

COMS3002 Software Engineering
Postgraduate Application Approval System



WITS
UNIVERSITY

Group 8

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1 Vision

1.1 Glossary

Term/Acronym/Abbreviation	Description/Definition
PGO	Postgraduate Officer
PGC	Postgraduate Coordinator
PGFO	Postgraduate Faculty Officer
Evaluator	Person who is responsible of evaluating the application for the recommendation phase.
EIE	The School of Electrical and Information Engineering
PAAS	Postgraduate Application Approval System
SIMS	Students Information Management System
Applicant	User who registers on the system to apply (formal request) for postgraduate degree
Application	Formal request submitted by the applicant to apply for a postgraduate degree
Associated Documentation	Any documentation that is associated with the application form. Retrieved from SIMS. These documents may also need to be analysed with the application by the users.
CRUD	Create, Read (View), Update (Edit) and Delete (Archive). Used to manage entities in the system
UX	User Experience

1.2 Project Statement

The school of electrical and information engineering currently has a paper based system postgraduate approval process.

1.3 Project Overview

Our aim for the project is to create an online postgraduate application approval system for the school of electrical and information engineering. This system will be completely paperless to keep the paperwork of the activity to a minimum. The PGO will receive completed applications from students and required documents from SIMS. These applications will be checked to make sure they are ready to process. Once they are checked, the applications with the required information can be sent to one of the three users that will either recommend or not recommend an application. The three actors are the Research Group Lead, Identified Supervisor and the PGC. The application will be sent to either one of these actors based on the program that the application is for. If an interview is needed, one of the three actors can book an interview with the applicant. After the interview the user can recommend/not recommend the application. The application will then be sent to the PGC who will then accept or reject the application based on the the application being recommended or not and based on faculty rules and regulations. The PGFO will receive an email/notification about the application's status. The applicant and the schools PGO will also receive an email notifying them whether the application was accepted or rejected with an explanation.

1.4 Summary of Benefits

1.5 Summary of Risks

2 Software Requirement Specification

2.1 Overall Description

2.1.1 Product Perspective

The solution we are developing will be a web application. This web application will be used by the employees of the EIE who are responsible for the postgraduate approval process of applicants to their graduate program. Our solution, the Postgraduate Application Approval System (PAAS), will provide these employees with an almost completely paperless electronic way of approving postgraduate applicants.

The PAAS will be designed to:

- Send notification emails to PGO about applications that need to be processed.
- Redirect PGO to SIMS.
- Receive and view applications and associated documents.
- Forward documents to Evaluator (Research Group Leads, Identified Supervisors or PGCs).
- Set up interviews for applicant and notify them by email.
- Allow applications to be recommended by Evaluators.
- Send application to PGC.
- Allow PGC to accept/decline application.
- Send the accepted/declined applications back to PGO.
- Send notification email to PGFO.
- Send email to applicant whether he/she has been accepted.
- Print documents if needed at any time.
- Login users.

2.1.2 Requirements Gathering

Brainstorming: We got together as a group and identifying as many possible solutions to the problem that the EIE is facing. We then simplified the solution details. Brainstorming helps casts a broad net, determining various discrete possibilities. Then simplifying and prioritizing the details of the solution. [2]

Observation: We were given a step-by-step walkthrough of the business process, which we believe is a more subjective form of obtaining requirements than pure observation. We then took those steps and converted them into functions for the PAAS. [2]

2.1.3 Use Cases

We will be converting what the PAAS is designed to do into use cases.

Main Use Case List:

- Create Application
- Read Document
- Create Interview

- Recommend Application
- Accept Application
- Login User

Secondary Use Case List:

- Print Document

CRUD (Create, Read [View], Update [Edit], Delete [Archive]) Use Case List:

- ie. Manage PGO = Create PGO, View PGO, Update PGO, Archive PGO
- Manage PGO
- Manage PGC
- Manage PGFO
- Manage Evaluator (Research Group Lead or Identified Supervisor)
- Manage Application
- Manage Interview
- Manage Document

2.1.4 User Characteristics

The users are the people and other systems that interact with the PAAS system. A user can be primary user or a secondary user. A primary user interacts directly with the PAAS and a secondary user interacts with the PAAS indirectly.

