Mobile App Enabled Scheduling System.
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Abstract

The aim of the project is to advance the St Mary's University schedule in the distribution of generated schedule in secured and time saving manner. The suggested system avoids the current manual working environment by replacing it with technology reliant working area or office. This will increase accuracy, reduce redundancy and occurrence of complications during scheduling process. Implementing the project requires to change the current scheduling software with the new system software which is capable of generating schedule much more effectively, and facilitates distribution of schedules through storing the generated schedule on system server. The students and instructors of the University retrieve it from any place or any time they need it using android installed mobile app or website through connecting to the system server. The backup method can be generated easily by the programming office. The system incorporates the advanced features which let the students and instructors participate in the scheduling process allowing them to give suggestions. The system counts and calculates the students vote on changing of the tentative schedule. It then sends it to the admin system software to be considered on generating the final schedule. This avoids the tedious checking of the notice board for the students and lets the instructors interact with program office without having to go to the office directly. This saves the instructors time and energy; it also reduces the institute' cost on schedule printing paper.

Keywords: Mobile App, Scheduling System

I. Background

1.1 Introduction

SMU basically accommodates high number of students, instructors and courses divided with in departments. The University provides variety of courses to its students in different departments. These courses are given to students with in different time interval following specific time table, which is called, prepared by the University's program office.

Schedule is time table for a program or project showing how activities and events throughout the University are sequenced and phased over the allotted period. The schedule is usually generated by the University's program office. This office prepares the schedules after collecting all the necessary details or information from the registrar office.

The university incorporates different departments providing lessons related to some specific field of study in the extension or regular division. The lessons provided according to the prepared schedule. Information that is on the schedule contains room, time, day, course and the instructor providing that specific lecture.

The program office prepares schedules after receiving the necessary information from the registrar office. The information is filled manually to the schedule generating software called

("GIZE SELEDA") which the university habeen using for over seven years. After the software generates the schedule, the printed format is sent to the departments to be given directly to the instructors, and print out of the schedules are posted on notice boards set throughout the University ground so as the students can see them.

Both class and exam Schedules have two parts. The first generated schedule is called **tentative schedule;** it contains programs which are temporary, used to collect the instructors' and students' suggestions. The second type of schedule is the **final schedule;** this one is prepared according to the suggestions given by instructors and students on the tentative schedule.

The system introduces a **fully computerized system** for generating and distributing class and exam schedules. The main idea of this system is to provide a simple, time saving and fully computerized system for program office of the Institute. This system provides technology supported environment that provides fast and accurate working methods that can be easily implemented on the current environment to improve performance.

1.2 Statement of the Problem

Scheduling process is essential since it is the tool used to show the contact hours of students with their instructors. Scheduling process needs to be more effective and accurate enough to consider the University instructors, students and other related activities that might compromise the schedules /programs. Even after the schedules are prepared, the methods used to distribute need to be time and cost saving; it is also needed to reach directly to the personnel in need of that information.

Schedules are organized and prepared by the University program office and are printed and shared to the instructors and students. The instructors' and students' day to day class activities are performed based on those schedules.
We used 3 different data collection methods to understand more about the current system. These are observation, interview and source document.

In the observation method, we found the following points:

- How data is inputted into the software;
- How data is shared between offices;
- How files are stored in computers; and
- Different kinds of out puts that the software produces (word, pdf).

The following are the questions we raised at the Interview:
- What software do you use?
- How old is the software?
- What does the software really do?
- What are the inputs and outputs of the software?
- How do instructors get their class and exam program?
- Why do they need tentative schedules?
- Is there any difference in preparing class and exam programs?

- How many days are needed to release the final program after the release of tentative program?
- How do they receive suggestions on class and exam programs?
- How do the backup systems work?
- Based on what are final schedules created?
- What kinds of problems do usually occur?

