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# COM3610: Dissertation

## Survey And Analysis Report

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### Managing The Extenuating Circumstances Process



## The University Of Sheffield

This report is submitted in partial fulfilment of the requirement for the degree of  
Computer Science by Rushil Shah.

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# Declaration

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# **Abstract**

## **Background**

Students who suffer from personal problems usually fill out the Extenuating Circumstances Form (ECF) which are then processed by various departments, some with higher clearance than others. This project is based on creating a system which can achieve confidentiality, ease of access and increase efficiency by reducing paperwork. Data has to remain confidential not only with different levels of hierarchy but also from outsiders trying to gain access.

## **Project Aims**

The system should achieve confidentiality, allow the stakeholders to toggle around quickly and efficiently allowing feedback and communication at all times and should reduce the paperwork pile.

## **Achievements to date**

Comparison between potential systems; Web based system or a mobile phone application. Information processing with a lot of data would not be readily accessible on an application and so a web based system is a potential project.

# Acknowledgements

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# Chapter 1. Introduction

## 1.1 Background

Students who suffer from personal problems usually fill out the Extenuating Circumstances Form (ECF) which then allows the examination board (the scrutiny committee) to consider their problems. The process usually begins with the student submitting the form and being reviewed. In situations where there is not enough evidence, the committee asks the student to provide more evidence and then processes the information accordingly, for example the committee may ask the student to present a death certificate. The form at this point has detailed information about the personal problem but from here on, only the general problem (without including details of the specific problem the student is facing) is taken ahead to the other departments and also added to the Students Record to allow leniency in terms of examinations and other assignments. Information regarding the ECFs can be found on the University Of Sheffield's page.[4]

## 1.2 Problem

Students sometimes fill out the form with less detail and so they need to be re-filled or the students have to provide more feedback/evidence. This leads to multiple documents being created and a lot of paperwork explaining the scenario. The forms are then accessed and duplicated by other departments and also added to the system for the Student Report. Multiple departments with different hieratic allowances creates a lot of confusion which then leads to improper book keeping and a reduction in information confidentiality. These forms may also be up for appeal and with multiple and mixed up forms the whole process tends to be biased.

## 1.3 Aims And Objectives

The system has to reduce paperwork, be secure enough to allow different levels of confidentiality and access and also be an easy but efficient to use system. A system which can be accessed by students, the examination board and can also be integrated into the student report. The forms contain important information in terms of text and so using a device such as a smart phone would not be efficient and could bring up accessibility issues. On the other hand a web based system with the correct levels of security and encryption can be access by anyone as long as they have a device connected to the Internet. All University buildings have access to computers making browsing easy. A big screen would allow accessibility and information can be processed swiftly.

Django[5], a high-level Web Framework based on Python allows the design of the system we are looking for. Its built-in features allows the coder to avoid and prevent



security threats such as SQL injection, cross-site scripting, cross-site request forgery and clickjacking[5]. It also data to be stored and encrypted in a database,

## 1.4 Report Summary

The report consists of five different chapters including this one. Chapter Two - Literature Review which expands on the use of web systems for solving the problem as well as other possible techniques that could be used but were not because of limiting factors. This chapter contains a broad variety of information and research. Chapter Three - Requirements And Analysis, contains specific information building on the previous chapter and contains evaluation of the project. Chapter Four - Progress will talk about the the testing and results that have taken place with all achievements to date. Lastly Chapter Five - Conclusion And Project Plan will summarise and end the report on the projects plan.

# Chapter 2. Literature Review

## 2.1 Introduction

Digitalising the Extenuating Circumstances Forms would have different platforms to choose from. Technology has advanced to different levels. Web based Systems, Smart Phone Applications, Virtual Reality, Augmented Reality, Artificial Intelligence[6] and recently introduced Blockchain Technology. However, for a system allowing users to fill forms it would be difficult to use Virtual Reality and Augmented Reality as these are used for altering the perception of the world[7]. Same goes for Artificial Intelligence as this would be costly to implement and not very useful when it comes to Extenuating Circumstances. In this section we will look at Web Based Systems, Mobile Phone Applications and the Blockchain Technology. Further ahead we will eliminate Mobile Applications and Blockchain and focus more on the Web Based Systems.

