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Designing Online Collaboration Tool for Managing Postgraduate Education with New Web Technologies

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Abstract

Today, collaboration tools and information systems are beginning to gain more attention in business life with the rapid development of communication and information technologies, which are accelerating business processes and increasing cooperation. Particularly in the globalized world economy, various scattered teams working on the same project are experiencing problems in terms of communication, synchronization and information sharing. Web-based collaborative technologies extend beyond the organization and traditional collaborative methods, helping participants in different geographies work together in a synchronized way. Within the same scope, various information systems and collaboration tools used in universities make the business processes practical and facilitated. Through these various information systems and collaboration tools used, it is easier for students, academic and administrative staff to manage, plan and control the processes. In this context, the information systems within the university that are examined in this context are generally used with a variety of information and document-sharing purposes, and they are not designed as a collaboration tool. Within the scope of this problem, the aim of this study is to increase the cooperation and communication among the student, the advisor, the department and the institute through a comprehensive collaboration tool, developed using various web technologies, thus making the process more manageable. Through the proposed structure, it will also make it possible for the advisor, the department and the institute to monitor the process related to the thesis stage of students. The process can be monitored instantaneously to optimize the managing process through this collaboration tool, which is designed as an interactive platform, and the necessary communication network can be realized on this platform.

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1. Introduction

With an estimated 566 percent growth in Internet usage in the past decade, the Internet has become the main source of communication around the world. With ever-increasing growth rates, the technology is increasing day by day to support the structure of the Internet [1]. As the Internet matures, rich applications with user-friendly interfaces and interactive capabilities are becoming increasingly popular [2]. In recent years, web applications have been dropping out of desktop software, which is less flexible and less dynamic, with the Internet speed and bandwidth increasing at a very high rate. Independent of the companies, interactive, without installation and maintenance costs, and high availability web applications are starting to take more place in everyday life and business life. As seen in Figure 1, the Internet speed and bandwidth are increasing day by day, and mobile platforms have improved Internet access and also increasing the usage rates of web applications. In addition, web software tools that are capable of supporting mobile platforms with development of mobile platforms and enabling development independent of the operating system are being used frequently as software development tools for mobile platforms. These developments, which allow transfer of more and larger data on the Internet, have greatly enhanced the capabilities of collaboration tools.
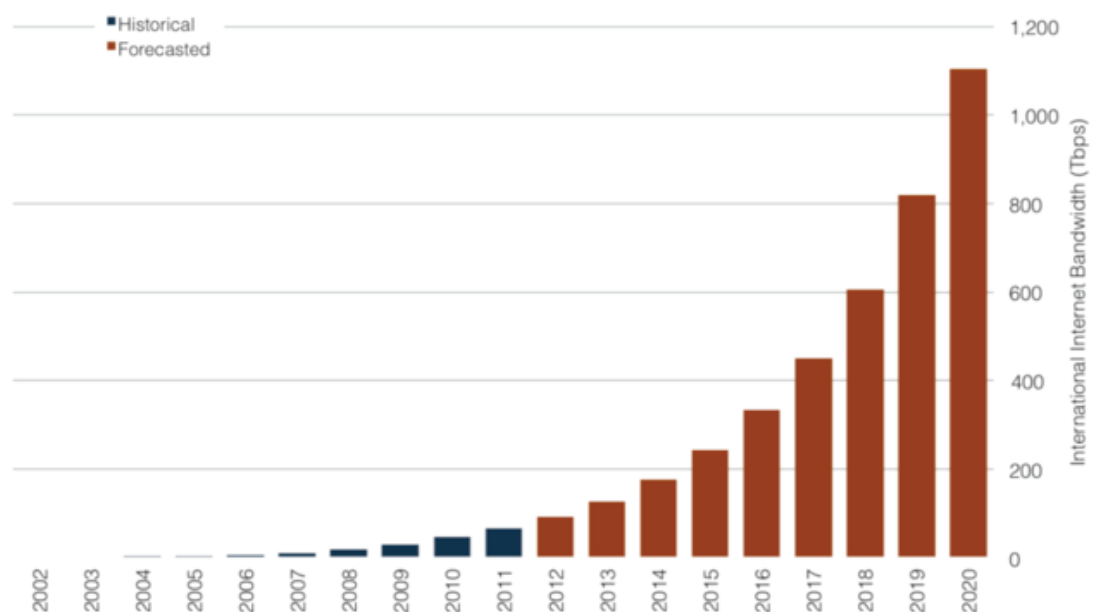
Figure 1: Used International Bandwidth. Source: The future of bandwidth, available at https://masscommgroup.com/trends/bandwidth-explosion-as-internet-use-soars-can-bottlenecks-be-averted/

