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Developing an Intelligent e-Learning Portal: Challenges and Opportunities

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The purpose of this thesis was to study the concept of eLearning portals, and to analyse the current educational portals used by the students of Helsinki Metropolia University of Applied Sciences, and to understand their advantages and disadvantages. Finally, the goal was to develop an eLearning educational portal which would replaces all the current portal functionalities for eLearning and intensive week courses. The user groups of the services of the portal are students and other individuals participating in such courses.

The basic edition of the portal was developed using Microsoft ASP.NET Web Forms, Microsoft SQL Server 2014, Microsoft Visual Studio 2013, and Bootstrap, and the advanced edition of the portal was carried out using Microsoft ASP.NET MVC5, Microsoft SQL Server 2014, Microsoft Visual Studio 2015, and Bootstrap.

As a result, the requirements set for this portal were accomplished. Also additional features, such as enabling social networks integration, and live sessions were realized and placed in the priority list for future implementations and updates of the portal.

The portal designed will be used for the targeted users of the portal starting from January 2016.

Keywords	eLearning, portal, MVC framework

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Abbreviations

ASP	Active Server Pages
CSS	Cascading Style Sheet
DLI	Difficulty Level Indicator
HEI	Higher Education Institutions
HTML	Hypertext Mark-up Language
IDE	Integrated Development Environment
MVC	Model View Controller
PDF	Portable Document Format
SQL	Structured Query Language
UAS	University of Applied Sciences
UI	User Interface

1 Introduction

Nowadays, people are not questioning anymore whether it is logical to spend their time and resources on benefiting from proper education or not, it is as clear as the pivotal and inevitable role of computers in our everyday lives.

For developing a desirable course, the primitive footstep is to provide beneficial material and content. To deliver the material to the students, audiences, and targeted groups, one needs to create an outstanding and comprehensive delivery method. Offering knowledge, solely base on written books is ancient history now. By the advent of computers, we are facing an ever changing situation almost every year. There are tools and methods being invented every year, which may be used for educational purposes. Educational administrations, especially in developed countries are spending a big portion of their budget on adopting and equipping themselves with such new tools and abilities to provide state-of-the-art applications to make it easier for their targeted groups to learn, and have access to their material. Computers and smart gadgets are here with us now. There are two factors which we benefit from their progress every day, better performance of computers and a higher speed of accessible internet. Such progress equips educational administrations to offer more advanced applications for educational purposes.

Effects of an exemplary educational system on any society is inevitable and plays a pivotal role in the diverse aspects of a community such as economic status, health system and welfare. Nowadays, governments consider the abovementioned issues as a top priority. In order to make sure the next generation will become an urbane, well-mannered, and proverbial, one has to select a proper educational system.

eLearning portals have been a marvellous helper for educational systems. By eliminating the need of making one’s teachers and educational staff being present in every classroom, the system simply duplicates their teaching force in an unlimited way. No matter how many students and classrooms the system has, once a proper eLearning portal has been developed, it can serve all those students by providing dynamic eLearning solutions.

The goal of this thesis was to analyse all the primary and secondary portals which students of Helsinki Metropolia UAS are using for their educational purposes, then summarize the necessarily requirements of an eLearning portal, and finally develop a comprehensive eLearning portal using state-of-the-art programming technologies.

2 Background to Portals

A web portal is specially-designed website which offers information from various sources in a unified single path. One of the major and most practical applications of such portals is providing a quick response over user's requests. [1.113]
A User Interface (UI) and appearance of a web portal can be displayed as a representative of the content, data, and information included in a site. UI may be demonstrated relevant to layouts and styles, and it may changes during each access. Such changes may be managed by users and portals. Mostly the system selects a design to filter the information for the user, and gives them the ability to navigate through content and pages. [2, 1]
To being able to develop a practical eLearning portal, first, one needs to understand the theoretical background about the eLearning portals, their purposes, and functionalities, and the features which the current competitors offer.
In the following some theoretical background related to this thesis will be discussed.

2.1 eLearning portals

eLearning is learning via utilizing electronic technologies and resources to access educational curriculum outside of a traditional classroom. Mostly, it refers to a course, program or degree delivered online as digital content.

Furthermore, eLearning portals are online systems to provide courses and material to the students who are the audience of such portals.

2.1.1 Benefits

By the advent of eLearning portals, quite many limitations for educational institutes are history now. In the following, the major benefits of using eLearning portals will be discussed.

eLearning materials may be made accessible to the students throughout the day. Such fact makes it possible for students to learn the subject at their own pace and in comfortable environment. Also, unlike conventional learning methods where classroom environment is provided, eLearning ensures the students may complete their studies sooner which such fact leads to enhancing productivity.
Once the material of a course is ready, the system may offer the course over and over again. Such a fact will increase the total number of participants could lead to greater financial benefits both for teachers and educational institutions. As a result, the cost of courses for end users, who are students may also be lower.
By developing a self-assessment system, a sizeable amount of time from teachers will be saved. Therefore, they may focus their time and resources on providing more beneficial content and material.
Since it will be up to the students that from where and when they want to start and continue their study tasks, it will lead to a more productive study plan.

2.1.2 Drawbacks

There are several aspects to discuss related to the concerns over eLearning portals. A weak-structured eLearning portal may act as a misleading educational resource. Since students directly do not have access to the courses teachers, the system mostly will rely on the portal. In the following, In the following, some issues which need to be confronted and solved to make sure an eLearning portal will act as a beneficial educational resource will be discussed.

Since the portal is the main source of content, material, and assessments, the availability and runtime of the server which the portal will be installed in, has to be guaranteed.
In the case of losing critical information, such as students' transcripts, or assessment information, the cost will be unknown. Therefore, the admin needs to always have an updated backup from critical information. If a student regularly encounters dysfunctionalities such as broken links or interruption of services or wrong assessment methods, he/she may lose motivation to follow the portal guidelines. The developing team needs to have a proper test plan to make sure the portal works perfectly.

Since the student deals with the portal all the time, the portal needs to make the student motivated to complete the necessary tasks. Having a pleasant design and pleasant structure will help a lot to make a student more eager to finish a course. Since the students

need to individually complete the tasks, and they may choose when and where start to work on the assignments, there is a chance that they may forget about such tasks. The portal needs to constantly remind the students about their current tasks which need to be done.

2.2 Current portals for Metropolia students

There are several portals being used by students of Helsinki Metropolia UAS for their studies. In this section, such portals and analysis of their features, advantages, and disadvantages will be discussed. In addition, a survey has been carried out related to such portals and asked from current students of Helsinki Metropolia UAS about their opinions toward the portals they are using.

In Figure 1, there is a list of different portals being used by Helsinki Metropolia UAS students.

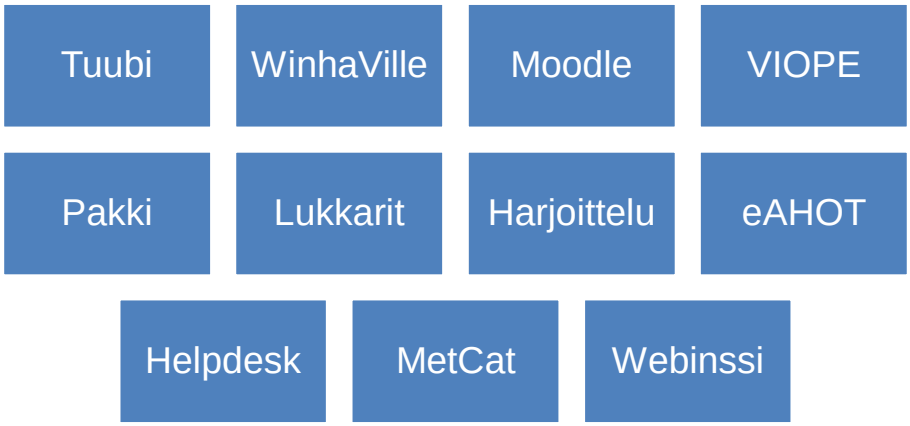

Figure 1. Different portals and platforms being used by Metropolia UAS students

As it was listed in Figure 1, there are several portals to be used.

2.2.1 Tuubi portal

Tuubi portal [3] is the major portal which students of Helsinki Metropolia UAS use during their studies. After sending their enrolment request in yet another portal, their request needs to be accepted by the administrator or the teacher of the course and then they will be added to the course workspace. After this phase, the students will have the course in Tuubi portal as an ongoing course. In Figure 2, there is an example of ongoing courses list.

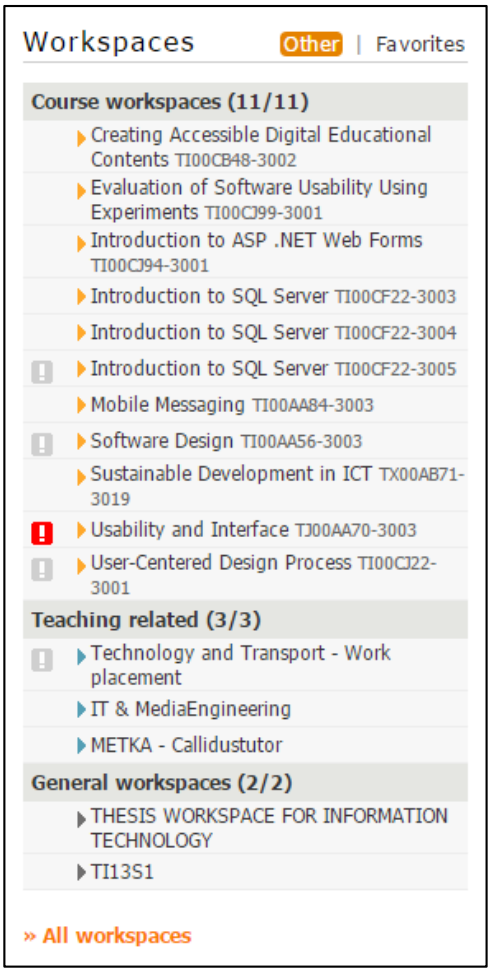

Figure 2. Workspaces list in Tuubi portal

Mostly, the teachers use Tuubi to provide students with their material related to the courses and add assignments for students to do and return for assessment.

To enter this portal students need to log in with their Metropolia user details (Figure 3), and once they have logged in, they will be redirect to the main dashboard of the portal (Figure 4).

Figure 3. Login page of Tuubi portal

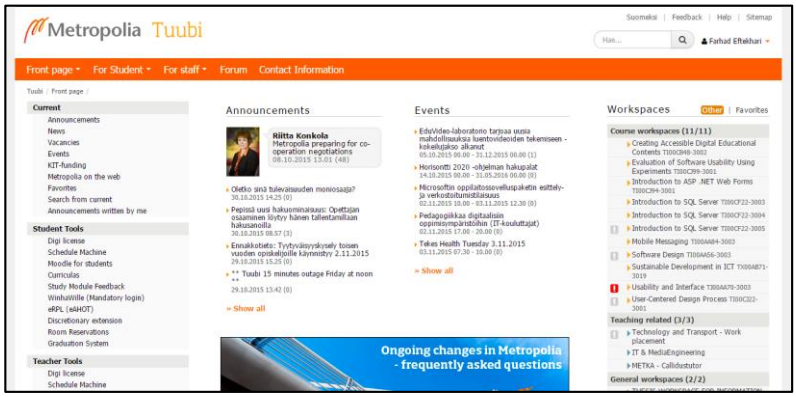

Figure 4. Home page of Tuubi portal

Tuubi portal as it was noticeable in Figures 3 and 4 has Metropolia especial orange color code.

In the following section, some features of Tuubi portal will be discussed.
There are many features and tools combined in Tuubi portal for students to use. Some of these tools are directly related to the courses of the portal. Tools such as receiving and downloading documents related to the courses for content and material of the courses. Receiving announcements from the teachers and sending a copy of announcements to the enrolled students Metropolia email address, having an ability to upload assignments and grading personal or group assignment, and finally having a discussion board to discuss topics during ongoing courses are the main features of Tuubi portal.

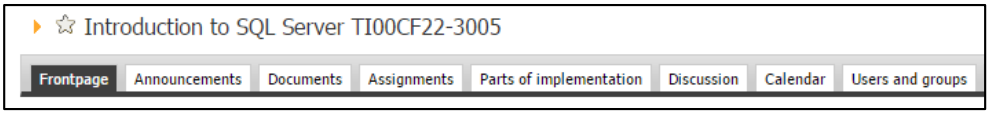

Figure 5. Course parts in Tuubi portal

Furthermore, there are many links which redirect the students to the content and material related to many diverse topics. Topics such as important dates, benefits and subsidies, crisis situations, student affairs office, and other topics related to students studies and living. Usually, the content of such topics are out-dated and hard to find. In Figure 6, there is an example of an important article which has not been updated for two years.

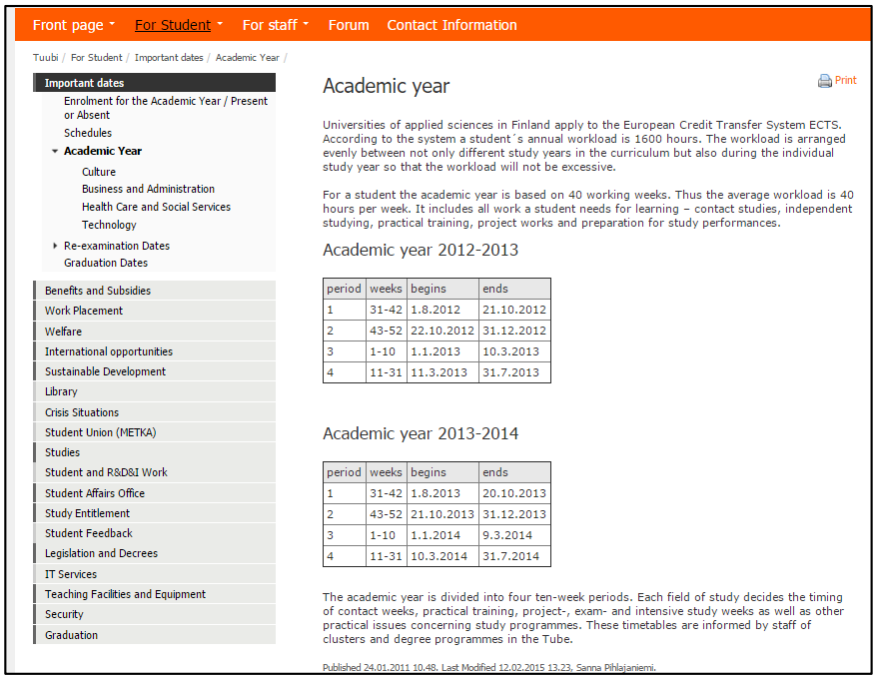

Figure 6. A sample of content page in Tuubi portal

In addition, the developers of Tuubi portal tried to make this portal a responsive portal, although, in the mobile view, many of the major features and abilities of Tuubi portal will be hidden which makes it hard for the student to use mobile view in practice. In figure 7, there is a mobile view of a course workspace.

Figure 7. Mobile view of a course workspace

Mainly, the workspaces list and some other content are only accessible in mobile view. In the following, there are some advantages of using Tuubi portal:

- Being used commonly by the teachers of Metropolia courses
- Having course workspace primary tools to be used by teachers and students
- Having links to other primary portals

- Using color codes related to Metropolia

In the following, there are some disadvantages of using Tuubi portal:

- Hard to find material, since many features and content are combined in a single portal with not very practical order.
- Not having a unified design structure which makes it quite hard for users to understand the link between parts and content.
- Having a not very practical mobile view base on the concept of responsive design.
- Not being a stand-alone portal since Tuubi requires other portals for many major tasks such as enrolment and receiving transcript of records.
- News and announcements of the portal are not in a well-designed pattern which makes it hard for the users to follow them.
- Combination of Finnish and English content with no filter ability which makes it even harder for users to follow especially for international students with limited Finnish language skills.
- Constantly stopping of services for maintenance

The following survey in Figures 8 and 9 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

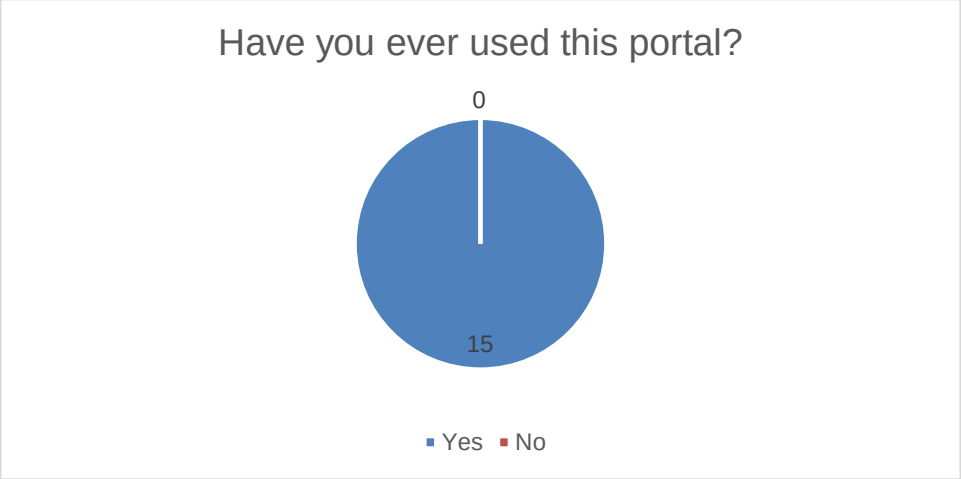

Figure 8. Survey for Tuubi portal

All of the students used Tuubi portal before, since it is a primary portal of their studies.

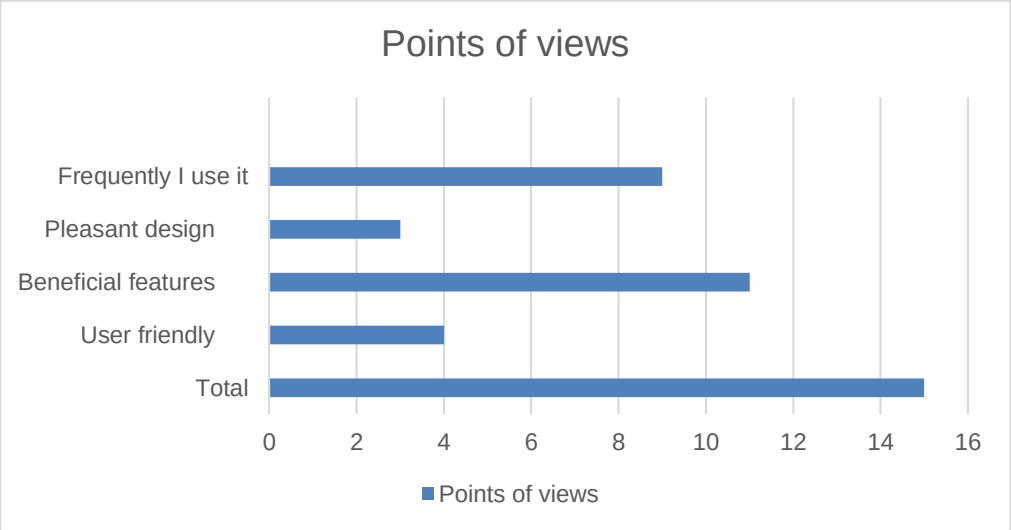

Figure 9. Survey for Tuubi portal

11 out of 15 of the students believe Tuubi portal has beneficial features, but only 4 out of 15 believes the portal is user friendly.

2.2.2 WinhaVille portal

In Helsinki Metropolia UAS, the students need to use another portal for specific tasks. If a student wants to enrol on a course, he/she needs to login in WinhaVille portal [4] with same Metropolia ID he/she uses in Tuubi portal (Figure 10)

Figure 10. Login page of WinhaWille portal

After being redirected to the home page (Figure 11) which shows to the user if he/she enrolled in current semester, the student needs to click on Implementation link and after being redirected to Enrolment page, the student needs to enter the course code or look for the course he/she is looking for by applying some search filters (Figure 12).

