

# DELIVERABLE REPORT

The logo for COMPLEAP, featuring the word "COMPLEAP" in bold, black, uppercase letters on a bright yellow, trapezoidal background.

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**New updates after M12 – based on the mid-term review feedback (Technical review report)**

## Summary

This updated deliverable describes the research done in the CompLeap project. The desk research is related to the development of CompLeap requirements and architecture design. Originally the research focused on a compilation of services in a table format, which was collected at the beginning of the project to position the current services being created in the project, and gain a good understanding of the existing architecture and digital services that the CompLeap project aligns with.

The updated desk research has focused on creating a deeper understanding of the current service ecosystem and the user needs relating to the current service ecosystem, or service jungle even, as depicted in the original table. The original table was based on the Learners Pathways business process, and presented a scattered image of the services available for learners. It did not present enough the needs for improvement or synergies between the services, but rather a static image on the multitude of services that learners are faced with in their process of gaining new competencies.

In this work, we focus more on the needs of the users. For this purpose, also some focus group interviews have been conducted and are described below. This research has been an integral part of creating the requirements for the prototypes developed in WP3.

# Desk research

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# 1 Introduction

This document describes research done in 2018 in the development of the framework architecture and user requirements in the Competence Leap ([www.compleap.eu](http://www.compleap.eu)) project (2017-2019), funded by European Commission. The Compleap project aims to develop new digital solutions for lifelong learning, helping users to understand their competences, gained through formal education or in non-formal contexts.

Mapping services, especially digital services, relating to individual skills and competences and finding a suitable educational offer based on personal needs and interest has been at the fore of the project. Currently, the service ecosystem relating to the above mentioned user needs is constantly changing and new services are emerging abruptly, and as such we have continuously collected the existing services relating to the Compleap ecosystem in the project Wiki pages:

<https://wiki.eduuni.fi/display/cscCompleap/Desk+research%3A+Services+in+different+EU+countries>

Also, as part of the project, user needs for such services were investigated. The goal of the user needs research in Compleap project was to gather and analyze information about user perspectives, needs and challenges when choosing a type of education in VET.

## 2 User-Centered Approach

Compleap project aimed at developing a user-centered digital ecosystem for competence development, and this has been key also for conducting the desk research.

User-centered design is a product development approach that focuses on end users. As a result of user-centered approach, user requirements are collected and analyzed. User requirements refer to features/attributes a product should have and how it should perform from the perspective of user (Baxter, Courage, Caine, 2015, p.7). This approach places the user in the center of the development efforts and tries to suit the product to the user and not the other way around.

Early in the emergence of the usability and user-centered research Gould and Lewis (1985) introduced principles of user centered design emphasizing attention to users before from the beginning of the project as well as systematics inquiry into users' perspective. The following principles are:

1. Early focus on users and tasks
2. Empirical measurement of product usage
3. Iterative design

Martinez-Maldonado et al., (2015) also separates steps for learning analytics development. The process starts with the problem identification phase, where user needs, and data needs have to be identified first. Summarizing user centered technology and learning analytics development recommendations, early focus on users and their perspectives is crucial for successful user – centered technology development. This ensures that technology is suited to the user needs, is usable, understandable and useful for the end users. It also increases product success and its' longer lifespan.

**Educational and career choices in today's society**

Selecting field to study is a remarkable phase of the process of designing and creating a lifelong learning path. During the last 20 years, making educational choices and designing the educational path with the context of lifelong learning has become complex (Kouvo, Stenström, Virolainen & Vuorinen-Lampila, 2011; Finnish Ministry of Education and Culture, 2018). Challenges to predict, what kind of competencies are needed in future occupations, quickly changing labor market and the complexity of different career paths make it difficult for educational institutions and citizens themselves to know and decide, which degree to choose.

In the late modern society, young people are held more individually responsible of their life choices. Gender and families' symbolic resources (such as financial situation) are still strong predictors of youth's educational choices (Armila, Käyhkö & Pöysä, 2018). Educational choices are complex combination of different practical, psychosocial, and structural factors. Participation in the secondary education is an important decision that have far reaching consequences. In Finland, 3% (1600 students) of the youth finishing their secondary school did not apply to high school or vocational education (Loukkola & Rautanen, 2017). 9% of the students with foreign language did not apply to high school or vocational education and training (Loukkola & Rautanen, 2017). Girls applied more often to the high school (62% of the age group) and boys to VET (55% of the age group).

Youths' educational choices are often discussed as abstract, rational, and ambition-based solutions without considering young people's everyday environments (Armila et al., 2018). The role of emotions, interests and values during the process of selecting the education has not been investigated in detail.

### 3 Context of VET

VET is an important part of the education system in Finland and in Europe. About 50 percent of young people in European Union choose vocational education and training as combined part of upper secondary education or as second-level education.

In the Finnish educational system, educational choice is typically done when students are 15-16 years old. From the governmental perspective these choices have far-reaching consequences for populations economic power and future economic development. Educational choice is also an important step in individuals' life, providing an access to new competences and professional development. Vocational education and training make these developmental possibilities available to very diverse population in terms of learners age, cultural and educational background and work experience.

### 4 Desk Research Feeding into Framework Architecture Design

The framework architecture design was kicked off at EDUFI in January 2018. Due to personell changes, the work paused for the spring and later coincided with the desk research and the finilising of the user scenarios.

The aim in the below desk research was to depict how digital services listed in the framework were organised, and in this way gain an understanding of the current situation both for user-centred service development and piloting.

The framework architecture depicted in the ComLeap project is housed in the project's public wiki pages, which contains the current versions of the ecosystem architecture:

<https://wiki.eduuni.fi/display/csccomleap/T1.1+Framework+architecture+design>

The framework architecture design has been a continuing task, and has been developed considerably in the later half of 2018. The framework architecture has been created as a shared map to help different stakeholders in different countries to see the current state of the digital service ecosystem and where there is the biggest needs for development and new services.

### 4.1 Architecture Principles

In architecture design the official enterprise architecture principles were followed. This work was started already in the first days of the project and after that together updated in close CSC-EDUFI enterprise and IT-architect collaboration with other project team experts supporting this work.

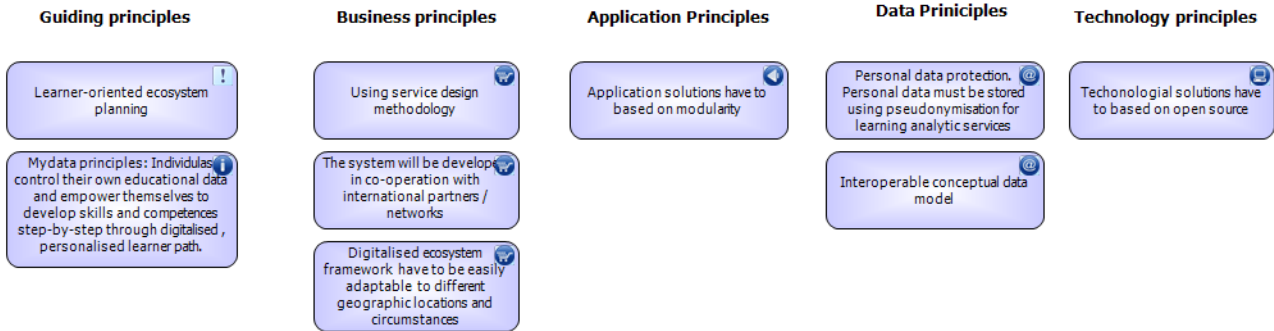


Figure 1: Architecture Principles

The above architecture principles have guided the development towards strategic goals. Every development decision was be aligned with principles. The power of principles is that everyone can utilized them in their everyday work and work towards strategic goals.

