
<b>21 Social Interaction</b>				
21.1	Multi document editing	+		
21.2	Lock/ unlock document	+		
<b>21.3 Mail Integration</b>				
21.3.1	Mail integration	+		
21.3.2	Open tasks from mail	+		
21.4	Commenting	+		
21.5	Intern chatting	+		
<b>22 Features</b>				
22.1	Microsoft products integration	+		
22.2	Group calendar	+		
22.3	Generating statistics & reports	+		
22.4	Dashboards	+		

TABLE 5.10: IBM Connections Requirements Fulfilment 2

## 5.4 Conclusion

This section summarizes the results of the four selected software applications based on the defined requirements. The focus lies on the portal solution which delivers the best value for that specific requirement. These sections explain why one portal solution is better than the others for each requirement group. As indicated above, the focus lies on portal solution features which are delivered by default to fulfil the identified requirements. It is important to state that the requirement group sections that follow do not go through each requirement individually, but rather concentrate on requirements which are of particular importance.

### General Requirements

Many requirements which are mentioned in the general requirements are “must have” criteria that must absolutely be met by the selected portal solutions. Most of these requirements are fulfilled by Liferay Portal 7.0, by SharePoint 2016, and by IBM Connections. For IBM WebSphere Portal the document template creation and self-administration features are lacking. The problem with Liferay is that one has private pages and public pages and the decision regarding who has access to which page rests with the supervisor or administrator. Users can upload documents in Liferay and employees can use these as templates. That means that saving changes in these read-only documents automatically leads to saving new documents, which is somewhat inconvenient. SharePoint provides template creation by default so that users can initialize new documents by one click on the specific template, which can also be automatically saved on the portal itself. In SharePoint 2016 all users can create their own project sites and invite other project members to the site if the users have the necessary rights to create their own pages. IBM Connections also provides, by default, template creation and the function to decide with whom you want to share which content. The weighting of the identified requirements indicated that self-administration and template creation are of particular importance for the involved stakeholders.

Thus for this requirements group I would say that SharePoint 2016 and IBM Connections 6.0 are slightly better than Liferay Portal 7.0 and IBM WebSphere Portal.

### Usability

One of the selected vendors for IBM WebSphere portal says that the IBM portal solution is not as user-friendly as IBM’s pure collaboration tool as concerns the company’s requirements. The Liferay Portal 7.0 is better than IBM WebSphere portal for the other requirements within this requirement group, but SharePoint 2016 and IBM Connections 6.0 fit better for the end-user expectations of being a user-friendly working environment for non-technical employees. In the view of the pre-selected three vendors, SharePoint 2016 is the only solution which provides the required functions and automatic rule-based document saving on the portal after creating the document. However, further analysis indicates that IBM Connections Content Manager also meets these requirements by default.

Therefore, for this requirements group, SharePoint 2016 and IBM Connections 6.0 are more user-friendly for document sharing, collaboration and rule-based document saving than Liferay Portal 7.0 or IBM WebSphere Portal.

**To Do List**

As you can see, WebSphere is not suitable for “To-Do List” requirements. Meanwhile, for Liferay 7.0 the “Social Office” task portlet, which could fulfil some of the requirements in this group, is not currently compatible with this version. The requirement which would be met by “Social Office” is task assignment for employees. In addition to the function task assignment for employees, SharePoint 2016 also has the following functions: assign task to group, pass task, approve task, reject task, task reminder and task deadline reminder. Consequently, the task feature of SharePoint is very strong and is business-process orientated. Most of these functions are also provided by IBM Connections’ web-based “Activities” collaboration service by default. It is not said that these functions are impossible with “Social Office,” therefore you need to take time to implement these functions, while SharePoint 2016 delivers these functions as a default in their task app.

For this reason, SharePoint 2016 and IBM Connections 6.0 are the winners for this requirement group.

**Project Management**

None of the solutions examined are able to support project management processes adequately by default. IBM WebSphere Portal and IBM Connections do not support any project management processes. Liferay’s portal solution also has no portlet by default, but several companies have developed project management portlet which can be purchased. The vendor contacted for SharePoint 2016 also advises the company to consider Microsoft Project Server 2016, which is a better candidate for this requirement group. However, there exist add-ons in the market which support project management processes sufficiently within SharePoint 2016 as an extension to the task app. Several add-ons are also available for IBM Connections.

For this requirements group a clear winner cannot be selected at the moment.

**Social Interaction**

IBM WebSphere Portal does not fit well for any collaboration purposes. Without the “Social Office” portlet the expected level of collaboration is also not possible in Liferay 7.0. Some of the expected requirements remain unmet by default, and can only be achieved with some customization. Document multi-editing is still not possible with Liferay 7.0, but it is possible with SharePoint 2016 by default. Users can lock/unlock documents with Liferay’s and SharePoint’s default functionalities. The two aforementioned features are provided by IBM Connections only with the integration of the “IBM Docs” add-on. The workflow engine of SharePoint 2016 includes mail integration for sending notifications, tasks and significant changes. SharePoint 2016 also allows users to open tasks from email, which is delivered by this portal solution by default as in IBM Connections’ “Activities” add-on. The commenting function on documents and tasks is also provided in SharePoint and IBM Connections. The chat feature must be acquired from third-party vendors for SharePoint 2016 and IBM Connections, whereas Liferay’s “Social Office” portlet includes the chat function as a default. For this requirement it difficult to select a winner. On the one hand, Liferay’s “Social Office” portlet, IBM Connections 6.0 and SharePoint 2016 are on the same level in delivering a collaboration platform. On the other hand, for the current Liferay portal 7.0 version there is no compatible version of “Social

Office”, which necessitates additional customization work. Meanwhile, for SharePoint one needs a third-party vendor for the chat function, which has been ranked as highly important. As an outcome for this requirement group, given the current situation IBM Connections 6.0 and SharePoint 2016 are more suitable than IBM WebSphere or Liferay Portal 7.0.

Nevertheless, SharePoint 2016 is slightly ahead of IBM Connections 6.0 because of the function for document editing by multiple users at the same time and locking/unlocking of documents without buying extra add-ons.

### Remaining Features

Any of the features grouped together with the remaining features do not fit with the IBM WebSphere Portal. Microsoft product integration fits the best with SharePoint 2016 because both product lines come from Microsoft. With Liferay users can open and edit documents directly in the browser. On the IBM Connections portal, saved documents can be easily opened and edited and these changes are saved automatically on the portal. The group calendar feature is provided by Liferay and SharePoint by default and by IBM Connections only with the “OnTime” add-on. Features for generating statistics and reports are included in Liferay, IBM Connections and SharePoint as embedded web services. The visualisation of content in a dashboard is provided by SharePoint and Liferay, but it depends on the resources available for customization. For IBM Connections the company must buy the “Orient Me” add-on to have a dashboard.

Because of these results, Liferay portal 7.0, IBM Connections 6.0 and SharePoint 2016 are equally advantageous, whereas IBM WebSphere is again unsuitable.

The following visualisation summarizes the outcome of the advice which has been explained in the sections before. The plus symbol stands for fulfilled completely, the circle symbol for partially fulfilled and the minus symbol stands for not fulfilled per requirement group for the selected portal solutions.