User List:

User	Primary/Secondary	Interaction with PAAS
PGO	Primary	<ul style="list-style-type: none"> • Receives email from PAAS about applications for processing. • Gets redirected to SIMS. • View applications and associated documents. • Forward documents to Evaluators. • Send notification email to PGFO. • Ability to print documents.
Evaluator	Primary	<ul style="list-style-type: none"> • Receive documents from PGO. • View applications and associated documents. • Setup applicant interviews. • Recommend/Don't recommend application. • Send documents to PGC and PGO. • Ability to print documents.
PGC	Primary	<ul style="list-style-type: none"> • Receive documents from PGO and Evaluators. • View applications and associated documents. • Accept/Reject application. • Send documents to PGO. • Ability to print documents.
PGFO	Primary	<ul style="list-style-type: none"> • Receive email notifications from PGO. • Send email to applicant on whether or not they accepted. • Ability to print documents.
SIMS	Secondary	<ul style="list-style-type: none"> • PGO gets redirected to SIMS from PAAS.
Applicant	Secondary	<ul style="list-style-type: none"> • Receives interview emails. • Receives email about application status.

2.1.5 General Constraints

Implementation

Not all internet browsers may work with our system. Moving from manual to digital may be time consuming, and are subject to human error. The number of active users may start out small due to human resistance towards new technology, especially those who are not computer savvy. Teaching new users how to use the system will be time-consuming.

Due to time constraints and the fact that we are students, the system may not be fully-functional as planned.

Hardware

Any device that makes use of a supported browser will be able to use the system. We cannot guarantee that all devices will be supported.

The system will require an internet connection.

Software

One needs a supported browser. There will not be an application available for mobile or computer, because it is a web-application.

The software may not be fully implemented as planned due to the fact that we are students and have time constraints.

Legal Issues

To obtain a web domain. The source code will belong to the University and therefore, if the client wants the rights to the source code, they might have to go through legal protocols to obtain it from Wits University.

As students we may not be given permission to access SIMS.

Reliability and Fault Tolerance

The system needs to be reliable and should be able to recover the student documents. It is extremely frustrating for applicants to re-upload applications because of the unreliability of the system.

The system also needs have as little faults as possible, since we are working with an important process at the university, this process cannot be put on hold because of a faulty system.

Security

The system is working with sensitive information and cannot be compromised. Student details and marks are very private pieces of data and cannot be leaked because of a poorly designed system.

User

Based on the security issue mentioned above, users will only be able to access the system with a username and password. Therefore users should not have access to other users' data.

The PGO should not have access to make the final decision until the recommendation for the application is received from the relevant users.

2.1.6 Assumptions and Dependencies

- We are assuming all users have a supported browser. We are assuming all users will use the system.
- We are assuming all users are computer literate.
- The system will be dependant on an online database (Web Service).
- We are assuming that we can access SIMS. The associated documentation are dependant on SIMS.
- We are assuming that all applicants and users use email actively.
- We are assuming that applicants can submit more than one application.
- We are assuming that all users may need to print the application documents.

2.2 Detailed Requirements

2.2.1 External Interface Requirements

Interfaces

The user interfaces may be different depending on what type of user is logged into the system. But all interfaces will follow some fundamental UX principles. Some of these UX principles are digestibility, clarity, trust, familiarity and delight. Digestibility gives the user the feeling of I get it. The format, components and layout of the interface should be as clear as possible so that the user can have a feeling knowing exactly what to do because of past experiences and familiarity. Clarity is used in terms of the components, fields, layout, validation, error messages and format. The formats, validation and error messages have to be clear in terms of language, ie. the field requires a valid email address. A user should never feel unsure when entering their details. The use of components such as date-time picker gives the user a feeling clarity and trust. The users of the PAAS should have a feeling of familiarity from the previous forms that used to fill in manually. The electronic forms should be designed around the manual forms, the formats and positions need to be as similar as possible to allow for an easier transition. A user should have a feeling of delight when using the system, they should never feel frustrated because this will lead to the users being reluctant to using the system. [1]