The framework architecture design creation was mainly done in the context of the original partner countries. However, right from the start the idea was to try to build the user-centred framework at a very general level so that it could be used in basically any EU-country when developing digital services for lifelong learning. The digital ecosystem already exists on some level in all EU countries, but the whole picture may not yet be visualized following the architecture principles. As such, Compleap work could create added value to many EU member states. If we could have a Eu level framework existing, it would be also easier to develop new services in this context (like Compleap service prototype). This kind of architecture work would also be needed to really be able to support interoperability between national and EU level services.

The learner's pathway is the main business process or value stream in the framework. It depicts the process a generic lifelong learner goes through cyclically.

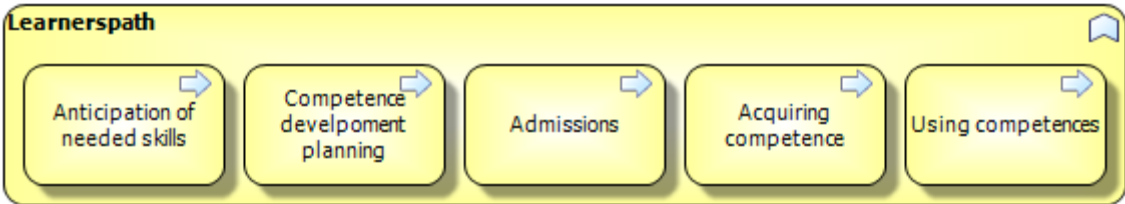


Figure 2: The Learners Path Process

The Learner's pathway supporting business services are described in Figure 3 below. This architecture model sums up the services that individual is using when developing competences in lifelong perspective. Circles are the generic services and in each EU-country there is different systems how these services are organized.

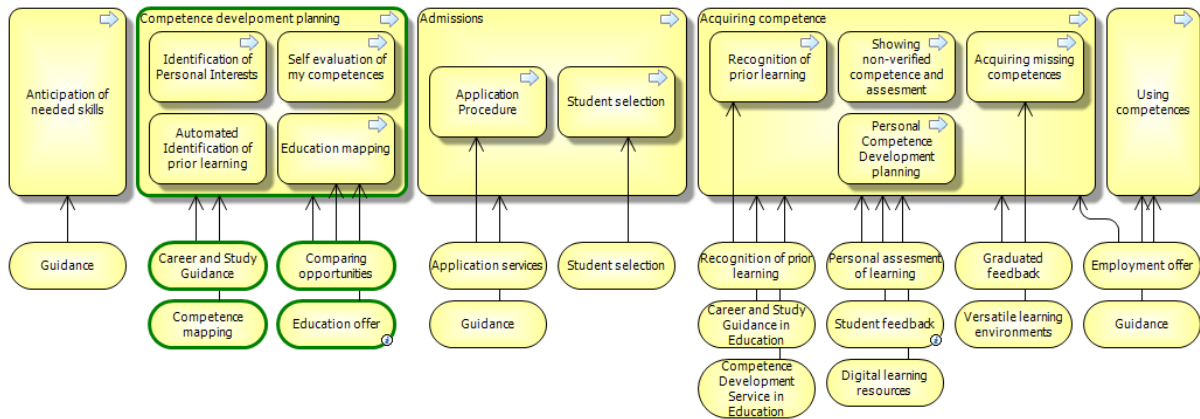


Figure 3: The Main and Sub Business Processes and Services

## 4.2 Description of the Value Stream

The value stream defines the steps the learner takes to increment hers or his competence. The value stream begins from anticipation of needed skills where the learner somehow recognizes the need for new skills or competences. The learner may use guidance at every stage of the learner's pathway and the guidance could give impulses to the learner at every stage to guide the learner to right direction. After the anticipation of needed skills the learner may do planning or do pre education personal competence development planning. The difference between the planning and pre education personal competence development planning is that the planning is not well structured process while the pre education personal competence development planning process is. The planning is more ad hoc and flexible and depends on the learner how to planning is done or if it is done at all. The pre education personal competence development planning is defined by legal entity of the education and is formal way to do planning at that stage.

After planning the learner does education mapping . After finding appropriate education, the learner enters to admissions. After admissions the learner acquires competences and finally uses the competences. During acquiring the competences and using the competences the learner does personal competence development planning all the time. The personal competence development planning is also formal process defined by legal entity of the education which guides the learner to do planning all the time. While the learner may do other kind of planning also, the formal planning provides common tools and information to do planning in competence development scope.

The sub processes clarify the main processes and tell in more detail what steps the learner takes in the learner's path. The Planning process is divided into three steps. Namely, identification of personal interests, self evaluation of my competences and automated identification of prior learning. Admissions are divided into application procedure and student selection sub processes. Acquiring competence is divided into recognition of prior learning, showing non-verified competence and assesment, and acquiring missing competences sub processes.

Thereafter, business services are pinned to the learner's pathway using the arrow notation. The notation describes at which stage of the learner's pathway the business service is utilized. For example learner uses competence mapping business service during planning process.

### 4.3 Process Integration – From wanting to Find Direction to Using Competencies

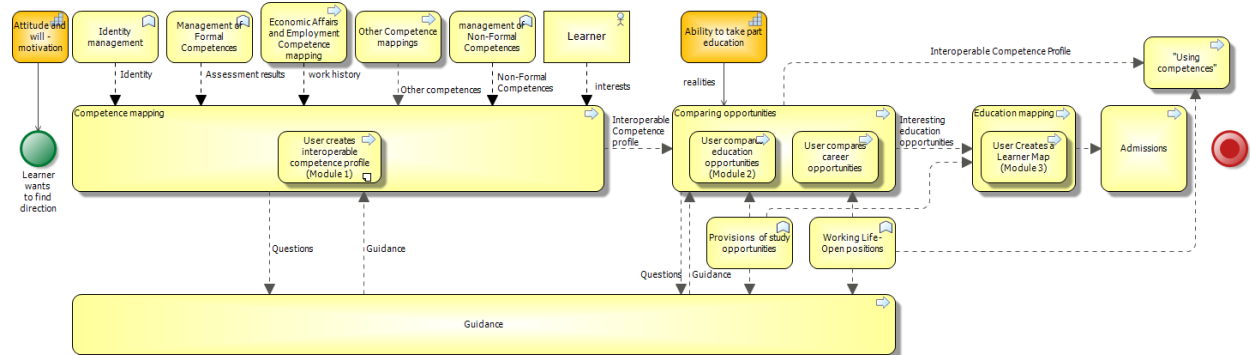


Figure 4: Process Integration

Framework process integration is described above. The diagram shows how data concepts flow between processes. Of course there are differences between the EU countries with the existing digital infrastructures but for example a digital competence profile linked to national competence databases was interesting in Finnish-Dutch context since in Finland there is KOSKI database and in Netherlands Diploma register so therefore the choice was justified although in every country the situation is not the same.

With the chosen prototypes and their deployment in partner countries the aim of the project is to show that same kind of solutions could basically be done in any EU-country if the infrastructure would be developed like in the countries who so far have been most active in digitalizing their services. The framework architecture was designed so that it would help any EU country to develop such services and a learner-centered service ecosystem.