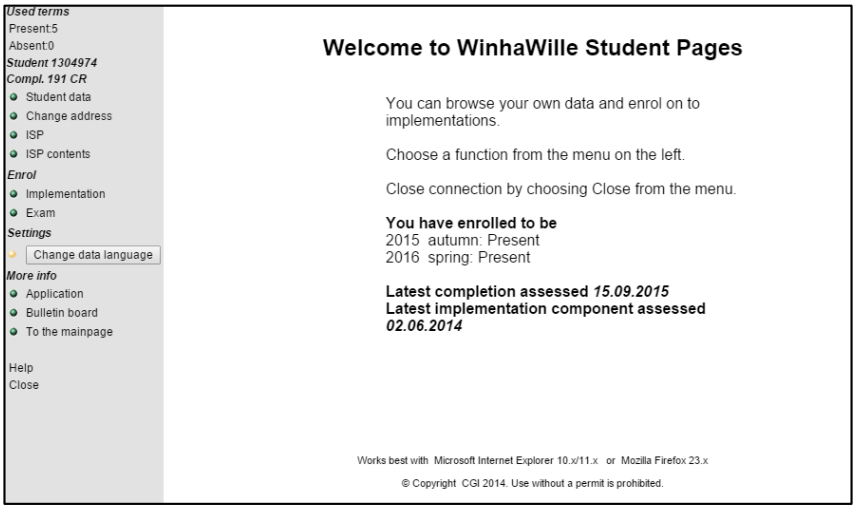

Figure 11. Home page of WinhaVille portal

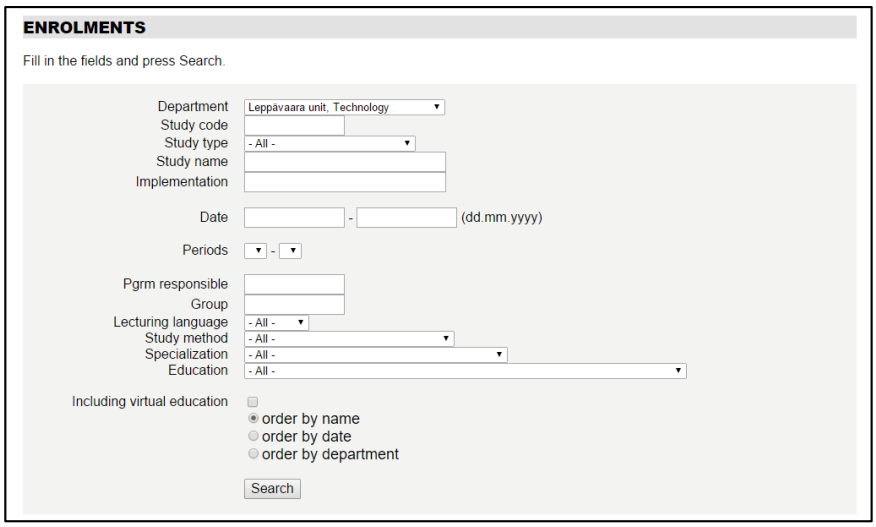

Figure 12. Enrolment form

In addition, the students may see a list of the courses they passed or have ongoing courses in a single list combined all together (Figure 13).

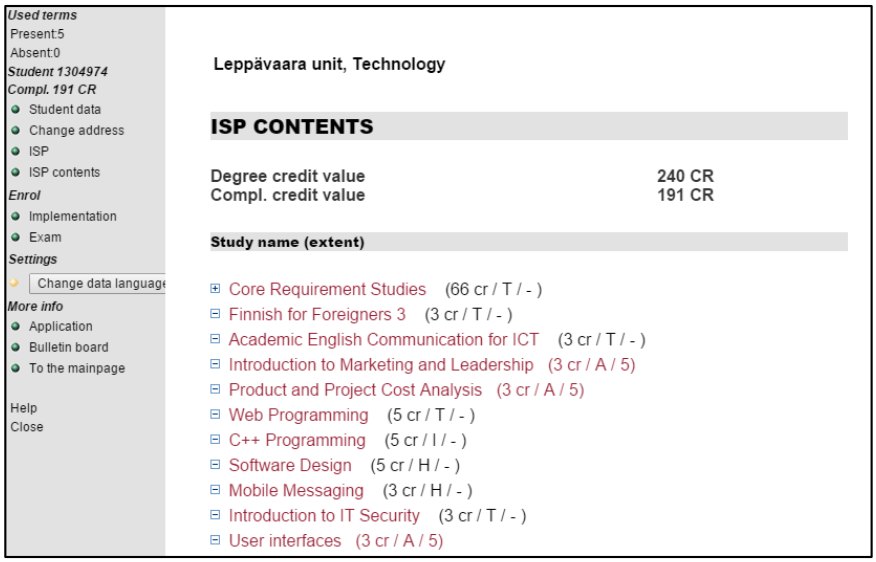

Figure 13. Courses list in WinhaWille portal which the student either completed or has as ongoing courses

In the following, there are some advantages of using WinhaVille portal:

- Having certain abilities
- Having a light-size design

In the following, there are some disadvantages of using WinhaVille portal:

- Having an out-dated design which is not user friendly
- Not having a mobile edition and not being responsive
- Using frames in HTML which is an out-dated concept and feature and it is not being recommended to use anymore
- Having a vague structure and not having a proper site map

The following survey in Figures 14 and 15 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

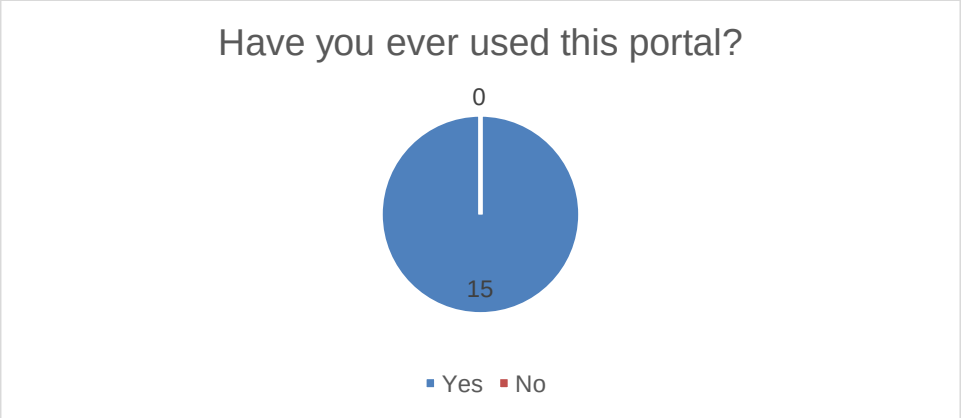

Figure 14. Survey for WinhaVille portal

All of the students used WinhaVille portal before, since it is required for enrolment.

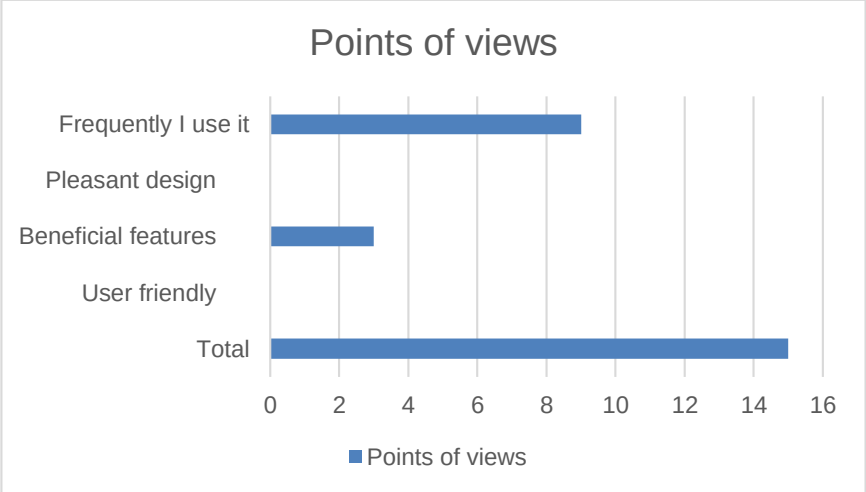

Figure 15. Survey for WinhaVille portal

As it is obvious in the survey result, the portal has a poor score in being user friendly and having pleasant design.

2.2.3 Moodle portal

Moodle [5] is a learning platform designed to provide educators, administrators and learners with an integrated system to create personalised learning environments. Moodle portal is being used by a few teachers when they are implementing their courses and it is an open source project which can be downloaded from its company website and installed by educational organizations. In Figure 16, there is a screenshot of the login page of Moodle portal. Also in Figure 17, there is a screenshot of a course page in Moodle portal.

Figure 16. Moodle home page

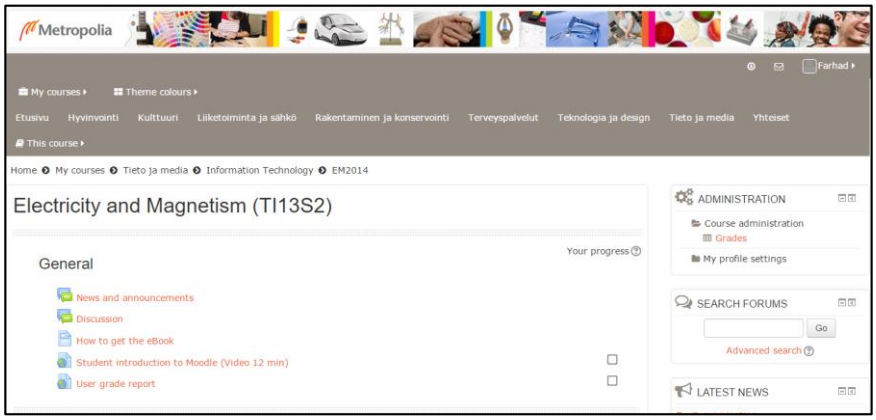

Figure 17. A sample of course page in Moodle portal

By having customizable management features, there are abilities to create private websites with online courses for educators and trainers to offer learning materials.

In the following, there are some advantages of using Moodle portal:

- Extra features and abilities comparing to Tuubi for the teachers and students of Metropolia to use
- More interactive look comparing to other portals
- Used widely in many universities globally

In the following, there are some disadvantages of using Moodle portal:

- Complicated to use, and since it is not being used quite often, it is hard for the students to get used to Moodle portal
- Complicated structure to use
- Not having a proper mobile friendly design

The following survey in Figures 18 and 19 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

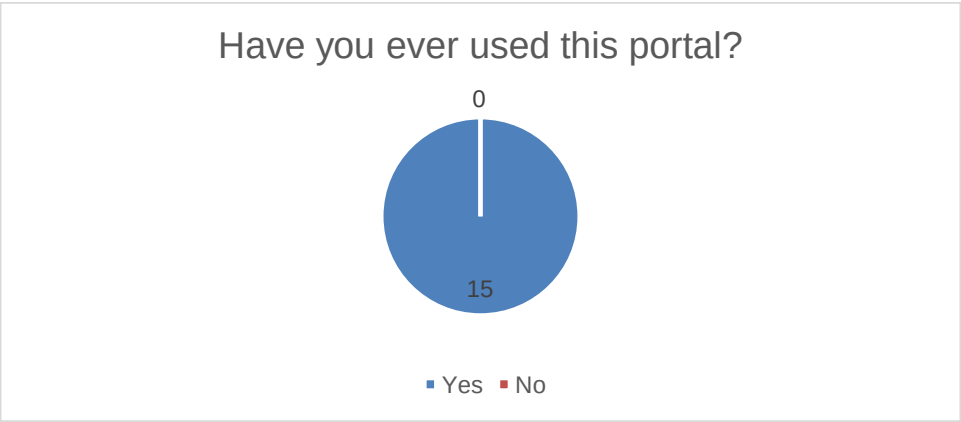

Figure 18. Survey for Moodle portal

All of the students used Moodle portal before.

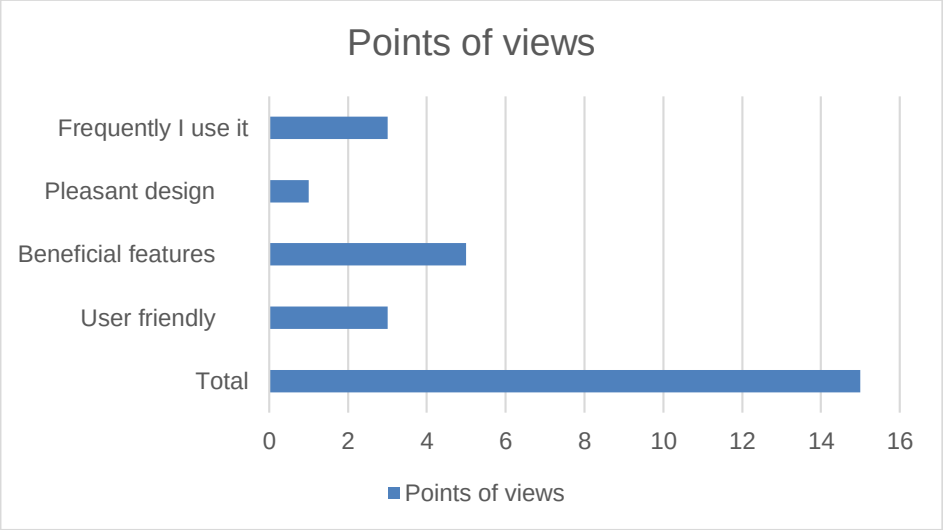

Figure 19. Survey for Moodle portal

According to the survey result, most of the students do not assume Moodle portal has beneficial features or is user friendly.

2.2.4 VIOPE portal

VIOPE portal [6] contains many optional eLearning courses gathered into one single portal for the students to learn individually and follow the instructors of the courses in order to pass courses as professional and optional studies. In Figure 20 and 21 there are screenshots of VIOPE main page and a sample course page.

Figure 20. Courses list in VIOPE portal

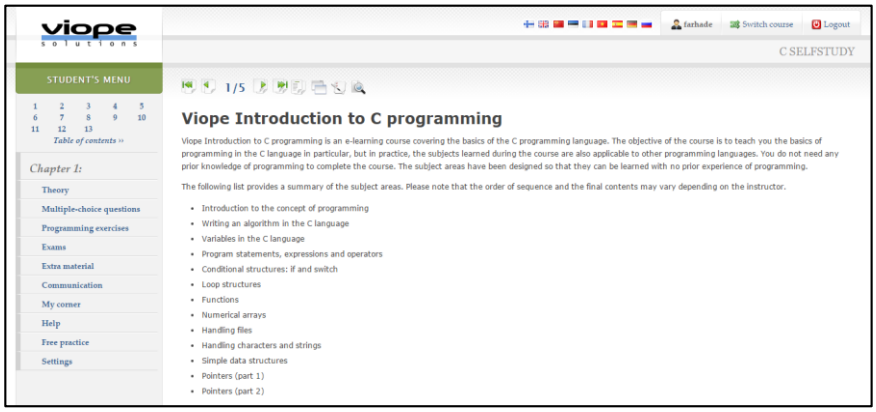

Figure 21. A sample course page in VIOPE portal

VIOPE provides simple eLearning courses for students to individually follow the course structures and complete exercises, and quizzes in order to pass the courses they enrolled on.

In the following, there are some advantages of using VIOPE portal:

- Having simple structure to follow
- Having many courses to choose from

In the following, there are the disadvantages of using VIOPE portal:

- Having programming bugs in assessing answers
- Not having a proper mobile friendly design

The following survey in Figures 22 and 23 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

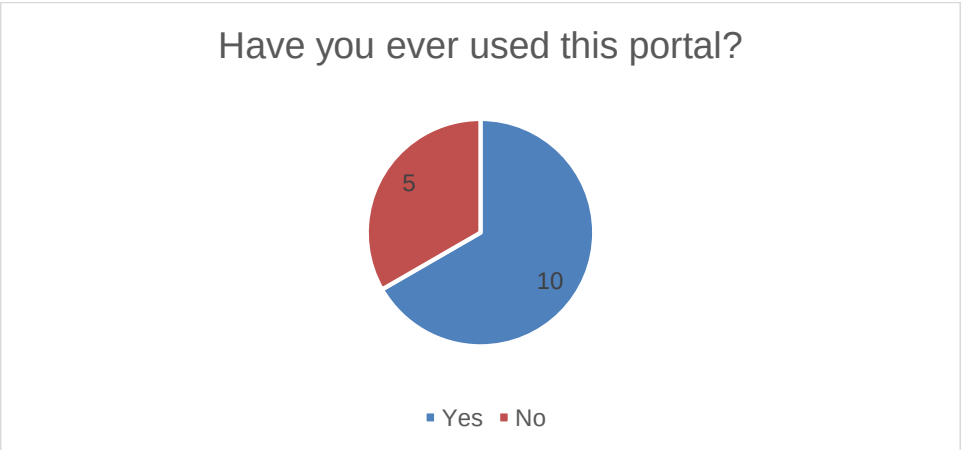

Figure 22. Survey for VIOPE portal

According to the survey, 2/3 of the students used VIOPE portal before.

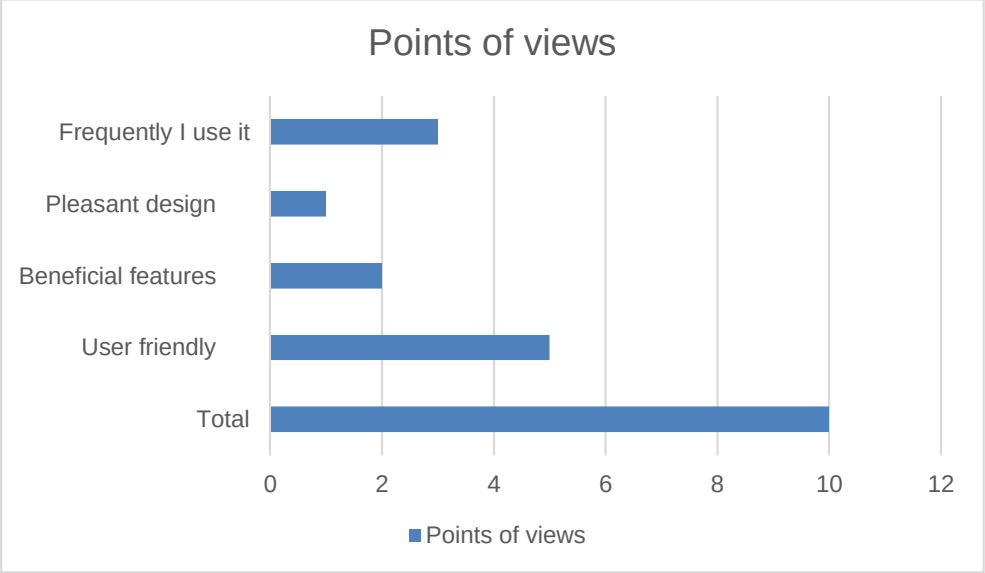

Figure 23. Survey for VIOPE portal

According to the survey, half of the users of VIOPE portal believe the portal is user-friendly and only 2 out of 10 believe it has beneficial features.

2.2.5 Other secondary portals

Here is a list of other portals being used by the students of Metropolia:

PAKKI portal

At Helsinki Metropolia UAS PAKKI portal is another portal for the students to use. As it was stated in the PAKKI [7] portal home page, PAKKI will provide the students with an online access to the details of their study achievements. These services form a part of their electronic EHOPS (Individual Study Plan) Service Entity.

There is no specific login page and students can be redirected to this portal, after logging in Tuubi portal and select PAKKI from the top menu (Figure 24). Mostly student use this portal to download their passed courses as a PDF file.