Hardware Interfaces

Since this solution is a web-based application, the hardware devices used must support the use of web browsers, as well as the ability to display a GUI and process input from the user in order to perform the interactions between client and server. To display the GUI of the application, a display device must be used, preferably with a DPI (dots per inch) above 300. If the DPI of the device is too low, the GUI may be too pixelated to view or give meaning to. For input, a keyboard is required. It may be a digitally displayed keyboard (on the display of a device) or a physical external keyboard. The keyboard is required for basic functionality of the application. Also on the aspect of input, a mouse or trackpad is required in order to perform basic mouse down functions as well as cursor movement. The device must have sufficient processing power and memory in order to run the web browser which will be the host of the web application on the device.

Software Interfaces

The software used for this web-based application will be web browsers. The web browsers which this applications functionality will be tested on are FireFox, Google Chrome and the mobile versions of these. As discussed above in section 3.1.2, the hardware devices need to be able to support FireFox and Google Chrome web browsers.

Communication Interfaces

The system will make use of email functionality to notify the users, both primary and secondary. The email function is used to notify applicants about the status about their application. The PGO will receive emails when there are new applications to be processes.

3 Design

3.1 Choice of a Software Development Life-Cycle

3.1.1 SCRUM

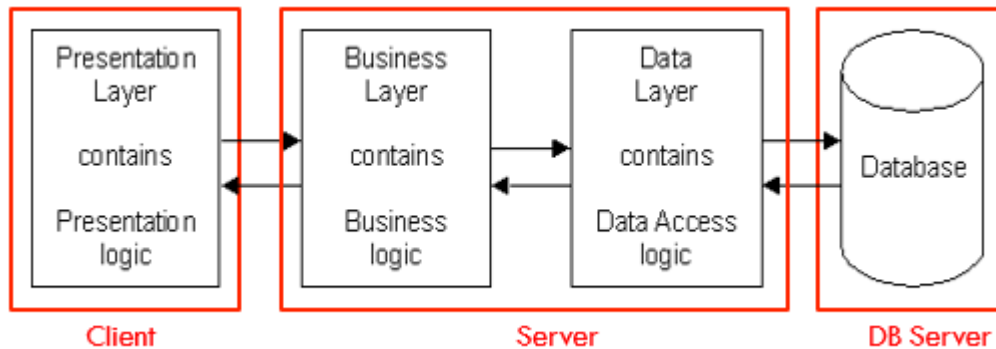
SCRUM is our choice of a software development life-cycle for our project. It is an agile development method which is iterative and incremental. This is how we plan to implement it:

- We will create a wish list of use cases and add them to our backlog.
- During sprint planning, we will pull some of the use cases from the backlog and add them to our sprint backlog, and then decide how to implement those use cases. Our sprint time is 2 - 3 weeks, depending on the team's availability.
- Along the way, the ScrumMaster (Project Leader) keeps the team focused on its goal.

- At the end of the sprint, the use cases should be implemented and work to the best of its ability.
- The sprint ends with a sprint review and retrospective. As the next sprint begins, we will choose more use cases from the backlog and begin working again. [2]

3.2 Choice of Architecture

3.2.1 Three Tier Architecture



- A Presentation Layer that sends content to browsers in the form of HTML/JS/CSS.
- An Application Layer that uses an application server and processes the business logic for the application. This might be written in C# or JavaScript.
- A Data Layer which is a database management system that provides access to application data. This could be SQL Server or Azure.