There are many books and articles written by academic researchers, consultants and managers in various fields about collaboration. Nevertheless, among both business and academic communities there is a general belief that the more a business firm is 'collaborative', the more successful it will be, and that collaboration within and among firms is more essential than in the past [3]. A global survey of business and information systems managers found that investments in collaboration technology produced organizational improvements that returned over four times the amount of the investment, with the greatest benefits for sales, marketing, and research and development functions [4].

Today, collaboration tools and information systems are beginning to gain more attention in business life with the use of actual web technologies in rapidly developing communication and information technologies, which are accelerating business processes and increasing cooperation. Particularly in the globalized world economy, various scattered working-teams working on the same project are experiencing problems in terms of communication, synchronization and information sharing. The growth of virtual teams working at different places and times is quite remarkable [6]. Web-based collaborative technologies extend beyond the organization and traditional collaborative methods, helping participants in different geographies work together in a synchronized way. We can now exchange ideas and partner with someone in another time zone, in another country, or on the other side of the planet by using a myriad of distance communication tools available through computers, smart phones and other devices [7].

The concept of Collaboration 2.0, which gained more importance especially with the development of Web 2.0, increases the capabilities of internet based business collaboration tools. Collaboration 2.0 refers to the deployment of Web 2.0-based social software tools and services, such as wikis, blogs, forums, RSS feeds, opinion polls, community chats and social networking, to facilitate enterprise collaboration [8]. Along with the development of these collaborative tools, the communication abilities and capacity of the working teams are increasing at a high level.

The increase in the use of technology in universities over time has led to the creation of new collaboration and communication tools. With the emergence of faster communication tools, it enables academics and collaborators to provide faster and more effective information transfer and more efficient communication and feedback [9].

Research show that effective knowledge management can improve education and learning in a higher education setting [10]. In addition, students should regularly participate in collaborative learning activities such as group projects, presentations, group

discussions and peer reviews that require significant collaboration and communication with their classmates during the lesson period [11]. Especially when the researches are evaluated as a group study between the academic staff and the students in the framework of postgraduate education, cooperation tools gain importance in this structure. As shown in Figure 2, the use of web-based collaboration tools in education increases training effectiveness and productivity.
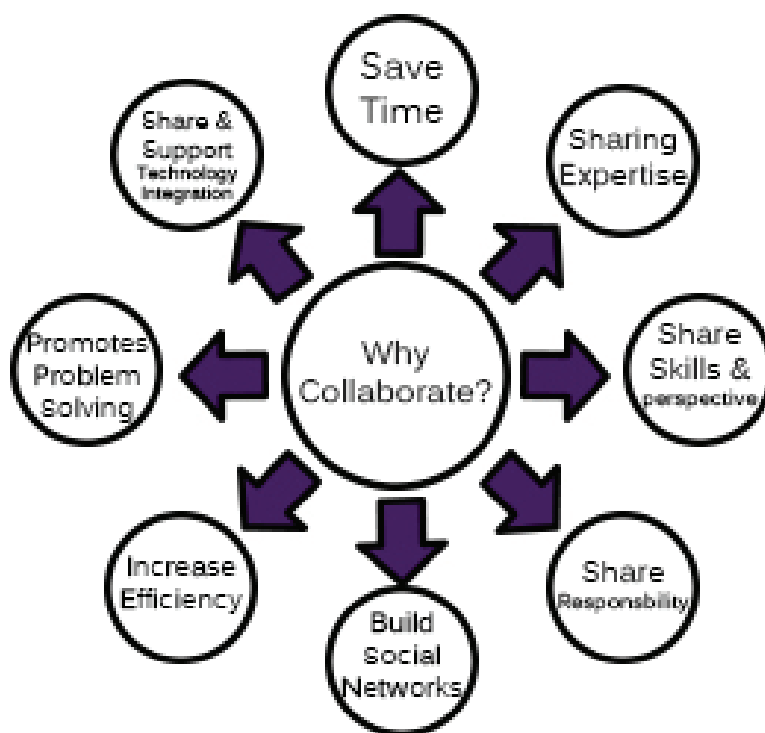
Figure 2: Benefit of collaborative web-based learning. Source: Online collaboration and communication tools: Web 2.0, available at https://online.tarleton.edu/Home_files/EDTC_538/Week_2/Week_27.html