Requirement Group	SharePoint 2016	Liferay Portal 7.0	IBM WebSphere Portal 9.0	IBM Connections 6.0
General Requirements	+	+	○	+
Usability	+	○	○	+
To Do List	+	-	-	+
Project Management	-	-	-	-
Social Interaction	+	-	-	+
Remaining features	+	+	-	+

TABLE 5.11: Advice Outcome Summarization

## 5.5 Recommendation

After identifying the requirements and contacting several vendors regarding the feasibility of the identified requirements for each pre-selected portal solution, it is possible now to render a final opinion. IBM WebSphere is not suitable for all of the requirements of this company. The current version of Liferay 7.0 is still error-prone and some features are missing which were available in previous versions, although they may be added to the current version of Liferay. IBM Connections is a good fit for the company. The selected winner among the four different portal solutions is IBM Connections because it is the most suitable portal solution, especially for the more highly rated requirements in the current situation. IBM Connections is very strong, as mentioned before, is no worse at meeting the company's expectations than SharePoint, for which one must purchase additional add-ons to meet certain requirements. On the other hand, for SharePoint 2016 it must be taken into consideration that the infrastructure within the company also needs to be upgraded before SharePoint 2016 could be properly configured, because some of the expected features are only possible after an upgrade to Microsoft Exchange Server and Microsoft Office products, which will also require time. To install an older version of SharePoint does not make sense in the long term because of the impending end of support services for the older SharePoint versions. This decision should be never seen as the final decision. IBM Connections fits the best at the moment. It is recommended that the selected vendors be contacted for opinions on the selected software. Further meetings should also help to clarify outstanding questions from the vendor side before they can send a cost estimate to DocMorris N.V. After this, it is very important to present these two different portal solutions to the key users and take their opinions into account before finally deciding on which portal solution to use, because they are the users who will work on the platform daily.

## Chapter 6

# Closing

The final chapter of this thesis states the project results, followed by a reflection on the project and on its future.

### 6.1 Results

The requirements for the planned portal solution were identified after analysing the current situation and were validated through interviews with the stakeholders. The requirements were then weighted with the help of two IT project managers. The identified and weighted requirements are presented in the appendixes. A full enterprise market analysis was then performed and three portal solutions were pre-selected based on product criteria. Vendors for the pre-selected portal solutions were then contacted for discussion of the feasibility of the requirements. The feedback of the vendors, or for Liferay the opinion of the internal software engineer, can be found in the appendixes. The vendors were very careful not to give any offer information because there had been no detailed conversations to obtain a clear picture of what the company wants. For this reason, only the cost calculation for acquiring the software license is presented. It is difficult to say how many project hours must be spent to initialize the new portal solution. Meanwhile, a new collaboration process for the two departments which use the current portal was designed and validated through interaction with the project managers. The main outcome of this project is the recommendation on the portal solution which is the best fit for the company, which is presented above. The recommendation is based on the vendors' opinion regarding how the selected portal solutions could meet these requirements.

### 6.2 Reflection

One of my faults was that I underestimated the amount of research needed for the portal solution decision. In general, the communication with the vendors took significantly longer than expected, so it might have been best to contact them earlier. The feedback session with the internal project managers went well and therefore I was able to improve my work steadily. Next time I would plan much more time for such situations. In writing this thesis I have recognized many things which I learned at the university and needed to apply, including a work breakdown structure, project plan, milestones, risk register and requirement management. I have learned how important it is to write down the requirements in as much detail as possible, and how exhausting it is not to prefer one portal solution from the start. I have also learned that it is not easy to find a portal solution with a good balance of being user-friendly and providing the expected solutions. With customization and enough money, any portal solution can be user-friendly and meet the company's

expectations. This is why I have concentrated on what will be delivered as default features.

## **6.3 Further Process**

This section outlines the next steps for the company to take.

### **6.3.1 Contact Vendors**

The vendor for the selected portal solution should be contacted and requests for further meetings must be made where they can present the portal solution to a broader audience. This will help all involved stakeholders get a vision of how the new portal solution will be designed and how the new collaboration processes will look.

### **6.3.2 Get Offers**

After the involved stakeholders have decided on one portal solution, they should again contact the vendors to obtain offers. Two forecasts should be provided by the vendors. The first cost estimate should be for the implementation effort and the second for the licensing and maintenance model.

### **6.3.3 Initialization Of Portal Solution**

Before the new portal solution can be introduced within the two departments, several things must be prepared. Mock-ups need to be presented to the vendors before the implementation starts, showing how the pages should look. Before launch, a written description of the file structure must be compiled so that all employees can later find the documents, provided that users adhere to the predefined file structure. Otherwise, standard site templates must be created, so that every site shared with other employees can be recognized by every user. It is recommended to launch the portal solution among smaller groups. It is very important to convince the key users of the benefits from the new portal solution. In some cases, employees have problems changing their behaviour. This is why it is important that they know about the advantages of the new portal solution. A user manual must be created to explain in brief how to use the platform. Screen recording would be also helpful in order to achieve this purpose. And internal user training must also be planned, during which the users have the opportunity to “play” with the new environment before the portal environment is changed.

## Appendix A

# Risk Register

The risk register can be found below. This risk register each risk contains information about the risk description, the bearer of the risk, likelihood of occurrence of the risk, severity of its effect, the status of the risk, mitigation of the risk and response actions.

Number	Risk Description	Owner	Likelihood Of	Severity of Effect	Mitigation Action
1	Scope: 1.1 Unclear formulation of expectations  1.2 Scope change/extension while research phase  1.3 Missing business process scenarios while identifying the scope	Project manager  Project team  Project manager	Low  Low  Low	High  Medium  Medium	Several interviews and meetings with the stakeholders will be planned where requirements will be worked out and formulated into a Requirement Specification Document In the Project Initialization Document it is written down what is in & out of the scope. How scope changes will be handled, is written down in the Requirement Specification Document Involvement of stakeholders
2	Costs forecasts are incorrect	Project manager	Low	Medium	The cost forecasts will be validated by stakeholders and the received cost estimation from vendors will be used as evidence
3	Stakeholders: 3.1 No information exchange with stakeholders on regular basis 3.2 Low quality of process input from stakeholders while meetings & interviews	Project team  Project team	Low  Low	Low  Medium	Contact company supervisor and explain the problem Formulate the questions more detailed and second interview with the stakeholders
4	Bad recommendation based on missing analysis elements	Project manager	Medium	High	Regular meeting with company supervisor to check if any elements are missing
5	Designed process does not solve the main problem	Project manager	Medium	High	Regular feedback session with stakeholders to adjust/ redesign the new process

FIGURE A.1: Risk Register(own illustration)

## Appendix B

# Enterprise Portal Research Outcome

### B.1 Oracle Corporation

In the blog “DZone/Java Zone” Kai Waehner published an article on 13 October 2011 about the advantages and disadvantages of using a portal. Waehner also talks about the disadvantages of the Oracle Portal. The platform has high acquisition costs, the complexity and the communication between Portlets is not implemented in a standard format so that one must have the custom proprietary solution. The advantages of the Oracle Portal are the full-stack suite for development, real support for the Application Development Framework (ADF) and the increasing efficiency if many products from one product line are chosen (Waehner, 2011).

Gartner, Inc. also describes the strengths and weaknesses of each portal. The weaknesses of Oracle cited by Gartner include the uncertain customer base; after the rapid shift to the cloud it became difficult for the customers to see the different integration strategies, benefits and portal offering prices. Oracle is a high-priced solution and typically the buyer ends up paying more than expected. The next weak point is that the development team in the company needs specialised skills for customising. For Oracle, Gartner states that the WebCenter Portal is among the stable portal solutions and that it is used in a wide variety of different approaches. Oracle is moving rapidly into the cloud to expand its cloud platform offerings, which support consistent management and integration between Oracle’s portal offerings, digital experience, middleware and business application portfolios. A further strength of Oracle is that they are successful with their portal strategy in terms of the overall customer experience strategy, and solidarity in the digital experience, which helps to deliver a powerful customer experience (Murphy et al., 2016).