We used the following document sources to collect data:
   ➢ From libraries and online books;
   ➢ From softcopy on software management;
   ➢ From the University's official web site;
   ➢ From the University's instructors and students; and
   ➢ From reference books

The program office uses software "GIZE SELEDA (ጊዜ ሰሌዳ)" to generate class and exam programs for both students and instructors. The software is used for over seven years without any update. This shows that the software does not fit the current state of the University. To make a single class program, the software needs data like total number of class rooms, sections, list of courses, student list and name of instructors. Sections, student list and list of courses are collected from the registrar. Class rooms and names of instructors are entered manually. Then the admin organizes the data inputted by **drag and drop** method. The software outputs the organized data (the prepared schedule) in PDF and Excel file formats. Following that, they post it for students on the University's noticeboard after printing the PDF format on a paper. This shows that the system requires a lot of resources, time and is not easily accessible.

Tentative schedules are schedules holding temporary data to be updated by the program office. It is released first for two main reasons:
- To gather suggestions from students and instructors, and
- To identify if there is shortage of instructors.

The **Final schedule** is released in between three to five days. The program office collects all comments that are made by students and instructors on the tentative schedule, and based on those comments, the final schedule is eventually prepared. The output is generated in the form of PDF or excel file format by scheduling software. The output generated in the form of PDF format is printed and distributed to instructors through their departments.

The university students retrieve their schedule by searching and checking schedules posted on the notice board. The students must search and check the noticeboard on some time interval until tentative schedules are changed and the final schedule are posted.

The excel file is used by time keepers (coordinators). Time keeper is a person who has the duty to check an instructor is attending class on time. The attendance process is done by checking random class rooms and if a certain instructor has too many absences, then the department forces the instructor to cover all uncovered portions of the course.

The program office has backup files/documents. They first copy the generated program to external storing device (CD, flash disk) and send the backup files to IT support department and from there it will be uploaded on database. The program office retrieves data from the registrar office through local area network which is installed throughout the University to share data between offices.

The difference between the class and exam program preparation is that to prepare exam program, student list, starting and ending date, maximum number of students in a class and gap between exam programs is needed to be entered. But in case of class program, it is not important to specify those specifications. The other difference is that class programs are generated only once in a semester for all departments, but exam programs are prepared twice in a semester and most probably not for all departments.

- **Problems with current system**
  - Constant change on printed and distributed tentative schedules takes high expenses on the University.
  - The office uses old software which is capable of handling specific small size data. Any change made to the data size could cause it misfunction or behave unusually causing the office work very difficult and leading to another related situation.
  - The software is manual; it works by drag and drop.
  - The current system does not fit the current state of the University.
  - Students have to keep checking the notice boards until the tentative schedule is changed and the final schedule is posted. This could waste time and energy.
  - The schedule posted on the noticeboards can be confusing for fresh student to search and find schedules.
  - The constant change in the schedules may cause the class to start later than the intended starting date.

1.3 Objective of Project and Requirement Analysis

- **General objective**

The general objective of this project is to develop **MAESS** which is capable of creating and distributing exam and class schedules with other related important features. **Mobile App Enabled Scheduling System (MAESS)** is a fully computerized system that is aimed to make the current working system of program office simple, fast, easily accessible, time and money saving system. Instead of using partially computerized and old system, we developed a system that will fit the current status of the University.

- **Specific objective**

The specific objectives of the project are listed below. These include designing, developing and testing the system that can:

- ❖ Shorten(reduce) the process of schedule preparation;
- ❖ Develop a software that can generate schedule on single click;
- ❖ Allow students and instructors to get their schedule on their cell phones;
- ❖ Allow students and instructors make comments on schedules;

- ❖ Exclude the paper work;
- ❖ Provide a simple file backup method; and
- ❖ Avoid constant checking of notice boards for information.

1.4 Requirement Definition

Requirement definition is the process of determining user expectations for a new or modified product. These features are called requirements and must be quantifiable, relevant and detailed.

