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Acronyms

Acronym	Description
AD	Active Directory
AOP	Aspect Oriented Programming
BRD	Business Requirement Document
HTTPS	Hyper Text Protocol Secure
IST	Integrated Systems Testing
JDBC	Java DataBase Connectivity
JMS	Java Message Service
MoSCow	Must go Should Could or Won't
MVC	Model View Controller
OOP	Object Oriented Programming
ORM	Object Relational Mapping
OXM	Object/XML
R&D	Research & Development
RAD	Rapid Application Development
SDLC	Systems Development Life-Cycle
UAT	User Acceptance Testing
UBE	Unsolicited Bulk Email

1. Introduction

The purpose of this document is the detailed description of the project's plan to design, develop and deliver a digital Pinboard website as a method to minimize the number of junk emails sent and received between students in the University of Surrey. The project is developed as part of 'COM3001 Professional Project' module, taught by the University of Surrey, Department of Computing.

1.1. Motivation

Nowadays, electronic mail is the predominant digital communication platform. According to Reuter's survey [1], 85% of human population is connected online and communicate through email despite the number of social channels available. The Internet is overflowing with 100 million emails sent and received daily [2], of which 97.4 millions are spam/junk [3].

The question investigated is what leads to the creation of so many 'junk emails' within the University environment.

1.2. Project idea and description

The lack of an organised way to advertise second hand books or requests for house sharing, leads the students to the creation and distribution of unsolicited bulk email (UBE) emails. These emails are categorised as junk emails.

The digital Pinboard website is developed as a method to minimize the number of 'junk emails' sent and received daily within the University of Surrey. Junk emails have a negative impact on the size of users' mailbox and the management of incoming emails. The Pinboard website, in the form of a marketplace, attempts to resolve this issue and allows students in the University community to connect, buy and sell second hand books and advertise room swaps on campus.

The model canvas shown below as a visual chart (Figure 1), describes the main elements of the Pinboard website idea. The creation of the template in the early stages of the project helped identify potential trade-offs and it was then used a strategic management model for the development of the project idea [16].

What?

is this project

Figure 1: Pinboard - model canvas

Key Partners		Key Activities		Key Resources		Value Propositions		Customer Relationships		Channels		Revenue Streams		Cost Structure	
University of Surrey students.		Website/platform development and creation of services to streamline the sales process.		University of Surrey student community. Pipeline of books in good condition and rooms available for rent. Pinboard platform/website.		Second hand books in good condition. Cheaper price of items. No sign-in fee, no registration required. Online university community: easier to connect to and compare prices and features of items. Organized marketplace that allows users to advertise items and thus minimize the number of junk email sent within the university for advertisement.		Online community.		Pinboard hosted on the University of Surrey intranet. Word of mouth.		N/A		Platform development and maintenance.	
Customer Segments		University students who want to sell/buy second hand books. University students who seek for room swaps on campus.													

1.3. Project objectives and goal statement

The objective of the project is the creation of a dynamic website as a University-specific marketplace. The digital Pinboard website offers an organised way for students to sell second-hand books. It also provides functionalities that allow students to advertise available rooms and make house hunting more efficient. *more*

The use of the services offered by the website have the potential to significantly reduce the number of 'junk' emails sent daily send between students regarding sales of second-hand books and requests for room swaps on campus. Additional functionalities can enrich the search user experience by offering a number of browsing categories like unwanted tickets for events, sports equipment, electronics etc.

The personal development objective is the successful completion of the full development lifecycle from general management of the project and solution design to development and delivery of the website. Another personal objective is the use of Spring MVC Framework technologies for the development of the project.

use of CSO to cater for different screen sizes (web vs Android)?

1.4. Project benefits

The project benefit is the introduction of a new communication channel that allows students to sell second-hand books and search for houses/apartments/swap rooms on campus. Therefore, the use of the website can help minimize the creation of 'junk emails' sent to advertise second-hand books and room swaps. The deployment of the website on the University's intranet and the services it provides can also promote the replacement of the physical Pin-boards on campus and thus reduce paper copies and promote environmental friendly behaviour. Lastly, the website can help reduce the network traffic and disk space used by 'junk' emails and therefore minimize the cost of storage required as well as other management activities carried out by the IT Services team.

Citation needed.

1.5. ROI statement

The return on investment (ROI) is that the Pinboard solution will enhance the quality of student experience with the use of multimedia and make students' requests/hunt for houses and sales of second-hand books easier.

Enable:

- Providing a high quality solution to meet students' needs and support the University of Surrey strategy for continual improvement. The creation of Pinboard site can be seen as a new communication channel.