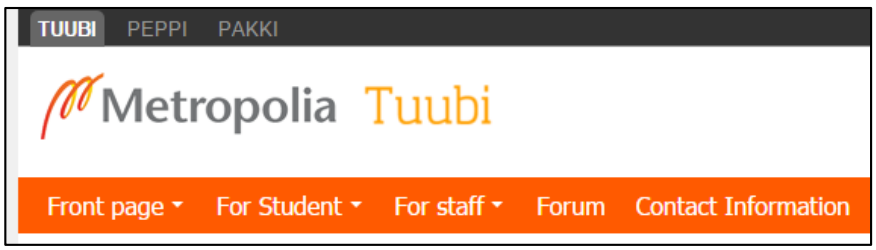

Figure 24. Header of Tuubi portal where there is a link to PAKKI portal

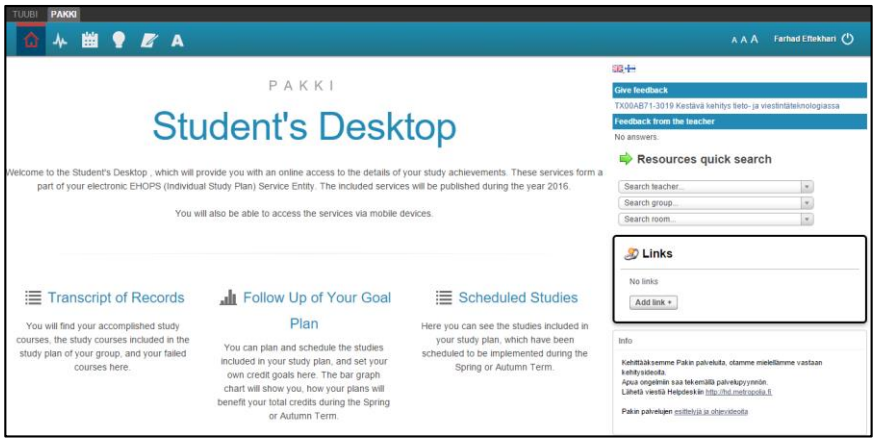

Figure 25. PAKKI portal home page

Usually there is a difference between the number of courses and credits being passed by the students in PAKKI portal compared to WinhaVille portal which indicates that such information is coming from different sources and there must be different operators entering information into such portals. In Figure 26, the number of total accomplished credits is 186, but in WinhaVille it was 191 credits. Also the course names are usually only in Finnish, which makes it harder for international students to understand such a list.

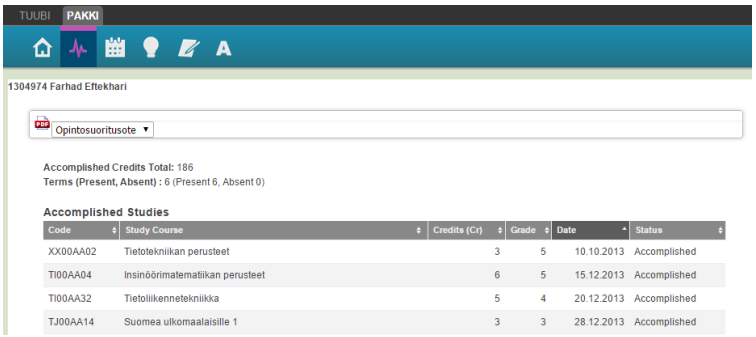

Figure 26. Completed courses list in PAKKI portal

The following survey in Figures 27 and 28 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

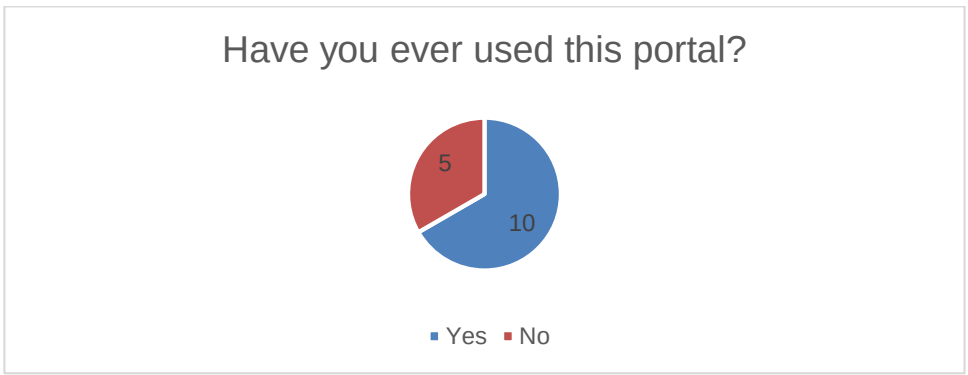

Figure 27. Survey for PAKKI portal

According to the survey, 2/3 of the students used PAKKI portal before.

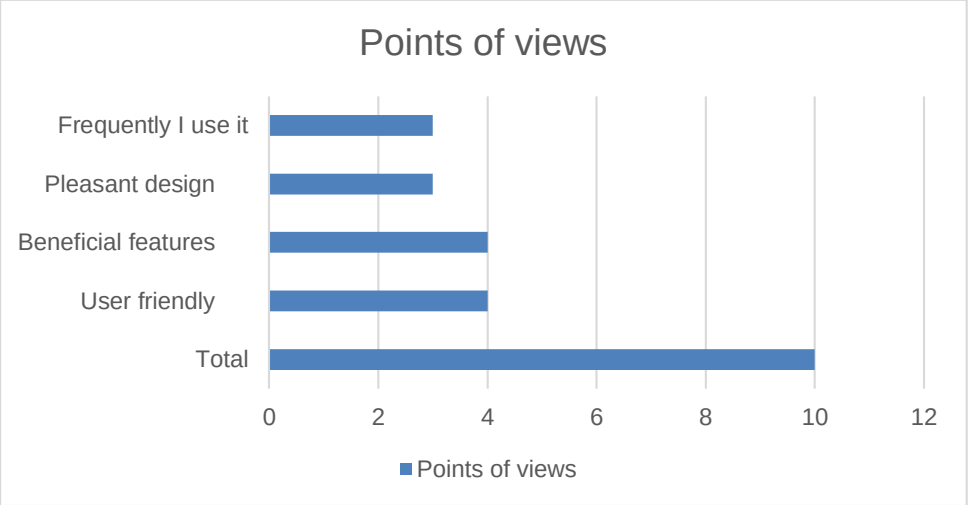

Figure 28. Survey for PAKKI portal

According to the survey, 4/10 of the students believe the portal is user-friendly and has beneficial features and 3/10 believes it has pleasant design.

Lukkarit portal

There is a specific portal to act as a schedule machine with powerful calendar and ability to synchronize events, sessions, and exam dates in students' personal calendars in other devices applications such as smart phones calendars.

The students may log in with their Metropolia user information and after the login, they will be redirected to the Schedule part of the portal, Lukkarit [8] (Figure 29).

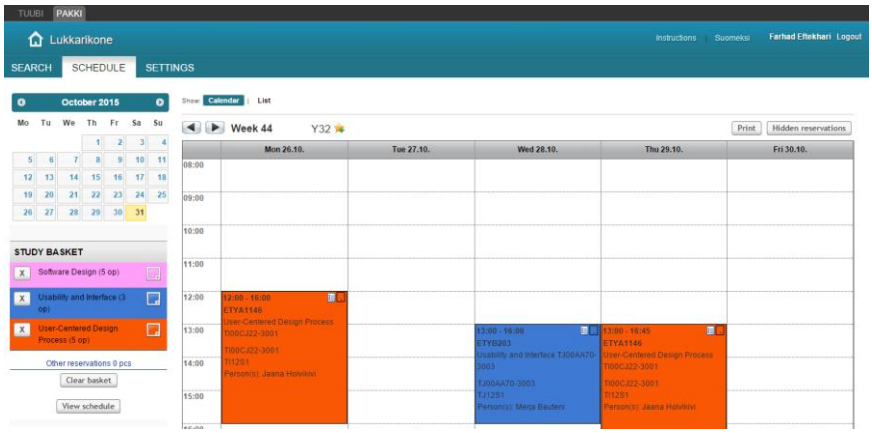

Figure 29. Schedule page in Lukkarit portal

There are also two other parts in this portal, one for searching for a specific course or a group calendar (Figure 30).

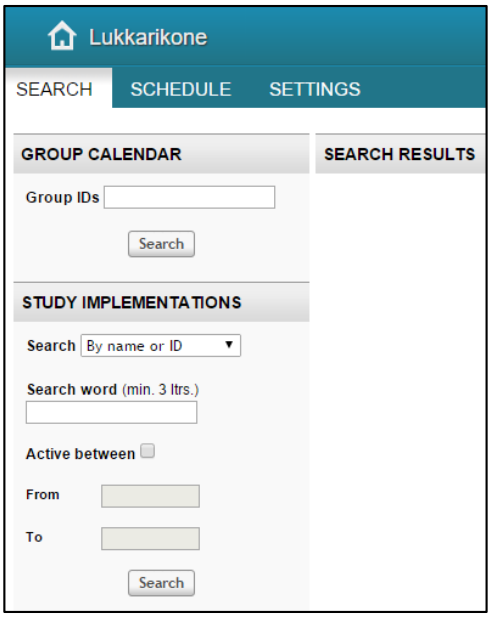

Figure 30. Search page in Lukkarit portal

Also students may store their calendar in their profile and assign a name to it. Therefore, they can later have access to the same calendar they personalized without looking for the same courses over again (Figure 31).

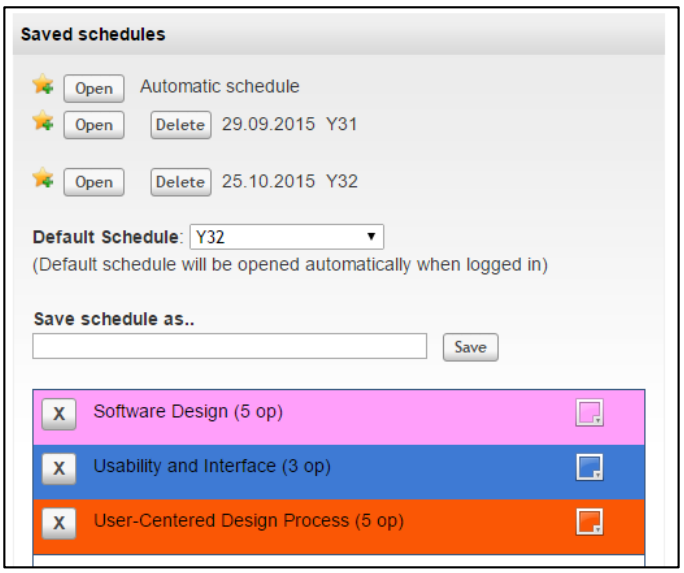

Figure 31. Setting page in Lukkarit portal

The following survey in Figures 32 and 33 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

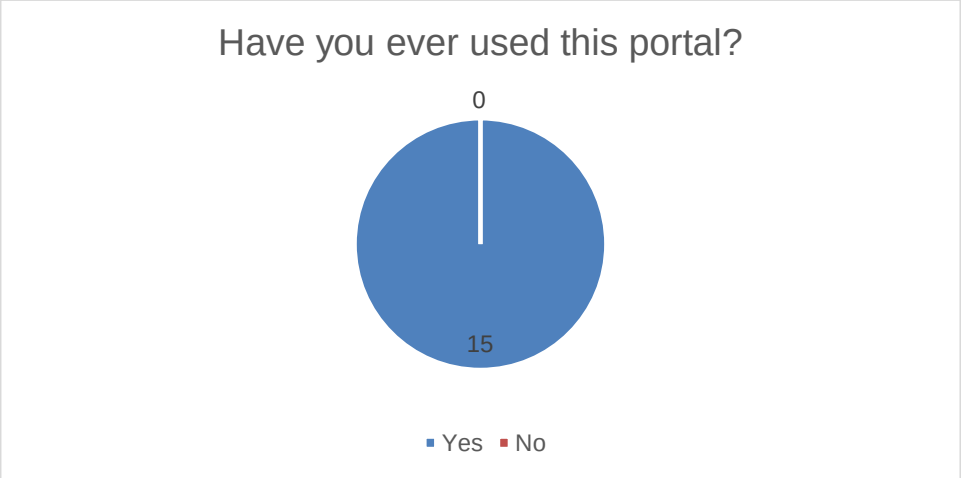

Figure 32. Survey for Lukkarit portal

All of the students used Lukkarit portal before.

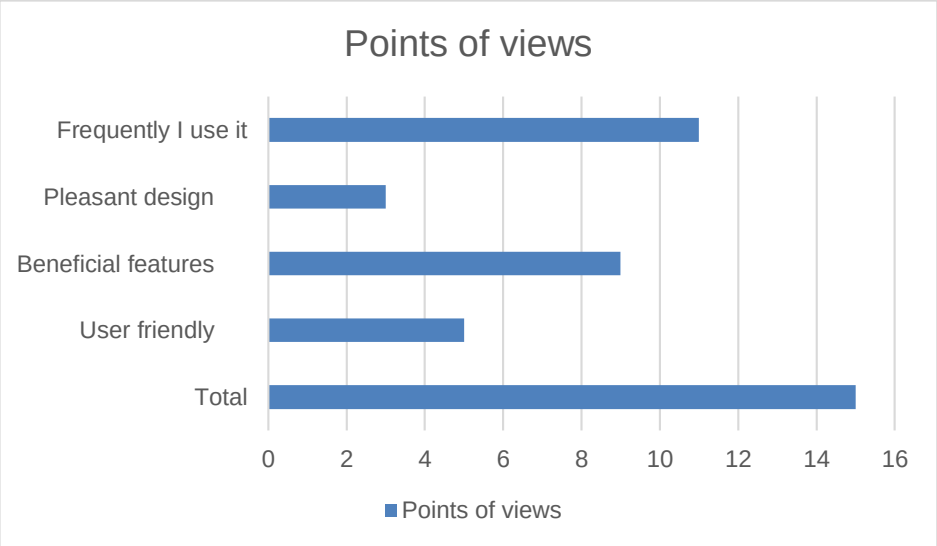

Figure 33. Survey for Lukkarit portal

According to the survey, 11/15 of the students frequently use this portal, and 9/15 believes it has beneficial features, although they mostly do not believe this portal has pleasant design or is user-friendly.

Work placement portal

To propose a work placement, students of Metropolia need to login in the work placement portal [9] and before starting their internship, they need to declare and provide the necessary information which is compulsory in order to earn their work placement credits. After their request got accepted, they will need to provide and upload documents and write a report regarding their work placement. Such tasks have to be done in the work placement portal. In Figure 34, there is a screenshot of the dashboard of this portal which is the landing page after students logged in with their Metropolia user information, and in Figure 35, there is also a screenshot of a form for proposing an internship.

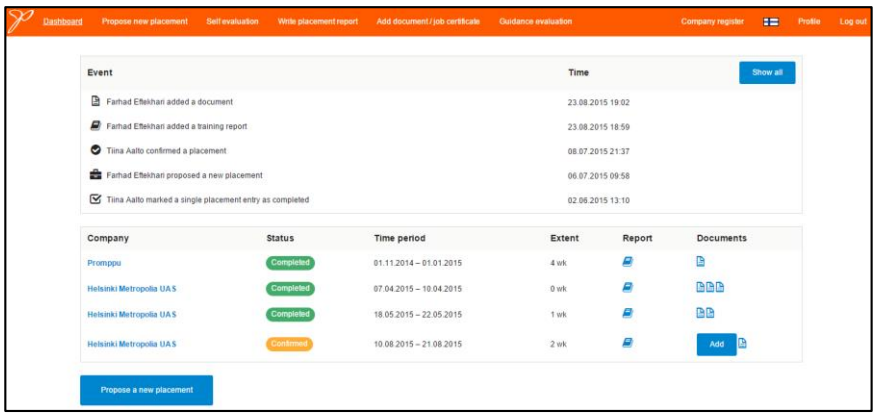

Figure 34. Home page in work placement portal

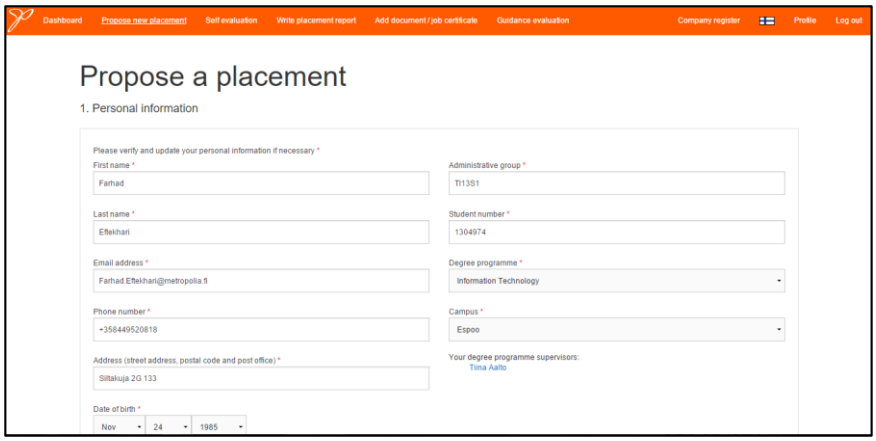

Figure 35. Propose a placement page in work placement portal

The following survey in Figures 36 and 37 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

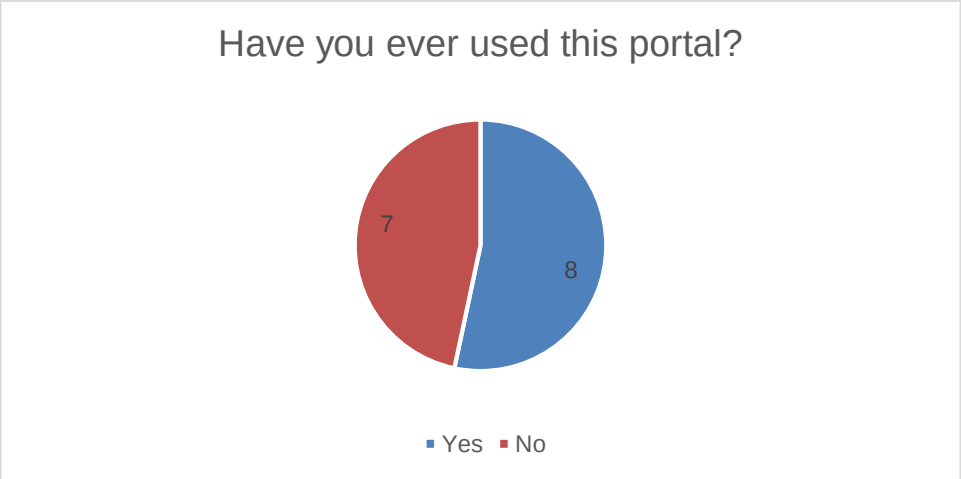

Figure 36. Survey for work placement portal

According to the survey 8/15 of the students used this portal before.

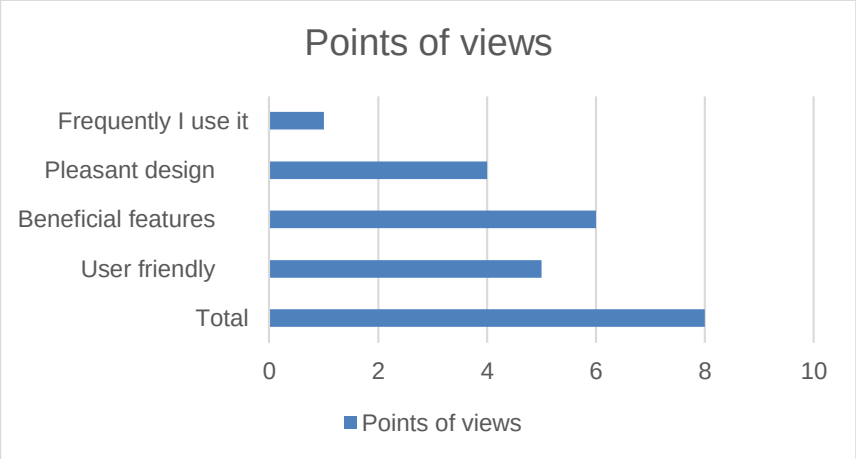

Figure 37. Survey for work placement portal

According to the survey, most of the students have positive feedback about this portal.

eAHOT portal

eAHOT portal is being used by the students of Metropolia to submit their requests related to transferring pre-passed credits at other universities before they start their studies at Metropolia. Also eAHOT will also be used to transfer credits from other universities while students participate in their courses. In Figure 38, there is a screenshot of the main page of the portal which is an inner page inside Tuubi portal.

