Enabling recommendation systems for lifelong learning and educational online marketing strategies for universities of applied sciences

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Laurea University of Applied Sciences **Abstract**
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The objective of this thesis project was to find out whether a framework or method such as a recommender system could connect the need of the students to the courses of the teachers as part of a continuous strategical approach to develop the operating models of the universities of applied science. The thesis project was funded by the Ministry of Education and Culture to support the ongoing strategical process in universities of applied science (UAS) in Finland.

The thesis aims to develop a proposal on the use of recommendation systems. The theoretical framework for the research begins with a review of Lifelong learning as the model used in universities of applied science and is followed by a discussion of the recommender systems and their function, connecting students to courses. The universities of applied sciences can utilize what e-commerce business have done with the support of a recommendation system. Finally, the decision-making process is explained with the five stages model.

Quantitative and qualitative research methods were used in this thesis project. A quantitative survey was sent to students, and a qualitative survey of open-ended questions was sent to teachers. Finally, still using a qualitative approach, a survey based questionnaire was sent to directors of the different universities to gain insight from the directors and their opinions.

Key findings in the research shows that a framework of a recommender system is beneficial to the UAS. The data collected from the surveys show that there is an interest in a system that could help to connect the need of the students to the offerings from the teachers. Furthermore, the system could give more information to interested individuals visiting universities such as Open University participants giving the UAS a more effectively way to reach and market the learning opportunities they have to offer.

Keywords: Lifelong learning, Recommender Systems, E-commerce, Purchasing decision process

Contents

1 Introduction

This thesis and its topic was given by one of the Laurea University of Applied Science Directors Petri Tani, as part of a continuous strategical approach to develop operating models for the Universities of Applied Science composed of Haaga-Helia, Metropolia, Häme University of Applied Sciences, and Kymenlaakso and Laurea. Funded by the Ministry of Education and Culture to support the Universities of Applied Science (UAS) ongoing strategical process.

In Finland, the vision of continuous learning is supported by the government as highlighted by the research done by the Ministry of Education and Culture, to have a highly competitive labor force by developing a highly productive and internationally competitive higher education system by 2030 (Ministry of Education and Culture. (Vision 2030 roadmap).

Currently, working life is in a major transformation. Professions are increasingly becoming redundant and disappearing. Many jobs are replaced by new occupations and work may also change over time. This requires additional training, in-service training, and professional development is needed. In 2018 Prime Minister Juha Sipilä proposed that one million people will have to be retrained within ten years. This poses challenges for educational institutions. The problem is how the University of Applied Science (UAS) can more effectively reach students and market the learning opportunities for them.

An automated guidance system could assist students and teachers in many ways. It could help remind students of available courses or best courses for them to choose according to their study path. The automated framework can also help teachers connecting students to their courses.

E-commerce has been using recommendation systems in their business for some time. This has allowed them to support customers better. Recommender systems help consumers to find products to purchase which benefits many of the commerce websites. (Schafer, Konstan & Riedl 1999, 1.) Universities of Applied Sciences (UAS) and the e-commerce world can be compared to each other because UAS sells services i.e. courses and e-commerce products.

The recommender system software helps users by giving related suggestions according to their desires. The research of recommender systems is fairly new, its emergence first came up as an independent study in the mid-1990s. With the growth of digital technologies, the interest in the recommender system has rapidly grown in recent years. (Ricci, Loir, Bracha & Kantor, 2011, 1.)

1.1 Purpose of the Thesis and Research Question

In this thesis, the objective is to find out if a framework or method could help to connect the need of the students to the offering of the teachers. The thesis aims to give a suggestion or a recommendation on the use of recommendation systems.

Research Questions

In this thesis the research objective is to find out:

1) A framework or method that could help students to find the right courses to study and teachers to find courses to offer, and connecting the need of students to the offering of teachers.

2) Whether the digital means used by e-commerce could be suitable for UAS.

Research Risks and Etiquette

In this thesis, the risk is that the research is very wide. It has to establish the boundaries of the purchasing process and recommender system in e-commerce. The risk is also the author's own opinion about e-commerce, due to the author's own experiences.

The research etiquette has to be determined with detailed standards. First, the research has to be honest with comprehensive research demonstrated and analyzed. Second, the investigated research has to respect the information examined and results given by other researchers by using the right references. This thesis and its permission have been allowed by Laurea University of Applied Sciences.

2 Methodology

In this chapter, research approaches will be examined closer. In the first portion of this section, the definition of the two methods will be explained by simply answering 'what is quantitative and qualitative research methods.' Then, the chosen implantation of Google Forms, and the chosen online survey tool used in the thesis will be looked at. Finally, the chapter will explain the reasons why the chosen methods were used.

2.1 Quantitative and Qualitative research approach

In general, as Raimo Streefkerk in his publication of Qualitative vs Quantitative research pointed out that both methods are imperative to research irrespective of the objectives of the research (Raimo, S., 2019). Depending on the research in some cases quantitative methods may be a better option when considering or predicting the future of the research at hand (Bhat, no date.). In other cases when wanting to understand opinions, concepts, or thoughts and experiences to get an in-depth insight into a problem, qualitative research is more effective. (Bhandari 2020.)

The quantitative research method focuses on using data to test the theory. In quantitative research data can be collected numerically, statistically or by computing, it is then analyzed using statistical graphs such as bar charts, pie charts, or other similar techniques. (Saunders, 2015, 166.) The information can be gathered by designing and conducting online surveys, questionnaires, sampling, or online- polls. The objective of quantitative research is to investigate data statistically and logically, the results in this approach, if done right, will be unbiased. Using well-thought-of and structured tools, such as surveys, paper questionnaires, or online polls the researcher can obtain concrete, practical and in-depth data and information from the respondents. (Bhat N.D.)

Qualitative research is the opposite of quantitative research. The qualitative research method involves collecting and analyzing data that is non-numerical, such as, text, audio, or video. There are multiple ways to collect information in qualitative research methods. Below are a few examples of some of the most common methods used in qualitative methods. (Bhandari 2020.)

- **Observations**: by recording what is heard, or seen in detailed notes.
- **Interviews**: asking in-person questions in one on one style conversation.
- **Focus groups:** engage in discussion among a group of people by asking questions.
- **Survey:** designing and distributing open-ended question questionnaires.
- **Secondary research:** collecting existing data from non-numerical information.

The goal of qualitative research is to understand different theories, concepts, opinions, or experiences by focusing on words rather than numerical data. When done correctly data can be analyzed efficiently by the methods shown above. Furthermore, in qualitative research, the amount of respondents does not need to be large to gain needed information. (Bhandari 2020.)

Google Forms is a survey tool provided by Google Docs. Google Docs includes additional services such as Google Sheets, Google Slides, Google Drawing, and Google Sites. It is available in mobile apps desktop applications and web applications and is compatible with Microsoft Word file formats as well. Google Forms facilitates and allows the user to collect and examine data or information through surveys. A user can create a survey with a simple online format and share it with intended audiences via social media, email, or a direct link. For an Individual using Google Forms, they must have a Google account or create one if they don't have one. Google Form is very effective and simple to use and what makes it especially attractive is, that it is cost-free. (Gavin 2019.)

In this thesis, a survey-based questionnaire was designed for the student studying at polytechnics or Universities of Applied Science level of all ages. The target group was full-time students, part-time and online students respectively. The questionnaire aimed to gain statistical data and insight into the opinions of students to whether a framework or method of an automated guidance system could help students find or recommend the right courses to study.

For the teacher and Director surveys, a qualitative research method was used. The goal for the chosen method, in regards to the surveys, was an applied research method. According to Formplus an online form for information data collections states that this is a type of research that strives to solve a particular problem or provide a solution to a research question. (Formplus, 2020.)

In this case, the results of the teacher's survey answer will help prove the hypothesis and the question the author had set: ‘Could a framework or method help teachers to find courses to offer’. The Directors survey was set up to help combine the student survey and teacher's survey to provide practical solutions to the research question and give suggestions and act as a benchmark for future projects.

3 Lifelong learning

Learning and education have played a vital role in human reasoning and intellectual growth. In other words, learning is the ability to acquire knowledge and learn new skills. This cognitive phenomenon has led individuals to realize great intellectual achievements and inventions throughout history. (Sitra, 2019, 2.) According to an article written by Caroline Vander Ark and Mary Ryerse, (2017) as a concept, lifelong learning is the notion that we, as humans can keep on learning throughout our lives and grow intellectually from birth to death.

3.1 Lifelong learning in Finland

Lifelong learning in Finland has been a movement for over ten years, as the former prime minister of Finland Juha Sipilä stated: "Finland is a country where it makes sense to learn something new all the time." As one of the leading countries in education and competence lifelong learning plays a big role in Finnish society supported by governmental programs to continue to develop social reform and stay in touch with the ever-changing environment. (Government and Ministry.)

Below are some of the Initiatives taken by Sipilä's government in 2015 (Government and Ministry).

- The modernization of the learning environments, digitalization, and utilizing pedagogy learning.
- The decrease in the unemployment of young people and increase of youngsters' education.
- The increased interaction between education and working life.
- The rise in quality and effectiveness in innovation through research is on the rise.
- The internationalization of education and research has increased and reduced barriers to education.

Also, to initiatives made by the government, other research institutes took part in studies to understand the link between learning, competence, skills, and what role the changing environment has on society. Research Institutes such as Elinkeinoelämän Tutkimuslaitos, which is an economic research forecasting institute that conducts economic business and social policy research as well as economic future forecasts, implemented a three-year research project from early April 2016 to late March 2019 on the grounds of education, and working structure. This meant teaching and reorganizing society to adapt to the fast-growing I.T. technologies. Globalization and upcoming trends such as digitalization, relocation of businesses, and production abroad brought new challenges to competitiveness and society as a whole. The research project found out that there were real and clear gaps in the knowledge and role of lifelong learning and the correlation it had on education and the path to working life. The research proved that there was a strong need to incorporate elements of lifelong learning to society by the government and organizations to tackle future challenges, as well as, giving opportunities for everyone to stay up to date. To improve skills, develop competence and knowledge in the educational institutes as well as in working life and beyond. (Elinkeinoelämän Tutkimuslaitos, 2020.)

Also, a publication by the Suomen Yrittäjät a business forum supported the idea of developing competence with continuous learning at the core. They saw improving competence for individuals as a necessity for future qualified digital society in Finland. (Suomi 2025.)

Furthermore, collaborating with 30 stakeholders including businesses, Union Leaders, educational institutes, and other governmental agencies, Sitra launched a three-year project for "Lifelong Learning Well-being and competitiveness from Lifelong Learning." in 2019. The aim was to support organizations in society with the view to build and improve Lifelong Learning. To update and finding solutions to global change and keep up with the rapid growth of technologies such as Digitalization. (Sitra, 2019, 2, 28.)

Finally, other initiatives taken in Finland to progress lifelong learning include enhancing the quality of learning and implementing it to all levels of education. Reform in the study to support and accelerate completion in education and ease the steps to working life while supporting business to accommodate possibilities for a traineeship. Upgrading teacher training competence and giving tools for educators to be able to add value to their competency. A bridge between education and working life, built to make use of information, communication, and technology. (Elinkeinoelämän Keskusliitto, 2020.)

Below are the latest initiatives recommended by Elinkeinoelämän Keskusliitto (2020)

- Integrating Lifelong learning into the education system, supporting individuals by giving them a flexible path to learning throughout their life cycle.
- Identifying previous competence and finding ways to better skills both in education and work-life while assessing the best way to improve them.
- Expand adult education, increase the network by developing and supporting educational institutes while finding ways to strengthen mutual bilateral cooperation between companies and learning.
- Develop lifelong learning in companies by developing their strategies. Improve the level of training including effectiveness, tasks, quality and the business atmosphere, and the changing environment.

3.2 Current Situation

Today, the government of Prime Minister Marin has continued with the program of "Finland socially, economically and ecologically sustainable society" started by the previous government of Sipilä. The idea behind this socially, economically, and ecologically sustainable society is that the economy is governed and run for the people with long-lasting and feasible economic input on employment and strong public finances. Furthermore, Marin's government has put a high emphasis on research and education to bring Finland's level of education and competence back to the top globally. To improve working life and upgrading well-being while making Finland a 'happy' nation with competent talented professionals where everyone's knowledge and skills are used effectively and put to good use. (Government and Ministry.)

The main policy objectives of the current government (Ministry of Education and Culture. Vision 2030 roadmap, 2019)

- Addressing employment, raising it to 75%, and create/increase jobs by at least 60,000.
- Increasing education and competence for everyone.
- Reduce inequality and income disparities.
- Protecting biodiversity, decreasing use of natural resources moving towards an emissions-free Finland by 2035.

3.3 Lifelong learning opportunities for Universities

As the need to improve the quality of life and develop competence in society, Universities play an important role in educating and re-educating individuals and increase the well-being of society as a whole. With the fast pace of globalization and digitalization, people need to be able to learn new skills to close the gap that new working markets bring. Universities can provide scientific knowledge and skills for individuals who want to improve existing competence as well as knowledge and skills for new jobs created by new technologies.

4 Recommender Systems

Recommender systems are software tools and techniques that offer suggestions for items that are useful to the user. It also tries to predict the 'rating' or 'preference' a user would give to an item. Recommendation systems are based on the use of algorithms that suggest relevant and appropriate items or products to users. It relates to the various decision-making processes individuals make when considering the best choice, such as what items to buy, what music to listen to, or what online news to read. Recommender systems also place importance on human psychology and individual experience as explained by Francesco Ricci in his renowned publication Recommender System Handbook. (Ricci et al. 2011, 1.)

4.1 Systems and Filters

According to Lops, Gemmis, and Semeraro (2011, 84-85) recommendation systems have numerous different ways of carrying out tasks. Lops et al. (2011) also state, today many recommendation systems use more than just one form technique and method, some even combine the various techniques to be more efficient. There are three forms of filtering methods the recommender system uses, they are; the collaborative filter, the content-based filter, and the hybrid filter.

4.2 Collaborative Filtering

The Collaborative Filter was the first technique used in the recommendation system, it is also one of the most wildly used styles. With the surge of Netflix for example, collaborative filtering has not only sparked interest but also given progress to recommender system technologies and their designs. (Koren & Bell 2011, 145.)

Collaborative filtering uses methods and techniques that are fixed or user-specific recommendations. An example of this is the way it rates items or the way it finds similarities between users. What is impressive is that it does this without providing any outside information about the item or users. (Ricci et al. 2011, 11-12.) In the first edition of *Recommender Systems*, the authors describe collaborative filtering as a filtering technique that is based on arithmetical processing of user opinions and patterns. This technique requires the verification authentication of a user on the content management platform and individual input. Once the system has suggested a document to the user on what the user has researched during the use of additional search engine such as Google, then usually the search engine will propose the possibility of rating, this is essential to the system so it can assess the importance of the document and the relevance it has to the user in context to the search. Furthermore, the rating will be saved or preserved within the system for future use. (Kembellec, Charlton & Saleh, 2014, 2-5.)

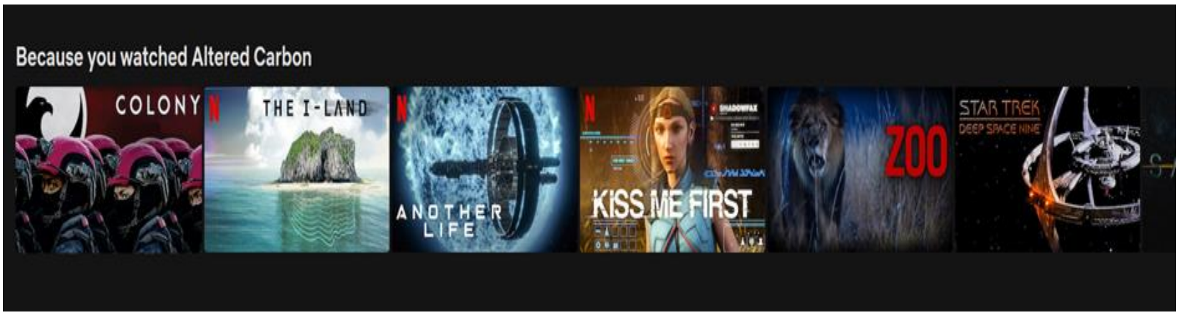

Figure 1 Example of Netflix's recommendation

For example, Netflix, shows the viewer a list of possible recommendations for the user, by stating "Because You Watched Altered Carbon", you might also like other similar types of series or movies. As shown above, in figure 1 Netflix has a very simple but effective browsing system with many different possibilities for its user when recommending a new movie or series related to the one previously watched. (Netflix 2020)

Collaborative filtering works by matching users with similar tastes and making a recommendation to a particular user. It looks at what items people previously liked and combines them into a categorized list and suggest them to the active user. (Ricci et al. 2011, 2.) There are two central aspects when it comes to the recommender system which are the:

'User' and 'Item'. The approaches used by the collaborative filter, are ‘item-based’ and ‘user-based’ techniques (Drachsler, Hummel & Koper 2008, 9-11). Item-based filtering uses similarities between the items and determines whether it is relevant to the user or whether the user would like it. The user-based filtering finds users with similar tastes and patterns. The basic deduction is that if users had similar tastes in the past they will most likely have similar tastes in the future (Ricci et al. 2011, 117-118.) An example of a Collaborative Filter with the user-based process is shown in figure 2. In the item-based technique, the focus is on the item itself. Assuming if the items are classed the same they presumably must be similar or the same. This technique recommends items that have the highest correlation based on user data instead of user classification. (Badaro, Haji, El-Haji & Nachman 2013, 349-350.)

