Guiding Product Developers to Software Tool Education

Current state analysis, user study and concept development for course guidance

Master's thesis in Product Development

JONAS BLOMQVIST
ALEXANDER JOHANSSON

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ALEXANDER JOHANSSON
Department of Industrial and Materials Science
Division of Product Development
Chalmers University of Technology

Abstract

Due to an increasing complexity of the product development processes at Volvo Cars, where development is iterative with interdependencies of upstream and downstream consumers of product data. It is important to ensure the quality of the product data and to create and use it efficiently. One way of ensuring this is through education. Hence, this study has investigated the software course needs of developers and how developers can be guided to courses in order to ensure quality of product data. The study contains four objectives: (1) An investigation of what software developers use to execute their work tasks. (2) An investigation how developers currently are guided to relevant software courses for their work tasks. (3) An investigation of the developers' needs regarding guidance to relevant courses. (4) Develop a concept, based on the needs, that guides developers to relevant software courses. The study was carried out in iterations with a Design Thinking approach. Meetings with experts, user interviews and observations and sitemaping have been carried out to research the current state and the user needs. The research of the current state resulted in the definition of two developer types, (Design engineer and GDL) along with recommended courses for each type. Additionally, six channels that guide developers to relevant courses were identified. For two of these channels, sitemaps were created. Three general course overview formats were identified: documents, tables and links. Lastly, three available education formats has been identified: in-person training, eLearnings and instruction material. Furthermore, personas and journey maps were created to define user needs. The research and definition of user needs resulted in three opportunities: increase awareness about courses, enhance the possibility to find specific courses, and enhance exploration of courses. To develop a concept to meet the user needs, brainstorming, idea screening and voting, benchmarking, prototyping, sitemap creation and wireframe creation were carried out. To perform evaluation, interviews and observations were carried. The concept creation and evaluation resulted in a concept for a course platform intended to guide developers to relevant courses. Furthermore, a suggestion of how the platform could be implemented is presented. Lastly, suggestions for further Development is to create a functioning prototype in SharePoint in order to evaluate with additional stakeholders. Furthermore, to address additional user need a suggestion is to develop a standardized course guidance process and investigate the potential to have all courses available as eLearnings.

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Terminology

LAD - An activity booking platform at Volvo Cars.

IDM - Volvo Cars internal identity manager.

CDSID - Account to Volvo Cars HR system.

Engineering Portal - A Volvo Cars intranet page with a collection of links and other information about commonly used software.

Developer - A team member at Volvo Cars. For instance design engineer.

Team - A collection of developers.

Team Manager - Manager of a collection of teams.

SharePoint - A document management and storage system.

Contents

1
Introduction

This chapter presents the background for the project, followed by the purpose. After this, the four objectives of the project are presented. Later, the scope and delimitations are specified. This chapter ends with an outline of the thesis.

1.1 Background

Volvo Cars faces challenges related to a global presence, a more rapid rate of product launches and environmental aspects. This results in increasing complexity of the product development processes. At the company, the development is iterative with interdependencies of upstream and downstream consumers of product data. Several different software tools for data creation and handling (such as 3D CAD and Product life cycle management software) are used, which further increases complexity. Hence, it is important to ensure the quality of the product data and to create and use it efficiently. The company has integrated quality assurance tools, support models, standards and work methods to support this. Furthermore, employees that create and handle product data at Volvo Cars are offered education in these tools through internal education departments that provides different courses. The suitability of the available courses at Volvo Cars is dependent on the employees work tasks, which often require usage of several different software. Currently there is no overview of how different teams work with guidance to software courses. In addition, the company has transitioned to an agile organization, where flexibility and short development cycles are a focus and the teams are comprised of developers that share work task, based on the Scaled Agile Framework, presented by Scaled Agile, Inc (2020).

This opens for an investigation on developers' course needs, within software, and how they can be guided to such courses, to ensure the desired quality of the product data.

1.2 Purpose

The purpose of this study is to enable developers, that create and handle product data, to obtain relevant knowledge within systems required to execute their work tasks. This is to ensure the quality of creation and handling of the product data is according to the company's standards and methods. By guiding developers to software courses, potential outcomes are higher quality of the product data and higher efficiency of the work tasks throughout the product lifecycle.

1.3 Objectives

To investigate how to enable developer to obtain relevant knowledge within systems required to execute their work tasks, this study contains four objectives, described below.

- The first objective is an investigation of what software developers use to execute work tasks.

- The second objective is to investigate how developers currently are guided to relevant software courses for their work tasks.
- The third objective is to investigate developers needs regarding guidance to relevant courses.
- The fourth objective is to develop a concept, based on the needs, that guides developers to relevant software courses.

1.4 Scope and Delimitations

The scope of the study is education related to systems used in product creation. The software within the scope of the study are software with courses available at the Volvo Cars intranet page "Engineering Portal".

Furthermore, the developers within the scope of the study are developers within mechanical design teams.

Lastly, course applications are currently made in the system LAD, a web-based course application tool. Any development or adjustments of this tool are not within the scope of this study.

1.5 Thesis Outline

The report begins with an overview of the process used in this project and continues with a presentation of the results to the objectives. The results are divided into four chapters: Current State Analysis, User Needs, Concept Development and Evaluation, and lastly Final Concept. The chapters Current State Analysis, User Needs, and Concept Development and Evaluation, provide the reader with a description of the methods used and the implementation of the methods to arrive at the results. Furthermore, these chapters presents the results from the implementation of the methods. The chapter Final Concept presents the final concept. Following the results of each chapter, discussions and conclusions are presented. Here, the results achieved and the methods used are discussed. Lastly, the report ends with suggestions for further research and development.

2

Process

This chapter provides an overview of the process used in the project. The project was carried out in iterations with a Design Thinking approach, as described by Luchs et al. (2015). The process was divided into four different modes: Discover, Define, Create and Evaluate. The Discover mode consisted of gathering information about the current state and the user needs. This was done iteratively through meetings with experts, user interviews, user observation, site mapping and research of current solution, see figure 2.1. The Define mode consisted of formulating the user needs. This was done through persona creation, Journey Mapping and definition of Pain Points and Opportunities, see section 4.1 for further information. The Create mode consisted of development of a concept based on the user needs. This was done with Brainstorming, Idea screening, Idea voting, Benchmarking and Prototypes consisting of Sitemaps Wireframes, see section 5.1 for further information. In the Evaluate mode, feedback on the concept was gathered. This was done through interviews and observations, see section 5.1 for further information. In the project, a concept was generated at an early stage to enable user feedback early in the process. The concept was improved upon iteratively to arrive at a final concept. The reason was to minimize the effort invested in a concept without feedback from users and experts and to achieve a user-centered concept.

Figure 2.1: Visualization of the project's process.

3

Current State Analysis

This chapter describes the steps carried out to gain understanding of the current state at Volvo Cars, regarding course guidance. The chapter ends with the result of the current state research. This includes what software developers use, different channels guiding developers to software related courses, how course overviews are accessed, descriptions of different formats of course overviews and course formats. This was done through meetings with experts, interviews and research of the systems that guide developers to courses, which are described in their respective sections below.

3.1 Method and Implementation

The current solution was investigated to map how developers are guided to relevant courses currently. The investigation of the existing solution included several aspects: how courses are accessed, identification of platforms used for course guidance and the structure and progression of the courses within different software i.e. course overviews and course formats. The aspects were researched through investigating and exploring the company's intranet site for information.

Site maps are used to hierarchically present functionality and content of websites, Resmini (2014). For the Current State Analysis in this study, site maps were created to map the existing sites used for course guidance, to specify what courses are available, how course overviews are accessed and what course overview format the software have. This was done by documenting all courses in software within the scope of the study which are available at the platforms. The results from the site mapping is presented in section 3.2.2.

The course related content available at the platforms used for course guidance was mapped. This was done by categorizing icons, course types and course overviews. The result is presented in section 3.2.2 and in section 3.2.3.
Meetings were conducted to gain a broader understanding of the current state. The meetings were conducted in an unstructured manner, as described by Kothari (2004). Notes were taken during the meeting which served as means for data collection. The data collected was analyzed and findings were documented. The meetings were done with the following people:

1. Experts within the software: CATIA V5, Teamcenter, TCVis, MiP and Exter. This was to gain understanding of the software used by developers and the courses related to the software. The result can be found in section 3.2.1.
2. A Design Engineer with the responsibility to guide the developers in his teams to relevant courses. This was done to gain insight in how a specific team is currently guiding their developers to relevant software courses. The result from this can be found in section 3.2.2.
3. The manager of an existing education platform at Volvo Cars, "Volvo Cars Academy". This was done to investigate the purpose and application of their platform and how this project intersects with their current solution. The result can be found in section 3.2.2.

4. A Team Manager that had developed a "Competence map"-template to be used by development teams. This was done in order to investigate how software competences are mapped currently within some teams. The result can be found in section 3.2.2.

5. An expert within the software SharePoint used for creation of the intranet pages, the Engineering Portal, PLM methods and PLM trainings. This was done in order to investigate potential limitations of the software, the purpose and the maintenance of the pages and to gain an understanding of their content. The result can be found in 3.2.2.

Furthermore, interviews were conducted with developers to gather data for both the Current State Analysis and the User Needs, see section 4. For the Current State Analysis, the interviews investigated what software knowledge developers need and what software they use. Additionally, it was investigated how the developers are guided to software courses, their context and how the current solution is used.

The interviews were semi-structured, described by Patel & Davidson (2011). This means the questions were open-ended and interesting answers were asked to be elaborated and follow-up questions were asked. The duration of the user interviews was approximately 45 minutes.

The subjects of the interviews were stakeholders of education. In total, 12 interviews were conducted out of which 11 where developers and one was team manager. Four of the developers had less than or three years work experience, three had between four and ten years of work experience and four had 11 or more years of work experience.

Data was collected during the interview and afterwards. During the interview the interviewer asked questions based on the interview guideline, see appendix A and B, and asked follow-up questions. A secretary took notes to keep track of answers during the interview and aided the interviewer with questions and clarification. The interviewees were asked for permission to record the interview and all accepted the interview to be recorded. After the interviews, the recordings were transcribed.

The transcripts from the interviews were analyzed with Affinity Diagrams, as described by Beyer & Holtzblatt (2017). With Affinity Diagrams, information is clustered in categories. The Affinity Diagrams were created to define user needs, see appendix C, and to define what software developers use within teams and gain an understanding how developers currently are guided to courses, see appendix D, E and F. Findings of interest to this study was highlighted and extracted from the transcripts of the interviews. The findings and answers were sentences, or part of a sentence expressed by the interviewee which was deemed to carry relevant or useful information for the Current State Analysis, to define user needs and to the creation of a concept in later phase. A software was used to aid the creation, support adjustments to the clusters and provide a visual overview of the clusters. The analysis of the interview data and the creation of said clusters are described below.

Each finding from the interviews was contained in a "textbox" to allow for the creation of clusters. The interesting findings and answers were color coded, with one color representing an interviewee. This was done to identify if something was expressed multiple times by one interviewee. Furthermore, the color coding provided traceability to the transcripts when uncertainty about a quote arose. The clusters in the Affinity Diagram was created by placing the interesting findings and answers, related to the same subject, next to each other. If a cluster was deemed too big or incomprehensive, it was divided into several smaller clusters with a more specific subject. See appendix D, E and F, for the Affinity Diagrams related to the Current State Analysis and C for the Affinity Diagrams related to User Needs. Lastly, the result of the Affinity Diagrams was also used in later steps, to define user needs by creating Personas, Journey Maps and identifying Pain Points. These are described in their respective sections in section 4.2.

3.2   Results

This section presents the results of the Current State Analysis. First the software that developers use are presented, followed by a presentation of the different channels that guide developers to software related courses. Lastly, the course overviews and course formats found are presented. At the end of this section, 3.2.4, is a summary of the results of the Current State Analysis.

3.2.1   Software developers use

When analyzing the interview data, two different types of developers were defined: (1) Mechanical Design Engineer, (2) Group Design Lead (GDL). These types were a remnant from the past, before Volvo Cars had made the transition to an Agile way of working. The distinction between Design Engineer and GDL was made to different degrees within different teams, and some developers was a mix of the two types. The two types of developers differ in what software they primarily use.

The tools that design engineers most frequently use are CATIA V5 and Teamcenter, while the GDLs have a wider spread in tools they frequently use. This has to do with the characteristics of the developer types' responsibilities - where the design engineer's main responsibility is mechanical design of components and the GDL's main responsibility is to maintain quality, cost and deadlines for the components.

Based on the two role types defined, relevant courses for each developer type was determined, see figure 3.1 and 3.2 below. This was done through analysis of interview data, research of pre-existing role-based course overviews and by investigating what courses different developers felt where especially important for their responsibilities. The courses shown in the figure 3.1 and 3.2 are sorted by software and level.

	Level 1	Level 2	Level 3	Level 4
CATIA V5	Green Card CAD Standard Basic			
Teamcenter	Teamcenter CAD viewer	Teamcenter Document Management (Author)		
KDP	KDP eLearning	KDP Software Handling eLearning		
BOM/CAD Alignment	BOM/CAD - Manage and Visualize in KDP/Teamcenter			
XFMEA	XFMEA Instructions*			
LEQM	LEQM - HW/SW planning (engineers), R&D step 1			
VIRA	VIRA training portal*			
Pecca Procost	Pecca Procost Training			
VPC	VPC - Volvo Part Change			
Misc.	Green Card Product Documentation			

Figure 3.1: Relevant software and respective courses for GDL.

	Level 1	Level 2	Level 3	Level 4
CATIA V5	Basic CAD Standard Basic	Solid Modeling Wireframe and Surfaces Assembly 3DPMI - 3D Drawing Basic 2D Drafting Delivery Body Methodology Comp. and Installed Parts	CAD Advance CAD Advance Self-study CAD Advance Refresh CAD/CAE Template Kinematics	CAD/CAE Templates Feature Templates Part Templates Engineering Templates
Teamcenter	Teamcenter for V5 users	TCVis Level 2 analyze		
KDP	KDP eLearning			
MiP	Mechanical Integration Process			
Exter	Methods page*			
Misc.	Green Card Product Documentation Supplier CAD Collaboration			

Figure 3.2: Relevant software and respective courses for Design Engineer.

3.2.2 Channels guiding developers to software related coures

Six channels that guide developers to relevant courses were identified. These are: email, colleagues, team manager, Volvo Cars Academy, LAD, and specific SharePoint intranet pages. All channels are presented in figure 3.3. The SharePoint intranet pages are Engineering Portal, PLM Methods and PLM Trainings. Each channel is described below.
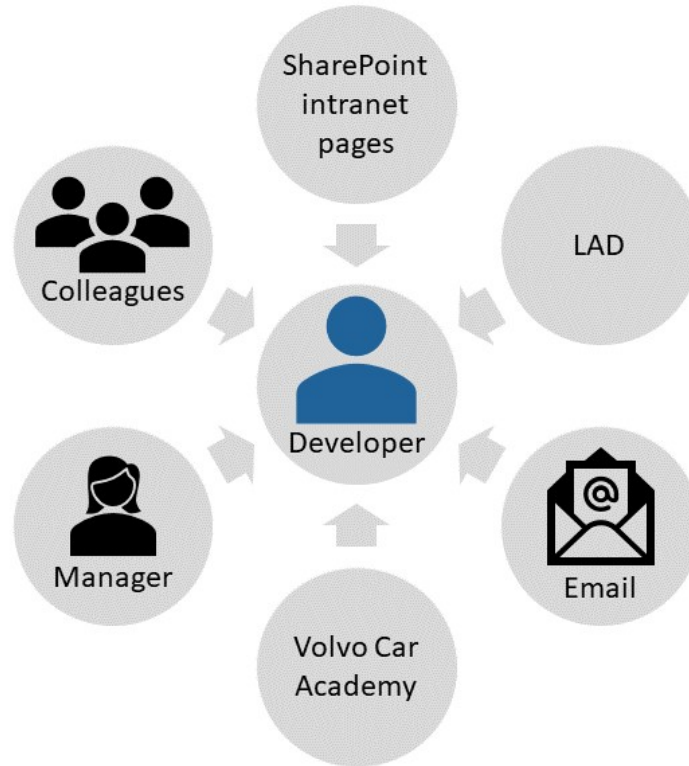
Figure 3.3: The six channels that guide developers to relevant courses (developer in center).

Through the interviews, "email" was identified as a channel guiding developers to software courses. These could either be emails sent by the team manager, as a suggestion for a team, or "commercial" emails from course tutors.

Another channel guiding developers to courses is "colleagues". This means developers hear about relevant courses either at informal situations such as conversations with colleagues or more formal occasions, such as meetings. For instance, a developer that participates in "CAD key user"-meetings will access knowledge about useful courses within the software tool CATIA V5. Later, this developer can inform colleagues about the useful course, either at other meetings or through regular conversations.

Through the interviews and the "expert meeting 2", it was found that every developer has regular meetings with their team manager. At these meetings, competence development is discussed, and in extension relevant software courses for the developers. It was found that some team managers have a document with relevant software courses.

A finding related to the manager meetings is the "Competence map"-template. This was found during "Expert meeting 4" and resulted in information about the purpose and application of the competence map. The document is a template intended to be used by team managers to visualize the skills within

a team. It is supposed to be a guiding tool for the whole team to evaluate its strengths and weaknesses. The competence map is divided in to three categories: "domain", "discipline" and "tools", where the team members can self-assess their competence. This is supposed to be used continually and re-assessed several times per year.

Another way developers are guided to courses is by the Volvo Cars Academy platform. In "expert meeting 3" it was determined Volvo Cars Academy is a department at Volvo Cars with two main responsibilities: (1) Trainings for managers and (2) performance learning. From their intranet web page, two course platforms can be accessed: LAD and a Volvo Cars Academy platform. The Volvo Cars Academy platform is provided by a supplier and supports eLearning. However, this platform does primarily not include courses within the scope of the study. Furthermore, it was found the department is in the process of acquiring a new LMS (Learning Management System) which is meant to be used by all "education departments" at Volvo Cars. According to Carlson (2019) an LMS is a software used to facilitate reporting and delivery of courses within an organization. It can act as a platform for students and tutors to access training resources and manage courses. An LMS can support both in-person courses and eLearnings, and by supporting access and organization of courses. Furthermore, an LMS often has the possibility to be connected to other systems within the organization, such as email, HR information system and enterprise resource planning system. The platform to be acquired is intended to contain all the available courses at Volvo Cars and should be able to support the users to create a "learning journey". The aim is that there should be one LMS within the company and the vision is that each department is responsible to "populate" the coming platform with: (1) All available courses within department, (2) Role definitions/Starter packs/progression paths.

Lastly, through the interviews and research of the current solution it was found that software course guidance is done through three intranet SharePoint pages (the Engineering Portal, PLM Methods and PLM trainings) and LAD. These are described in detail below.

For courses within the scope of this study Volvo Cars currently has no LMS. However, the pages LAD, Engineering Portal, PLM methods and PLM trainings fill the functionality of what an LMS is supposed to. However, the functionality is fragmented between the pages. Below the tools and their functionality is described.

Through the interviews and research of the current solution it was found that LAD is a site on Volvo Cars' intranet used by employees to find and book internal company activities. The main page of LAD has a short text describing how to use it and references to other learning platforms within Volvo Cars. Furthermore, there is a search field where activities can be searched, and page where activities can be filtered by categories. At LAD, the user have the possibility to show a calendar with booked activities. One type of the activities that LAD contains is courses. Each course has an information page, with content description and general information such as course code and teacher. The information page also has a button for course application. Specific courses can be accessed by searching with keywords that match either the course name, the description, or the course code. An overview of courses in a specific software can be accessed by entering a software name in the search field on the LAD start page, however, when this is done, courses in software that was not part of the search key words is also presented. Through the interviews, this was deemed to be the most common way to find overview of courses in a software. A sitemap of LAD is presented in figure 3.4, showing the pages found at the site and their location.
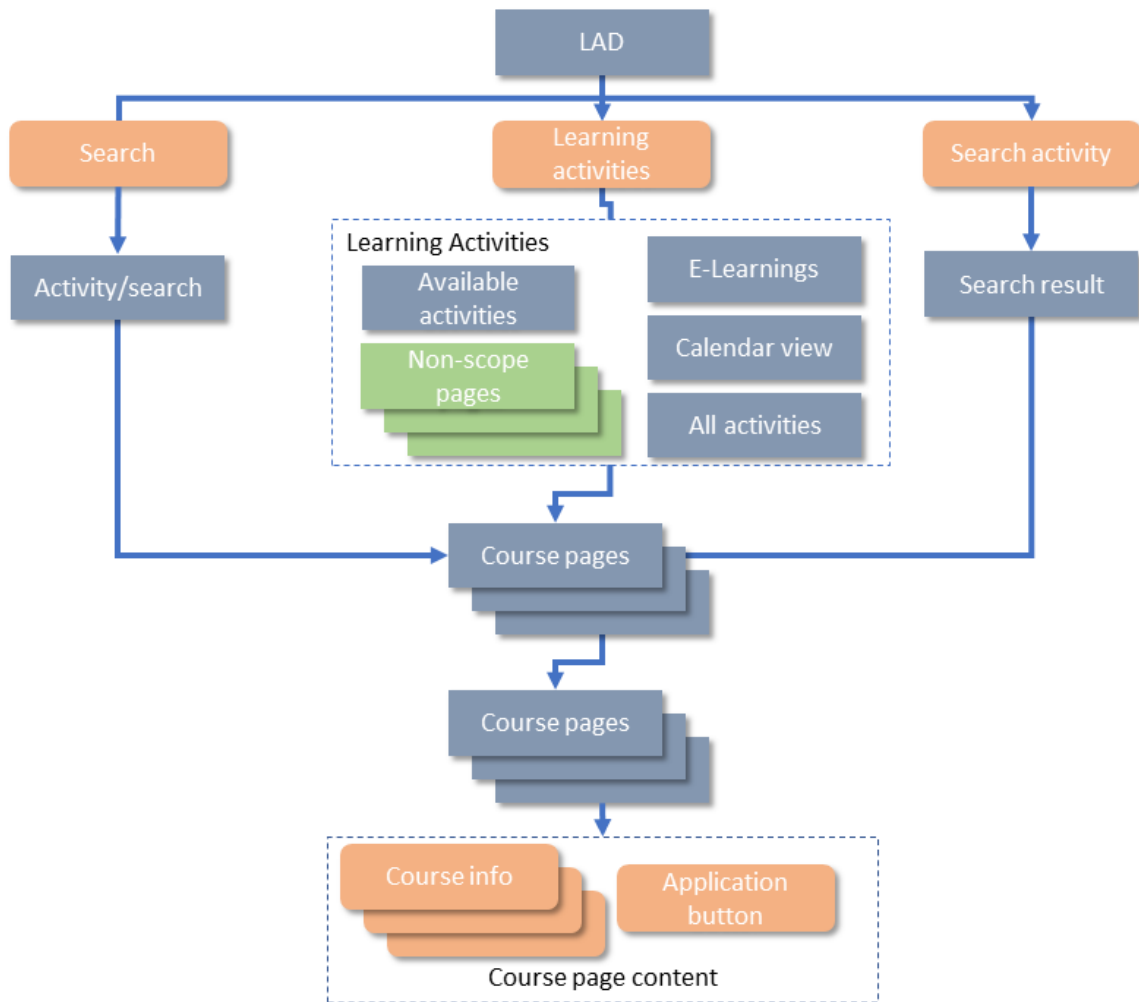
Figure 3.4: Sitemap of LAD.

Through expert meeting (1), the interviews and research of the current solution it was found that the Engineering Portal is a platform and website where information aimed to support Design Engineers is located. The Engineering Portal has five "categories": Engineering tools, Product data analysis tools, engineering news, Process deliveries, and User support. Each category has a group of icons. Each icon leads to a webpage with more detailed information, for example, there are icons for CATIA V5, Teamcenter and PLM Trainings. The information on the page can be for example software access and instructions (called methods, processes and applied concepts). Where software trainings can be found and how to access them is described below.

Another page found, through expert meeting (1) and (5), the interviews and research of the current solution, was the PLM Methods page. This page contain several link icons and is a "sister-page" to the Engineering Portal, located on the intranet. At PLM Methods, five categories of content were identified and defined. These categories were defined as Guides, Contact and Support, Courses, Engineering Portal and News.

The link icons categorized as Guides were:

- Methods

- Processes
- Applied Concepts
- How To's

The link icons categorized as Contact and Support were:

- Engineering Support
- First Aid
- Contacts

The link icon categorized as Courses was:

- PLM Trainings

The link icon Engineering Portal was deemed to be its own category, as it was considered a unique item at the PLM Methods page and difficult to reorganize.

Lastly, through expert meeting (1), the interviews and research of the current solution, the PLM Trainings page was investigated. This page is, as the PLM Methods page, a "sister-page" to the Engineering Portal. The PLM Trainings page contains link icons of software. These link icons links the user to course overviews within software. The software available at the PLM Trainings page are a selection of the software available at the Engineering Portal. The software included are the ones used by engineers working in mechanical designing teams.

3.2.3 Course overviews, course formats and how to access them

In this section, two sitemaps, figures 3.5 and 3.9, are presented. Both sitemaps visualizes how course overviews are accessed at the Engineering Portal. The sitemap in figure 3.9 is a detailed sitemap of some of the content seen in the sitemap in figure 3.5. Additionally, the sitemap in figure 3.9 presents the course overview format and the course format of the software used by the roles, presented in section 3.2.1. How course overviews are accessed is described below.

At the Engineering Portal there are two ways to reach course overviews in software. One is through the PLM Trainings icon, as seen in 3.5, located at the start page under User Support which navigates to a page containing a selection of link icons of software available. Each of the link icons navigates to their respective course overview within the software. The other way is through software link icons, located at the Engineering Tools, Product Data Analysis Tools and Process and Deliveries areas, at the Engineering Portal start page, see figure 3.5. These navigates to the previously mentioned web-page containing more detailed information, out of which course overview is one.

Some course overviews are accessible from the "Engineering Tools" area and also from PLM trainings. This is indicated as "synchronized course overviews". Some course overviews are not accessible from the PLM Trainings page, this is indicated as "Not Synchronized with PLM Trainings" in figure 3.9. Furthermore, some course overviews are exclusively accessible from the PLM Trainings page, as indicated as "Not Synchronized with Engineering Portal tools" in figure 3.9. An additional finding was that for some software, the two ways of navigating to the course overview lead to different course overviews, as seen in 3.5 for CATIA V5, indicated by an orange arrow.
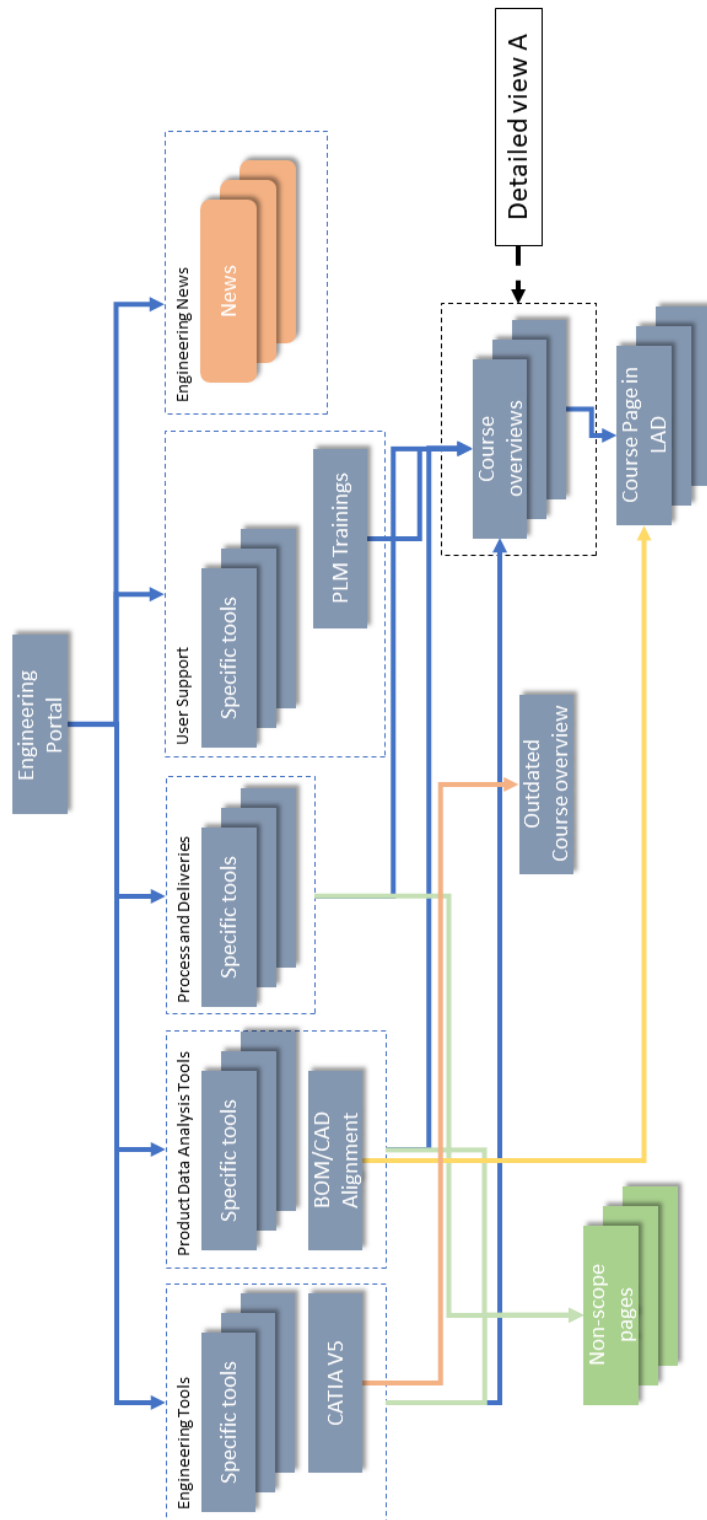
Figure 3.5: Sitemap of Engineering Portal showing how to access course overviews.
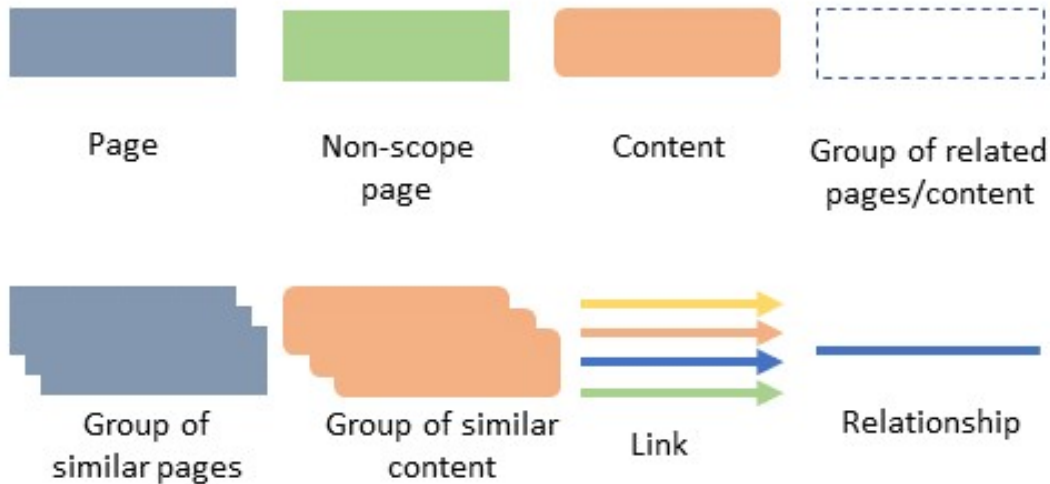
Figure 3.6: Legend to sitemap in figure 3.5.

Through site mapping it was found the format of the course overview in all software differs. However, three general course overview formats, presented at the Engineering Portal, were identified: document, table and direct link to LAD. Figure 3.9 visualizes which type of course overview format each software, relevant for the study, have. Each course overview format is described below.