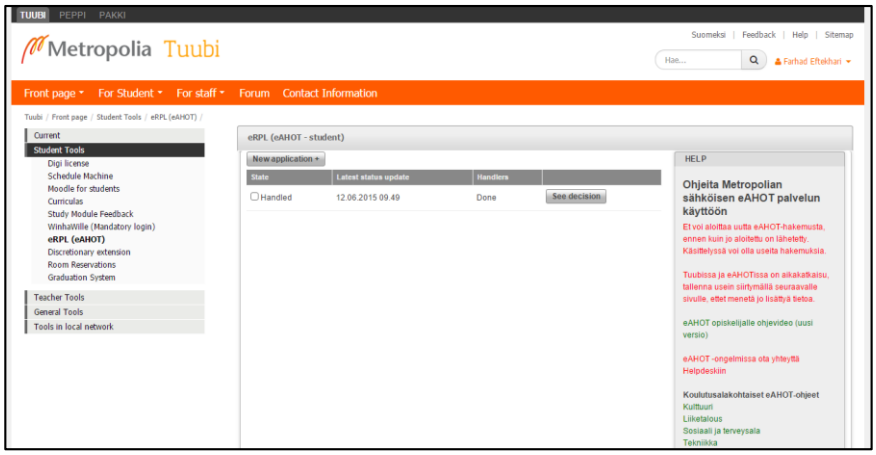

Figure 38. eAHOT portal home page inside of Tuubi portal

Helpdesk portal

Whenever students of Metropolia are in the need of assistance from the helpdesk, they need to submit their request to Helpdesk portal [10]. The requests will be analysed and answered by the Helpdesk team. In Figure 39, there is a screenshot of the login page of this portal, and also in Figure 40, there is a screenshot of the send request page.

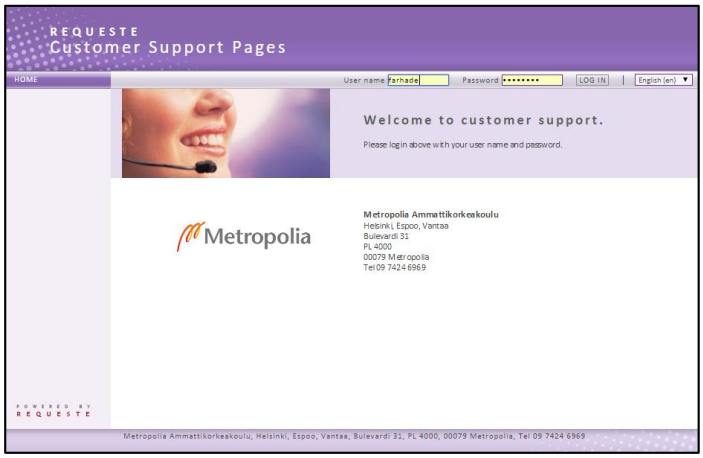

Figure 39. Login page of Helpdesk portal

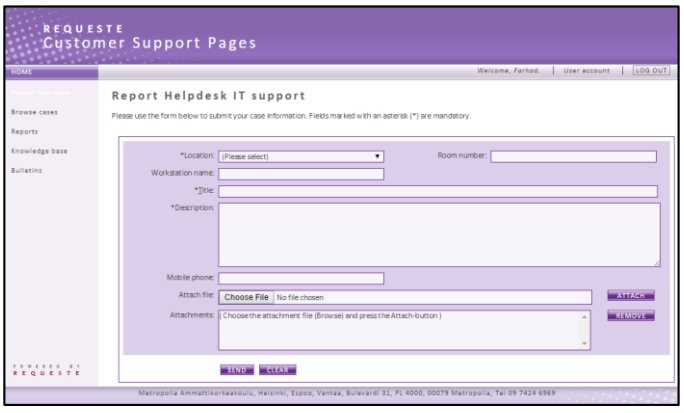

Figure 40. Report page in Helpdesk portal

The following survey in Figures 41 and 42 have been carried out of 15 full-degree students of Helsinki Metropolia UAS.

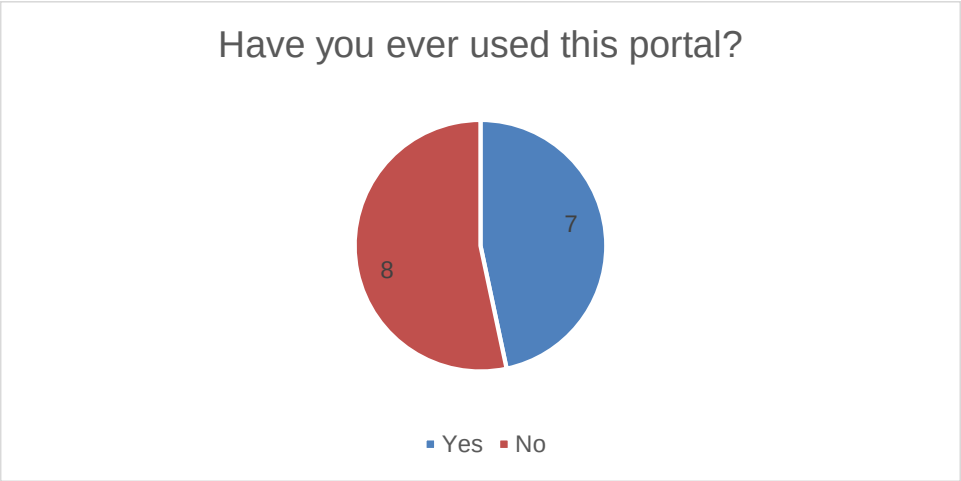

Figure 41. Survey for Helpdesk portal

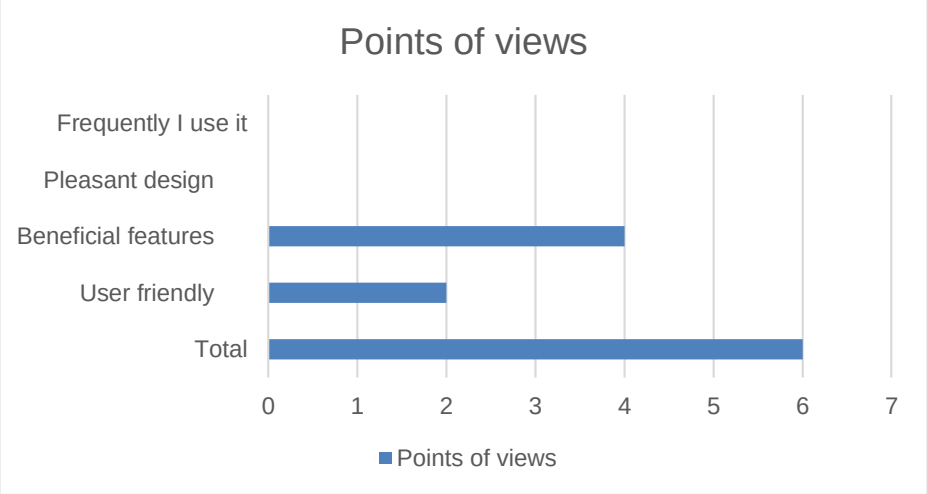

Figure 42. Survey for Helpdesk portal

MetCat portal

MetCat portal [11] is Metropolia library portal. Students can search for the material they are looking for, or check their borrowed items and renew them if they wanted to. In Figure 43, there is a screenshot of the login page of MetCat portal.

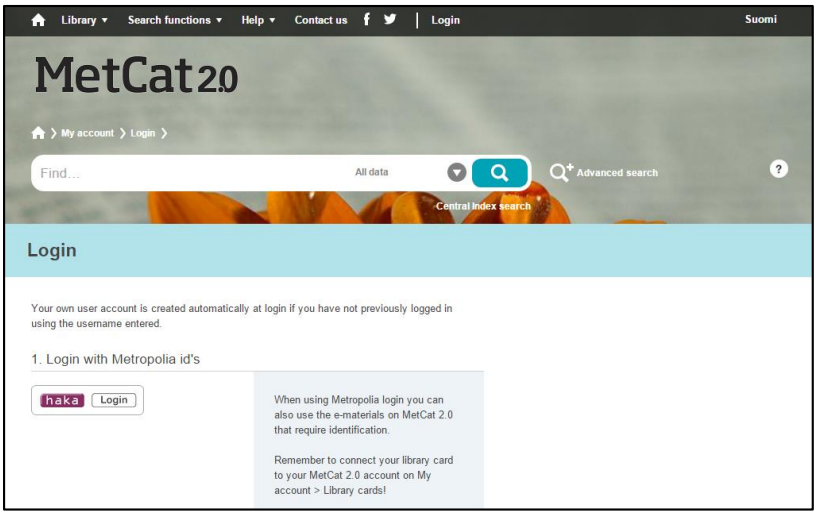

Figure 43. Login page of MetCat portal

Webinssi portal

To declare the thesis subject, description, and instructors, students of Helsinki Metopolia UAS need to submit a request in Webinssi portal [12]. In Figures 44, and 45, there are screenshots from Webinssi portal.

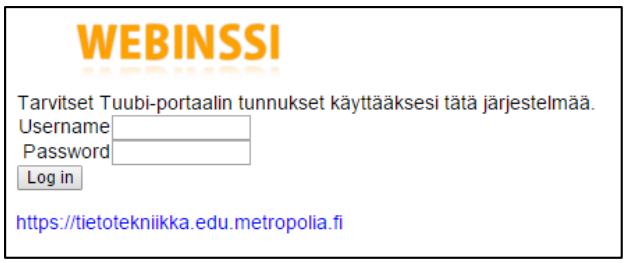

Figure 44. Webinssi login page

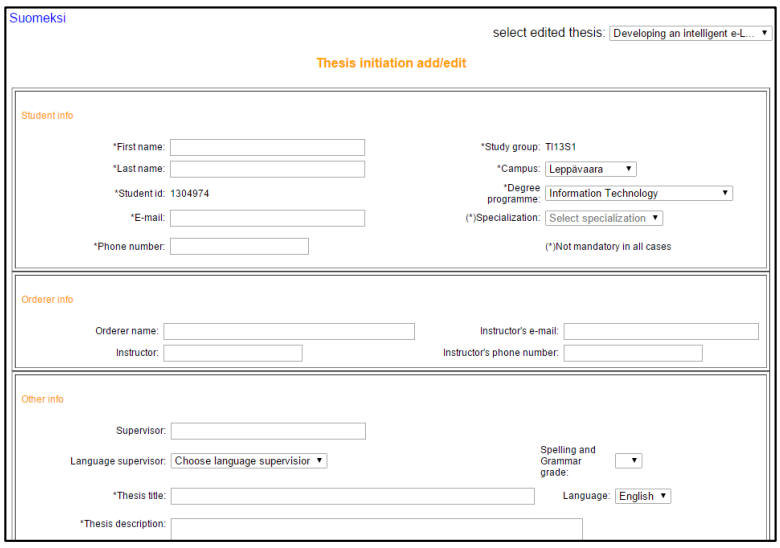

Figure 45. Add thesis request page

As it was noticeable in the Figures, the portal is primitive when it comes to the design and being user-friendly.

2.2.6 Survey results

Here in Figures 46 and 47, one may compare feedback received from the survey of different portals.

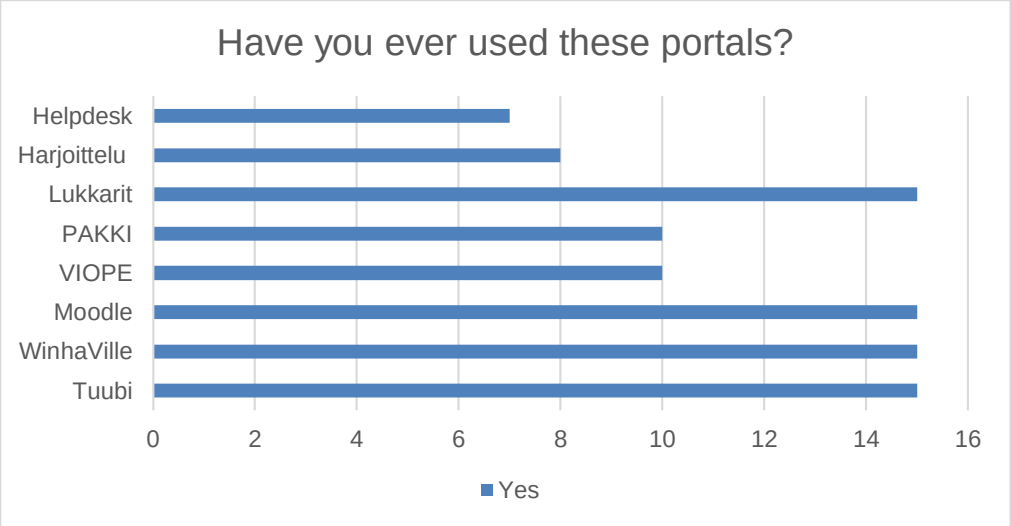

Figure 46. Question 1 results

According to the survey, Tuubi, WinhaVille, Moodle, and Lukkarit has the most visitors, when only half of the students used Helpdesk portal before.

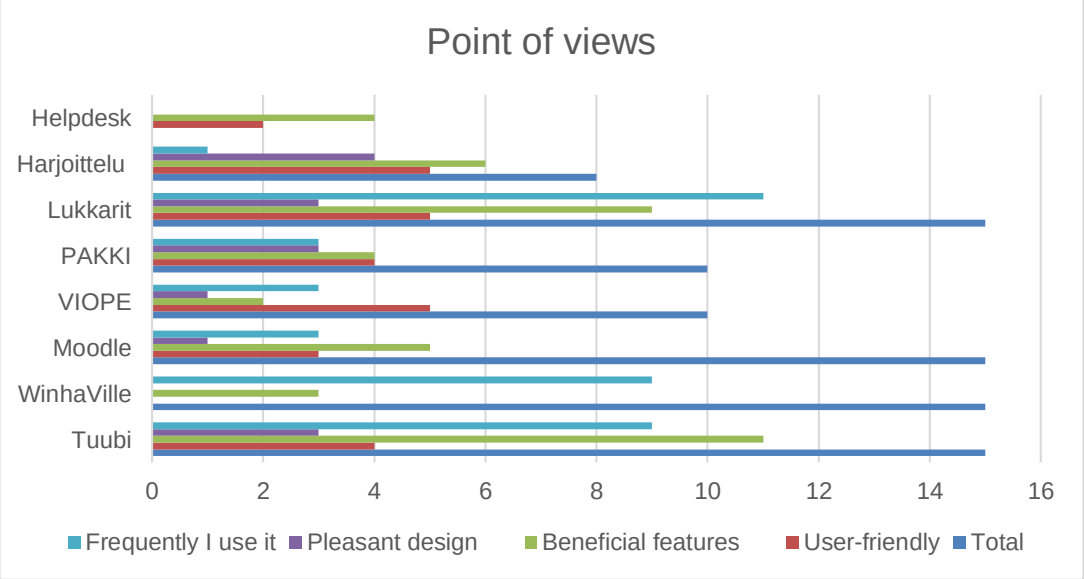

Figure 47. Question 2 results

According to the survey most of the portals are struggling in being user-friendly and having pleasant design.

3 Requirement analysis

The amplified use of technology in course instruction is an inevitable change in higher education. Higher education institutions (HEIs) use technology in instruction need to alter their focus: instead of asking whether or not technology ought to be used for instruction, they should rather focus on how to effectively adopt technology for instruction to increase or improve their capability to educate using technology. HEIs are installing computer technology in their campuses at a swift rate for numerous purposes as it can play a pivotal role in effective learning and teaching. One example of such computer technology is e-assessment. Many HEIs accept Web-based learning systems for their eLearning courses. However, there is limited study of the factors underlying student adoption of Web-based learning systems. Successful implementation of a system and adoption by learners requires a solid understanding of the user acceptance process and ways of encouraging students to engage with these technologies. Much effort goes into developing the technology for an effective and easy to use electronic assessment system, whether positive implementation depends as much, or even more, on understanding campus culture and using suitable change strategies. [13]

To develop a powerful, practical, and easy to use portal for the students, there are two main concerns the developer may benefit from. First, using many portals during the developer's own studies gave him adequate perspective over students need, and their point of view regarding the application of using portals for their studies. Second, teaching few courses as intensive courses in Metropolia was a great opportunity which made him to obtain experiences on the other side of a class, which was teachers' prospective. Therefore, by considering such matters, his ideas and plans could become more realistic and practical to be used by both groups of students and teachers.

In the following, the experiences which the developer gained through teaching his courses which were related to developing an eLearning portal will be discussed:

3.1 Teaching experience

First, in real life situations, one has to always consider the fact that without defining and trying a method, all of the conceptions and may be superficial and not completely practical to apply. This is one of the main reasons that the portals being created only by the developers and not the cooperation of teachers lead to become unsuccessful projects, since they come up with the solutions from a whole different point of view. Teaching actual courses by the developer was a great opportunity that the university gave to the developer. A comprehensive log file of all the problems and issues which the developer were encountering got to be created, and by documenting their solutions, it was possible to avoid spending time to solve reiterative problems and issues. Second, confusion is the most unbearable concept for a student. If the student has no idea about a problem, or a situation in learning a material, he/she can hardly come up with a solution or find his/her way out of the situation. Therefore, having a steady and related study plan and material play a pivotal role in clarifying the process of learning. Thankfully, there are many diverse material related to Information Technology topics in books, journals, internet articles, and online videos which a teacher may use to create comprehensive content by expanding his/her own knowledge.

Hence, by gaining such experiences developing a realistic and practical structure for an eLearning portal was possible.

3.2 Methods and style

For offering a course, a teacher needs to have a study plan, and just like a student, an eLearning portal also needs to be able to follow the study plan.

3.2.1 Learning material

The content of a course is a primitive aspect of a course. The learning material of courses in the eLearning portal has been divided to the following items:

Developing a powerful eLearning portal without having beneficial and comprehensive course material will not going to be beneficial in the end. No matter how beautifully one design a portal, or in this case slide shows for students to use, without placing well-

structured, easy-to-follow, and well-targeted content. By diving the course into such parts, the teacher may makes it easier for the students to have a study plan and enable them to have goals and checkpoints while they are learning about a topic. Then, it will be easier to have such content in an eLearning portal.

Having tutorial videos is a great advantage for a course being offered as online course. Offering material in only text file formats may be monotonous for the students of the course to follow and learn. Furthermore, there are many interactive and innovative potentials in multimedia files such as using animations, sounds, moving objects, and etc. which by creating tutorial videos a teacher may benefit from. Finally, even if the course is being offered as a regular course in classrooms, therefore, if a student miss one of the sessions, he/she has the opportunity to watch tutorial videos related to that session and make himself/herself familiar with the topic which had been discussed.
Additional content, material, and files may also be hosted in an eLearning portal for more in depth material to download and use by the students.

3.2.2 Assessment

To determine if a student was able to pass a course or not an assessment method must be created. After providing content for students to receive from an eLearning portal, the next step ought to be assessing students' tasks. The smarter the portal is, the quicker and the more such portal will do the assessment job by itself. The ultimate plan is to create a portal to do assessment as an automation task with less interference from the teacher. Once teacher provided right answers and solutions to the problems and tasks he/she provided for the students to work on, after such phase, the portal needs to automatically assess the answers.

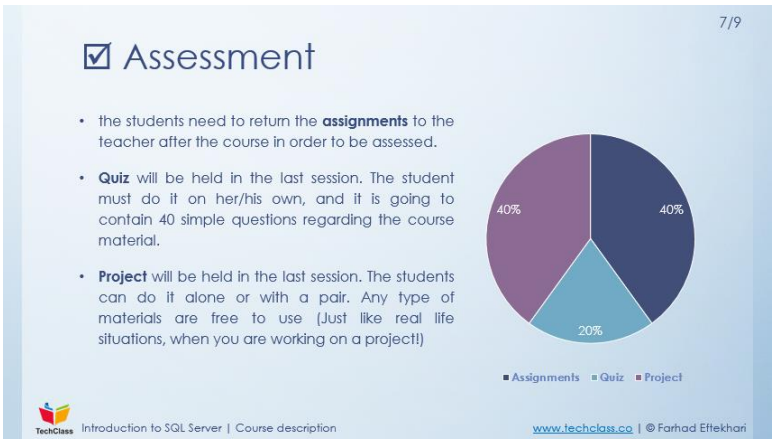

Figure 48. A sample of assessment method being described in a course description

Assignments

Assignments are simple problem solving questions which the students need to provide answers by researching about the related topics and content. The portal needs to have a strong built-in Artificial Intelligence to assess the assignments by itself since mostly the students will return text, and not only final answers as right choices or easy to understand keywords or numbers. The portal need to have a part which it shows the assignments to the students, and it asks for answers and the students need to provide such answers and submit them, to be stored for the teacher. The teacher after reading the returned answers need to accept, reject, or return the assignments and enter the points they received. Therefore, the students will not require to submit any extra document as a word document or PDF document by uploading somewhere or sending an email containing an attachment.