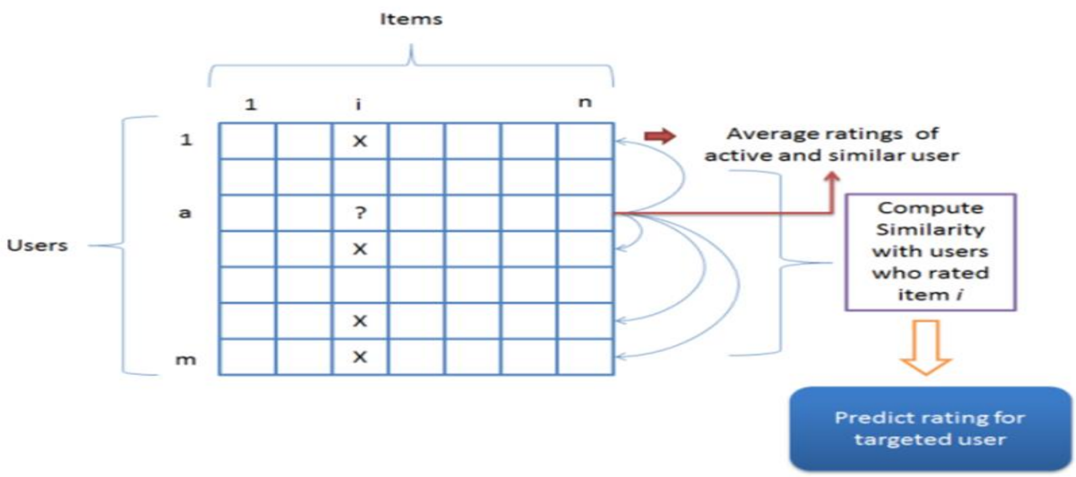

Figure 2 User-based Collaborative Filtering process

The collaborative filter is commonly used due to its simplicity, many common systems can be narrowed to two simple types. The Nearest-neighbor model looks for users who share the same rating patterns with the user whom the prediction is for. It uses the ratings from like-minded users found to calculate a prediction for the active user i.e. Netflix. (Ricci et al. 2011, 164-165.)

While the Latent factor model can describe numerous and diverse amounts of data making it an alternative approach and is more accurate than the nearest-neighbor models. The latent model attempts to explain the ratings by defining or characterizing both product and user. One way is by gathering information from user feedback. For example, if the product is movies it would measure the aspects and dimensions such as comedy vs drama or other complicated and impossible to explain dimensions (Ricci et al. 2011, 110-116.)

The shortcoming of the collaborative filter in regards to its filter and techniques is the 'cold start' problem and the early ‘rater issue’. These persisting issues have been listed by several different authors. (Valois B. Jr & Armanda De Oliveira 2011, 689; Drachsler et al. 2008, 9.)

The cold start problem as its name states occurs at the beginning of the system. The problem is that it needs the user to commit themselves when making the profile. The profile has to be as accurate as possible with a lot of information before the system can make any relevant recommendations to the user. The collaborative filtering and the so-called early rater issue happens because the system cannot provide a recommendation on newly added items without user review. This is because there is no rating available at the time for newly added items. Even when the user gives a rating on the item, an accurate recommendation is difficult until there is a big pool of ratings. (Valois B. Jr & Armanda De Oliveira 2011, 690.) Lastly, another issue in regards to the collaborative filter which is a common limitation in most, if not all systems, is the new user and new item problem. This according to Drachsler et al. (2008) occurs when the system cannot generate a personalized and appropriate recommendation for a user who has just registered into the system. This is challenging because it can take place in any domain or situation and there is no distinctive solution to the issue yet. (Drachsler et al. 2008, 12.)

4.3 Content-based Filtering

The other most common and standard technique used by the recommender system is known as content-based filtering. In the content-based technique, the recommendation system try's to recommend items to individuals similar to users who have liked the same item in the past. (Lops et al. 2011, 75.) The content-based methods make use of the user behaviours by matching unrated items to the user profile which is based on the user history. For example, if a user liked a movie A, the recommender will try to find movies that are similar to movie A, and then recommend those movies to the user in question. (Wang & Tang 2015, 3.)

One of the content-based filters' main tasks includes examining a set of documents and descriptions of the items that were previously rated by a user, then it builds a profile or model of the given user's interests and tastes based on the item rated by the user. (Mladenic & Webwatcher 1999.) The profile of the user is made to the representation of the user interests and is tasked to recommend new interesting items for the user. The processes used by the recommender system involves matching up the traits of a user profile where interests and preferences are stored with the features of the content object (item) for it to be able to recommend new and interesting items to the user in question. The high-level architecture system has the appropriate methods for illustrating the items and creating a user profile, Figure 3. Also, it has ways for comparing the user profile with the item representation. (Lops et al. 2011, 75-76.)

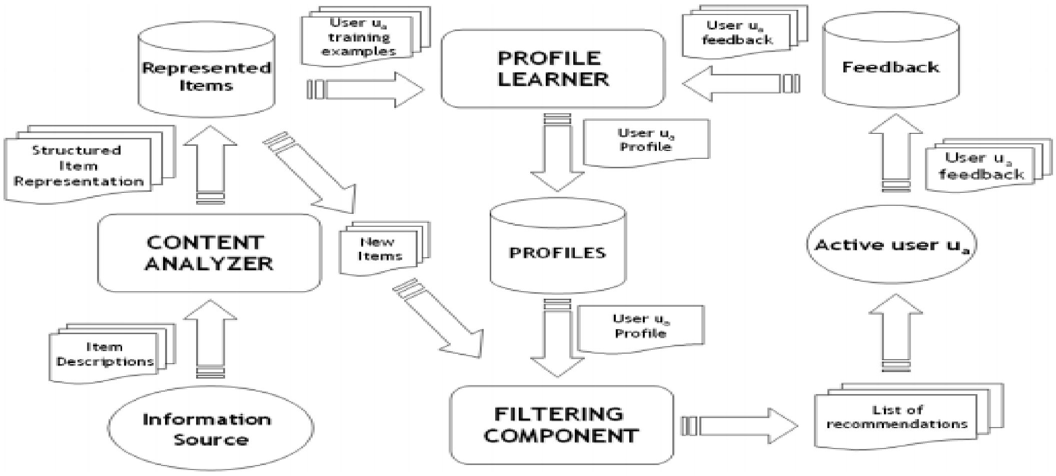

Figure 3 The high-level architecture of a Content-based Recommender

The recommendation process has three different stages. These separate components are the Content Analyser, Profile Learner, and the Filtering Component as described below. (Lops et al. 2011, 75.)

- Content analyser's main responsibility identify and extract information such as text and decide what is useful, these can be content of items such as news-text, product descriptions, web-pages, or other documents. The data is analysed extracted and sent to the profile learner filtering component.
- Profile learner is the component that collects all the extracted data that is the closest representation to the user's taste and preferences. With this data, a user profile is constructed with the component using machine learning techniques by starting with the items that were liked or disliked in the past. The machine learner then uses the feedback method and in examples of web page recommenders it analysis the users like or dislike through positive or negative feedback provided to the user after visiting the page.
- Filtering component's main task is to decide whether a user is interested in a specific item or content on a web-page or not. It does this by matching up the traits of the user profile against the items to be recommended.

In addition to learning user's likes and dislikes based on the item's feature, another positive quality of the content-based filtering is the absence of the "cold start" problem found in the collaborative filters". (Drachsler et al. 2008, 13.)

4.4 Hybrid Recommender Filter

The hybrid approach and its methods are based on combining two or more recommendation strategies to increase the overall performance. The most common Hybrid recommendation system uses a combination of collaborative filtering and content-based filtering techniques. This is an effective method since the hybrid system combines techniques A and B, taking the benefits of A and uses them to correct the disadvantages of B. (Ricci et al. 2011, 13.) Seven hybridization techniques in a hybrid system are listed in table 1 below (Burke R., 2002, 6-9).

Table 1 Hybridization Methods

Hybridization method	Description
Weighted	The scores (or votes) of several recommendation techniques are combined together to produce a single recommendation.
Switching	The system switches between recommendation techniques depending on the current situation.
Mixed	Recommendations from several different recommenders are presented at the same time
Feature combination	Features from different recommendation data sources are thrown together into a single recommendation algorithm.
Cascade	One recommender refines the recommendations given by another.
Feature augmentation	Output from one technique is used as an input feature to another.
Meta-level	The model learned by one recommender is used as input to another.

By manipulating various strategies, the hybrid system improves the problems associated with collaborative filtering or content-based filtering. With an increase in techniques, the system can do more with less. Also, the system can use knowledge-based techniques to solve problems such as which item should be recommended in which context. These methods are applied when approaches used by collaborative filtering and content-based filtering cannot be applied at the given time. Lastly, a hybrid recommendation system can use utility-based techniques that can recommend products or items and determine the interest of each user and calculate the benefit of the product or item to the active user. (Burke, 2002, 9.)

4.5 Recommender Systems in Business

In the last two decades and especially in today's world the recommender systems are used in many business websites and applications. Increasingly, the input of the recommendation system plays a vital role in many, if the not most top-ranked commercial websites, such as Amazon and Netflix to mention a few. (Ricci, et al. 2011, 2-3.) When there is an enormous amount of products or items to choose from and an equal amount of customers to deal with and/or a massive amount of available data the recommendation system's importance comes to effect, with it being able to assist individuals and consumers to identify their preferences when browsing. The recommendation system has a significant impact on many businesses and their operating profit. It can increase revenue indirectly by, for example personalizing user experiences and providing suggestions to consumers of previously not known items or products that consumers may potentially be interested in as mentioned by. (Lü, Medo, Yeung, Zhang, Zhang, Z & Zhou, 2012, 2-3.)

4.6 E-commerce Recommendation system

As the recommender systems are changing from their original forms to new dimensions in the online services, they are also reshaping the world of e-commerce. In e-commerce, the recommender systems help consumers to find a product to purchase, this in turn benefits many of the commerce websites. (Schafer et al. 1999, 1.)

The recommendation system has multiple advantages in the e-commerce world. They help to assist the customer in product offering but also increase online business/e-commerce sales. This is because it will suggest extra products to the customer and efficiently save time in searching thus improving customer loyalty towards the company or e-commerce site. The correlation to loyalty and satisfaction is that consumers are more likely to return to the sites that best served their interests and needs most simply and efficiently. (Schafer et al. 1999, 1; Lü et al. 2012, 3)

Schafer et al. (1999, 1) give three ways how the recommender systems increase e-commerce sales and improve engagement with consumers as listed below

- **Browsers into buyers:** As many visitors, visit desired web pages without ever purchasing anything the recommender system can help customers find products that they wish to purchase .
- **Cross-sell:** Since businesses try to entice the customer by selling different products or services to existing customers the recommender system will improve this technique by suggesting additional products to the customer. For instance, an e-commerce site might recommend additional products at the checkout point based on the products in the shopping cart.
- **Loyalty:** Customer loyalty is one of the most essential strategies for many businesses which is universally known in today's world from athletes to celebrities business. Many companies rely heavily on loyal customers. The recommender systems improve customer’s faithfulness by creating value-added relationships between the company and the consumer. The recommender system uses its learning techniques to match

customer needs by their behaviour. This is then paid back by the customer returning to the site and the more customers return, the more the recommender system can cater to their needs and give them what they want. By creating a relationship between customers the more loyal they will be. Customer will show their loyalty by returning to the site because of a recommendation given by a friend, family, or someone with whom they interact with.

Amazon, which is currently the largest e-commerce retailer in the online world, uses an item-based collaborative filter that helps with recommendations that can handle a massive scale of products and customers (Linden, Jacobi, and Benson, 1998, 11). Amazon uses a filtering technique in their online platforms that they created themselves. Every individual or customer that visits Amazon's web page perceives the shop differently. This is because the pages are personalized for each individual and dedicated to their preferences and interests. (Linden, Smith and York, 2003, 77-78.) For example, it will show for a user, who is interested in football, everything Amazon has to offer on products related to football as shown in figure 5.

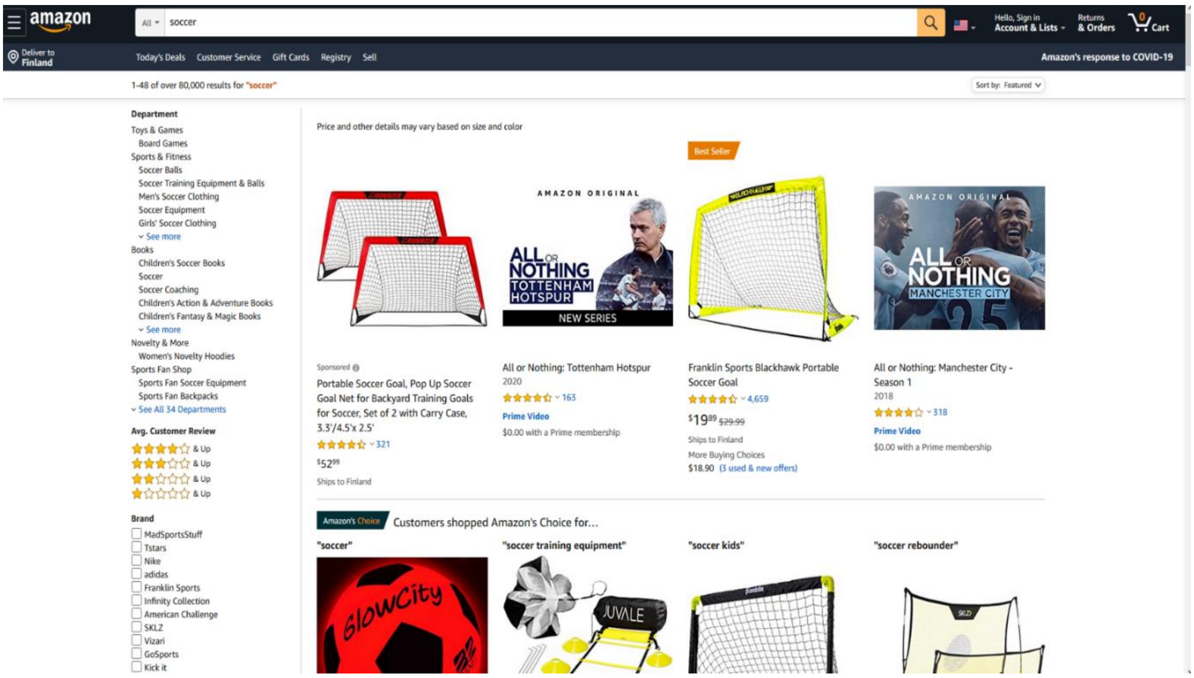

Figure 4 Amazon online shop soccer search (2020)

Amazon uses its own "item to item" collaborative filtering which is a form of filtering technique used by the recommender systems that is based on the similarity between items used by users or the rating of items by people. This is impressive because it can do this simultaneously and produce high-quality recommendations. (Linden et al. 2003, 78.) Furthermore, their item to item technique model uses a rating distribution per item and not per person or user. This is especially useful when there are more users than items/products. When a user purchases a product and then rates the product, it is picked by the system and added to the user's recommendations for others. (Linden et al. 1998, 12.)

4.7 Recommender system in Social Networks

With the growth of technology, social networking applications or web pages enables users to communicate with each other by posting comments, messages, pictures, or information. (Pazos 2012, 2.) Probably the most well-known of these sites is Facebook. Facebook uses a type of technique in a recommendation system that suggests new contacts. (Valois et al 2011, 682). This technique is based on the recommendation of items or products that other users liked. Facebook for example recommends events, products/items, or even articles that their friends might have liked or been interested in. The system generates predictions or recommendations based on information picked from the user's profile, as well as things or items they liked, and shared. (Victor, Cornelis & De Cock 2011, 1.)

4.8 Recommender System in Universities case Melbourne University

The recommender system, its different techniques, and highly intelligent filters can perform many extremely challenging tasks for Universities. Also, the system can assist in marketing courses through alternative media outlets or web pages and attract new customers the same way e-commerce businesses do. A learning software system that can coherently and consistently assist students throughout their studies can be an advantage to Universities. The recommender systems' ability to specifically recommend individual's best possible courses while adapting to changes in their study path will simplify course selections and meet the demand of the students individually. Lastly, the recommender system can support teachers with course visibility to students from different degree programs or universities connecting the need of students to the offerings of the teachers. Marketing courses on behalf of teachers as well as finding the most motivated students for their course.