### B.2 Salesforce.com

On the website SlideShare, Chuck Schaeffer, CEO at Vantive Media, published a presentation entitled “Salesforce Pros and Cons” on 5 December 2012. He states that one of the disadvantages of Salesforce is the private cloud solution which makes it impossible to transfer data if one changes providers. Another problem is the need to acquire separate products at additional costs, as well as multi-vendor management issues. A further disadvantage which he identifies is poor performance due to having fewer international data centres than their competitors. The last obstacle which he mentions is the absence of a Service Level Agreement for the cloud services if the

customer does not request it. He sees Salesforce's advantages in the software's life-time, increased payback for customers, a positive customer relationship, consumer-related user interface and the support for companies for cloud integration and cloud integration (Schaeffer, 2012).

The weaknesses of Salesforce are, first and foremost, the dependence on other Salesforce products for the Community Cloud's portal, the need to invest a significant amount of time for customization, and insufficient web content management. Gartner Inc. states that Salesforce's Community Cloud portal product has all the advantages of a cloud architecture, such as fast deployment of changes, improved security and high scalability. Users can create websites and apps suited to their needs with Salesforce tools. Salesforce offers mobile capability for portals, responsive websites and mobile apps (Murphy et al., 2016).

### **B.3 SAP SE**

In a blog entry published on 7 May 2013 at "Forrester," Stefan Ried listed the pro and contra arguments about SAP's portal solution Hana Cloud Portal (HCP). SAP's strength is the integration and compatibility of many SAP systems, which shows the high customer responsiveness of the vendor. SAP's enterprise portal, the SAP HCP, can be used instantly and is highly customizable. As a contra argument, he cites the license modelling of the Hana Enterprise Cloud, in which the user must buy Hana licenses; this could be seen as difficult because of the high costs for companies with a significant number of users and high data volume. Another contra argument is that the HCP solution only offers infrastructure-as-a-service (IaaS) and not software-as-a-service, and in this case again the license model forces the users to invest significant money. Another contra argument is that SAP is creating its own standards for cloud management and does not follow the same cloud standards as most other providers. As a pro argument, he stated the large customer base and the understanding of customer needs as part of this cloud portal solution. Another pro argument is the possibility to run any SAP application on the Hana cloud and connection to the Hana database, which allows the customer to work within the same environment as before. It is also possible to run applications which are not related to SAP's Business Suite. Consequently, SAP is recognised as a platform vendor. One of the main strengths is the real-time data access from the SAP ERP and other data sources (Ried, 2013).

According to Gartner Inc. SAP's weaknesses are that its portal solution is offered to customers who already use SAP software, its weak content management capabilities and frustrated customer base. The Gartner Inc. article states that SAP has created a link between SAP Fiori and SAP enterprise portal. SAP Fiori is a user interface which represents a collection of SAP applications which can be used device-independently by users. In other words, SAP Fiori is not an application which needs to be installed on a device. Therefore it will run on any browser which is HTML5 compatible (Murphy et al., 2016).

### **B.4 IBM**

Gartner Inc. states that the disadvantages of IBM's WebSphere Portal are the high costs for the portal solution, less flexibility for companies which want to have a simple portal solution and the need for Java Enterprise experts if customization is

desired. IBM's WebSphere Portal's advantages include its stable and high performance, which shows continuous improvements based on user experiences and feedback. IBM offers business-driven and customer-friendly portal solutions and they are the first vendors to use smart machine capabilities in a portal solution (Murphy et al., 2016).

## B.5 Microsoft Corporation

In the article "12 SharePoint Pros and Cons," published on the website "Brandon-gaille.com" on 26 June 2015, Brandon Gaille describes the advantages and disadvantages of SharePoint. He says that SharePoint's weaknesses are mainly general customization problems, in particular for the search options and extensive user training. A further issue is that one must contact a third party to solve problems because there is no public website for customization support, usage of existing apps is difficult, and there is a need for a massive deployment environment if one wants to use all the functions of SharePoint. He sees SharePoint's strengths in its multi-accessibility from any device, mobile access features, social networking, Microsoft Office integration and better security options than in the past (Gaile, 2015).

Microsoft's SharePoint is available as an on-premises server application and as a cloud-based online platform. According to Gartner Inc., the main weakness of Microsoft's SharePoint is that it will be not ready to use for the high-end customer and special use cases, meaning that there is a need for customization, connection with Microsoft partners and supporting software. Another disadvantage is the need for third-party tools, enhancements and solutions which must be implemented in SharePoint for proper usage suited to the company. The cloud-based solution is less customizable than the on-site version. Gartner Inc. states that SharePoint's strengths include delivering a suitable portal solution for customers who have had problems in the past with complex portal offerings, the possibility to integrate other Microsoft applications, low acquisition costs and user-friendly interface (Murphy et al., 2016).

## B.6 Liferay, Inc.

On the website "trustradius" Varun Shah, a Software Engineer at MedImpact health-care System, Inc. published an article on 21 August 2014 with feedback concerning Liferay. As disadvantages of Liferay Portal, he mentions weak security, the lack of auto-login, fewer configuration opportunities and the absence of a virus scan for uploads (Shah, 2014).

On the website "TheServerSide" Vivek Agarwal published an article in March 2012 on the benefits of Liferay. There he wrote that Liferay has the lowest total cost of ownership (TCO). Other advantages are its out-of-the-box functionalities, improved business agility, and open-source nature, which supports independence in the choice of technologies to create the portal. Another advantage is the growing Liferay community (Agarwal, 2012).

Gartner states that Liferay is behind some of the leaders in the competition for web content development, despite improving their coverage in portal technologies every year. The open-source edition of Liferay is only a good alternative for highly skilled software development teams. According to Gartner, the advantages of Liferay include its solid performance, the fact that the portal solution was developed independently and without any support or features from other companies, and that Liferay has partnership program and development teams (Murphy et al., 2016).



## Appendix C

# Decision Criteria Outcome

The following sections describe the outcome from the enterprise portal analysis brief summary for each decision criteria, as well as a brief summary of why some products are present in the narrow selection and, finally, the next steps to be taken after the portal solution software has been selected.

### Portal Solution:

After sorting the experience of IT specialists and users into pros and cons, we reached the decision that SharePoint, Liferay and WebSphere fulfil the functions that a portal solution should fulfil. For example, the portal SAP Hana Cloud Portal solution has no content management features, as mentioned above. Oracle's WebCenter Portal has a solid portal solution, but it is still behind the SharePoint, Liferay and WebSphere portals. Finally, the Salesforce portal solution also has insufficient web content management.

### Customization:

Every portal has its difficulties in this category. One needs real experts for customization, but it is not impossible. Salesforce is in a lower position in this category than the others because one must buy extra Salesforce products with additional customization resources.

### Performance:

Because of real-time access to data through the SAP Hana Cloud Portal on the SAP ERP, other data sources place it at the leading position among the vendors in this category. In contrast, Salesforce's performance is poorer because of the access to the data from international data centres. Liferay's and Oracle WebCenter's performance is solid. SharePoint is slightly better than Liferay and WebCenter. IBM's WebSphere Portal is also a high-performance portal solution.

