Graduates' Progression Tracking System

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Summary

Universities are open systems that aim to prepare students to meet academic and industrial programs' expectations. It is important for universities to recognize these expectations and to make sure that they are achievable. To do so, graduates' progression tracking system is an essential tool for universities' development to ensure graduate students meet the market requirements. The purpose of this paper is to create automatic tracing system that captures information about students after graduation and creates annual report that represents the status of university students in term of employment or completing their study. It mainly assists graduates to find appropriate jobs that meet their desires or enabling them to complete their higher education by providing all these opportunities in one platform. The system main objective is to improve communication between graduate students, the university and companies. It also aims to identify the difficulties associated with graduate employability and changes are required to serve current students in term of creating new programs or activities. This helps universities to identify and address the existing curriculums and program's strengths and weaknesses and their adequacy, quality and competencies of a graduate in the labor market, which enhances the quality of higher education. we analyzed and implemented the tracing system using PHP language, which speeds up custom web application development and MySQL database, which guarantee data security, high performance, and other features. Graduate students found the proposed system usable and valuable.

Keywords:
Students Tracking, Tracing Graduates, Higher Education, Career Path.

1. Introduction

Saudi Arabia students are seeking to find a job in different sectors according to their needs, skills, and certificates. In fact, there are different types of job applications can be on-demand from the graduate such as part-time or full-time, contract-to-hire, long-term & short-term projects, direct placements, and professional placements.

In addition, there are several orders for job recruitments on the online such as: LinkedIn, Bayt, and Akhtaboot websites, which are considered the excellent and professional services that connect job seekers for helping them to find a suitable job. These sites operate through several processes starting from job seekers to provide their personal information, testimonials, previous employment history during the work period, name of previous companies and previous job titles such as software developer, project manager, web engineer, digital marketing, etc.

With the advancement in technology, there is a greater demand for recent graduates to find vacancies in organizations, institutes and private companies. Some students may wish to complete their educational careers in the same university programs that they graduated from. Among the advantages of this is that the university continues to progress and keep abreast of the latest developments with its students by providing available job opportunities and educational programs in the capabilities of supporting graduates after graduation with the possibility of employing its graduates or ensuring the opportunity to complete the study as it suits him.

The proposed system will help the university meet the ABET principle. The National Accreditation Council for Higher Education Institutions (ABET) defines the graduate as an achievement that the student has achieved after completing his educational experience in accordance with the international education standards to which the academic programs are subject. It depends on the educational outputs instead of the inputs in the academic program, as the requirements focus on graduating qualified students in the global labour market and mastering academic competencies and technical and professional skills, whether difficult skills or personal skills as mentioned in the university's quality objectives, and as evidenced by the performance of graduates in society according to their background, which has a solid educational foundation. A good university should have a good management and monitoring system for its alumni so that the alumni can be used as the human capital for their university.

Several universities' have employed alumni tracking program in the form of questionnaires annually distributed to the alumni, for example [8-26]. These universities use WEB-based database. However, this method is not sufficient for the management to make decision for future development. There is a need to add to other indicators to meet the ABET requirements. Thus, we proposed the tracking system to have a clear overview about graduates' status.

1.1 Problem Statement

Universities graduates face many problems, and these problems are derived from the region that the graduate lives in or student skills that the graduate got it from the university. In terms of jobs, there is a lack of knowledge of suitable job applications in our region, required expertise, certificates or skills. In terms of the academic program, there is a lack of knowing the educational programs after graduation, especially for postgraduate students. this derived from the lack of communications between the university and postgraduate students.

However, there is a lack of clarity regarding the statistics of university data to track graduate students. In fact, the general authority for statistics found that the unemployment rate in Saudi Arabia rose to 15.4% in the second quarter of 2020. Hence, Corona Covid-19 have been affecting on the economic side negatively by decreasing the number of employments in the country [4].

1.2 Objectives

This project aims to promote online employment and study completion for students who have graduated from Taif University and their follow-up after graduation. The main objectives of our project are as follow:

- Help Taif University graduates find job opportunities in the public and private sectors.
- Help graduates find suitable Master or PhD programs based on their qualifications and university standards for program acceptance.
- Enhance the university communication with graduates and ensuring the continuity of the relationship between them.
- Allow the university to have an overview about the graduates' status and determine the rate of employed as well as students who have completed their education.
- Help the university develop new educational methods and programs needed by the labour market.
- Help the university to build a beneficial relationship with companies and quickly localize the private and government sectors.
- Assist the companies by raising the level of quality and ensuring that employees of companies have sufficient experience.

1.3 Project Scope

The scope of this research targeting graduate students is creating a link between graduate students and their universities. It also gathers graduate students and available companies to assist them to find jobs. In addition, the system notifies graduate students about available master and PhD programs in universities. All these services are provided to graduate students through a web-based software application, which worked by developing a content management system to track graduates, job opportunities and graduate CVs.