The course overview format "document", available at the Engineering Portal, offers guidance to a collection of courses, consisting of different training steps, based on role and area. The software with documents as course overview format is indicated by *blue* outlines in 3.9.

An example of this course overview format is the "training steps" for CATIA V5. In this document the reader can find courses based on a specific role. The courses are divided into hierarchical steps, which are based on the level of the course, basic to more advanced. There are four steps in total and the number of steps and the courses included in each step varies depending on the selected role and work area. The most advanced courses, step four, have course requirements, e.g. course participation of a certain course on a lower level. Furthermore, an overview is available, visualizing all courses available in CATIA V5 organized in the same hierarchical training steps. See figure 3.7 for an example of training steps for a role with work area. Lastly, the document has clickable links that directs to LAD for course application, description of course content and potential accesses needed before participation.
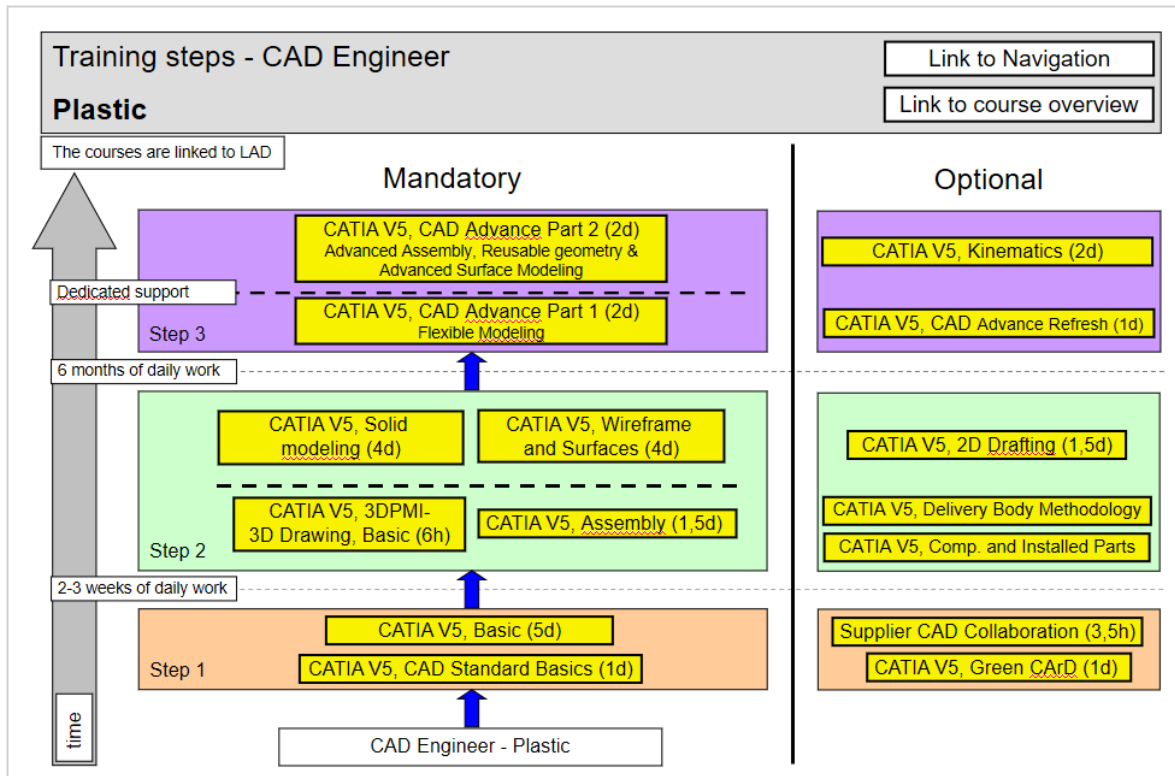
Figure 3.7: An example of a page from the document "training steps" for CATIA V5 presenting courses for a specific role.

Another format of course overview, available at the Engineering Portal, is "table". This course overview format included both "classroom courses" and "eLearnings" for the software with such course format available. The tables contain information about the individual courses within the software. This includes the name of the course, their duration, a short description of the course content, eventual prerequisites and booking link directed to LAD. The software with table as course overview format is indicated by *green* outlines in figure 3.9.

An example of this is the table for Teamcenter and TCVis available at the Engineering Portal. There is one table for classroom trainings, which are basic trainings with exercises, and one for "Zoom in" for trainings that are more advanced sessions describing some area in-depth. These are given at the departments requesting them. The tables describe the name of the trainings, their lengths, a short description of the course content, eventual prerequisites and booking link directed to LAD, see figure 3.8.

Classroom Trainings – Basic trainings with exercise

Training	Length	Description	Prerequisites	Booking in LAD
Teamcenter for V5 Users	4 days	Basic training for V5 Designers to get write access (an Author role).		INF00654
Teamcenter CAD Viewer	8 h	Basic training for readers/viewers to get access to Teamcenter. Focus on viewing CAD-data.		INF00655
Teamcenter Document Management in Document Portal	7 h	Basic training to get write access to Teamcenter for NON CAD documents.		INF00656
TCVis Level 1 Basics	8 h	The course will provide a basic knowledge in how to use Teamcenter Visualization (TCVis) for visualisation and analysis of geometries. After completed course the participant shall be able to use the knowledge in her/his daily work. The course will give the participant fundamental knowledge in visualising and analysing geometries in Teamcenter Visualization (TCVis).	Completed any of the courses Teamcenter CAD Viewer & TCVis Basic (INF00655) and/or Teamcenter for Catia V5 Users (INF00654).	INF01256
TCVis Level 2 Analyze	8 h	The course will give the participant deeper knowledge in analysing the virtual car in Teamcenter Visualization (TCVis).	TCVis Level 1 Basics or similar	INF01305
Teamcenter for skilled PLM users	8 h	Advanced training for those who previously have experience in using Teamcenter.		INF00745
Teamcenter for Vehicle Package	4 h	Training for Designers at Vehicle Package who needs to create and save CATIA V5 documents in TC.		INF00625
BOM/CAD – Manage and visualize in KDP/Teamcenter	3 h	Knowledge of how to easily obtain data regarding an assignment, and to give better availability and knowledge of virtual test cars to be able to perform analyses and to understand the system connections. Give knowledge of how to use and interpret BOM/CAD alignment-reports.		INF00487

Figure 3.8: An example of the course overview format table for Teamcenter and TCVis.

The third course overview format found is reached through a link on the specific software's intranet page. The link directs the user to LAD, where either a pre-defined search result with useful courses is presented or simply a single course page. The software with LAD as course overview format is indicated by *yellow* outlines in figure 3.9.

Software without outlines in figure 3.9 does not have a course overview format. The reason are either (a) no course overview exist for the courses for a software or (b) the software has no courses, instead instruction documents. The identified course formats, as the ones mentioned, are presented below.

In addition to how course overviews are reached and course overview formats, different education formats were identified that differ between software. Firstly, it should be mentioned it seems the terms "course", "training" and "guide" is used interchangeably at the Engineering Portal, hence a distinction between the usage of the terms could not be made. However, three different formats were defined: "In person training", "Elearnings" and "Instruction material". This is visualized in figure 3.9 and indicated by *blue* background color of the software with this course format. In person courses are either "tutor visits" or "classroom course". The course format "tutor visit" mean a tutor visits a department to teach a certain aspect of a software and "classroom course" means the course is held in a classroom with a tutor teaching a certain subject. The format "Elearning" is a course which is entirely digital and can either be held by a tutor or the course participant can attend the course in their own pace. The course format "Elearning" is visualized in 3.9 and indicated by *green* background color of the software with this course format. The third training format found is "instruction material". Some of the software have folders with instructional material on the software page on Engineering Portal. The instruction material are PowerPoint documents, PDF documents and video instructions. The course format "instruction material" is visualized in 3.9 and indicated by *yellow* background color of the software with this course format. A distinction was made between instruction material and eLearnings, where instruction material was deemed to act support material when using a tool, while eLearnings was deemed to have a course-like structure with the possibility to start and finish.
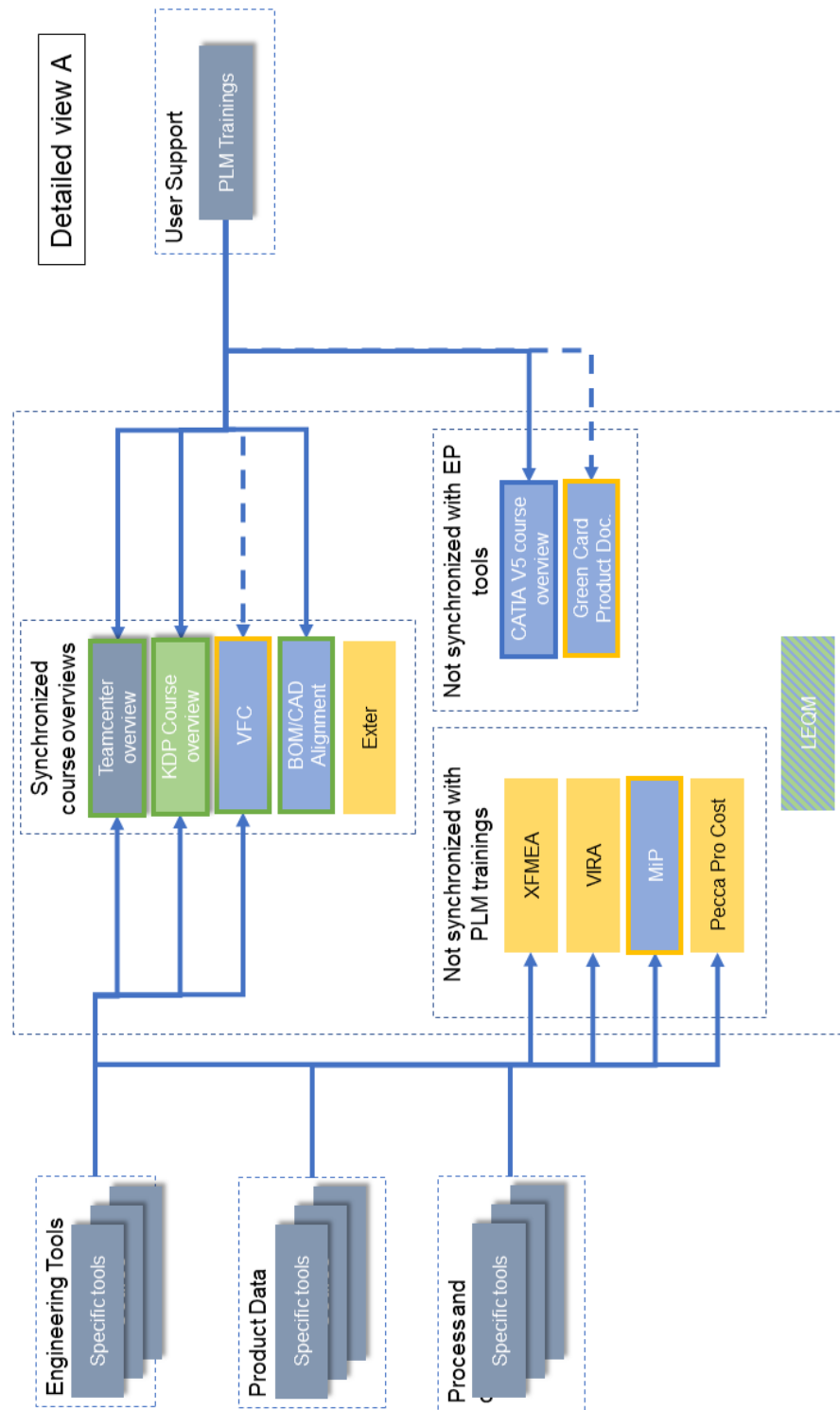
Figure 3.9: Detailed sitemap, of the course overview page in figure 3.9, showing how to access course overviews, course overview formats and course formats.
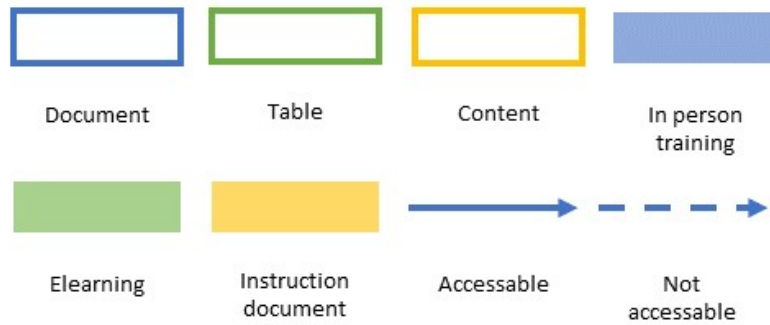
Figure 3.10: Legend to sitemap in figure 3.9

3.2.4   Summary of the Current State Analysis Results

Summary of the Current State Analysis results:

- Two role types were identified when investigating what software developers use. These are Design Engineers and Group Design Leads (GDL). These role types vary in the software used which was described in 3.2.1.

- Six channels that guide developers to relevant courses were identified, these are colleagues, team manager, email, Volvo Cars Academy, LAD and certain intranet SharePoint pages (Engineering Portal and PLM Methods), shown in figure 3.3.

- At the Engineering Portal there are two ways to reach software trainings. One is through the PLM Trainings icon, as seen in figure 3.5 and 3.9, and the other way is through software link icons. For some software, it was found that the two ways of navigating to the course overview lead to different course overviews.

- Three general course overview formats presented at the Engineering Portal were found. The course overview formats each software have differs and are: document, table and direct link to LAD.

- Three different education formats were defined: "In person trainings" (tutor visit and classroom course), "Elearnings" and "instruction material". A distinction was made between instruction material and eLearnings, where instruction material was deemed to act support material when using a tool, while eLearnings was deemed to have a course-like structure with the possibility to start and finish.

3.3 Discussions and Conclusions

This section presents a discussion and conclusions regarding the Current State Analysis' method, implementation and results. Additionally the delivery of the first and second objectives, stated in chapter 1, is presented.

3.3.1 Method and implementation

The level of detail of the sitemaps was intentionally lowered. Sites which were out of the scope of the project was left out of the site map. The reason for this was to make the sitemaps more comprehensible and in line with the scope of the study.

The meetings with experts were not recorded and transcribed. Potentially this could have resulted in a loss of useful data for the study. However, there was a trade-off between transcribing the expert interviews and other useful tasks within the scope of the study. By transcribing the expert interviews, either the data synthesis or the concept development could have been affected.

Several of the interviewees were "CAD Keyusers", the reason for this was they work closely with the software education department where the study was carried out. This could have affected their opinions and that they potentially have more experience and knowledge, within course guidance, than employees that are not Keyusers. However, not all interviewees were "CAD key users".

In total, 12 interviews were conducted. Interviews were carried out until it was concluded that no more unique findings from each interview was received. This conclusion is supported by Ulrich & Eppinger (2012).

Since the data gathered from the interviews is qualitative, it is subjective which data should be transferred from the interview transcripts to the affinity diagram. This could affect the reliability of the method since the outcome is dependent on the practitioner extracting the interview data.

3.3.2 Results

The first objective of the study was an investigation of what software developers use to execute work tasks. The study found there are two types of roles for developers, Design Engineer and GDL, and that the software they primarily use differ. This study presents a list of courses deemed relevant for the two types of roles. The identified software is dependent on the interviewees included in the sample. The software identified relevant for the developers was intended to act as a basis for a course suggestion package, which could be used and modified by teams within the company. In this aspect, the method used is considered sufficient.

The second objective was to investigate how developers currently are guided to relevant software courses for their work tasks. The study found six channels that guide developers to relevant courses. This result is dependant on the sample of interviewees and execution of the interviews and meetings with experts. Hence, could potentially be different if another interview guide would have been user or different employees would have been interviewed.

A quantitative method could have been used to determine what software developers use, such as a survey sent to the employees or analysis of software access data, could have been used. However, when mapping the software used for all teams at Volvo Cars, the software used could potentially change in time. This could make the result from the mapping outdated, it could then be argued such an investigation would be required again to ensure accuracy.

The current course guidance process could potentially benefit from a streamlining of the channels and increased coherency between the channels and the departments that offer courses. Potential points of improvement could be:

- Ensure that links between channels are active and synchronised

- Ensure that the overviews of courses within different software are presented in the same manner across software.

- Improve search and filtration of the course platform.

- Establish a naming convention that highlight distinctions of the education formats across software. For instance, "in person training", "eLearnings" and "instruction material".

4

User Needs

This chapter accounts for how the user needs were investigated and defined. To investigate the user needs, User interviews were conducted, and the data was analyzed through Affinity Diagrams. Later, Personas, Journey Maps, Pain Points and Opportunities were created from the analysis of the data. The purpose of this was to formulate a user-centered basis for the creation of a concept and the results are Personas, Journey Maps and Pain Points with Opportunities, these are presented in the result section. The user needs are defined as Pain Points and Opportunities and are presented in their respective sections below.

4.1   Method and Implementation

To define user needs, which is the basis of the creation and development of personas, and to gain understanding of current user context and usage of current solution, interviews, Luchs et al. (2015), were used. The user interviews were the same interviews used to conduct the Current State Analysis, hence, the description of the method and implementation of the User Interviews can be seen in 3.1. After the user interview were conducted, the recordings were transcribed, and answers were analyzed with an Affinity Diagram, see section C, to act as basis for the definition of the user needs in the form of Pain Points and Opportunities.

Clustering, Luchs et al. (2015), was used to define user needs with affinity diagrams, Beyer & Holtzblatt (2017). The method and implementation of this was the same as mentioned in section 3.1; however, the clusters and findings were different as they were related to user needs.

User observations were used for data collection regarding user needs in addition to the user interviews. The user observations were used in the early phases to understand the users' context and behavior, as according to Sharp et al. (2015). Specifically, the observation method "direct observation in controlled environments" was implemented. Furthermore, to ensure receiving data on what the users are thinking and seeing the "think-aloud technique" was used, Sharp et al. (2015). This technique aids the observers in understanding what the participants are thinking during the observation and was used to externalize the participants thoughts throughout the observations. Specifically, this was done by encouraging the participants to say what they are thinking throughout the observation.

Furthermore, the focus of the observations was to observe the users' ways to find courses by utilizing the engineering portal and LAD. Qualitative data from the observations were collected by taking notes throughout the observation. A script, see appendix G, was used to guide the participants of the observation. The script included several tasks for the user to solve during the observation. Firstly, the participant was told to freely navigate to a site of choice to solve the tasks related to course search, exploration and course application. Lastly, the participant was told to solve the tasks, this time not freely, but instead with the Engineering Portal as starting point. The results were used, together with the user interviews, to create the Personas and Journey Maps. The results of the user observations were synthesized and the feedback was used for the definition of the user needs.

The personas were created based on the result from the Affinity Diagrams for user needs, see section C. The clusters created in the Affinity Diagram acted as foundation for the characteristics of the

personas Luchs et al. (2015). The purpose of creating personas was to gather the needs of the users in a concise format, whilst maintaining focus on the user rather than requirements Luchs et al. (2015). Five characteristics that were considered important for guiding developers to relevant courses was defined. The characteristics were: (1) Course needs, (2) Course search, (3) How information about courses is received, (4) Education motivation, and (5) Wishes. The characteristics were synthesized in the Affinity Diagram and each persona is described within the framework of these. In total, three personas were created. See section 4.2 for the results of the personas.

To arrive at a holistic view of the user experience and since users derive value from the total experience when using a product or service, Journey Maps, Luchs et al. (2015), were used. Three Journey Maps were created based on the personas. The Journey Maps were used to visualize the user experience and to identify Pain Points, Luchs et al. (2015), presented in section 4.2. Each Journey Map is an aggregate of expressed opinions and experiences and could be viewed as a worst-case scenario for a specific Persona.

The Journey Maps were created based on a template from Luchs et al. (2015), see 4.1. Each Journey Map is divided into different phases called "current experience". Each "current experience" describes what information that flows and between which stakeholders, what the user does, what the user says/thinks and what the user feels in that phase. "Current experience" are different phases of the "education journey" for the personas and is for example "course search". "Information flow" contains different people between which information is shared on different steps, indicated by arrows. "What they do" is a short description for each of the steps and explains what the user is doing at this step. "What they say" is a quote of what a persona might say during each of the steps. "What they feel" is adjectives describing what the persona might feel during each step.

Figure 4.1: Journey Map template based on Luchs et al. (2015)

To populate all the aspects of the Journey Map, the Personas were used, and each aspect was developed and refined to reflect the characteristics and problems for each Persona. All Journey Maps created are presented in the result section 4.2 below. When all Journey Maps had been created, they were analyzed to identify Pain Points. The identification and the definition of each Pain Point with respective Opportunity is presented in section 4.2 and *how* they were created is described below.

Pain Points are occurrences in the user experience which reduce the perceived value of the user, as described by Luchs et al. (2015), and was created to constitute as the basis for what a potential new solution should address. By analyzing the Journey Maps, three Pain Points, with one Opportunity statement respectively Luchs et al. (2015), were identified and defined through discussion and reflection, see figure 4.8. Several iterations were needed to finalize the definition of the seven Pain Points. The Pain Points include a short text describing the problem a user faces in a certain moment in the Journey Map. For each Pain Point, Opportunities were defined to act as basis for the idea generation in the following phase. The Opportunities were defined with a short text based on a template of words. This template was: "how might we [INSERT TEXT] in order to [INSERT TEXT] Holmén & McCrory (2019). The reason for the usage of the template was to receive a clear definition of the Opportunities and lower the risk of ambiguousness for participants of the following Brainstorming sessions, described in section 5.1.

4.2 Results

In this chapter the user needs are presented through three "user journeys". Each user journey contains a Persona, a Journey Map and a Pain Point with an Opportunity. This is done to provide insight in the difficulties that developers face related to course guidance. Each user journey results in an Opportunity, presented below.

4.2.1 Opportunity 1

The Journey Map created for the Persona Liam, see figure 4.2, is presented below in figure 4.3. Liam has four experiences related to course guidance. At the first Experience, Liam becomes aware when solving work tasks that he lacks knowledge. His lack of knowledge also becomes evident in the quality of his work tasks. In this Experience he feels concerned, uninformed and not taken care of. The second Experience is when Liam becomes aware of courses, that could bridge the knowledge gap he is experiencing, through his colleagues. In this experience, Liam feels curious but insecure in applying to the course. The third Experience is when Liam has a meeting with his manager. This meeting includes a discussion about workplace issues and Liam mentions he lacks knowledge and wants to take a course. During the meeting, the manager approves the course that Liam has heard of and Liam feels more confident and taken care of. After the meeting, Liam applies for the course and this is his last Experience. Liam searches for the course in LAD, send his application and receives a confirmation of the application from the course tutor. In the last Experience, Liam feels excited since he has applied to a course which could fill his knowledge gap.

For this Journey Map, a Pain Point was identified in Liam's first Experience, when he became aware of the knowledge gap. During this Experience, Liam is notified about that he needs knowledge when working, which potentially affects the quality of his deliverables. Hence, the first Pain Point, PP1, is defined as: "developer does not receive information about useful and required (access providing) courses. Instead realize they lack the knowledge needed for their work tasks when working.". Potentially, if Liam was notified about courses relevant to him proactively this risk could be minimized, hence the corresponding Opportunity was defined as: "How might we... increase awareness about useful and required courses... in order to... proactively ensure course participation ", to act as basis for the idea generation in see section 5.1. The first Opportunity is presented in table 4.8.

Liam

Course needs

He is unaware of which courses he needs. Finds it difficult toknow what is needed for future work tasks.

Course information

He recieves information about courses primarily from colleagues. Sometimes through emails and sometimes he searches in LAD

Education motivation

Participates in courses because access is needed.

Course search

He thinks it's unclear how to find courses.

Wishes

He wishes there was an overview of the courses he needs

Figure 4.2: The persona Liam.

Current experience	Awareness of lack of knowledge (PP1)	Course awareness	Manager meeting	Course application
	Liam becomes aware of knowledge gap	Liam becomes aware of courses	Liam meets manager	Liam applies for course
Information flow – Course tutor				
Team manager			Manager accepts course	Application confirmation
Colleagues		Colleagues tells about courses		
Work tasks	Work tasks inform developer			
Liam	Working with lack of knowledge	Liam asks colleagues about relevant course	Informs about lack of knowledge	Application
What they do	Liam realises that he lacks knowledge for proper work.	Liam finds out about course that might help him	Liam meets with manager and discusses workplace issues and competence development. Liam raises lack of knowledge and asks for course	Liam searches courses with course related key words. Applies for suggested courses in LAD
What they say	"I do not think I am doing this the right way."	"Aha, this course seems to meet my needs."	"Now i feel more confident about applying for the course that i have heard about"	"Im excited about this course"
What they feel	Concerned, Uninformed, not taken care of	Curious, insecure	More confident and more taken care of	Excited

Figure 4.3: The Journey Map for persona Liam.

4.2.2 Opportunity 2

The Journey Map created for the Persona Emma, see figure 4.4, is presented below in figure 4.5. Emma's Journey Map has, just as Liam's, four experiences related to course guidance. At the first Experience, Emma participates in a meeting with her manager. During this meeting, Emma and her manager discuss workplace issues and competence development. The manager suggests a course as part of the competence development discussion and Emma accepts the course. In this Experience she feels pleased as she has been suggested a course to develop her competence. The second Experience is when Emma searches for the specific course she was suggested. She searches with text search in LAD to find the course, however she is unsuccessful to find it. In this experience, Emma feels confused with the course search since she cannot find the course. To find the course, Emma asks for help from her manager to find the course and is provided with a link to the course, this is her third Experience. During this experience she is again pleased as she received help. When Emma has found the course with the link she was provided, she applies to the course and receives an application confirmation from the course tutor. Emma then feels excited to participate in the course.

In this Journey Map, a Pain Point was identified in the second Experience, when Emma searches for her course. Emma was unable to find the course since LAD presented incorrect courses and not the course she was searching for. Hence, the second Pain Point, PP2, was defined as "LAD presents search results that do not match the developer's expectations". To aid this and to act as basis for idea generation, see section 5.1, the corresponding Opportunity was defined as "How might we... enhance the possibility for developers to find a specific course... in order to... minimize effort". The second Opportunity is presented in table 4.8.

Emma

Course needs

She is aware of which courses she needs.

Education motivation

She is pleased with the courses she has taken

Course information

She recieves information about courses primarily from her manager

Course search

She only uses LAD to apply for courses

Wishes

Wishes she could book courses outside of LAD
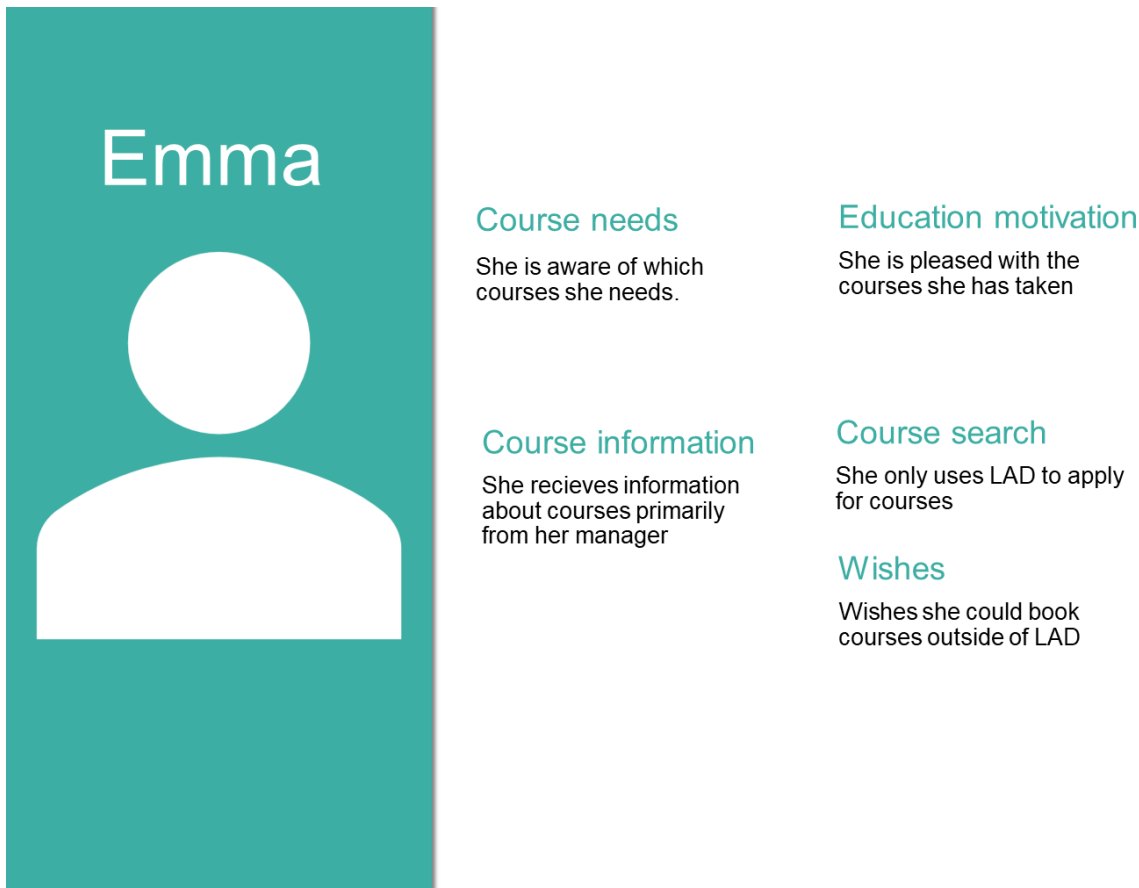
Figure 4.4: The persona Emma.
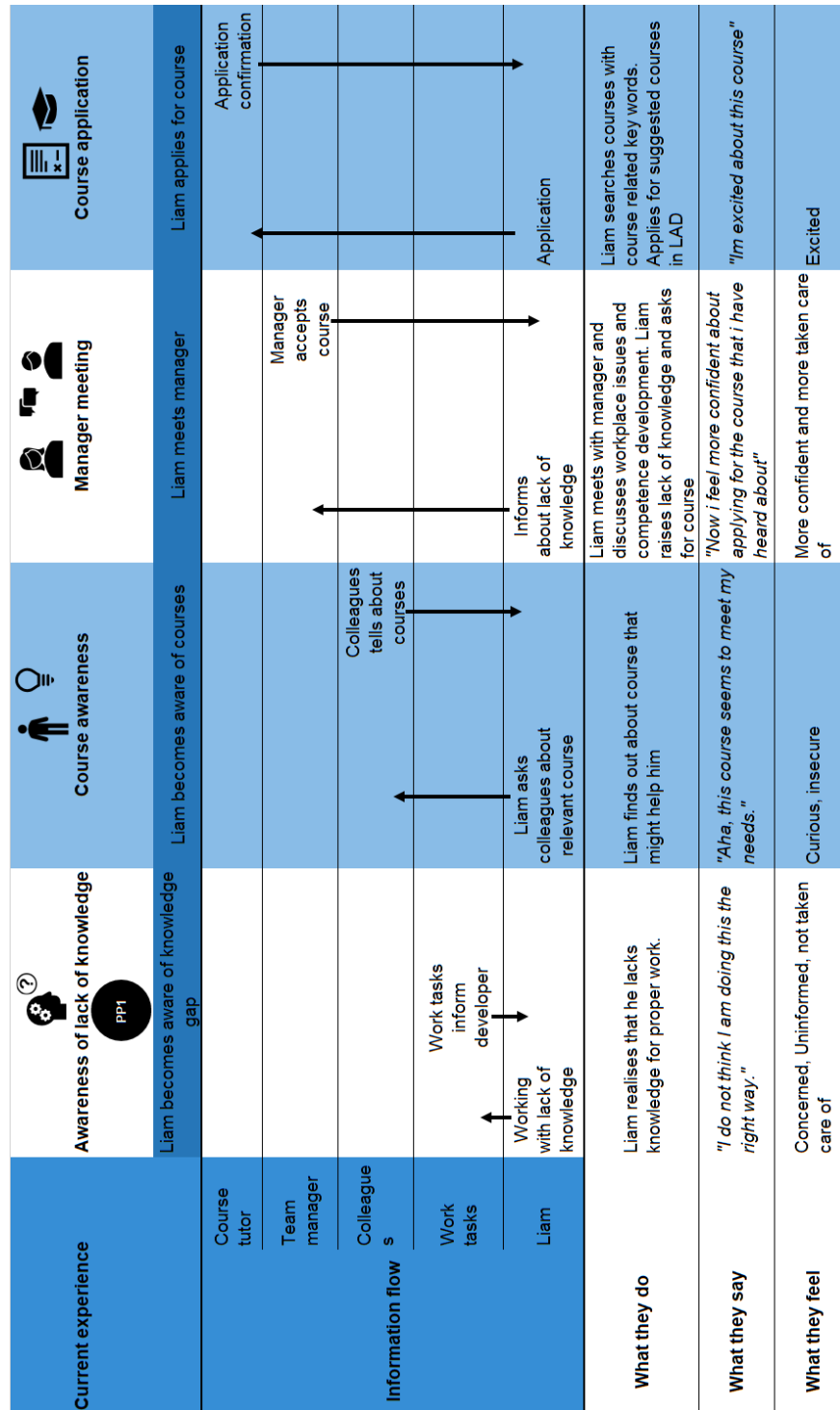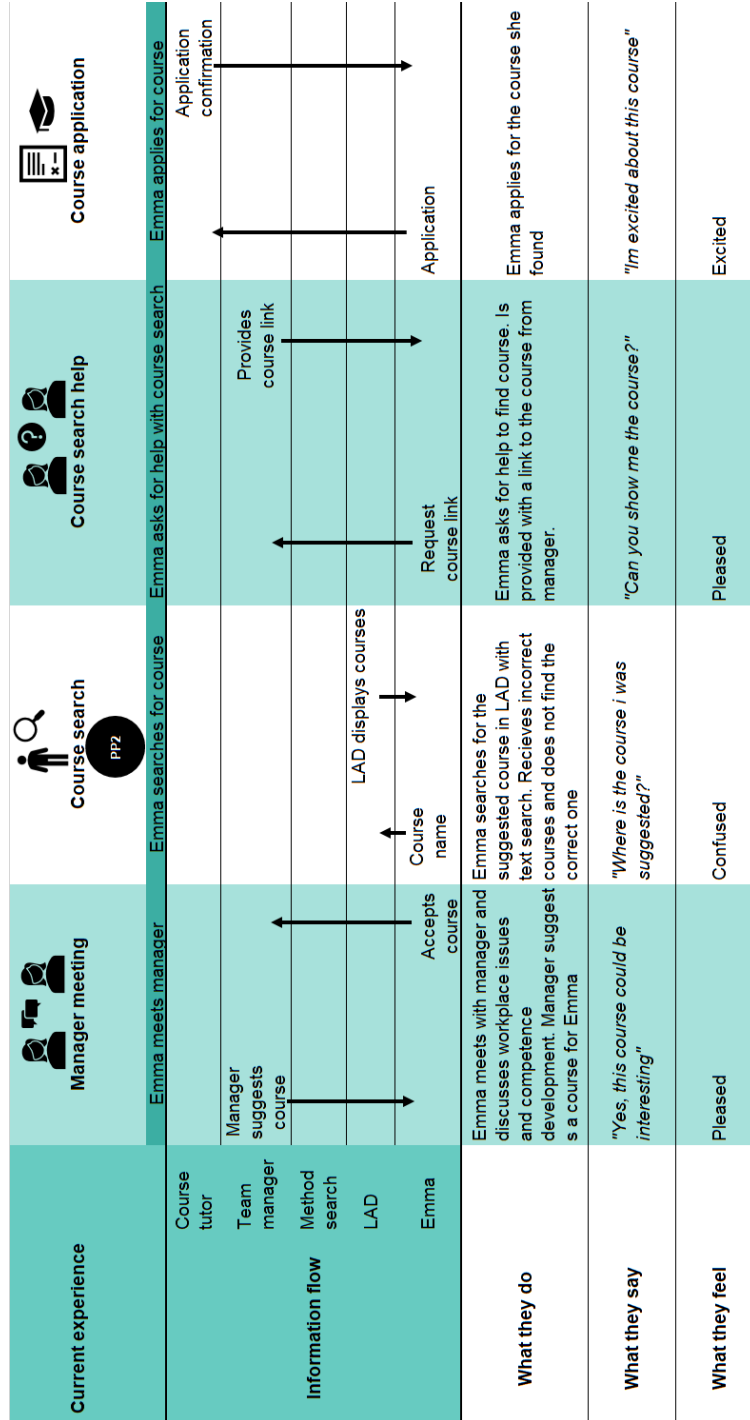
Figure 4.5: The Journey Map for the persona Emma.