Due to the nature of this thesis, finding information on a recommender system in universities is limited. There are not many examples of research made about recommender systems in Universities. However, one example exists where a recommender system has been implemented on the university web page in Australia.

In Australia, the Melbourne University uses a customized approach in its web page. When you visit the website it asks you a few questions and then personalizes the page content for you. Visitors can choose whole study units programs, or single courses, from Bachelor Degree to Master’s Degree to other professional and specialist certificates. If for example, someone is interested in Masters of International business, the website gives you a detailed description of the course, the benefits of the course, the knowledge gained from the course, and employment outcomes. Visitors can watch a short video from former students giving feedback on their experiences and knowledge gained from the course. With all the information available it is easy to navigate Melbourne's web page and choosing the right option. The page also allows visitors to filter study options to focus on a career path. The webpage https://www.unimelb.edu.au/ for the Melbourne University can be accessed by anyone and get a good idea about how they have set up the web page and how it guides you to their offerings.

5 Purchasing Decision Process

In today's world and throughout history people have constantly made different types of decisions in their daily lives when identifying a need or solving a problem. Today people have to make many different choices when choosing a specific product or service, this is called purchasing decision process. The purchasing decision process takes place before, during, and after the purchase of the good or service. The bigger the decision is the more effort is put into the decision process. (Kotler, Opresnik, & Armstrong 2021, 169.) This process in purchasing decision making can be described in a five step-model represented (Kotler, Armstrong, Armstrong, Harris, & Piercy 2017, 155).

1. Identification of the need,
2. Search for Information of need,
3. Comparing of alternatives,
4. The purchasing decision
5. Post purchasing behavior

Figure 5 Five stage purchasing model

The consumer decision process as seen in figure 6 is thoughtful and each step is usually thorough before purchasing the given item. In the decision-making process, the purchasing situation affects how individuals go through the five stages of the buying process. The five step-model is thought of as one if not the most important model in the field of behavioral studies and accepted by many scholars. (Kotler et al. 2021, 169.) However, in more usual routine or regular purchases the customer may skip steps or complete them in a different order depending on the product and buying habits of the consumer (Kotler et al. 2017, 155.)

Marketing and understanding customers are no longer about persuading the consumer what the company produces. Businesses have to be able to communicate to the consumer and know the customer's needs, motivation and actions. They have to identify the need of the consumer by learning their motivation and purchasing behavior (Mihrat 2012, 121-126.)

5.1 Identification Need

The first stage of the purchasing decision process is the identification of the need or need of recognition. This is where the consumer realizes he or she needs a product or service (Kotler et al. 2017, 155.) This need can be caused by internal stimuli such as thirst or hunger that drive the consumer to act. The need can also be triggered by external factors such as marketing and advertising mechanisms or conversation with friends or family members. In general, the marketers identify the consumers' needs and problems and offer solutions to the consumer (Kotler et al. 2021, 169.)

5.2 Search for Information

Depending on the need and the importance of the item, the consumer will want to research the product to satisfy their need. The more information the consumer has of a specific product the more knowledgeable the customer is of the product or service. After identifying the need, individuals usually do an information search, this can be done online on different search engines such as Google. In addition to internet search, the consumer may get their information from peers or other people who know the given product. Information search can be classed into at least four groups as described in detail below. (Kotler et al. 2021 169-171; Kotler et al. 2017, 156.)

- The first one is 'Personal source' which is information gathered from acquaintances, friends, or family. Sometimes the best information can be obtained from people who the individual trusts or has a good understanding of the given need.
- 'Commercial source' information is mostly obtained from advertising, dealers, salespeople, packaging labels, manufacturers, and internet sites. This source is used when the consumer wants professional advice.
- 'Public source' is information collected from entities such as mass media, social media, search engines, and consumer rating individuals or organizations. This

type of search helps the individual learn what other customers think of a given product and how satisfied they were with the product.

- The final method for information search is the 'Experiential source' which is the testing, or examining, and use of the given product. This is helpful when the individual wants to get a feel of the product and how they interact with it. (Kotler et al. 2021 169-171; Kotler et al. 2017, 156.)

When then the individual has more information about the product his or her awareness and knowledge of the product, brand, and its attributes increase making the consumer more self-assured when purchasing the product. It also helps the consumer relate to the brand better and exclude other brands. (Kotler et al. 2021, 169-170.)

5.3 Evaluation of Alternatives

The third step in purchasing decision-making is the evaluation of alternatives. In this stage individuals process information evaluate and analyze the product either from past experiences or assess different brands to see which product best suits their personal needs. There is no right way to highlight how consumers evaluate a product or service, instead, it depends on the individual or specific buying situation. (Kotler et al. 2017, 156-157.) Where some might conduct a thorough, logical way of thinking, others might use impulse or past experiences or no evaluation at all when purchasing a product. Consumers and buyers might also make their decision from online ratings or information from their friends or professionals for buying advice of a product. (Kotler et al. 2021, 170.)

5.4 Purchasing Decision

The purchasing decision-making comes after the consumer has evaluated the alternatives, in most cases. This is the decision the consumer makes after choosing the right brand from the different options or in some cases omit the purchase altogether. There are two external factors consumers may consider in their purchasing decision-making. (Kotler et al. 2021, 170.)

The first factor is the human influence or the attitudes of others. For example, if a good friend feels that the product a specific consumer is interested in is too expensive, it might change the opinion of the consumer buying the product. (Kotler et al. 2021, 170-171.) Individuals may also base their purchasing intentions or decisions on expected factors, such as income, prices, and or certain product benefits. The second external factor is the 'unexpected situational factor', these are events that may change the consumers purchasing decision making. For instance, is, a sudden change to the economy or competitors dropping prices. (Kotler et al. 2017, 157.)

5.5 Post-purchasing behavior

The final phase or stage of the purchasing decision process is the post-purchasing behavior. After purchasing the product the consumer will usually participate in customer satisfaction engagement or post purchasing behavior with the marketer. The consumer will either be satisfied or dissatisfied with the product. This is important for many businesses so that they can monitor and understand the customer, their needs and behavior better so that they can add value to their services or product. (Kotler et al. 2017, 157.) Furthermore, the consumer expectations and the product's perceived performance is vital information for sellers. If the product meets consumer expectations, the customer is satisfied. When the given product surpasses expectations, the consumer is happy. But if the product fails to meet expectations the consumer will be disappointed. When there is a gap between what the seller promises and what the product can do the consumer expectation will be low and the product lose value. That's why sellers have to be careful in what they promise their product or brand can deliver (Kotler et al. 2021, 171.)

As mentioned before, customer satisfaction is important to build trust and a profitable relationship between the consumer and the seller. A satisfied consumer will help spread the word of the brand and keep buy products from the same place. This is why many companies and businesses will go up and beyond to meet customer expectations and keep the customer satisfied. A satisfied customer is a loyal consumer Likewise, a dissatisfied consumer can cause a business to suffer and give a bad image. It can also affect other customers since bad experience travels faster than good. This is why many companies measure customer satisfaction regularly and some encourage customers to give feedback on what can be improved making the customer feel more appreciated and listened to (Kotler et al. 2017, 157-158.)

5.6 Importance of the decision-making process for Universities

The decision-making process begins with identifying a need. For students, it is to find a suitable university, courses, or degree programs. Before making a decision individuals will do complete research about the university. In today's world information can be found through social media or university homepages or even advice from a friend. Finally, after considering and evaluating the alternatives a final decision in regards to the best university will be made by the individual.

The universities themselves have an important role in the decision-making process because they produce information about the university and what they can offer for interested individuals. As the decision-making process can be difficult with so many different options, the university can help influence the interested individual by having detailed and inspiring information about themselves and why they are superior to their competition. The more the university can deliver the needs of individuals, the more they can attract students which improves their image and brings better revenue.

6 Research Framework and Analysis

The quantitative approach was used for students, a questionnaire was formulated to get statistical facts. This is followed by a qualitative survey of open-ended questions sent to teachers. Finally, still using a qualitative approach, a survey-based questionnaire was sent to directors of the different universities to gain insight from the directors and their opinions. Figures and findings of the student survey, along with the teacher and director survey questionnaire can be found in the appendix for more detailed revision.

1. First, the author designed a questionnaire using Google Forms an online-based survey tool. The survey was published on social media such as WhatsApp, Facebook, and Twitter in addition to the mentioned platforms the questionnaire was also sent by email to students sent to 200+ students on the 19th and 28th of December 2020. With 26 answers received for analysis. The retrieved answers and data from Google Forms were analyzed on January 25th, 2021.

2. For the teachers, the author distributed an open-ended questionnaire via emails to various teachers at the Laurea University of Applied Science. The process began on the 1st of February 2020. The objective of the survey was to learn the opinions of the teachers and see the relationship between the answers of the students with the thoughts of the teachers. The target groups were teachers and tutor teachers. The questions were designed again by the chosen tool of Google Forms and sent by email to 20+ amount of teachers of which seven answers were received for analysis. The gathered information was analyzed on the 20th of February 2020.

3. Finally, after analyzing both the student's and teacher's answers, the author was able to move to the final stage survey which was the director's questionnaire. As with the teachers, the author used a qualitative approach for the survey-based questionnaire sent by email to 10 different directors of UAS of which three answers were received for analysis. The questions were formulated from the student and teacher answers and sent by email on the 19th of March.

6.1 Student Survey and Analysis

The student survey questionnaire was created with 14 questions with a mix of a few choices, one scale question two short open-ended questions, and three yes, no or maybe questions. Question 1 asks about the respondents' age and includes the options 20 or younger, 21-30, 31-40, 41-50, 51-60, and 60+. Questions 2, 3, 4, 7,9,10, and 11 gives respondent few different answering options with a maximum of five possible choices to choose from. Questions, 5 and 8 are short open-ended questions where the participant can write their answers. Question 6 is the only scale question with a scale of 1-5 given with the number the respondents most agree with, 1 being 'least agree, and 5 being 'most agree' in regards to the question. Finally, questions 12, 13, and 14 were yes, no, or maybe giving the respondents three options that best suited them.

The student survey was broken down into three categories which are background information, information valuation, and opinion about automated recommendation framework. Questions 1, 2, 3, and 11 are questions that give background information about the respondents. The questions look into age, what kind of students they are and what motivates them most in regards to choosing course selections.

Questions 4, 5, 6, 7, 8, 9, and 10 give insight into the respondent's desire in regards to what they feel is important to them. The purpose was to find out what information was important when choosing courses. If the content in the course description was sufficient or did it lack information. What kind of additional information was needed? What information was most important, and what influenced respondents most in regards to course selections

The last three questions 12, 13, and 14, were designed to get an idea of whether respondents had prior knowledge of a recommendation system. The aim was to find out would this kind of approach be useful to the respondents and how they felt about an approach that would give suggestions to get more precise suggestions for what to study.

The results in the respondent's background information show that the answered collected were from two groups. The two age groups were: 21-30 and 31-40. Most of the respondents from the age group of 21-30 were full-time students whereas in the age group 31-40 were part-time students. The majority of the respondents from the age group 21-30 felt self-study suited them best. In the group of 31-40, a majority of respondents wanted a mixed form of teaching of both online and contact lessons, and 33% of them wanted a complete contact course.

What motivated the respondents the most? A majority of the respondents in the age group 21-30, felt a course that supported their future profession was a big factor when choosing courses. In the age group 31-40, a majority of the respondents felt that the content of the course, course supplements, and teaching methods were important when choosing courses.

Information on courses was a predominant factor in both age groups. It influenced respondent's decision-making when choosing courses. Choosing the right courses was difficult for some respondents due to a lack of information. Many respondents wanted more precise information when choosing courses, such as the content of the course, how it helped their study career path and the timing of courses. From all of the responses from both age groups, 60% wanted additional information. The majority of respondents felt that content, timing, knowledge gained and competence was important information when applying to a course. The respondent from the age group 21-30, felt that the course supplements that complete their career path were most influential when choosing their course. While in the age group 31-40, a majority felt that courses, which best supported their profession, influenced their course selection. Most respondents felt it to be important that information received should come from a trusted source like student desktop and electronic means. However, 10% of responses from the age group of 21-30 got their information from other students or peers.

Many of the respondents did not have prior knowledge or experience of receiving emails based on their online activities. 89% answered yes to whether they wanted a system that would help recommend or remind them of the best possible courses according to what was most important to them. The majority of respondents from both groups were willing to answer a survey to get more precise suggestions.

6.2 Teachers Survey and Analysis

For the teacher's survey, a qualitative method was used. A short open-ended questionnaire was sent to teachers via email. In this case, the survey was sent to the teachers and lecturers of the Laurea University of Applied Science. The survey aimed to gain written, non-numerical information.

As part of the research four open-ended questions were compiled from the results of the student questionnaire. This was done to get an understanding of the opinions and thoughts of the teachers were, whether they agreed with the results, and test the theory of the research question. The research question aims were to find out whether the digital means used by e-commerce could be suitable for UAS. The teacher's answer help proves the hypothesis and the question the author had set.

As with the student questionnaire the survey was designed using Google Forms the online-based survey tool, then sent by email to 20+ teachers from different courses and degree programs.

Question 1. “What would help you in offering a more hybrid / fully online courses? What would be an ideal combination of online and contact in your study unit?”

In the first question of the teacher's survey-based questionnaire, the aim was to find out if the teachers and lecturers agreed with the students about the mixed forms of teaching and would hybrid be useful to their study units.

One important factor in regards to contact courses, as one respondent pointed out, is that there are (on purpose) different implementation of study units so that students can choose the format most suitable for them. Even though a study unit is contact-based there is always an element of online activity to take full advantage of all the course material and resources at hand.

Then there are courses and study units where interaction is mainly based on teachers seeing the nonverbal expression of participants which is vital to their teaching method communication and face to face discussion being key factors to their teaching methods.

The difficulties arise when teachers have to facilitate two different groups (one present and one online) at the same time. This makes it less desirable for teachers to go fully online courses with large groups since it gives more work for the teacher and less interaction. Another issue is that teachers noticed that some students have difficulties in contributing to discussion online, this makes it harder for teachers to interact with students the best possible way.

Perhaps one of the biggest hinder to online lectures is the attitude towards online learning. But even so, everyone understands that with the pandemic situation it is inevitable that UAS are trying to find solutions to move forward and give the best possible options in regards to learning. Furthermore, with knowledge and training, the attitudes of online lecturing may change with more knowledge and experience.

Question 2. “What course information do you think is the most important when helping students to choose what to study?”

In the second question, the question aimed to find out what information for the teachers was most important when helping students choose what to study. Whether the information was reaching students and if the information given to students through the University's desktop was sufficient enough.

With most of the respondents, a vast majority felt that information is always available and sufficient to students in the implementation plan before enrolments and accessible through the University student desktop. Adding to that most respondents felt that the most important information is the course content, course timing, and the objectives of the course to help students find the right course.

The most critical information to convey to students in the practicalities of the implementation (working methods, timetable, objectives, dates …). The shortcomings are when the study unit starts. There is always a period when it is not clear for the teachers to see which students are part-taking in the course and which are not. This can be problematic when, for example, teamwork is a big part of the study unit. Also, confusion arises by the students who have not fully understood or read the contact implementation before enrollment (for example, that there is an intensive period, or that there is teamwork, or that attendance is required for workshops, etc.). In other cases, it is because the individual wanted to do an online course and enrolled in a contact course.

In general contact, online or hybrid, the timing of the course, course content, and objectives of the course was mentioned in all responses. Study unit descriptions are vital to students and teachers because this information is what determines whether the student can take the course in question. Also, the responses addressed the need for course evaluation to gain an understanding of the experiences of students and what aspects to improve on.

Question 3. “Have you ever bought something from a store recommended to you by a trusted source or received advertisements recommended to you by a third party based on your activities online?”

The third question of the teacher's survey was designed to find out whether the respondents have had prior experience receiving advertisements through a third party recommendation based on their activities or bought something from a store recommend to them by a trusted source. The response was unanimous yes, all participants had some kind of interaction of this kind.

While most respondents felt this form of advertisement or recommendation was efficient, at the same time it might bring some challenges in regards to the course selections and its associates concerned. According to one respondent courses evolve and change during their implementation depending on the participants as well as companies and organizations the study unit was in connection with and developed and set out tasks for students. This in turn might affect not only the implementation but also the success of the course.

As whole respondents were familiar with the recommendation system and all its capabilities. As some noted its efficiency in their opinion was more effective than traditional marketing. Unlike in the student survey, the respondents of the teacher's survey had more knowledge about the recommendation system, this may be due to having more experience through working life.

Question 4. "In your opinion, would an automated framework or recommendation system to students help find the most motivated and interested students to your course?"

The fourth and final question aim was to find out what teachers felt about an automated framework and if they agreed to the statement in the same way that students did. The answers from the participants indicated that some participants agreed with the statement and thought it would help students, while others were not so convinced.

For participants that agreed with the statement, it clearly showed that they believed that this type of framework would help the student in the process of selecting studies. The fact, that it could help build and set a path for students while accommodating their needs, was a desirable element for those participants that agreed with the question. Perhaps these respondents have the experience of such frameworks or similar and the benefits it would bring not only to students but for themselves.