This research worked to improve communication between graduates, the university, and companies after graduation to share information about vacancies, college recommendations, and master programs available after graduation to its graduating students. In addition, graduates are encouraged to improve their skills based on the required job specifications or encourage them to complete the remainder of the study. Moreover, the participation of graduates in the labour market or the presentation of alternative options clearly supports the success of the educational process in the city of Taif. In addition, this helps to improve the efficiency of the graduate affairs unit, whether through feedback or following up statistics.

The general authority for statistics adopted a methodology to show the findings in the second quarter of 2020 as; unemployment rate among Saudis was observed to 15.4%. Saudis and non-Saudis have contributed to the rate with 9.0% increasingly. The unemployment rate for Saudi males were 8.1% and for females were 31.4%. Deeply, 63.1% of unemployed Saudis are aged (20-29) and 56.6% of the unemployed have graduated with a bachelor's degree. In fact, all of these are negative indicators with causes from significant aspects; there is a gap in the relationship between university graduates and university institutions, and the adoption to the graduates' skills was very weak which impact on the results of finding good opportunities [4].

1.4 Expected Benefits

The several expected benefits out of this system are below:

- Increase students' awareness of employment opportunities and available Master of PhD programs.
- Encourage the students to improve their skills based on labor market requirements.
- Give the University a clear vision of the proportions of the employed and unemployed.
- Allow the university to enhance higher education to meet the market requirements based on the students tracked report.
- Give companies a clear vision of graduates' experiences and skills.

2. Related Papers

2.1.1 Tracking system

There are few systems that built to track graduate students' status [13]. Suryani et al. proposed a system at Hatta University, which is targeted at alumni, employers and the university [12]. It collects accurate alumni information and their accomplishments from the time they leave the university until they find a job. Therefore, the system was designed to study online tracking that can be accessed directly by university officials to follow the

performance of graduates and receive opinions and suggestions from graduates and employers. The program was created using PHP and MySQL programming languages, by applying bootstrap as CMS tool. Figure 1 shows the application main screen.
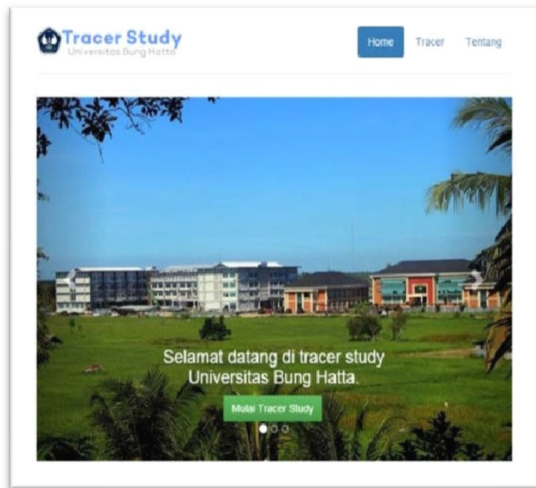

Fig. 1 Tracer study at Hatta University

Another current research by Albina et al., where they proposed an employability tracer study of information technology education graduates from a state university in the Philippines. In this study, researchers used a retrospective cross-sectional survey method. This study aimed to improve higher education outcomes through a data collection tool using a committee's graduate tracking study [13]. The study was carried out on 177 graduate students out of 204 during the period 2015-2017 The results were that 139 out of 177 of those surveyed had a job. Moreover, 97 out of 139 said that their first job was related to the program in which they participated, 28.06% of employees found their job for a year or less than two years, and 25.90% found it from 1 to 6 months. 69.78% found that the educational program methodology is appropriate for their first job. The possibility of employing graduates, one of its recommendations was the periodic review of educational curricula by academic leaders to ensure that graduates are equipped with the necessary knowledge and skills. The researchers found that enhancing the programs requires that the educational process exceed the level of data transmission. This ensures that students graduate with a level that qualifies them for employment. These studies became a useful tool for tracking the educational process's strengths and weaknesses at the end of the study, which aimed to address issues such as employment, monthly salary, and the duration of the job search.

Other researchers indicated that unemployment in Vietnam may be due to educational results and labor market requirements [18]. And according to the graduates 'response, they lack useful bodies that link universities and employers. It is reported that there has been a surplus of graduates in recent years. The primary objective of the project was to increase employment opportunities for graduates in Vietnam. To reach the main objective, the research attempts to achieve the following objectives: Determine the requirements and characteristics of integration into labor markets for graduates. Provide data on job numbers and the nature of work. Analysing graduate job search strategies. Their effectiveness provided information about the usefulness of their education, marks earned in obtaining jobs, suitability for the job, and job performance. Some results found that the methods and strategies of research most prevalent among graduates of the University of Vietnam, which are done through Internet portals and company websites, while graduates rarely used university services. For example, only 5% of graduates have the employment services provided by the university, indicating a great need to enhance the university's employment services for graduates.