1.4.1 Functional Requirement

These are statements of features the system should provide- how the system should react to particular inputs, and how the system should behave in particular situations. It specifies the software functionality that the developers must build into the product to enable users to accomplish their tasks. The functional requirements of the system are concerned with the major activities that the system has to perform. Some of them are:

- Allow students to log in using their student ID and password;
- Save the entered ID and password;
- Allow instructors to log in using their username and password;
- Authenticate the user entered information;
- Return any errors related to invalid data input and bad connection;
- Return any information that the student or instructor must receive every time connection is made;
- Allow students and instructors to comment on schedule changes;
- Estimate the number of class or exam program change suggestions and notify the program office;
- Request for reason /giving suggestion; and
- Download class and exam programs.

1.4.2 Non Functional Requirement

Non Functional Requirement defines the quality attribute of a system. They represent a set of standards used to judge the specific operation of a system. And they are not tasks that will be automated by the system.

The new system should execute the following tasks:

Privacy:

The privacy of the user - information is secure through the system.

Efficiency:

The system must give services for users by using minimum memory storage, network data, cost and time.

Availability:

All data in the system will be available all the time.

Performance*:*

The system gives service all the time with maximum response time.

Accuracy:

The level of accuracy in this system will be better due to reduction of errors. All operations can be done correctly and it ensures that any information coming from the database is accurate.

2. Methodology

The methodology used to collect and organize requirements for the project includes:

2.1 Data source

The data gathering is taken from the University's official web site and students hand books provided by the University which informs rules and regulations, structures of offices, learning methodologies, student benefits, expectation from students, and other information.

2.1.1 Data collection

The data collected for the requirement to generate problem solving methodologies are:

❖ **Interview**

We interviewed some students, instructors and other employees of the institute mainly from the program office to understand how the current system works and identify the existing problem of the system

❖ **Observation**

We observed how the current system (the software used to generate schedules) uses the inputted information to generate exam and class program, and what kind of output the software generates and how those outputs are stored (backed up) and posted to students and instructors.

❖ **Document analysis**

The document analysis is performed to understand the existing system's working style. The analysis basically focuses on identifying which office is responsible for collecting students and instructor's names, how these names are send to the program office and offices related to scheduling or the changes made on the schedules.

2.1.2 Development Methodology

The proposed system analysis and design will be developed using the object oriented analysis and design approach. The reason this approach is chosen is the idea behind building software system by modeling them based on the real object that the system will represent. There are

several software development models used for improving the quality of the software and the overall development process of the software. The system generates using:

➢ Rapid Application Development (RAD) Model.
➢ Object Oriented Programming (OOP).

Reasons for Selecting RAD

❖ **System Integration**

RAD model is the model which supports the reuse of the existing system. The system tries to develop supports reusing the existing system with the additional support of environment with additional technologies to avoid the manual working areas of the schedule programming and delivering process to create accurate and technology dependent environment.

❖ **Easy to incorporate changes**

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The system contains many functions and each of these functions has its own properties and requirements. These functions work collectively to create the system performing higher number of tasks. The RAD by nature divides entire project into modules and treats each module as separate prototype and each prototype undergoes a separate testing phase. And all components are finally collected together to create the final application.

❖ **Quick delivery**

RAD modeling highlights an extremely short development life cycle. This feature supports the system developed to create prototype and check what needs to be added or removed from the system to create a system capable of handling high number of data and generate accurate and timely results.

❖ **Faster market analysis**

Since each prototyping can be tested by its end users, it becomes easier to survey the prospect for suggestion and improvement. Any changes are easy to incorporate as it will affect one model of the application and not the entire development.

2.1.3 Development tools and technologies

To develop the new system, it requires using technologies and developing tools that support high number of features that enable the developers to create and reuse the created resources to achieve a system capable of handling high number of data, and processes that data effectively to create accurate useful information that supports the scheduling and delivering environment.

The Front-end technologies

Front-end of the system building of web site and user interface for the web application implements the structure of design, behavior of everything that is seen on the screen when opening the web site to interact with the system.

The system also contains other methodologies of delivering schedules to university instructors and students through system mobile app which is installed on android supported devices.