Within the same scope, various information systems and collaboration tools used in universities make the business processes practical and facilitated. Through these various information systems and collaboration tools used, it is easier for students, academic and administrative staff to manage, plan and control the processes. In this context, the information systems within the university that are examined in this context are generally used with a variety of information and document sharing purposes and they are not designed as a collaboration tool.

In addition, it was determined that the students at the graduate thesis stage have problems related to the communication and cooperation with the institute, the advisor and the department. It has been also observed that the students in the thesis stage have difficulty in managing the thesis processes, planning the process with the advisor and obtaining the necessary information from the institute and these reasons are thought to affect the completion rate of postgraduate thesis.

Within the scope of this problem, the aim of this study is to increase the cooperation and communication among the student, the advisor, the department and the institute through a comprehensive collaboration tool, developed using various web technologies, thus making the process more manageable. Through this collaboration tool, communication between the advisor and the student is being tried to be made more interactive with tools such as video call and real-time messaging and file sharing. Through the proposed structure, it will also make it possible for the advisor, the department and the institute to monitor the process related to the thesis stage of students. In addition, they will be able to manage group areas and other activities that students or academics can create among themselves. The process can be monitored instantaneously to optimize the managing process through this collaboration tool, which is designed as an interactive platform, and the necessary communication network can be realized on this platform.
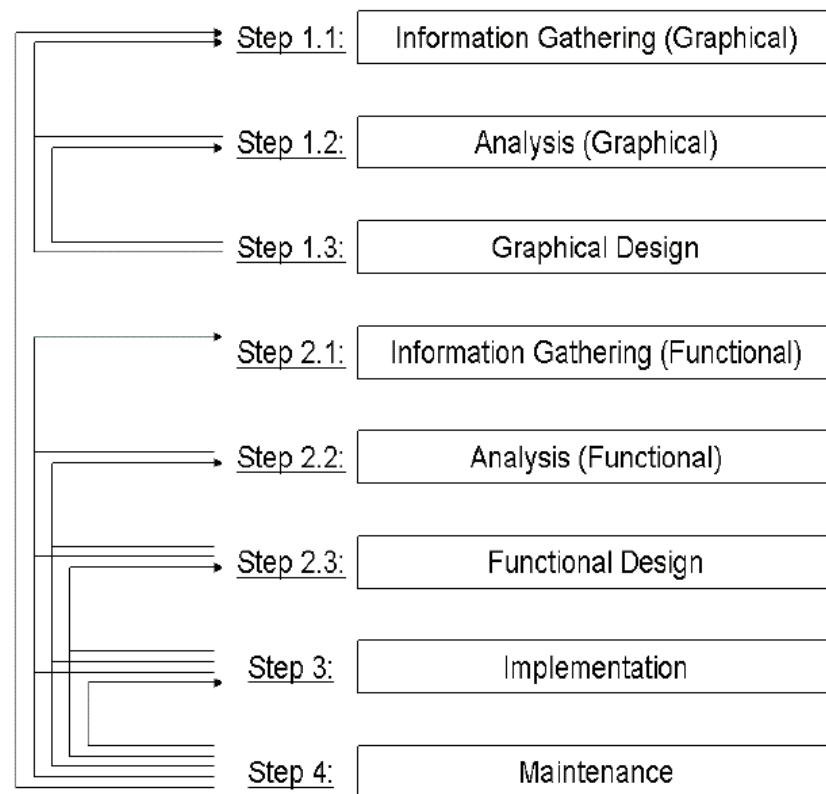
2. Methodology

The web-based software development process consists of two phases, graphical and functional design. Although standard software development methodologies are used for web-based software development, they do not fully cover the requirements. Therefore, each steps of Web Development Life Cycle (WDLC) which is a combination of two methodologies known as 'System Development Life Cycle' and 'Prototyping' have been followed in this study. As shown in Figure 3, WDLC addresses the web application development process in two parts as graphical and functional development [12]. Therefore, in the scope of the research, each step of Web Development Life Cycle was implemented.