### Operator Model:

In total we have identified three different operator models. These are on-site, software as a service (SaaS) and infrastructure as a service (IaaS). On-site means that the application, in our case the platform, is installed and runs on the servers of the company. SaaS delivers applications via the web and these are managed by the vendor. Therefore the customers access their service through an interface. Microsoft, Liferay, Oracle and IBM have on-site portal solutions. Microsoft, Oracle and IBM also offer SaaS portal solutions. Salesforce offers only SaaS portal solutions, and SAP offers only IaaS solutions.

### Customer Support:

On the one hand, Oracle's customer base seems to be satisfied, which could be the

result of their customer experience strategy. However, on the other hand the customers seem to be confused by different offerings for the two different operating models because the fast move to the cloud resulted in neglecting on-site customer support. Microsoft has its own support page for SharePoint, but there is no public website for customization problems. Liferay also has a public website for support where the software developer writes its solution possibilities, but if any bugs are detected it takes a while before these are fixed and the fixes are released on their page. Salesforce's private cloud solution does not allow customers to transfer data into someone else's cloud. Salesforce does not provide SLAs unless they are requested. IBM listens to their customers' feedback so that they can improve to deliver stable and high-performance portal solutions. SAP Hana Cloud Portal customers seems to be frustrated with poor content management capabilities and the license model of SAP Hana.

#### Costs and Conditions:

The high acquisition cost of Oracle's WebCenter Portal solution and the fact that one cannot use the delivered standard portal solution. The buyers pays more than expected, as mentioned above. The standard solution of Microsoft is not expensive but is not ready to use as is, so experts in this field must be engaged to build the SharePoint portal. Customization is also expensive. Liferay has the lowest TCO, and for the low amount of money invested, there are many benefits, including out-of-the-box functionalities and the open-source platform. Salesforce portal solution also forces you to buy additional products and in return one gets less web content management. IBM's WebSphere Portal solution is very expensive but one gets a stable and high-performance portal solution. For WebSphere Portal solution a company must have a Java expert on its development team. For the SAP HCP solution one must first buy the service and then invest a significant additional amount of money to integrate all services needed, which could become very expensive for a larger company due to the number of users.

## Appendix D

# Enterprise Portal Software And Hardware Requirements

### D.1 Microsoft SharePoint 2016

SharePoint 2016 is the newest version of Microsoft's portal solution. The following sections briefly describe the hardware and software requirements and the acquisition cost for the SharePoint environment.

#### D.1.1 Hardware And Software Requirements

The necessary information for the hardware and software requirements has been taken from Microsoft's Technical Support site, where this information is briefly described. The minimum requirements are 16 GB RAM, 64-Bit 4-Process core, 80 GB system driver and 100 GB for the second system driver. SharePoint 2016 must be installed on Windows Server 2012 R2 or above.

As minimum software requirements, the site first specifies the Microsoft SQL Server 2014 64-bit or above as the database server. SharePoint 2016 automatically installs several components, such as web server roles, Microsoft .NET framework and ODBC drivers. As the minimum client-based browser application, the recommendations are Internet Explorer 10 and above and the current versions of Google Chrome, Mozilla Firefox and Apple Safari. Another optional minimum requirement for the software which is used in the company is Office 365 or Microsoft Office 2016 (TechNA, 2017).

#### D.1.2 Acquiring Costs

Licensing requirements are for (SoftA, 2017):

- Windows Server 2012 R2 or Windows Server 2016
- SQL Server 2014 SP1 or SQL Server 2016
- SharePoint Server 2016 License
- SharePoint Server 2016 Client Access License

The following information on the prices was collected from the website "Software Express" (SoftA, 2017):

- One SharePoint Server 2016 License costs 12105 EUR, including software assurance
- One SharePoint 2016 Standard Client Access License costs 112 EUR

- One SharePoint 2016 Enterprise Client Access License costs 128 EUR, which must be purchased in addition to the SharePoint 2016 Standard Client Access License
- One SQL Standard Server 2016 costs 1609 EUR
- One Windows Server 2016 costs 773 EUR
- One Windows Server Client Access License costs 46 EUR

## D.2 Liferay Portal CE 7.0

Liferay Portal Community Edition 7.0 is the newest version from Liferay's portal solution. As like before the following sections will describe a little the hardware and software requirements and the acquiring cost for Liferay Portal CE 7.0.

### D.2.1 Hardware And Software Requirements

For Liferay Portal CE 7.0 deployment can run Linux based system or on Windows systems. The suitable application servers are for example JBoss EAP, Tomcat and Wildfly. The database for saving the documents can be chosen for example from MySQL, Oracle or PostgreSQL. The scripting language can be selected from Java, Groovy, Ruby, Python and Scala (Life2017, 2017). Full details on the technical specifications can be found on "<https://www.liferay.com/de/product/tech-specs>". According to the forum entry while releasing Liferay CE 7.0 for the first time, they have tested extensively for application servers Apache Tomcat 8.0 and Wildfly 10.0 and both with Java 8. And for the database MySQL 5.6, PostgreSQL 9.3 has been tested extensively. Additional through downloading the tomcat bundle it was found out, that 1 GB hard drive space and 1,5 GB RAM to deploy Liferay 7.0 on the Windows 7 32-bit machine with JDK 8 (Sammons, 2016).

### D.2.2 Acquiring Costs

The Liferay 7.0 Community Edition itself does not cost money but to run the Liferay portal on a server so that every user within an organization have access to that Liferay portal and a database where data can be saved, that costs. Unfortunately I was not able to collect the information on the running costs for the used platform because the server where Liferay runs is also used for other applications which makes it difficult to calculate the running cost only for Liferay 7.0.

## D.3 IBM WebSphere Portal 9.0

IBM WebSphere Portal 9.0 is the newest version from IBM in delivering portal solutions. As like before the following sections will describe the hardware requirements, software requirements and acquiring costs briefly.

### D.3.1 Hardware And Software Requirements

Through the published documentation by IBM for IBM WebSphere Portal 9.0 it was possible to find the requirements on the hardware and software. IBM WebSphere Portal 9.0 can run on Linux based and Windows systems. Especially for Windows

systems, minimum requirement operating system is Windows 8.1 Standard and for Windows Server the minimum requirement is Windows Server 2012 R2. At minimum 8 GB disk drive space is necessary for the installation of the IBM WebSphere Portal 9.0 and for an optimal performance 8 GB RAM is required. For the databases, the minimum requirements are Apache Derby 10.11, Microsoft SQL Server 2014 or Oracle Database 12.1. The minimum requirement for the supported Browsers are Microsoft Edge 25, Apple's Safari 10, Mozilla Firefox 49 and Google Chrome 52 (IBMa, 2017).

Full details can be found on "<https://www.ibm.com/software/reports/compatibility/clarity-reports/report/html/softwareReqsForProduct?deliverableId=E9A07E60537411E6865BC3F213DB63F7&osPlatform=Windows>".

### D.3.2 Acquiring Costs

Unfortunately it is not possible to determine approximately the acquisition cost per every user license or server. To mention the acquisition cost IBM's customer support has been contacted, but until now they have not responded.

## D.4 IBM Connections 6.0

IBM Connections 6.0 is the collaborative tool from IBM and this tool is recommended by the contacted vendor as already mentioned before.