## 5 Desk Research for User Needs Investigation

User need research in the project was carried out in a way that would adhere to the above stated principles. To ensure development of successful and useful services in the Compleap project framework, research was carried out concerning already existing studies and practices of learning analytics use in vocational education and training (VET) as well as similar services in other countries. User research has been conducted gathering and analyzing user perspective. Also, continuous collaboration with associated partners and other stakeholders was practiced, gathering ideas, reflections and other input concerning Compleap services.

Further we describe the types and processes of research involved.

Desk research conducted 2017-2018

1. Systematic literature review about learning analytics possibilities and challenges in the context of VET (2012-2017) as well as ethical and data use concerns.

2. Analysis of case examples of learning analytics use in VET settings.
3. Analysis of current similar services available in Finland and other countries (Germany, Netherlands and EU level services). The results are presented in the table (Eduuni) with summary description.

User needs and experience research conducted 2018:

1. Discussion with guidance counselor identifying possible user groups
2. Interviews with students about the decision-making process when applying for VET
3. Interviews with teachers about their perspective on students' decision-making process when applying to VET
4. Observation of user experience when using other similar career recommendation sites
5. Stakeholder seminars – further identifying and defining user needs

Associated partners seminars took place on 17.01.2019, 31.10.2018 and 18.09.2018, 04.2018.

In the following sections we describe each of these research activities, specifying the research questions, methods, results and implications of the analysis.

## 5.1 Systematic literature review about utilising learning analytics and its challenges in the context of VET from year 2012-2017

Research question:

1. How has LA been used in different contexts of VET?
2. What ethical concerns have been raised as related to the use of LA in VET?

Methods: To answer research questions, a systematic literature review was conducted following the procedure of Cooper & Hedges (2009) for research synthesis. PRISMA checklist (Moher, Liberati, Tetzlaff, Douglas & The PRISMA group, 2009) was used for the all the steps of the process. The data was composed of peer reviewed articles from 2012-2017 describing LA challenges and possibilities in various educational contexts related to VET; Four databases, Google Scholar and other sources were used to find relevant LA articles. Searches resulted in 309 articles. After the selection criteria has been applied, 62 articles were chosen for the final analysis. However, very little number of articles focus on VET, as this area of research is underrepresented in scientific literature.

Results:

1. As a result of the analysis research paper „Learning analytics in education: Literature review and case examples from vocational education” has been developed and submitted to the Scandinavian Journal of Education. Article makes a conceptual review of the field of learning analytics in the context of VET. It summarizes possible ways of LA usage regarding its relation to different stakeholders in educational system. Ethical concerns are analyzed and suggestions for further development of learning analytics in VET context are made.
2. After analysis of ethical concerns and data protection issues, ethical and data protection guidelines for Compleap were developed describing current planning state of the project and recommendations for future development process. These guidelines were developed according to the ethical code suggested by Sclater and Bailey (2015), there was also an aim to adhere to General Data Protection Regulation (GDPR,



Regulation (EU) 2016/679) . The code consists of responsibility, transparency and consent, privacy, validity, access, enabling positive interventions, minimizing adverse impacts and stewardship of data. We go through all the points to discuss how have these principles been applied in the framework of Compleap project.

Table 2. Application of ethical code of practice by Sclater and Bailey (2015) in the framework of Compleap project

	Principle	Description	Application in Compleap
1.	Responsibility	Responsibility – it must be decided who has an overall responsibility as well as specific aspects of learning analytics, e.g. collection of data and interventions. Student and staff body should be consulted as well.	It is still being negotiated who will have final responsibility of different aspects of transferring and storing user data. Priority is being given to safe and ethical handling of user data.
2.	Transparency and consent	All steps of learning analytics have to be clearly explained and transparent. Consent has to be given for any changes with data use or any new projects.	User consent has to be granted to create user profile. Transparency will be ensured by explaining to the user what kind of data and for what purposes is used. User can also choose what kind of data he/she wants to import and use in user profile and for calculating education recommendation. Limitations and interpretation of education recommendation will be explained to the user in a written form.

3.	Privacy	<p>Access to students' data should be restricted and re-identification from metadata and aggregation of different data sources avoided. Cases where institution may have legal obligation to intervene should be clearly stated.</p>	<p>Privacy is ensured by restricting the access to user data. Strong authentication by a trusted service provider is needed to create and access user profile.</p> <p>Users who don't want or can't use strong identification will be able to modify the profile, but it will not be possible to save it, so user privacy is protected.</p> <p>It still has to be considered what third parties (e.g. education institutions) if any will have access to the service.</p>
4.	Validity	<p>Institutions must ensure that data and analytics processes are of high value, valid and also useful and appropriate.</p>	<p>Data will be used only from trusted data sources (defined here as Finnish registries and some user-entered data). We also try to make data presented useful and appropriate. For this reason, testing with end users will be done to make sure the information is understandable and useful for them.</p>
5.	Access	<p>Student must be able to access their data at all times. However, institutions may temporarily withhold data if it may have harmful impact on the student's academic progress.</p>	<p>Users will be able to access their user profile with data in it at all times in the time frame of the project.</p>

6.	Enabling positive intervention	It should be specified when institutions need to intervene and advise students. Their appropriateness and effectiveness should be reviewed.	Work that has been done is carefully designed to enable positive impact of learning analytics. Visualisation of competence profile as well as education recommendation will be designed to be of value for the user. Moreover, using the service as a whole is seen as an intervention on user reflection and decision-making process and the appropriateness and effectiveness of that will have to be evaluated in the second part of the project.
7.	Minimizing adverse impacts	Institution take steps to ensure that students' data categorization, labeling, norms and trends do not lead to bias, discriminatory attitudes, non-participation, cheating the system, loss of control in learning or any negative effect on wellbeing or academic performance.	Great care has been taken to prevent any undesired effects of learning analytics. For instance, not including any predictive or profiling functionalities in Compleap services as this is would potentially demotivate those already struggling users, and possibly increase discriminatory attitudes.
8.	Stewardship of data	Learning analytics will be kept to a minimum to deliver desired result and retained only to specified and clear purposes. It has to be in compliance with existing legislation.	Learning analytics is kept to a minimum in Compleap and unnecessary data gathering is avoided. Data is gathered and presented only to support individual in taking control of her/his learning process. Effort is also made to ensure that whole service works according to Finnish and European legislation.

Not all principles, however, are equally developed in the project. For instance, there is still work to be done concerning the transfer and storage of the data and responsibility for that together with database

representatives (KOSKI) and developers. Interventions taken will still have to be evaluated to measure the extent of positive effect it has on the users. Feedback from the users will have to be gathered to see how beneficial and sensible the information presented is to them. Adherence to the ethical standards have to be ensured even after the end of Compleap project. As the project goes in to the second year these issues will have to be investigated and solved.

### ***Analysis of case examples of learning analytics use in VET settings.***

Concrete case examples of LA applications in VET institutions were gathered and described.

Research question:

1. What case examples could be found from VET using learning analytics?

Methods:

62 research papers and other grey literature sources have been analyzed identifying descriptions of LA use in vocational education settings.

Results:

Five cases of LA application in VET have been identified. Four case examples come from various European countries (Germany, Norway, UK) and one from USA. Two of the cases come from UK as an early adopter of learning analytics and educational technology in general in educational settings. Overall number of cases is quite small representing rather under researched area of VET and learning analytics. However, some more extensive case examples were found representing research done in fire department, Norway as well as community college in UK implementing learning analytics for student recruitment and retention. Further we present these two cases in more detail.