2.1. Information gathering (graphical)

It is the first step of application development, in which the necessary information is gathered for the design stage. The necessary information is compiled here before deciding on the design that is appropriate for the developed application. Considerable attention has been paid to this stage in this study. Because design is very important in this application as it is in every web based application. At this stage of the application, it has been considered that the application to be designed will be an academic platform. It is considered that the application developed in this study can be used not only on

Step 1.1:	Information Gathering (Graphical)	
Step 1.2:	Analysis (Graphical)	
Step 1.3:	Graphical Design	
Step 2.1:	Information Gathering (Functional)	
Step 2.2:	Analysis (Functional)	
Step 2.3:	Functional Design	
Step 3:	Implementation	
Step 4:	Maintenance	

Figure 3: Web development life cycle. Source: French, A.M. (2011). Web development life cycle: A new methodology for developing web applications.

desktop computers but also on mobile devices. In addition, a general road map of the design process is prepared.

2.2. Analysis (graphical)

At this stage, the graphical design needs of the application are determined with the information obtained. Design steps have been put forward for the developed web application. The site map is set out in the outline and it is determined at this stage how the users can navigate in the application. In addition, interfaces for different types of users have been defined, and graphical design differences have been introduced for each user.

It was decided at this stage which graphical design tools or design languages would be used in this study. After obtaining the information and analysis, HTML 5 and CSS 3 design languages were chosen. These dynamic languages are suitable for developing

web-based applications, and they support mobile platforms at the same time. In addition to these design languages, the entire structure of the application, which will also be used on mobile devices, is designed on the Bootstrap Framework.

2.3. Graphical design

After the obtained information and analysis, the graphical design of the application is realized at this stage. Pages and menus are designed so that users can navigate after all the interfaces of the application have been defined.

2.4. Information gathering (functional)

At this stage, the functionality of the web application needs to be determined and the purpose of the application is to determine what functionalities are required and the different components for each part of the application. The necessary information for the functions, procedures, classes and database structures to be used in application are collected at this phase.

2.5. Analysis (functional)

In general, the implementation phase of the software process and the data flow structure is determined. It was analyzed how the structure will be traced through the obtained information and the targeted aims. Within the scope of the study, how each object to be created is programmed and its aims are determined.

It was also decided at this stage which libraries, software languages, databases and platforms should be used in application.

Software languages used in the developed application:

1. PHP programming language and AJAX Framework for database connections,

2. JAVASCRIPT programming language and JQUERY library for functional programming.

Database language and database used in the developed application:

1. SQL with MYSQL for database queries

Frameworks, tools and libraries used in the developed application:

1. WebRTC framework for video call,

2. TFPDF library for create PDF,

3. CKEditor Responsive FileManager tool for create file manager.

2.6. Functional design

The application developed in this phase is also integrated into the application of code blocks, functions, classes and procedures used. As a result of the information obtained and the analyzes made, the prototype of the application is functionally demonstrated. In this way, the outline of the application is outlined except the updates to be made later.

2.7. Implementation and maintenance

At this stage the application is moved to the temporary server and tested. In this way, both the test phase and the application development phase can be continued. After development is complete, all files are moved to the main servers.

Maintenance includes any changes to existing programs, functions, or databases that need to be changed in the application to update the style sheet or to apply a different look to the application [12]. Maintenance is an ongoing process and it can be done by returning to necessary steps when necessary.