4.2.3 Opportunity 3

The Journey Map created for the Persona Charlotte, see figure 4.6, is presented below in figure 4.7. Charlotte's Journey Map has five experiences related to course guidance. At the first Experience, Charlotte gets interested in a certain subject and feels interested. She then enters LAD and searches for courses with keywords related to the subject to find a course, this is her second Experience. LAD presents an overflow of results; Charlotte is overwhelmed and wonders which course that suit her needs. Charlotte is eager to find a course; hence she scans the results and reads course descriptions to find a course that suit her needs, this is the third Experience. Finally, Charlotte finds the most suitable course. During the fourth Experience, Charlotte meets with her manager to discuss workplace issues and competence development. She mentions the course and asks her manager for permission, as part of her competence development discussion. During the meeting her manager accepts the course and Charlotte feels pleased. The fifth and last Experience for Charlotte is when she applies for the course. She sends a course application and receives an application confirmation from the course tutor.

In this Journey Map, a Pain Point was identified in the second Experience, when Charlotte searches for her course. Charlotte was overwhelmed with the result and had to scan the courses to find a course that meets her needs. It could be stated LAD lacks in its ability to allow for course exploration. Hence, the third Pain Point, PP3, was defined as "LAD do not support/encourage exploration of courses". To ease the difficulty with exploring courses and to acts as basis for idea generation, see section 5.1, the corresponding Opportunity was defined as "How might we... enhance exploration of courses... in order to... increase individual competence development". The third Opportunity is presented in figure 4.8.

Charlotte

Course needs

She is well aware of the courses she needs

Education motivation

Her motivation for education is curiosity and to learn more than what is needed

Course information

She recieves information about courses through course overviews available and Key User meetings

Course search

She primarily search for courses in LAD

Wishes

She wishes LAD had greater functionality

Figure 4.6: The persona Charlotte.

Figure: The Journey Map for the persona Charlotte

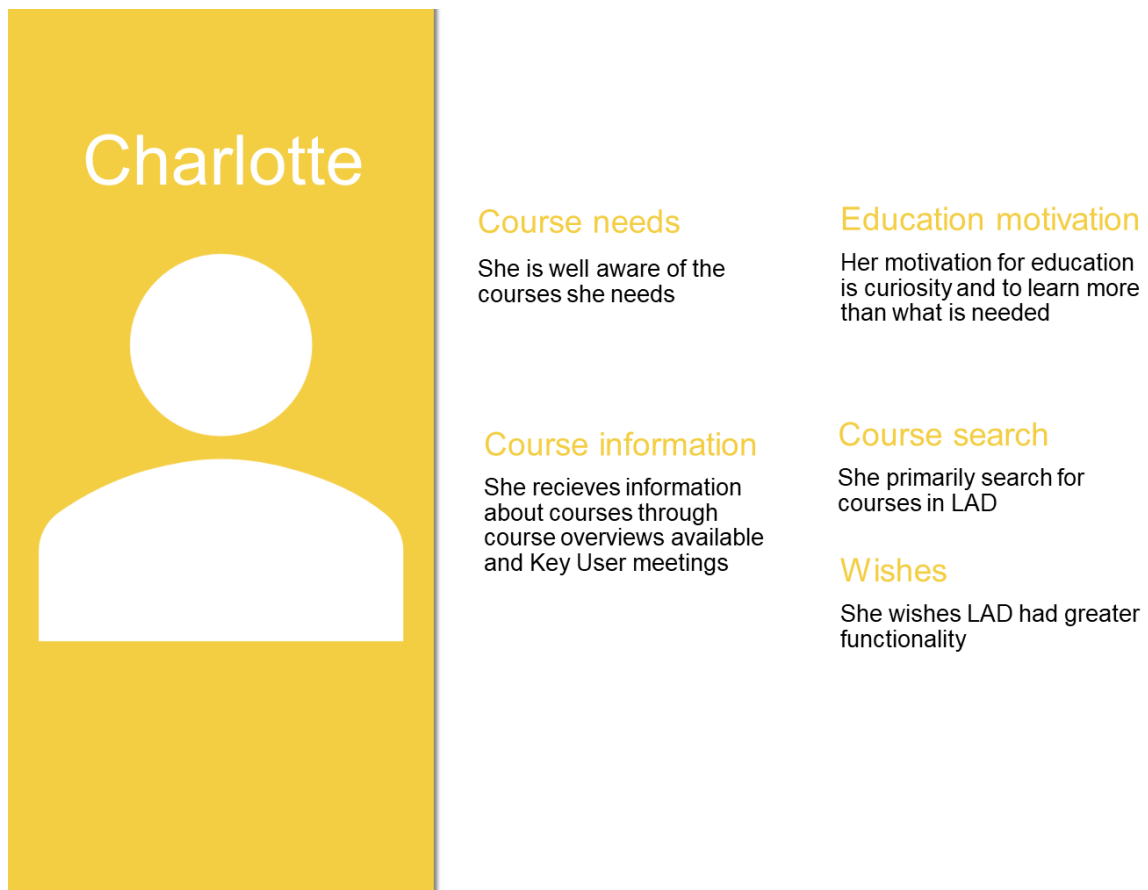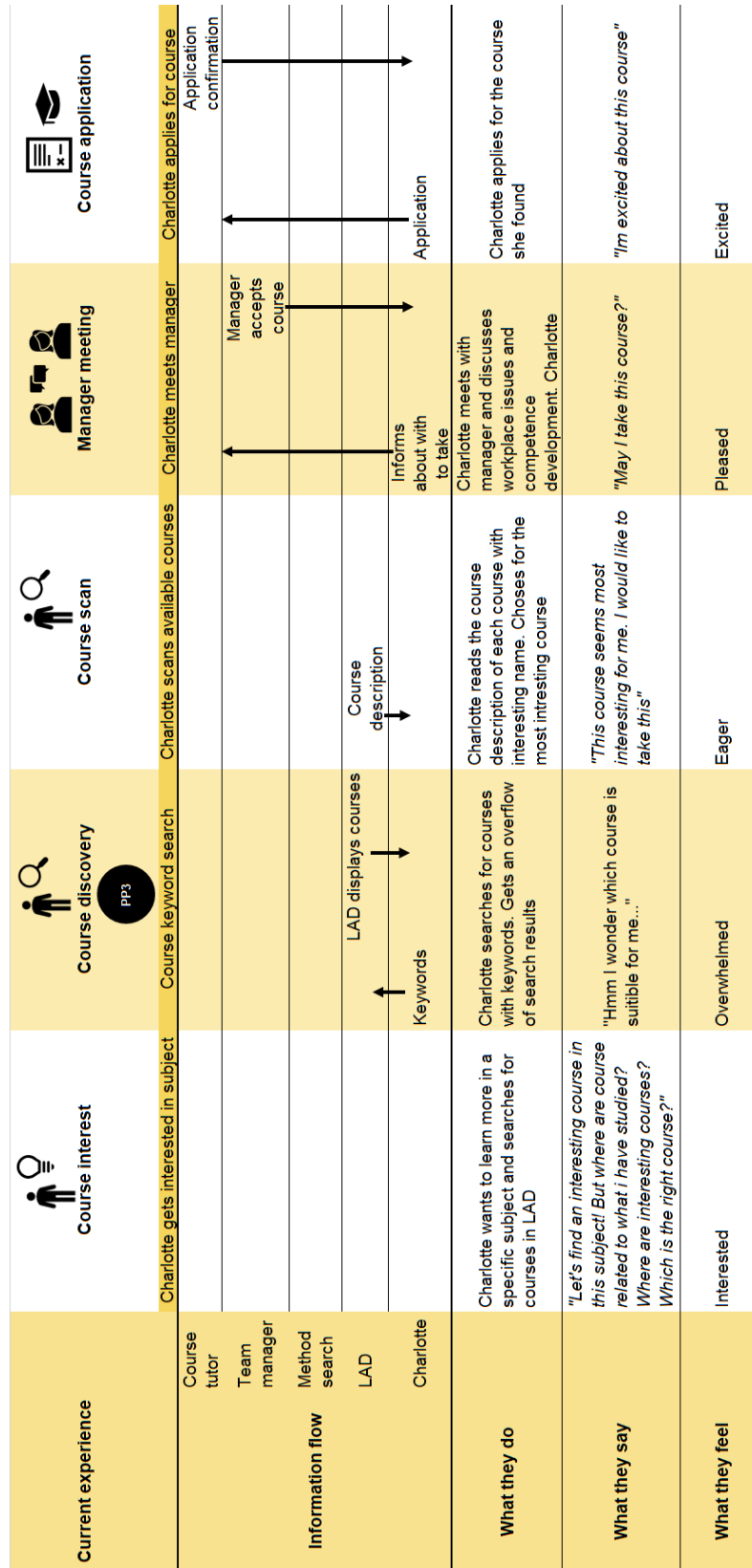| Current experience	Course interest	Course discovery	Course scan	Manager meeting	Course application
	Charlotte gets interested in subject	Course keyword search (PP3)	Charlotte scans available courses	Charlotte meets manager	Charlotte applies for course / Application confirmation
Information flow — Course tutor					
Team manager				Manager accepts course	
Method search					
LAD		LAD displays courses	Course description		
Charlotte		Keywords		Informs about with to take	Application
What they do	Charlotte wants to learn more in a specific subject and searches for courses in LAD	Charlotte searches for courses with keywords. Gets an overflow of search results	Charlotte reads the course description of each course with interesting name. Choses for the most intresting course	Charlotte meets with manager and discusses workplace issues and competence development. Charlotte	Charlotte applies for the course she found
What they say	*"Let's find an interesting course in this subject! But where are course related to what i have studied? Where are interesting courses? Which is the right course?"*	*"Hmm I wonder which course is suitible for me...."*	*"This course seems most interesting for me. I would like to take this"*	*"May I take this course?"*	*"I'm excited about this course"*
What they feel	Interested	Overwhelmed	Eager	Pleased	Excited

Figure 4.7: The Journey Map for the persona Charlotte.

4.2.4 Additional findings

In addition to the identified Pain Points and Opportunities related to education, more problems potentially exist, see appendices C and F. From the interviews it was found that problems related to time, course location and how developers are guided to courses, exist. Currently, some users perceive a conflict between attending courses and executing their work tasks. This was expressed to be tied to the location of the course and that there currently is no time allocated to attend courses. As stated by Pfeffer & Sutton (2000), the possibility to apply new knowledge is decreased when stressed, and the likelihood to do as one has always done is increased.

Furthermore, an additional finding from the interview was that it seems to be a difference in the manner teams guide their developers to courses relevant for them, specifically the newly employed, exist. Some teams have recommendations of relevant courses for newly employed developers, some teams let a newly employed developers ask colleagues for what courses that are relevant, and lastly some teams rely on documents left by the person who previously had their position.
Lastly, through the interviews it was found that consider the team managers responsible for defining what courses are relevant for them. This requires the team manager has knowledge about which software courses are relevant for the work tasks of the developers.

4.2.5 Summary of User Needs Results

To summarize, the identified Pain Points and their corresponding Opportunities are presented in figure 4.8. Pain Point 1 was found in Liam's Journey Map and highlights the issue of developers' unawareness of relevant courses for them. Pain Point 2 was found in Emma's Journey Map and highlights the difficulty for users to find specific courses with current search tools. Pain Point 3 was found in Charlotte's Journey Map and highlights the difficulty for developers to explore courses that are relevant to them. These Pain Point and corresponding Opportunities was later used as basis for concept development.

	Pain Points	Opportunities
PP1	Developer does not receive information about useful and required (access providing) courses. Instead realize they lack the knowledge needed for their work tasks when working.	How might we... increase awareness about useful and required courses... in order to... proactively ensure course participation
PP2	The current search tool, used to find courses, presents search results that do not match the developer's expectations	How might we... enhance the possibility for developers to find a specific course... in order to... minimize effort
PP3	The current search tool, used to find courses, do not support/encourage exploration of courses	How might we... enhance exploration of courses... in order to... increase individual competence development

Figure 4.8: All Pain Points identified and their Opportunities.

4.3 Discussion and Conclusions

This section presents a discussion and conclusions regarding the user needs method, implementation and results. Additionally the result of the third objective, stated in chapter 1, is presented.

4.3.1 Method and implementation discussion

A potential risk with the user observations is the participants might not feel comfortable. It is considered important to ensure the users share their thoughts to receive useful data for the creation of the personas. During the interviews the observers relied on the participants of the observation to convey their thoughts and feelings when solving the tasks. If the participants do not convey their thoughts, useful data could potentially be missed. A solution to this could have been to do the observations "in real life" and e.g. used video recording to receive data on impressions and expressions and not just words. However, the "think aloud technique" was used and the participants were encouraged by the observers to share their thoughts. In addition, questions were asked during the observations to ensure receiving useful data and the result was considered sufficient. Hence, this method was deemed sufficient for the study.

The personas were not evaluated with the participants of the user interviews and user observations, whom they were based on, to verify. However, the purpose of the personas was to create journey maps to identify paint points and formulate opportunities to create a concept early and evaluate with users and experts. Through the evaluations of the concept, it was considered that potential feedback regarding the user needs would emerge. Furthermore, each persona is a composition of several users needs and thoughts, from the user interviews and observations, and the individual personas include several individuals opinions. Hence, each persona is not a portrait of several users with the same needs. Each persona was created to represent one journey map and one pain point to communicate the user needs clearly.

Specifically, the personas were used to address many different needs and opinions in a concise way. The use of personas also provides a basis for discussion. This is beneficial, since there is a higher likelihood to achieve a good result if a solution is based on a specific users' needs rather than to take all possible users into account Yström et al. (2010).

Furthermore, the journey maps' "experiences" could have been based on observations in the "natural environment" of the users. It was deemed problematic, as during such observations the participants should not be aware of the observer since it could affect the results. However, the journey maps were based on data from the user interviews and observations.

The Personas, the journey maps and the Pain Points and Opportunities were used to create a user-based solution. No existing problem definition with the existing solution was available before this study, hence the study included an investigation of the problems. Therefore, it was deemed necessary to investigate the users needs and understand their usage of the existing solution to enhance their experience and develop the existing solution or a new one.

Lastly, qualitative user observations was conducted instead of quantitative. The latter could have measured how much time was needed to finish a certain task or how many steps required to reach certain information. This quantitative data from the existing solution could have been compared with the data from observation with the concept for evaluation. The reason is that the purpose of the observations was to gain understanding of how the user interacts with the existing solution and not to act as a comparison.

4.3.2 Results

The third objective was to investigate developers' needs regarding guidance to relevant courses. This study found opportunities for improvements regarding creating awareness of courses before working to

ensure quality of the deliverables. Furthermore, the study found needs for improving the efficiency of finding courses, both specific courses and to explore courses of interest to the user.

Regarding increasing the awareness of courses, it could be translated to increasing the possibility for the persona "Liam" to sign up for courses. Furthermore, through the interviews it became evident most developers get to know about courses, relevant for them, from their team manager. Hence, a focus to increase awareness of courses could be to provide tools to team managers to help developers.

Regarding improving the efficiency of finding courses, by increasing the user experience of searching for courses, the possibility for Liam and Emma to find specific courses could potentially be increased. This also applies for Charlotte, however for this persona the focus would be to enhance the exploration experience of courses to lower the risk of missing relevant courses.

By solving the issues found, the quality of the deliverables of the developers could potentially be improved, if the knowledge received through courses is relevant for their work tasks.

An important note is that LAD was found as the main way for developers to search for and explore courses. Since changes to LAD is outside the scope of this study, an alternative to LAD's functionalities could potentially be developed to address the issues raised.

Additional findings, presented in section 4.2.4, were discovered but not accounted for in later concept development as they were deemed outside of the scope. Hence, the concept developed will not solve these problems. To solve these problems, the concept needs to include additional aspects. Examples of such are a formal course guidance process, this is suggested in chapter 7.

5

Concept Development and Evaluation

This chapter presents a description of the concept development process used in this project. The initial part of the chapter presents the methods and their implementation to arrive at the result, which is described in the later part of the chapter. The chapter is concluded with discussions and conclusions.

5.1   Method and Implementation

Brainstorming, Ulrich & Eppinger (2012), was used to acts as input for the creation of the concept. As stated by Al-Samarraie & Hurmuzan (2018), this technique can be used in order to generate more ideas that are novel. The brainstorming was conducted as two open idea generating session with the aim at generating a large quantity of ideas to solve the problems defined as Pain Points and Opportunities, see section 4.8. In this study individual brainstorming, Ulrich & Eppinger (2012), was used initially and later the ideas were presented to the brainstorming participants and improved upon collaboratively.

The participants of the first session were the authors. During this session, the participants generated ideas for 15 minutes individually, to minimize risk of bias and influence, for each pain point respectively.

The participants of the second session were two experts, within software education at the company, and the authors. This second session was conducted similarly to the first. However, in this session the authors acted as moderators and introduced the pain points and opportunities. Ideas were generated for one Pain Point at a time. After ideas had been generated for all Pain Points, the ideas were elaborated and discussed among the participants.

The brainstorming sessions resulted in a total of 29 ideas for Pain Point 1, 28 ideas for Pain Point 2 and 31 for Pain Point 3. All ideas generated, from both sessions, sorted by Pain Points, can be seen in appendix H.

After both of the Brainstorming sessions had been conducted, the ideas were analyzed. Additionally, ideas were gathered from the user interviews and synthesized in an affinity diagram. This was done to incorporate idea suggestions directly from the users. The ideas gathered from the user interviews can be seen in appendix I.

The ideas from the brainstorming and the user interviews were categorized and developed to make them comprehensible, to enable concept creation and to act as basis for the voting of ideas, described below.

This resulted in 25 developed idea categories, see figure 5.1. Several of the developed ideas include a set of the ideas generated from the Brainstorming sessions and the user interviews. The ideas included in the idea categories were color coded to enable traceability on which Pain Point each category might solve. Some developed ideas aimed at solving more than one Pain Point.

Idea Categories	
The platform	Course-responsible in teams supporting the team manager in education needs
Course participation game, achievements, unlocking	Course ambassador for collecting feedback on courses and needs, and spreading information about courses available
Intelligent education application	Manager asks question about course needs regularly on Team meetings
Modular courses	Course tutor information sessions about courses
Team defines common courses	Allocate time for courses each increment
Standardized course guidance process	Survey course needs before each increment
Software plug-in	Poster advertisement
Team discussion forum, spread information about useful course content	Email advertisement
Course specific forum, ask questions about content before and after course	Highlight education related to a method used
Automatic (opt-out course registration for team's mandatory courses	advertisment notification in software
Course provides access	advertising courses through events
Manager informs and encourages individuals at meetings about courses	reward system based on course participation
Top down meeting promotion	

Figure 5.1: The idea categories before screening.

When the ideas had been categorized, they were screened to determine which developed ideas to include in the voting and later concept development. Idea screening is one of several ways to determine which ideas to develop further, as stated by Ulrich & Eppinger (2012). The screening of ideas was done based on a broad set of criteria: Desirability, Feasibility and Viability Luchs et al. (2015). During the screening, desirability took into account the user perspective and whether the concept accommodate for the identified user needs i.e. the Opportunities. Feasibility took into account the technical perspective meaning whether the technical skills required to create the concept is within the scope of the study. Lastly, Viability took into account whether the developed ideas were deemed economically defensible, meaning the benefit of the concept should be greater than the investment for implementation. Only the developed ideas that were deemed desirable, feasible and viable were kept for idea voting. The result of the screening of the developed ideas can be seen in figure 5.2. The "x" symbol indicates the idea was deemed to fulfill a criteria, the "/" symbol indicate it was undecidable to determine and the "-" symbol indicate the criteria was not fulfilled.

Concept	Desireable	Feasible	Viable
The platform	x	x	x
Standardized course guidance process	x	x	x
Team discussion forum, spread information about useful course content	/	x	x
Course specific forum, ask questions about content before and after course	x	x	x
course registration for team's mandatory courses	x	/	x
Course provides access	/	/	x
Manager informs and encourages individuals at meetings about courses	x	x	x
Course-responsible in teams supporting the team manager in education needs	x	x	x
collecting feedback on courses and needs, and spreading information	x	x	x
Manager asks question about course needs regularly on Team meetings	x	x	x
Course tutor information sessions	/	-	-
Allocate time for courses each increment	x	x	/
Survey course needs before each increment	x	x	x
Poster advertisement	x	x	x
Email advertisement	x	x	x

Figure 5.2: The result of the screening of the ideas.

To choose which developed ideas to include in the concept creation, Multivoting, Ulrich & Eppinger (2012), was used. First, the voting was done individually, by the authors, to minimize the influence on each other's voting decision. The voters were provided with three colored dots, one green dot, one blue dot and one yellow dot. The colors indicated the value of each vote, green equaled to three points, blue equaled to two and yellow equaled to one. After the individual voting was done, the votes were collected and counted to distinguish which developed ideas to include in the concept. The ideas that ended up with the greatest number of votes were the ones estimated to fulfill the criteria most accurately. These ideas were selected for further concept development. The criteria were included to act as basis and to guide the voting. Each developed idea, from the idea screening, see figure 5.2, was evaluated on three requirements: Desirability, Feasibility and Viability, these were the same criteria used in the Idea Screening. Furthermore, the evaluation of each developed idea was done based on the knowledge the authors gathered in the project through interviews and meetings. The focus was to generate a low fidelity concept and let the evaluations guide the development or change the ideas included in the concept. The voting resulting in developing a concept based on the "platform" idea, see figure 5.3.
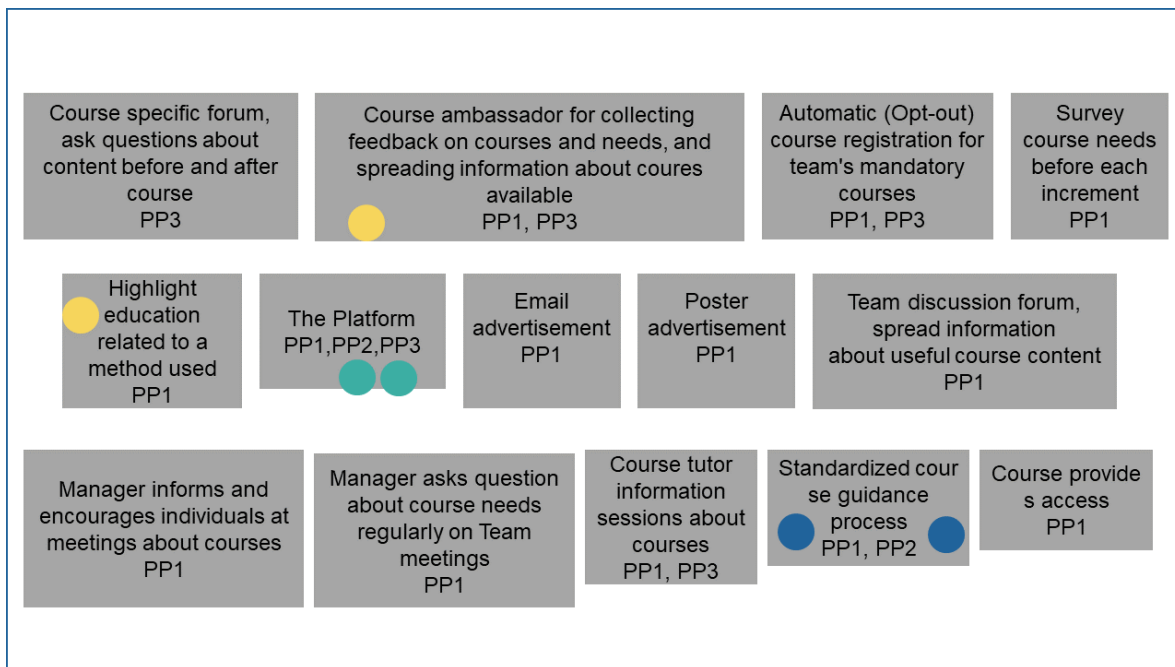

Figure 5.3: The result of the voting.

Johannesson et al. (2013) states that when developing a product, information about existing solutions is important. Benchmarking was conducted by investigating existing products that address similar problems to the pain points defined in this project Ulrich & Eppinger (2012). This was done to gain inspiration and knowledge which later could act as input for the creation of the concept. See figure 5.4 for a comparison table which was created for the existing products that was included in the benchmark. The table columns was used to list the "pain points" and the rows was used to list the existing products. The table was filled with descriptions on how each product address the "pain point". Examples of the solutions are video games (Skyrim, Bethesda Softworks (2020) and Borderlands, Gearbox Software (2020)), learning platforms (Khan Academy, Khan Academy (2020), and Duolingo, Duolingo (2020)) and course application platforms (Antagning.se, Swedish Council for Higher Education (2020), and NTICADCenter Nti CAD Center (2020)).

Pain Points/LMS or eLearning platform or Skill Package	increase awareness about useful and required courses in order to proactively ensure course participation	enhance the possibility for developers to find a specific course in order to minimize effort	enhance exploration of courses in order to increase individual competence development
Canvas	Course notifications	N/A	Total overview of all participated course, contained with all course information
Khan academy	N/A	Searchfield	Total overview of all subjects within a tab (rullgardin)
DuoLingo	Notifications, progression for each course for languages	list of languages	list of languages
Antagning.se	Info/New page as first page	Filtering search (school, subject, duration)	Overview of subject categories (tree menu)
NTICADcenter	Commercial to customers of CAD software	Filtering search (software)	Long list of courses (possible to filter)
Skyrim	Notification, spend point	several skill tress populated with perks	Perks "locked", but visible in skilltree
Boarderlands	Notification, spend point	several skill tress populated with perks	Perks "locked", but visible in skilltree. Each skill tree consists of rows that are unlockable visible.

Figure 5.4: The Benchmarking.

Based on the ideas voted to include in the concept, see figure 5.3, and the result from the Benchmarking, see figure 5.4, as input a concept was created. An overview of the concept was created as a hierarchical diagram, see figure 5.5, to show the aspects of the concept. This was done to represent the concept with low time investment and was followed by Low Fidelity Prototyping described below.

After the concept overview was created, a prototype was created in order to visualize and explain the course platform concept to users during evaluation and to enable further development of the concept. Initially, the prototype had low fidelity and was presented in the form of a story prototype Sharp et al. (2015). A low fidelity prototype was used to gain early user feedback on the concept and the aim was to iterate and increase the fidelity level in later iterations. The prototype was created with a software and consisted of all the solutions to the Pain Points and Opportunities, mentioned previously in section 4.8. The prototype, see section 5.2, consisted of sitemaps and wireframes, Rosenfeld et al. (2015).

To gain feedback for concept development on specific features of the concept, structured interviews, described by Patel & Davidson (2011), were used. This served as means for evaluation of the concept iterations. The evaluation was conducted with experts and users in all iterations. The evaluations with experts were conducted to gain input on the concept feasibility and the user evaluations were conducted to gain feedback whether the concept addressed the user needs.