Defend

- *Improve student relationships by providing a common platform as a mean to control and minimize the number of spam emails sent internally.*

Grow

- *Taking a strategic approach by introducing a new communication channel that allows the students to sell second-hand books and search for housemates/swap rooms on campus. Pinboard solution enhances the quality of student experience with the use of multimedia and makes their requests/hunt for houses and books more pleasant.*

1.6. Project stages

The management of this project is based on the Systems Development Life-Cycle (SDLC) [17]. The first step was the investigation of an existing problem that can be improved.

1. *Preliminary analysis and idea:* To help minimise the creation of junk emails for second hand books and room swaps, the development of the Pinboard website was suggested.
2. *Literature review:* Background research helped identify websites, which offer similar services and then functional requirements were created in order to measure Pinboard's features for improvement and strengths over existing websites. Examples of existing websites are Gumtree, Proloved and eBay.
3. *System analysis, requirements definition:* Functional and non-functional requirements were defined and analysed to create a Business Requirement Document (BRD).
4. *System design:* To support the BRD, features of the website were defined and screen layouts as well as process diagrams are created.
5. *System Development:* In preparation for the development of the website, a request was made to the IT Services team to enable access to a Tomcat server and a MySQL database backend. Following the creation of Pinboard's home page, the login functionality for the user was developed. Appropriate measures were taken to ensure that input text submitted by users is secure and the website is protected from attacks. A local as well as a remote database instance was created and additional functionalities were added to improve the usability of the website. These functionalities include creation of bookmarks for the available items, the option to allow the users change their password and additional buttons to share the website on social media channels.
6. *Test and evaluation:* Following the completion of development the system was tested to ensure that each requirement is met. Test of functional requirements ensure that different web browsers can be used to open the website and unexpected behaviour or crash of the web client is avoided. The full list of functional requirements can be found in section '3.2.1 Functional and non-functional requirements'. Tests were also undertaken to tackle security concerns such as unauthorized access to the website or SQL injection by

attackers. Finally, User Acceptance Testing (UAT) was performed to ensure that early adopters are happy with the service and functionalities offered by the website. I know that testing hasn't been completed yet even if it's described using past tense — that's the tense we've been advised to use.

OK!

2. Literature review

2.1. Background research

Background research was undertaken to identify other solutions that offer similar functionalities and understand how those websites are developed. Identification of their strengths and weakness helped identify the must-have features of the Pinboard website. The main areas investigated were the target audience and key functionalities that the users would like to see on the website. The comparison made was between a number of open source e-commerce solutions such as Gumtree, Preloved and eBay. The strengths and weakness of the services are shown below:

None of them are open source!
 You should look at some open source ones!
 too. Search for open source e-commerce applications, eg Apache OFBiz, OS Commerce, etc.

Functionalities	Gumtree [18]	Preloved [22]	EBay [23]	Pinboard
Type of site	Classifieds	Classifieds	E-commerce	Classifieds
Registration	Optional	Required [21]	Required to sell. Guest checkout available.	Not required. Student's University email address will be used to login.
Target audience	-Initial target audience: Australians, New Zealanders, South Africans. -Current target audience: Business customers and general public. -Current target users in the UK, Poland, France, Canada, Australia, New Zealand, South Africa, Hong Kong, Singapore.	Business sellers and general public.	Business sellers and general public.	University of Surrey students and staff.
Number of users	13.7 million [19]	5.5 million	155.2 million [24]	University of Surrey students and staff.
Categories	-Goods for sale; -motors listings; -jobs advertisements; -property advertisement.	Over 500. [20]	Over 35+.	Second hand books; Goods for sale, (new/used) auction, "Buy it now" shopping(fixed price); Items. Is currently one of the most popular websites used to advertise pets, horses, and livestock.

Featured adverts	-Free use of the website. Featured adverts: -advert in the top of search page; -advert on the homepage; -urgent advert; -site search ranking boost.	Delivery services	Collection from the seller only. Shipping Shipping	Students are located on campus and deliveries are made in person (meeting between student seller and student buyer). Online payment. Online payment.	Payment method	Presence in	social media	Pinterest, Google+, Twitter, Facebook, Twitter, Google+, Instagram, LinkedIn.
	-Free use of the website. Featured adverts: -Option available for a yearly membership upgrade (buyers £5, and when they're sold he is charged sellers £25). Once an advert is created is only available to membership holders. After 10 days the advert is available to non-membership users too.							