3. System Design and Application

The developed Online Collaboration Tool Application consists of the three basic structures shown in Figure 4. In these three structures, the system works in a continuous connected state within the system. The main purpose of this application is communication, but it makes the system more manageable for managers and advisor. As mentioned earlier, these three aims are to increase the cooperation and communication among the student, the advisor, the department and the institute through a

comprehensive collaboration tool, developed using various web technologies, thus making the process more manageable.
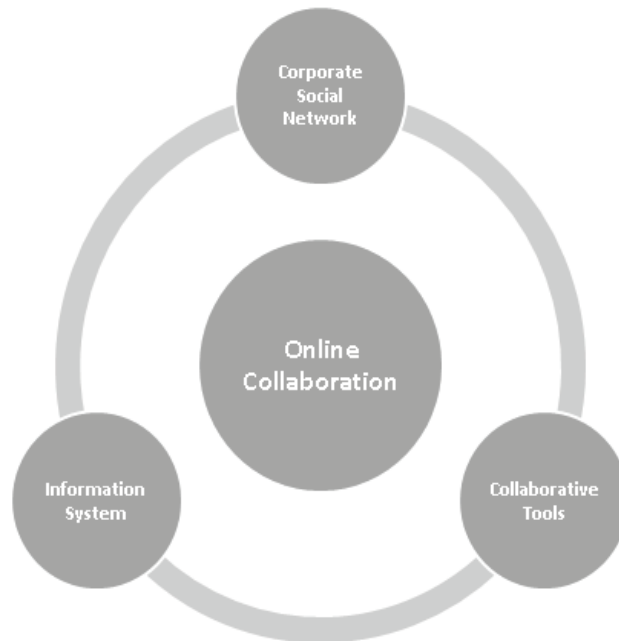
Figure 4: Structures of the online collaboration tool application. Source: Authors.

In this application which is developed within the scope of this study, there are five types of users mainly in terms of usage and accessibility. These user types are:

1. Student

2. Advisor

3. Department

4. Institute

5. Admin

From these users, students and advisors are not able to use the field of information systems although they are authorized to use corporate social networks and collaboration tools. Meanwhile, while departments and institutions have access to information systems structures, access to collaboration but corporate social networking tools are limited. Departments and institutions have access to various reporting screens in particular. Admins who are the administrators of the whole system have access to all areas of interest. Authorities such as creating departments and institutes are defined only by the administrators. As it is clear from the authorities, the information system only provides information to the student and the consultant, and provides the department

and the process of managing the process. The information was considered safe when all the authorities were made. This means that only high-level user types can access the areas where personal information is available. In addition, only the advisor, student and other users defined by the advisor can access the thesis work area.

3.1. Information system

This section consists of the structures where user information is recorded and reports are available to the department or institute. As shown in Figures 5 and 6, this area records student, advisor, institute, lesson and department records, reports related information or can be output in various formats. For this reason, the information system constitutes the main frame of the whole system.

Figure 5: Students list. Source: Authors.

Figure 6: Student detailed information. Source: Authors.

3.2. Corporate social network

This section is where all users can share content, messaging, and tracking each other. As shown in Figures 7 and 8, all types of users can share content such as text, images or videos from this area with their followers and see their followers' share. In the same way, followers can be examined in profiles. In addition, all users also know real-time messaging with other users.
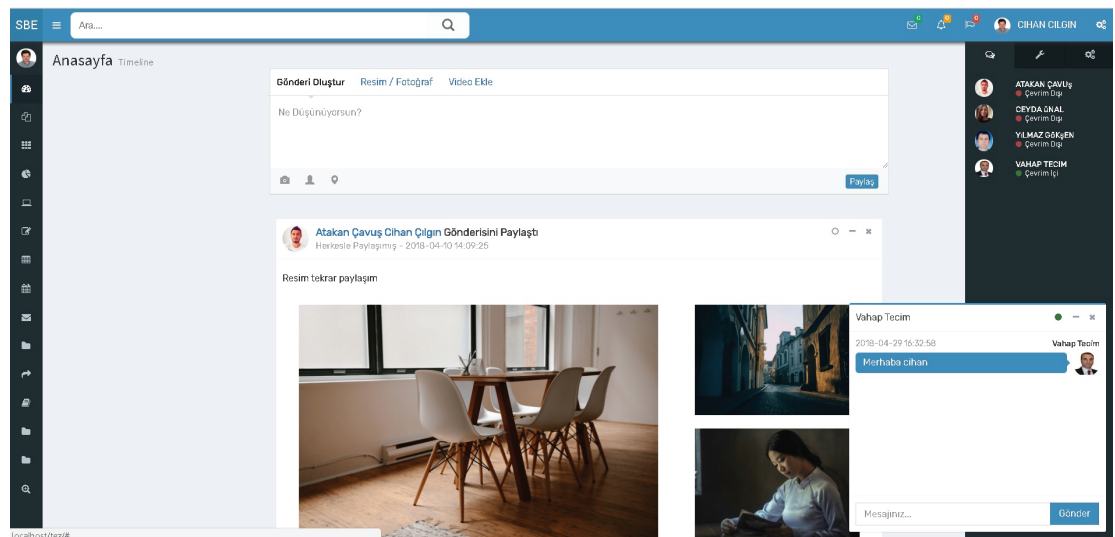