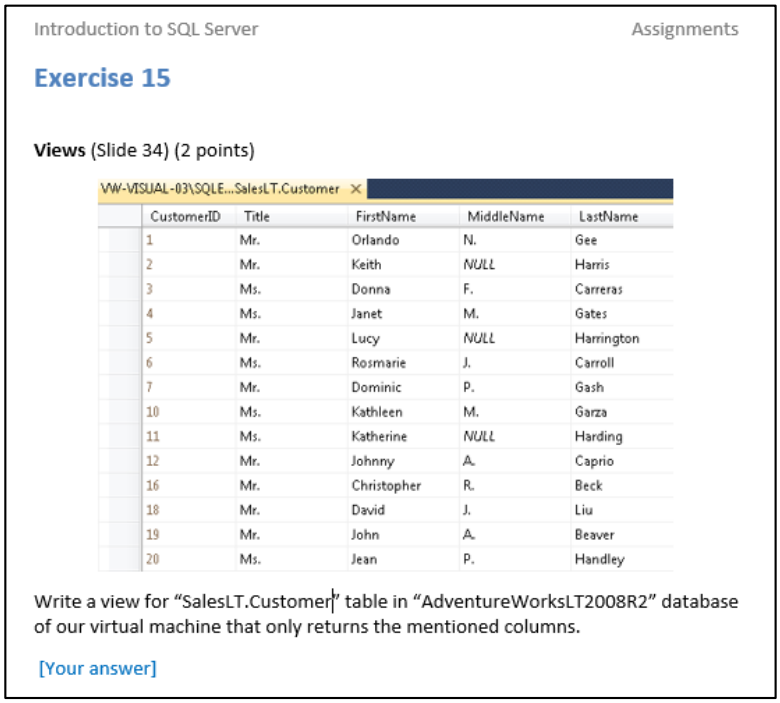

Figure 49. An exercise sample of a course

Quiz is easier to develop and assess comparing to assignments, since there are four choices questions and the students need to select the most proper answer which they believe is true. After submitting the quiz, the portal needs to assess the whole given answers and compare them to the right ones, to determine how much points the student received from the quiz and store it in the portal.

The final task to complete in order to pass the courses will be working on a project related to the course material. The students will have a final hands on experience on all the

major topics of the course by working on various steps in the project. In the portal, there will be a part for projects which the students will get familiar with it and the system will describe each step individually in a comprehensive way, and finally there will be an ability in the system to receive the project files from the student. The teacher later may receive the projects' files and assess them by his/her own and enter the scores in the system.
Throughout the learning process, understanding some precise topics of the subject may deliver great difficulties. The solution to such problems may be more complex in a virtual environment if one solely opts for strictly written feedback. Various actions are planned in order to respond to such situation in a flexible technique and to attain three major objectives: (1) Defining the suitable and collaborative tool to answer the questions proposed, according to the typology and characteristics of the question. (2) Elaborating answers in a more graphical format to enhance the understanding by the students. [14]

3.2.3 Validation of the methods

Since the courses were going quite pleasant and there were many students being eager to enroll and complete the courses, for validating the teaching method, and earning the approval of the teachers in the campus, there were many meetings with few teachers who their teaching method were more pleasant for most of the students of the campus, to openly introduce and discuss the teaching methods.
There were few meetings and appointments with 8 teachers of ICT campus of Helsinki Metropolia UAS to validate and discuss the teaching methods to make sure the analysis of the parts which needed to be maintained before finalizing the teaching method has been done to be implemented in the eLearning portal.
After receiving the teachers' endorsements, new ideas got introduced to apply on the current teaching methods to make the learning experience even better for the students.
One of the ideas which got initiated while there was a meeting with Mr. Timo Salin was to introduce an ability to divide the content into several categories, therefore, the students who are looking forward to learn more material, freely learn about such topics, and the other students who are just passing the course to get familiar with the concepts, do not go through more advance and difficult topics to avoid losing motivation. DLI stands for Difficulty Level Indicator and simply on top of the slides, there is color coding; green for easy content, yellow for moderate content, and red for difficult content.

3.2.4 Guidelines

After finalizing the teaching method, guidelines for all the courses to offer in the eLearning portal got introduced. The guidelines would enable the teacher to provide practical, easy-to-use, and comprehensive courses for the students to benefit from.
Quality of the content of courses is the main goal. The course learning approach needs to fully get explained, and the material needs to be comprehensive and fully understandable by the students, starting from the description of the technology following by the comparison between competitors and related technologies.

4 The portals

In this section, the features and the development process of the different editions of eLearning portals which got developed as an outcome for this thesis will be discussed. There were two different developed editions of the portal; the basic edition and the advanced edition.

4.1 Basic edition

To initialize the concept of having an eLearning portal, the basic edition with the minimum functionalities got to be developed to receive feedback and develop and analyze other ideas regarding this portal. The main concern was to create a portal quickly and make it available for the courses. There were two main matters which had more pivotal role concerning the other matters. To begin with, having an ability to host the courses files in a single server, in order to make the students able to receive the updated material was the main concern. In addition, developing a simple access method to enable the students of the courses to have access to the material was the other concern.

4.1.1 Features

Here are the main features and functions of the basic edition of the portal:
In this part, students get familiar with the portal and its characteristics to be able to work with its abilities during their studies.
The students will be able to see the available course list to be motivated to enrol in other courses which are being offered in this portal as well.

In this section, the course will be fully described and the students will be familiar with the content which will be offered during the course, the assessment method and what they will expect and need to be ready for in order to pass this course, and also all the material such as slides, tutorial videos, files and etc. will be available from this section.

In Figure 50, there is a screenshot of a top part of a course page.

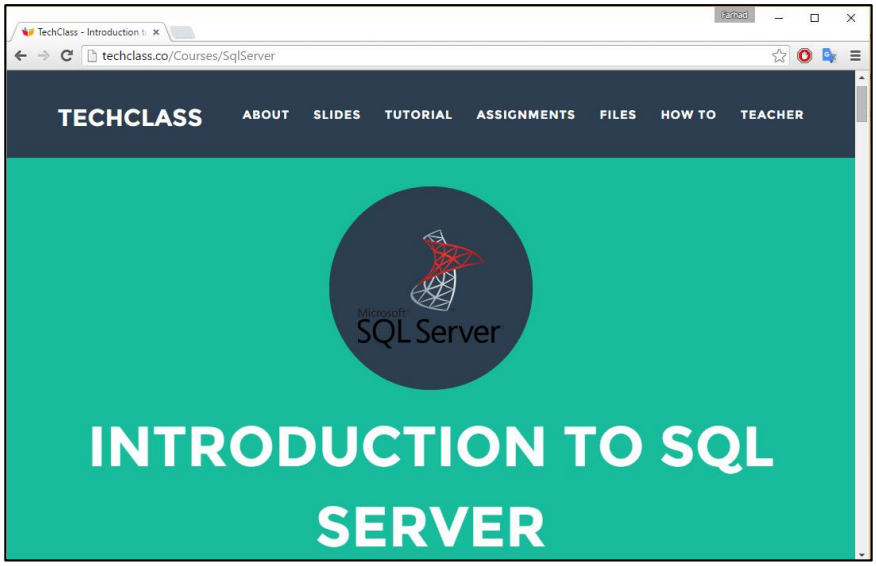

Figure 50. A screenshot of a course page

In Figure 51, there is screenshot of slides section of a course page. From this section, the student may download the slides in various formats.

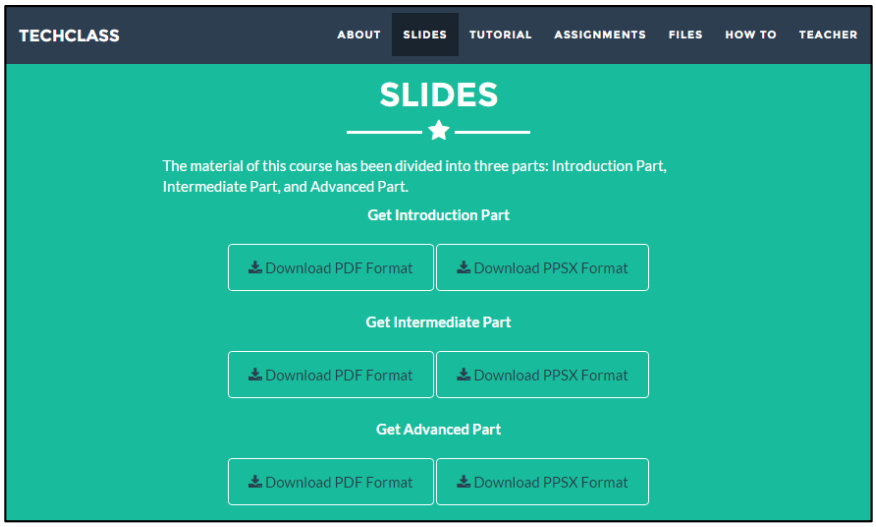

Figure 51. A screenshot of slides section of a course page

In Figure 52, there is screenshot of tutorial section of a course page. From this section, not only the student may select what part of the course he/she wants to be redirected to watch, but also may choose the exact topic he/she is looking for and the portal will specifically directs him/her to that certain topic.

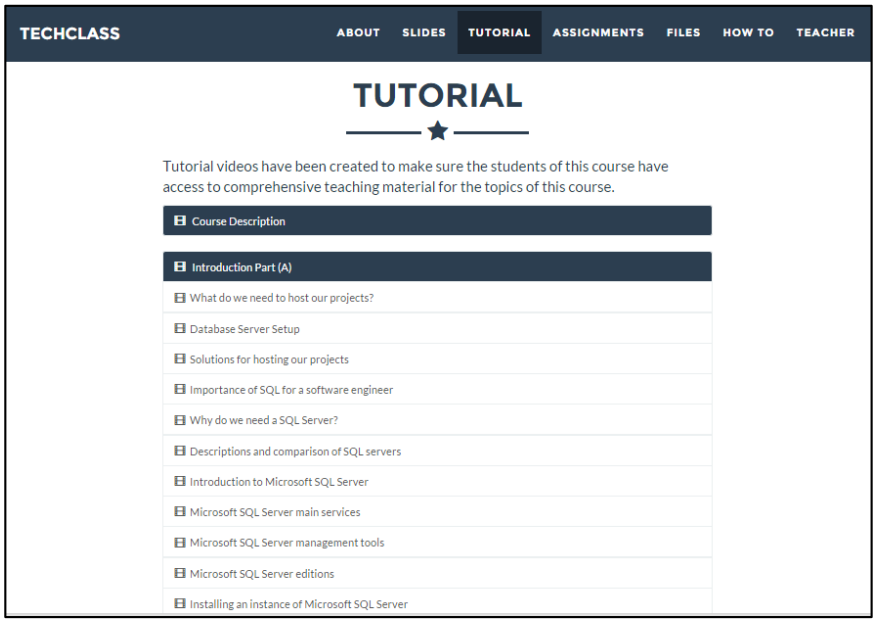

Figure 52. A screenshot of tutorial section of a course page

In Figure 53, there is a screenshot of assignments section of a course page where all the necessary tasks of the course has been listed and provided documents.

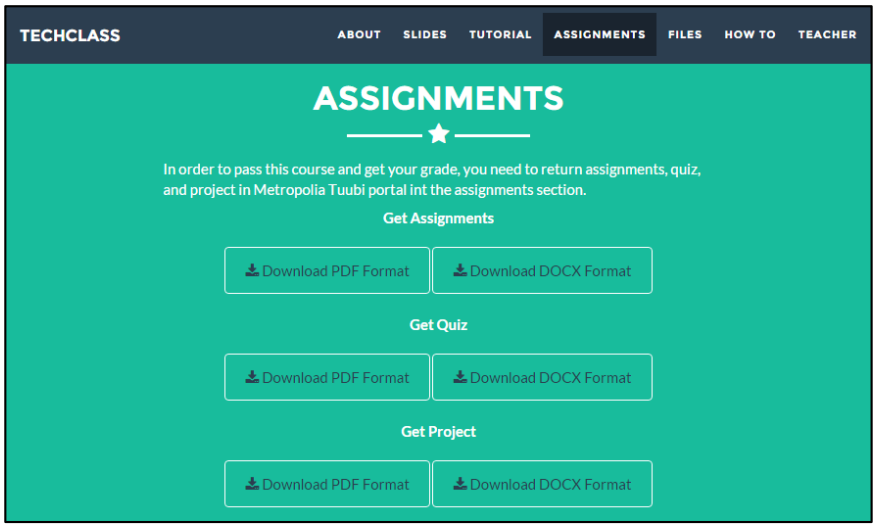

Figure 53. A screenshot of assignments section of a course page

And finally, in Figure 54, there is a screenshot of files section of a course page where all the related files provided for the students to download and use.

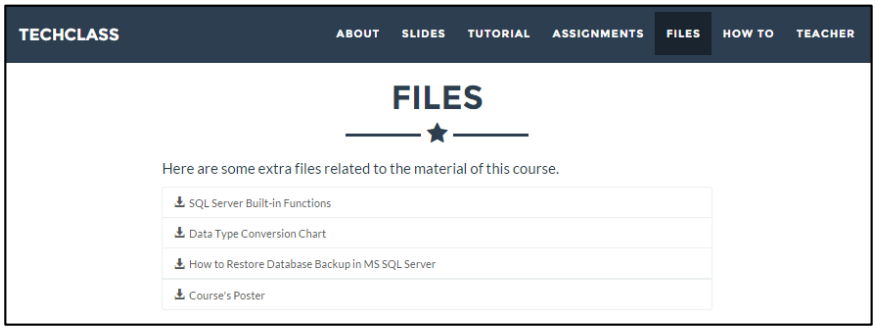

Figure 54. A screenshot of files section of a course page

Fully responsive

The basic edition of the portal is fully responsive and that enables the students to work with this portal on any device that can have access to a web browser and internet. In Figures 55 and 56, one may compare screenshots coming from the portal on a desktop computer and a mobile phone.

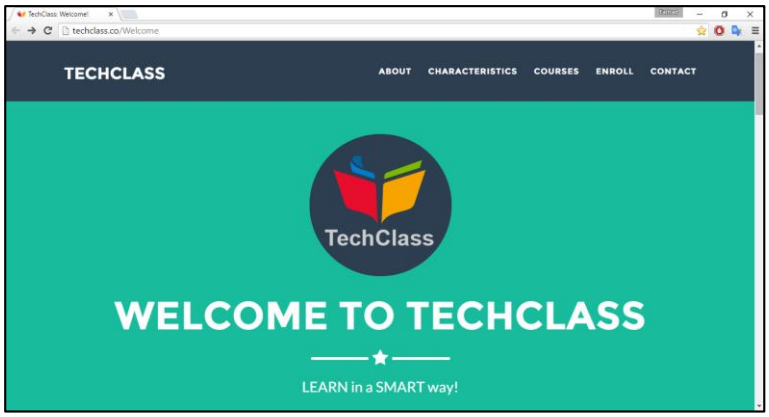

Figure 55. A desktop view of a course page

Figure 56. A mobile view of a course page

Such feature is very essential for an eLearning portal, since there may be situations that a student wants to have access to the portal from different locations by using various devices.

4.1.2 Enrolment method

In this basic edition portal, the enrolment will be as same as usual, without the interference of the portal. Students need to enrol in other portals which they used to use earlier, therefore, there is no specific method to give such feature to the students who are eager to enrol in available courses. The only benefit they can get from basic portal is to be able to see the available courses which in Figure 57, there is such list.

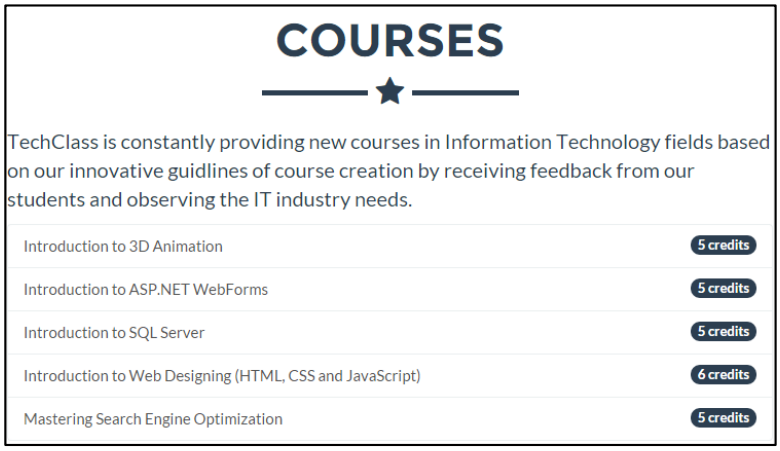

Figure 57. A list of available courses in the portal

Such a list is available in the portal home page.

4.1.3 Access method

To give access to the course material to the enrolled students, a certain password has been assigned to each course and the enrolled students will be notified about the password, after their enrolments get accepted. In Figure 58, there is a page that the students need to enter the specific password to enter courses' pages. Obviously if they enter a wrong password, the system will notify them about such error.

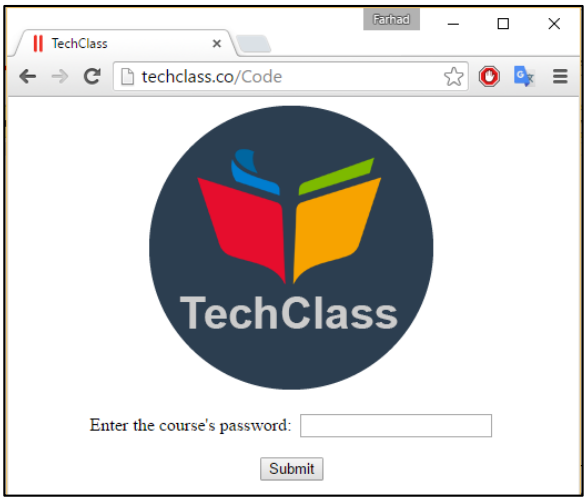

Figure 58. An access page which validates courses codes before redirecting the students to the courses pages

4.1.4 Development and technologies

In Figure 59, the technologies that has been used to create the basic portal got divided into three categories; database, back-end, and front-end.

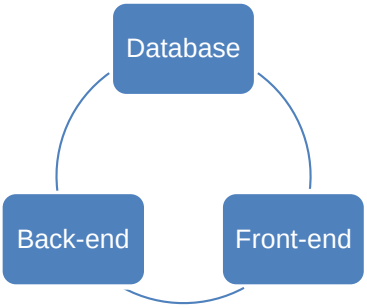

Figure 59. Different categories of technologies being used in the basic portal

Database development

For implementing access method, and tutorial video redirection features, the system needed to store information in a database, and then later, whenever a user was requesting to get access to a course page, or get redirected to a specific part of a tutorial video, the validation of such information needed to be validated. For basic edition of the portal, a simple database created in Microsoft SQL Server 2014 with the tables mentioned in Table 1.

Table 1. List of tables in the portal database

#	Name	Description
1	Codes	To implement access method feature
2	Go	To implement redirecting to tutorial videos feature

Back-end development

For developing the back-end part of the basic edition of the portal, .NET framework has been selected and among all of its supported languages, C# has been selected due to its high performance and sophisticated abilities. Also ASP .NET Web Forms has been selected which is a server-side web application framework designed for web development to create dynamic web pages, web sites, web applications and web services. In addition, Microsoft Visual Studio 2013 which is an integrated development environment (IDE) from Microsoft Corporation has been selected. It is used to develop computer programs for Microsoft Windows, as well as web sites, web applications and web services. In Figure 60, there is a screenshot sample from the basic edition of the portal back-end using Visual Studio 2013 as an IDE.