2.2. Tackling the problem

The development of Pinboard website provides an alternative process to email distribution for students that wish to sell their second-hand books or request room swaps on campus. By providing an organised system, the target audience can navigate to Pinboard website and check numerous options before they make their decision on which book to purchase / room to swap. The organised service helps minimize the number of bulk emails created by student-sellers that wished to advertise books or room swaps.

2.3. Acceptance and usability concerns

The key concern is for the IT Services/Systems Team to accept the deployment of the website on Surrey's intranet. If this is resolved, the arising concern is the level of usability of the website by the end users. However, if the deployment of the website is not approved, the project will be seen as an opportunity for-hand-on experience, management and completion of the development lifecycle for a website.

hand-on - 6m

2.4. Research on technology

The client and web server website is developed using Java and the Spring MVC Framework. *Spring Framework* is an open source, Aspect Oriented Programming (AOP) framework for Java based applications. *Spring MVC Framework* is an extensible MVC framework and a component of Spring that is used for the creation of web applications. It's developed on core Spring functionality that provides technologies for views (JSP) [10].

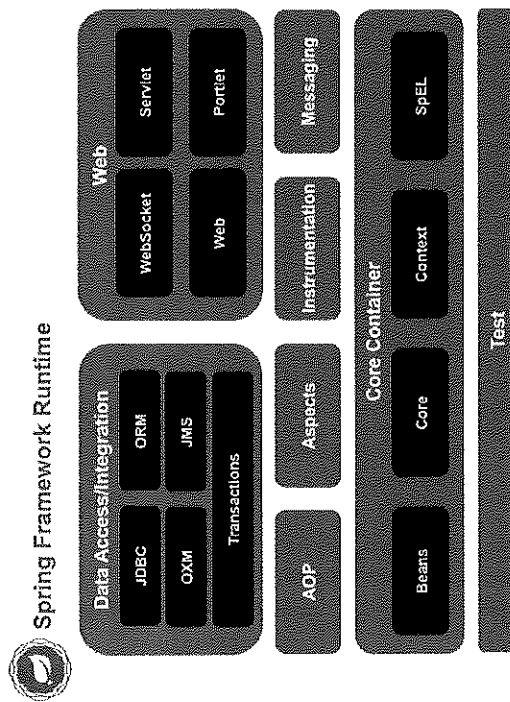


Figure 1: Overview of the Spring Framework

The Spring Framework consists of a number of modules: Data access/integration; Web; AOP; Aspects; Instrumentation, Messaging; the Core container and finally the Test module.

In Data access/integration module provides support to: (i) JDBC, (ii) ORM, (iii) OXM, (iv) JMS and (v) Transaction module.

- (i) The Java DataBase Connectivity technology (JDBC) defines how a client accesses the database and provides methods to query and update the database.
- (ii) The Object Relational Mapping (ORM) converts data between incompatible types and systems. In particular, this technique is beneficial in modern systems where systems include a number of subsystems.
- (iii) The Object/XML mapping (OXM) converts objects to XML and vice-versa.

- (iv) The Java Message Service (JMS) sends messages between two or more clients and enables reliable connection between different components.
- (v) The Transaction module coordinates the transactions for management APIs and Java objects.

The Aspect Oriented Programming (AOP) manages the application challenges, such as security, logging and management, into aspects and helps create modules that enable reusability. AOP complements OOP (Object Oriented Programming) by creating a new program structure. The difference between OOP and AOP is that is OOP the key element (unit of modularity) is the class where in AOP the key element is the aspect.

The Core container is Spring's key module and it's used to provide BeanFactory and ApplicationContext containers.

The purpose of the Test module is to support the services for unit and integration testing.

2.4.1. Benefits of Spring MVC framework

Spring MVC Framework was chosen over other MVC technologies, such as Struts, due to the support features it offers. Struts is a sophisticated framework, strictly focused on presentation. On the other hand, Spring is a "*Lightweight inversion of control and Aspect Oriented Container Framework*" [10]. It's a popular framework used by a lot of web developers because it offers quality from design to implementation, promotes best practices and it's adaptable. The creation of specialised objects like Model View Controller (MVC), DispatcherServlet and Handler Mapping result in clear separation of roles. The use of existing business objects allows reusability of code and escapes duplication. Therefore system flexibility is increased and maintainability is improved [10].

2.4.2. Features of Spring MVC framework

- *DispatcherServlet* is a request-driven framework and it makes use of a central Servlet to dispatch requests to controllers [10].