The evaluation with experts and users were conducted in a similar way, however the intent differed. The user evaluations were carried out with a single user at a time and the expert evaluations were carried out with both experts present at the same time. The concept was presented and explained with the story prototype mentioned previously. The presentation contained information on where the concept would be located on the company's Intranet and what functionalities it would have. After the concept was presented the user or experts were asked a set of open questions, see appendix J. This was done to investigate in which aspects the concept was lacking and what needed to be changed or investigated further, foremost with regards to desirability (user evaluations) and feasibility (expert evaluations). During the evaluation sessions, notes were taken to act as input for the evaluation synthesize and the concept development.

The same two experts participated in all evaluations, however the participating users differed. The users participating were unique for every session, and the reason was to minimize the risk of developing the concept for a specific individual and missing useful feedback from the users.

The first user evaluation of the first concept iteration had two users participating. One was a Design Engineer and the other was a GDL. Both participants were interviewees of the user interviews conducted previously, see section 4.1, to define user needs. For the second evaluation with users of the second concept iteration one user, a Design Engineer participated. This user was also one of the interviewees from the user interviews. The third user evaluation of the third concept iteration had one user, a Design Engineer, who were also an interviewee of the user interviews. Evaluation through interviews was done until the fidelity of the concept was sufficient to perform the method Wizard of Oz, which is explained by Sharp et al. (2015). This method was used for the fourth evaluation, where the concept was presented to four different users. They were asked to perform specified tasks. All interactions with the concept was simulated by the authors in order to present the content of each site. The users were asked to think aloud in order to collect feedback from their interaction with the concept.

After each evaluation, before updating the concept based on the feedback received, the feedback was analyzed. The analyzed feedback acted as input for the concept updates and the result from the evaluations and the concept updates are presented chronologically in section 5.2 below.

5.2 Results

This section presents the results from the concept development and evaluation sessions. First, the initial concept is presented. Later, the results of the evaluation with users and experts is presented along with iterations of the concept. For each iteration, only the updated aspects of the concept are presented since aspects not receiving feedback during the evaluations were left unchanged. The final concept is presented in section 6.

5.2.1 Initial Concept

The initial concept was based on The Platform idea, from the idea voting and the results from the Benchmarking, in section 5.1. The concept aims to address the three Opportunities presented in chapter 4, through the potential to make available courses more visible at the current intranet pages, and to reduce the users' need to interact with LAD.
The initial concept contains: (1) a course platform and (2) a suggestion of how it can be integrated with the current intranet pages presented in section 3.2.2. The structure of the concept is based on the PLM methods page. The integration of the concept with the current intranet pages is based on an identified potential to raise the visibility of the available courses at these pages, mentioned in 3.3. The course platform is a Courses page. The suggestion of the integration is to locate the Courses page on a merged site of PLM Methods and Engineering Portal. In the merged site, how the content content of the two previous pages are presented is reimagined, based on the categorization done in section 3.2.2.

The course page includes a course package, a search/filtration function and an exploration function with categories and course overviews. The concept aims at solving all three Pain Points presented in section 4.2. A sitemap of the concept is shown in figure 5.5. The sitemap includes four icons, based on the categories identified on the PLM methods site in section 3.2.2. All icons are meant to be clickable and link to sub-pages, however in the figure, only the subpages of the course page are shown. To summarize, the initial concept constitutes the Courses page and how it is intended to be integrated with existing SharePoint intranet pages.
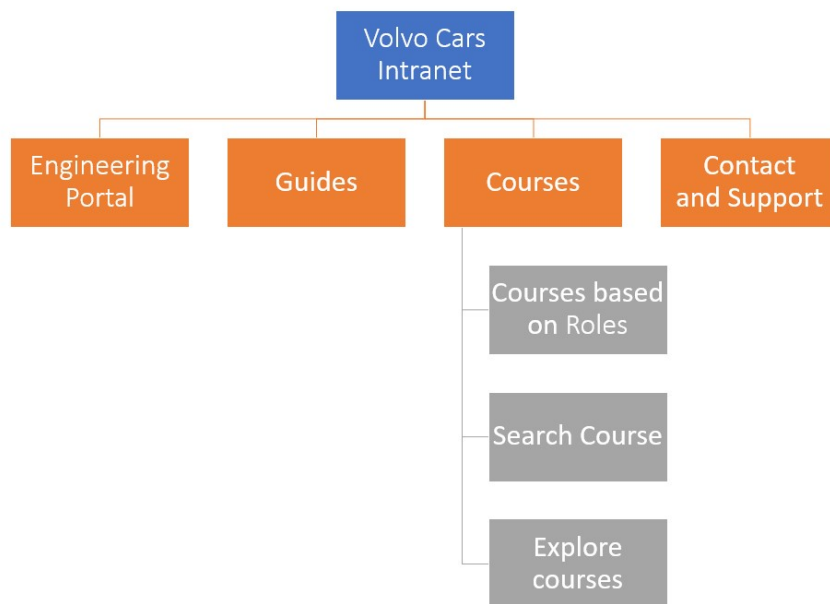

Figure 5.5: Sitemap of the initial concept. Based on the PLM methods site.

In the initial concept, the four pages Engineering Portal, Guides, Courses and Contact and Support are intended to be available as separate pages. These pages are based on the categories defined in 3.2.2. A low fidelity wireframe of this is shown i figure 5.6.
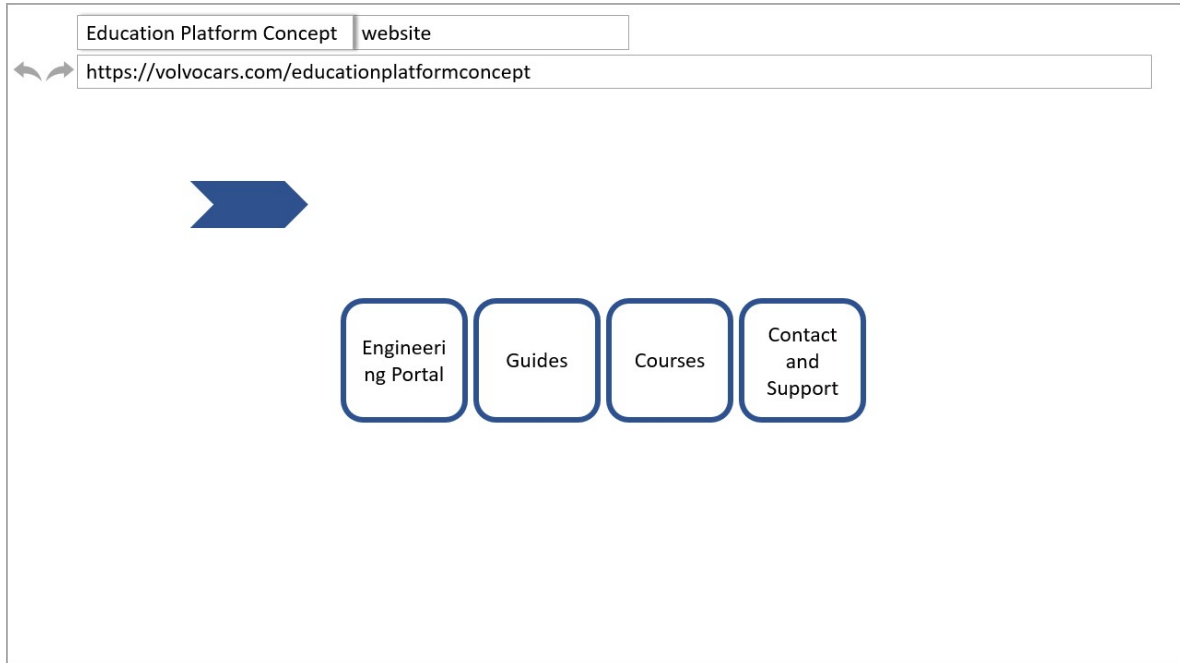
Figure 5.6: Low fidelity wireframe of available pages of initial concept.

Figure 5.7 shows the wireframe of the sub-page located under Courses, this is indicated by the arrows in the top left corner. This sub-page includes three icons, Courses Based on Roles, Course Search and Explore Courses. These icons are included to address Opportunity 1, 2 and 3, defined in 4.2. All icons are meant to be clickable and link to sub-pages explained below.
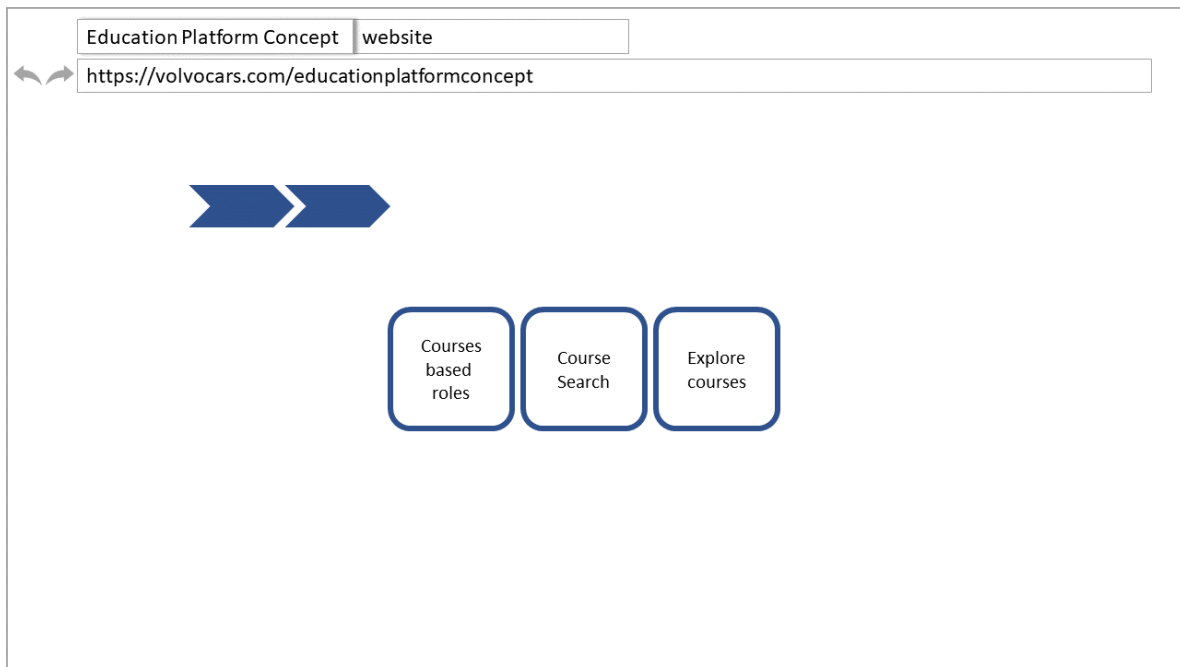
Figure 5.7: Low fidelity Wireframe of the icons available at the Courses sub-page.

Figure 5.8 shows the wireframe of the Courses Based on Roles sub-page. This page includes two icons, Design Engineer and GDL. These are the identified roles mentioned in section 3.2.1.
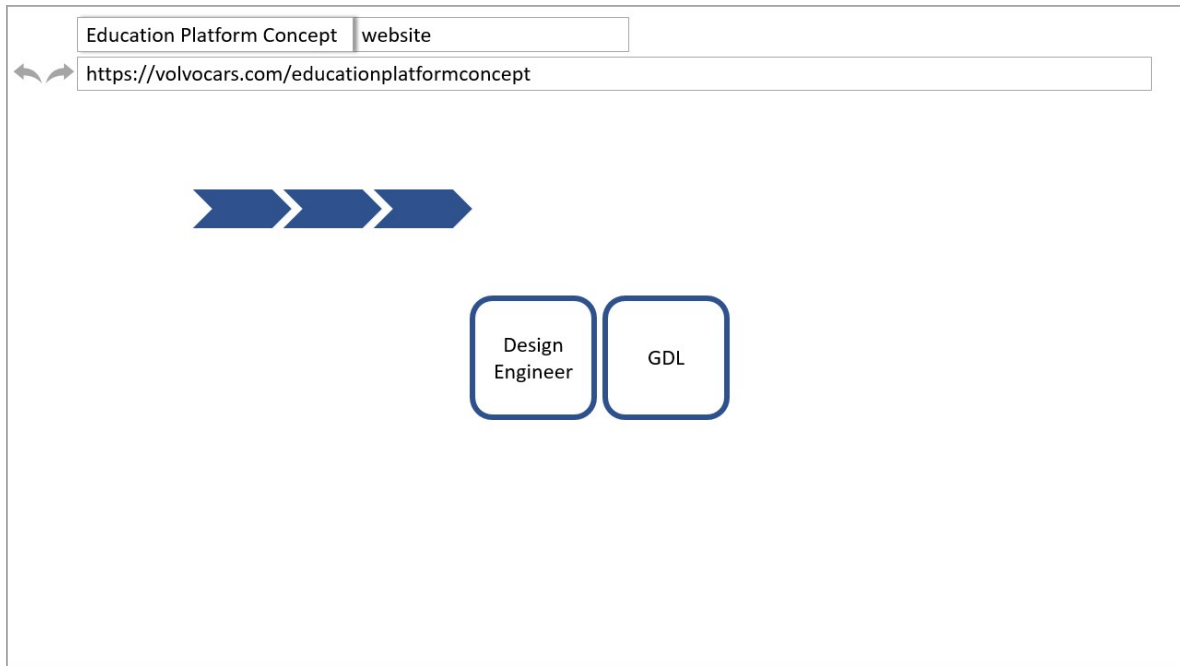
Figure 5.8: Low fidelity Wireframe of the icons available at the Courses Based on Role sub-page.

Figure 5.9 shows the wireframe of the role sub-page. This page includes a course package containing introduction courses and specialty courses. The course package provides the user with a holistic view of courses within different software sorted by levels e.g. basic to more advanced courses. The role sub-page aims at solving Pain Point 1, presented in figure 4.8, by providing the user with holistic course overview with courses relevant for their work.
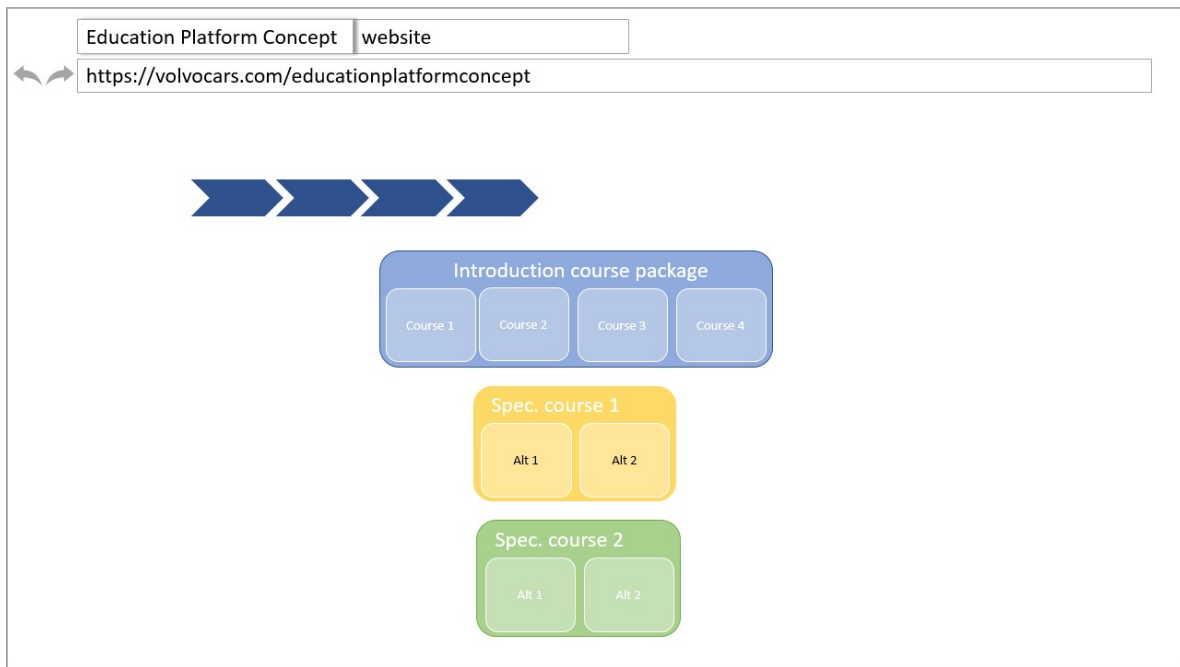
Figure 5.9: Low fidelity Wireframe of the Design Engineer sub-page.

Figure 5.10 shows the wireframe presented under the link icon Course Search, shown in Figure 5.7. This page aims at addressing Opportunity 2, presented in figure 4.8, by providing a search function which allows for filtering by categories. The search function for this concept include a free text search field, a filtration function allowing for filtration by software and search results. The search results displays information about the courses, e.g. level of the course, the LAD ID number and the duration of the course. The intent is each search result is clickable leading to a course page presented in Figure 5.11, this page is described in detail below.
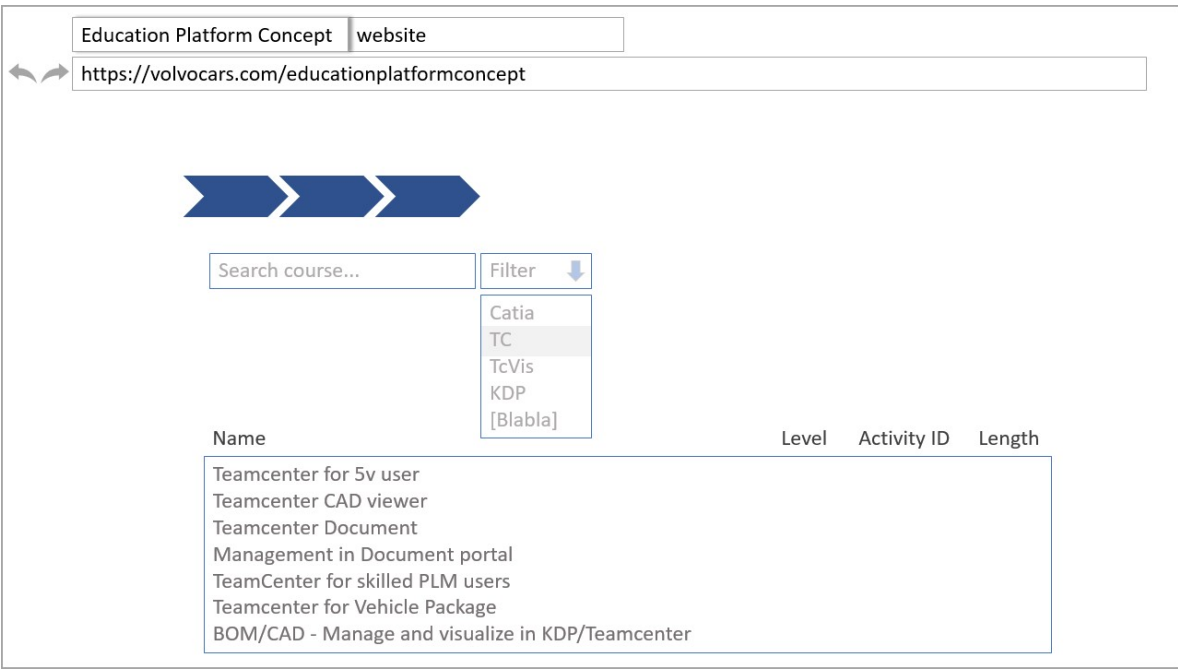
Figure 5.10: Low fidelity Wireframe of the Course Search sub-page.

Figure 5.11 shows a low fidelity wireframe of a generic Course Page which is meant to be accessed by clicking the search results of the course search page presented in Figure 5.10 or by clicking a course presented in the software course overview page presented in Figure 5.9. The course page is intended to include information about the course and link the user to LAD for course application. This page is included in the concept in order to aid the Course Search and Explore Courses pages in addressing Opportunity 2 and 3, presented in figure4.8, by providing relevant information about the course.
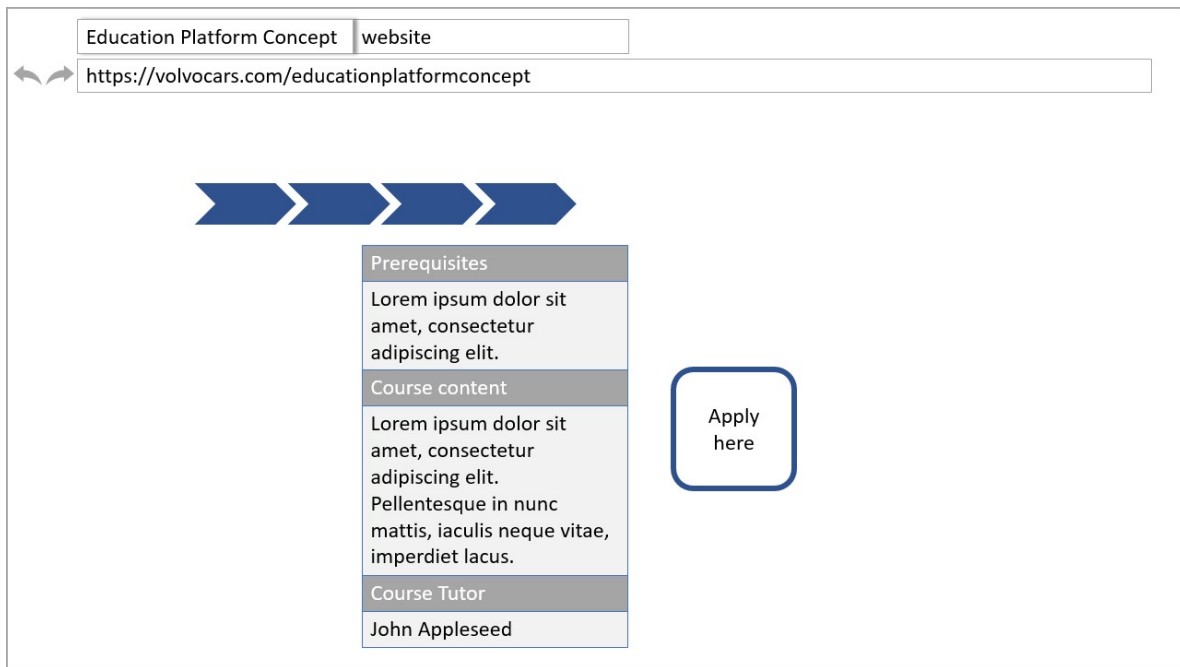
Figure 5.11: Low fidelity Wireframe of a general course page sub-page.

Figure 5.12 shows the wireframe of the Explore Courses page, which is meant to be accessed by clicking the Explore Course icon at the page shown in Figure 5.7. This page aims at addressing Opportunity 3 by allowing the user to explore courses based on software and area. The page includes three areas derived from the Engineering Portal, see section 3.2. These are Engineering, Product Data Analysis and Processes Deliveries. For each area, all relevant software are presented for the specific area.
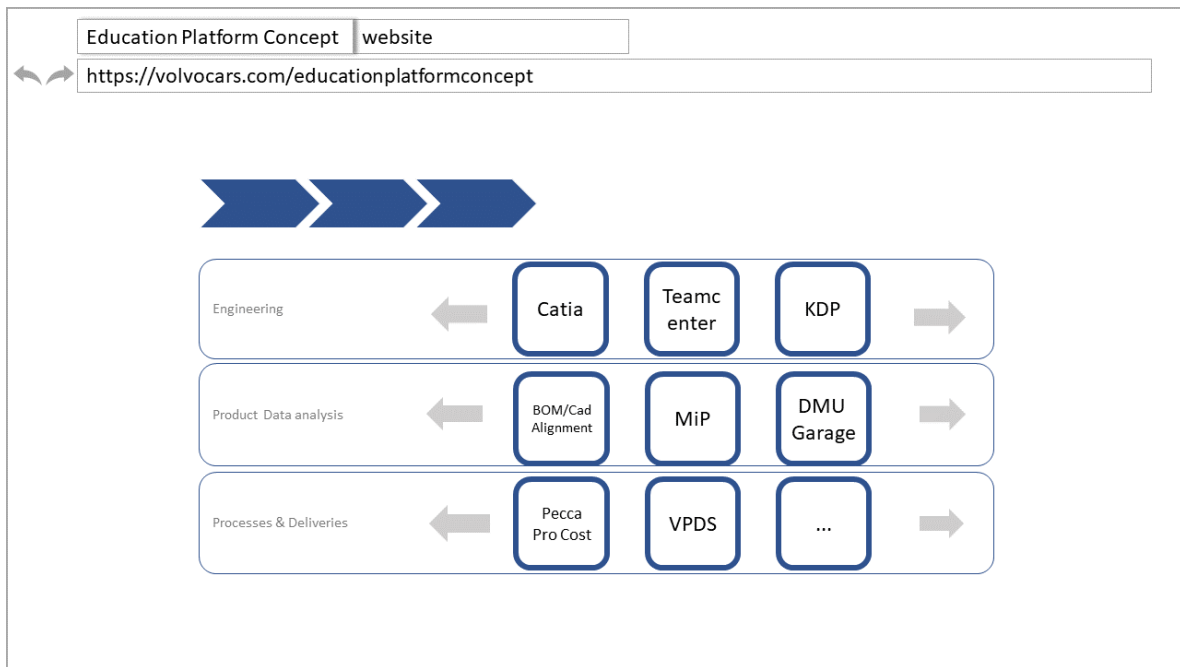
Figure 5.12: Low fidelity Wireframe of the Explore Courses sub-page.

The course overviews are accessed through the clickable icons presented in Figure 5.12. Each course overview page provides the user with an overview of all courses available within a specific software, much like the current course overviews presented in section 3.2.3. In this concept however, all course overviews are intended to be presented in the same format, independent of software. The courses are sorted by level. All courses presented are clickable icons directing the user to the Course Page presented in Figure 5.11, for additional information regarding a specific course.

5.2.2 Platform evaluation 1

The first evaluation with experts and users resulted in three updates to the concept. These were: two high fidelity wireframes (figure 5.13 and 5.14), division of course levels, and a news section under the Courses sub-page.
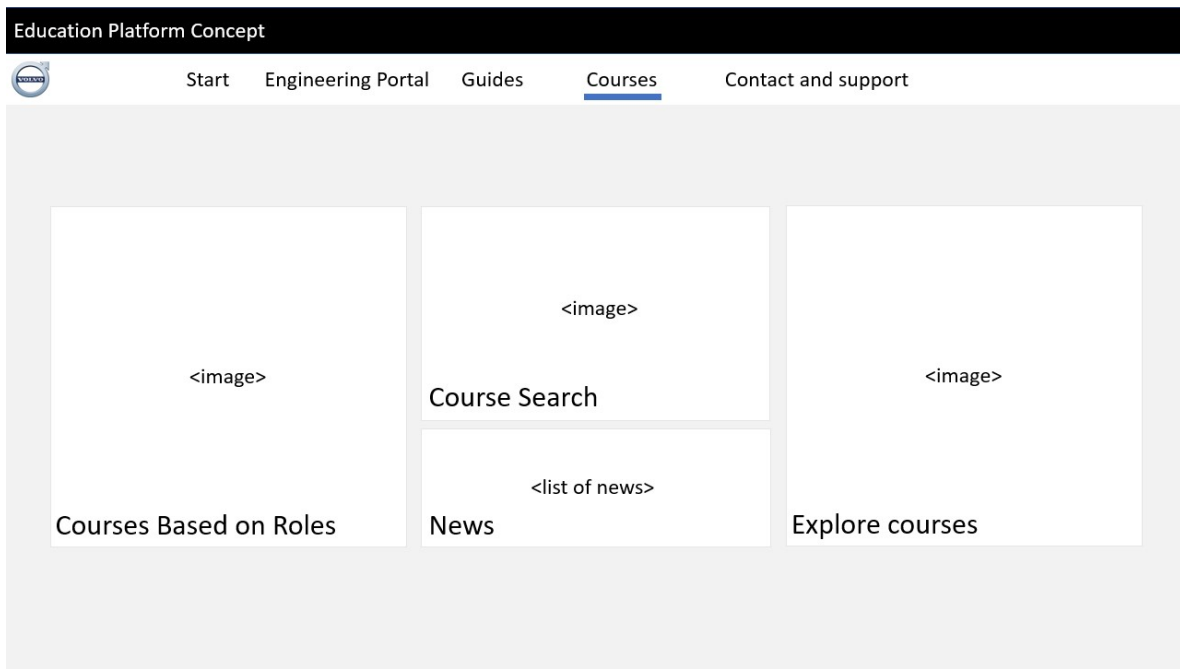
Figure 5.13: High fidelity Courses wireframe. News section added.
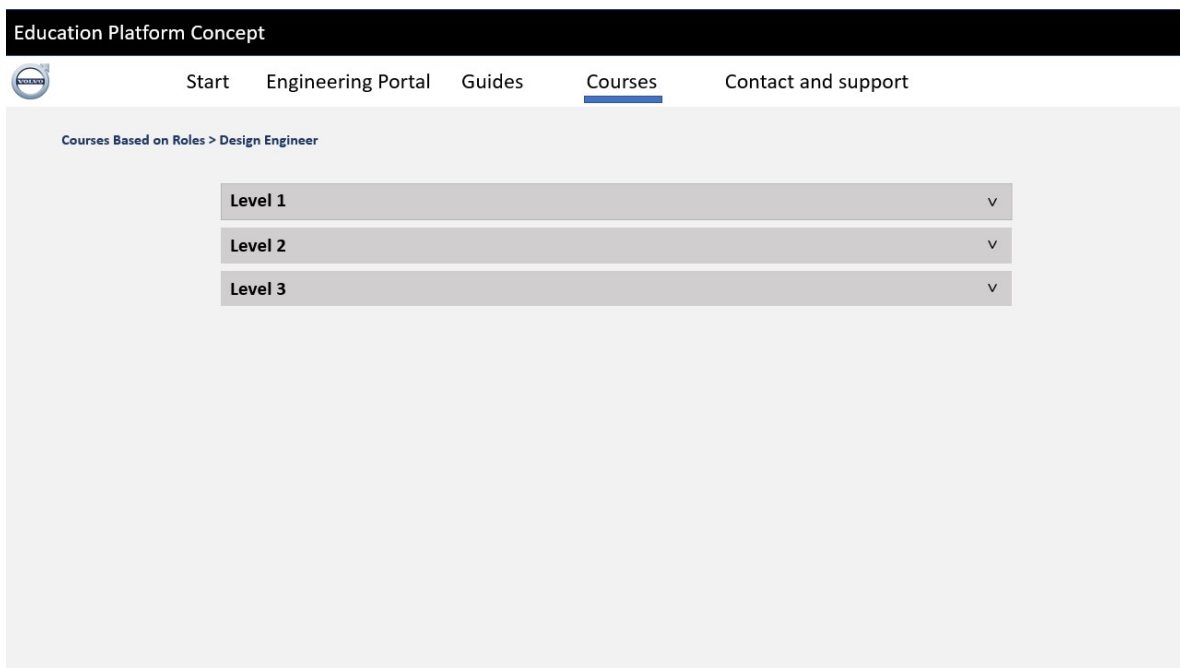
Figure 5.14: High fidelity wireframe of the Design Engineer sub-page with all Level sections closed.
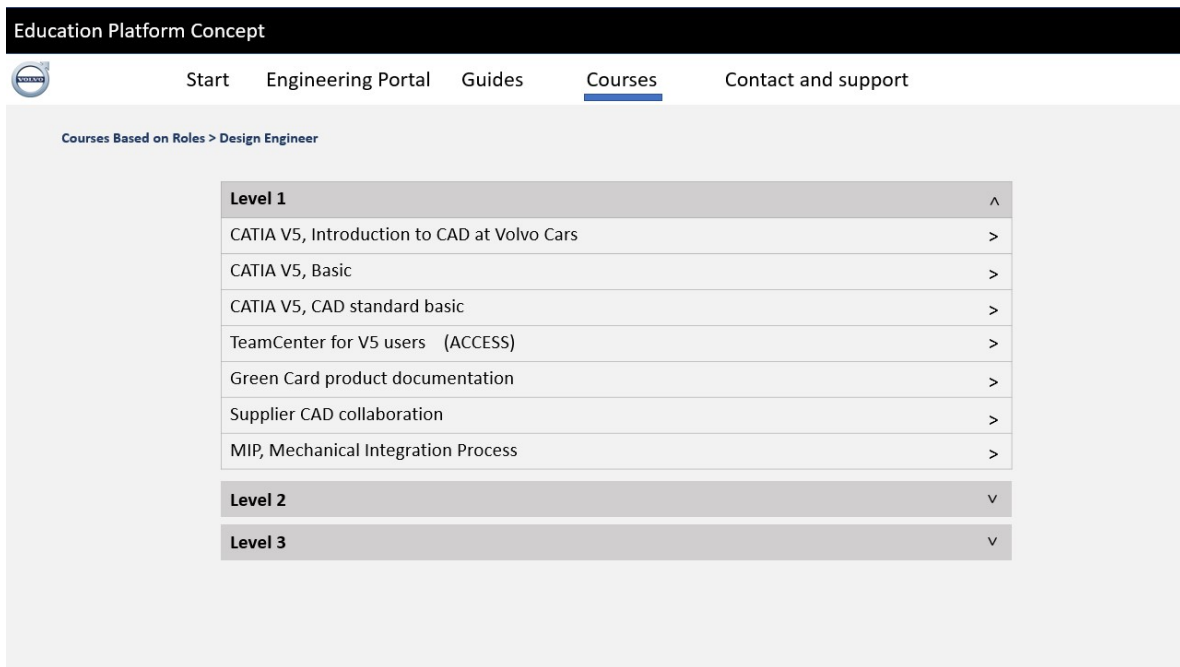
Figure 5.15: High fidelity wireframe of the Design Engineer sub-page with expanded Level 1 section.