### Hardware And Software Requirements

The necessary information has been found out through the published document about the system requirements on the official IBM's support page. IBM Connections can be accessed with a minimum requirement of Windows 7 Professional, Linux Client 7 or Mac Sierra 10.12 as operating systems for Desktop PCs. Additionally, it can be accessed on the Windows server with a minimum standard of Windows Server 2012 R2. Another important system requirement is the WebSphere Application Server Network Deployment 8.5.5.10 definitely. Further hardware requirements for the installation and for optimistic performance are nearly 100 GB of driver space is needed to cover all the features of IBM Connections inclusive installation of IBM Connections and IBM WebSphere Application Server. After the installation & configuration each system needs additional 100 GB. At the same time for the application itself 8-16 GB memory and for the database 8 GB memory is needed. Under minimum supported software for database selection are Microsoft SQL 2016, DB2 Enterprise Server Edition 11.1.0 and Oracle Database 12.1 listed (IBMb, 2017).

Full details on the minimum required hardware and software can be found on <https://www.ibm.com/software/reports/compatibility/clarity-reports/report/html/softwareReqsForProduct?deliverableId=670DD6B085AF11E6A66B8253C435768F>

### Acquiring Costs

On the website software-express the license cost per each user for the on-site version has been published. There it is said that each software license costs 165 EUR (SoftB, 2017).



## Appendix E

# New Collaboration Process For Customer Service

### E.1 Business Process Modelling

In the diagram one can see that it begins with the news sent by the Marketing Department with a marketing advertisement to the team leader. The team leader receives the information. After that, he creates the announcement on the portal and attaches the marketing advertisement document to the announcement. He then initiates the publishing process. Therefore he needs to select the readership members. This is why the next gateway is an exclusive gateway; it depends on which readership he has selected. Three options are available: publishing the content only to internal staff members, or only to external staff members or to all Customer Service employees. The last options mentioned here lead to a parallel gateway which indicates the internal and external staff members. The following steps are described in the next two sections.

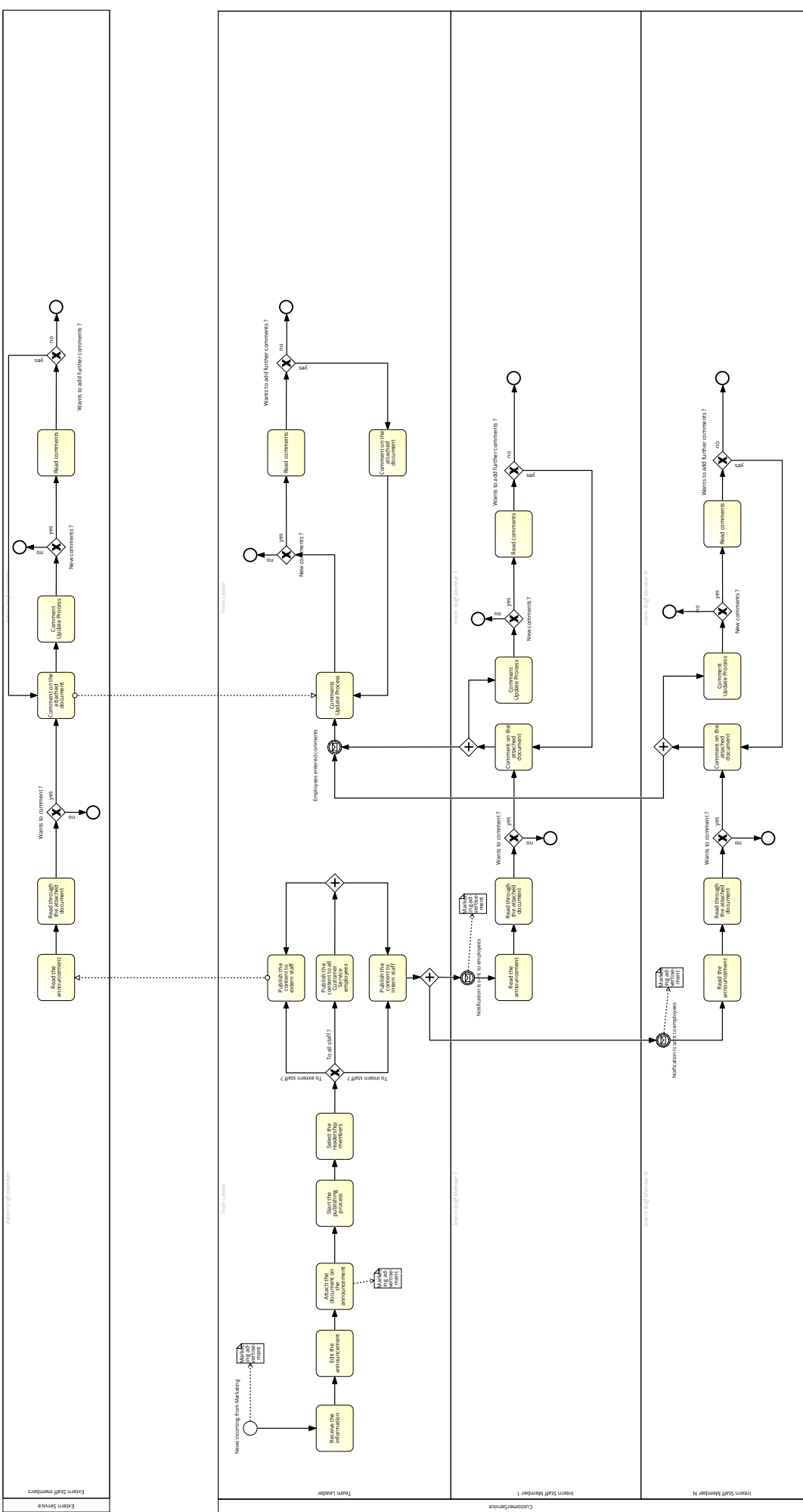
Following the internal staff member lanes, there are two lanes which are equal and have the names Intern Staff Member 1 and Intern Staff Member N. This structure indicates that these activities are the same for all internal employees. The internal staff member receives the notification that the team leader has published an entry. Then the employee is able to read the announcement and the attached document. If he does not want to comment, then the process ends for the employee. However, if he decides to comment, the “Comment Update Process” starts. After this, if any new comments are available, he may read the further comments posted by his colleagues and can decide whether he wants to comment on these or not. If not, the process ends for him. If he wants to add further comments to the entry, the process begins again at “Comment on the attached document.”

Following the external staff members pool the external staff members have their own pool because some of the external service employees also work for other companies. The external staff is also sent notification that an entry has been published and reads the announcement. The employee then reads through the attached document. If he does not want to comment on the announcement or on the attached document the process ends here. If he wants to comment on it, then he does so. After this, the comment update process begins. If there are no further comments the process ends here. If there are new comments the external staff member reads the comment. If he wants to reply on the comment the activity starts again at “Comment on the attached document.” If he does not want to comment, then the process ends here for him.

The team leader is also notified after an employee writes a comment on his published content. If there are no new comments detected after the comments update process the process ends for him. If there are new comments, the team leader reads

the comments and can decide whether he wants to comment or not. The process ends here if he does not add new comments to it. If he does wish to comment, then the “Comment Update Process” starts again so that the employees are notified of the new comments.