## 2.2 Web-Based, Smart Application Or Blockchain?

Blockchain is built on transparency. It will allow the storage of forms and data to be secure and encrypted with no central database holding everything. However, Blockchain is more useful when a digital property is involved as it works efficiently with trading and not storage for single entries. It still is a new technology and there is not enough detail on how exactly it can be helpful[8].

Smart Phone Applications on the other hand are used almost daily. There are officially more Mobile Phones than people in the world[9]. Students all use smart phones and it would be easy for them to use a simple application to fill in all the questions and feedbacks for the form. However, the same brings an issue for data processing and readability for the examination board and student report. The scrutiny committee would want the data to be readily available, not having to download a new application where they can barely read the large amounts of data and attachments uploaded by the student. Using mobile applications would allow instant communication as the system can use notifications for constant feedback and review processes.

Web Based Systems have been in the market for quite a while now and they still are the most used compared to any other digital technology[10]. Being accessible from any internet connected device this makes it usable from Mobile Phones, Desktops/Personal Computers and other devices. Web system would also allow the scrutiny committee to access the system and view it on a big screen.

## 2.3 Web-Based System

Web-Based systems are spread into various different languages with both positives and negatives. Java, .NET, PHP, ASP, Python, Ruby, ColdFusion are just a few of the most used language examples for web systems[11].

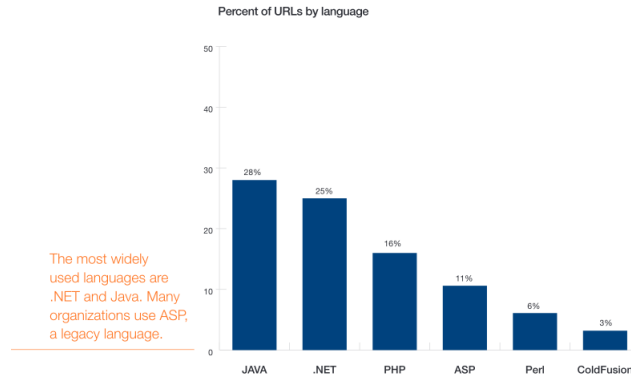


Figure 2.1: Most widely used languages for Web Systems - WhiteHatSec[1]

With all these languages, the highest priority would be to find a language which has Cyber Security as one of its strong points. .NET, Java, ASP, PHP all come with a high number of vulnerabilities as they are highly used[11].

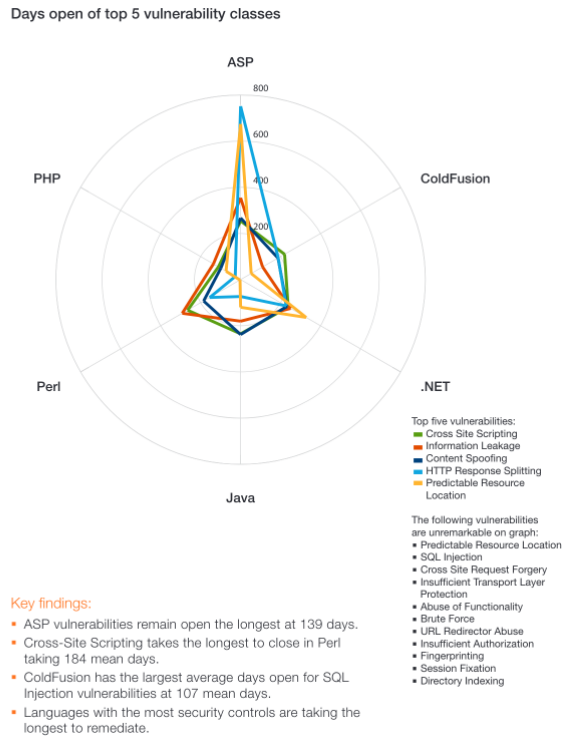


Figure 2.2: Security Vulnerabilites in ASP, PHP, Perl, Java, .NET and ColdFusion - WhiteHatSec[1]

This would then leave us with Python and Ruby which are both easy to code with and used widely. Using a web framework of the languages, Django(Python) or Ruby On Rails(Ruby) would be a smart idea because frameworks allow increased security as they are built for this and increase the efficiency and are cost effective[2].