2.1.2 Related Websites and Applications

- Akhtaboot

This application is considered one of the most common applications that are providing the online career network in the middle east region by building an online resume for the employees. The online resume contains personal data, professional information like total years of experience, most recent job function, the industry of most recent employer, languages, and skills. In addition to education information like education level, educational institute name, education level, and educational institute name. Moreover, this application provides general tips for an impressive CV and recommended Jobs to the Employers which helps to create vast opportunities for talented candidates [1]. Figure below shows the application main screen.
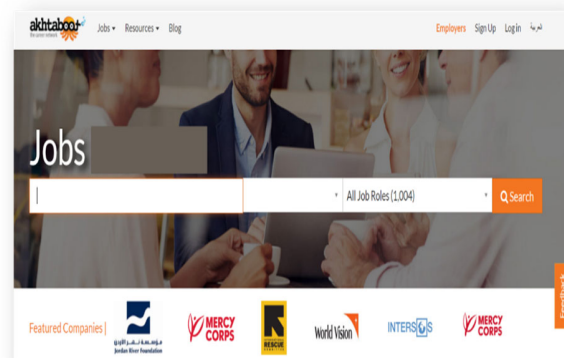

Fig. 2 Akhtaboot application

- **Linkedin**

This application is founded in 2003 which considered a social network app that targeted the career seekers to develop its own resume. It offers a digital search engine for searching on jobs in the targeted fields based on the

qualifications and employee skills. The user on this application is able to update and upgrade it won resume. The aim of this project is for Creating economic opportunity for every member of the global workforce and connect the world's professionals to make them more productive and successful. In fact, LinkedIn leads a diversified business with revenues from membership subscriptions, advertising sales and recruitment solutions under the leadership of Ryan Roslansky. In December 2016, Microsoft completed its acquisition of LinkedIn, bringing together the world's leading professional cloud and the world's leading professional network [5]. Figure 3 shows the application main screen.
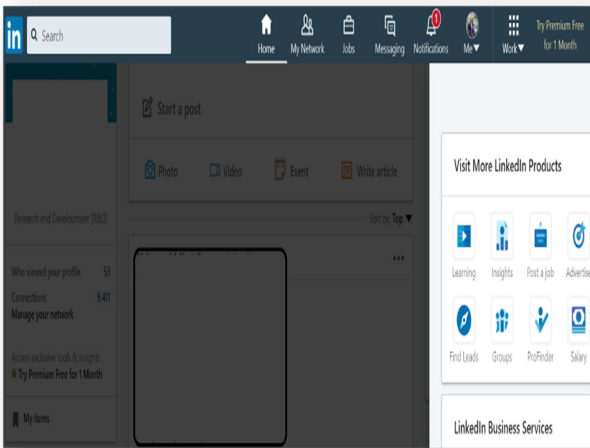
Fig. 3 LinkedIn application

- **Jordan University alumni application**

This application founded for the students after the graduation in Jordan university for helping them to add or update the personal information, skills, history of the previous and current job is joint before [6].
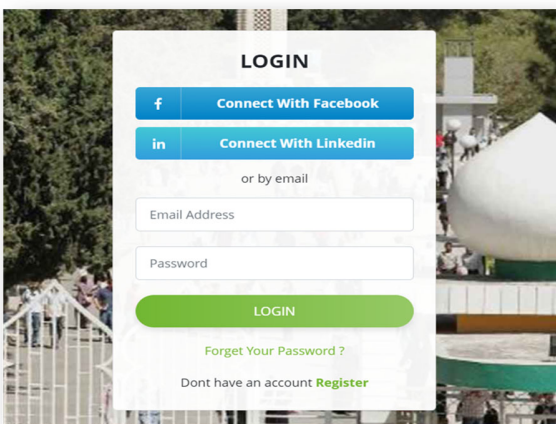

Fig. 4 JU alumni application

This application encourages the students to find job opportunities and following the tips and recommendations to reach the career path. In fact, the job seekers in this application are just limited with the students who are graduated from the Jordan university. The aim of this application is tracking procedure of college graduates and providing alumni data to college faculties. Figure 4 shows the application main screen.

2.2 Related Works Summary

To summarize the comparison of related works with our application, there are aspects in the features and characteristics. In terms of characteristics, our application will be able to be available all the time to the students, companies and administration who are associated with Taif university, providing the security to the used data in this application, easy to use by providing a highly designed graphical user interfaces, the application will provide the services by free, the application support Arabic language which is the most common used in the region, and supporting the multiple platforms by providing a responsive graphical user interfaces with mobile and tablet.

On the other side, there were limitations of resources programs that help the students in the process of choosing the appropriate postgraduates' programs (Masters, and PhD). The found existing application provide the services based on payments and the majority of them were in the English language, while the majority of our community prefer the Arabic language.

2.2.1 Comparison of Related Works

This section studded the main related three applications to our proposed project for tracking the graduates from Taif university. Table 1 shows the comparisons between the existing systems and our system.

Table 1: Comparison between systems based on software characteristics

Systems/ features	Available	Secure	Usable	Free	Global	Support languages	Multiple platforms
Akhtaboot	Yes	Yes	Yes	Free and paid	Yes	Yes	Yes
LinkedIn	Yes	Yes	Yes	Yes	Yes	Yes	Yes
JU alumni application	No	No	Yes	Yes	No	Yes	No

Our system supports some of software characteristics like availability, security usability, free services and supporting English languages and multiple platforms.