# CustomerServiceNewCollaboration





## Appendix F

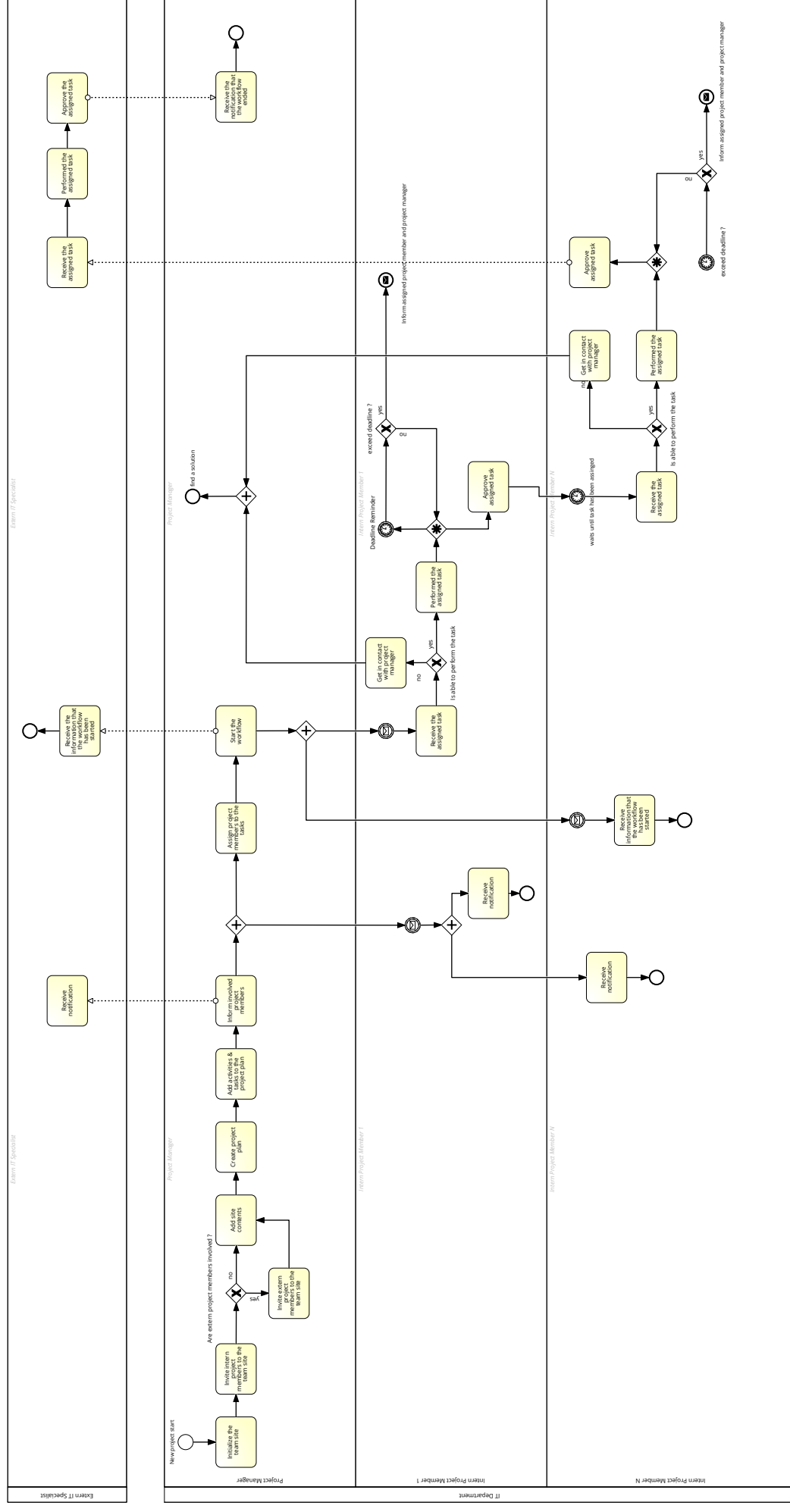
# New Collaboration Process IT Project Management

### F.1 Business Process Modelling

The diagram begins with an initialization of the new project. The project manager initializes the team site and first invites the internal project members to the team site. The next gateway is an exclusive gateway which states which activity will follow. If external employees are to be included in the project, then they are invited to the team site. This activity is followed by adding site contents to the team site. The project manager then creates the project plan and adds activities and tasks. Then he starts the activity, which informs the project members. A parallel gateway then follows. At the time the project members receive the notification, the project manager assigns tasks to them. When finished assigning the tasks, he starts the work flow. Again the employees involved receive notification that a work flow has been started. The ensuing steps are described in the next two sections.

At first on the internal project member lanes one can see that there are two lanes which are nearly equal and are called Intern Project Member 1 and Intern Project Member N. The internal project member receives the assigned task. This activity is followed by the exclusive gateway, which offers the possibility of accepting or declining the assigned task. If the employee is not able to perform the assigned task, he contacts the project manager, who then tries to find a suitable solution for the problem. If the employee is able to perform the task, then he starts his work. This activity is followed by a complex gateway. While the employee is working, the deadline reminder runs in the background and checks the assigned deadline for the task. If the deadline has been exceeded, then the assigned project member and the project manager are notified. After Internal Project Member 1 finishes the assigned task and the task is approved, Internal Project Member N receives the task assigned to him. From here, the procedure follows that for Project Member 1.

As mentioned above, if an external IT specialist is involved in the project, he is also notified when he has to perform his task. This takes place here after Internal Project Member N approves his assigned task. After the external IT specialist finishes the task, he also approves the task. Finally the project member is notified that the work flow has ended and the process ends here.



## Appendix G

# Feasibility Of Requirements - Liferay 7.0

### General Requirements

The core functionalities which a portal should have for document management, including document saving, wikis, newsfeed and blogs, can be added and used even by a non-IT-specialist out-of-the-box. However, the currently used E-Learning tool is not compatible with the current version of Liferay. Document revision safety is also provided with Liferay Portal 7.0. After the upgrade, file corruption problems occurred, which led to low quality in Liferay Portal's saving of data. The function traceability is also provided by default in the Liferay Portal. One can upload templates on the Liferay portal, but it needs to be checked later in order to use it for one's own purposes and then upload it as a normal document on the Liferay portal. Consequently, one-click document creation based on the selected template is not possible. The Liferay portal has an availability of 99% and the system must be shut down if any upgrades to the Liferay portal are to be executed. Self-administration is also possible with the current Liferay portal solution, but with several restrictions. Certain users and administrators can be authorized to see all private and public pages while the general users see only the public pages and their own private pages. A user may not decide himself with whom to share the content. He must instead contact the administrators or the authorized user to grant that particular person authorization to see that page. The role concept requirement is fulfilled completely because only the assigned employee has access to the specific sites. Liferay is a content management system which has extensive out-of-the-box functionalities to support content management. Liferay portal's front-end can be easily customized, but the back-end is also customizable, although this is more complex. Liferay guarantees users high security standards.

### Usability

The Liferay Portal 7.0 is not as user-friendly as one might expect from a portal which connects people and work. Liferay Portal has a faceted search method which supports the user by looking for a specific document. Liferay allows the users to navigate through the sidebar menu, but it is also restricted, which leads once again to the fact of not delivering a user-friendly default portal solution. With Liferay Portal 7.0 Community Edition, it is not possible to save documents automatically fitted to the metadata. With Liferay Portal one can set the language of the interface to the preferred language. Using Active Directory, which is a directory service from Microsoft, it is possible to log in with your Windows Log-in data from the work PC.

**To Do's**

The task portlet "Social Office" could fulfil some of the requirements under the "To-Do" list category, but the current Liferay Portal 7.0 version is not compatible with the "Social Office" task portlet. With Social Office it is possible to assign tasks for employees, but the default capabilities do not include group tasks, setting deadlines, deadline reminders or reassigning tasks to another employee. However, this can be implemented with the necessary resources. "Social Office" also has further functions to support collaboration, these are not addressed here because of concentrating on the results for the requirements in this chapter.