One aspect that was a reason for respondents not agree with the statement, was that the respondents felt that the most motivated students would not need such a system and, what is most suitable, does not always mean it is the right choice for the individual student. Especially when taking into consideration the student's history, knowledge, and background. This was why the curricula of the studies were designed to incorporate the most issues which let the student choose and grow. The concerns of an automated framework by one respondent was, could the system take into account changes in student's wishes that happen throughout the learning process. The optional courses enable students to incorporate the knowledge that is best for them as individuals. The teacher-student (PSP) discussions help to go through these issues as does peer feedback. If students solely rely on this system, it may amount to limiting their possibilities of choice.

6.3 Directors Survey and Analysis

From a possible 10 different directors from 10 different UAS, three answers were received for analysis. The responses support the research hypothesis the author had set out and the results give a good picture of what the trend is like. As with the teacher survey the author used a qualitative survey-based questionnaire to gain non-numerical data from the opinions of the directors. Questions were compiled from the answers of the students and teachers survey. The aim was to understand whether the directors agreed with enabling a recommender system and if this approach could assist in house students and Open University students.

As with the student survey and teacher survey, the director’s response proved that there is strong interest to implement a system that could help in house students, teachers, and as well as Open University degree students. With more and more non-degree students studying than before reaching them is important. Addressing the need of the students to what different UAS have to offer benefits students, teachers, and the universities themselves. The overall feeling gathered from the responses was that the recommendation system could not only refer the right courses to the right people but also help build competence which would also improve student expertise in the field they are most interested in. Also, this in turn would ensure teachers would get the most motivated students into their course.

6.4 Key Finding

In this section of the research analysis, the key finding will be assessed from the results of the teacher and student survey. One key finding seen from both surveys was information and how it influenced individuals' decision-making.

The results from the student survey showed that some participants found it difficult when choosing a course. This could be because course content lacked enough description on the course or that some students may not have access to the Universities desktop management. Also, many respondents wanted additional and more precise information when choosing courses such as the timing of courses, whether it was recorded, if the course was relevant to their study path, and how the course related to future professions.

Likewise, the teachers' survey showed that the most important information for the student is the course content, course timing, and the objectives of the course. Study unit description is vital to both teachers and students since course content determines whether the student can take part in the course in question. The survey also highlighted the importance of course evaluation to gain understanding and the experiences of the student. This information could help with the course description.

Lastly, information that may be very useful to students, when choosing courses, would-be student tips communicating to those thinking of choosing courses. A type of recruiting of students that have previously completed the study unit to give insight to those individuals thinking of enrolling. This could help motivate first-time students and give them vital information about the course and what to expect from the study unit at large.

Another key finding was the type of courses students preferred and how teachers preferred to teach in their respective study units. The two preferences, which stood out, were the online self-study style and contact courses.

In the student survey, there was a difference between the younger age group of 21-30, who were more comfortable with self-study or online studies while in the other age group of 31-40, mainly wanted a mixture of both contact course lessons and online course.

In the teacher survey, what can be taken from the answers is that some tasks, courses, and study units suit a completely online environment, while others need contact courses to fully engage with students and give value to the course. A balance between traditional methods of contact courses and online might be the best option moving forward. Furthermore, a recording format for both contact and online course, where students could join via an online platform as an alternative, might not only help the student, who cannot physically attend the course but also help ease the workload for teachers.

Finally, the last key finding, which can be concluded from all surveys, was the positive support for an automated framework or recommendation system that would help students find the best course for them and teachers find the most motivated students for the course.

In the Student survey 89%, of all respondents wanted some sort of approach of a framework or application that would help them when choosing courses and remind them of the best possible courses according to what was most important to them. A vast majority of the respondents were willing to answer a survey or a few questions to get more precise suggestions about the best possible courses available to them.

The answers from the teachers' survey showed, that there was a mixture of responses, with some feeling that it would limit students to grow and make independent choices. The concern is whether a recommender system could take into account changes in student study paths and incorporate optional courses. On the other hand, respondents who agreed with the statement felt the recommender system could help students in the process of selecting studies as well as build a path for the student while assisting their study goals.

The most important detail, that arises from the final question, is that depending on the level of teaching, whether a fully contact course, or a fully online course, or the degree program, or even a single course, teacher's want what is best for students and help them achieve their goal and support student the best way they can. The answer could be an algorithm that takes all possibilities into consideration and an automated system that does not neglect the important issues, giving each student the freedom to grow and take into account different changes that might happen in the students study path while recommending the right courses

In conclusion to the student and teachers survey, the director's results agreed to the use of a recommender system that could assist both in-house and Open University students. Reaching students across the board and connecting them to the offerings was important for directors.

7 Research Limitations Reliability and Validity

The reliability of any research is associated with the consistency and solidity of the research findings. Such as whether the research is reproducible by someone else or re-testable on a different occasion. (Drost 2011, 106-108.) In regards to this research, one issue that arises, when considering the research, is the small sample. The small sample size may increase the margin of error of the research and give less conclusive results.

Validity refers to how accurately research methods measure the research objective and the integrity of the research. The research should confirm that the method approaches used are high of a standard and that quantifiable techniques measure exactly what you want to know. One such deficiency that may occur, is the lack of external validity of the study. External validity refers to generalizing to other persons, settings, or time. (Drost 2011, 115.) In this case, it refers to whether the used example of the framework of e-commerce systems could be replicated the same way to the UAS.

One potential concern to the validity in regards to the study is the low response return from the student, teacher, and director survey. According to Sivo, Saunders, Chang, and Jiang (2006, 355), the low response return can give a bias effect due to it not reflecting the true nature of the research and gives threats to the statistical conclusion validity. When the sample size is small, sampling error usually tends to be high and so the statistical validity of the research is weak, this threatens both the statistical validity and the external validity in research using questionnaires. (Sivo et al. 2006, 355.)

The potential reason for the low return in all of the surveys indicates that both timing, busy schedule, and other external factors such as the pandemic could have affected responses. In the case of the student survey, the questionnaire was sent on two occasions to get more responses.

Likewise, with the teacher survey, the low response return may indicate that the timing and busy schedules of the teachers may have affected the overall participation. In the case of the teacher survey, some respondents pointed out that the heavy workload teachers have correlated with low responses. However, even with the small response return, the results can be viewed as an indication of what the trend is. It gives an indication and approximates and there may not necessarily be a huge difference with a bigger population.

Another additional bias that may affect the reliability of the research in regards to the student survey questionnaire is that not all possible participants were reached, such as single course students and Open University students. This does not give a full picture of all possible participants and gives a threat to the statistical conclusion validity.

Furthermore, since the research did not reach all intended participants, it cannot be generalized since it lacks the participation of the two groups of single course students and Open University students as mentioned previously. This in turn makes it difficult to assess whether the used example of the recommender system in e-commerce could be replicated the same way to the Universities of Applied Sciences.

To sum everything up, the main possible errors to the research were the timing and low response return which increase the margin of error and does not necessarily give the whole intended picture of the research. Also, the research was conducted during the unprecedented global pandemic of Coronavirus (COVID 19). The impact adds to the bias since personal face-to-face interviews were not able to be done. That being said, with strong literature review, theoretical research, and well-formulated surveys the study can give future indications and trends for further investigation and be a benchmark for further projects or research.

8 Conclusion

With the world going through the Covid-19 pandemic, Universities of Applied Science have taken a big digital leap. Implementing lifelong learning has been an important tool for universities as part of an ongoing strategical process funded by the Ministry of Education and Culture to help close the gap in working life, retrain individuals, and connect students to UAS offerings. One tool that could help improve existing issues and bring more visibility is the recommender system. Recommender systems are used widely in the e-commerce world. Their functions as mentioned in the theory section prove to be very beneficial to many businesses such as Amazon. The recommender system does not only help find the right product or service for the consumer but also suggests other relevant products saving time efficiently. In many cases, the software personalizes the web page for each individual with specialized content for them. This makes the consumers decision process easier and improves loyalty towards the e-commerce business.

In this thesis, the research objectives were to find out if a framework or method such as a recommender system that could help students to find the right courses to study and teachers to find courses to offer and connecting the need of students to the offering of teachers. The second research question was whether the digital means used by e-commerce could be suitable for Universities of Applied Science.

Key findings in the research prove that a recommender system is beneficial to the UAS. The data collected from the surveys show that there is an interest in a system that could help connect the need of the students to the offering of the teachers. Also, a framework that actively seeks students to the course benefits the teachers in marketing the course. This is especially important to individuals such as Open University students, single course students, and part-time students who do not have access to the given university desktop and what the UAS has to offer. The recommender system can play an important role to students both in-house and Open University students.

As noted in the surveys, information was key to the students choosing the right courses and teachers need to get that valuable information about their course to students. With the help of a recommender system information will be more accessible to students in finding what is most important to them and teachers to gain the most motivated students to their course. The recommender system could give more information to interested individuals visiting universities such as Open University participants giving the UAS a more effective way to reach and market the learning opportunities they have to offer.

One challenge for the UAS is to incorporate an approach or system for information to be available to students from different universities, or degree programs, or Open University students to be able to access relevant information concerning them without having to separately check all the different UAS web pages for courses or offerings. Since each UAS uses different types of software the information between universities is hard to access unless the student is from that particular polytechnic. Information just as in the student and teachers results is vital and being able to share offerings would benefit students and universities.

Finally, for the recommender system to work as well as possible, for example, to be able to recommend the right things to the right students, it requires logging in to the system, from which the student's information can be accessed. This means that UAS will have to set up a system where information can be accessed safely and personalized for the recommendation system to utilize when referring courses or study degrees to the students. On the other hand, a lighter version of a recommendation engine or application can be implemented according to evaluation given students who have completed a course or degree program giving insight into what experiences participants have gained. This would mean there would not have to be integration between the universities.

Universities of Applied Science can use a similar approach by implementing a recommendation system to their social media or web page, such as a chatbox that asks the visitors a few questions in regards to what the university has to offer and direct the individual to what they are looking for. The added value for the universities is that it is cost-effective and the visitor can get the information they need.

Another type of framework that could be beneficial to UAS is to use a similar approach that is being used in Australia Melbourne University. By applying the systems to the university web page that picks up every visitor and asks a few questions directing the individual to what the university has to offer is time-efficient and effective. A hybrid system that personalizes the page for each individual according to what they are looking for would also be able to recommend different opportunities and keep the individuals up to date by sending relevant information to the visitor’s email.

To conclude the research objectives, the research answered the questions the author had set out. Even with low response return from the surveys, the results can be viewed as an indication of how respondents felt and what the trend would be like with a bigger population. According to the empirical study, theory, and surveys, a recommendation system can improve the student's study journey and help personalize the study path to what is important to each individual. The surveys give good insight for universities to understand the current situation, what is important to the universities in assisting student's needs for both in-house and Open University students. The recommender system can ease the process by accommodating the induvial needs of in-house students and recommending courses or relevant information the universities have for Open University students.

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Figures

Tables

Appendices

Appendix 1: Student survey

Student Questionnaire:

My name is Salomon Färm and I am conducting a research on a recommendation system that helps students find the right courses to study. This study is related to my Business Management thesis studies at Laurea University of Applied Sciences in Leppävaara. Your response helps me to identify factors to support students' needs. The research is anonymous and no single respondent can be recognized. The gathered information is treated confidentially. Thank you very much in advance for your contribution!

1. Age:

20 or younger

21-30

31-40

41-50

51-60

60-

2. Please select the answer that best describes you.

I am full time student

I am a part time student

I study Open University

I do only individual courses

3. How do you prefer to be taught?

I prefer to contact lectures.

I prefer self-study online courses.

I prefer to study online and have contact lectures.

4. How you would like to receive information about courses?

Through the student desktop / study management platform provided by University of Applied Science.

Through electronic recommendations.

Through both the student desktop and electronic recommendation.

Through online advertisement / social media.

From students or other peers

5. What additional information would you like to have or what information is missing in your opinion?

____

____

____

6. From a scale 1-5 do you think that there should be more additional I information in the course description?

7. How has the process of choosing the courses been?

Easy

Somewhat difficult

Neutral

Extremely difficult

Challenging

Laborious

8. What would help you in choosing your courses?

____

____

____

9. What kind of information would you find most important when applying to a courses?

Content of the course

Timing of the course

The knowledge gained from the courses

Relation to work life / Competence

All of the above

10. What influences your choice of study when choosing your courses?

The course was recommended by tutor teacher or other teacher.

The course was recommended by another student or peer.

The course was recommended by work colleague

The course that best supports my future profession.

The course supplements or completes my career path.

All of the above

None of the above

11. What motivates you the most when choosing the right course for you?

The content of the course and what it has to offer.

Courses that support my path to my future profession.

The teaching methods used in the course

All of the above

12. Have you ever received marketing emails / ads from online stores based on your activities? Would this kind of approach help you in selecting your studies?

Yes

No

Maybe

13. **Would you like a system that would help recommend and or remind you of the best possible courses to your study path according to what is most important to you?**

Yes

No

Maybe

14. **Would you be willing to answer to a survey or a few questions to get more precise suggestions for what to study?**

Yes

No

Maybe

Appendix 2 Student Survey Figures:

Figures from the student survey (Questions 1-4, 6-7, 9-14)

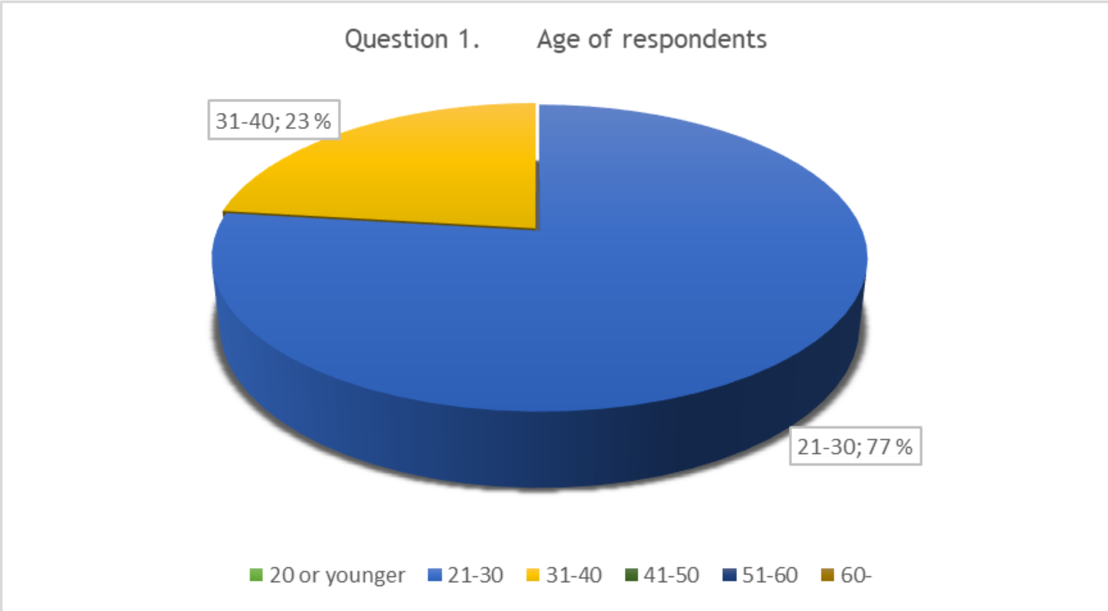

Figure 1. Age of respondents

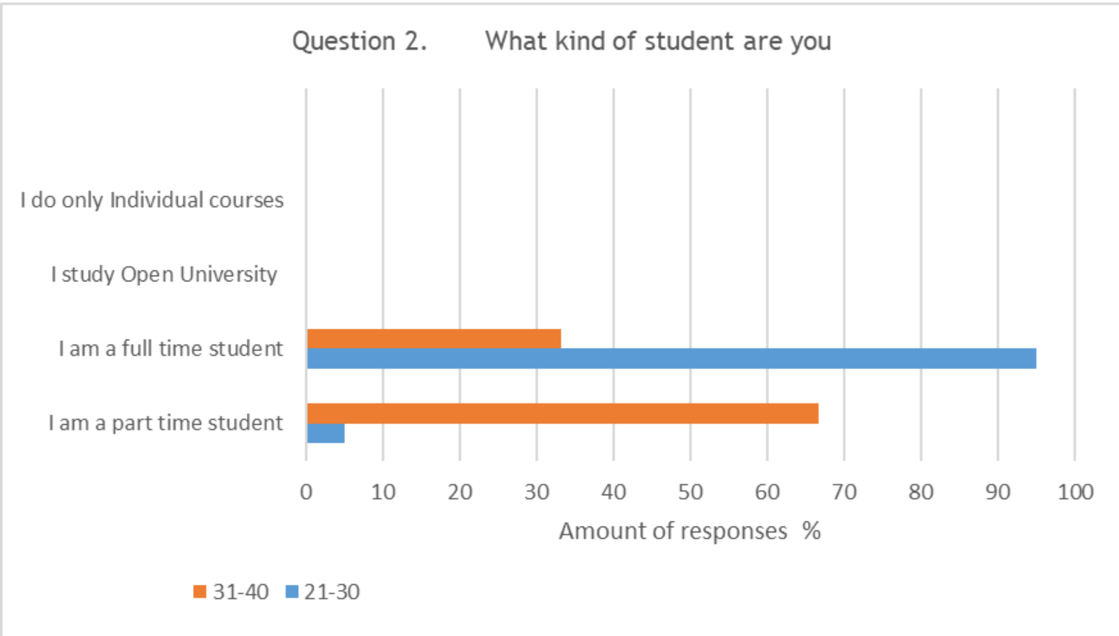

Figure 2. What kind of student are you?