The increase of fidelity of the two Wireframes in the concept was done to gain additional feedback on these in coming evaluations. High fidelity Wireframes were added for the Courses sub-page, see Figure 5.13, and the Role sub-page, see Figure 5.14 and Figure 5.15. The wireframes were given the same graphical layout as the intranet to provide familiarity for the user.

The inclusion of a News section on the Courses page, see Figure 5.13, was done to notify the user about news regarding courses with information about e.g. new courses and potential changes to existing courses.

The division of the courses into level-lists, see figure 5.14 and figure 5.15, was done to present the course progression in a clearer way. The level-lists were added since it was deemed difficult for the users and experts to understand the course progression in the initial concept. The course overview is populated with the design engineer courses from section 3.2.1, to visualize how courses based on you role can look.

5.2.3 Platform evaluation 2

The second evaluation resulted in three updates to the concept. These were: a Start sub-page, an individualized Courses Based on Roles sub-page, and a Course Overview wireframe was created with filtering functions.

One user expressed that it was unclear how the Courses page related to the existing sites, e.g. the Engineering Portal. The Start sub-page was added to address this concern and inform users of the site's contents before being presented to the available sub-pages. Furthermore, a high fidelity Wireframe was created for the Start sub-page, see Figure 5.16. Included in the Wireframe is a short welcome message and information to the user about the site's content.
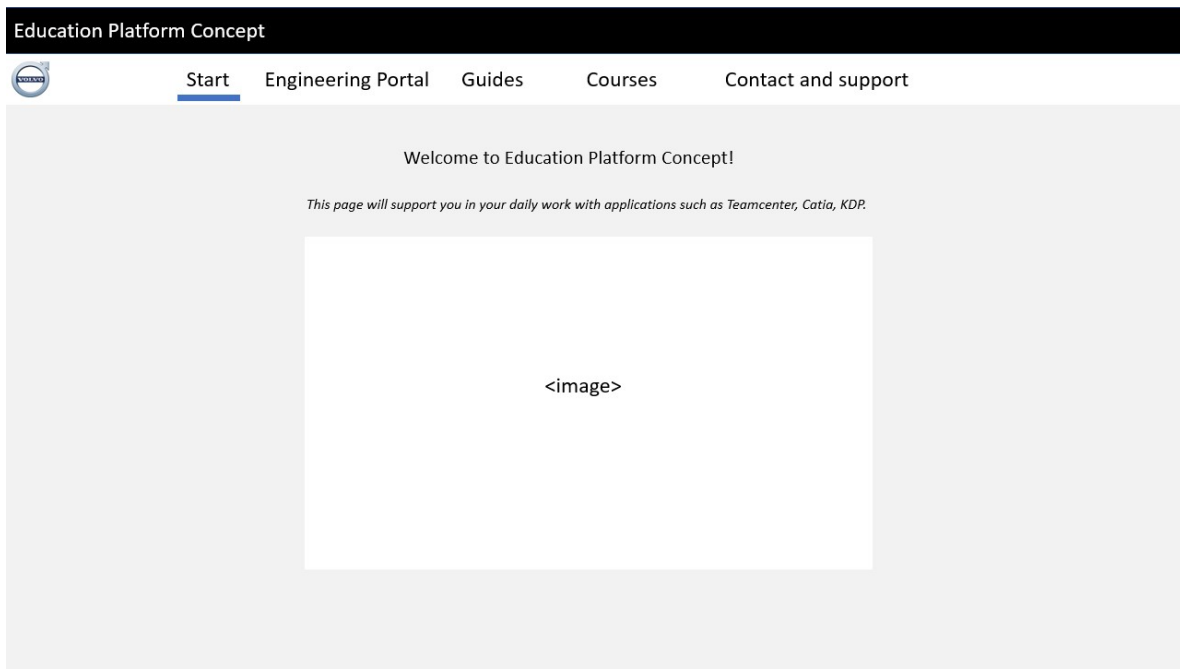
Figure 5.16: High fidelity Wireframe of the Start sub-page.

The individualized Courses Based on Roles sub-page was named Courses Based on Your Role. The user's existing intranet account, CDSID, enables the presentation of courses based on their individual needs in this sub-page. Figure 5.17 shows this high fidelity wireframe of the individualized Courses Based on Your Role sub-page. In the wireframe, there is an indicator, in this concept a green tick and a different background color, to inform the user that a certain course has been completed. Additionally, a progression indicator is included, in this concept numbers, to inform the user of how many courses that have been completed within a certain level. Lastly, an indicator was added to inform the user of which courses that provide access to a software or certain areas within a software, in this concept a key symbol.
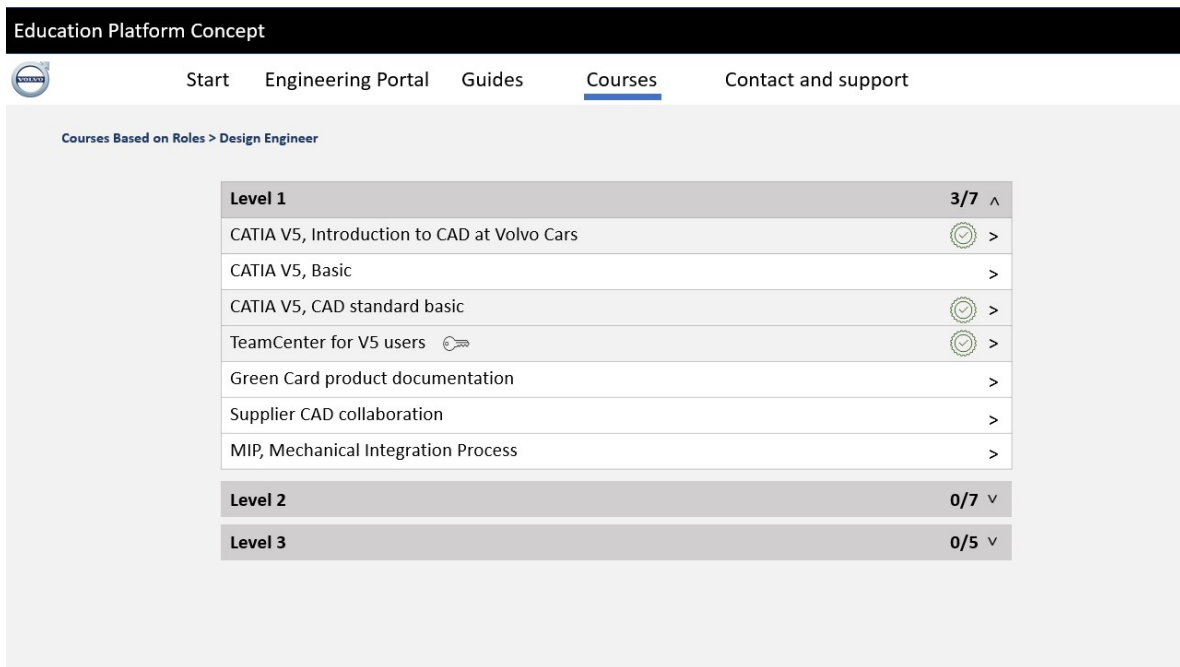
Figure 5.17: Updated high fidelity Wireframe of the Courses Based on your Role sub-page.

A wireframe was created for the course overview sub-page and a filtration was included. This was done based on user feedback, to allow the user to filter the courses based on categories, such as work area attributes. Figure 5.18 presents an unfiltered overview of the courses in CATIA V5 and Figure 5.19 presents a filtered view, with only courses relevant for plastic design in CATIA V5, as an example of the filter function. The icons on the right side of the wireframe, are intended to be clickable and selecting one filters the courses presented and only courses related to the category is presented.
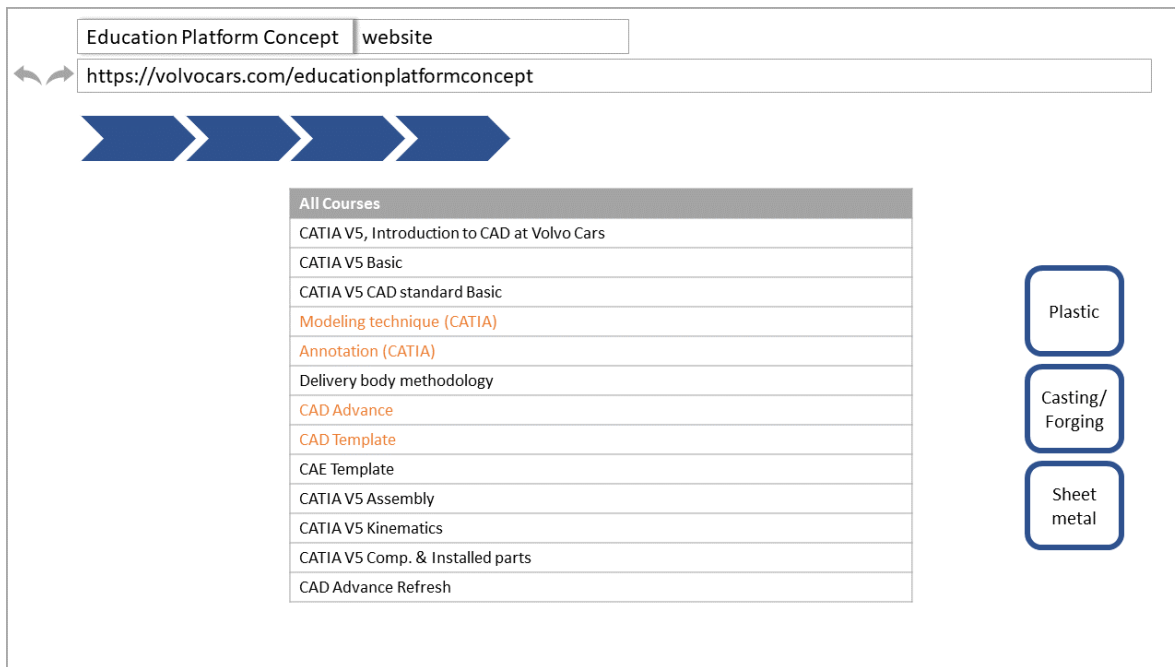
Figure 5.18: Updated Wireframe of the Course Overview sub-page.
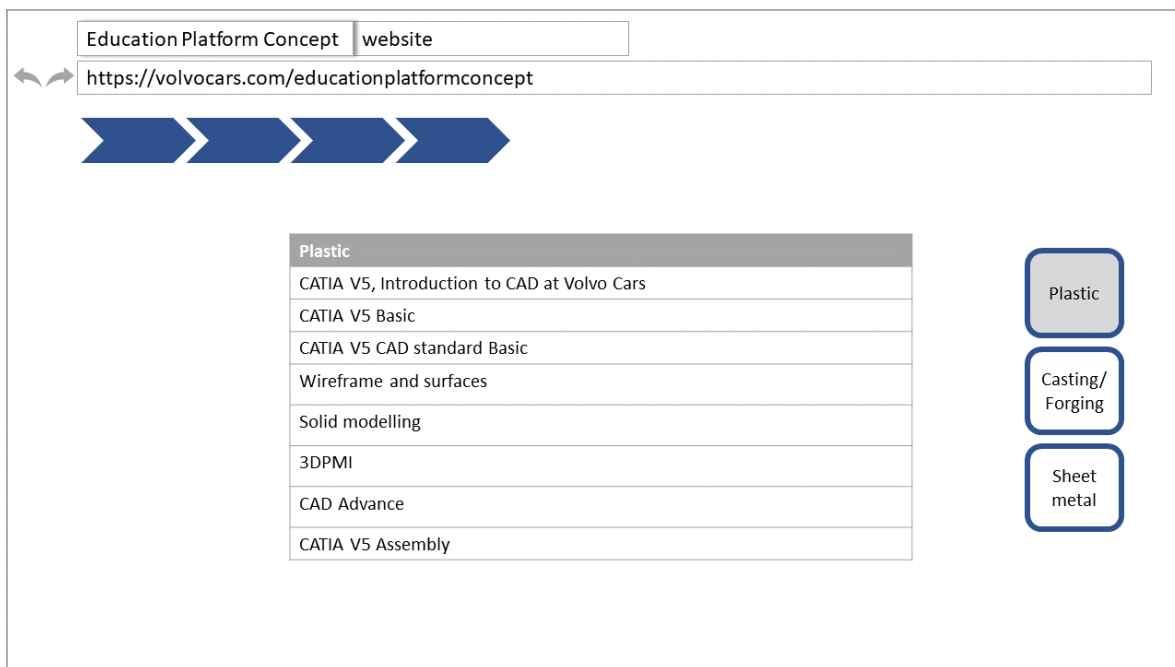
Figure 5.19: Updated Wireframe of the Explore Courses sub-page with filtered view.

5.2.4   Platform evaluation 3

The third evaluation resulted in one update: combining Course Search and Explore Courses. The pages for Course Search and Explore Courses was combined since the filter function in the Course

Search page could act as means to isolate courses in software and work areas. These are the same categories used in the Explore Courses page, which would leave the Explore Courses page redundant, hence it was removed. Figure 5.20 shows a high fidelity wireframe of the new Courses sub-page and Figure 5.21 shows a high fidelity wireframe of the Course Search page.
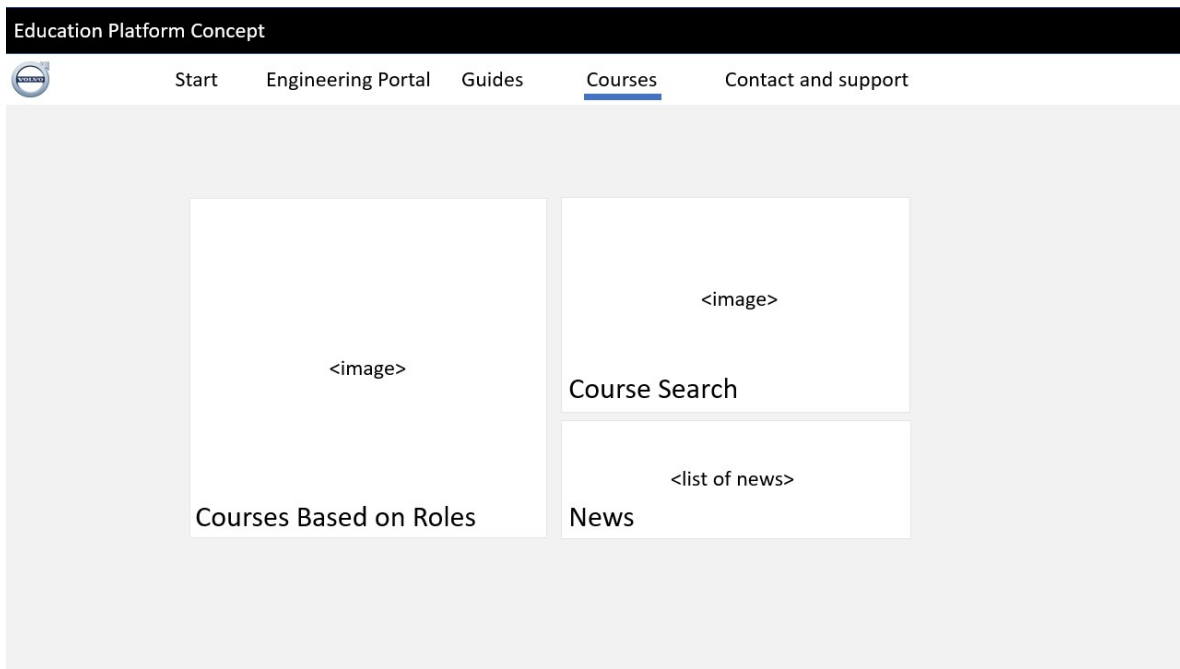
Figure 5.20: Updated high fidelity wireframe of the Courses page.
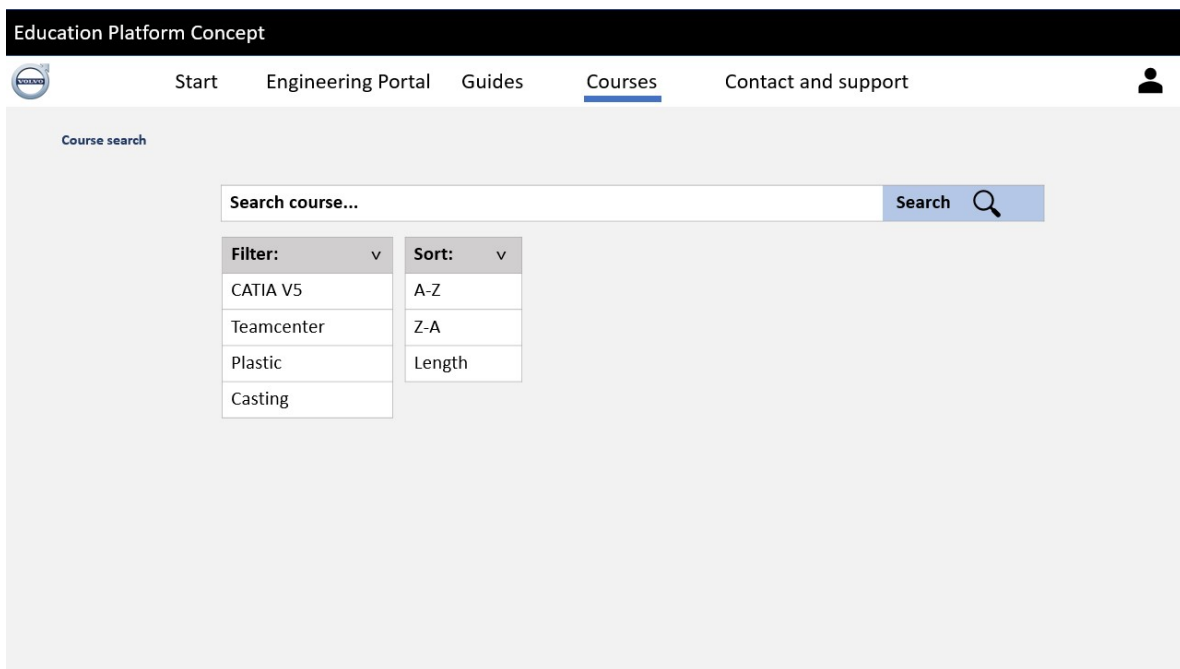
Figure 5.21: Updated high fidelity wireframe of the Course Search page.

5.2.5 Platform evaluation 4

In the fourth evaluation it was learned the concept was used as intended by the users. The Course page was used by participants to look for courses, the Course Search sub-page was used to search for

specific courses and the Courses Based on Roles sub-page was utilized to find courses relevant for their role, as was intended.

The evaluation resulted in two additional findings about user interaction with the concept. These were:

- Users tend to click on Engineering Portal when searching for course overview in a specific software.

- Users expect to get correct search result even if no keyword from the course name was used in the search.

5.2.6   Summary of the Results

Summary of concept development and evaluation results:

Initial concept:

- The initial concept contains: (1) a course platform and (2) a suggestion of how it can be integrated with certain current intranet pages.
- The Course platform constitutes the Courses page in figure 5.5.
- The courses page includes course package based on roles, search and exploration under Courses-tabs.

Evaluation 1:

- Higher level of fidelity of two wireframes was created to allow for more specific feedback.
- News field was added to the courses-page
- Course level-lists was added to emphasize the progression in the course package

Evaluation 2:

- Start page was added the the merged intranet page, and a wireframe was added
- Individualized "mode" was added to the Courses Based on Roles page, with indicators for what courses that has not been completed.
- Course overview wireframe was created with filtering functions.

Evaluation 3:

- Exploration and search were merged due to similar functionality.

Evaluation 4:

- In the fourth evaluation it was learned that the concept was used as intended by the users.
- It was found that users tend to click on Engineering Portal when searching for course overview in a specific software.
- It was found that users expect to get correct search result even though no key word from the course name has been used in the search.

5.3   Discussions and Conclusions

This section presents discussions and conclusions regarding the concept development. Firstly, a discussion regarding the methods used and the implementation is presented. This is followed by a section with discussions and conclusions regarding the results of the concept development.

5.3.1 Method and implementation discussion

The results of the brainstorming session is potentially dependant on which participants participating in the session. However, if the same problems are used as input with different participant, it could potentially lead to similar results. This was the case for the first and second brainstorming session. Several ideas generated from both sessions were same or similar. Furthermore, additional experts within different software courses could have been involved in the brainstorming. This could potentially have generated more ideas. However, since the brainstorming was not tied to a specific software course, rather how developers could be guided to courses generally, this was deemed sufficient.

The screening and voting of ideas was based on the authors' judgement and evaluation against criteria. This is a subjective method, however, the aim of the study was to generate one concept early and iterate. Hence, if some ideas selected for further development does not meet the users needs, it is thought such feedback is received during the evaluations, and later iterations could include aspects meeting the potentially missed needs. Furthermore, when screening ideas, experts could have participated to help determine whether the concept met the criteria of feasibility and viability. However, since this was at a concept development stage it was not deemed necessary, since experts was included in concept evaluation. Lastly, the idea screening could have been made together with the participants of the interviews. However, there could be a risk of participants vouching for the idea solving their problems the most. Additionally, as mentioned earlier, the goal was to generate a low fidelity prototype of a concept early to iterate and evaluate with users. The developed concept was presented as wireframes and not as a functioning software.

When carrying out the benchmarking, greater effort could have been put on evaluating existing solutions within similar organisations. However, without access to other companies' course guidance software, this proved difficult. By comparing similar software, not specifically tied to course guidance within engineering software, the key functions was deemed to identified.

The evaluation method Wizard of Oz was used to avoid the need to code the concept and to make it interactive, in order to present a functioning concept. It was learned the project potentially could have benefited by using this evaluation method earlier, even with the low fidelity wireframes. However, this was discovered when the method was used for the first time and was not apparent before. Furthermore, the feedback from the user interviews was sufficient enough to act as basis for concept improvement.

5.3.2 Results

The fourth objective was to develop a concept based on the user needs, which guides developers to relevant software courses. In this study, the initial concept was based on the ideas generated to solve the user needs found during observations and interviews with the users. Furthermore, the concept was developed iteratively and updated based on evaluations with users. The concept development aimed at refining the aspects of the concept to meet the users needs from low fidelity to high fidelity prototype.

The concept development resulted in a platform concept which aim at being integrated with the Engineering Portal. A platform concept independent of Engineering Portal, with a broader scope of courses, could have been developed. However, through the expert meeting with the manager from Volvo Cars Academy, section 3.2.2, it was learned that a purchase of a Learning management system is on its way. This justified a more "short term" solution which could be integrated in a commonly used intranet page. The Engineering Portal was deemed the most widely used by the target group, based on both interviews and expert meetings.

6

Final Concept

This chapter presents the final concept to guide developers to courses in software related to their work tasks, including a course platform and how it is intended to be integrated with a suggested merged site (of the intranet pages Engineering Portal and PLM Methods). Additionally, this chapter presents a comparison, in how developers are intended to be guided to courses with the final concept and how they are guided to courses currently. Lastly, this chapter is concluded with discussions and conclusions regarding the final concept.

6.1   Results

This section presents the results of the final concept. A general version, see section 6.1.1, of the course platform, constituting the course page, is described first. This is followed by a description of an individualized version of the course page, see section 6.1.2. Both versions share similar pages, hence only the unique pages of the individualized version is presented under its section. The Courses page is based on the concept development results presented in 5.2. Furthermore, the general version of the course page is deemed possible to implement with the current system and the individualized version requires an integration with the Human Resources system, as was found during the meeting with expert (5), section 3.1. Furthermore, the courses page is intended to be integrated with the existing Engineering Portal and PLM methods, mentioned in section 3.2.2. The concept for the integration with the merged site (of the Engineering Portal and PLM Methods) and a suggestion of content of the pages "Engineering Portal", "Guides" and "Contact and Support" is presented in section 6.1.3.

6.1.1   Course platform: general version

The design of the concept's interface is intentionally matched with the intranet's interface design. This was done to increase user acceptance and to lower the difficulty for the user to navigate as it is a familiar environment, putting lower need for understanding a new interface design. A sitemap is presented in figure 6.1, visualizing the structure of the general version of the course page, constituting the course page, and the locations of its sub-pages described below and the integration on the merged site described in section 6.1.3.
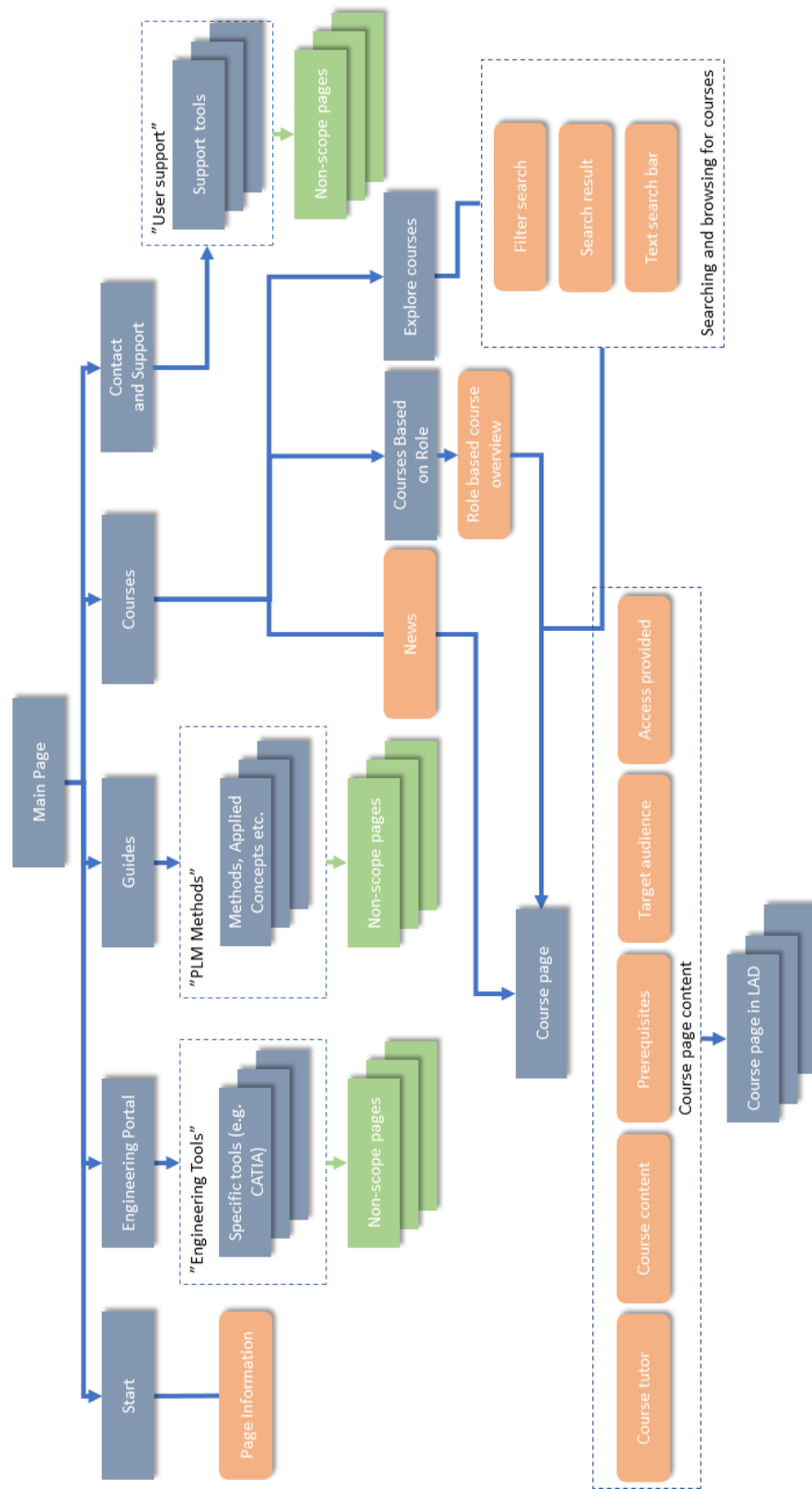
Figure 6.1: Sitemap of the general concept.

The Courses page is an overview page of the different subpages, see figure 6.2. Three images are presented: Courses Based on Role, Course Search and News. The two former are clickable icons directing the user to its specific subpage. The "Courses Based on Role" subpage presents a course package for the two roles identified, design engineer and GDL, see section 3.2.1. This subpage aims at addressing Opportunity 1, see section 4.2. The Course Search subpage allows the user to search and explore courses by using a filter function. This subpage aims at addressing Opportunity 2 and 3, see section 4.2. The news field includes recent information regarding courses, for example new courses, changes to courses and new course moments available. This field is included based on evaluation 1, see section 5.2.2.
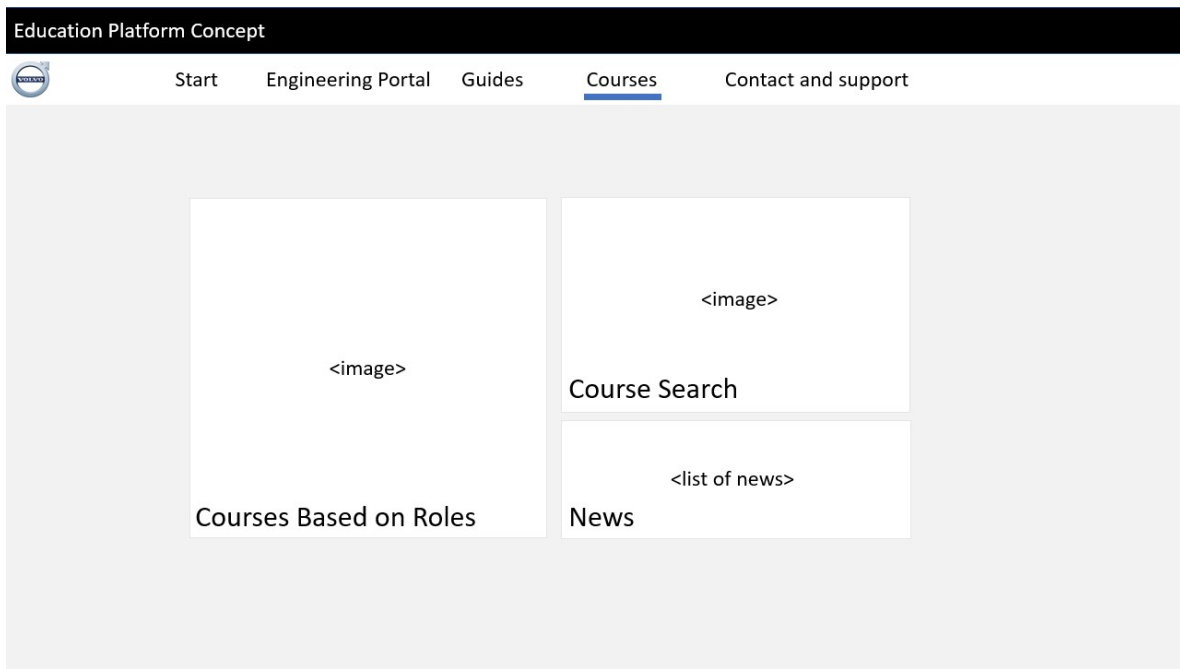
Figure 6.2: Wireframe of the general final concept's Courses page.