**Project Management**

Liferay has no portlets to support any project management processes by default. Of course there are some portlets which have been developed by companies to support project management, but money must be spent to purchase these.

**Social Interaction**

The requirement that several users can work on one document at the same time is not supported by Liferay Portal 7.0. Automated mail sending is not part of the task portlet, but the portlet can be modified such that the users are informed about the significant changes, notifications and tasks via their mail account. The comment function for documents is not possible with the current version, because of the lacking compatibility with "Social Office." The same problem applies to the chat feature available in the "Social Office" task portlet.

**Remaining Features**

It is possible to work on Microsoft Office documents directly on the browser and save them later in the document library where they become visible for all involved employees. The desired calendar feature is not available for the current Liferay Portal 7.0 version. To generate statistics, it is recommended to have a connection to the external report tool IBM Cognos, which is already in use within the company. A dashboard representation of the content on the portal is provided by default in the Liferay Portal. Liferay Portal has no tracking system portal, but does have the possibility to embed issue-tracking tools such as Jira.

The performance of the Liferay portal is solid at the moment, but it could be increased by using better hardware.

FIGURE G.1: Feasibility Of Requirements - Liferay 7.0 (Internal Software Engineer)



## Appendix H

# Feasibility Of Requirements - Microsoft SharePoint 2016

### General Requirements

The SharePoint 2016 on-site version provides most functions as a default that were indicated as general requirements. Every portal solution has the intention of being used for total information flow, and SharePoint 2016 is therefore a good fit, and the solution which shown by the vendors confirms this. SharePoint's version history for specific documents helps track the activities performed on the document. Within Microsoft Office documents it is possible to see recent changes made with the help of the review and tracking function. To avoid data errors on the portal, the vendors recommend adding another SharePoint 2016 default server where parallel copies of SharePoint entries are stored. With SharePoint's content types, the users are able to create templates and save them into groups, from which the other employees are able to use this as a template. As before, via VPN connections the employees can perform activities on the portal within the company network. SharePoint has a default function to decide with whom you want to share content and also which content is shown to which user group. Therefore, the roles and rights needs to be established with care. Employees are thus able to manage the content themselves. This should be not a problem with the correct user training for SharePoint 2016.

### Usability

SharePoint provides a user-friendly default interface. It also provides a search function as a default whereby a user can look up a document by typing one of the relevant data entries such as document name, document owner, department and so on. SharePoint 2016 also allows navigating with the sidebar, which is delivered as default function. The Content Organizer feature allows routing of documents to the target locations based on set content types and rules for the document. SharePoint has a default feature to change the language of the SharePoint labels to the preferred language. With a combination of SharePoint and Single Sign-On it is possible to be connected with the system without any extra log-in.

### To Do's

All the requirements for the To-Do List are delivered in SharePoint as default. The task feature of SharePoint is very strong. One can create a task list by adding the web-based task app out-of-the-box. One can then see, create, perform, approve, pass, reject and delete the tasks after being invited by the site developer. It is also possible to set deadlines and task reminder dates for the tasks. Finally, the user can also see the recent status of the tasks for all project members.

### Project Management

The default SharePoint 2016 is not the best solution to support project management. There are add-ons for SharePoint on the market which could be bought and which fulfil the project management requirements such as resource management. Even the vendor advises to look at Microsoft Project Server 2016, which could better fulfil these requirements.

**Social Interaction**

With an upgrade of the current Microsoft Office products, it is possible for multiple users to edit the documents at the same time. The Check-in/Check-out functionality which is delivered in SharePoint by default allow users to lock/unlock the documents. The Workflow Engine 2013 has mail integration feature which makes it possible to receive notifications, changes and task assignment information via the linked mail account. The default task notification mail template has a link directly to the task so that the users can open the assigned task and the attached document through the email message. The comment function is also supported by SharePoint's Workflow 2013. The chat feature must be acquired from third-party vendors because there is no default function for this feature. The vendors propose integrating the software "Skype for Business." The problem here is that the company already uses two communication tools which cover most of the "Skype for Business" functions.

**Remaining Features**

With SharePoint's document client library sync feature it is possible to upload, download, create, edit and delete documents from the desktop and the changes are automatically visible on the portal. SharePoint 2016 also offers a group calendar function as a default where the group members can subscribe to information about upcoming events. Web parts can also be integrated into SharePoint 2016 to perform tracking activities and generate statistics which can be shown in a dashboard.

The performance of SharePoint 2016 also depends on the hardware infrastructure.

(Vendor A)



## Appendix I

# Feasibility Of Requirements - IBM Portal Solutions

### I.1 IBM WebSphere Portal 9.0

#### General Requirements

The IBM WebSphere Portal can be used for document management. Wikis and blogs are available by default within IBM WebSphere. However, WebSphere Portal cannot be used as an e-learning platform. The WebSphere Portal is able to save the data faultlessly on the server. With IBM WebSphere Portal it is not possible to create document templates. IBM WebSphere-based products can be configured such that they are easily available. The role concept is implemented by personalization rules on the WebSphere Portal so that the administrator can decide which user group has access to which content. The WebSphere Portal allows users to create and set the position of the content, but it is not possible to decide with whom you want to share which content.

#### Usability

IBM WebSphere is not as user-friendly as IBM's collaboration too, IBM Connections. The search function exists in IBM WebSphere Portal because it supports file content indexing. Rule-based document saving is not possible with the IBM WebSphere default portal solution. The WebSphere portal solution is also available in three languages so that employees can work in their preferred language. One can automatically connect to the portal through the "SPNEGO mechanism," which must be integrated in the IBM WebSphere portal. To fulfil any tracking feature requirements, it is advisable to integrate existing software such as Atlassian Jira in the IBM WebSphere Portal.

#### To Do's

The grouped "To Do List" requirements are not fulfilled by the IBM WebSphere Portal. The vendor recommends for this case, especially for user task interaction, IBM's collaboration software, IBM Connections.

#### Project Management

IBM WebSphere Portal is not suitable to support any project management processes in the opinion of the vendor.

#### Social Interaction

There are add-ons on the market which support multi-editing and document locking/unlocking, but these add-ons are not for IBM Websphere Portal, but rather for IBM Connections. This is also the case for mail integration and for the chat function.

IBM Connections is thus more suitable than the IBM WebSphere Portal.

### **Remaining Features**

To fulfil any tracking feature requirements it is advisable to integrate existing software, e.g. Atlassian Jira in the IBM WebSphere Portal. Again, further requirements can be fulfilled by IBM Connections better than by IBM WebSphere portal.

IBM WebSphere is powerful in delivering high-performance solutions, but even here a better hardware infrastructure could lead to higher performance.

## **I.2 IBM Connections 6.0**

### **General Requirements**

IBM Connections provides wikis and blogs as a default, but it does not have an e-learning platform. Document revision safety is also included by default. Not by default, but with the support of add-ons, IBM Connections can track activities for the specific work item. IBM Connections can save data faultlessly on the portal. There is a feature available by default to assign several users various rights to access sensitive content by creating community groups. By default the user can create templates for others to use to initialize documents and even to create community templates help sites. The collaboration tool can be configured to have 99% availability. IBM Connections can be linked with the Active Directory service so that only actions within the company network can be performed. IBM Connections supports the expected function to share content with designated users, and external employees involved in project can be invited to a separate community site. Users can also change the position of the content on the portal. The requirement for easy maintenance by internal staff members can be met through an add-on.