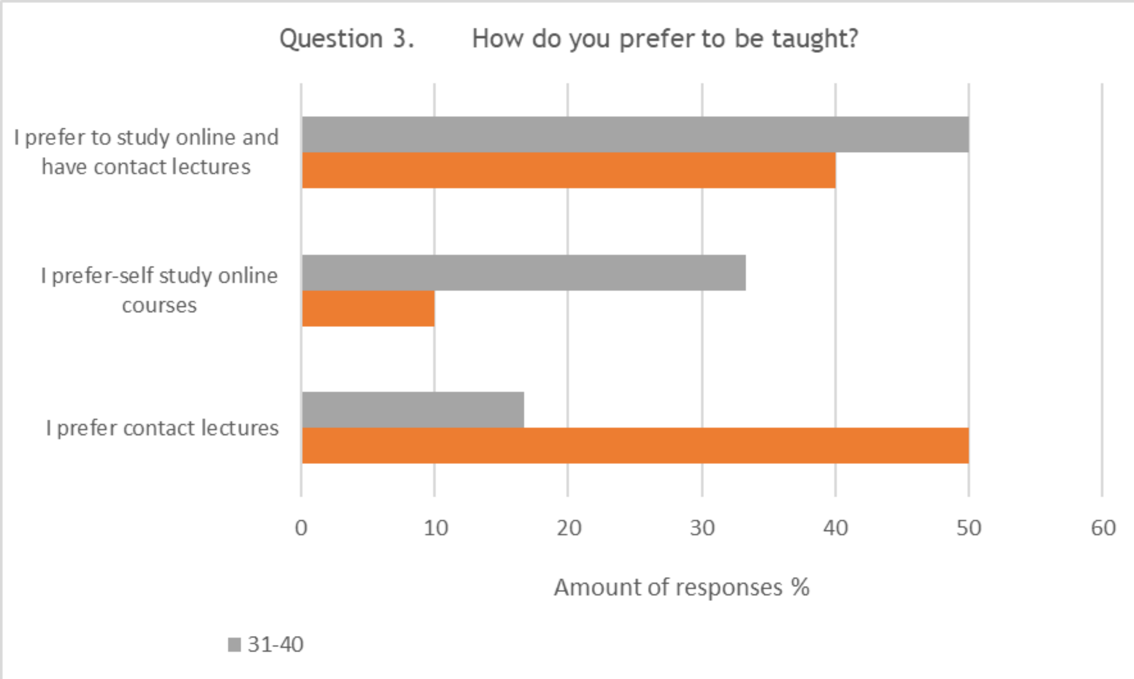

Figure 3. How do you prefer to be taught?

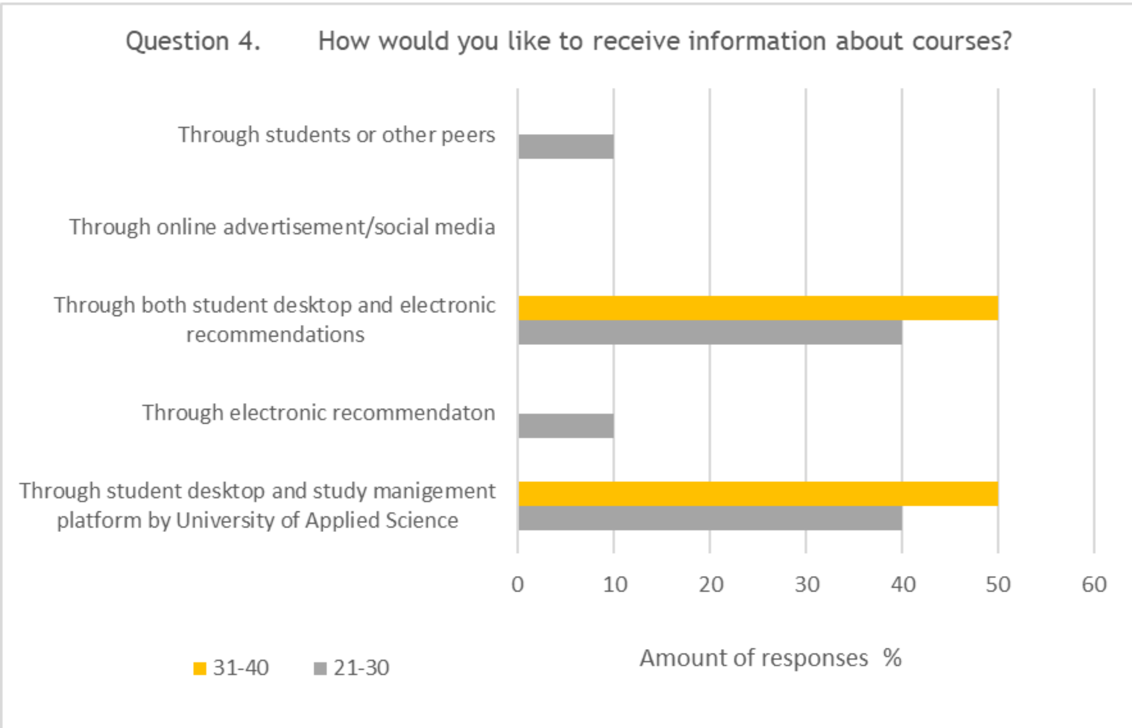

Figure. 4 How would you like to receive information about courses?

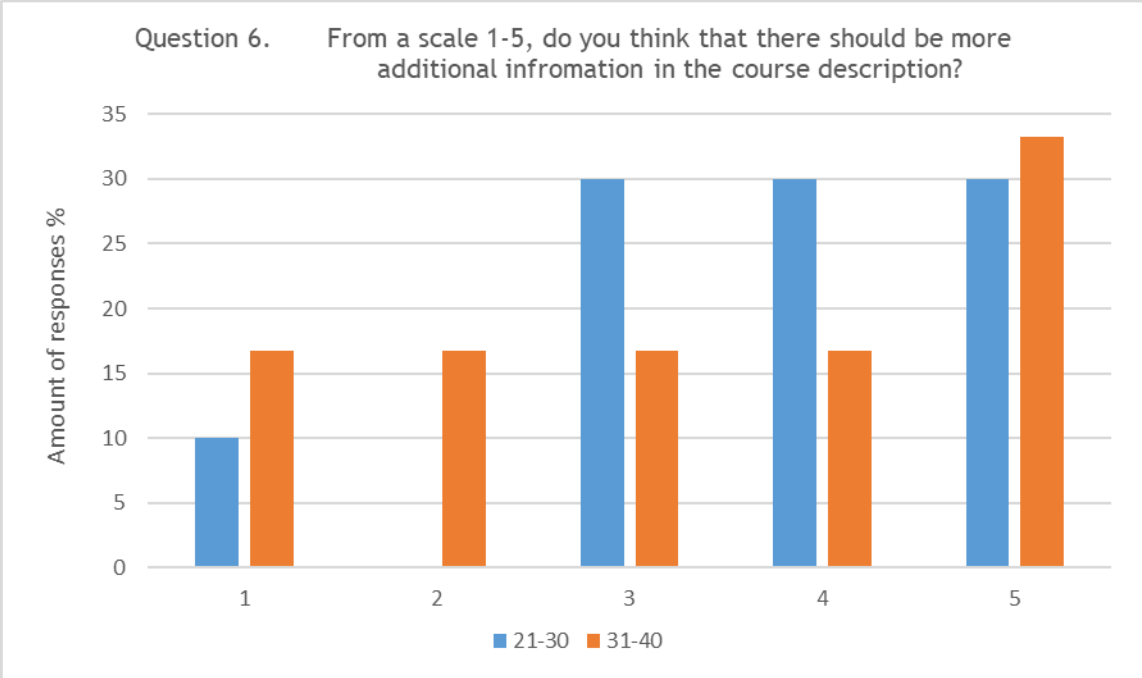

Figure 5. From a scale 1-5, do you think that there should be more additional information in the course descriptions?

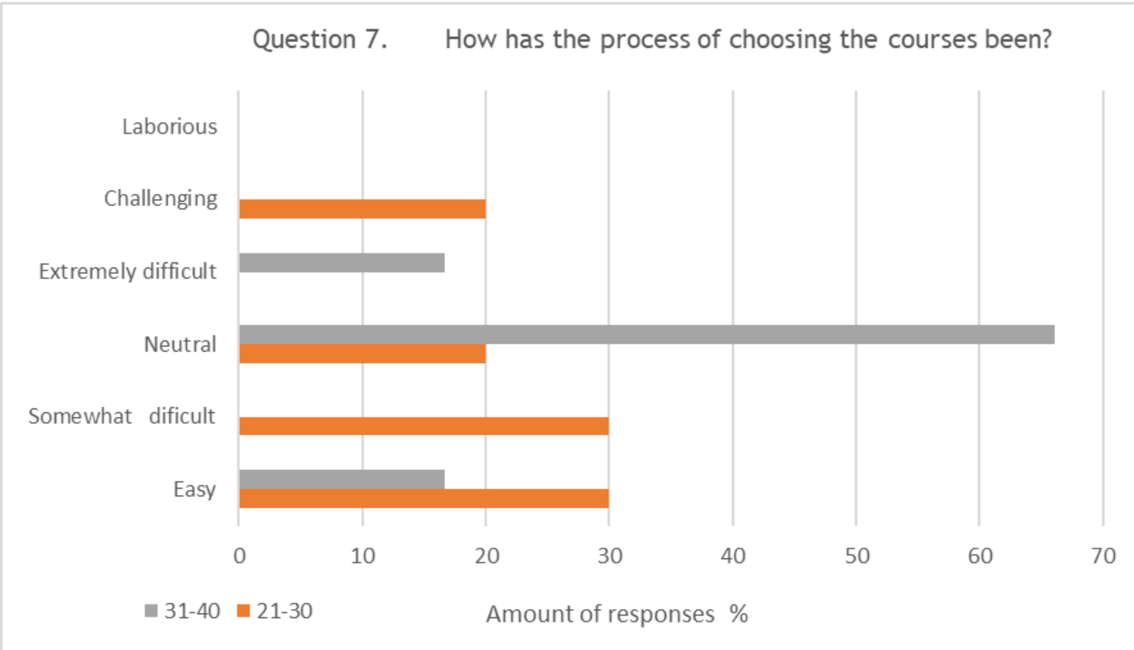

Figure. 6 How has the process of choosing the courses been?

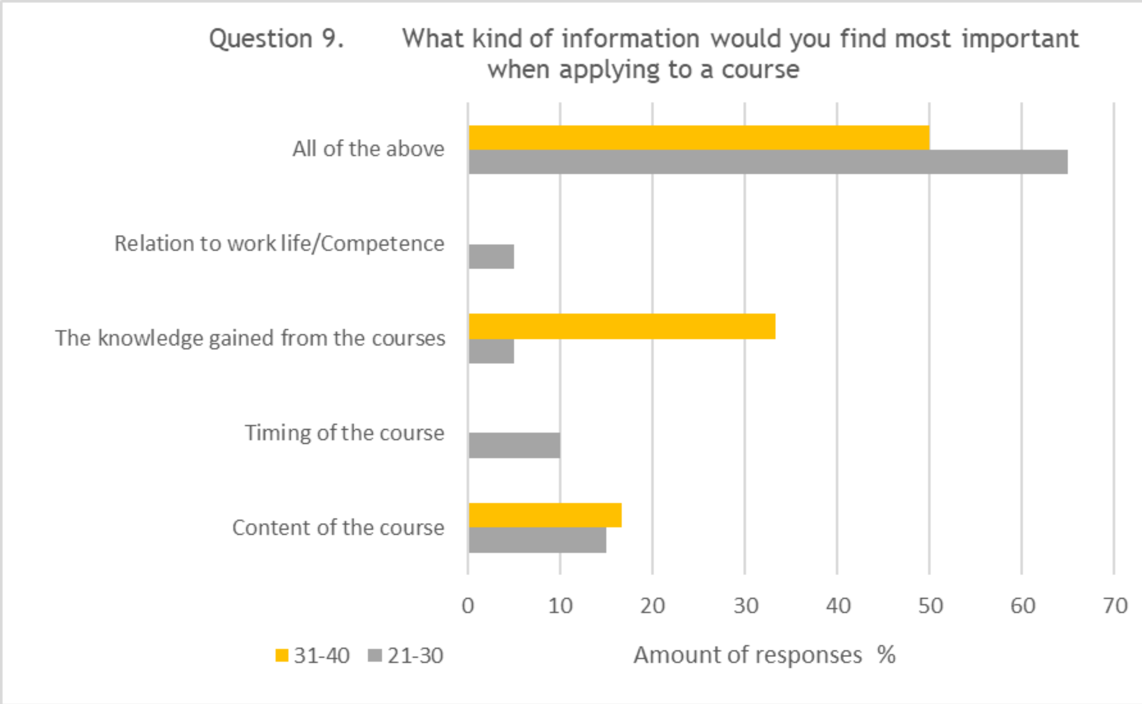

Figure 7. What kind of information would you find most important when applying to a course?

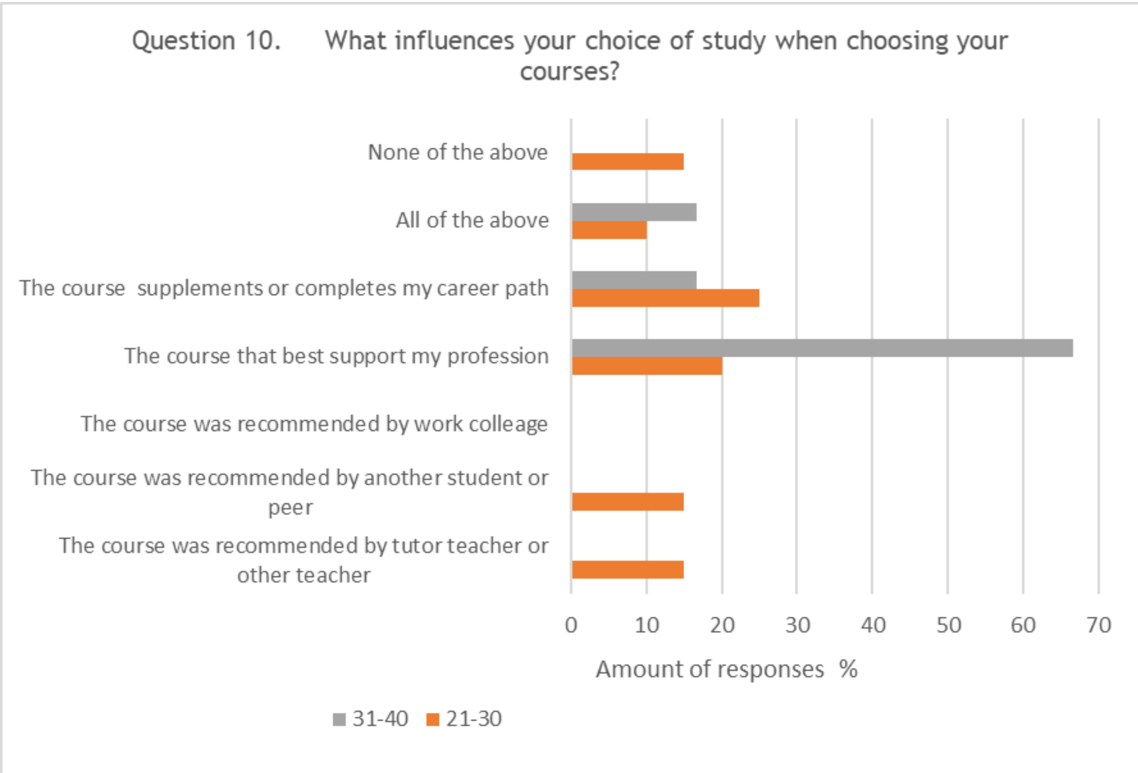

Figure. 8 What influences your choice of study when choosing your courses?