These website developing technologies include:

SUMBLIME TEXT

The system software developing technologies includes

➢ NETBEAN(IDE)

The mobile phone application developing technologies include

❖ ANDROID STUDIO

The reason we used the above technologies is that they can be easily updated, can be downloaded freely, and based on their abilities, we can create comfortable and easily adaptable interface which supports the development process with:

- Advanced methods of error correction,
- Less complicated using high level languages,
- Consider different relations between features generated,
- Control and support on logical parts of software, and
- Preferred by many software programmers.

The Back-end technologies:-

The back- end technologies perform the most important part of the system. That logical part of the operation performs by accepting data from the front end. The system website backend technologies include:
- PHP language to communicate back-end the server,
- Html language generating the basic structure of the website,
- CSS to create more attractive and interactive website,
- MY SQL language to interact with database, and
- XAMPP software which includes the server and database to store files.

The system software back end technologies
➢ Java SDK packages that holds all java utilities
➢ Java languages

The android back end technologies include:
➢ Android SDK packages holding the tools and utilities for generating mobile application,
➢ Java SDK packages holding the java utilities, and
➢ Java language.

3. Result and Discussion

The result of this project is a system that solved the problems (limitations) in the preparation of schedules. We ran **system testing** methods on the resulting software to check its

effectiveness, and it qualified. System testing is a level of software testing where complete and integrated software is tested. The purpose of this test was to evaluate the system's compliance with the specified requirements.

3.1 Testing Approach

❖ **White Box Testing Approach**

White Box Testing, aka glass box or structural testing is one of the software testing mechanisms, which is the finest to test software at code level. We chose to use glass box approach because it makes it simple to discover logical, design, typographical and syntax errors.

❖ **Black Box Testing Approach**

In this, we just focused on inputs and outputs of the system to analyze the system's functionality. This approach helped us to know how our system acts for some real data inputted and the information generated from processing those inputted data. The real data our system uses as an input include the following:

- List of departments
- List of sections
- Courses list
- Instructors' list
- List of rooms
- Students' list

From these inputs, our system generates schedules for both students and instructors, and allows them to access their schedule using their cell phones or computers.

4. Conclusion and Recommendation

4.1 Conclusions

We are aiming to prevent wastage of time, resource and willing to decrease unnecessary cost that is paid by SMU for paper and other activities. Our system is not based on one dimensional method. Not only will it save students' energy, time and money but also will save a lot of unnecessary expenditure of the institution.

The new proposed system (MAESS) will be more secure and safe from any physical accidents as it is digitalized (computerized); there is also no need of paper work. We began our work by identifying the significance of automated system and the overall techniques to be used in the development process. This involved defining the system development methodology, identifying resource, cost requirements, and setting the deliverables scheduled for the project. The analysis helped the team to well understand the major functional areas and processes of the system. Through this method, we evaluated the existing system's weakness and strength.

After designing our system, we started to write the codes and testing it using different procedures as we mentioned above and we end all that by checking the whole system using system testing procedures.

At the end of the phases, we needed to review that we have covered in accordance with what we have planned at the beginning.

Schedule: To get our project done, we set a time schedule and we used *three* weeks for gathering information, and based on that information, we met our plan and wrote this documentation.

Objectives: We set a standard based on the objectivity of our system and to achieve that we compared and contrasted between our system's objectives and the current system used by SMU.

4.2 Recommendation

As a team, we faced different challenges like limitation of time and budget, but we tried to cooperate and discuss more about the challenges. All the group members strongly made efforts to cope with the challenges and take the turn to the front. We tried to automate some sub systems and functionalities. In addition to this, due to the crises we were facing (COVID 19), we could add video conference features to it to keep the learning process in line by allowing students to learn from their homes.

The developed system will only focus on the data sharing between the University students and instructors; any additional features that support advanced backup process are not included.

We would like to recommend some of the extra features to this System , such as:

- MAESS for COVID 19 prevention. Make MAESS an artificially intelligent (AI) system that has much more additional features.

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