1. *Hansen, Netteland, & Wasson (2016) are aiming to integrate formal qualifications from class trainings with evaluations and observations from real life work situations. One needs to take variety of courses ranging from first aid to working with heavy constructions and keeping the best physical shape. On top of that, every separate team has to have people with extra qualifications in specific areas. Fire department has to reviewed qualifications regularly, keep in mind retirement plans and injuries to produce sufficient number of employees. Program should be able to visualize students' and workers' competences, e.g. in a word cloud. This would help management see individual, group and organizational needs. The project is in its early stage and a number of tools have to be developed to solve challenges in using learning analytics to visualize and develop students' competences.*
2. *Brockenhurst College, UK, is a an institution for further education, providing various degree and non-degree courses, vocational training and leisure courses for teens and adults and attracting around 3000 local and international students. Big part in Brockenhurst College is sixth-form education, designed for pupils in their final years of secondary education, starting at the age of 16 and up to 19. Dom Chapman, Director of Learners at the college, presented learning analytics initiative implemented in this school in the 2015 conference of the Association of Learning Technology. Brockenhurst College implemented learning analytics in September 2015. The program gathers data and makes predictions based on 5 year student data. First predictions are made during the enrolment process when students at risk are identified. Later in the school year predictions are made again and the results from both are compared to see if the students are improving or going further the wrong track. This way administration can see if the student's individual risk level is falling or rising. As many courses in the college take up to 30 weeks to complete, early detection and intervention is important. School hopes to be able to reach out for high risk students before week 4 or 3. Visualizations*

*are also presented to staff and individual students, where they are able to see if their risk level is rising or falling. However program does not compare student's risk to others, just to his own current and previous data. School has the ambitious goal of improving student recruitment and retention by 15% over the next five years. However as the project was started in the late 2015 results are not available yet.*

## 5.2 Analysis of current services available in EU countries

Analysis of the current learner's path and other similar services have been conducted to gain the perspective of supply of services available to the users in the European Union and also on the perspectives different EU countries have on the education path learners can take.

Research question:

1. What learner's path services could be identified in different EU-countries
2. What similar career recommendation services could be identified different EU-countries

Methods:

Desk research have been conducted looking for Finnish, German, Netherland and EU level services on-line related to learners path as well as similar services providing career guiding information and services.

Results:

1. The results concerning learner's path services in different EU-countries as well as to Compleap similar services are presented in the table (Eduuni) with summary description:  
<https://wiki.eduuni.fi>

Architecture model presented below sums up the services that individual is using when developing competences in lifelong perspective. Circles are the generic services and, in each EU-country there is different systems how these services are organized. Table under the picture is a summary what kind of different ways of organizing digital services there are.

Figure 1. Architecture model summarizing services for life long competence development in EU

## 5.3 Identification of possible user groups and user scenarios

Research question:

1. What user groups could be identified as potential users of Compleap services and career guidance services?
2. What user scenarios (personas) could be created representing user groups

Methods

Discussion with experienced career counselor from Jyväskylä Educational Consortium Gradia was held about possible user groups. The discussion was focused to find out what groups of people usually approach guidance counselors for career guidance advice and what are main characteristics of these groups. Career counselor experience with people interested in career counselling services was integrated with literature research results from the field to identify possible user groups for VET

recommendation system and other Compleap services. After the identification of user groups, user profiles or personas were created.

Results:

From the discussion, possible five user groups were identified as well as their special characteristics and challenges they may be facing. After that the need for support was assigned to each user group according to the experience and views expressed by guidance counselors. Identified user groups are: Immigrants, NEETs (not employed and not in education), basic education graduates (15-16 year old), unemployed and people in the midst of career shift.

After five user groups have been identified, there was a user profile created representing each user group. Created user profiles or personas are characterized by features proposed by Baxter, Courage, Caine (2015, p. 39) including characteristics like demographics, occupation, education, specific experience, attitudes and values. There more specific user profiöes were created to gain a better understanding of possible users, their needs and expectations for career and education guiding services.

Table 2. User groups and their more detailed user stories/personas

<p>Immigrants</p>	<p><b>Maryam (23)</b> escaped the civil unrests and wars in Middle East when she was 18 years old. After making it to Europe her family split and she made it out to Germany and started to daunting task of finding a better fortune then what she left behind. After spending few years in Germany she got acquainted with Matias, a Finnish fellow to whom she eventually got married and moved to Finland. Maryam believes that cracking any culture requires the knowledge of the language, so she enrolled to a Finnish course immediatly. After learning the language she would love to get a part-time job and then further her studies in the field of IT and/or healthcare. Maryam has tried to find some information about educational offer from opintopolku.fi, but she is not sure, which education would be the best for her compared to her experience, competencies and previous education.</p>	<p><b>Goals:</b>Settle in Finland, Learn Finnish language, Find a stable workplace</p> <p><b>Concerns:</b>People in Finland seem distant, Can't get any interviews for part time jobs, It is hard to find friends</p> <p>Interests:Information Technology, Health care,Music</p> <p>"Finally a moment of peace"</p> <p>Work: Unemployed</p> <p>Education: Upper secondary school, general ed.</p> <p>Family: Married</p> <p>Location: Tampere, Finland</p>
<p>NEETs</p>	<p><b>Liisa (16)</b> will soon finnish her 10<sup>th</sup> grade studies. During the upper-elementary school, she did not show so much interest towards school and therefore her grades were not sufficient for any secondary studies in the end of 9<sup>th</sup> grade. During the summer, she decided with her family, that</p>	<p>"Vocational training, general education in high school, how should i know what to choose?"</p> <p>Work: no experience</p> <p>Education: Basic education</p>

	<p>she will start 10<sup>th</sup> grade and work-hard the whole year to raise her grades at least in Finnish, English, mathematics and biology. During that year, she got really interested about chemistry, but because her lower success in previous years, she couldn't progress in it as much as she would have wanted. Now she has raised the grades, but is still frustrated of what to choose. Would high school be too difficult? What to study in vocational education then? Liisa enters to <a href="http://mesaatio.fi">mesaatio.fi</a> and starts to investigate the data about different fields.</p>	<p>Family: Mother, father  Location: Kotka, Finland  <b>Goals:</b>Decide what study next  <b>Concerns:</b>Not enough knowledge to make a right choice,uncertain about her skills as a learner  <b>Interests:</b>Chemistry, travelling</p>
<p>Basic education graduates</p>	<p><b>Kaisa (17)</b> is a skilled artist. From her first steps she has always been into drawing and following her surroundings carefully and recording them on paper. If she were to be asked, she would want to just create beautiful things around her and that no one would interrupt her. She completed an art school in her hometown after she completed her elementary school. Art-school studies were challenging but she felt at home with other like-minded, artistically gifted people. Now after graduation Kaisa feels overwhelmed with what to do and how to make ends meet.</p> <p>Kaisas' mum has explored different options with her daughter for career, work and study opportunities through the website <a href="http://kunkoululoppuu.fi">kunkoululoppuu.fi</a>. They have found some interesting ideas to connect her drawing skills with coding or marketing, but she does not know where she could study that kind of things. Besides that, she doesn't know any other girls that would code and is afraid to ask any help for that. She is also scared to move away from home.</p>	<p><b>Goals:</b>to find an inspiring job,Be remembered by her skills, Be a source of inspiration for others  <b>Concerns</b> People and social situations are difficult, Almost always gets fired from jobs, Does not know how to use her skills and education to get employed  <b>Interests:</b> Drawing, Design "I like pretty things"  Family: Her parents and a brother  Work: Unemployed  Education: Vocat., Arts  Location: Liminka, Finland</p>
<p>Unemployed</p>	<p><b>Raimo (55)</b> has been unemployed more or less constantly since the mid 1990s economic collapse. Raimo used to work in project management after graduation. He has had short-term and fixed-term</p>	<p><b>Goals:</b>Help kids get through school, Find meaningful pursuits in life, Bring up his kids well</p>