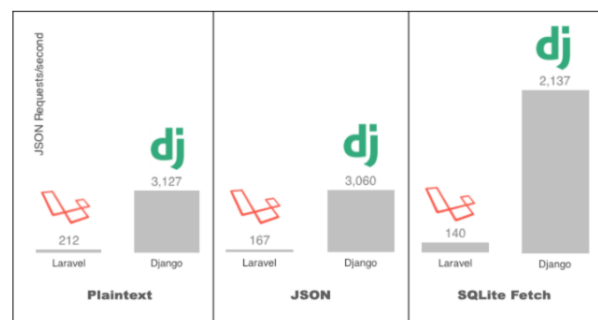
## 2.4 Django

Django is a Python based web framework which allows clean and pragmatic design as well as rapid development. The framework is designed to enable the coders to code without worrying about the security of the code as it guides the coders through securing the vulnerabilities such as SQL injection, cross-site scripting, cross-site request forgery and clickjacking. Django also has a user authentication system which can be customised to allow a secure way for data to be transferred[5].

### 2.4.1 Django vs Laravel

Django is a Python based framework as stated above but Laravel[12] on the other hand is a PHP based web framework. Django follows the Model View Template similar to Ruby on Rails but Laravel follows Object Oriented Programming as well as the Model View Template. In terms of website security, Django takes it extremely seriously and helps developers avoid the common mistakes which lead to the website having vulnerabilities while Laravel also has a guide to avoid making such mistakes but it does not beat Django.

Django is naturally very fast as it uses Python which is known for its speed and processing. Django beats Laravels speed in all; Plaintext, JSON and SQLite Fetch[2].



**Django:** Plaintext test - 3127 requests/seconds, JSON test - 3060 requests/ seconds,

Random SQLite Fetch test - 2137 requests/ seconds.

**Laravel:** Plaintext test - 212 requests/seconds, JSON test - 167 requests/ seconds,

Random SQLite Fetch test - 140 requests/ seconds.

Figure 2.3: Django vs Laravel Speeds 2016 - CabotSolutions[2]

### 2.4.2 Django vs Ruby on Rails

Both are popular web frameworks, Django more than Ruby on Rails for professional developers. They are open-source which allows all code to be customised in any way. Ruby on Rails allows the use of gems which are designed by other users, these come in handy when programming personal or individual projects however with professional projects licensing is a good idea to allow the code to be usable in the future[3].

Based on JetBrains research[13][14] we know that Python is a really popular language compared to Ruby and it is highly used for Data Analysis and Web Development among various other things while developers use a mixture Ruby Versions which makes future updates to the code harder.

The table below shows the differences between Django and Ruby on Rails

	Django	Ruby on Rails
Pros	<ul style="list-style-type: none"> <li>- Python is versatile</li> <li>- Fast</li> <li>- Caching System</li> <li>- Data Analysis</li> <li>- Great Security and Authentication</li> </ul>	<ul style="list-style-type: none"> <li>- Flexible</li> <li>- Large Community</li> <li>- Gems Available</li> <li>- Easy Migration</li> </ul>
Cons	<ul style="list-style-type: none"> <li>- Hard to debug</li> <li>- Monolithic architecture</li> </ul>	<ul style="list-style-type: none"> <li>- Bloated</li> <li>- No Data Analysis</li> <li>- Very explicit and inelegant to read</li> </ul>
Started By	- Django-Started in 2003 by Adrian Holovaty and Simon Willison	- Ruby on Rails-Started in 2005 by David Heinemeier Hansson

Table 2.1: Django vs Ruby on Rails Pros and Cons [3]

### 2.4.3 Summary

Django, compared to various other web frameworks, is a good environment to use for the Extenuating Circumstance Forms because it provides security we are looking for, avoids vulnerabilities and is really fast when accessing and using with SQLite. Even with small or large numbers of data, it will be able to process it really quickly. Upgrading the system at a later stage will also be simple as Python is a highly developed language.

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