Table 2: Comparison between systems based on provided services

Systems/ features	Find a job	Find an academic program	Connect graduate students with university	Connect graduate students with companies	Report rate of employee and Master and PhD
Akhtaboot	Yes	No	No	No	No
LinkedIn	Yes	No	No	No	No
Jordan alumni application	Yes	No	Yes	Yes	No
Our system	Yes	Yes	Yes	Yes	Yes

According to the relevant projects' analyses, comparisons analysis was made based on following criteria, which are the provided services system, such as finding a job, pursuing academic programs, allowing communication processes between the university and students, as well as graduate students and companies as shown at the above Table.

Table 2 presents that no available system that link Saudi universities with their graduate students and no available system that informs graduate students about available master or PhD program. Furthermore, none of the discussed systems provide a detail report about the graduate students' status in term of employment rate or percentage of students who enrolled in high education programs. This indicates the importance of our system, which addresses graduate students' needs, universities' requirements and companies' desires.

In addition to aforementioned necessities of the system, several researchers have reported the various factors that influenced graduate's employability in Saudi Arabia, the most important of which are: labor market needs, competition, employment policies within firms, and size of enterprises [2]. So, our system will take in its account of these factors.

On the other hand, employment managers at companies consider several criteria as well, including the conformity of the qualifications of the job applicant with the required qualifications, previous experiences, the applicants' skills, the organization of resumes and the extent to which the qualifications of the job applicant match the required qualifications [16]. Similarly, our system ensures that the applicants who see the announcements that are suitable to their qualification.

Similarly, each university has its condition and policies of acceptance at the graduate programs. For example, some Saudi universities require submission of two scientific recommendations, and the applicants 'assessment for master's and doctoral degrees is not less than (very good), performing a number of required tests such as abilities exam, and English language test (Step, IELTS, Toffel). So, all of these assessments are taken into account in our systems when presenting the announcements to the registered students at our system. So, each graduate student can see the announcements based on his/her equivalent and cv. Therefore, the most important information needs to be registered from graduate students is their cv, experience and GPA to ensure they receive the most suitable information for them based on their level of education and qualification.

2.3 Questionnaire

We conducted a short questionnaire with graduate students at Taif university to investigate the importance and valuable of this type of system, which shows graduate students the available jobs as well as academia graduate programs at one place. The questionnaire conducted online with 110 students, and they reported that they think the system is promising. 95% reported that they think the system is valuable. 92% stated that the system can help them track the available master or PhD programs without missing the deadline.

3. System Analysis and Design

This section shows the system analyses and design aspects of our system by following the Unified Modelling Language (UML) for understanding, analyzing, and designing our system. It is considered as a problem-solving technique that decomposes a system into its component pieces to study how well those parts work and interact to accomplish their purpose. To achieve that, system analyses and design based on UML presents several diagrams to represent the system such as use case diagram, and activity diagram. The used methodology in this project was the agile development methodology, which presents the phases of the software development lifecycle as sprints [3][7][10][11].

3.1 Use Case Diagram

Use case diagram is considered one part of unified modelling languages (UML) representation in its simplest of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. The interaction of the use case helps the developers to understand the workflow of the system functionalities between the actors of the system.

- **System Use Case Diagram**

It describes the use case diagram for the university admin, graduate and company which contains the functional requirements on the system as shown in Figure 5.
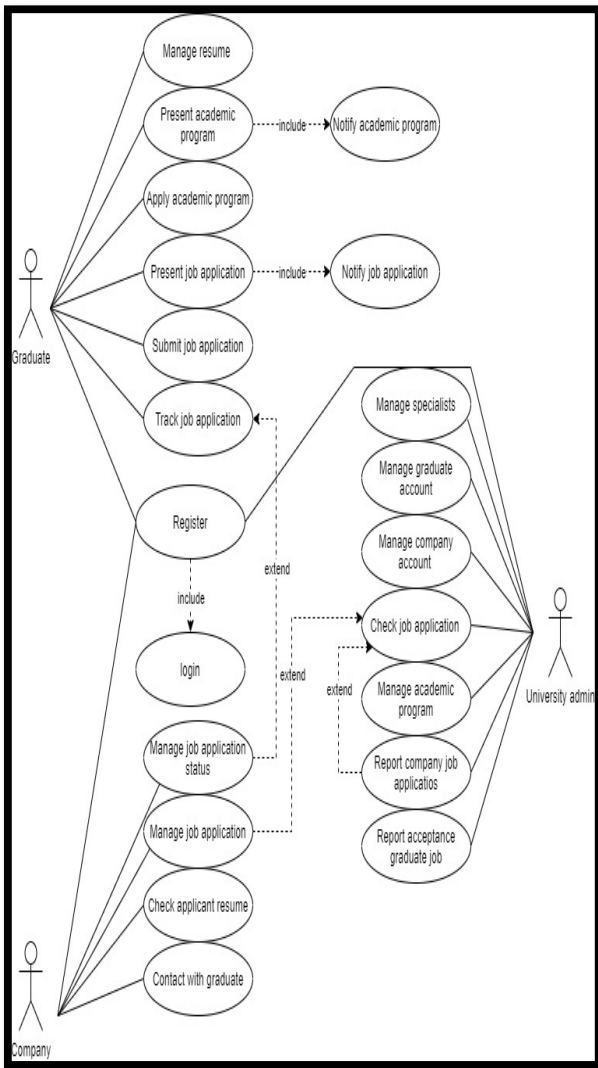
Fig. 5 System Use Case Diagram