The Courses Based on Roles subpage, presented in figure 6.3, include two link icons. These are the roles identified in Current State Analysis, see section 3.2.1. Both are clickable directing the user to a course package sub-page. This was done to allow the user to select a role they "identify" with, to receive a selection of courses relevant to them, to address Opportunity 1. The fidelity of this wireframe was increased compared to the wireframe of this subpage presented in section 5.2.
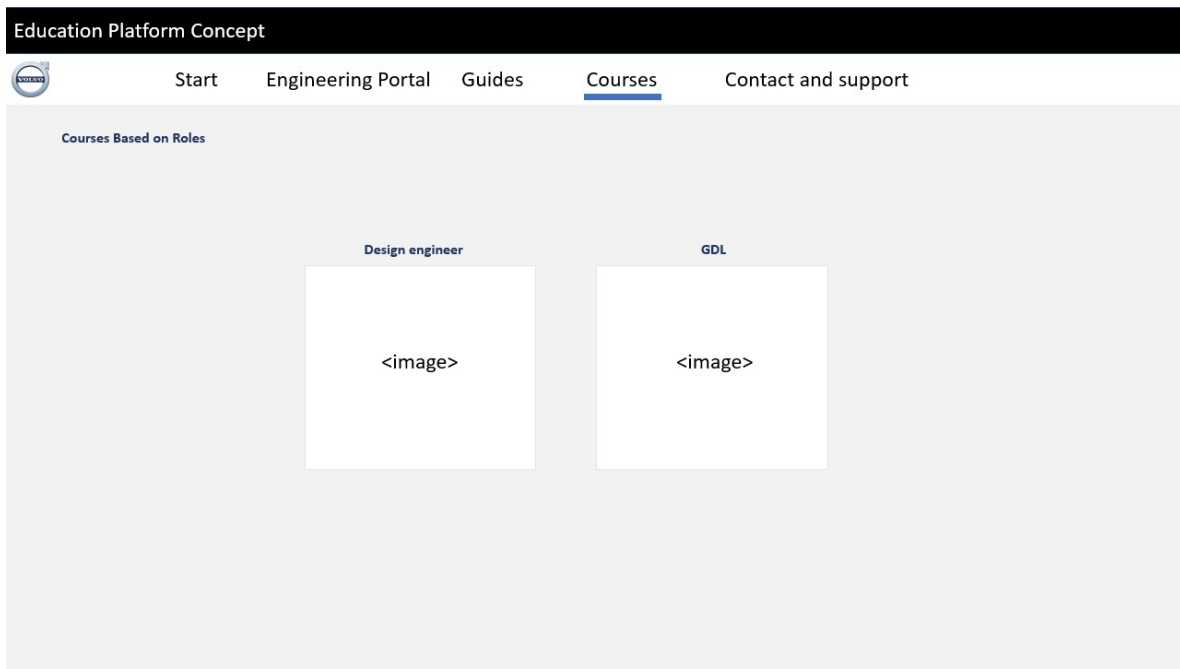
Figure 6.3: Wireframe of the general final concept's Courses based on Roles page.

The subpage presented in figure 6.4 include a selection of courses for the role selected, in the figure a selection of courses for the role Design Engineer is presented. All courses are clickable and links the user to the courses' respective course information page, presented in figure 6.7. Furthermore, several levels are presented to inform the user of the progression of courses. This was based on concept evaluation 1, see section 5.2.2. Each level is intended to be populated with software courses for the role types, defined in section 3.2.1. The courses meant to be included in the first level are courses regarded relevant for all employees with that specific role type. The following levels are meant to be populated with courses which the individuals or teams can select to meet their team specific needs. To aid this and guide the selection, the courses are presented holistically and at different levels. The courses included in figure 6.4 are a selection of the courses specified in section 3.2.1 and is suggested as a foundation for different teams to define their specific course needs. Furthermore, it could be used by team managers when guiding developers to courses.

After a potential implementation of the concept, the content of this page is meant to be administrated and updated by the course owners. Lastly, the sub-page was included to inform the user of courses relevant for them in a holistic view by including software of different courses sorted by levels, to address Opportunity 1.
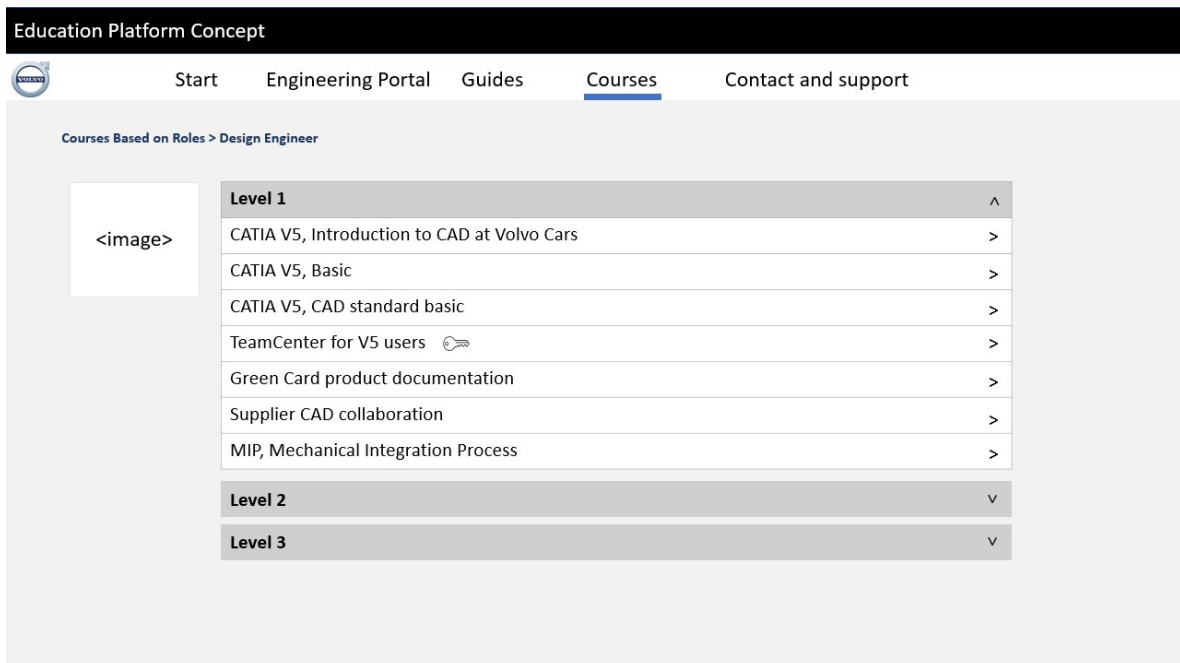
Figure 6.4: Wireframe of the general final concept's Role course overview page.

The subpage, Course Search, presented in figure 6.5is intended to be used when applying for a specific course and to gain an overview of what courses exist in a specific software, in order for the user to search and explore courses relevant for them. The subpage include a search bar with text search, to address Opportunity 2. Furthermore, the subpage contain a pre-defined filter with different categories, to address Opportunity 3 based on evaluation 3 5.2.4. The filter categories includes software and working areas. The intention is to include the software which were identified relevant for the design engineer and the GDL, see section 3.2.1. The working areas are based on the current course overview for CATIA V5, see figure 3.7 for an example of one of its pages, and include plastic, casting and sheet metal. Additionally, the sub-page also include a sorting function which includes different sorting options, e.g. alphabetical or course duration.
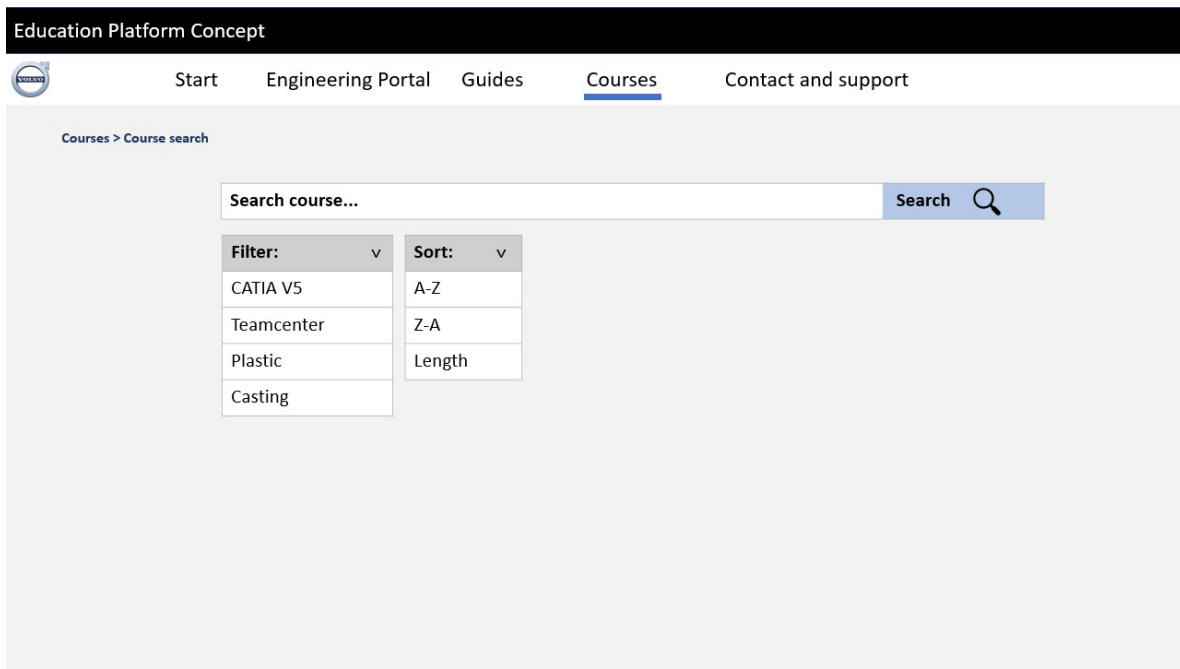
Figure 6.5: Wireframe of the general final concept's search page.

The search result of the courses are clickable and links the user to the courses' respective course information page, presented in figure 6.7 and described below. The search function should only search for certain categories, such as, course name or software type, and not for instance course description. This is to lower the risk of presenting a large amount of results which could potentially overwhelm the user, to address Opportunity 2 and 3.

Education Platform Concept

Start   Engineering Portal   Guides   Courses   Contact and support

Courses > Course search

Basic   Search 🔍

Filter: CATIA V5 ∨   Sort: A-Z ∨

CATIA V5 Basic   Basic   1 day   >
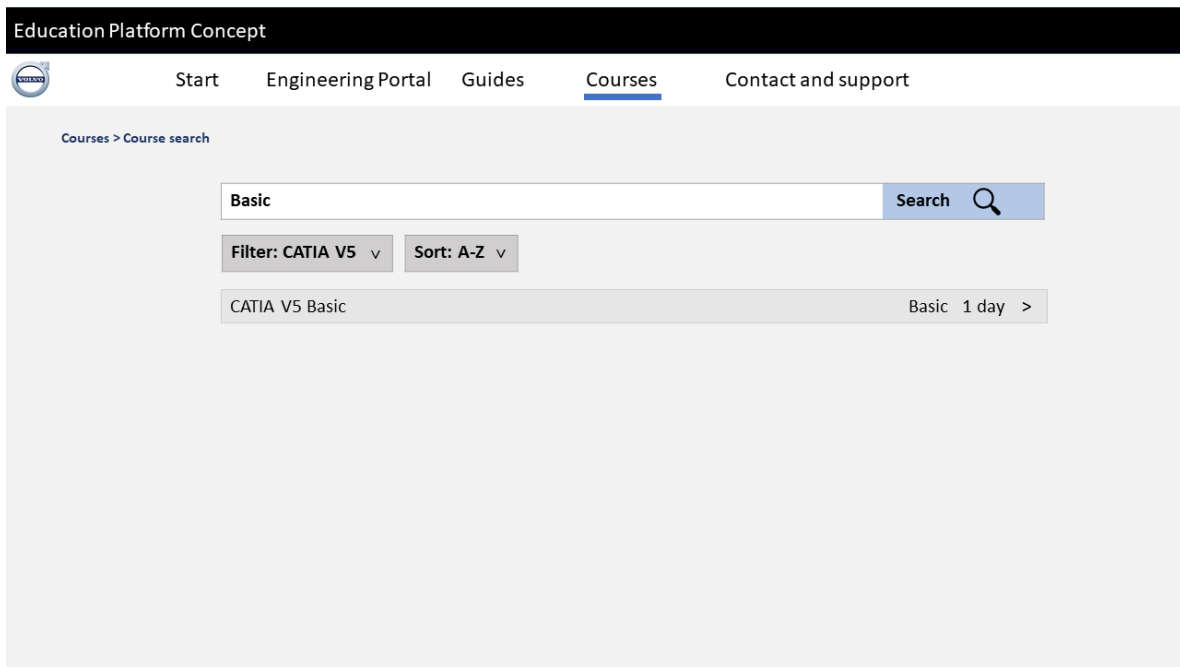
Figure 6.6: Wireframe of the general final concept's search result page.

The course information subpage, see figure 6.7, include information about the courses. The information presented is divided into the sections Prerequisites, Course Content, Target Audience, Course Owner, and Course Material (related to the course). The Prerequisites section is meant to include any required prior knowledge before taking the course, e.g. a lower level course or work experience. The Course Content section is meant to include information about the contents of the course e.g. areas within the software covered, skills achieve after course completion and more. The Target Audience section is meant to include information to whom the course is relevant to, based on the existing work area categories, see figure 3.7 for an example, and the defined role types found in section 3.2.1. The Course Owner section is meant to include contact information of the course tutor, e.g. name, email and telephone number. Furthermore, related instruction material could be included on the course page, specified as Course Material, to be able to gain preview and refresh from a course. A clickable link icon "Apply Here!" for course application is available at the page, directing the user to LAD to register for the course. This subpage aims at further increasing the chance for the user to find the correct by including relevant information allowing the user to evaluate if the course is correct or interesting. This subpage is meant to aid the course search function in addressing Opportunity 2 and 3.
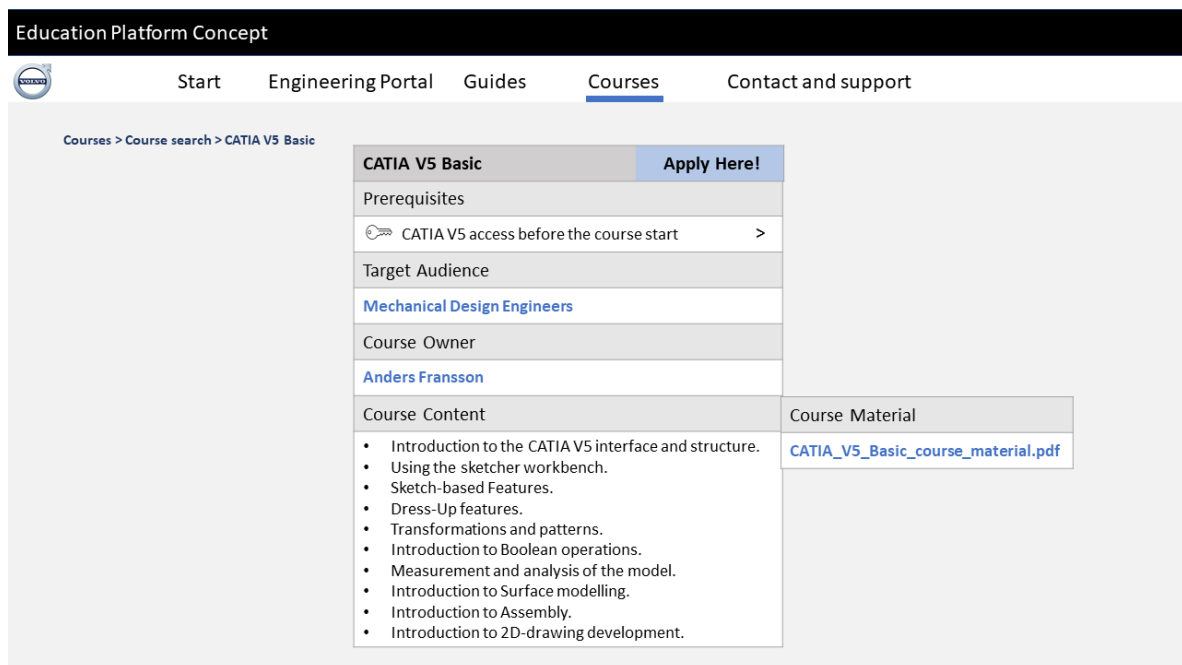
Figure 6.7: Wireframe of the final concept's course information page

6.1.2 Course platform: individualized version

The individualized version of the course page shares several aspects with the general version of the course page, however, the individualized version is based on that the user is identified by the page. This requires the user is signed in on its computer with CDSID, indicated by the "person icon" in the top right corner of the Wireframes. When signed in, the content available at the page is adapted to the user. This version of the course page was based on evaluation 2 5.2.3.

A sitemap is presented in figure 6.8, visualizing the structure of the individualized version of the course page and the integration with the merged sites, see section 6.1.3. The integration with the merged sites is the same for both versions of the course page and the Opportunities the subpages aim at addressing are the same.
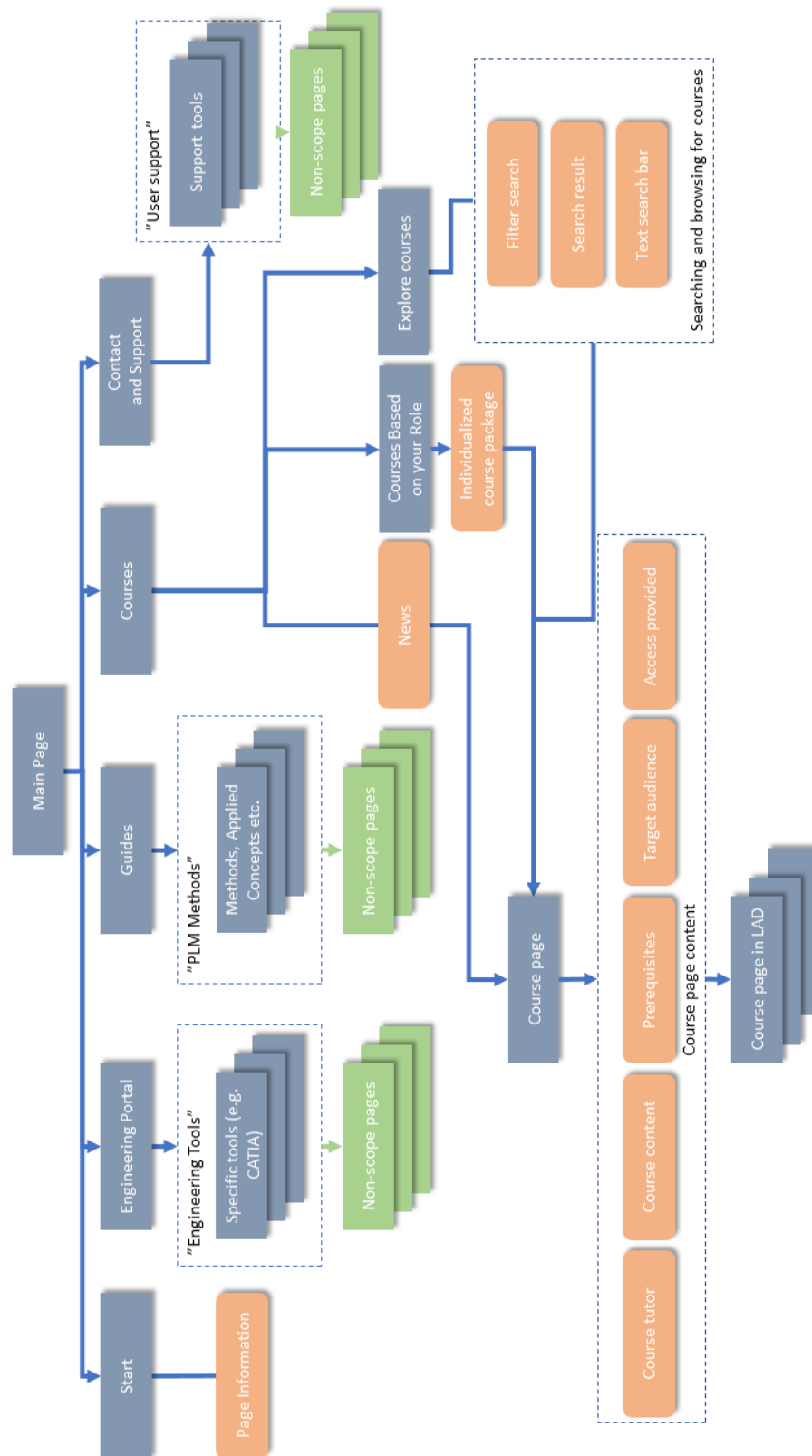
Figure 6.8: Sitemap of the individualized concept.

The page presented in figure 6.9, is the individualized version of the course page. In this version of the course page, the "Courses Based on Roles", see figure 6.2, is called "Courses Based on your Role", see figure 6.9.
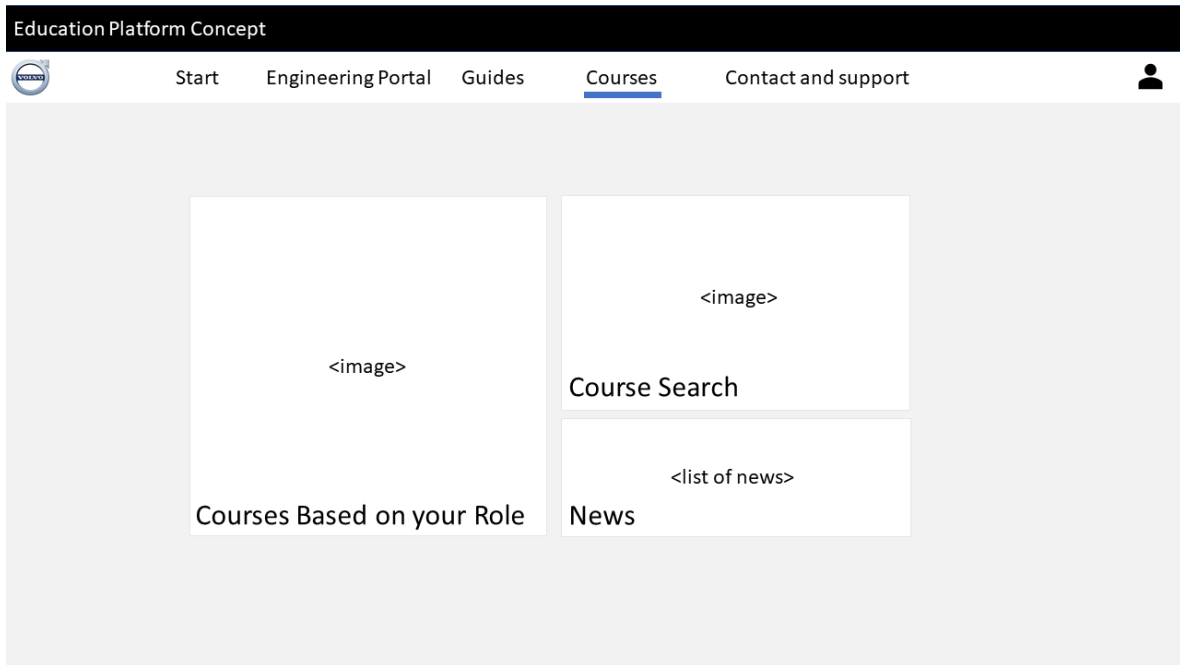
Figure 6.9: Wireframe of the individualized final concept's course overview page.

In this version, compared to the general version, the user does not select a predefined role after clicking the Course Based on Your Role icon. Instead, as the user is signed in, clicking the icon directs the user to a page with an individualized and customizable course package. The developer has the possibility to add or remove courses from the course package. Additionally, this page could be used by the developer and team manager when discussing competence development.

Furthermore, a feature not included in the general version is the possibility for the user to see the amount of completed and not completed courses. This progression is indicated with green ticks for each course completed and numbers indicating how many courses are completed within each level, see figure 6.10. This was done to present progression and to let the user know which courses they have taken and to potentially make the user want to take more courses, which was based on evaluation 2 see section 5.2.3.
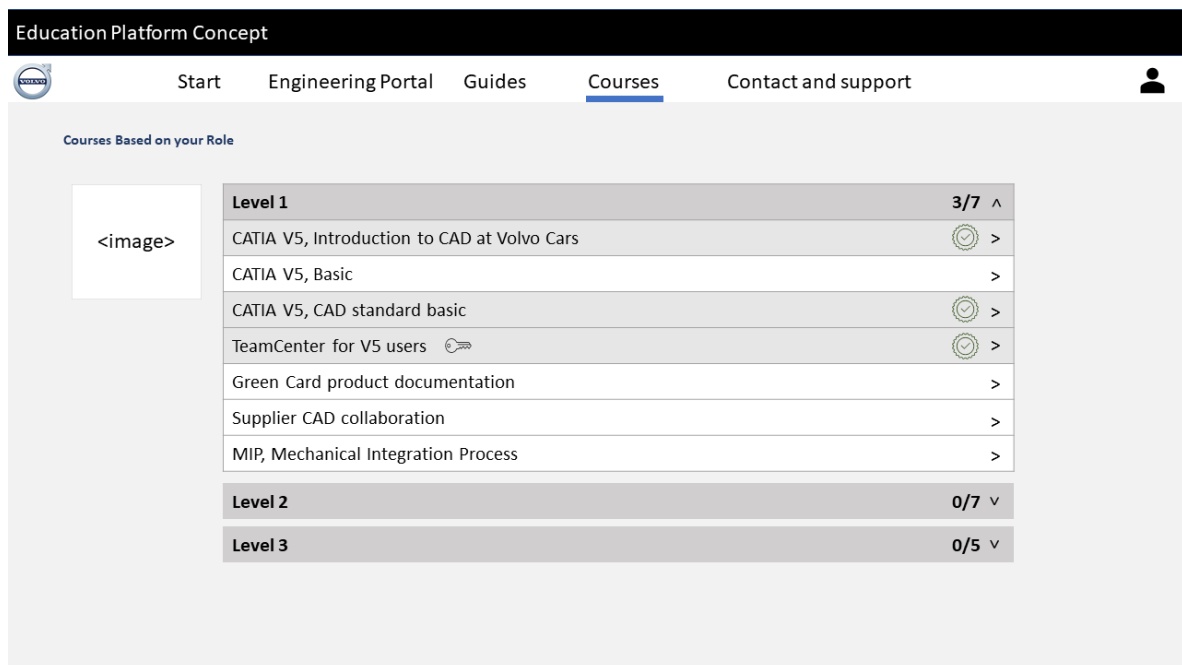
Figure 6.10: Wireframe of the individualized final concept's Courses Based on your Role page.

Another unique feature of the individualized version, in addition to the ones in figure 6.6, is that the course search result include the same green tick, see figure 6.11, as the previously mentioned page, see figure 6.10. This features was added to make the user aware of which courses they have already taken when exploring or searching for courses, based on evaluation 2 see section 5.2.3. Furthermore, added is the possibility for the user to add a course to the Courses based on Your Role page with a plus symbol. This feature was added to allow the user to expand their course package presented on the individualized role page.
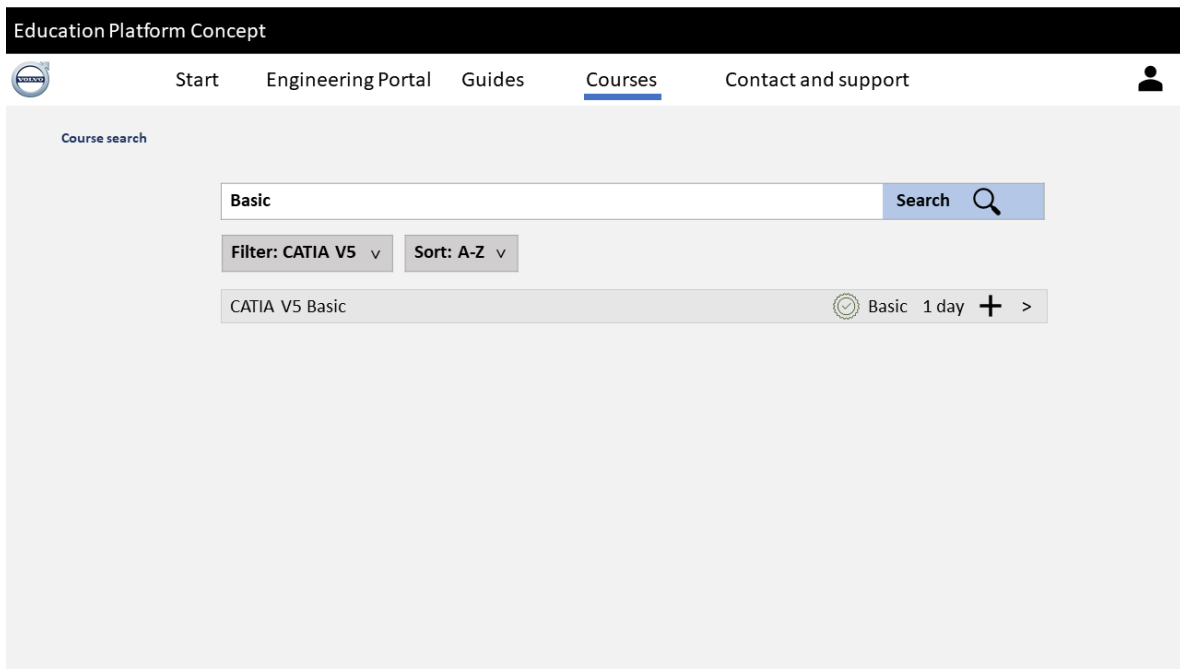
Figure 6.11: Wireframe of the individualized final concept's search result page.

6.1.3 Course platform - integration with a merged site of existing intranet pages

The course platform presented earlier could be integrated with a suggested merged site of the pages: Engineering Portal and PLM Methods. The merged site suggested, includes the pages Start, Engineering Portal, Guides and Contact and Support. The content of the pages, except the courses page, are available at the existing Engineering Portal and PLM methods, mentioned in section 3.2.2. However, the content of the pages of the merged site is a reimagination of the categorization of their content done in 3.2.1. The pages of the merged sites is described in detail below.