3.2.2 Benefits

- It gives you the ability to update the technology stack of one tier, without impacting other areas of the application. It allows for team members to each work on their own areas of expertise.
- You are able to scale the application up and out. A separate back-end tier, for example, allows you to deploy to a variety of databases instead of being locked into one particular technology. It also allows you to scale up by adding multiple web servers.
- It adds reliability and more independence of the underlying servers or services.
- It provides an ease of maintenance of the code base, managing presentation code and business logic separately, so that a change to business logic, for example, does not impact the presentation layer. [3]

3.3 Front-end Interface Method

A web application which allows for browser support will be created. There it should work on most browsers including mobile browsers.

3.4 Back-End Service

ASP.net MVC uses SQL Server and we will use a cloud service such as Azure or Amazon web services.

3.5 Other Supporting Software

Dot Net Highcharts will be used for any reporting functionality we might have. Bootstrap will also be used to make sure that the web app looks good and works on all browsers.

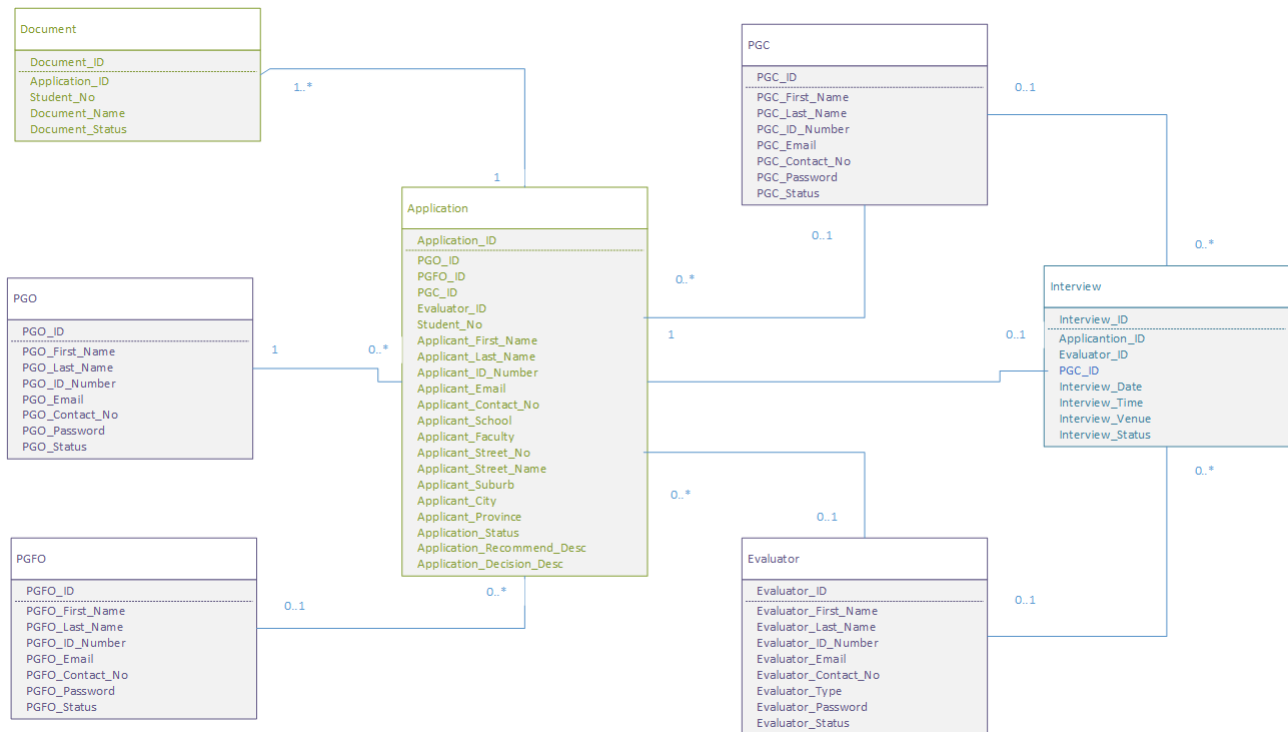
3.6 Student Responsibilities

- Abdulkadir Dere - Group Leader
- Brenda Lin - Quality Assurance
- Jesse Wright - Technical Lead
- Liam Leibrandt - Analysis Lead