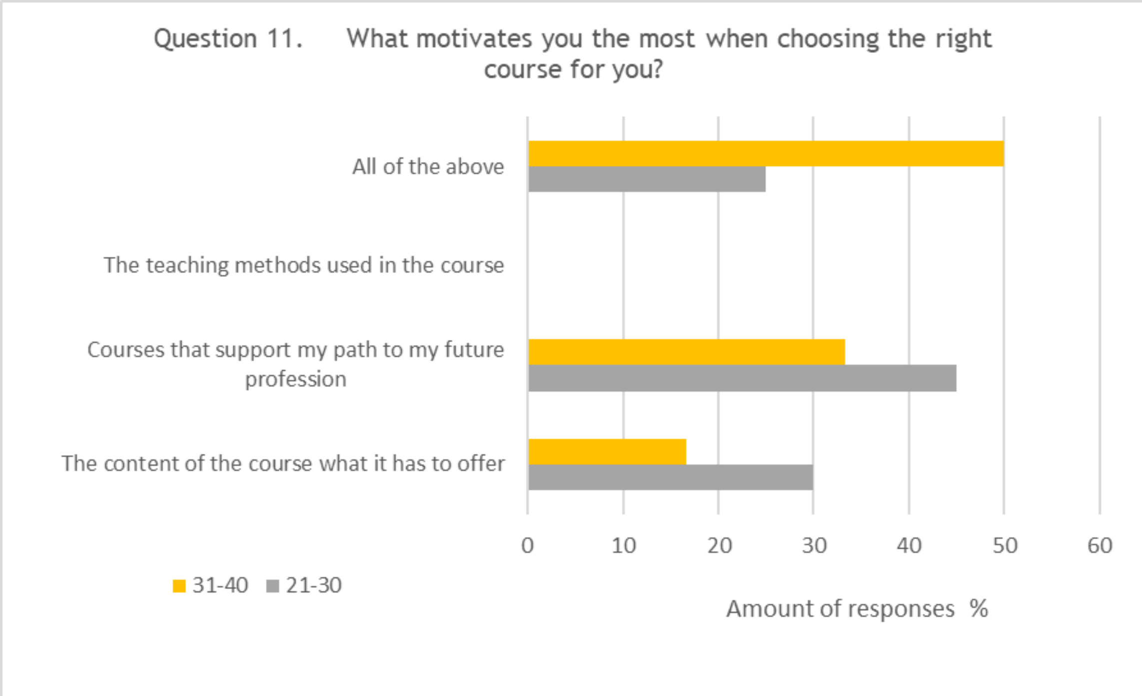

Figure 9. What motivates you the most when choosing the right course for you?

Figure 10. Have you ever received marketing emails/ads from online stores based on your activities? Would this kind of approach help you in selecting your studies?

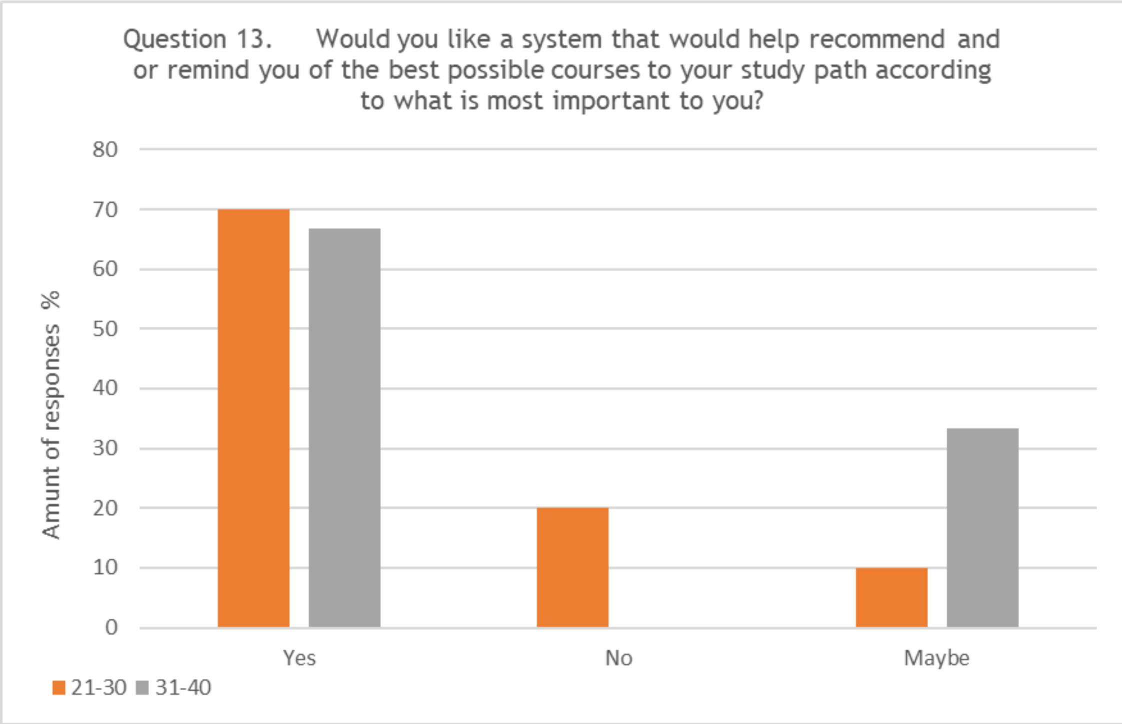

Figure 11. Would you like a system that would help recommend and or remind you of the best possible course to your study path according to what is most important to you?

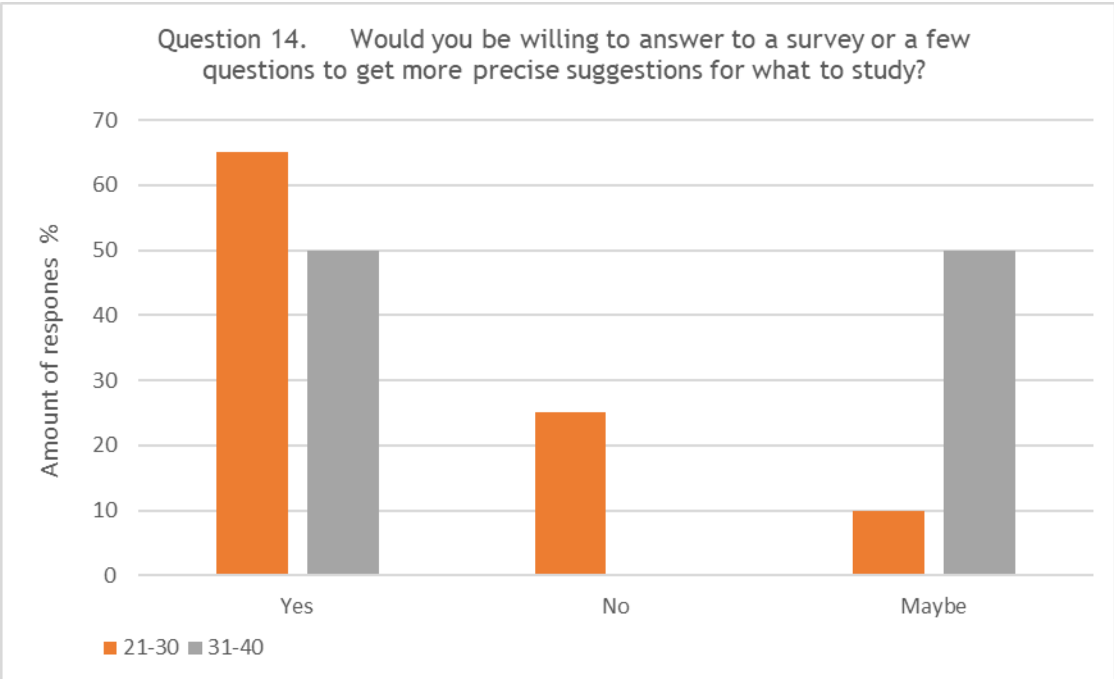

Figure 12. Would you be willing to answer to a survey or a few questions to get more precise suggestions for what to study?

Tables From the student survey (Questions 5, 8)

Table 1. Question 5

What additional information would you like to have or what information is missing in your opinion?

Respondent's	What additional information would you like to have or what information is missing in your opinion?
1.	- No input
2.	Social activities.
3.	If the course needs prerequisites or requirements that the student should know about before taking the course.
4.	Information about course selections available
5.	I'd like to have more information about different study programs
6.	I would like to know the assignments of the course because some people prefer long writing assignments and group work etc. These kinds of things would affect my choice of course
7.	None
8.	- No input
9.	Timetables are a bit hard to find.
10.	What tasks the course will consist of.
11.	A nice clear representation of the courses available in English and for which semester.
12.	- No input
13.	The canvas platform is very helpful and simple.
14.	I would like to receive information by phone message.
15.	I would like to have more information about future jobs after my studies.
16.	Career-related course.
17.	Nothing.
18.	I think it would be great if Laurea UAS had a base of thesis topics to choose from.
19.	Clear guidelines for international students.
20.	I can't think of any.
21.	What all courses we can choose from
22.	No answer to this
23.	When lectures take place, are they recorded, can they be seen at a later stage and is it compulsory to be present. *"Milloin tunnit ovat, nauhoitetaanko tunnit jotta voi katsoa jälkikäteen ja onko läsnäolopakkoa"*

24.	– No input
25.	The course information is quite often very limited and quite frankly gives little to no information about how the course is timed and what is needed to complete the course.
26.	Easy access to enrolment periods and other important dates, I always struggle to find these.

Table 2. Question 8

What would help you in choosing your courses?

Respondents	What would help you in choosing your courses?
1.	More info on what they have to offer.
2.	Content and teacher.
3.	I choose my courses depending on their suitability with my major leading to my future profession.
4.	Simple and clear software, maybe a mobile app?
5.	Feedback comments on it.
6.	To know more about what the course will require (do I have time to do it in that particular semester).
7.	Clear descriptions and perhaps a short introduction of the teacher who is responsible for teaching that specific course.
8.	A complete list of courses.
9.	They are hard to find and when you open the info box most of them don't have the timetable ready so it's a bit hard to see if you have class on top of it already.
10.	The schedules coming early enough, some courses don't show them in time
11.	More information on how they can be applied in the real world
12.	- No input.
13.	The teacher is the one who helped a lot, to choose the courses.
14.	Longer meeting with our tutor.
15.	You just need to be familiar with pakki (Student desk-top) then is manageable.
16.	More explanation about courses and future work-related courses. So that can help someone build up their career.
17.	Planning the studies properly with the tutor teacher.
18.	I think it is fine as is.
19.	The clarity in what the courses are for
20.	Nothing really, I had no problems.

21.	A brief video of the content of each course for example.
22.	No answer for this.
23.	A multimodal implementation, it would be important to know whether attendance is mandatory and when the hours are, so that those working can choose the most suitable ones in time. *’Monimuotototeutuksessa olisi tärkeää tietää onko läsnäolopakkoa ja milloin tunnit ovat, jotta voi työssäkäyvätkin valita sopivimmat ajallisesti.’*
24.	To hear from students who have already done the course.
25.	More information.
26.	I struggle mostly because of personal reasons. I've always had a hard time deciding what I want to do and have been interested in a variety of topics. So maybe information on different career paths and how different courses contribute to these.

Appendix 3: Student survey Findings

Student Survey Findings:

Respondent’s background information

Questions 1, 2, 3, and 11 are questions that were designed to give background information about the respondents. The questions look into the participant’s age, what kind of students they are and what motivates them most in regards to choosing course selections.

The first question of the survey was the age of the respondents. The given answering options were, includes the options 20 or younger, 21-30, 31-40, 41-50, 51-60, and 60+. As shown in the figure below the largest group of the participants were 21-30 with a total of 77%. The second group that scored 23% where from the age of 31-40. There was no representation from the other group, therefore future figures show only the age groups of 21-30 and 31-40 respectfully.

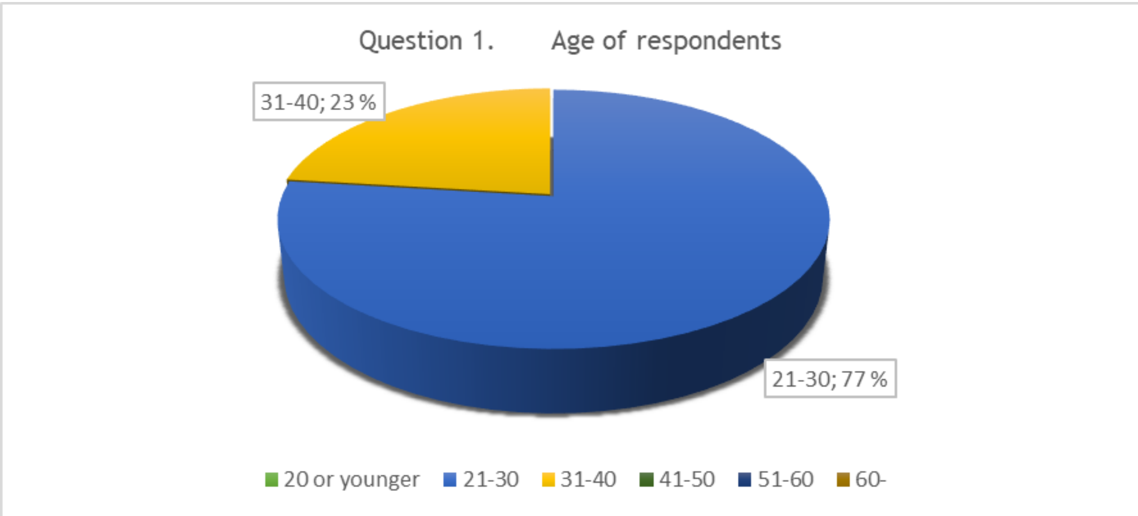

Figure 1. Age of respondents

The second question of the survey was 'What kind of student are you?' The second question aimed to identify what type of students study in UAS's. The choices available to the participants were; full-time Students, Open University students, part-time students, and Individual/single course students. Out of all the respondents, 95% were full-time students while 5% were part-time students from the age group of 21-30. On the other hand in the age group of 31-40, approximately 67% were part-time students and 33% were full-time students. In the survey, there were no Open University students and single course participants.

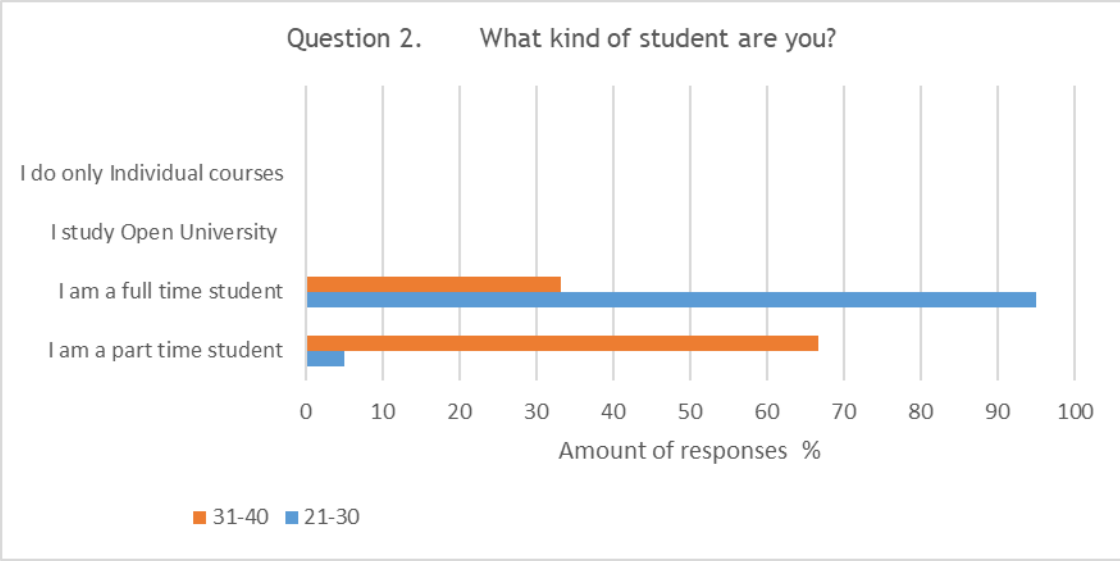

Figure 2. What kind of student are you?

Question number three 'How do you prefer to be taught?' This question was designed to determine how students wanted to learn and what their preferences were regarding course selections. There were three available choices for participants to choose from; Contact lectures, Self-online studies, and a mix of online and contact lectures. Out of the answers received, 50% of respondents from the age groups of 21-30 wanted to study individually online while 40% wanted a mix of online studies and contact lectures. Only 10% of the respondents wanted contact lectures. Meanwhile, in the age group of 31-40, 50% wanted a mix of both online and contact courses, 33% wanted contact lectures and approximately 17% wanted to self-study.