3.2 Activity Diagram

This section shows the activity in our application for admin, graduates, and companies who will user the application. The given figures represent a workflow or process as step-by-step approach to solving a task. They analyzed, designed, documented and managed a process of our application in different fields (as shown in Figure 6,7 and 8).
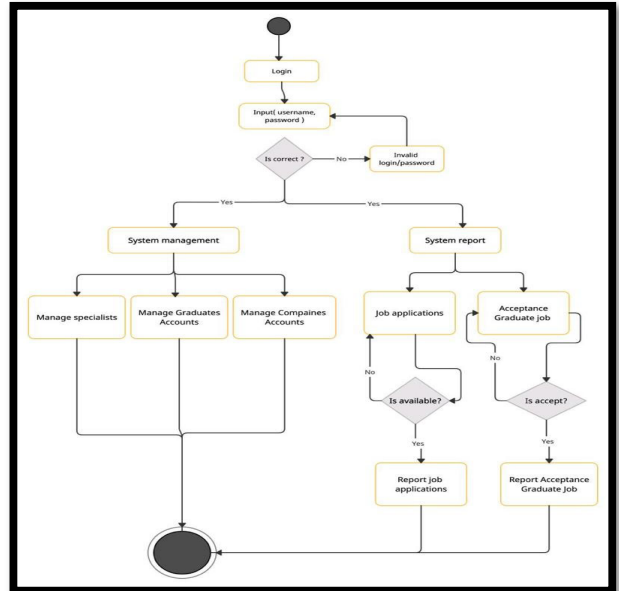
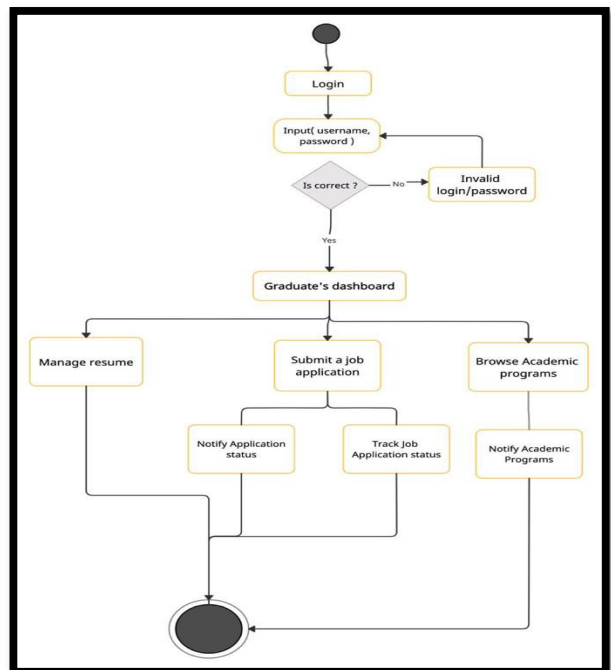• **Admin activity**

Fig. 6 Admin Activity Diagram

• **Graduate Activity Diagram**

Fig. 7 Graduate Activity Diagram

- **Companies Activity Diagram**
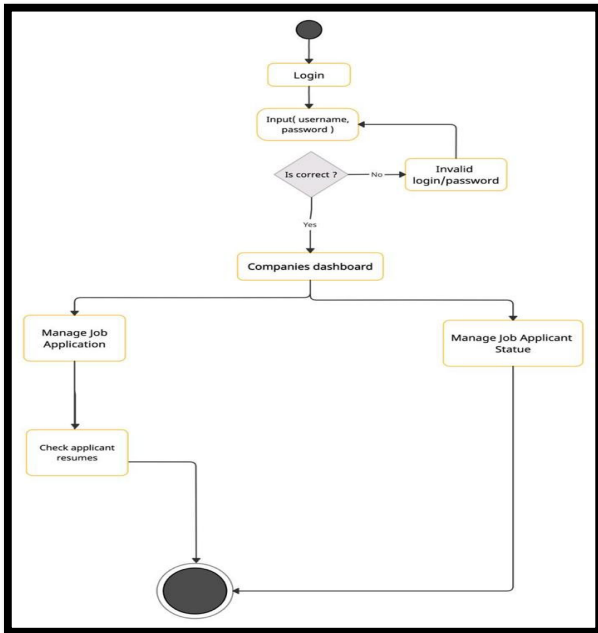
Fig. 8 Companies Activity Diagram

4. Implementation and Testing

Interfaces is considered a part of system implementation, which is clearly used in the tech world to present the interactions of elements with the end-users in an optimal way using different programming languages. The interface designed into an information device, such as windows applications, web applications, and mobile applications used by the users to access the software services and information. This section shows software specifications that were used to implement the system and design system interfaces.