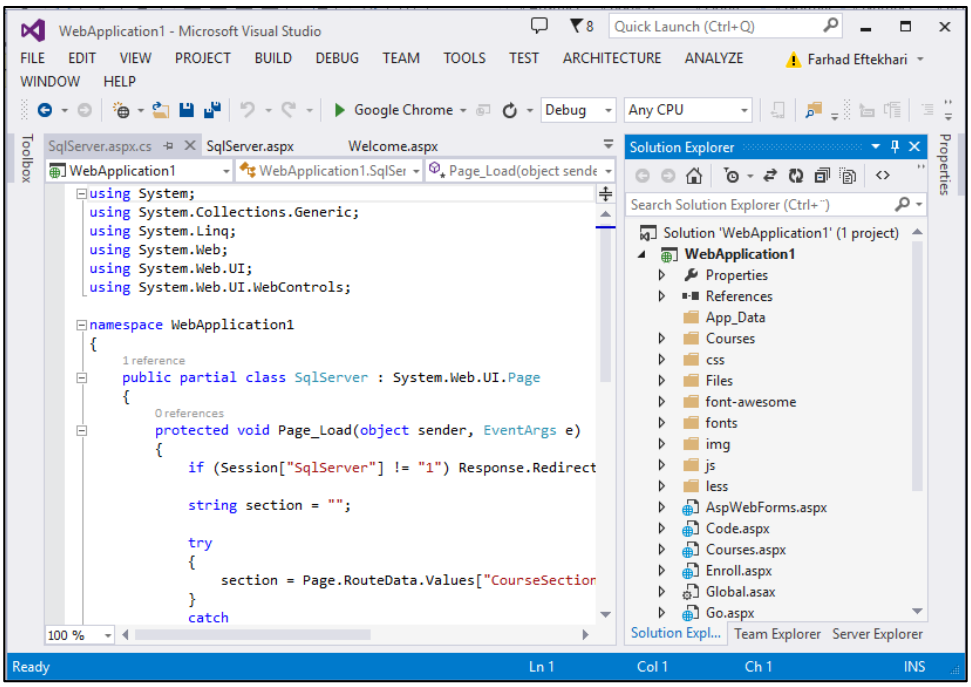

Figure 60. A screenshot of the back-end using Visual Studio 2013 as an IDE

Front-end development

In front-end, HTML5 and CSS3 have been selected due to their ability to create universal applications for various platforms such as browsers, windows phone apps, android apps, and iOS apps. Furthermore, JavaScript and jQuery have been selected for having more sophisticated design in our front-end. To ensure having web pages fully compatible with responsive design ability.

4.1.5 Platforms

Any device that has a web browser and can get connected to the internet can work with the basic edition of the portal.

4.1.6 Development schedule

In Figure 61, there is the basic portal development schedule. The development of the basic portal has been divided in various stages such as idea and planning, database developing, back-end developing, front-end developing, graphic designing, documenting, testing, and finalizing.

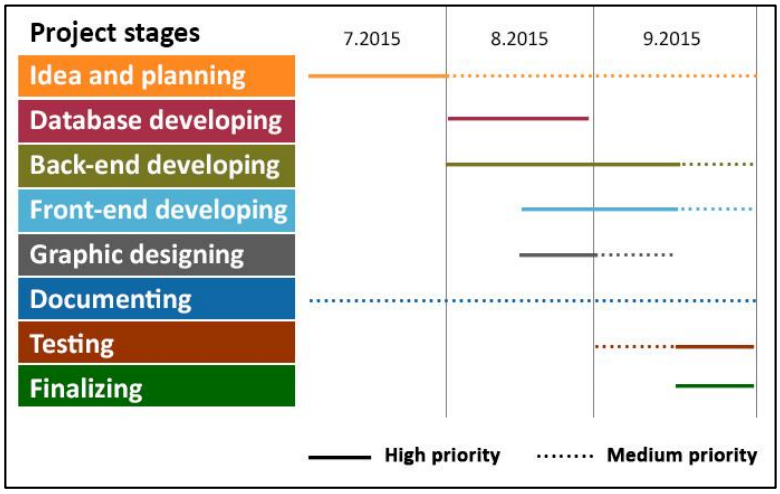

Figure 61. Development schedule

4.1.7 Drawbacks

Although the basic edition of the portal was just a testing phase to receive students' feedback and analyse the potential of having such portal, whether, the limited abilities to

communicate with students was definitely one of the biggest drawbacks of such portal. The basic edition portal features mainly revolves around providing content to authorized students.

In addition, there is no ability to receive students assignments, quizzes, and projects, which still the teacher needs to work with old portals or simply rely on sending and receiving emails which is not pleasant when it comes to efficiency and speed.

4.1.8 Survey

After using basic edition of the portal by the students of a course, a survey has been asked from 20 students who were using the portal for the first time, that how satisfied they are about the portal, and in Figures 62 and 63 there are the result.

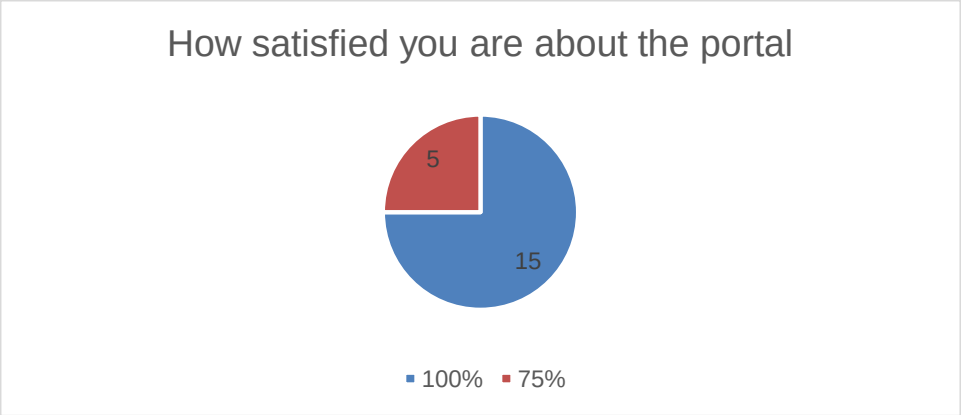

Figure 62. Survey for basic edition of the portal

According to the survey, 15 out of 20 of the students were completely satisfied and 5 out of 20 were 75% satisfied.

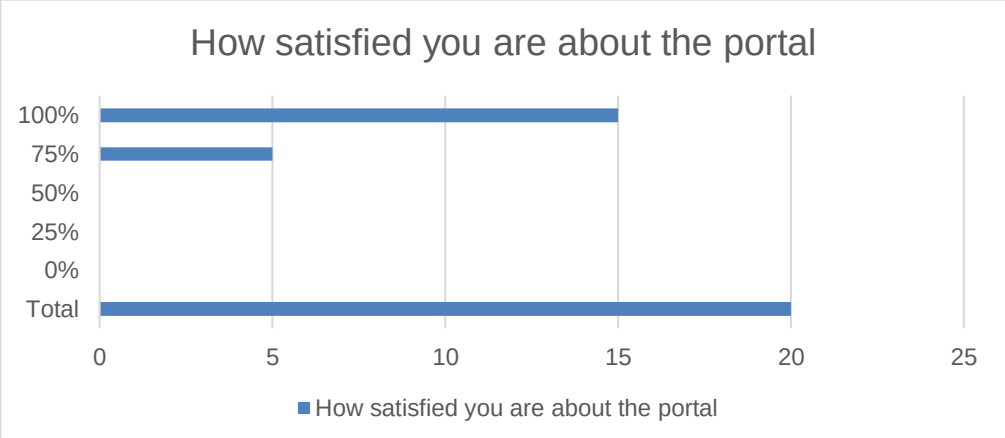

Figure 63. Survey for basic edition of the portal

None of the students selected 50%, 25%, or 0%.

4.2 Advanced edition

After hosting and using the basic edition of the eLearning portal for a while and represent it to one course students, other ideas got analyzed alongside of the feedback received from the students. The main concern was to develop a standalone portal which requires no interference from the other portals. Furthermore, the point was to look for having a two-way channel between the portal and the students instead of one-way channel which only provides content and has no ability of personalization.

4.2.1 Features

Here are the main features and abilities of the advanced edition of the portal:

Login/Register

In this edition of the portal, there is an ability for the students to personalize their account, and such feature requires specific login criteria for each user. By implementing and developing login and register pages, the students will be able to create their account and log in to the portal. In Figure 64, there is a screenshot of the login page and also in Figure 65, there is a screenshot of the register page.

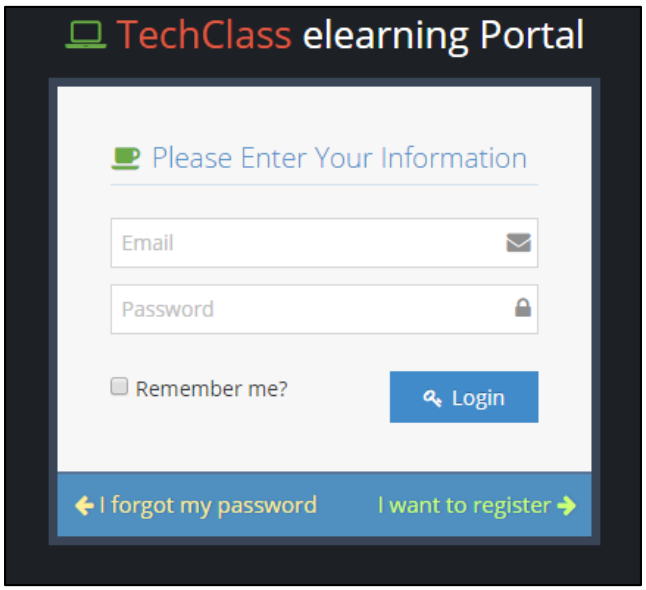

Figure 64. Login page

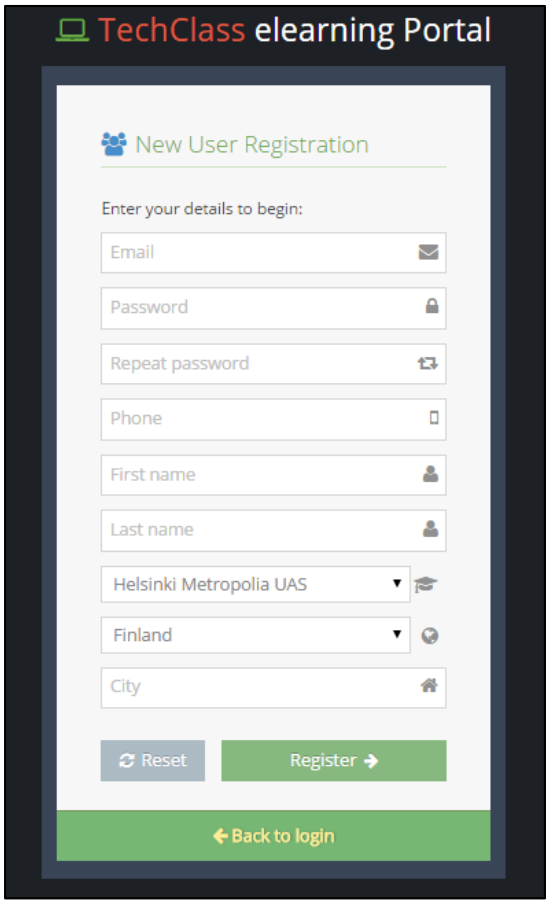

Figure 65. Register page

Dashboard

The advanced edition of the portal dashboard offers transparency and control over the information related to students' information. When the students log in to the portal, dashboard is the first page that they will be redirected to. Therefore, this is a vital opportunity to engage them with the portal and provide them important, whether, brief information. In Figure 66, there is a screenshot of dashboard.

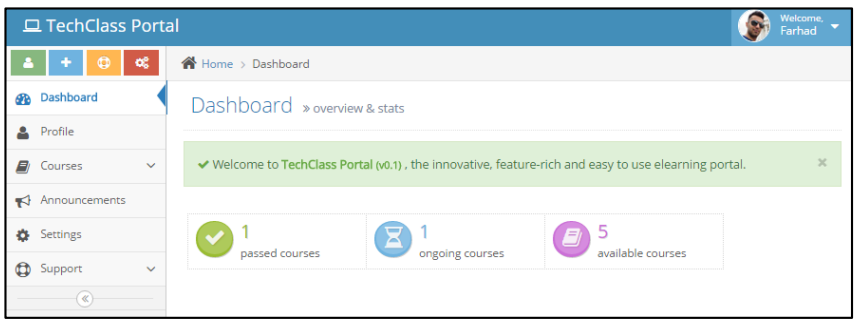

Figure 66. Dashboard

Profile

To personalize accounts of each students and also monitoring each student history of courses as a public feature, profiles have been created. Each user in the system has his/her own profile which is accessible with his/her username. In profile section, users have the ability to modify their public information, and upload their profile picture. By developing profile section, the requirement for giving the abilities of social networks and encouraging the users to visit the portal regularly has been established. In Figure 67, there is a screenshot of a profile page in the system.

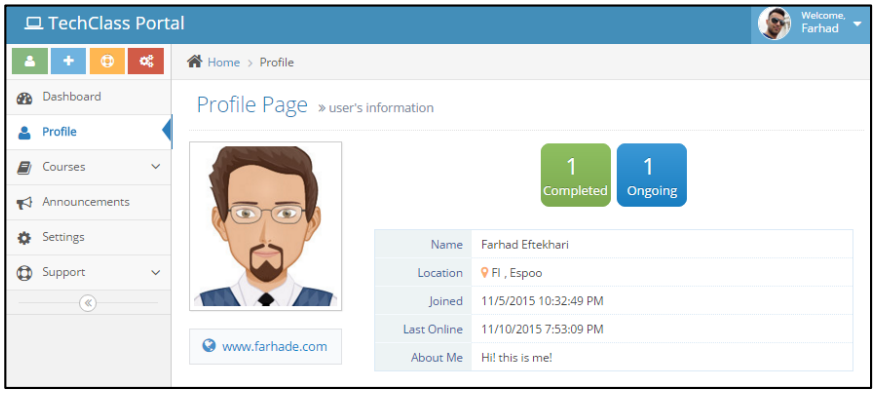

Figure 67. Profile page

Courses – Ongoing

In this section, the students will be able to see the list of the courses they are currently enrolling in and need to submit their tasks in order to pass the course. By selecting each course from the list, then the whole information regarding their status in the course will be shown to them. Information such as course information, number of credits that the course has, the teacher information of the course, and their progress in different tasks such as tutorial videos, assignments, quiz, project and etc. In Figure 68 there is a sample screenshot of a list of ongoing courses in this page, and also in Figure 69, there is an example of full details of an ongoing course being shown to the user.

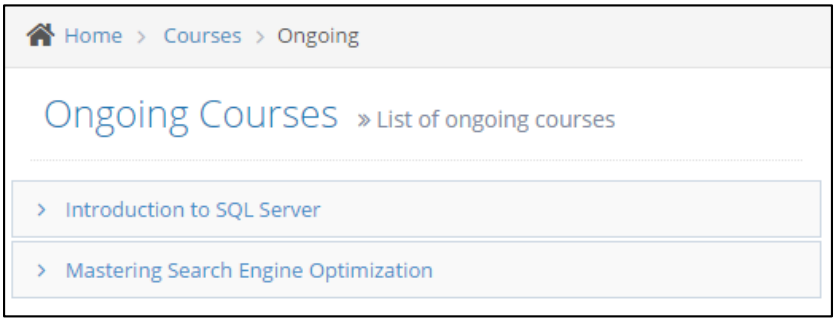

Figure 68. Ongoing courses page

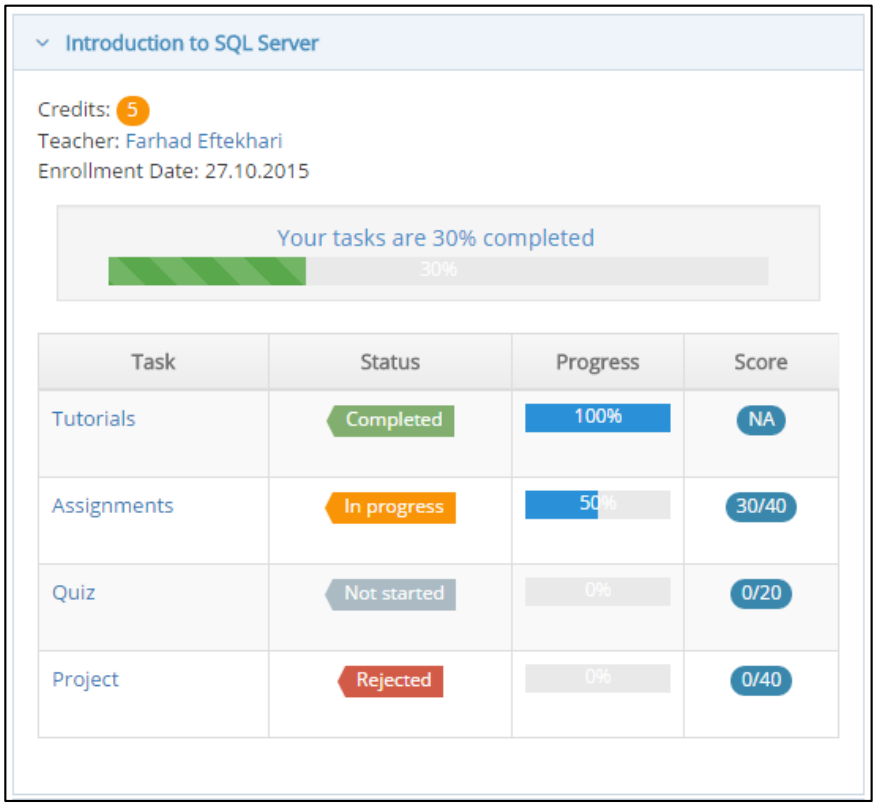

Figure 69. A screenshot of an ongoing course details

Courses - Completed courses

For the students to keep track of their completed courses, there is a section to provide them a full list of their completed courses with specific details about their score and grading for each task of the completed courses. In Figure 70, there is a sample screenshot of a list of completed courses in this page, and also in Figure 71, there is an example of full details of a completed course being shown to the user.

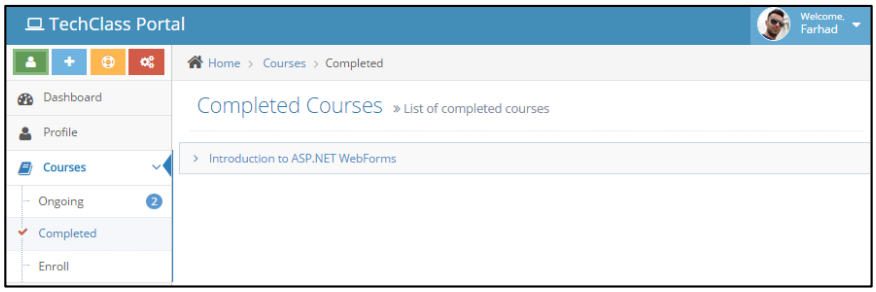

Figure 70. Completed courses page

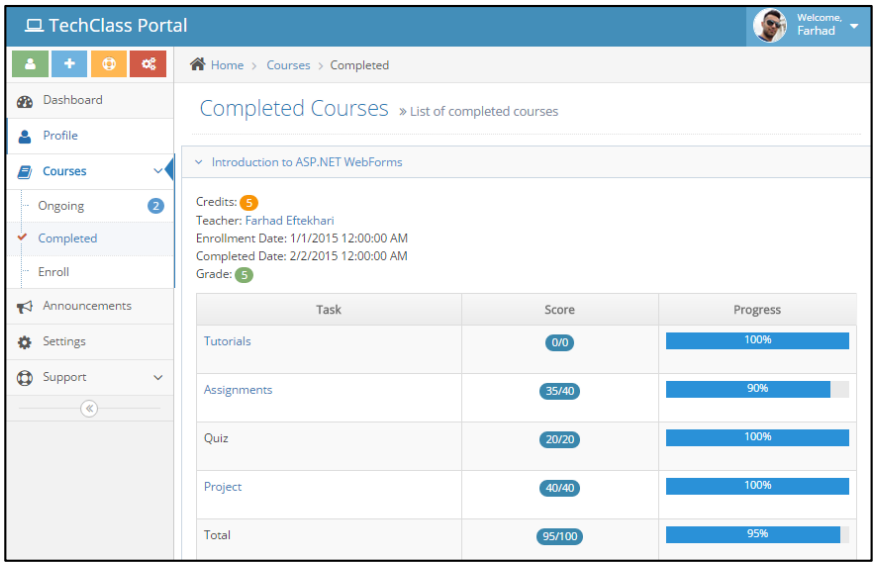

Figure 71. A screenshot of a completed course details

Courses – Enroll

In this section, the students will be notified about the full list of available courses in the portal to take and enroll. From this page, the students can easily send a request to enroll in a specific course, and after the teacher of the course approve their request, they can have the course in ongoing courses page, and start working on the course tasks in order to complete and pass this course. To avoid students enroll in an already passed or ongoing course, for the courses which the user already enrolled or passed, as it is visible in Figure 72, instead of enroll button, there will be passed or ongoing label. Once a student sends a request to enroll in a course, he/she will be able to cancel his/her request by clicking on “Cancel” button.