	<p>positions, but no permanent contracts have been awarded. Considers himself to be a hard-working and honest. Has kept himself occupied with his children's needs. Volunteers in his children's school as a general housekeeper and guard at recess breaks. Participates in a lot of job coaching activities especially when his ex-partner has the kids. Feels frustrated at the system and doesn't feel it is helping him and also a bit hopeless that he will ever find permanent employment. Similarly, Raimo is a bit afraid of getting some work. He is not sure if his competencies match for any jobs available in 2018. He has tried to find out through <a href="http://osaan.fi">osaan.fi</a>, what kind of competencies he has and kept his technological skills updated through short-term website courses. He is not really motivated to apply any jobs anymore, but recently he heard about the twelve-weeks programming courses in Helsinki and got interested about that.</p>	<p><b>Concerns:</b> Been unemployed for long, Doubts whether will ever find employment, Retirement age is approaching, feels unaware about the modern working culture</p> <p><b>Interests:</b>MOOCS,volunteer jobs at school,Old cars</p> <p>"I want to help people to grow to their full potential"</p> <p>Work: Unemployed</p> <p>Education: Engineer</p> <p>Family: Divorced with 2 kids</p> <p>Location: Helsinki, Finland</p>
Shifting career	<p><b>Jouko (21)</b> has completed his secondary education as vocational training and has earned an electrician's degree. After completing his education he has worked in short-term part-time jobs not directly in the field of his acquired competences. Currently he has not found any work and is unemployed. He has started to think that he might need to acquire new skills and competences because there are no jobs matching his interests or skills he has learnt. He also has no interest in leaving his current surroundings. Jouko has used <a href="http://osaan.fi">osaan.fi</a> –website for trying to recognize, what kind of formal competencies he already has, but it made him confused. Besides that has has made several different tests to find out, what kind of fields would be good for him. He has also collected a lot of different kind of working experience from a variety of different short-term jobs he has had after his</p>	<p><b>Goals:</b> Finding employment, Possibly getting new skills and competences, Find out his place in the world</p> <p><b>Concerns:</b> Wouldn't like to leave his hometown No educational or learning options available nearby.Not available jobs for electrician nearby his hometown. Would like to get permanent job</p> <p><b>Interests:</b> Water system installations, mathematics, programming</p> <p>"I don't know what to do in my situation"Work: Unemployed</p> <p>Education: VET., Electrician</p> <p>Family: Dog</p> <p>Location: Ilomantsi, Finland</p>



	graduation, but he doesn't know how to describe all that in work applications properly.	
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#### 5.4 Interviews with students about the decision-making process when applying for VET

One user group was selected for further investigation of the user needs. To answer research questions and to uncover user needs and challenges when choosing an education in vocational settings, potential user interviews were conducted. The group of basic education graduates was selected as this group had a medium need for guidance support and uncertainty about their educational choice was their main challenge.

Research question:

1. What information student use as a basis for their educational choices?
2. What kind of information students consider important in making educational decisions?
3. What kind of support students got when they made educational choices?

Methods: structured interviews with VET students. Students' interviews were analyzed by using data analysis program NVivo 11. Classification of answers was conducted based on the themes presented in interviews and based on the themes in students' and teachers' answers.

Subjects: First- and second-year students (N=51), of which 45 students 16-18 - years old and 6 adult students (18-year or older). Part of the students were studying for a vocational education degree as a part of upper secondary education. Interviews were carried out in groups of 3 students. Students were selected for the interview from Oulu OSAO vocational education and training (VET) center in Finland from tree different areas of education - construction/building, social and health and business.

Table 2. Questions asked on the group interviews with students

Interviews with students

Questions

Warm-up	Tell about your studies, what kind of things belong to them? What is interesting? What is not so interesting in your studies?
<b>Factors that influenced for students choices of studied field</b>	of things have influenced most your decision about studying your current field? e or from who you got support to make your decision? the most difficult thing in applying and entrancing education? easy?
<b>Needs for information</b>	of information was available to support applying and entrancing? you search information about different options? sh to have more information about something to support making the choice?

**Thoughts regarding students' career path and future Recognition of one's' own competences**

of plans do you have after graduation?  
id of position would you like to work in the future?  
of things were your strengths in primary and secondary school?

Results:

1. The first choice youth finishing their basic education need to do is between high school and vocational education. 12 students brought up that they chose vocational education because they wanted to study something where they could use their hands and do something else than sit and study. The most popular factors for students' decisions of their education according to their own experience were their own interest, families' support, opportunities in working life or for further studies, and advice from study counselling. 67% of the students had plans to continue studies either directly after finishing their vocational degree or after few years of studying.

*" For me it was obvious already in secondary school that I want to apply in practical nurse school. There weren't other options actually because I like to take care of people and make customers to be in a good mood and anyway I am empathic by nature. So, it was quite clear for me, but it is difficult to choose where to specialize as I am interested in so many different customer groups."*

Students searched information about different educational opportunities through internet, but they also experienced the role of student counselors and excursions in different educational institutions as important. Accordingly, families and friends had a big role as information providers about different educational opportunities. Families, friends and student counselors also had a role to support students in making educational choices. According to the answers of youth themselves, majority of the students did not actively search information through the internet, but they rather trusted teachers, parents, friends and student counselors. Following the notions of Armila et al. (2018), some students raised up the emotional aspects of the process and described the difficulty of making big decisions because of the big impact for future lives.

*" For me it was quite difficult. It felt such a big thing that the whole life is about one single place to study, the whole life. And then my friends of course, they applied in totally different school than I and I was thinking if I should just go to the same school with them or choose something what I am interested myself about. But the I just ended up to the place I was interested most, thanks to others who encouraged me. And of course, I am happy that I came here because this is so different with new people compared to be here with my old friends."*

2. Students wished to have more information about the benefits of different career options for future studies and information about different orientation opportunities, information about how studies proceed and what kind of everyday life is during the studies, and experiences of current students told by themselves. Main source of support during the decision-making process for young students was their parents and families, but friends and student counselors played an important role as well. 10 students told that they made the decision independently.

3. 16 of the students described that their studies had met their expectations in vocational education. The challenges in the application phase was described in different ways, but what connected the answers was that students had no idea where to apply for. Thus, students who struggle with making educational choices, will get help from the service that supports comparing different available educational opportunities to one's' own interests and competencies and demonstrate possible study paths.

*I haven't had an idea after high school about what I would like to do, there has not been anything exactly what I want to do, but something I had to do, so I went to study ICT-technician degree. After that I still was not sure if that's what I wanted to do, so I started studies of security guard. After that I still did not know if that was my field and then... Some jobs have been in between, but now, for the first time this felt like a right field, this practical nurse school, that I had been thinking about it when I was twenty or something, but maybe I did not feel myself mature enough in that age. This work requires so much responsibility and adult-like attitude. So I thought about it and now I finally applied and it seems that I am suitable for this field."*

## 5.5 Observation of user experience when using other similar career recommendation sites

Student interviews included a task in which students had time to get familiar with two different websites which were created for youth to support them comparing different educational opportunities and provide information about study possibilities. Students got to evaluate the websites and describe if the information was usable and important.