The start page, see figure 6.12, aims at informing the user about what content to expect at the page. It includes a welcoming message and a short description of the content to expect at the individual pages. Additionally, the page aims at lowering the risk of overwhelming the user by presenting a limited amount of content and instead only introducing the user to the contents of the page. As stated by Saaty & Ozdemir (2003), exceeding seven elements could decrease peoples capacity to process information. Furthermore, the banner at the top of the page provides an overview of the different pages in the concept, and is supposed to be clickable and redirect the user to the specific pages.
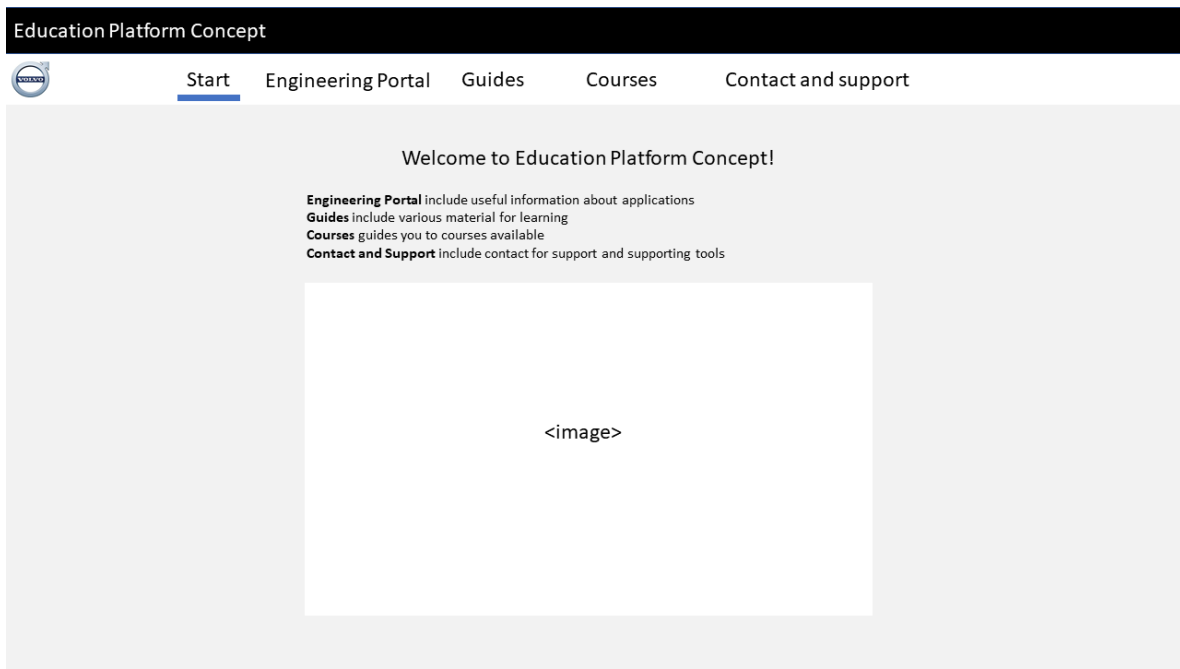
Figure 6.12: Wireframe of the general final concept's start page.

The integration of the course platform with the Engineering Portal and PLM Methods resulted in the Engineering Portal being a page at the site together with the course platform, constituting the courses page, see figure 6.13. This page includes information about software as the existing Engineering Portal and include the content already available on that page. Furthermore, it is intended to be maintained as the existing Engineering Portal, apart from the group of icons "Contact and Support" which was removed, and its content relocated to the new tabs "Courses" and "Contact and Support". Lastly, some tools and aspects have been relocated to other pages, this is described below.
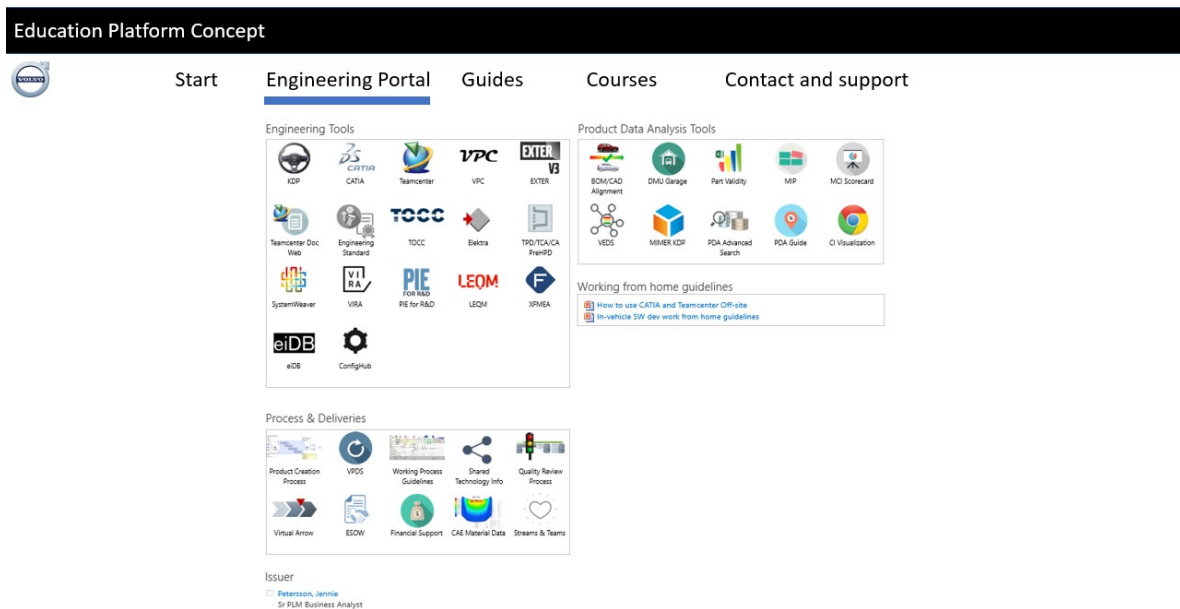
Figure 6.13: Wireframe of the general final concept's Engineering portal page.

"Guides" is another page included in the concept, see figure 6.14. It is one of the categories defined in the Current State Analysis, see section 3.2.3. In the existing solution this content was available at the PLM methods page and within some of the software pages at the Engineering Portal. Instead, the final concept suggests a relocation of all documents which was identified as "instruction material" to the "Guides" page. This relocation is intended to help the user distinguish "instruction material" from "courses" and "eLearnings" and potentially make it easier for the user to predict what to expect to find on each page, since categorization of resource type is helpful for browsing education resources, as stated by Hirumi (2014).

Education Platform Concept

Start   Engineering Portal   Guides   Courses   Contact and support

| Methods (How?) |
| Processes (When?) |
| Applied Concepts (Why?) |
| How To's (Tutorials) |
| Training Videos |
| Course Material (PDF, Powerpoint) |
| Instruction Material (PDF, Powerpoint etc) |
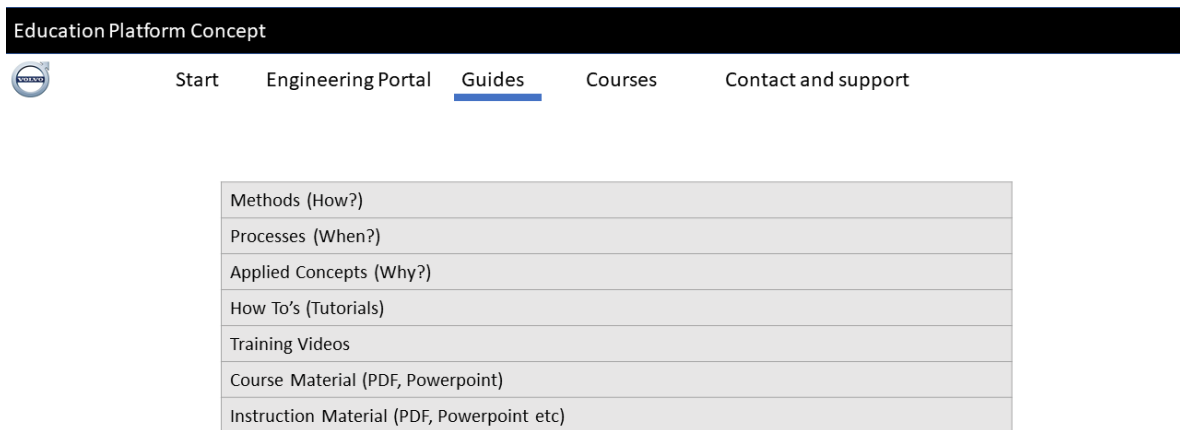
Figure 6.14: Wireframe of the general final concept's Guides page.

The integration of the courses page with the merged sites resulted in separating the "Contact and Support", presented in figure 6.15, from Engineering Portal. This was located in parallel with the other pages, "Start", "Guides" and "Courses". The page include content previously available at the Engineering Portal and PLM methods. It was created for the same reason as the "Guides" page and is based on the Current State Analysis results presented in section 3.2.2.
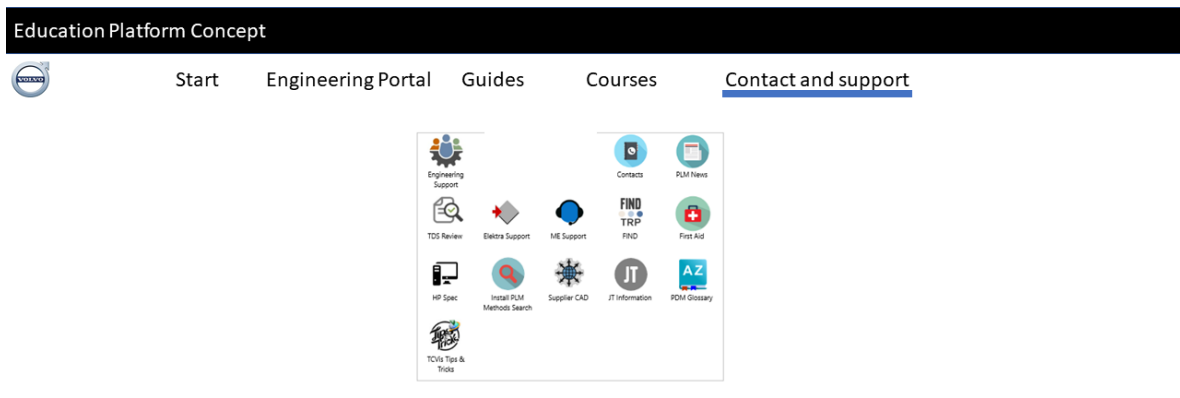
Figure 6.15: Wireframe of the final concept's contact and support page.

6.2 Comparison of the final concept and the existing solution

In this section a comparison of the final concept with the channel SharePoint intranet pages and LAD, described in section 3.2.2, is presented.

When navigating to course application with the final concept, less content is presented on each page compared to the existing solution. Using the final concept to apply for courses five steps are required, regardless of navigation path. For the Engineering Portal this number is three. The tradeoff found is, either more content is presented to the user at a time or more steps are needed to reach the final goal, to narrow the amount of content. A detailed comparison between the final concept and the existing solution is presented below.

For the final concept, all courses in software, within the scope of the study, are located at one page of the site and is also available at the existing LAD site. In the final concept, the course information page located under the course page links to an application page in LAD. For the existing solution courses can be reached through *four* ways, the PLM trainings and the main page of the Engineering Portal, PLM Methods and LAD, this was mentioned earlier in section 3.2.2.

The final concept have, see figure 6.16, categorisation as the top pages, Start, Engineering Portal, Guides, Courses and Contact and Support. Located under these top pages are subpages of software (Engineering Portal), tools (Contact and Support and links to subpages (e.g. Courses). The existing Engineering Portal has all software and tools located at one top page. At this page, there are areas which the software and tools are grouped, see section 3.2.2.

Hence, the main difference between the final concept and the existing Engineering Portal, regarding structure, is the final concept presents content by several pages, see figure 6.16, and the existing Engineering Portal presents all content at one page with content grouped in areas, see figure 3.5. However, the same content is available in the final concept and the existing Engineering Portal, the difference is the way the information is presented.

Courses are raised in the hierarchical structure and gathered in one page for the final concept compared to the Engineering Portal. The final concept has courses as one of the top pages and the Engineering Portal have courses located under each of the software and tools. For the final concept, the courses are reached through one courses page with a holistic view. For the Engineering Portal, courses are reached by navigating to one of the software or tools, making the courses separated by software and tools at the highest hierarchical level.

The features available for course search differs between the final concept and the existing solution. The final concept has, at the courses page, a search function, which LAD also has. This function does not exist for the Engineering Portal, PLM Trainings and PLM methods. Furthermore, the final concept has a individualized holistic course package (individualized version of the course page) or a holistic role course package (general version of the course page). For the existing solution, role course packages exist for course overviews in some software, however no holistic view of courses in all software exist.
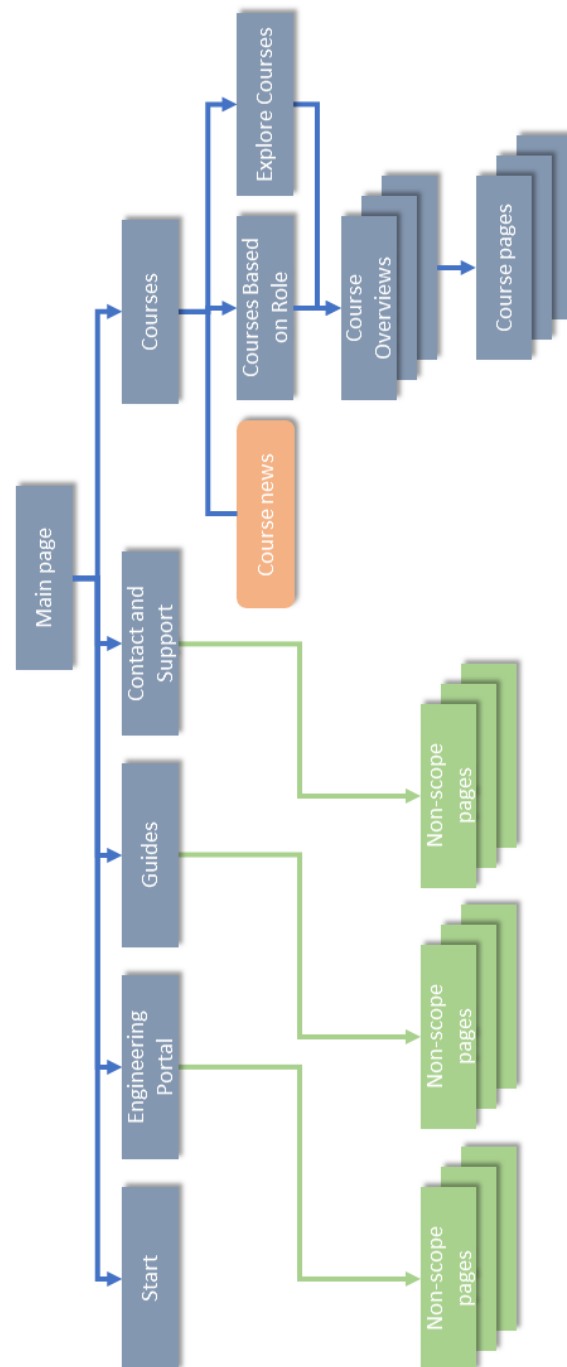
Figure 6.16: Sitemap of the Final Concept for comparison with figure 3.5

6.3 Discussion and Conclusions

6.3.1 Results

The fourth objective was to develop a concept that guides developers to relevant software courses. The study presents a concept with two versions, one general and one individualized. The concept is based on the user needs, presented in 4.2, and was evaluated in several sessions at different stages of the development, see section 5.2.

The user needs defined as opportunities were: increasing awareness about useful and required courses, enhancing the possibility for developers to find a specific course and enhancing exploration of courses. The solutions to meet these needs are described in detail below and at the end, a comparison between the existing solution and the concept is discussed.

Opportunity 1 was addressed by providing an overview of the pages and a start page. Additionally, it was addressed by including the possibility for the users to browse and search for relevant courses on one single platform. This is intended to inform the user that courses are available on the website by increasing the visibility of courses and creating a designated courses page. The need was also addressed by presenting a holistic view of courses within software relevant for the developers, making it more accessible and presenting courses needed for gaining access to certain software. Furthermore, a distinction between "Guides" and "Courses" was made to further provide the user with guidance to courses. The intention was to minimize the probability of finding documents when looking for a course, and vice versa. Additionally, Pain point 1 was addressed by providing a pre-defined course package for the two identified role types (Design engineer and GDL). The purpose was to give the users a suggestion of courses relevant for them, which in turn could provide the users an indication of what courses they should attend.

Due to greater technical requirements the concept was divided into general and individualized. The general version requires a re-structuring of the intranet. The features unique to the individualized version would require larger efforts with several actors involved to be implementable, such as experts within SharePoint and the system IDM (used for managing CDSID). The reason for this is the sign-in function and making the content presented customized to the user signed in. This was mentioned in expert meeting five, see section 3.1. Hence, the individualized version is suggested as a solution for the future and the general concept is suggested for implementation in the near future. Because, the technical requirements for the general version is implementable with lower efforts and the functionality is available in the current system used for the intranet, this was mentioned during the expert meeting five, see section 3.1.

As mentioned in section 3.2, an LMS is meant to be acquired within the coming years and is meant to be used by all education departments at Volvo Cars. Hence the final concept, especially the general version, aims at being implementable in the near future. There is potentially a risk of making an advanced concept, the individualized version, when an LMS is about to be acquired. It may be redundant to implement a solution requiring larger efforts, if an LMS from a third party is acquired. However, the concept, especially the individualized version, can act as a guideline for what the LMS system should contain, as it is based on the needs of the potential users of the coming LMS.

The aim when creating the concept was to provide "creative tension", Peter (1990), which potentially could motivate developers to search and apply for courses, based on a vision, in this case a pre-defined course package. This is preferred to solving a problem with the current state, in this case realising the lack of software knowledge while working. When solving a problem, the risk is that only measures required for the problem to diminish is taken, in this case for instance only attending mandatory or access-providing courses. This could result in a loss of knowledge gained from advanced courses which in turn could affect the quality of the deliverables.

Two role types: Design engineer and GDL was included in the concept, while only one "official" role exists: Developer. The reason for this is it was expressed by the developers during the interviews,

see appendix K, and that it is stated in Barke & Prechelt (2019), where roles are defined as "area of responsibility" and "expertise required to cope with it". By presenting courses that are based on the area of responsibility developers could potentially be aided in being conscious about their role, which in extension could help the teams to self-organize. Since several different software is used by the developer knowing which ones are relevant for a certain role is deemed important since it potentially could aid the quality of the creation and handling of the product data.

Additionally, the course packages may alleviate individual developers from the need of doing the research on their own, by asking colleagues and searching LAD and engineering portal. It may also provide a foundation for newly employed to gain insight in what steps to take in order to increase their competence for their work tasks within relevant software.

Opportunity 2 was addressed by providing a search function on the platform. This search function is intended to include all the courses that are accessible from the individual software pages on the engineering portal. The reason for this is to alleviate the user from the need to enter every individual software page in order to find the courses that are relevant for them. As stated by Hirumi (2014), search is the most common function on sites for finding educational resources. For the purpose of this study, this is deemed to be applicable for courses. Furthermore, the search function is intended to only search for keywords within specific categories, instead of all information tied to the course, as it seems to be currently. This is done in order to prevent that "irrelevant" courses are presented and to meet the expectations of the user when searching for a course.

Opportunity 3 was addressed by presenting a filtering function located at the "course search" sub-page. The filter function allows the user to view courses relevant for specific work areas or software. Specifically this was done by including options such as plastic, sheetmetal, CATIA V5 and Teamcenter. The filtration categories presented was intended to be few in order to be simple to understand. By doing so, potentially increasing the the course search and application. As stated by Pfeffer & Sutton (2000), the possibility for action, in this case applying to courses, is increased by using simple concepts. The categories are based on the existing categories in the CATIA V5 course overview. This was included to address the issues with the current search platform, where there is no apparent way how the filtration categories are intended to be used, and it is difficult to know what to expect when using a certain filtration option.

The information intended to be available in the final concept is currently available on the Engineering Portal and its sub-pages. The concept aims at streamlining the way this information is presented by:

- Having less content on each page.
- Introducing a naming convention for different formats of education: Guides and Courses.
  - Documents and movies are found under "Guides".
  - In-person trainings and elearnings are available under "courses".
- Providing one single path to the available courses, and to raise the visibility of this path.
- Providing a search function.
- Providing a holistic view of courses within several different software for the two role types: Design engineer and GDL.

The concept addresses all three pain points, however it is important to note that there are more user needs related to course guidance, mentioned in 4.2.4. These needs could potentially be addressed by including course attendance in the team planning. Furthermore, by providing more eLearnings at the platform, these developers could potentially attend courses when it suits them.

In the study it was found different teams had different ways of guiding their newly employed developers as mentioned in 4.2.4. This could potentially be solved by a standardized course guidance process. A standardized course guidance process across teams could aid the team managers when guiding the developers within the teams to courses. This process could include an introduction to the education

platform, i.e. the concept presented, and an introduction to courses relevant for the developer. This could act as simple steps towards guiding developers to courses. As stated by Pfeffer & Sutton (2000), it is usually not lack of knowledge that is the issue, rather it is taking action with the relevant knowledge. By providing a simple structure, such as a standardized course guidance process, the likelihood of going from knowing, in this case awareness of courses within software exist, to doing, in this case searching and applying for courses, is increased. This would be especially useful to aid developers resemble the personas "Liam" and "Charlotte", presented in section 4.2. This should be done to further increase the awareness of courses for the developer. Without the a standardized structured way to guide developers to courses, a risk is the developer might not find the platform and potentially not receive useful knowledge within software needed for their work.

This concept can hopefully provide a foundation for teams to define what courses they deem relevant for them and help guide developers and team managers during competence development meetings, by providing a foundation of suggestions.

7

Further Development

This chapter presents aspects suggested for further development.

- The platform could potentially be expanded to facilitate training evaluation and communication with course owners. This could be done in accordance with Kirkpatrick's four levels of course evaluation Kirkpatrick & Kirkpatrick (2016), 1. Reaction, 2. Learning 3. Behaviour, 4. Results.

  - A suggestion for how level 1 could be applied in the platform is by providing a course satisfaction evaluation to users who have attended a course.
  - A suggestion for how level 2 could be applied in the platform is to implement a multi-answer quiz some time after each course occasion.
  - A suggestion for how level 3 could be applied in the platform is a questionnaire directed to the users, investigating what course content that they actively use in their day to day work.

  - A suggestion for how level 4 could be applied in the platform is to tie the course content of the available courses to specific measures in an automated quality evaluation program, for instance Q-checker. To act as a leading indicator to achieve a globally defined goal at the company.

- The graphical design of the final concept should be evaluated and developed further to potentially increase user experience.

- Evaluate the final concept with course owners in all software included at the courses page. The evaluation would be: (1) regarding the features of the final concept, (2) regarding the possibility to present education material within every software in a standardized format i.e Guides and Courses.

- Evaluate with the intended users whether the defined role types and their course suggestions are satisfactory. This could be done by demonstration at for instance several Community of Practice.

- A functioning prototype of the concept should be developed in SharePoint to evaluate the functionality.

- Evaluate the individualized course page with regards to the technical feasibility of integrating it with IDM. Furthermore, perform an evaluation of the potential overlap between this solution and the LMS intended to be acquired by Volvo Cars Academy.

- Develop a standardized course guidance processes that all teams can use to ensure that all developers have access to the same information concerning the courses available. To address the additional user needs presented in section 4.2.4. This could be a checklist for the team managers including:

  - Introduction to course platform for each employee.
  - Introduction of course package for each employee.
  - Introduction of accesses for each employee.

- Investigate the potential to have all courses available as eLearnings to provide developers the possibility to study at their own terms, with regards to time and location. To address the additional user needs presented in section 4.2.4.

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Appendix

Appendix A: Interview Guide - Team Member

Introducera vårt exjobb
- Bakgrund till projekt och tänkt resultat
- Intervjudata konfidentiell. Får vi spela in? (bara vi har tillgång, inspelning tas bort efter transkribering)
- Vi kör 45min nu

Generella frågor
Vad är din tidigare arbetserfarenhet?

Hur lång arbetserfarenhet har du?

Hur länge arbetat på Volvo Cars?

Akademisk utbildning?

Kön?

Teammedlem

Ansvarsområde SNABBA
Vad är din roll?

Team SNABBA
Vilken ART tillhör ditt team?

Vilka roller finns I teamet?

Vilka faser arbetar ditt team i? (konceptfas, detaljkonstruktion, industrialisering)

Vad "levererar" du? (CAD-modeller/TC-data)

Konstruktionselaterade verktyg

Vilka konstruktionsrelaterade verktyg använder du för att utföra dina arbetsuppgifter dagligen/Veckovis/ en gång i månaden)? (Catia, Teamcenter, TCVis, MiP, Exter)

Vad gör du i dessa verktyg? (drafting, assembly, surfaces, wireframe etc)

Vilka områden I dessa verktyg *behöver* du kunskap inom? / Hur vet du det?

Hur söker du information för att lösa problem du stöter på? / Hur visste du att du skulle göra så? (engineering portal, utbildningar, metoder)

Hur avgör du vilken kunskap som krävs för dina framtida arbetsuppgifter?

Utbildningar

Vilka utbildningar inom konstruktionsrelaterade programvaror har du gått? (i de som nämnts tidigare)

Hur införskaffade du information om relevanta utbildningar, inom verktyg, för dina arbetsuppgifter? / Fanns det problem här?

Har ni någon form av tillvägagångssätt som visar utbildningar baserat på roller i teamet?

Hur relevanta var utbildningar du gått för dina arbetsuppgifter?

Hur pass prioriterade upplever du att utbildningar är?

Saknas utbildning inom något relevant för dig?

Vad anser du bra/mindre bra med upplägget av utbildningarna i konstruktionsverktyg (längd, format, tillgänglighet)?

Utbildningsbehov

Förekommer det problem som kan motverkas med utbildning?

Öppna avslutande

Har du några förbättringsförslag kring hur konstruktörer kan guidas till relevanta utbildningar?

Inom det agila brukar man tala om att individer ska kunna ta sig an alla uppgifter i teamet ("alla ska kunna allt"). Det pratas också om ibland om "T-formad" kompetens.

> **Hur ser du på utbildning och T-formad kompetens? ("ska alla utbildas i allt")**

Kan man se trend på vilka utbildningar som gås?

Finns det någon du vet som vi mer kan prata med detta om?

Outroduktion

Vi ska transkribera och skicka till dig för att kolla om vi uppfattat korrekt

Går det bra att vi kontaktar dig igen om en eventuell workshop? (vilken vecka)

Appendix B: Interview Guide - Team Manager

Introducera vårt exjobb
- Bakgrund till projekt och tänkt resultat
- Intervjudata konfidentiell. Får vi spela in? (bara vi har tillgång, inspelning tas bort efter transkribering)
- 45 min

Generella frågor
Akademisk utbildning:

Hur länge arbetat på Volvo Cars:

Team manager
Ansvarsområde SNABBA
Vad är din roll?

Vad är din tidigare arbetserfarenhet?

Team SNABBA
Vilken art tillhör ditt team?

Vad "levererar" ditt team? (CAD-modeller/TC-data)

Vilka roller finns I teamet?

Vilka faser arbetar ditt team i? (konceptfas, detaljkonstruktion, industrialisering)

Konstruktionsrelaterade verktyg
Vilka konstruktions-verktyg används i ditt team för att utföra arbetsuppgifter dagligen? (Catia, Teamcenter, TCVis, MiP, Exter)

Vad är ert tillvägagångssätt för att täcka de kunskapsbehov som finns i teamet?

Hur avgör ni vilka utbildningar som teammedlemmar ska gå?

Hur planerar ni för kompetensbehov i kommande features/uppgifter?

Intern-utbildningar

Hur införskaffade du information om relevanta utbildningar, inom konstruktionsverktyg, för teamets arbetsuppgifter? / Fanns det problem här?

Vad anser du bra/mindre bra med upplägget av utbildningarna i konstruktionsverktyg (längd, format, tillgänglighet)?

Saknas utbildning inom något relevant för ditt team? / Vad?

Hur högt prioriteras utbildningar?

Utbildningsbehov

Förekommer det problem som kan motverkas med utbildning?

Öppna avslutande

Har du några förbättringsförslag kring hur konstruktörer kan guidas till relevanta utbildningar?

Finns det någon du vet som vi kan prata mer med om detta?

Outroduktion

Vi ska transkribera och skicka till dig för att kolla om vi uppfattat korrekt

Appendix C: Affinity Diagrams - Personas

Personas

Liam

Jag känner inte till något tillvägagångssätt för utbildningar baserat på roll i mitt team

Svårt att veta vad som kommer i framtiden gällande kompetensbehov

Vi pratar inte mycket om utbildningar I mitt team

Det var inte så bra när han började, folk hänvisade till nyaste personen I gruppen.

Det är lite otydligt hur man hittar utbildningar, ibland mejl, ibland LAD

Det är mer när jag stötet på en uppgift som utbildning lyfts

Jag har inte haft någon genomgång av utbildningar med min chef. Bara om jag har tagit upp det själv att jag vill gå "de här utbildningen", men kanske inte hur jag ska få mer erfarenhet och bli bättre

Får reda på kurser främst mun till mun, känner till LAD, får mail om kurser

Det ska finnas något dokument på vår grupp på vilka kurserm an ska gå, men det visste jag inte om när jag var ny, blev inte informerade om de där stegen

För BOM/CAD-alighment så har jag hört att det är viktigt att det blir rätt så då blev jag orolig och sökte en kurs

Det borde finnas en funktion i LAD där man kan välja sin roll, sen visas alla relevanta utbildningar

Nyanställda får tips från erfarna teammedlemmar "du borde gå denna"

Det är mycket att man går på kurser I början, för att komma igång och få accesser

Information om utbildningar fick jag från hen som innehade min tjänst innan mig, via hens anteckningsblock där det stod vilka kurser hen gått, vad som krävs för kommande uppgifter och hur man gör vissa uppgifter

Charlotte

Om det finns något jag vill lära mig mer om så går jag in på LAD och söker

Det är lite svårt att hitta CADtrappan

Känner till CATIA-trappan, Letar efter kurser på hemsidorna, både LAD och Engineering Portal

På möten med folk som utvecklar programmen - (CAD key user meeting)

När jag letar information om utildningar, gör jag det via LAD

Kommer gå på möten där nya kurser dyker upp

COOP för konstruktörer på ARTen och internt Key User-möte. Där kan man tipsa om bra kurser

På Key User-mötena kan man fråga om det finns någon kurs

Har fördel att veta om kurser från Key User-möten

Får reda på om utbildningar genom CAD key user mötet, oftast nya utbildningar

Det finns även folk som är intresserade och kollar runt i LAD och tipsar om det på gruppmöten

Han känner till CADtrappan

Information om utbildningar finns på engineering portal, nya releaser finns här

Har dragit ihop en grupp konstruktörer för att gå kinematics-kurs

Det hade varit hjälpsamt om det fanns en related-to-knapp med utbildningar så man kan se vad som är relaterat

Ingen ifrågasätter om man vill gå kurs, men måste få godkännande av chefen

Se user observation

Personas

Emma

Man brukar inte gå in på LAD för att kolla kurser, det är oftast utifrån som man får reda på kurser och går in och bokar I LAD

Det vore bra med någon portal som ger överblick på bokning och utbildningar, utan att behöva gå in I LAD

Försöker hålla sig uppdaterad på programvaran

Kollegor kan hjälpa mig att veta vad för kunskap som krävs för kommande uppgifter

Om han brister I något så kan han prata med andra

Jag känner att kurserna jag har gått räcker för mig. Resten av kunskapen får jag från kollegor och engineering support

Tycker det funkar bra att chefen skickar iväg nyanställda på utbildningar.

När det dyker upp intressanta kurser så anmäler man sig liksom

Om man ska börja jobba ett nytt system så tar man kontakt med expert och lär av den

Tror det är bra med korta utbildningar med fler tillfällen så man kan reflektera emellan

Tror att team manager borde ha koll på vilken kompetens som behöv

Min manager gav som förslag att vi börjar med vissa utbildningar och behöver jag mer så är det bara att säga till så löser vi det

<+ observations>

Additional Findings

Tenderar att prioritera bort utbildningarna

Vill kunna så mycket som möjligt, men har ibland inte tid

Hade tyckt det var skönt om det kom ovanifrån, "här är en kurs" - som man ska gå oavsett hur mycket man har att göra

Kanske hade peppen kring kurser hjälp om cheferna hade haft mer kunskap om vilka (kurser) som finns

Jag har inte riktigt aktivt sökt utildningar. Det är väldigt många så det känns väldigt tidskrävande att sitta och läsa på om allihopa.