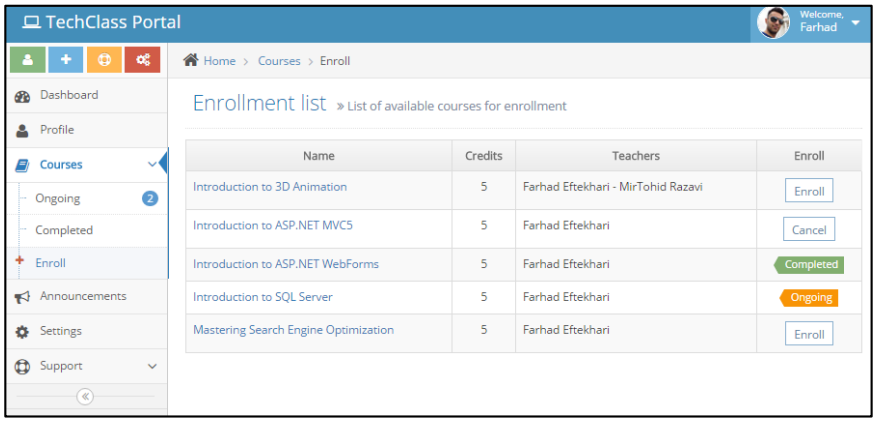

Figure 72. Enrol page

And also to read the full information regarding a course, by clicking on the name of a course, as it is visible in Figure 73, a window will pop up and show the full information of

a course such as name, number of credits, the teacher of the course, outcome, content, evaluation, material, and requirements.

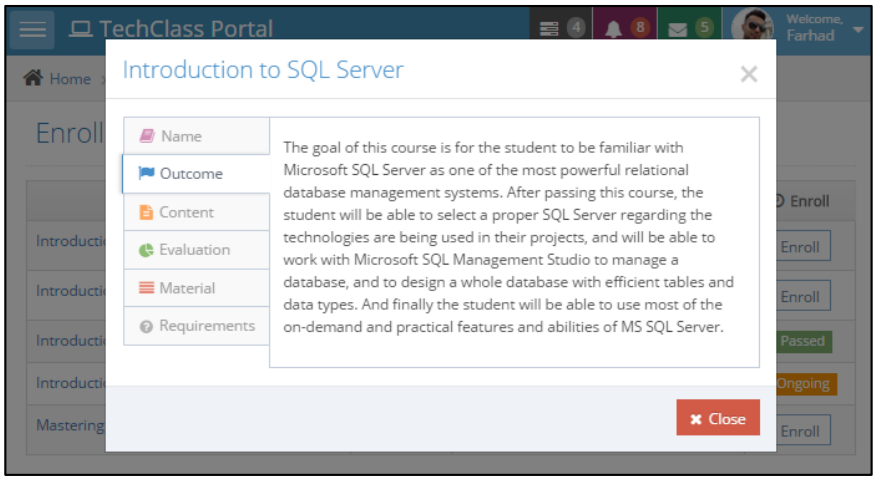

Figure 73. Full details of a course available in enrolment list

Tasks – Tutorials

In this section, the students can have access to the tutorial videos of the courses which they enrolled or passed. The list will be updated each time the teacher modified it, therefore, the students will have access to the newest tutorial videos. In Figure 76, there is a screenshot of tutorial videos of a sample course.

In this section, the students can declare they went through and watched the tutorial videos of a course to complete tutorial videos task of that certain course.

Tasks – Assignments

In this section, the students have the ability to receive the assignments, work on them, and finally submit their answers and solutions to the teacher to be assessed and complete assignments tasks of a certain course.

Tasks – Quizzes

From this section, the students of ongoing courses will be able to take the required quizzes and submit their answers, and the system will automatically assess their answers based on the answers the teacher of the course who published the quiz provided.

Tasks – Projects

In this section, the students will see a list of the courses that require them to submit their projects. Students can upload their project files from this section, and the teachers can receive and assess them.

Files

From this section, the students can have access to the files of their ongoing and passed courses that the teachers of those courses provided for them. The content of this section can be updated by the teachers, therefore, the students will always have access to the updated material even after passing some courses. In Figure 74, there is a screenshot of this section.

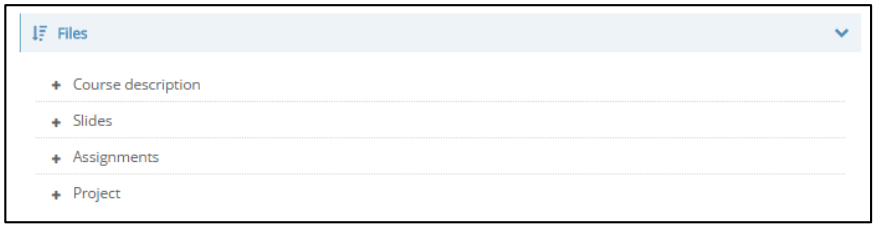

Figure 74. A files section of a course

Announcements

System announcements will be accessible for the students from this section. In Figure 75, there is screenshot of this section.

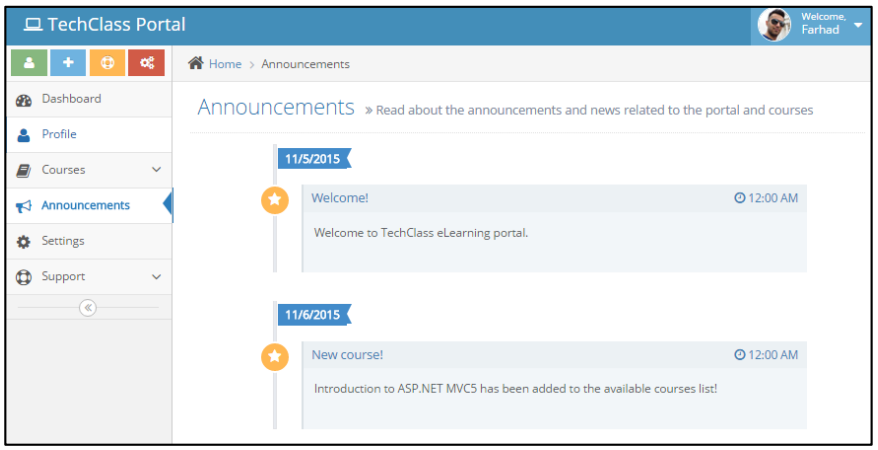

Figure 75. Announcements page

Settings

In this section, the students will be able to modify their settings related to their profile and account. And also from this section the students will be able to change their password. In Figure 76 and 77, there are screenshots from these sections.

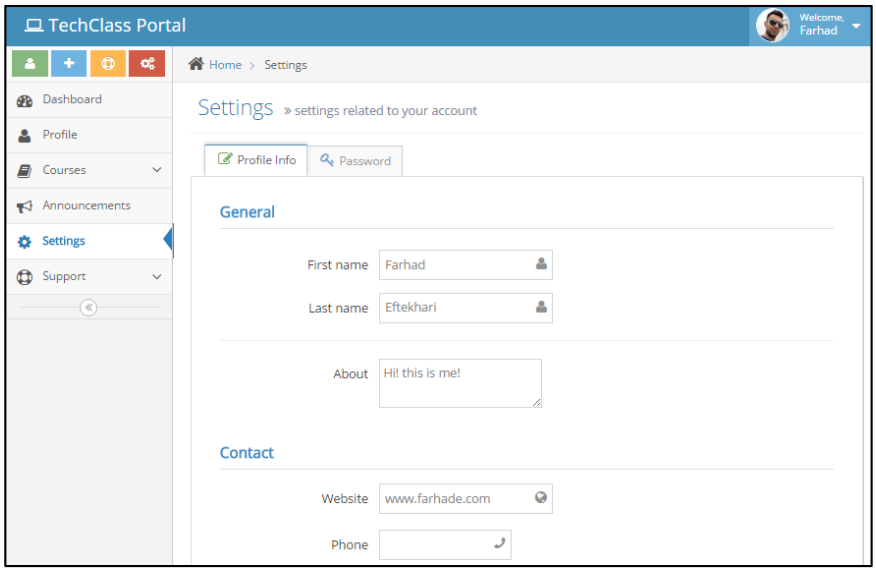

Figure 76. Profile info section in settings page

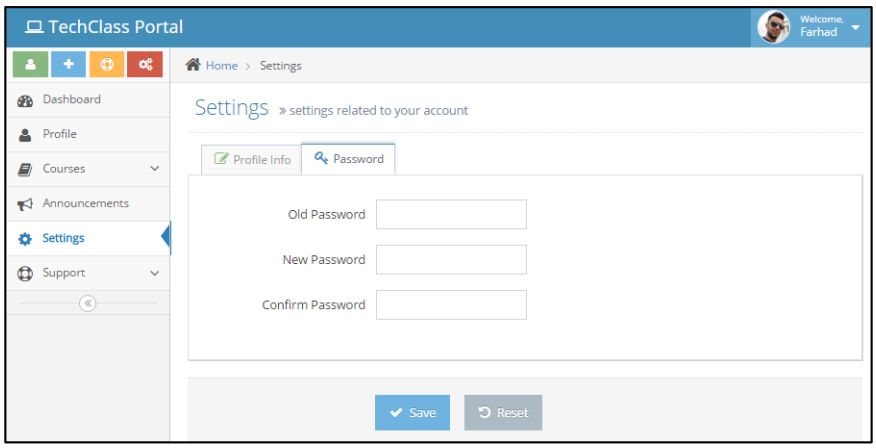

Figure 77. Change password section in settings page

Support – FAQ

In this section, the students can read and find out more about the frequently asked questions. The content of this section has been divided into different categories such as general, account, payments, and misc. For each category, many questions with their answers has been provided. In Figure 78, there is a screenshot of this section.

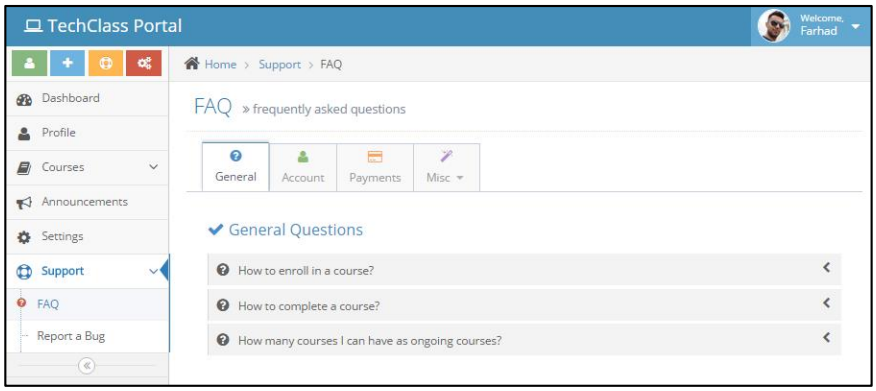

Figure 78. FAQ page

Support – Report a bug

If the students confront an error in the system, from this section they can notify the administrators of the portal. In Figure 79, there is a screenshot of this section.

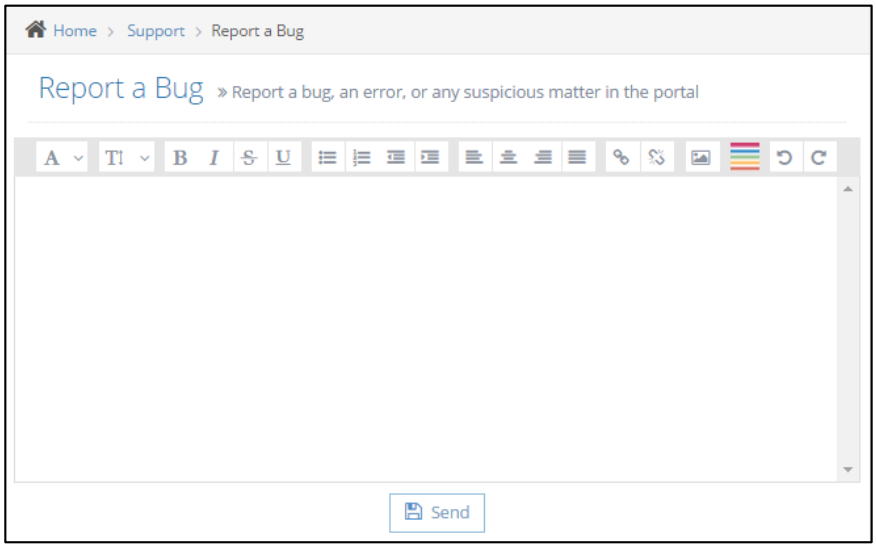

Figure 79. Report a bug page

Fully responsive

The advanced edition of the portal is fully responsive and that enables the students to work with this portal on any device that can have access to a web browser and internet. In Figure 80 and 81, one can compare screenshots coming from a single page of the portal on a desktop computer and a mobile phone.

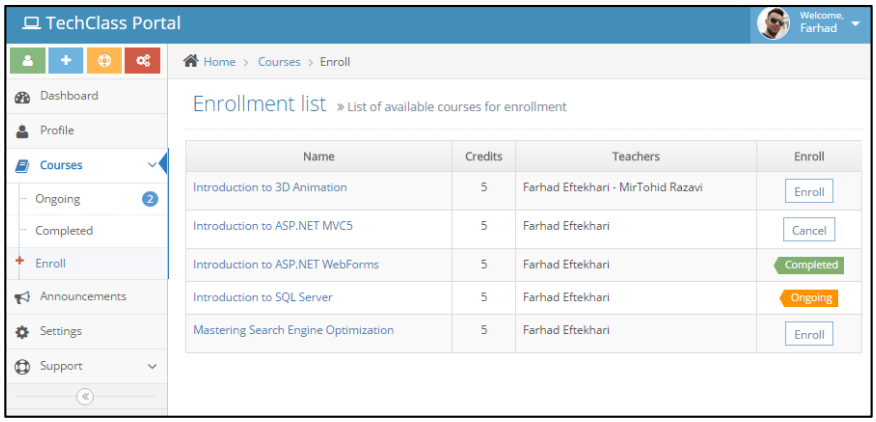

Figure 80. A desktop view of the portal

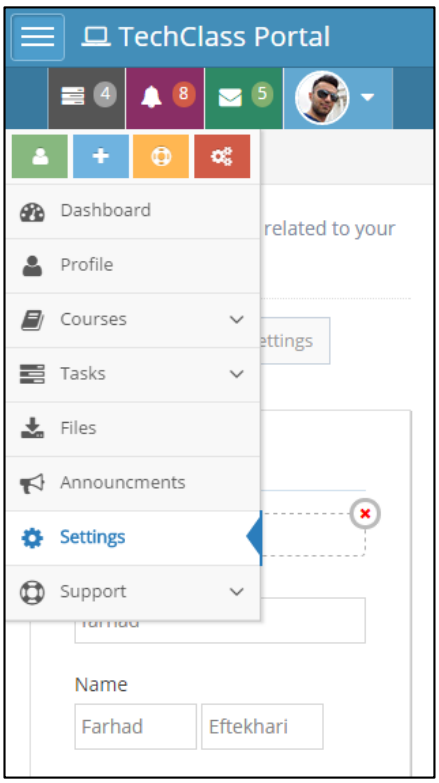

Figure 81. A mobile view of the portal

Google Analytics

To have a fully understanding over the portal traffic, audience, system information and etc. Google Analytics service has been installed on the portal. Google Analytics is a freemium web analytics service offered by Google that tracks and reports websites traffic. In Figure 82, there is a screenshot of the dashboard of Google Analytics.

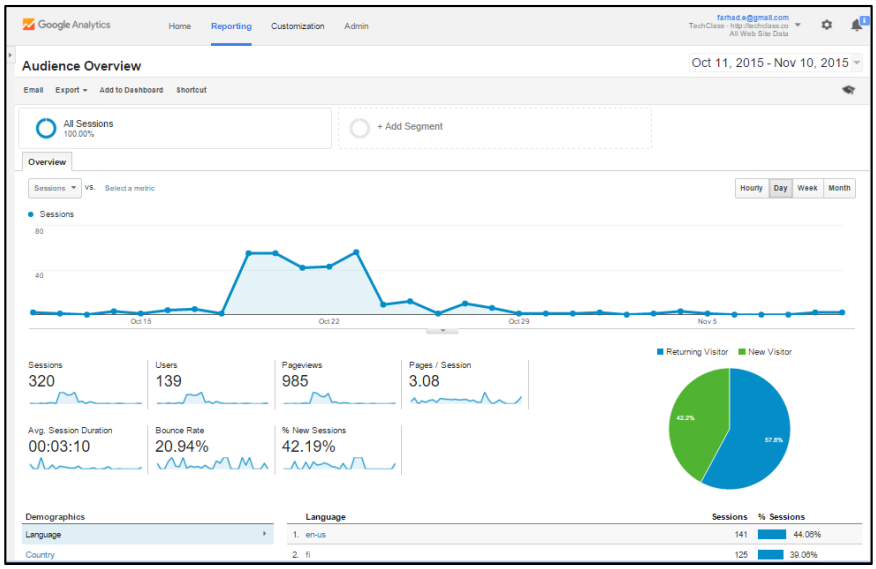

Figure 82. Dashboard of Google Analytics report for the portal

4.2.2 Enrolment method

In the advanced edition of the portal, as it got described in Courses – Enrol section, students need to create their own account, and then visit courses – enrol page to view the full list of available courses to enrol and then select their desired course and send their enrolment request to the teacher of the course by submitting the enrol button.

4.2.3 Access method

For the students who have certain courses as ongoing or passed course, they may download the courses' material from Files section.

4.2.4 Development and technologies

In Figure 83, the technologies that has been used to create the advanced portal has been divided into three categories; database, back-end, and front-end.

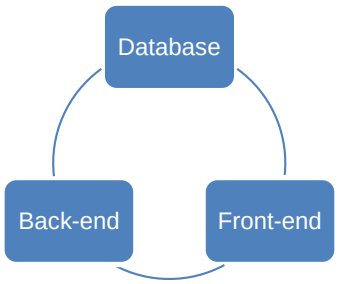

Figure 83. Different categories of technologies being used in the advanced portal

Database development

The developer designed and created a database to store the portal information in it. Information regarding our users, our services and features information, and the project platform information. The developer used same family of technologies, since, using a same family of technologies will result in creating a more sophisticated platform with higher performance, having an ability to more easily debug, and having better support. For our database, we used Microsoft SQL Server which is a relational database management system developed by Microsoft corporation. As a database, it is a software product whose primary function is to store and retrieve data as requested by other software applications. In Table 2, there is a list of tables inside of the database.