Research question:

1. What information young people value in online education and career guiding services?
2. What problems do they face using current recommendation systems?

Methods: structured interviews and observation of VET students when using the career recommendation services. Students were given a think-aloud task and were asked to try using three online career guiding services opintopolku.fi, noodi.me and kunkoululoppuu.fi. In the end of the interview, students got time to riffle in two different websites created to support finding the right educational field for youth. Students estimated the available information and shared their experiences and thoughts about the websites.

Results were analyzed using data analysis program NVivo 11. Classification of answers was conducted based on the themes presented in interviews and based on students' answers and comments during the observation time.

Subjects: study subjects were the same as in the student's interviews. As students' interviews were conducted first and using and comparing different online services was done afterwards.

The presentation of the task went as follows:

*„Next three different websites will be presented for you. Websites are created to support youths' educational decision-making process. After that we will discuss about them together"*

After that students got 5-10 minutes time to get familiar with each webpage opintopolku.fi, noodi.me and kunkoululoppuu.fi

Results:

1. The most important factor for students was that the information was easily available and presented understandably. They valued as important that there was information about studies, different educational paths and further study opportunities. Accordingly, they valued information about different occupations and information about salary and employment.

Recommendations for suitable occupations for the user were kept as important information as well.

2. Some students had challenges with the usability of website and many groups had challenges to understand how are these services supposed to be used. Especially with occupation questionnaires, students did not consider the provided suggestions for different occupations reliable or usable. Some students experienced that the provided information was not specific enough or would not help the user to find out about interesting occupations.

## 5.6 Interviews with teachers about their perspective on students' decision-making process

Research question:

1. What kind of expectations students have towards their VET studies, according to teachers?
2. What kind of influence students' expectations have to students' motivation towards VET studies, according to teachers?
3. What kind of information should be provided for students before applying for VET, according to teachers?

Methods: structured interviews were conducted with VET teachers (N=9) from OSAO vocational education and training center in Oulu, Finland. Teacher interviews were analyzed by using data analysis program NVivo 11. Classification of answers was conducted based on the themes presented in interviews and based on the themes in students' and teachers' answers.

Teachers were asked following questions:

- What kind of experiences teachers have from students' expectations towards their studied field?
- What kind of experience teachers have about students' motivation in the beginning and during their studies?
- What kind of information they consider important for applying to education?

Results

1. Teachers often pointed out that students may be surprised by the challenging nature of their studies (having to study a lot) or the requirement of the profession, for example, in the construction sector (to be at work in any weather and to work physically). In general, false impressions are present if the student does not have much prior knowledge of the area. However, if the information has been obtained, for example, from parents, the images can be more realistic. There is strong significance of the information in the choice of the field. The education selection process underpins the emergence of internal motivation and attachment to studies throughout the course of studies. Making a conscious choice helps the learner to justify this choice at later stages, thus providing useful information at all stages of the process is central.

2. According to teachers' experiences, if students that have made their educational choices carefully and are motivated, they most often succeed with studies and employment. But if students follow their friends to some education or otherwise they are not sure about their motivation towards their studies, they often change to some other field, discontinue studies or it takes time to find the motivation towards the studies. Teachers considered important that students would get information

about everyday life in different occupations and educational institutions, told by their peers. They highlighted the power of videos and social media as a way to inform students about different things.

Teachers kept the lack of motivation as biggest reason to change studied field or discontinue studies. Also challenges with health and wellbeing could be reasons to drop out from studies.

3. Teachers underlined the importance of concrete information, and the value of using videos and social media to tell about different fields for students. It was mentioned in several different interviews, that students value information told by their peers. Better education and career guiding services during upper secondary school time was also mentioned as important. According to teachers, the information provided about working life and studies should be easily accessible from the user's point of view, with concrete information. Information is needed on the everyday life of work and studies in different fields

## 5.7 Stakeholder engagement

Stakeholder expertise was utilised in both creating the ecosystem and the user scenarios. Similarly, important stakeholders such as student counselors and study program coordinators were involved in the process of identifying user needs through stakeholder seminar workshops, discussions with experienced student counselors.

Research questions:

1. What kind of functionalities associated partners see as important in Compleap services?
2. How these functionalities are prioritized by the associated partners?

Goals of the stakeholder workshops held in April were to identify the place for Compleap in the network of digital services and clarify what enables the identified target. The workshops acted as the starting point for stakeholder network building. The seminar was the place where the suggested service prototypes were approved by the stakeholders based on the initial framework architecture design, and after this the prototype development could get started. Results of the April workshops have been described in a separate deliverable (Del 16)

### 5.7.1 Stakeholder workshop, October 10, 2018

Methods: Participants worked in mixed groups, so that organisation representatives were not in same groups and each group contained participants from various industries.

Groups viewed three main screens of the prototype and commented these questions:

- 1) Identify other public services that Compleap can communicate with
- 2) Identify the information that Compleap needs from other services and the information that Compleap provides for other services
- 3) Identify user groups and usage situations where knowledge transfer is essential
- 4) What are the Enablers? How can a model be created in the future?

What are the actions required? What are the forums where Compleap information should be shared?

Subjects: The workshop was attended about 25 people from Gradia, Salpaus, Oamk, KEHA, Omnia, Ohjaamo, Migri, Tredu, Suomen Tilaajavastuu, REDU, Agency of education, TEM, TEK, STTK, PALTA and CSC.

Results: comments and various feedback about the developed prototype was gathered from all groups and summarized crystalizing main points:

- Not clear for the potential users, how and why to start using the guiding services(Compleap)? There is a need to motivating the user to use the services, emphasizing personal gains.
- Idea: Common data model with Työmarkkinatori and ESCO could be used, providing and exchanging information
- The data could be following the user, even if he relocates in EU countries, taking up different education and gaining competences. This data should be used for guidance.
- Filtering of the possibilities (duration of education, location, costs), e.g. location is important for adult learners
- How the soft data – dreams, goals etc. are reflected in Compleap? Could this information also be visualized, reflected in the services?
- Is the target knowledge-based or degree-oriented ?
- Information about the funding of the studies is needed

#### 5.7.2 Associate Partner Workshop 18.09.2018

Workshop was aimed at gaining information what user requirements seem the most important to associated partners how are they prioritized.

Subjects: 18 people attended the workshop from Gradia, Oulu vocational education and training school OSAO, CSC, Lapland education center REDU.

Methods: group work, card sorting and discussion. Workshop was divided into two slots 9:45 am to 12:30 am and 13:15 pm to 15:00 pm. Participants worked in 5 mixed groups, so that organisation representatives where not in same groups and each group contained participants from various industries. Participants were presented with detailed user stories/personas. They were also given list of possible service functionalities from the perspective of user. Participants were asked to think and evaluate what functionalities would motive the given persona and then prioritize accordingly.

Results: the results of this associated partners workshop, was modification of personas so that they represent the actual potential user groups as much as possible and prioritizing the requirements for Compleap service functionalities. The most prioritized user requirements were:

- User sees current competences in user profile
- The user can map out what kind of work he wants to do in connection to their values
- User can use strong and light identification (consideration for security and privacy)
- The user can create his own skill profile that can be shared in order to market his expertise
- The user will receive suggestions for training appropriate to him / her / and opportunities for accumulating skills

## 6 Discussion

Desk research, user needs and experiences analysis have been conducted to ensure smooth and successful development of user-centered ecosystem. Eight different research activities have been performed, including three desk research activities and five user needs and experience tasks.