### **Usability**

In the vendor's opinion IBM Connections is very user-friendly. An integrated functionality recommends entries that might be of interest to the user on the portal. The required search feature is also available in IBM Connections. The "TagButler" feature and IBM Connections Content Manager meet the requirement for saving the documents based on rules automatically on the portal. Setting the language to the preferred language is a default functionality in IBM Connections. The expected feature that the users are connected to the portal side without extra log-in is provided by integrating Single Sign-on in IBM Connections. IBM Connections itself is not a tracking tool, but it is possible to integrate Atlassian Jira into IBM Connections.

### **To Do's**

IBM Connections' "Activities" feature fulfils many of these requirements. With the web-based "Activities" collaboration service it is possible to assign tasks to specific employees, pass the assigned task to another employee, check the task status and assign tasks to multiple persons. Furthermore, it is possible to set dates for the tasks and the portal interface shows users the outstanding tasks. However, group tasks are not provided by default.

### **Project Management**

IBM Connections is not suitable to support any project management processes.

**Social Interaction**

The add-on “IBM Docs” for IBM Connections enables several users to edit one document at the same time. With this add-on users can also lock/unlock documents if necessary. IBM Verse, a web-based mail client, can be integrated with IBM Connections so that the users are informed by email about changes, notifications and tasks. The desired function of opening the task activity through a received message can be provided with the “Activities” add-on. With IBM Connections users can write comments on uploaded files and activities performed. There are several ways to chat within the IBM Connections portal but these are not delivered by default with IBM Connections. IBM Sametime chat or the Cisco suite can be integrated with IBM Connections.

**Remaining Feature**

With a link between IBM Connections and the Microsoft Office suite users can upload, download, edit and delete Office documents, and these changes are automatically saved in IBM Connections and the change is available to all users who have access to the document. Not by default, but with an extension of the “OnTime” add-on, it is possible to have a group calendar and see the upcoming events. With the integration of Cognos or Kudos Analytics users can generate various reports with data for different user groups. The desired dashboard feature is provided by the integrated “Orient Me” feature in IBM Connections.

Req ID	Req Description	Business Process	Impact	Priority	Feasibility	Notes
<b>General</b>						
1	General information content	The system shall provide access to the same level of information	It should be used for document management, also being used for other purposes	Functional	Not Done	Not Done
2	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
3	Transparency	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
4	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
5	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
6	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
7	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
8	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
9	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
10	Document metadata	The system shall allow users to view the metadata of documents in the system	Document management	Functional	Not Done	Not Done
<b>Security</b>						
11	Authentication	The system shall allow users to authenticate themselves	Authentication	Functional	Not Done	Not Done
12	Authorization	The system shall allow users to authorize themselves	Authorization	Functional	Not Done	Not Done
13	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done
14	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done
15	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done
16	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done
17	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done
18	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done
19	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done
20	Account management	The system shall allow users to manage their accounts	Account management	Functional	Not Done	Not Done

FIGURE I.1: Feasibility Of Requirements - IBM WebSphere Portal 9.0 (Vendor B)

## Appendix J

# SWOT Analysis

SWOT stands for Strengths – Weaknesses – Opportunities – Threats.

A SWOT analysis is used for strategic planning. Opportunities are possibilities which can be used to improve the current product. These opportunities may be threatened by product offers from several competitors. If the threats are weighted as more venturous, then corrective actions must be taken. And these counteractions must be adjusted based on internal strengths and weaknesses. SWOT analysis is used for the whole company to identify possible improvements in business activities. In this case, however, I have reduced it to my needs, and I concentrate on the current usage of the Liferay portal within the departments. It is important to analyse opportunities and threats in depth to gain an understanding of one's own strengths and weaknesses. The goal of the SWOT analysis is to decide which of the selected powers will be used to realise the opportunities. After that, suitable techniques, budgeting and other methods are used as a preparation for the realisation. It is also recommended that a transformation from weaknesses to strengths and from threats to opportunities be performed. It is important to do the SWOT analysis before coming to a decision and not the other way round (WikiE, 2017). With the answers from the SWOT analysis, the task is to develop a SWOT Matrix to sort the results in the four areas. After the SWOT analysis, one can identify the requirements for the enterprise portal project. It is important to define which product strategy needs to be followed by determining the requirements and techniques such as SWOT analysis can help with this (Ebert, 2014).

Below is a visualisation of the SWOT matrix regarding how the employee thinks about the current Liferay implementation. This information was collected through interviews.

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>•Documents storage</li> <li>•Revision history &amp; Revision security</li> <li>•Open Source</li> <li>•Filter function/ tagging</li> <li>•Standardised communication/ Information low</li> <li>•Coded in established programming language</li> </ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>•Missing traceability</li> <li>•No intuitive operations possible/ not user friendly</li> <li>•Compatibility problems after upgrade</li> <li>•Missing documents after upgrade</li> <li>•Error-prone → less trustworthy</li> <li>•No "back-to-last side" - button</li> <li>•Confusing folder structure</li> <li>•Bad readable thumbnail view of pdf</li> <li>•No fast support from the vendor</li> <li>•Bad performance</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>•Self-customizing</li> <li>•Dashboard</li> <li>•Outlook integration</li> <li>•Resources planning</li> <li>•Calendar</li> <li>•Intern chat</li> <li>•Microsoft Office integration</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>•competition</li> <li>•missing content development resources</li> <li>•less experience with Liferay</li> </ul>

---

FIGURE J.1: SWOT Analysis Outcome(own illustration)

## J.1 Strengths

The employees use the current portal mainly as a document storage platform, which works well. Using the current Liferay portal solution, users are able to upload or download different version of the documents. The users like the revision security function which the Liferay portal offers. Another benefit is that the current version of Liferay is free. The implemented version of Liferay also has a "tagging" feature so that employees can mark the document with a tag and others can find the text by searching for the name of the tag. The Liferay portal helps provide for standardised communication within the department. The developer states that the Liferay portal is coded in a popular programming language, i.e. Java.

## **J.2 Weaknesses**

The employees face problems with the current implementation of the Liferay portal. There is no user-friendly overview in the current portal. Operation is also not intuitive for most of the employees using the portal. For example, there is no “back to the last side” or “back to home” button in the portal. Other examples are the complex folder structure and the difficult-to-read thumbnail view. The most unfortunate situation happened when the Liferay portal needed to be upgraded. After the update, several problems occurred. These were compatibility issues, missing documents and document versions, which led to a less trustworthy portal in the eyes of the users.

## **J.3 Opportunities**

Through the interviews, I discovered several features that users would like to have to improve their daily business, including a self-customizing feature in which employees can choose the portal layout themselves. Another feature which was desired is a dashboard function to give employees an overview of their tasks, statistics and current status of the project on which they are working. Outlook and Microsoft Office integration are also desirable for the employees. Another function is internal chat, which would help with faster exchange of information within the department or organization.

## **J.4 Threats**

The biggest threat to Liferay is the portal solution SharePoint from Microsoft. SharePoint is also one of the leading portal solutions for companies. SharePoint has features such as project management tools, reporting tools, workflows and tasks, which make it easier to use. Some employees also have previous experience with SharePoint.

## **J.5 Look into the future**

If we look one step ahead of the current situation, we must ask ourselves what will happen if Liferay is no longer open-source. Having no licensing also means limited or no support if problems occur. And the performance influence factor must be taken into consideration for open-source tools.



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