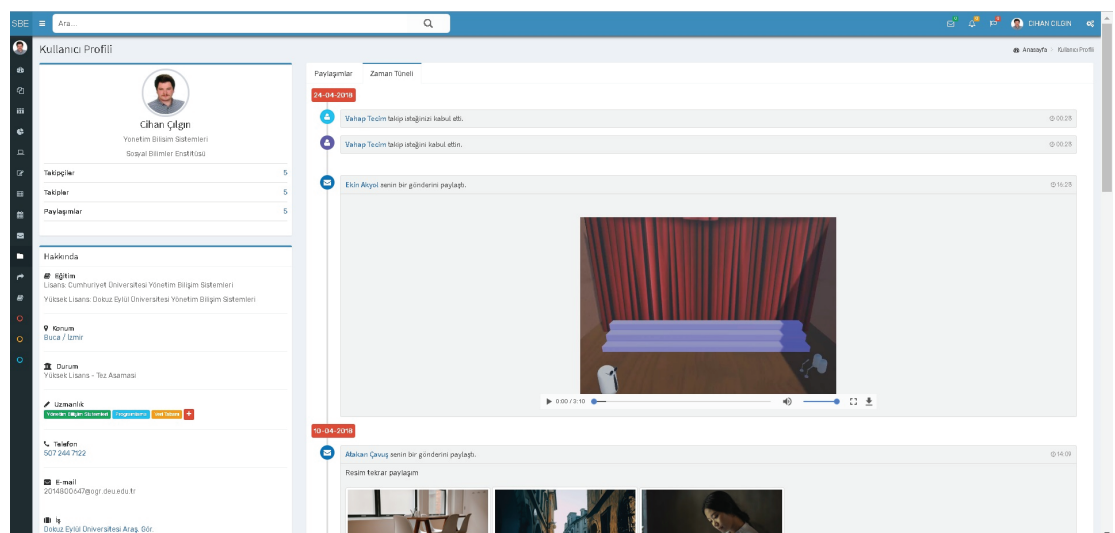**Figure** 7: Main page (timeline). Source: Authors.

Figure 8: Profile page. Source: Authors.

3.3. Collaborative tools

This section consists of areas where the advisor and the student can share files, plan actions, or make video calls. As shown in Figure 9, any file can be shared with this file manager with the designed file manager. In addition, real-time video calls will make communication between the student and the advisor more effective. In addition, this section can be used under the separate titles for group work of each user independently of thesis studies.
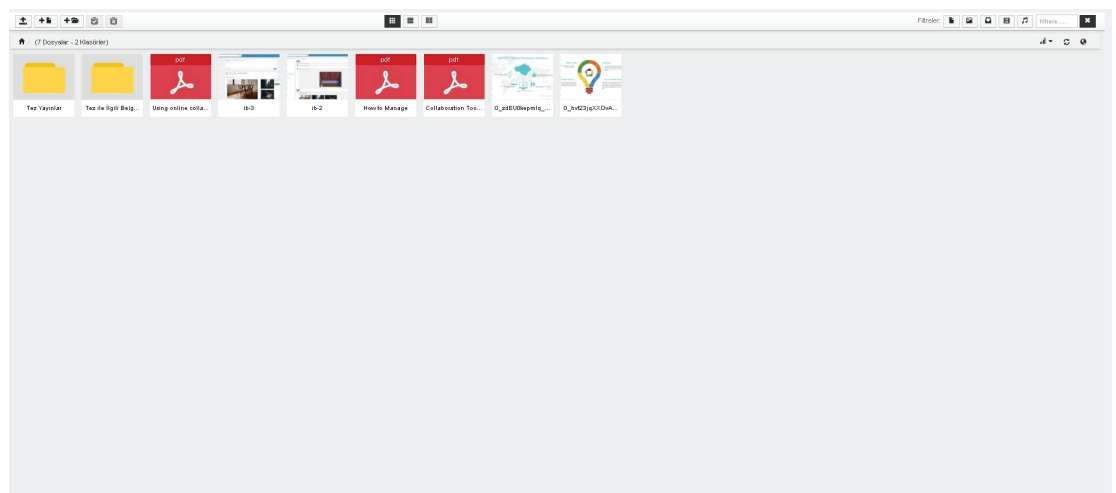
Figure 9: File manager page. Source: Authors.