Table 2. List of tables in the portal database

#	Name	Description
1	Announcements	Announcements will be stored in this table
2	AspNetRoles	Various roles such as admin, and teacher will be stored in this table
3	AspNetUserClaims	
4	AspNetUserLogins	Login logs will be stored in this table
5	AspNetUserRoles	Records of users being assigned to different roles will be stored in this table
6	AspNetUsers	A full list and properties of users will be stored in this table
7	Courses	Course information will be stored in this table
8	EnrollCourses	List of ongoing and completed courses will be stored in this table
9	EnrollRequests	Enrollment requests will be stored in this table
10	Go	To implement redirecting to tutorial videos feature
11	QuizQuestions	Quizzes questions will be stored in this table
12	Reports	Reports submitted by the users will be sotred in this table

Back-end development

For developing the back-end part of the advanced edition of the portal, .NET framework has been selected and among all of its supported languages, C# has been selected due to its high performance and sophisticated abilities. Furthermore, ASP .NET MVC5 has been selected which is a server-side web application framework designed for web development to create dynamic web pages, web sites, web applications and web services

using MVC model. In addition, Microsoft Visual Studio 2015 has been selected which is an integrated development environment (IDE) from Microsoft Corporation. It is used to develop computer programs for Microsoft Windows, as well as web sites, web applications and web services. In Figure 84, there is a screenshot sample from the advanced edition of the portal back-end using Visual Studio 2015 as an IDE.

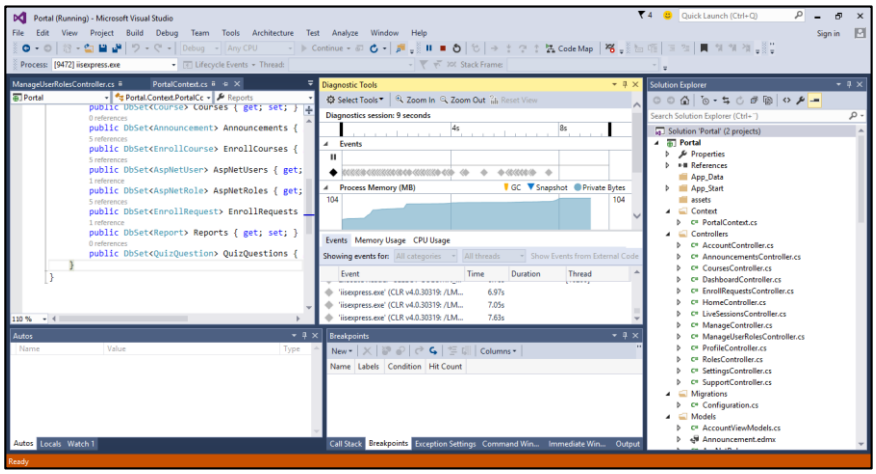

Figure 84. Using Visual Studio 2015 as an IDE

MVC software architectural pattern

Model-View-Controller (MVC) has been a significant architectural pattern in computer science for many years. Originally named Thing-Model-View-Editor in the year 1979. Later it was simplified to Model-View-Controller (MVC). MVC is a powerful and elegant method of dividing concerns within an application (for instance, dividing data access logic from display logic) and applies itself quite well to web applications. Its explicit separation of concerns does add a small portion of additional complexity to an application design, whether, the astonishing benefits overshadow the extra effort. It has been used in dozens of frameworks since its introduction. MVC may be used in C#, Java and C++, on Mac and on Windows, and inside literally dozens of frameworks.

The MVC separates the user interface (UI) of an application into three main aspects:

- The Model: A set of classes that defines the data working with as well as the business logic for how the data may be altered and manipulated
- The View: Defines how the application UI will be showed
- The Controller: A set of classes that handles communication from the user, overall application flow, and application-specific logic [15, 2]

ASP.NET MVC is a framework for developing web applications that applies the general Model-View-Controller pattern to the ASP.NET framework. In Figure 85, there is MVC software architectural pattern.

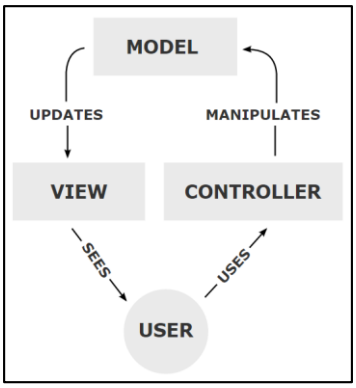

Figure 85. MVC software architectural pattern

The portal models

Models are a set of classes that defines the data working with as well as the business logic for how the data may be altered and manipulated. Here in Table 3, there is a list of models in the advanced edition of the portal.

Table 3. List of models in the advanced edition of the portal

#	Name	Description
1	AccountViewModels	Various models related to the account of users
2	Announcement	Announcements model
3	AspNetUser	Users model
4	Course	Courses model
5	Dashboard	Dashboard model containing the information which will be shown in the dashboard page
6	EnrollCourse	Ongoing and completed courses model
7	EnrollList	List of available courses model
8	EnrollRequest	Enrollment requests model
9	IdentityModels	Models related to the identification of users
10	ManageViewModels	Models for managing views
11	Profile	Profile model containing the information which will be shown in the profile page
12	QuizQuestion	Questions of quizzes model
13	Report	Report a bug model

In Figure 86, there is a sample from the models of the portal.

```
namespace Portal.Models
{
    3 references
    public class EnrollRequest
    {
        [Key]
        0 references
        public int EnrollRequestID { get; set; }
        [Required]
        4 references
        public int CourseID { get; set; }
        [Required]
        4 references
        public string UserID { get; set; }
        [Required]
        1 reference
        public DateTime RequestDate { get; set; }
    }
}
```

Figure 86. EnrollRequest model

The portal views

Views defines how the application UI will be showed. In Figure 87, there are categories of views which got used in the advanced edition of the portal.

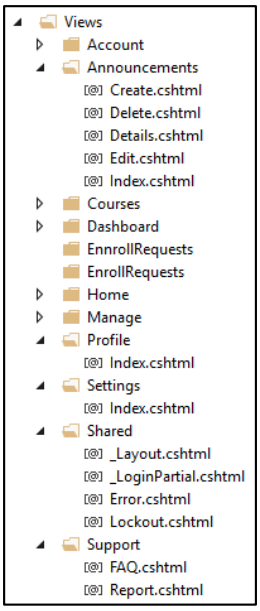

Figure 87. Categories of views with some samples

And here in Figure 88, there is a sample from the views of the portal.

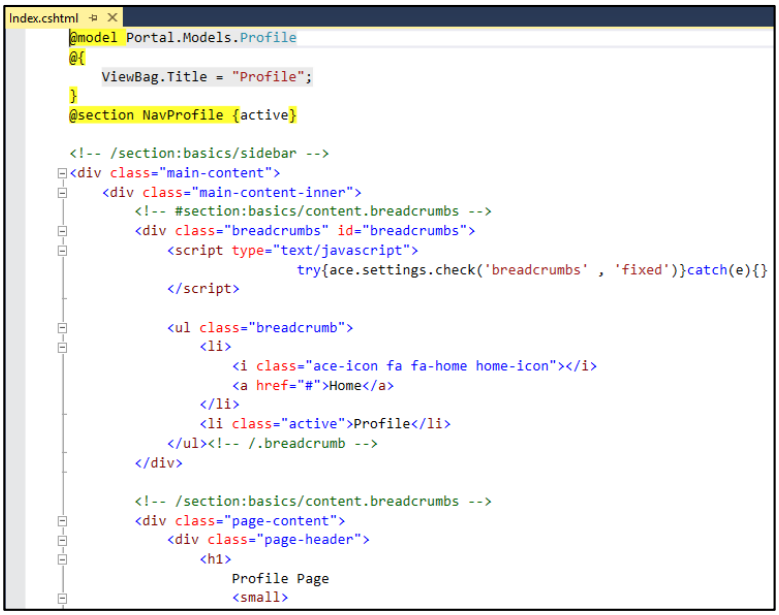

Figure 88. Profile/index.chtml view

The portal controllers

Controllers are set of classes that handles communication from the user, overall application flow, and application-specific logic.

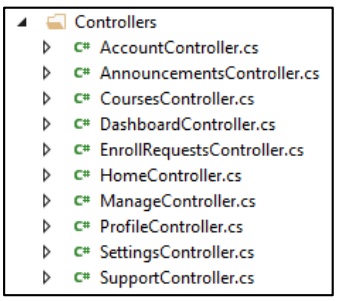

Figure 89. Controllers of the portal

And here in Figure 90, there is a sample from the controllers of the portal.

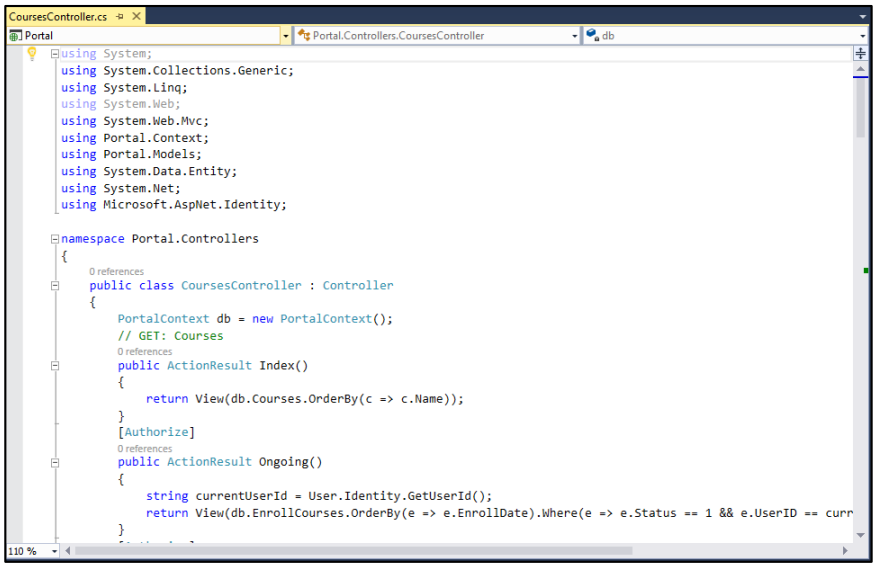

Figure 90. CoursesController.cs

Front-end developing

In front-end, HTML5 and CSS3 have been selected due to its ability to create universal applications for various platforms such as browsers, windows phone apps, android apps, and iOS apps. Also JavaScript and jQuery have been selected for having more sophisticated design in our front-end. To ensure having web pages fully compatible with responsive design ability.

4.2.5 Platforms

Any device that has a web browser and can get connected to the internet can work with the advanced edition of the portal.

4.2.6 Development schedule

In Figure 91, there is the advanced portal development schedule. The development of the advanced portal has been divided in various stages such as idea and planning, database developing, back-end developing, front-end developing, graphic designing, documenting, testing, and finalizing.

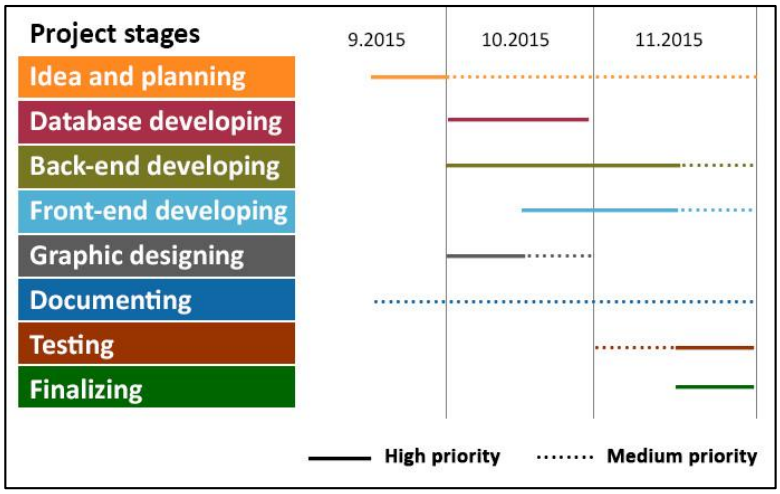

Figure 91. Development schedule

4.2.7 Drawbacks

Although the advanced edition of the portal comparing to the basic edition had significant features, abilities, and capabilities, whether, still there was room for improvement. The portal is such a strong portal when it comes to the students' point of view. There are several features and tools which are available to be used by them, whether, at this stage, there are many limitations for the teachers of the courses and also administration of the portal. Such drawbacks need to be confronted and solved in the next edition of the portal to make this portal as a strong, standalone and comprehensive eLearning portal. In section 4.3 the ideas and suggestions for improving the current state of the portal have been discussed.

4.3 Suggestions for improvement

Here are some ideas and suggestions to improve the portal in the next edition:

Teacher portal

In the upcoming editions of this portal, more features for teachers need to be provided to make the managing process of a course easier and more pleasant for them.

Admin portal

Having a strong and comprehensive admin portal to manage the portal settings and analyse its activities is essential for an eLearning portal. In the upcoming editions of this portal, there ought to be features to fully manage the portal.

Live sessions

To go beyond the walls of classrooms, live sessions feature may be a great feature to offer to the students who are looking for distance learning courses. By broadcasting live sessions and providing tools such as sending instant questions, solving demanded problems and etc. the virtual experience of enrolling a course may be as equal as being present in an actual classroom.

Social networks integration

By integrating social networks APIs, the portal may benefit from serving larger amount of customers, and in the mean time making it easier for the students to manage their login criteria.

5 Conclusions

To begin with, the goal was to develop an eLearning educational portal which would replaces all the current portal functionalities for eLearning and intensive week courses. The user groups of the services of the portal are students and other individuals participating in such courses.

In short, the first advanced workable and finalized edition of the eLearning portal got released. The developer were able to create a comprehensive user-friendly environment with the state-of-the-art technologies for the students to benefit from the practical and unique features of such in a simple, vivid, and pleasant framework. They can fully manage their tasks, information, and privacy via such powerful tools and abilities.

In addition, due to the development of this portal, an innovative system to receive the students' feedback was implemented. Such feedback will be applied in the future goals and strategies for this portal. Creating such systems required a complex and comprehensive plan which was developed before initiating to develop this portal.

Furthermore, due to the analysis that got obtained from the current portals, there is a clear understanding about the differences and advantages, and in what aspects there are similarities. Such facts make the development more reliable, and dependable.

Moreover, although we are benefiting from high speed Internet connections in Finland, the portal was designed in an efficient way so that it requires minimum requirements

when it comes to using disk space and bandwidth. Therefore, our application will run smoothly and quickly on different devices and platforms even with slow/speed Internet connections.

Although, quite many features and abilities have been provided in the first advanced edition, there are still many features to release as soon as possible.

While the portal was in the development phase, a sizable portion of time had been dedicated to document most of the details and the written code for the portal to make the further developments easier.

Nevertheless, in the end, the developer was able to finish developing this portal with a very pleasant and satisfying outcome which makes me more eager to come up with new ideas for further development and upgrades for this portal.

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Appendix 1: Database tables, columns, and data types

Announcements

Column Name	Data Type	Null	PK	FK	IX	Descriptions
AnnouncmentId	smallint		X			Auto
Type	tinyint					
Title	varchar(100)					
Body	varchar(4000)					
SubmitDate	smalldatetime					Default: GET-DATE()

Courses

Column Name	Data Type	Null	PK	FK	IX	Descriptions
CourseId	smallint		X			Auto
Name	varchar(50)					
Credits	tinyint					
Files	varchar(4000)	X				
Outcome	varchar(2000)	X				
Content	varchar(2000)	X				
Evaluation	varchar(2000)	X				
Material	varchar(2000)	X				
Requirements	varchar(2000)	X				
Status	tinyint					1 Available / 2 dis-continued Default: 1

EnrolCourses

Column Name	Data Type	Null	PK	FK	IX	Descriptions
EnrolId	smallint		X			Auto
UserId	smallint			X		
CourseId	smallint			X		
EnrolDate	smalldatetime					Default: GET-DATE()

PassDate	smalldatetime	X				
Grade	char(1)	X				
Status	tinyint					1 enrol / 2 passed Default: 1
TutorialsStatus	tinyint					0 Not started / 1 In progress / 2 Completed / -1 Rejected Default: 0
TutorialsScore	tinyint	X				
TutorialsProgress	tinyint					Default: 0
AssignmentsStatus	tinyint					0 Not started / 1 In progress / 2 Completed / -1 Rejected Default: 0
AssignmentsScore	tinyint	X				
AssignmentsProgress	tinyint					Default: 0
QuizStatus	tinyint					0 Not started / 1 In progress / 2 Completed / -1 Rejected Default: 0
QuizScore	tinyint	X				
QuizProgress	tinyint					Default: 0
ProjectStatus	tinyint					0 Not started / 1 In progress / 2 Completed / -1 Rejected Default: 0
ProjectScore	tinyint	X				
ProjectProgress	tinyint					Default: 0
Feedback	varchar(255)	X				

TeacherId	smallint	X	X			

Reports

Column Name	Data Type	Null	PK	FK	IX	Descriptions
ReportId	smallint		X			Auto
Type	tinyint					
UserId	smallint			X		
Body	nvar-char(4000)					
SubmitDate	smalldatetime					

Teachers

Column Name	Data Type	Null	PK	FK	IX	Descriptions
RecordId	smallint		X			Auto
CourseId	smallint			X		
TeacherId	smallint			X		

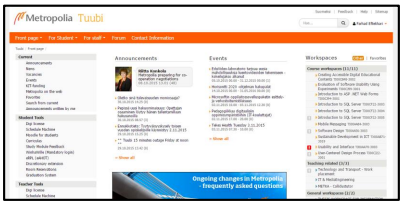
Users

Column Name	Data Type	Null	PK	FK	IX	Descriptions
UserId	smallint		X			Auto
Email	varchar(100)					
Phone	varchar(50)					
Password						
Institute	tinyint					
FirstName	varchar(30)					
LastName	varchar(30)					
PassedCourses	tinyint					Default: 0
OngoingCourses	tinyint					Default: 0
Country	char(2)					
City	varchar(30)					
DOB	date	X				

LastLogin	smalldatetime					Default: GET-DATE()
RegisterDate	smalldatetime					Default: GET-DATE()
About	nvarchar(200)	X				
Website	varchar(50)	X				
Facebook	varchar(30)	X				
Twitter	varchar(30)	X				
Instagram	varchar(30)	X				
Linkedin	varchar(30)	X				
HasPhoto	bit					Default: 0
Status	tinyint					Default: 1 1 active / 2 disable

Appendix 2: Questionnaire for analysing Helsinki Metropolia UAS portals

1. Tuubi portal



Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

2. WinhaVille portal

Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

3. Moodle portal

Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

4. VIOPE portal

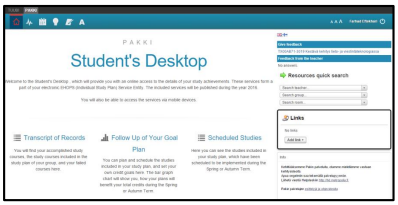
Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

5. PAKKI portal



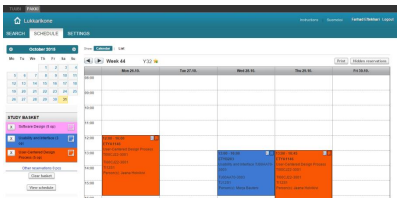
Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

6. Lukkarit portal



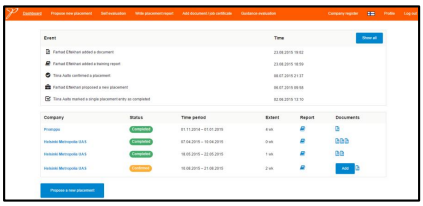
Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

7. Work placement portal



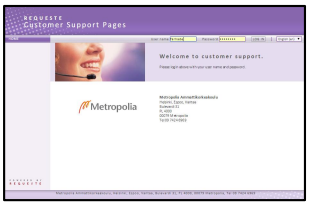
Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

8. Help desk portal



Have you ever used this portal?

__ Yes __ No

Select the ones you think it is true for this portal (if you used it before):

__ User friendly __ Beneficial features __ Pleasant design __ Frequently I use it

☺ Thank you for your time and consideration.