4.1 Software Specifications

Software requirements deal with defining software resource requirements that must be installed on the computer to implement this application. The following points represent the main project software requirements.

MySQL Database: MySQL is an open-source relational database management system, MySQL stores data in tables based on rows and columns. Users can control and query data using Structured Query Language, MySQL is the most popular open-source database system in the world. It has the advantage of being High Performance, reduced Total Cost of Ownership, Data Security and On-Demand Scalability.

Visual Studio Code: Open source running system (Windows, MacOS and Linux) Fast, light and easy to use

The ability to develop it and add additions to it to meet all your needs If you're using another editor, you can transfer your usual shortcuts and add them to the Mobile Studio Code Customizable you can change the look of the editor Visual Studio Code includes the features you need to edit ,high-productivity source code VS Code has a rich collection of virtual keyboard shortcuts as well as allowing you to customize them The source code editor can check the syntax while entering .the code and immediately warn of syntax problems Depends on the Electron framework that is used to develop node web applications.js that run on blink's layout engine Instead of a project system, it allows users to open one or more directories, which can then be saved in workspaces .for future reuse This allows her to work as a neutral-language code editor .for any language Supports a number of programming languages (C&c++and CSharp HTML CSS and JavaScript backend).

4.2 User Interface Prototype

This section introduces some of the interfaces for the application. We present the most important interfaces that show the objective of our system.

- **Homepage Interface**

Fig. 9 Home Page Interface

Figure 9 present the first interface that users can see when opening up the web system. Users can search for a job or an opportunity of enrolling in a graduate program imedately without registering their information. If they want to have access to all the system services, users are

required to registered to the system through new users link (see Figure 9).

- **Create Admin Account**

Fig. 10 Creating Admin Account interface

Figure 10 shows the registration process for admin at the Graduate Tracking System. The system admin is required to enter their demographic information including full name, date of birth, gender, email and password.
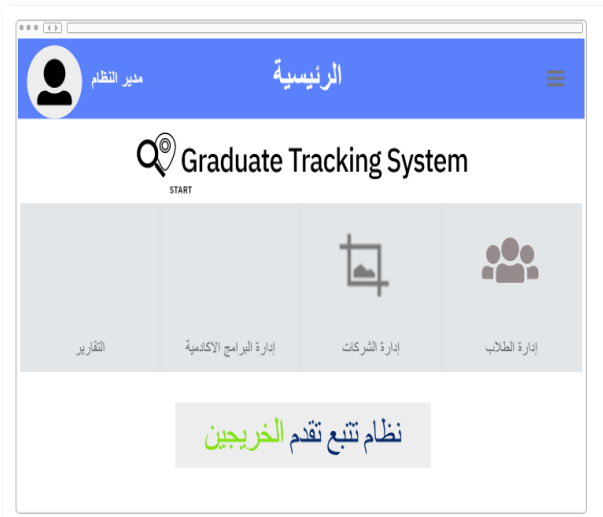

Fig. 11 Admin Home Page

Figure 11 presents the tasks that admin has to do to track the system services. Theses tasks are managing registred gardaute students, companys' management, high graduate programs and final reports.

- **Managing The students**
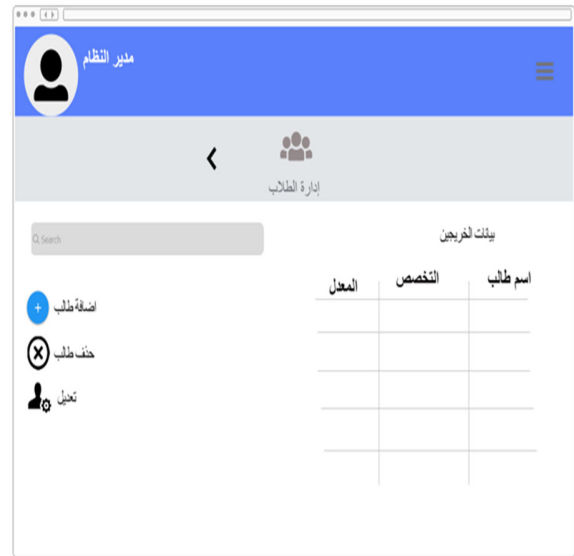
Fig. 12 Managing Enrolled Graduate Students