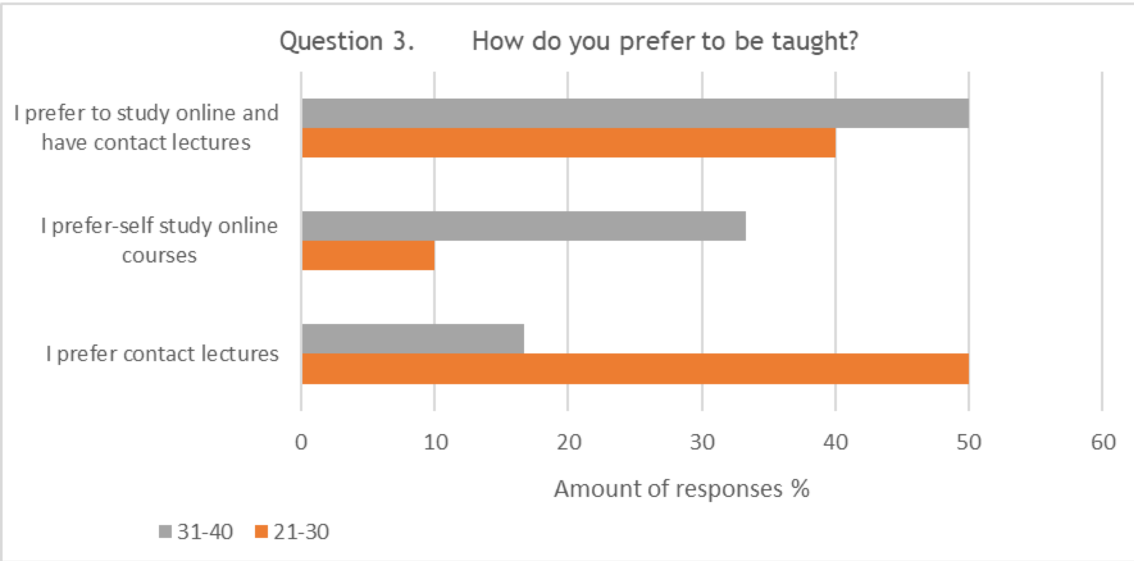

Figure 3. How do you prefer to be taught?

'What motivates you the most' was asked in question number eleven. In question number eleven the aim was to determine what information motivated the respondents the most when choosing the course. The participants had four different choices to choose from. In the age group of 21-30, 45% or the majority of respondents were motivated by the courses that supported their future profession. 30% were most motivated by the content of the course and what it had to offer. 25% of respondents in the age group of 21-30 felt that course content, courses that supported their future processions, and the teaching methods motivated them the most when choosing their courses. Meanwhile, in the age group of 31-40, 50% of respondents were motivated most by all of the choices. 33% of the respondents who answered the question were motivated by the courses that supported their future profession, and 16% were motivated by the content of the course and what it had to offer.

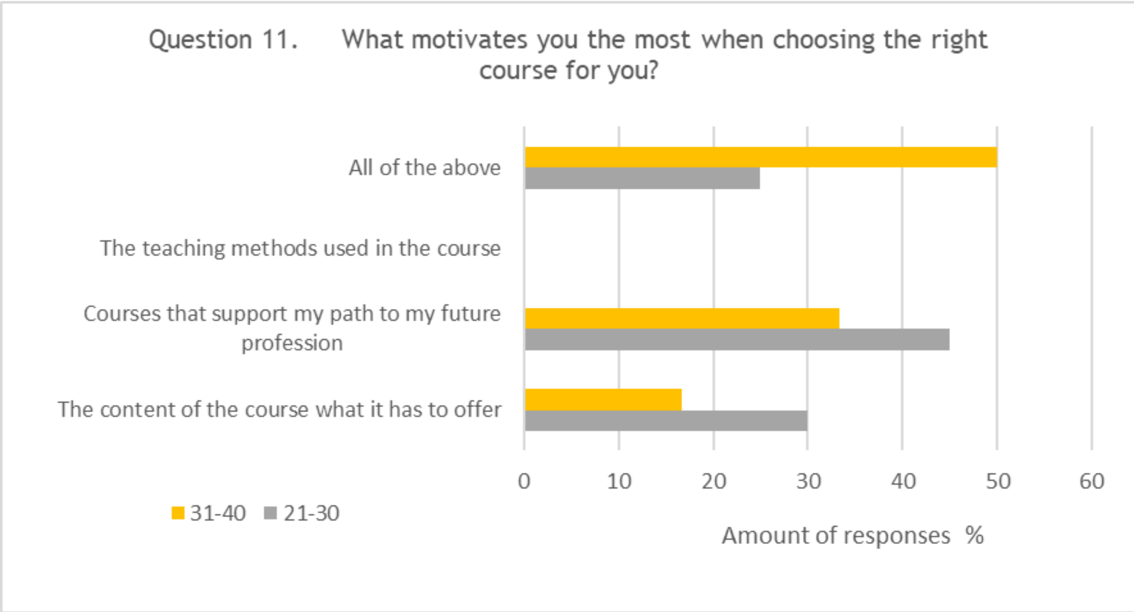

Figure 4. What motivates you the most when choosing the right course for you?

Information evaluation

Questions 4, 5, 6, 7, 8, 9, and 10 give insight into the respondent's desire in regards to what they feel is important to them. These questions were designed to find out what information was important when choosing courses if content in the course description was sufficient or was there lacked information, what kind of additional information is needed, what information was most important, and what influenced respondents most in regards to course selections

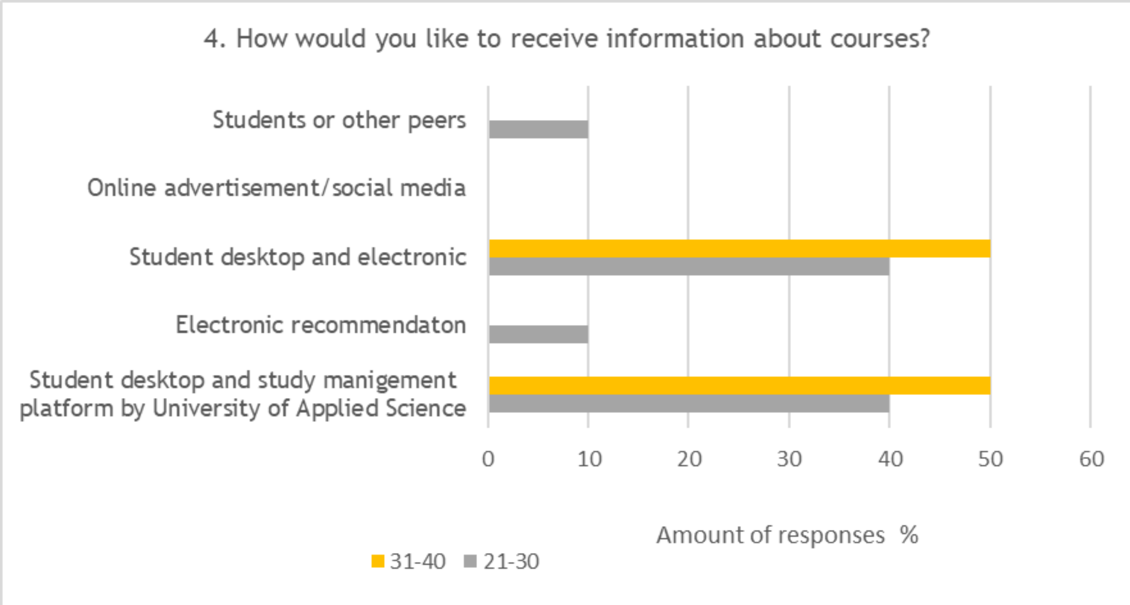

Figure 5. How would you like to receive information about courses?

The fourth question of the survey was to determine how the students wanted to receive information about courses. The five available choices were; student desktop and study management, electronic recommendation, student desktop and electronic, through online advertisement/social media, and Students or other peers. From the age group of 21-30, 40% of the respondents wanted to receive information by student desktop and study management platforms of UAS. Another 40% wanted to get their information about courses from both student desktops and electronic recommendations. 10% of the respondents wanted information received through electronic recommendations. Finally, 10% wanted to receive information from students or other peers. In the second age group of 31-40, 50% wanted information about courses from student desktop and study management platforms of UAS, and another 50% wanted information to be available about courses from both student desk-top and electronic recommendation. In neither age group did students wanted information through online advertisement/social media nor did they want to receive information about courses from students or other peers.

Question five was open-ended, (see tables) 'What additional information would you like to have or what information is missing in your opinion?' in this question the aim was to get the opinion of students. The objective was to understand whether the students felt that there was enough available information about courses and if they felt the need for more information. The majority of the respondents felt that there was a need for additional information. In addition to missing information, most felt that course information was important.

Question six was, 'From a scale 1-5, do you think there should be more additional information in the course description?' In the sixth question, the aim was to determine what measurement amount of the respondents agreed with the statement and whether there should be additional information in the course description. The scale was from 1-5 with 1 being least agree and 5 being most agree with the question. Most respondents completely or most likely agreed with the statement. In the age group 21-30, 30% of the respondents gave a scale between 3 and 5 each while only 10% gave a scale of 1. Meanwhile, in the age group of 31-40, 33% of respondents gave a scale of five. Approximately 17% gave scales of one, two, and three. Also, another 17% of the respondents gave a scale of four.

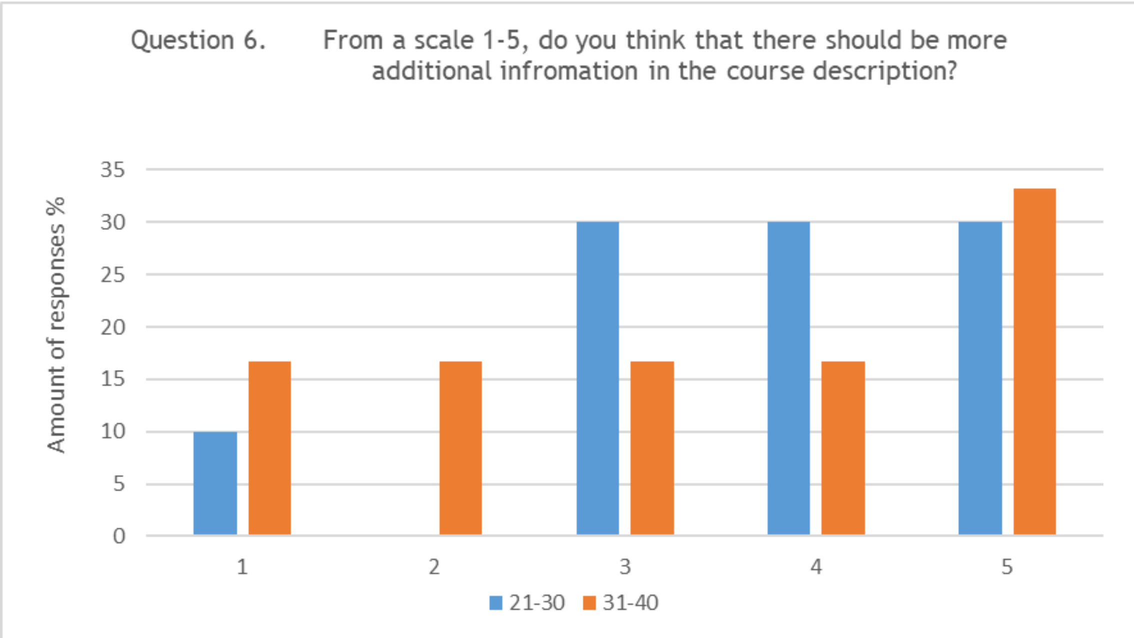

Figure 6. From a scale 1-5, do you think that there should be more additional information in the course description?

In question seven of the survey; 'How has the process of choosing the course been?' the aim was to determine how the students felt about their process when choosing the course. There were six choices to choose from, easy, somewhat difficult, neutral, extremely difficult, challenging, and laborious. In the age group 21-30, 30% of the respondents felt the process was easy, another 30% felt that the process was somewhat difficult. 20% of the respondents felt neutral about the process and another 20% felt the process of choosing a course to be challenging. No-one in the age group of 21-30 felt that the process of choosing courses was laborious. On the other hand in the age group of 31-40, 66% that respondents in the survey felt neutral in regards to choosing the course while approximately 17% felt the process was easy and the same amount of respondents felt the process was extremely difficult. In the same age group, no respondent felt the process of choosing a course was somewhat difficult, challenging, or laborious.

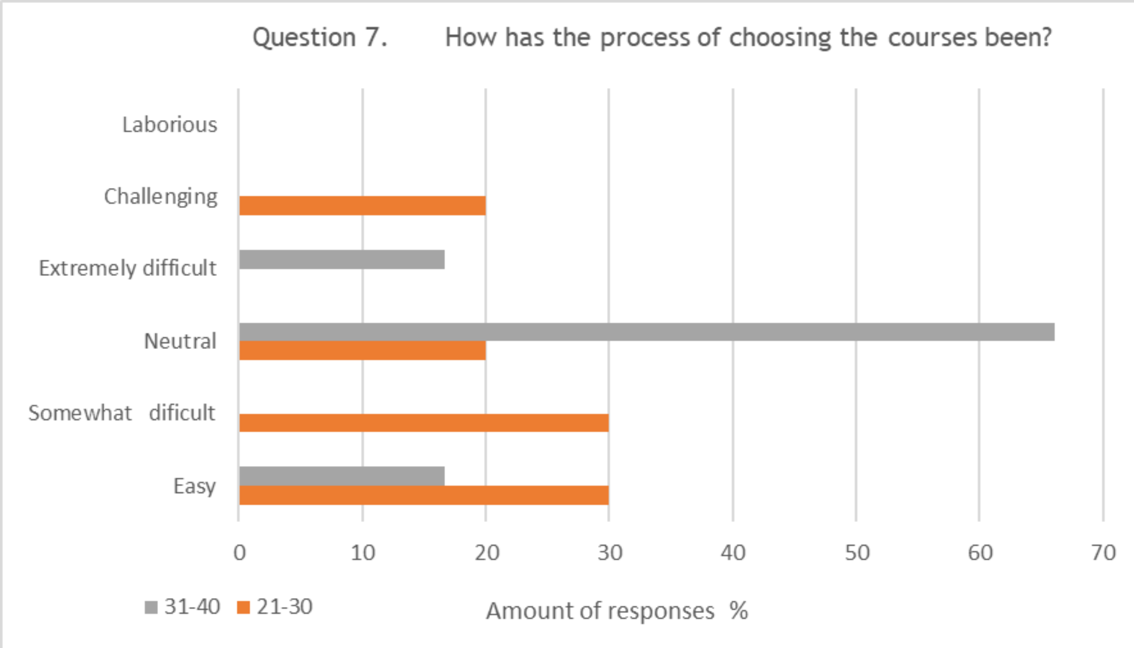

Figure 7. How has the process of choosing the course been?

Question eight was the second open-ended question, (see tables) 'What would help you in choosing your courses?' This question was designed to help understand the students feeling on what type of help they would like to get. Question eight was the second short open-ended question and was related to question number seven: 'how has the process of choosing the courses been?' Majority of respondents that answered the questions felt that they would appreciate help of some sort in helping the course whether it was from a tutor teacher or better content description. From all the respondents only three felt they did not need any help or had no answer to the question. There was only one who had no input. Like in the first open-ended question five most a few respondents felt more information was needed whether it was about the course description, or information about courses related to future professions, or what courses were on offer and even an implementation to help course choices for those who work. In general, there was a feeling from the respondents that they knew what would help them in choosing the courses.

Question number nine was 'What kind of information would you find most important when applying to a course?' This question was created to determine what kind of information was most important to the students when applying to a course. The choices for the respondents in the question were: the content of the course, the timing of the courses, the knowledge gained from the course, relation to work-life/competence, and all of the above. In the age group 21-30, 65% a majority of the respondents felt all available options were important when applying for courses. 15% of participants felt the content of the course was important. 10% felt the timing of the course was important. 5% of respondents felt that the knowledge gained from the courses was important information and finally, 5% from the same group felt information related to work was important when applying to the course. In the second age group of 31-40, 50% felt all of the choices were important while approximately 17% of respondents felt that the content of the course was important.

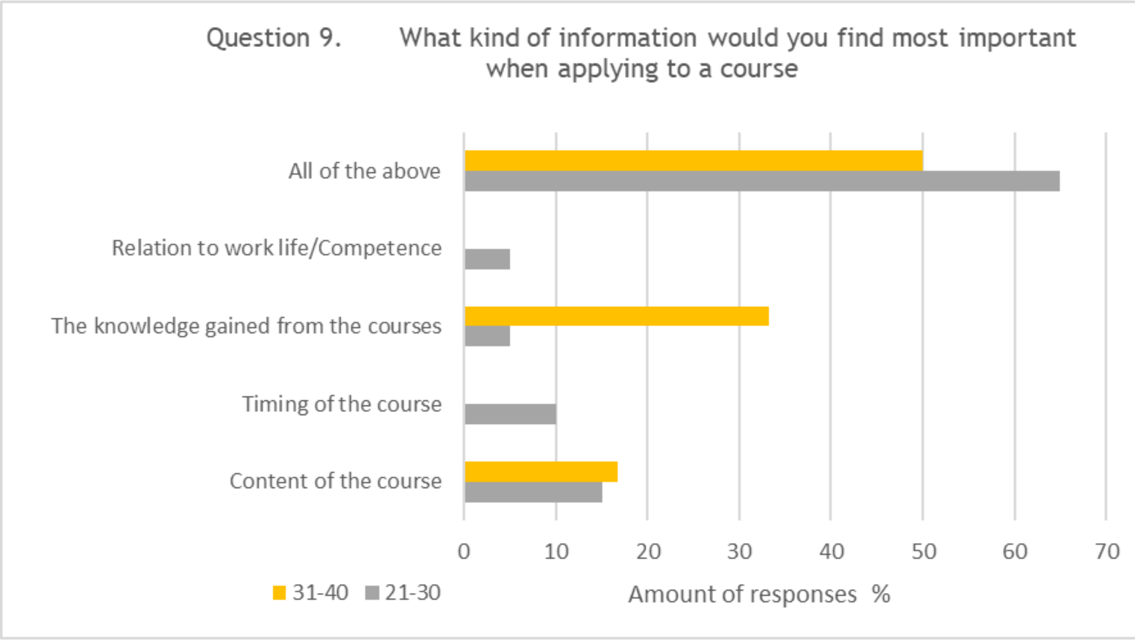

Figure 9. What kind of information would you find most important when applying to a course?