These research activities and information gained from them developed in to these results:

1. Scientific article „Learning analytics in education: Literature review and case examples from vocational education” has been developed and submitted to the Scandinavian Journal of Education.
2. Ethical and data handling guidelines for project team members and developers to ensure data rights of service users. Guidelines based in the ethical code suggested by Sclater and Bailey (2015),and adhering to General Data Protection Regulation (GDPR, Regulation (EU) 2016/679).
3. Architecture model summarizing learner’s path services available in EU countries have been created.
4. Five user groups identified(immigrants, basic education graduates, career shifters, young people with previous learning struggles and no in education or employment at the moment, unemployed) and user scenarios/personas created representing the user groups.
5. Qualitative data from students and teachers interviews concerning user needs and other aspects of decision making when applying to VET. Data from this research will be used to develop a scientific article concerning the process of young people’s decision making when applying to VET.
6. Description of five case examples of learning analytics use in VET.
7. Descriptions of user needs regarding career and education guiding services.
8. Descriptions of user experience when using currently available career guiding services.
9. List of user priorities for various functionalities.
10. List of ser requirements for learning analytics functionalities, specifically competence visualization, have been identified
11. Gathered user feedback regarding mockup prototype. This feedback will be used for prototype development in the future.

The work carried out with end users and various other stakeholders secured the development of user centred services in this project. Data gathered from desk research, user needs and experience research as well as from workshops and discussions with stakeholders indicate the need for user centred career and education guiding services. There is a high need for clear and easily available information on VET possibilities, simple and understandable services accommodated to young users with lower reading skills and strong visual needs.

In order to support people to make relevant educational choices, it is important to make learners aware of their different competencies, experiences, interests and strengths. This supports learners to engage in their studies. Providing easily accessible and relevant information about different educational opportunities, gives learners an opportunity to get new information about different fields, occupations and opportunities that they would not have found otherwise.

Several different websites are available to inform learners about different educational opportunities, but the information is scattered and it can be hard for learners to find the right information. Learners making educational choices don’t always know what they are actually looking for and therefore the information is not very accessible for them.

Different visualizations about study programs and educational paths would help learners understand what possibilities they have. By producing recommendations for learners, comparing one’s’ existing competences and interests would help them to have more ideas about interesting fields.

Accessibility challenges may arise due to different reasons with different users, such as the knowledge about the Finnish educational system or users’ language skills, users’ week reading skills or different learning difficulties. There exists a variety of different counseling and support services for learners whose accessibility to compare educational opportunities is somehow limited. These services are involved as a part of user needs identification in Compleap.

Compelep services are aiming at creating learner centred digital ecosystem of competence development. This involves gathering and using various data ranging from completed previous and ongoing present education, education application attempts made in the past, work experience and hobbies, language skills to open badges as well as acquired competences and future goals.

This information will be used in Compelap services and by learning analytics functionalities and is planned to be coming automatically from databases as well as from manually user provided data.

Databases in question (e.g. KOSKI) deal with very diverse and sensitive information. For instance, KOSKI has information available on the education accomplished in imprisonment institutions as well as on learning, intellectual or physical disabilities a person may have and governmental assistance a person may have used. Unethical, uncaredful data handling or even users' concerns about the data handling can easily compromise project credibility and success as well as put users at risk for unethical conduct.

Personal information of this type is very sensitive and private and requires adequate handling. For this reason, high priority on privacy and data security must be placed during the time frame of the project and even after project is over. At the moment there is no single perspective on handling ethical issues on learning analytics and there is no united or common framework of ethical standards regarding the use of learning analytics for educational purposes. However, most of the scientific sources agree on the importance of consent and clarity and data related citizen rights will be secured in Compelep services according to GPDG regulations.

## 7 References

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## ORIGINAL DELIVERABLE

### Description of the action:

The desk research of digital services related to the development of ComLeap requirements and architecture design was compiled as soon as the project started to gain a good understanding of the existing architecture and digital services that the ComLeap project aligns with.

The material was collectively compiled from various sources and encompasses primarily Finland and The Netherlands. The material will be updated with other European countries during the implementation of the project.

### Outcome of the action:

A comprehensive list describing and comparing various functionalities and digital services is continuously updated and can be found on the [eDuuni wiki webpage](#), and below.

# Services in different EU-countries

## CompLeap

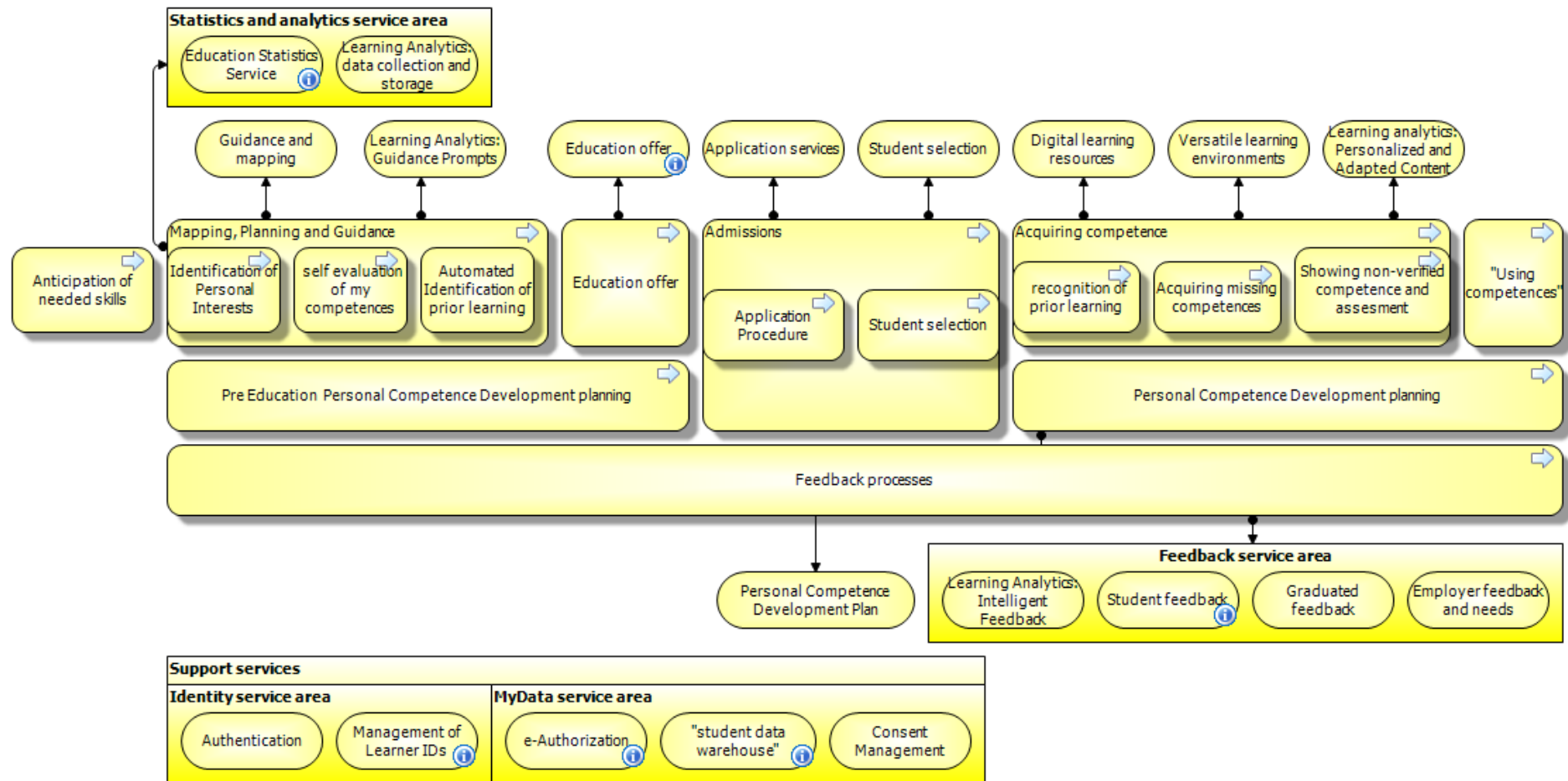
Service	Description	Finland	Netherlands
<b>Authentication</b>	Identification methods	Haka-federation (for administrators and HEI students), Suomi.fi (strong national authentication (eIDAS) for learners and administrators), studyinfo-authentication, google-authentication	SURFconext (single signon with student account for many educational services, ); Digid (National governmental authentication system);
<b>Management of Learner IDs</b>	Way to manage learner's unique person identification codes.	National learner ID register *Register consist unique person OID codes for all the learners *every learner can be identified by using the OID code	Students in the Netherlands have a national student-ID (onderwijsnummer), for Dutch citizens this is normally the same as their social security number
<b>Pre-education Personal Competence Development Plan</b>	Prospective student can measure his/her personal competences and skills and make plans regarding further development of his/her skills and competences	osaan.fi *all the three prototypes (competence mapping, comparing educational opportunities, rolling admission) in this project.	Disadvantaged learners: <a href="https://www.beroepenbeeld.nl/werkverkenner/">https://www.beroepenbeeld.nl/werkverkenner/</a>
<b>Personal Competence Development Plan</b>	Tools to identify and develop competencies	eHOKS, separate project going on 2018, contact/link. <a href="https://confluence.csc.fi/display/OPHPALV/eHOKS+-+hanke?preview=/72834367/74979410/eHOKSProjectResults.pdf">https://confluence.csc.fi/display/OPHPALV/eHOKS+-+hanke?preview=/72834367/74979410/eHOKSProjectResults.pdf</a>	Toolkit for Volunteering organisations <a href="http://bit.ly/2p9aNvc">http://bit.ly/2p9aNvc</a>