Figure 12 shows the essential task that admin do to manage enrolled students' information. Admin is able to add student, delete and edit their information.
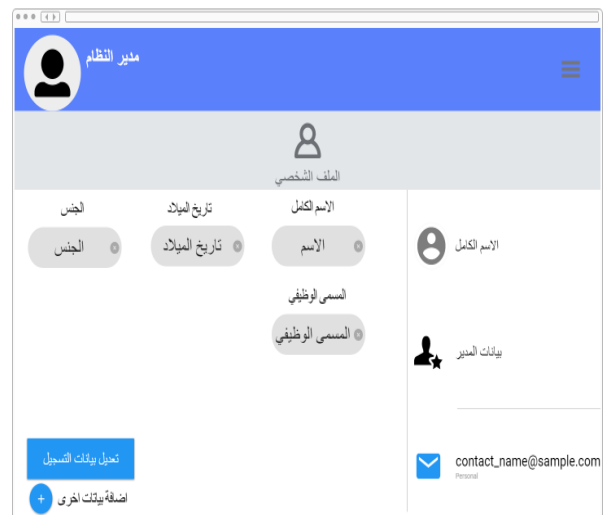
- **Admin Profile**

Fig. 13 Admin Profile

Figure 13 shows the admin main page that presents his/her information including name, date of birth, gender and email.
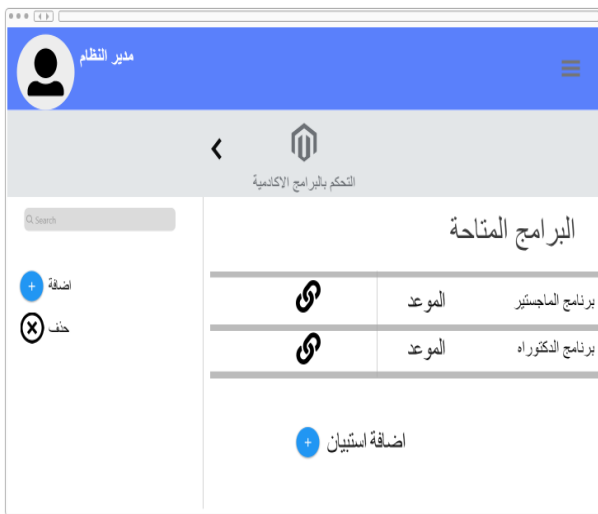
- **Controling Acadimic Programs**

Fig. 14 Controling Acadimic Programs

Figure 14 presents the academic programs that are available for graduate students to register. Beside each academic program, the system presents the program deadline and program link. At the same time the admin can add these academic programs or delete them based on the availability of the posted programs.
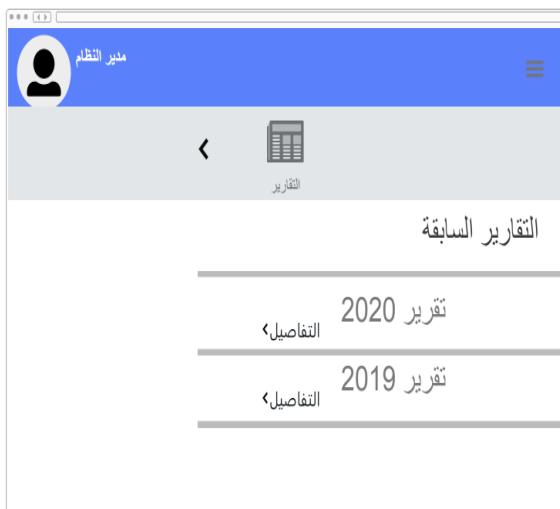
- **Reports**

Fig. 15 Report Interface

Figure 15 shows the final report about graduate students each year including their employment status or complting their studyin gstatus.

- **Reports Details**

Fig. 16 Reports Details

Figure 16 shows the report information that summarize the collected information about graduate student each year. For example, report 2020 shows the number of jobs that are announced through our system, number of students have been employed, and number of student who are studying mater or PhD prgrams.
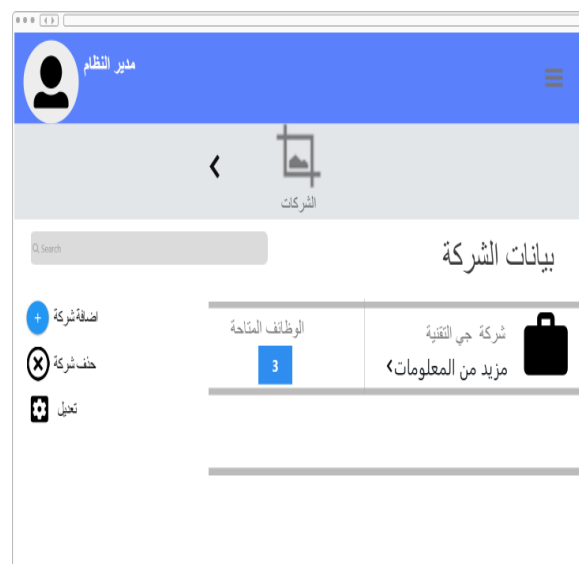
- **Companies Management**

Fig. 17 Companies Management

Figure 17 shows the companies information that want to annnounce their jobs through our system. As you can see, the admin can add company information, delete or edit it.