3.7 Sprint Plan

3.8 Use Case Diagram

3.9 Class Model Diagram



3.10 Process Model(Flow Models)

3.11 Sequence Diagrams

3.12 State Machine Diagrams

4 Implementation (User Manual)

5 Testing

5.1 Functionality Testing

5.1.1 Motivation for Functionality Testing

Functionality testing is very important because it allows us to check and ensure that all functions that we have implemented for our systems use cases, are running correctly. This ensures that the data passed from

users through the functions (via field forms) to the database is accurate and without errors. This also allows us to determine if any use cases/processes contain faulty logic or flow so that we may review and alter them.

5.1.2 Case Name: Create a New Application

Test Number	Action/Test	Test Input	Expected Results	Actual Results	Pass/Fail	Comments
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5.2 Interface Testing

5.2.1 Motivation for Interface Testing

Interface testing is very important because this is the view that our end-user interacts with in order to use the functionality of our system. We have to ensure that the interface features, components and tools run correctly. We have to ensure that the user is never confused as to how to use our system and its functions. If our interface is not user-friendly then it is highly unlikely that anyone would make use of our web- application.

5.3 Security Testing

5.4 Cross-Browser Compatibility Testing

5.4.1 Motivation for Cross-Browser Compatibility Testing

Cross browser testing is the process of testing a web application across different browsers to ensure that a web application works as intended across multiple browsers since certain components might work differently on different web browsers.

We shall test our web application on the following web browsers:

- Microsoft Edge version 40.15063.0.0
- Google Chrome version 60.0.3112.113
- Mozilla Firefox version 55.0.3

Desktop Browser tests have been conducted on Windows 10 operating system.

Mobile Browser tests have been conducted on Android 7.0 Nougat operating system.

5.4.2 Test Case Name: Check Cross-Browser Compatibility

Requirement Description: The system should be compatible with different types of browsers

Test Number	Action/ Test	Test Input	Expected Results	Actual Results	Pass/Fail	Comments
1.	Access the Web Application using the Google Chrome Desktop browser (version 60.0.3112.113)	Run the PAAS Web Application on Google Chrome Desktop Browser (version 60.0.3112.113)	The user should be able to view and interact with the PAAS website, including login into the system	The system did as expected	Pass	
2.	Access the Web Application using the Google Chrome Mobile browser (version 60.0.3112.116)	Run the PAAS Web Application on Google Chrome Mobile Browser (version 60.0.3112.116)	The user should be able to view and interact with the PAAS website, including login into the system	The system did as expected	Pass	
3.	Access the Web Application using the Mozilla Firefox Desktop browser (version 55.0.3)	Run the PAAS Web Application on Mozilla Firefox Desktop Browser (version 55.0.3)	The user should be able to view and interact with the PAAS website, including login into the system	The system did as expected	Pass	
4.	Access the Web Application using the Mozilla Firefox Mobile browser (version 55.0.2)	Run the PAAS Web Application on Mozilla Firefox Mobile Browser (version 55.0.2)	The user should be able to view and interact with the PAAS website, including login into the system	The system did as expected	Pass	
5.	Access the Web Application using the Microsoft Edge browser (version 40.15063.0.0)	Run the PAAS Web Application on Microsoft Edge browser (version 40.15063.0.0)	The user should be able to view and interact with PAAS website, including login into the system	The system did as expected	Pass	

5.5 Test Summary

Cross Browser Compatibility Test was successful for all the specified browsers except Microsoft Edge. Microsoft Edge does not display the Date Picker. So, the user cannot view Date Picker hence they cant select a date. This feature works well with other browsers. After analyses and research, we have found that Microsoft Edge has default style and selector for date. The default style takes precedence over additional styling done through the plugin. The user can still enter a date manually with the format of yyyy/mm/dd. This is problematic as the does not know the format hence will not be able to enter the correct date format. This issue is noted and will be fixed in construction phase.

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