<b>Guidance and mapping</b>	Online guidance platforms	<a href="http://ohjaamot.fi/ohjausta-verkossa">http://ohjaamot.fi/ohjausta-verkossa</a> (online guidance), Studyinfo.fi	(this is a wide area... two separate lines?) <a href="https://www.studiekeuze123.nl/">https://www.studiekeuze123.nl/</a> <a href="http://www.euroguidance.nl">Euroguidance.nl</a> Many specialized tools, like <a href="http://www.gogeostudiewijzer.nl">http://www.gogeostudiewijzer.nl</a>
<b>Learning opportunities</b>	Search engines to identify education and learning opportunities	Studyinfo.fi *contains learning opportunities from secondary education to higher education kunkoululoppuu.fi (TAT) noodi.me (Me-säätiö)	<a href="http://www.leermogelijkheden.nl/">http://www.leermogelijkheden.nl/</a>
<b>e-Authorization</b>	Reliable verification of a person's right to specific services	Suomi.fi * <a href="http://Suomi.fi">Suomi.fi</a> e-Authorizations is a service for reliable verification of a person's or organisation's authorization and right to use digital services on behalf of another person or organisation regardless of time or place.	na
<b>"Student data warehouse"</b>	National register for study rights, study attainment and study achievements	KOSKI (National register for study rights, study attainment and study achievements) *	BRON National register of student admissions from primary, secondary and tertiary education; and study results (@DUO)
<b>Consent Management</b>		Not available	na
<b>Admission services</b>	Application management services where admission is understood as the whole process from applying to accepting a study place.	Studyinfo.fi (application management services and My Studyinfo.fi) and educational institutions	Enrollment for Higher Education: <a href="http://studielink.nl">studielink.nl</a> , also for numerous fixus studies
<b>Entrance services</b>	Accepting the study place	My Studyinfo.fi -service (accepting study place and link to student financial aid application service at KELA)	Applying for a study grant: <a href="https://www.duo.nl/particulier/studiefinanciering-aanvragen/mbo-havo-of-universiteit.jsp">https://www.duo.nl/particulier/studiefinanciering-aanvragen/mbo-havo-of-universiteit.jsp</a>

<b>Learning environments and resources</b>	Resources to aid everyday teaching and learning	Publishers (Otava, SanomaPro, edita, Alfapublishing etc), Digital publishers (Tablettikoulu), Open learning resources (Perusopetuksen wikiloikka, Muikkuverkko, many institute spesific sites) Many institute specific learning environments and resources <a href="#">Edu.fi</a> - official platform for teachers	Non-formal online: <a href="#">studytube.nl</a> . Higher education: divers initiatives by institutions. Many commercial providers.
<b>Student feedback</b>	Feedback on progression of studies and it's support	Arvo - national service for feedback	not known, probably institution specific?
<b>Graduated feedback</b>	Feedback given after graduation to evaluate studies	Arvo - national service for feedback	not known, probably institution specific?
<b>Employer feedback and needs</b>		Arvo - national service for feedback	not known, probably institution specific?
<b>Education Statistics</b>	Collects official education statistics	Vipunen.fi (Education statistics Finland), Statistics Finland	kept by the national agency for statistics: <a href="https://www.cbs.nl/nl-nl/maatschappij/onderwijs">https://www.cbs.nl/nl-nl/maatschappij/onderwijs</a>
<b>Labour market needs gathering (foresight/anticipation)</b>	Use of labour market and skills information to predict and develop policy responses to future skills needs.	Done in various institutions (eg. Edufi) The national education authorities cooperate with the enterprises as well as employee and employer organisations to monitor and anticipate the developments in skills needs in the labour market. Key actors in this work are the National Education and Training Committees, tripartite bodies established for each occupational field.	Diverse commercial initiatives
<b>Work placement</b>	Official platforms for finding work placements	<a href="http://www.te-palvelut.fi">http://www.te-palvelut.fi</a>  Työmarkkinatori.fi Website and digital services being produced by the Ministry of labour with focus on skills	A website that publishes all offerings on work placements for VET-students <a href="https://www.stagemarkt.nl">https://www.stagemarkt.nl</a>
<b>Credential issuing</b>			Initiative started around issuing Open Badges for modules (sesters) within HEI.

			Initiative started around non-formal education, issuing (smaller) badges based upon VET learning outcomes
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# Learner path -framework



## Services on competence mapping and comparing educational opportunities and other such projects close to Compleap

Service	Description	Data they use	Country	Target group
<a href="#">Positive CV</a>	Children evaluate their competences to build a "positive CV" - CV that describes what they are good at	Generated in the service	Finland	Children / youth without work experience
<a href="#">HeadAi's artificial intelligence</a> / Microcompetencies	An artificial intelligence that predicts what sort of expertise is needed in the future. The artificial intelligence understands natural language and uses open data		Finland	
Foredata /foreammatti			Finland	
Me-säätiö / Noodi <a href="http://www.noodi.me">www.noodi.me</a>			Finland	
Töissä.fi			Finland	
Valmentavasta valmiiksi -hanke,			Finland	
SIMHE			Finland	