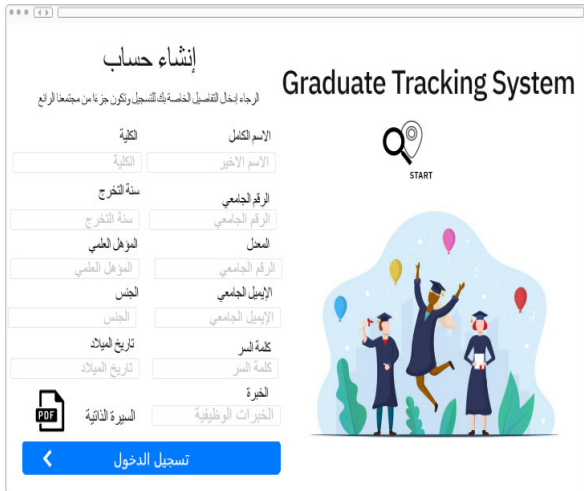- **Creating Student Account**

Fig. 18 Creating Student Account

Figure 18 allows user to simply create an account at the Graduate Tracking System. Users are required to enter their demographic information including full name, date of birth, gender, GPA, college, department, cv, expeiernce, email and password.
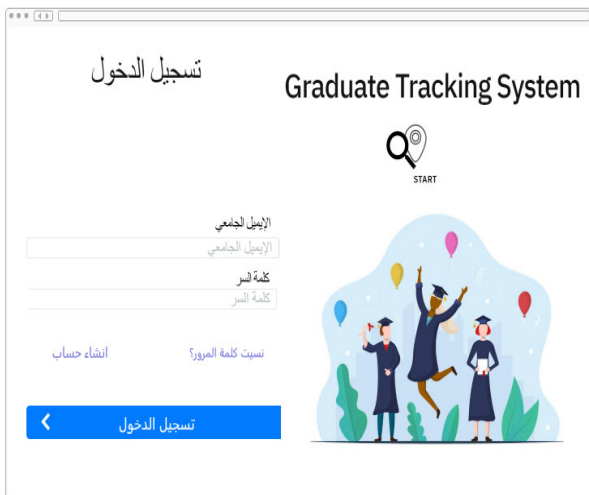
- **Student Login**

Fig. 19 Students Logging

Figure 19 shows the page of students' logging, which presents email and password that are required to enter the system.
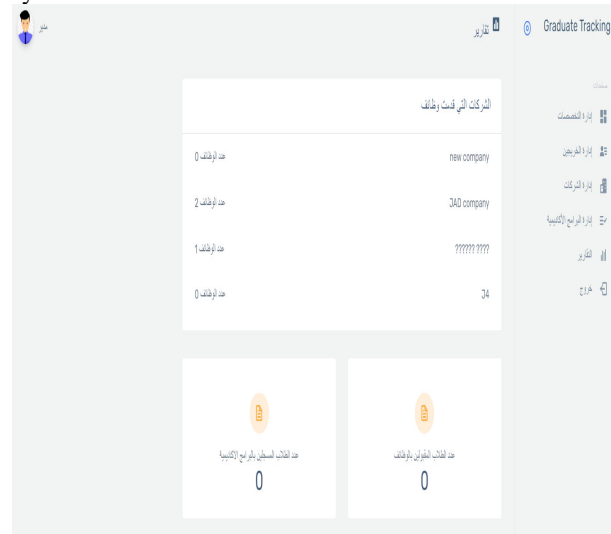

Fig. 20 Final Reports from Admin page

Figure 20 show that interface for report page,which summarize companies and students pages.

4.5 Usability Testing

We conducted a study to evlaute the usability of the developed system. We used the System Usability Scale (SUS) questionaire to test the level of the usability in our system and how much do the system meet the user satisfction [27]. The questionaire has 10 statements and they are measured on a scale from strongly agree to strongly disagree. The questionared was answered by 25 graduated students and the result was 86 %, which indicates the system is usable and it meets the usability principles.

5. Conclusions

This research solves the challenges of graduates looking for a job or completing a graduate academic program. It has done by developing a web-based application, which helps the university administration, alumni, and companies to make the process management of the features for getting the process management to the features of the presented software web application. This project is useful in collecting alumni data and investigating their conditions, and useful in understanding the level of satisfaction of graduates with the programs offered by the university and the extent of its approval for their current jobs. Graduate students will be tracked by querying from a relational database and tracking reports will be annual. There are three parties that play roles in the system: the university, the alumni, and the companies. The techniques used were

Visual Studio Code using PHP language and MySQL database management.

5.1 Recommendations and Future Works

We are going to encourage graduates to join the application for facilitating the process of looking for a job or academic program. For future work, we will develop an application that would be compatible with different platforms such as iOS, and windows. For further improvement, we will develop extra communication features in the application and improve the developed system security and privacy to meet end users' satisfactions such as further research we are going to analyze company information and accept only real one and prevent spam advertisements from registering on the website. We are also planning to make our system a commercial project, for example, a preparing CV, posting jobs after paying fees and other services.

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