In question number ten the aim was to understand what influenced the respondent's choices most when choosing their courses. The respondents could choose from seven choices to what influenced their choice selection the most. In the age group of 21-30, 25% of the respondents felt that the course supplements or completes my career path was most important, while 20% felt that the course that best supported their profession influenced them in their course selection. 15% of the respondents felt courses recommended by another student or peer-influenced their choice of study when choosing courses, while another 15% felt that courses recommended by tutor teachers were most important to them when choosing study courses. 15% of respondents in the age group 21-30 answered none of the above and 10% of respondents felt that all of the available choices influenced their choice of study when choosing a course. In the other age group of 31-40, 66% of respondents or a majority that answered the question felt that the course that best supported their profession influenced their course selection. 16% felt the course supplements or course that completes their career path was influential to their choice of course selection. In the same group, 16% of respondents felt that all seven available choices influenced their choice when choosing a course.

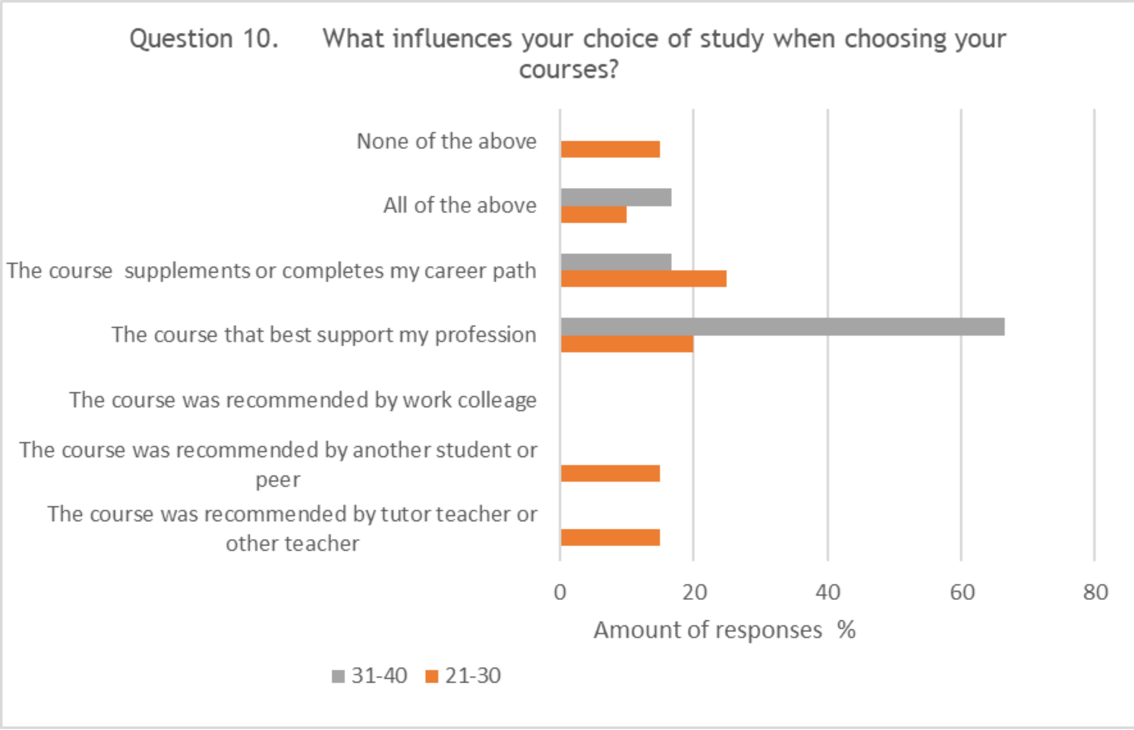

Figure 10. What influences your choice of study when choosing your course?

Opinions about automated recommendation framework approach.

The last three questions 12, 13, and 14, were designed to get an idea of whether respondents had prior knowledge of a recommendation system. The aim was to find out would this kind of approach be useful to the respondents and how they felt about an approach that would give suggestions to get more precise suggestions for what to study.

In question number twelve, 'Have you ever received marketing emails/ads from online stores based on your activities? Would this kind of approach help you in selecting your studies?' the question aimed to find out whether respondents had prior experience of receiving emails based on their online activities and what their thought was on having a similar approach when choosing courses. There were three choices to choose from of which 50% answered no. 23% of all respondents were answered yes to the question while 27% answered maybe. In the age group of 21-30, 55% of the participants answered no while 30% answered yes. 15% answered maybe. In the age group 31-40, 66% of respondents answered maybe and 33% of the participants answered no. No one had answered yes in the age group 31-40.

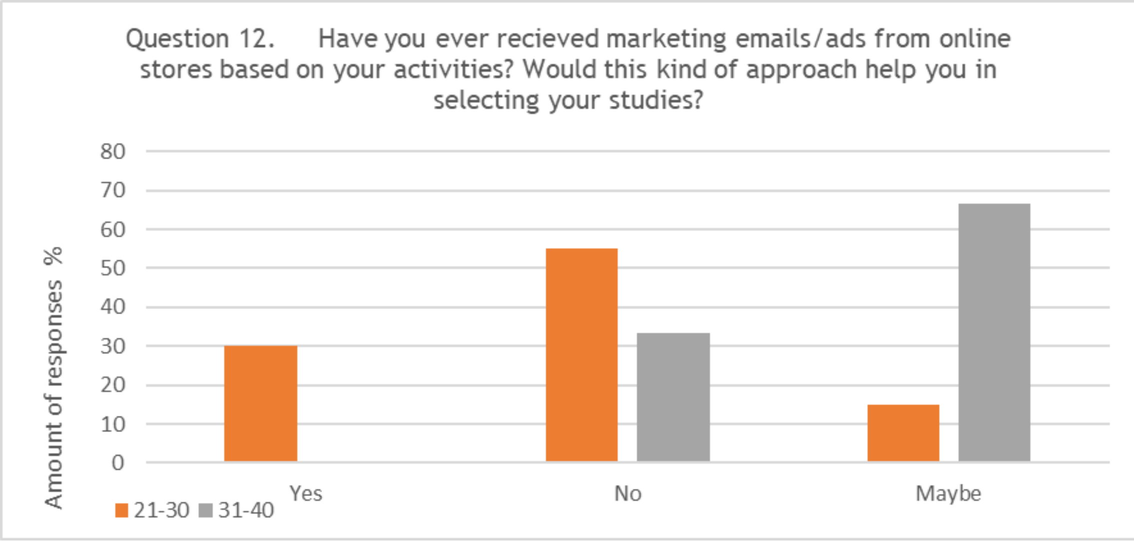

Figure 12. Have you ever received marketing emails/ads from online stores based on your activities? Would this kind of approach help you in selecting your studies?

In question number thirteen the aim was to determine whether the respondent would like to have an automated system that would help them or remind them to choose the best study path according to what they felt was most important to them. From all of the answers, 89% of the respondents answered yes, while 15% answered no. Likewise, 15% of all the respondents answered maybe. In the age group of 21-30, 70% of the participants answered yes, 20% answered no, and 10% of the respondents answered maybe. Meanwhile, in the age group 31-40, 67% of the respondents answered yes and 33% of participants in the same age group answered maybe. No one in this group answered no.

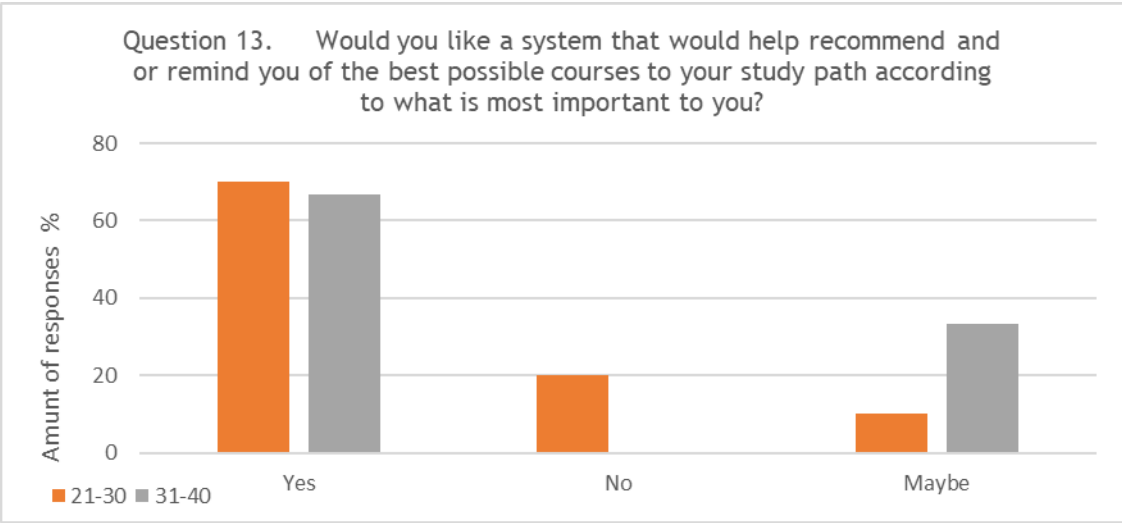

Figure 13. Would you like a system that would help recommend and or remind you of the best possible courses to your study path according to what is most important to you?

The fourteenth and final question of this survey was 'Would you be willing to answer to a survey or a few questions to get more precise suggestions for what to study?' This question was designed to understand whether the respondents were willing to answer a few questions to get the best possible suggestions for what to study. 64% of all respondents answered yes. This question was related to question thirteen, of which 75% of respondents had answered yes to whether students would like an automated system to help choose the best study path or remind them of the best courses according to what was most important to them. Out of all of the answers to this question, only 20% answered no. In the age group 21-30, thirteen respondents answered yes to the question while five participants answered no. Two participants answered maybe in the same age group. Meanwhile, in the age group 31-40, three participants answered yes to the question and three respondents answered maybe. Nobody in the same age group answered no to the question.

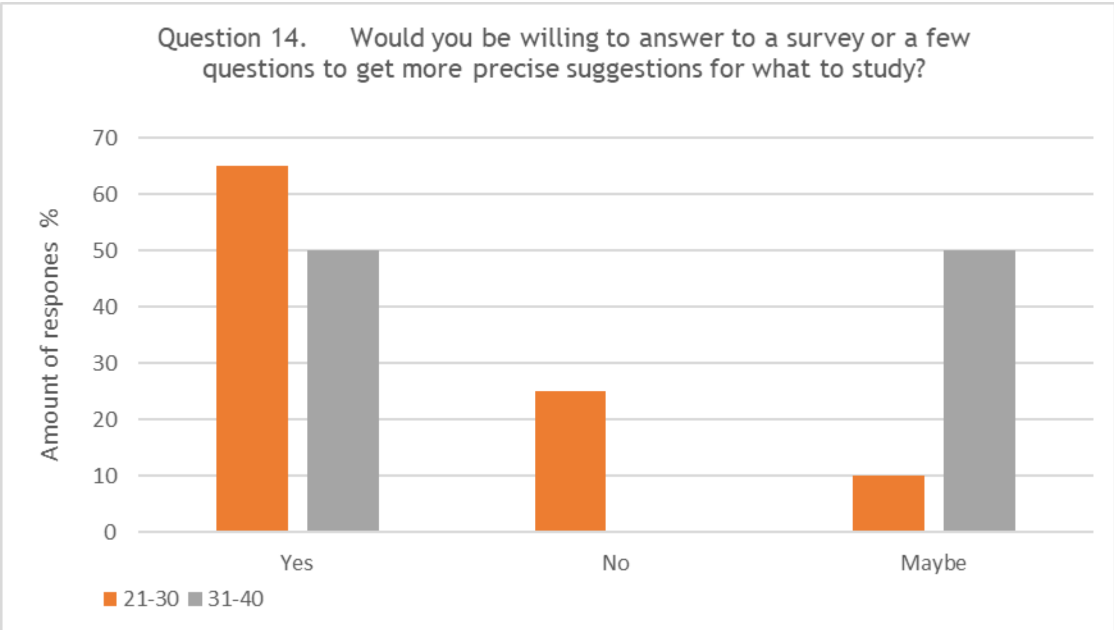

Figure 14. Would you be willing to answer to a survey or a few questions to get more precise suggestions for what to study?

Appendix 4: Teachers survey

Teachers Questionnaire

My name is Salomon Färm and I am conducting a research on a recommender engine that could assist teacher with course offerings. A recommender system refers to a system that is capable of predicting the future preference of a set of items for a user, and recommend the top items. This study is related to my Business Management thesis studies at Laurea University of Applied Sciences in Leppävaara. The research is anonymous and no single respondent can be recognized. The gathered information is treated confidentially. Thank you very much in advance for your contribution!

To complete the study, four open-ended questions was compiled to complete the research. The questions are straight forward and easy to respond. Your response will help me to identify what is most important to you, how to maximizes course visibility, course offerings and if a hybrid tool or framework could help connect students to courses.

Below are the questions that were created from the results of the student survey. Please answer the questions to your best ability.

1. According of respondents to the student survey, a vast amount of respondents preferred a mixed form of learning both online and contact course.

What would help you in offering a more hybrid / fully online courses? What would be an ideal combination of online and contact in your study unit?

2. In the student survey, information on courses was a predominant factor when choosing courses the right courses. Majority of respondents felt information received about courses should come from student desk top and electronic means. In addition to this, respondents felt that additional information was needed such as, course content, length of the course, course timing, and whether the course recorded.

What course information do you think is the most important when helping students to choose what to study?

3. The student survey questionnaire revealed that most respondents were not familiar with a recommendation system.

Have you ever bought something from a store recommended to you by a trusted source or received advertisements recommended to you by a third party based on your activities online?

4. Finally, in the results of the student survey, an overwhelming 89% of all respondents wanted a system or application that would help recommend or remind them of the best possible courses according what was most important to them.

In your opinion, would an automated framework or recommendation system to students help find most motivated and interested students to your course?

As part of the research students were sent a survey questionnaire of fourteen questions which was set into three categories. The categories are: Background information, Information evaluation, and Opinions about a recommendation hybrid approach. Below is a breakdown of the student survey.

The in first category, four questions were designed to get background information of the respondents. The questions looked into the participant's age, what kind of students they were, (full time, part-time, or single course students) and what motivated the participants most when choosing courses.

In the second category, seven questions were designated to give insight to the respondent's desire in regards to what they felt was most important when choosing courses. These questions where designed to find out what was the most important information to the participants such as, if content in course description was sufficient or was there a lack of information in their opinion, what kind of additional information was needed, and what information influenced respondents most in regards to course selections.

In the last category, the final three questions were made to get an idea to whether respondents had prior knowledge of a recommendation framework. The aim was to find out whether this kind of an approach would be useful to the respondents and how they felt about a hybrid system that would give suggestions to get more precise suggestions for what to study.

Appendix 5 Directors survey

Director’s questionnaire.

Lifelong learning plays an important role for Universities. Universities help educate and re-educate students to equip them with the knowledge needed in the working markets. New professions and new technologies like digitalization increase the need for new skills and services or re-training that the universities can offer in the form of courses.

Social media and the Universities webpage acts as facilitators and architects of information and what the universities have to offer. Gaining visibility and reaching information to individuals is important to the university, as well as for potential students who are looking to study or improve their competence.

The e-commerce world uses the recommender system which helps, simplifies, and influences the customer decision-making process by suggesting extra products to the customer and efficiently save time in searching thus improving customer loyalty towards the e-commerce site. As in the e-commerce world, the universities can help influence the student's decision-making by providing key information and ease the decision-making process for the students.

According to the research done in the thesis, information was a predominant factor when choosing courses in the student survey. Information related to, the timing of the course, the knowledge gained, supplement that complete career path, and courses that best support their future profession.

1. **Would you see an opportunity for Universities of Applied Science to use the Recommender system to provide information and helping students in the decision-making process?**
    a) By reminding the individual of the study opportunities with different course options?

    b) Help out-of-house individuals to get access to information about courses, study degree programs, or what the university has to offer?

    c) Do you see the possibility of influencing the selection of student material for suitable courses or degree programs with the recommender system?

2. **What are the biggest challenges recommendation system should address?**

3. **What should be taken in consideration when designing recommendation systems to universities?**