4. Conclusion

Considering communication and process management problems, especially at the level of postgraduate education, within the scope of this study, a framework is created for the students to conduct management, communication and collaboration between the institute, the consultant and the department during the thesis studies or the lesson period studies. Problems in the management process have been solved with various collaboration tools and corporate social networks created. Furthermore, through the created information system, the institutes and departments are more easily monitored, reported and directed to the students' interest processes.

As a result, the use of collaboration tools and corporate social networks provides the following outputs:

1. To speed up communication and make it effective.

2. Increase productivity with quick access to sought-after information.

3. Connect the users in different areas through the developed environments.

4. Sharing the most up-to-date information and ensuring that it is available as soon as possible.

5. The education process takes place in everyday life and the education process continues uninterruptedly.

6. Making training processes more visible.

In subsequent work, a web-based project management tool can be developed to give the application a more dynamic structure. Given the problems of students, especially at the graduate level, students can become more effective by adding a structure where Gantt diagrams, PERT, or CRM analysis can be done so that both the course and the thesis students can perform process management.

References

[1] Rudman, R. and Bruwer, R. (2016). Defining Web 3.0: Opportunities and challenges. *The Electronic Library*, vol. 34, no. 1, pp. 132–154. Available at https://doi.org/10.1108/EL-08-2014-0140

[2] Paulson, L. D. (2005). Building RichWeb applications with Ajax. *IEEE Computer*, vol. 38, no. 10, pp.14–17.

[3] Laudon, K. and Laudon J. (2012). *Management Information Systems – Managing the Digital Firm*, p. 57. Upper Saddle River, NJ: Pearson Education.

[4] Frost and White. (2009). *Meeting Around the World II: Charting the Course of Advanced Collaboration*, pp. 3.

[5] Jon Brodkin. (2012). *Bandwidth explosion: As Internet use soars, can bottlenecks be averted? The Future of Bandwidth*. Available at https://masscommgroup.com/trends/bandwidth-explosion-as-internet-use-soars-can-bottlenecks-be-averted/

[6] Brake, T. *Where in the World is My Team: Making a Success of Your Virtual Global Workplace*, ss. 21. Hoboken, NJ: Jossey-Bass, Wiley.

[7] Wahl, L. and Kitchel, A. (2017). Internet based collaboration tools, in *Remote Work and Collaboration: Breakthroughs in Research and Practice*, pp. 105–115. USA: IGI Global. DOI: 10.4018/978-1-5225-1918-8

[8] Turban, E., Liang, T., and Wu, S. (2010). A framework for adopting Collaboration 2.0 tools for virtual group decision making. *Group Decision and Negotiation*, vol. 20, no. 2, pp. 137–154.

[9] Lomas, C., Burke, M., and Page, C. L. (2008). Collaboration tools. *Educause Learning Initiative*, Paper: 2.

Online Collaboration and Communication Tools: Web 2.0 (2016). Using Google Documents for Collaboration. Available at https://online.tarleton.edu/Home_files/EDTC_538/Week_2/Week_27.html

[10] McCarthy, A. (2006). Knowledge management: Evaluating strategies and processes used in higher education. Doctoral dissertation, Nova Southeastern University, Fort Lauderdale, FL.

[11] Chu, S. and Kennedy, D. Using online collaborative tools for groups to co-construct knowledge. *Online Information Review*, vol. 35, no. 4, pp. 581–597. Available at https://doi.org/10.1108/14684521111161945

[12] French, A. M. (2011). Web development life cycle: A new methodology. *Journal of Internet Banking and Commerce*, vol. 16, no. 2, pp. 3.