Gruppchef uppmanade att gå Catia kurser så han gick de flesta

Att gå på utbildningar hos Sigma på Lindholmen är segt även om det bara är en halvdag. Då måste man åka tillbaka till kontoret och det är en bit och omständligt om man inte har en bil.

Man borde hålla IP-veckan helig - för att kunna planera in utbildande, åka till leverantörer och fabriker

Det kan vara svårt att få tid med utbildning när man har leverans

Flerdagarskurser kan också ställa till det, ena dagen kanske man har viktiga möten

Hade varit bra om utbildningar var här I torslanda

Platsen utbildningarna hålls på är lite jobbigt. Att åka till Semcon istället för där vardagliga arbetet sker. Hade varit skönare om det låg i ens dagliga rutt

Tror det skulle vara bra med fler halvdagsutbildningar

Fick information om baisc och advance av sin gruppchef

Tanken är att utb ska gås under IP-veckan, främst vill de att man ska gå då, finsn dock möjlighet att gå mitt i inkrement

Tycker det är lite dumt att utbildngar är på semcon, många får nog prioritera bort pga det

Det är lite svårt när man är borta en heldag (på kurser)

Appendix D: Affinity Diagrams - Developers Roles

Team composition

Det finns konstruktörer och GDLer	Alla är nu för tiden Developers
Alla ska vara developer men de har GDL och konstruktör, överlappar lite men läser inte exakt samma kurser	I teamet finns PO, SM och teammedlemmar
Det är många GDL I teamet, de flesta jobbar med ett projekt med större artikelinnehåll	I teamet ingår: developers, TAL (team attribute leader), systemansvarig, scum master och product owner.
Det finns SA (konceptfas), GDL och konstruktör	
De har kvar de gamla rollerna Design engineer och GDL	
Gamla roller är konstruktör och KU/GDL	
I teamet finns konstruktörer, GDL och scrum master	
Det finns PM, PO, Teamleader, Design leader, GDL, KU	
Det finns två roller I teamet, GDL och designingenjör, utöver det så har dom design leader	
Det finns systemansvarig, PO och GDL och Konstruktörer och Scrum master	

Design Engineer

50% konstruktör och 50% i annat projekt

Levererar CAD-modeller till Teamcenter

Jobbar 50% inom ett annat projekt som "joining coordinator", någon form av projektledarroll

Har jobbat med templates parallellt med konstruktionsarbete

Mycket kontakt med leverantörer

Är modeller, tar fram CADunderlag, Har även tagit fram metodik

Jag jobbar med saker som är I produktion

Tar fram Cadmodeller och administration (Grunden är KDP – BOM)

Ansvarar över konstruktion I ett visst område

Det finns design engineers – ritar och utvecklar produkter, använder Catia och teamcenter och tcvis

Catia är huvudverktyget för honom

Mest med plastkonstruktion

Konstruktörer gör konstruktionsarbetet

Han tycker om Catia väldigt mycket

Levererar CADmodeller främst, och technical input

Jag får uppgifter av två i vårat team som ansvarar för vår produkt, som kommer på lösningar som jag sen skapar CAD av eller powerpoint av något annat

I teamet finns personer som caddar: ska hitta lösning hur man packar och konstruerar

Jag levererar data, det är mer än CAD-modell, mest information bland annat CAD-modeller

levererar CAD-parter och assemblies

Levererar CADdata – underlag för saker som ska produceras

Design Engineer & Group Design Lead

Desgin Engineer to GDL is more common than GDL to Design Engineer

Design Engineers begin with specializing themselves in CAD, but they can move towards the GDL role if they like

A lot that Design Engineers can do, can GDL's do. GDL's participates in meetings and Design Engineers is working with the CAD where licenses are nedded etc.

Var konstruktör, nu GDL. Vill inte tappa konstruktionsuppgifter.

Om det är brist på CADare så kan GDL hoppa in temporärt (om den har jobbat som CADare tidigare)

GDL är projektledare och Konstruktören ritar

I teamet har de försökt göra så personer som konstruerar kan hjälpa till med GDL-uppgifter

Konstruktör och GDL överlappar lite

It's starting to merge and we take work tasks from each other

Vissa GDLer har varit konstruktörer

De flesta har jobbat som konstruktör innan de blir GDL

Konstruktörer vet vad GDLer gör men inte hur dom gör det och vice versa

Det är främst GDL som går på möten men tar ibland med sig konstuktör och vid pakcningsmöten går design leadern med.

Det finns gemensam kunskapsbas mellan GDL och konstrutkör, men det är nog för att många GDL:er har varit konstruktörer tidigare.

Group Design Lead

Hon (GDL) har en konstruktör som hon jobbar med

GDL är med fram till launchen och efter vid eventuella problem

GDL: mer administrativ, använder någon form av kostandsprogram

GDL ansvarar för sista stegen, kordinera, mätrapporter

GDL -använder teamcenter, tcvis, KDP och kringliggande applikationer

GDL - Om det behövs någon förändring så drar i det, tar konstruktör till hjälp

GDL är inte inne I de tekniska frågorna - hittar leverantörer och KDP

GDL driver projekten

Design lead håller koll på hela konstruktionen, så allt är gjort till släppen, alla följer guidelines, vem som gör vad och designar vad

GDL har ansvar för planering, pengar och teknik

Problem report hanterar GDLer mycket

Som GDL är man ansvarig för tid, teknik, cost. Rätt kvalitet I rätt tid till rätt pris, man levererar I grindar. Presenterar status tillsammans med Caddarna

GDL -springer runt mellan beslut, rapporterar I system, spindel I nätet

Det finns GDL -hanterar artiklarna väg, artikelnummer

GDL använder mer exter

GDL -köpa in, kostnad, sortiment

GDL har kontakt med leverantör, sköter tidsplaner, ser till att system följs med kostand och tidsplan

GDL måste hålla koll på tekniken, hjälps åt med design leadern.

Han (GDL) försöker göra lite av varje, både modeller och Pecca och KDP

GDL går på packningsmöten och designmöten och WEED, där dom ger technical input till design

GDL har deadline som de måste följa, öppnar partfoldrar så konstruktörer kan koppla sina modeller, har kontakt mellan suppliers, kollar igenom med cost estimator och inköp. Lägger in priser I Pecca ProCost

Appendix E: Affinity Diagrams - Courses used by Developers

CATIA V5

Arbetar enbart i Ytmodelleringsarbetsbänken i CATIA (generative shape design)

I Catia är det 95% GDS och 5% Solider. Använder även asselby-bänken och DMU navigator, och 3DPMI och Knowledge adviso

Använder Catia dagligen

Använder catia dagligen

Jobbar ganska mycket med att ta fram verktyg för att förbättra kvalitén och motverka "looper"/få tillbaka CAD-modeller

Templatesutbildning är lite high level – vore bra med något mer konkret i templatesutbildning

CATIA används för konstruktion, förberedelse av joining

I catia gör han ny konstruktion eller ändringar

Har gått teamplate-kurs med Jose

Catia används dagligen

Använder mest part design och generative shape design - varvar solid- med ytmodellering

Använder främst solidmodellerin och assembly

Använder CATIA

CATIA används varje dag

Använder CATIA dagligen

Dagligen Catia

Man behöver kunskap inom generative shape design, solidmodellering, assembly, DMU-bänkar, kinematik och en speciell modul som heter Cast forge Optimize

Vi har inga egna templates (bodyside inner)

På gruppen har vi templates men inte i teamet. I gruppen: rear end-template och tak-template

Konstruktör har tagit fram templates för bättre kvalitet

Varvar solid- med ytmodellering

Ritar solid och 3DPMI I Catia + lite monteringssimulationer och lite kinematics

Använder även asselby-bänken och DMU navigator, och

Assembly i CATIA används i den mån man behöver lägga till muttrar och sådant

CATIA används dagligen

Vid enstaka tillfällen har Kinematics-arbetsbänken i CATIA använts

90% av jobber är att rita modeller, 10% är att måttsätta

Templates faller lite vid sidan om - osäker på om templatesutbildningar en gås

När han jobbade med templates var det någon form av konceptfas

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CATIA används för att kontrollera modeller och för att koppla I KDP

Använder CATIA

Konstruktörer använder Catia

Använder 2D-rintningar för det funkar inte med 3DPMI pga komplex struktur

Catia används om man är konstruktör

I CATIA tar jag fram concept, exempel bara för att visa något som vi tänker, en fulCAD

vid tak- och tvärgående-gruppen fanns rear-end-templaten och jag satt med och ritade den

Använder CATIA dagligen

Använder inte CATIA för att rita upp saker från "scratch", mer för att ändra och uppdatera

Jobbar mycket med templates, där används också assembly för kontextuella länkar

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Använder Ytmodellering, Solidmodellering och assembly och 3DPMI

Använder ibland knowledge advisor för parametrar (CATI

verktyg som används är: CATIA, Teamcenter, TCVis (väldigt ofta), MiP och Exter

Gör "captures" I functional tolerancing annotations (3DPMI)

Använder 3DPMI och Knowledge advisor

Han använder 3DPMI

3DMPI används

Använder 3DPMI

När jag gick CATIA-kursen så var det tre andra som inte alls var inom mitt område, inte alls konstruktörer

Jag hade behövt gå CATIA-kursen med andra konstruktörer, samt att man kanske hade gått med sina egna.

Blandar mycket solid och ytmodellering

Teamcenter

- Använder Teamcenter
- Teamcenter skulle behöva användas dagligen men används några gånger i veckan
- GDL använder teamcenter veckovis
- Använder Teamcenter dagligen
- Teamcenter används varje dag
- Använder teamcenter dagligen
- Använder Teamcenter
- Använder Teamcenter dagligen
- Dagligen Teamcenter
- Teamcenter används dagligen
- Använder Teamcenter dagligen

- Släpper modeller och ibland skapar strukturer I teamcenter
- Sparar ner, skickar och tar emot modeller I Teamcenter
- Teamcenter/tcvis för att öppna modeller, frysa modeller och spara allting
- Laddar in I teamcenter
- Släpper wordfiler
- I teamcenter – kopplar virtuella likare – mycket ska kopplas til nytt artikelnummer, testdokument, ytmaterial, rullvara
- Skapa regler och gråbollar och kör därifrån (som man inte ska)
- Teamcenter används för att kolla omgivningen
- Teamcenter används för att mäta, kolla avstånd
- Söker modeller

TcVis

- Använder TCVis
- Använder tcvis dagligen
- Använder TCVis dagligen
- TcVis för att läsa in bilar för att se packning
- TcVis används för att kolla konflikter efter frys
- Använder TCVis några dagar i veckan
- TcVis veckovis
- GDL använder TcVis en gång I veckan
- Använder TCVis för att visualisera, göra bilder och presentationer
- Vismockup används dagligen
- • Använder Vismockup
- Tycker TcVis är svårt att använda

KDP

- Använder inte KDP som konstruktör mer som GDL
- Använder KDP
- KDP används flera gånger om dagen
- KDP: hantera artikelnummer, frabriksflödet, så artikelnumrerna kommer till rätt bil I rätt tid
- Konstruktörer har read only i KDP
- Vid KDP-kursen gick jag med folk från jätteolika ställen, olika roller
- KDP används varje dag
- CATIA används för att kontrollera modeller och för att koppla I KDP
- I KDP kollar man change orders och öppnar partfoldrar, allt som har med artiklar att göra finns I KDP

MiP

- MiP används en gång I månaden max
- MiP används kanske en gång varannan vecka om man är i sluttampen
- MiP månadsvis - ofta I vissa gates I projekten som det ska MiPas
- MiP används kanske två gånger I månaden
- MiP körs vid releaser
- Använder MiP I slutet av inkrement
- MiP kanske en gång I månaden/någon gång I veckan
- MiP används för geometrisäkring
- Finns inte krav på att använda MiP tidigt i projeten, används aldrig i konceptfasen
- Tycker man borde använda MiP lite oftare, men det hinns inte riktigt
- MiP används, känns påtvingat, vet aldrig när man ska använda det, får mejl ibland om att det är problem I MiP, vet man inte riktigt vad man gör I MiP. Tycker inte MiP är så bra
- Konstruktörerna använder MiP

Genomförda kurser i CATIA

- Jag har gått CATIA-kursen
- Har försökt få till kinematics men den blev inställd
- Tror han har gått till och med Template
- Har inte gått kinematics
- Har gått Catia basic
- Har gått CAD Advance
- Har gått Catia grund och advance och templates och geometriska toleranser, även CAE-kursen
- Jag var tvungen att gå CAD advance för att få jobba I template
- Har gått Catia-basic och advance
- Har gått de flesta utbilningarna I CATIA inkluderat template
- Tror inte han har gått kinematics och CEA engineer och 3DPMI

Genomförda kurser i Teamcenter

- har även accesskurs I teamcenter
- Jag fick först Teamcenter-kurs för konstruktörer, fyra dagar
- Har gått Teamcenter
- Jag har gått Teamcenter-kursen
- Jag har gått Teamcenter Document Management in Document Portal
- Har gått TC+TcVis-kurs, men inte vågat gå ren TcVis-kurs,
- Har gått TCVis och Teamcenter
- Har gått Teamcenter 4-dagars-kurs
- Har gått någon TCVis-kurs
- Teamcenter for Cad Viewer & TC Vis basic, Viewer access required
- Teamcenter Document Management in Document Portal

Genomförda kurser i KDP

- Har gått green card
- Jag har gått KDP-kursen
- Har gått grönt kort, där man lär sig teamcenter och KDP
- Har gått grönt kort för KDP
- Har grönt kort, kan jobba I KDP ibland
- Green card product documentation
- Green card product documentation

Genomförda kurser i MiP

- Har gått MiP två gånger (det blir man aldrig klok på)

Genomförda kurser i PeccaProcost

- Har gått snabbkurs I Pecca
- Pecca ProCost training

Genomförda kurser i LEQM

- Jag har gått LEQM – HW/SW planning (engineers) R&D, step 1

Genomförda kurser i FMEA

- FMEA Design focus

Genomförda kurser i VIRA

- VIRA for Board Owners

Pecca Pro Cost

Att Pecca Procost lärs ut till mig är inte det bästa nyttjandet av min tid för jag vill aldrig sitta i det

Pecca Procast är kanske jätterelevant för en ny GDL

Har inte något behov av utbildning i Catia, känner sig kompetent. Borde snarare gå utbildning i Pecca Pro Cost.

GDL:er som går utbildning i Pecca Procost

Använder som GDL, Pecca Procost inför Teamcenter-släpp, uppdaterar priser

Exter

Använder Exter när man behöver skicka modeller till leverantörer

Exter är från projekt till projekt

GDL använder Exter en gång I månaden

Exter används två gånger I månaden

Exter En gång I veckan

VPC

VPC för ändringaar på artikelnummer – kopplar in hela projektet - beslutsfattningsträdet (Inköp, SQM, ME). När man startar en VPC är att man skickar en förfrågan till leverantören "vad kostar det och när levereras det?"

LEQM

GDL använder LQM (planering) LQM = tidplan, projekt ahr gates, resurser, hålla tidplan

Använder LEQM för tidsplaner, hela projektets tidsplan för ett specifikt artikelnummer.

Använder LEQM

VIRA

Vira används vid problem I byggnation. All planering finns I Vira – mer det agila som vi jobbar med det – skriva storys och problempunker.

CAD/BOM

Använder CAD/BOM för kolla kopplingar är rätt

För BOM/CAD-alighment så har jag hört att det är viktigt att det blir rätt så då blev jag orolig och sökte en kurs

XFMEA

Jobbar I XFMEA för riskanalys

Appendix F: Affinity Diagrams - Channels guiding Developers

Utbildning/Kunskapsdelning
Kanaler som guidar developers 1

Utvecklingssamtal team manager

Gruppchefen kan se I LAD vilka kurser alla har gå

Min manager gav som förslag att vi börjar med vissa utbildningar och behöver jag mer så är det bara att säga till så löser vi det

Rutin att gruppchefen bokar in kurser till nyanställd - får gå CAD advance – utbildningar är prioriterade bland nya

Man har dialog med sin chef – exempel att man behöver gå utbildning för att kunna ta en roll.

Jag fick ganska tidigt information från min manager om utbildningarna, jag visste redan att de var bra att gå också

Vid tidigare kompetensutveckling smöten togs utbildningar upp, jag har en engagerad manager som stämmer av vilka kurser jag gått och undrar om jag har förslag och erbjuder mig hjälp för att söka kurser. Vi tittade på utbildningar tillsammans, jag föreslog och han höll med

Man får gå och fråga sin chef om kurserna man vill gå

Gruppchef uppmanade att gå Catia kurser så han gick de flesta

Man har utvecklingssamtal
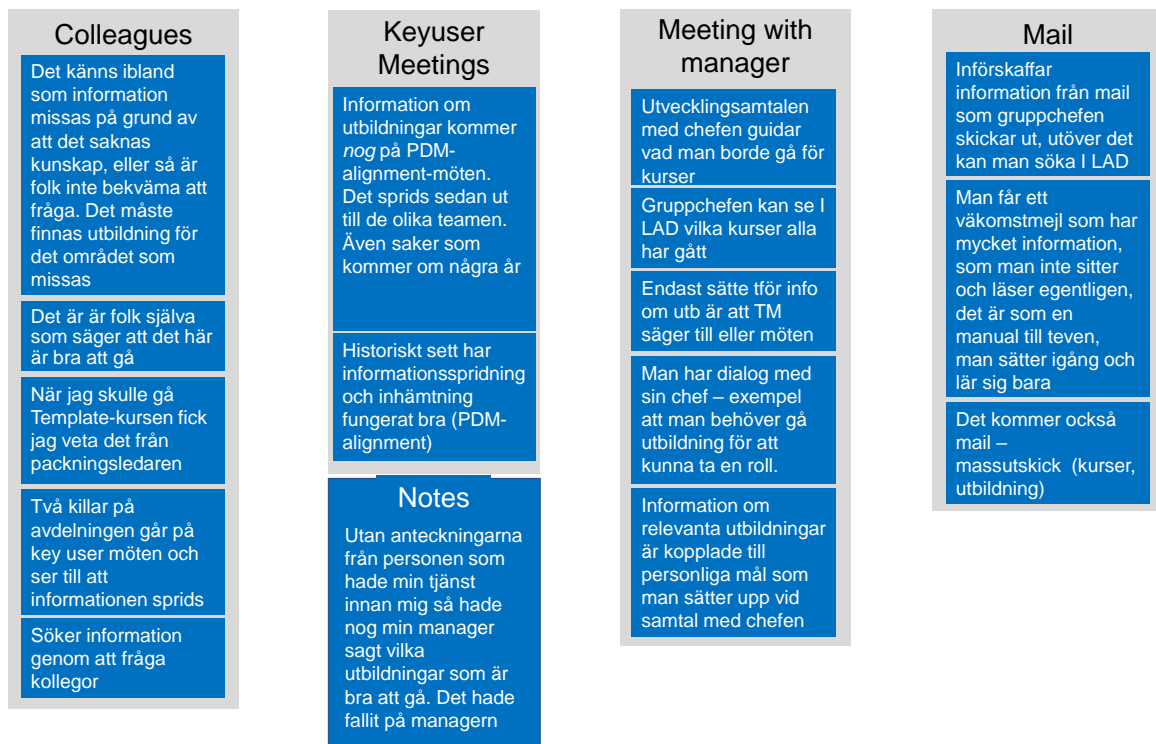
Tror att team manager borde ha koll på vilken kompetens som behövs

Lathund/Kunskapstrappa

De tydligaste spåren man inriktar sig på är nog något man blir tilldelad, inte något man väljer själv. För alla i teamet har ju samma kunskap generellt

Tror det finns ett dokument för vilka accesser som behövs

Det är viktigt att introduktionen när man börjar på en grupp eller om man har en ny roll att det finns någon med erfarenhet eller att det finns ett dokument, när erfarna saknas, med utbildningar vi behöver I olika faser

Tror det finns någon lathund, kanske något ramverk

I vårt team har man försökt ha en Lathund för nya personer som anställts med vad de ska utbilda sig i för att jobba "hos oss".

6 st från utbildningen (skola YH) alla fick ett paket med green card, acd advance, teamcenter osv

Kom från yh, fick paket av en "handledare". De var 6 st

Det är upp till gruppen att samla ihop något angående utbildningar

Vissa utbildningar måste man gå för att kunna jobba, de är prioriterade.

Jag tror inte det finns ett tillvägagångssätt I vårat team, grupp eller ART som visar utildningar baserat på roller eller arbetsuppgifter. Det är folk själva som säger att det här är bra att gå

Utbildning/Kunskapsdelning
Kanaler som guidar developers 2

Colleagues

Det känns ibland som information missas på grund av att det saknas kunskap, eller så är folk inte bekväma att fråga. Det måste finnas utbildning för det området som missas

Det är är folk själva som säger att det här är bra att gå

När jag skulle gå Template-kursen fick jag veta det från packningsledaren

Två killar på avdelningen går på key user möten och ser till att informationen sprids

Söker information genom att fråga kollegor

Keyuser Meetings

Information om utbildningar kommer *nog* på PDM-alignment-möten. Det sprids sedan ut till de olika teamen. Även saker som kommer om några år

Historiskt sett har informationsspridning och inhämtning fungerat bra (PDM-alignment)

Notes

Utan anteckningarna från personen som hade min tjänst innan mig så hade nog min manager sagt vilka utbildningar som är bra att gå. Det hade fallit på managern

Meeting with manager

Utvecklingsamtalen med chefen guidar vad man borde gå för kurser

Gruppchefen kan se I LAD vilka kurser alla har gått

Endast sätte tför info om utb är att TM säger till eller möten

Man har dialog med sin chef – exempel att man behöver gå utbildning för att kunna ta en roll.

Information om relevanta utbildningar är kopplade till personliga mål som man sätter upp vid samtal med chefen

Mail

Införskaffar information från mail som gruppchefen skickar ut, utöver det kan man söka I LAD

Man får ett väkomstmejl som har mycket information, som man inte sitter och läser egentligen, det är som en manual till teven, man sätter igång och lär sig bara

Det kommer också mail – massutskick (kurser, utbildning)

Appendix G: Observation Guide

Observation

Simulate an interaction

Feedback to develop further

Synthesize feedback to create understanding

Först tänkte be dig visa hur du hittar kurser

Sedan tänkte vi visa vårt koncept och ställa lite frågor

Går det bra att vi filmar skärmen?

Think-aloud-technique

Direct observation in controlled environment

- **Fri navigering: Låt "intervjuobjekt" navigera från ett obestämt utgångsläge.**
  - Kan du visa vart du navigerar för att hitta kurser?
  - Hitta specifik kurs:
    - Kan du navigera till anmälan för accesskursen för att få write-access I TeamCenter?
    - Kan du navigera till anmälan för kursen CATIA V5 Basic?
  - Kan du visa hur du hittar det kompletta utbudet av kurser I KDP?
  - Kan du visa hur man hittar en översikt på vilka PLM-kurser som är obligatoriska för dig?

- **Styrd navigering: Låt "intervjuobjekt" navigera från Engineering portal.**
  - Kan du navigera dig till engineering portal?
    - If not provide this link: [LINK]
  - Hitta specifik kurs:
    - Kan du navigera till anmälan för accesskursen för att få write-access I TeamCenter?
    - Kan du navigera till anmälan för kursen CATIA V5 Basic?
  - Kan du visa hur du hittar det kompletta utbudet av kurser I KDP?

Appendix H: All ideas from the Brainstorming sessions

How might we... increase awareness about useful and required courses... in order to... proactively ensure course participation

- Intro-pamflet when people start working
- Hand-out paper with info about courses and access needed at start
- Course suggestions presented at "access courses"
- "Character-builds". Choose your character
- Digital platform showing relevant courses based on team's needs. Introduced to newly employed when starting to work. Personalized log-in
- Software know what you need AI
- As PLM-search but "training search"
- Commercial during meetings (PI-planning?)
- Poster commercial in building entrance
- Email with document with info about courses and access needed start
a. Random course suggestion – Email
b. Competition/Hackaton in course subject "Playful"
c. **Reklam (Mail, skyltar)**
- Built-in/plug-in education and access application in the software
- Software commercial – popup
- Course reference in Methods
- Introduced to courses and access process before first day
- Mentor programme with A and R - "weekly questions"
- **Checklista för chefer -** *(Enklare att förstå om det är code of conduct än Catia. Finns möte med chef och finns som del av utvecklingssamtalet)*
- Access is provided by doing tasks on your own computer. Some info and some tasks. Like e-learnings
- A forum for each team. Info is spread there between members. Some template of info for all teams to ensure it is included.
- **Forum**
- **Kursfrågor som stående inslag under "återkommande möten"**
- **Ambassador**
- **Chefmöte om utbildning**
- **Ett par gånger om år - Utbildningsfrågor (Checkas av)**
- **Automatisk anmälan -** *(Baserad på roll eller uppgift. Man blir "tvångsrekryterad")*
- **Accesskrav**
- **Kartläggning/Mappning inför "uppgfit" -** *(Utbildas beroende på kommande uppgifter)*

How might we... enhance the possibility for developers to find a specific course... in order to... minimize effort

- Better/Clearer UI – logos/Pictures - when looking for courses
- **Utbildningsprofil lättillgänglig**
- **Lyfta fram utbildning på engineering portal -** *(Det ligger undanskymt)*
- **Väl synlig information på intranätet -** *(Engineering portal. My employment. Kopplat till LAD. Kanske inte ha utbilningar på engineering portal. Länka från engineering portal till ett annat ställe där man kan se sin progression.*
- In search field: fill in sentence (google)
- Enhance keywords
- Introduce filtering
- Filtration search – Workbench/Program/Basic,advanced course
- Search based on method/tool-in-tool contained in course
- Frequently taken courses. "Top of the...of...by...". E.g.: Top of the week of CATIA V5 by Team X. Day,week,month,all time. Software. Team, ART, Corporate
- **Virtuell agent -** *(Kan svara på frågor om utbildning)*
- **Intelligent sök och anmälningsystem -** *(Stöttat av AI)*
- **Kursinformation kopplat till mjukvara** - *(System man använder ger info om kurser som finns, kopplat till systemet)*
- Tags #
- Category navigation: Software>tool>skill level
- Complete overview/map of all courses
- "Related to" in course information page
- New courses tab
- Profile page with pre-defined skill tree (no search)
- "Unlocking" courses - (Finished/To do)
- Personalized filtering based on log-in/team/ART
- **Templates baserat på roll** - *(Utbildningstrappan har en släng av detta. "Vad är lämpligt för mig?")*
- SYV- Study councellor/advisor
- Spread awareness of keywords
- **Automatiserad påminnelse om kurser**
- **Information om utbildning på introdagar**
- **Utbildare är närvarande på stående möten**
- o **Riktad reklam -** *(Mail personlig startsida på intranätet, skyltar)*

How might we... enhance exploration of courses... in order to... increase individual competence development

- Tags #
- Sort by level, software, area, tool within tool, length
- Filtering: level, software, area, tool within tool, length
- Categories – Team/software
- Frequently taken courses by (team/art/corporate), "top of", day, week, month, year, all time
- Favorites of (team/art), day, week, month, year, all time
- UI- Icons
- **Tydliggöra kursutbudet -** *(Luddigt formulerade. Kurser går in I varandra)*
- **Intelligent system för att hitta och anmäla sig -** *(Kanske föreslår saker och ting beroende på hur man beter sig I systemet.)*
- **Gameification -** *(Om du får ett interaktivt blåbär om du gör rätt så vill man fortsätta söka)*
- Random suggestion – within software
- New courses tab
- Coming courses (notification when released?)
- New courses
- Related to (topic, field)
- Course suggestion based on interest
- "Might interest you", based on what courses you've looked at
- "Give me a course" - based on your method search
- Start page based on CSID "this might interest you based on your team, art, taken courses"
- Display requirements of courses with a link to the prerequisites
- Course suggestions – Most popular/related to
- Course creation voting (hand in suggestions)
- Graphical map of courses
- Display courses on a specific level holistically, e.g. Teamcenter 1 and CATIA 1
- **Tydlig/Naturlig koppling mellan kurser -** *(Naturlig progression. Fortbildningssystem. Man ska inte behöva leta vad man ska behöva härnäst. Tydlig väg. Bli lättare att utforska utbudet)*
- Auto-signup on course every increment ("opt-out") integration
- Matchmaking with people that has taken the same courses as you
- **Diskussionsforum -** *(Prata direkt med kursansvarig)*
- Create your own package in addition to the mandatory
- **Koppla kompetens och kurser till lön/ansvar**
  o **Exempel på kurser –** *(Vad dom är till för. Modeller tillgängliga)*

Appendix I: Developers' Suggestions for Improvement

Förbättringsförslag av utbildningar och hur man kan guidas

Paket med kurser

Man skulle kunna ha ett träd där man ser kurser samlade (ex Tcvis och MiP), så man kan se nischat

Tycker det vore bra med en fil eller papper med vilka kurser man ska gå och när

Ett paket med utbildningar som behövs för att kunna jobba hade varit bra

ett starterpack, när någon börjar får man en guide för till exempel accesser, vilka utbildningar man måste söka och lite "runt-omkring-saker". Det hade hjälpt väldig mycket

I en perfekt värld så har man en utvecklingsplan som man går igenom med de anställda

Det hade varit bra om man hade allt innan, program, så man inte behöver söka allt

Det kan också vara bra att se vilka accesser man behöver, med länkar till utbildningar

Chefguidning

Förbättringsförslag: jag antar att cheferna och gruppen borde sitta ner och verkligen ha klart eller liksom diskutera vilka utbildningar är relevanta för den här rollen. Sen att det finns på papper, jag tror vi ska ha något sådant, men det känns aldrig som att man diskuterar

Gruppchef borde ha på sin agenda vilka programvaror som behövs och vilka utbildningar som ska gås

Misc.

Förslag att integrera tips om utbildningar I de verktygen man jobbar I.

Portal/Plattform

Spontant tänker han att LAD-portalen kan förbättras: här är utb för cad-konstr, här är för gdl,

Det borde finnas en funktion i LAD där man kan välja sin roll, sen visas alla relevanta utbildningar

I LAD skulle man kunna skriva sin befattning och få utbildningar uppradade som är relevant för en

Det hade kunnat finnas en portal med överblick över vilka kompetenser som finns I team som scrum master har tillgång till

Appendix J: Evaluation Questions

Evaluation

Beskriv tanken med nytt koncept. (Hur det ska funka, var det ska ligga). Använd bilder/Journeymaps?/Något mer(?)

Frågor om vår lösning:
- Har du några spontana tankar kring vårt koncept?
- Var det någon du tyckte var särskilt användbart?
- Var det något du tyckte var överflödigt?
- Var det något du tyckte var otydligt?
- Tycker du det saknas något?

Appendix K: Developers roles

T-shape/gemensam bas

Tror det är bra att vi alla kan lika mycket i Teamcenter eller KDP, eller kanske t.o.m. CATIA, sen har man en som är extra duktig på det och en annan på något annat.

Det kan vara bra att folk blir specialister, som konstruktör, inom en särskild sak, tex ritningar

Personer kan inte göra allas uppgifter i teamet rakt av

Det är inte så att man är T-shaped och alla går allt

Jag tror vi har specialiteter, varje medlem i teamet har ju sin del.

Jag tror det hade varit bra för alla (teamet) att gå på vissa av utbildningarna

Alla har en grundkompetens (det man gör större delen av sin tid)

Varje developer är sin kompetens – det är svårt att få alla vara exakt lika

Även fast vi är developers har vi kvar våra gamla roller

T-shape är populärt i teamet, man ska kunna bredda sin kunskap

GDL måste finnas

"Blir du för bred så tappar du spetskompetens"

Förstår poängen med T-shape, men tror inte det är bra om man blir för bred. Tycker det är bra att ha uppdelning mellan kostrutkör och GDL

Teammedlemmar har olika ansvarskomponenter

En huvudansvarig I teamet, en som håller på med 3D och en som tar fram ritningar

Tanken är att alla ska kunna allt

Jag tror att alla får ha samma grundkunskap för att förstå varandra mycket bättre

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