DispatcherServlet is configured in XML and acts as the front controller. The Front controller receives the incoming request from the client and then delegates the request to a Controller. The Controller receives and handles the request, performs business logic and creates a new model. In order to delegate rendering of response, the Controller forwards the model to the Front Controller. The Front Controller selects a View and forwards the model in order to create a render response. Finally the View returns control to the Front Controller and the response is sent to the client.

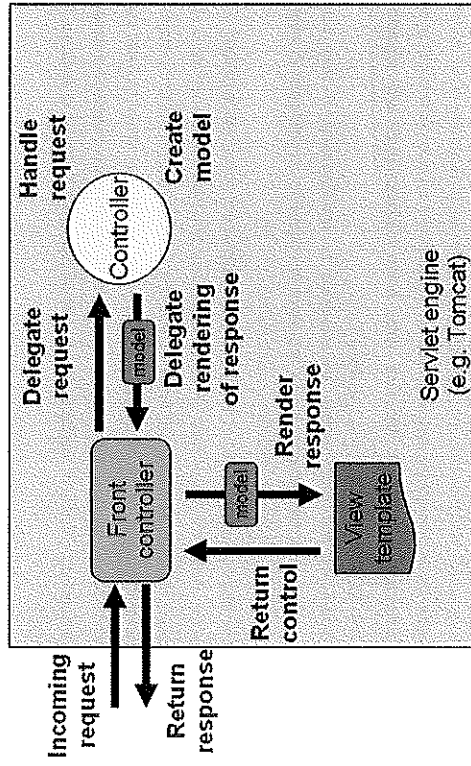


Figure 2: Request processing workflow in Spring MVC

- *Model, View, Controller (MVC)*:

Model View Controller is a well-established software architectural pattern. It's used in web application development in order to separate the business logic from the user interface [11]. The MVC consists of three modules: Model, View and Controller. Controller is the front servlet and acts as an interface between the View and Model.

The client sends requests to the Controller. The Controller then forwards the input to JSP pages. In Spring Web MVC terminology, JSP pages are named Views and are managed by the Controller. In response, the View (JSP) calls the Model.

The Model (JavaBean) represents the state (data) and business logic of the application. The Model connects to the database to retrieve/saves data.

The View (JSP) generates the response and sends it back to the controller to return it to the client. Note that in complex applications the Controller also manages the Service entity whenever it needs to perform business logic. This helps improve maintainability, as the business logic is not contained directly in the controller [12].

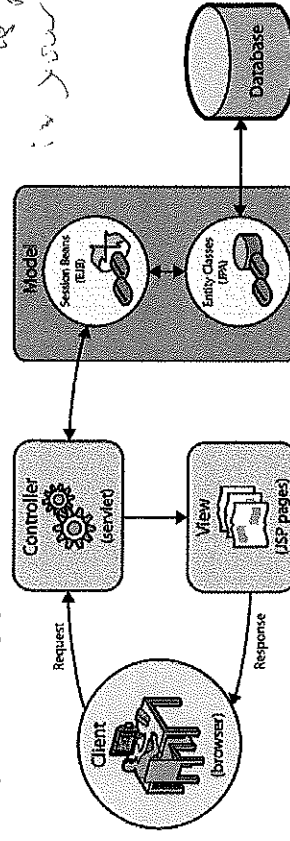


Figure 3: Context hierarchy in Spring Web MVC

3. System analysis

3.1. Current process

Currently, there's no organised process for the University of Surrey community to advertise second hand books or request room swaps on campus. As a result, the sellers/seekers create and distribute bulk emails (known as UBE) hoping that someone will get back to them. This process generates numerous unwanted emails for students that are not interested, and it's possible that overloads the network as well as the amount of storage on servers.

3.2. System requirements and analysis

The requirements listed below will be used as the basis for the development and testing of the web application, to determine the completion of the project and assess its success.

- Requirement Type: Functional or Non-Functional.
 - Functional: Requirements are classified as Functional if their aim is to provide information on what the system should do. [6] Examples include: authentication and authorization processes, historical data, audit tracking, legal and regulatory requirements etc. [7] *details...*
 - Non-Functional: Requirements are classified as non-functional if they cover constraints of the solution, targets and ways to control its mechanisms. Examples include performance, scalability, maintainability etc. [7]
- MoSCoW: 'Must or Should Could or Won't' business analysis and prioritization method. The prioritization shows the importance of each requirement however it does not mean that requirements classified as Musts will be developed first; it means that by the completion of the project they must be delivered. Requirements classified, as 'Won't' should be listed even if they won't be met during this sprint. The list of 'Won't' requirements represents a number of suggestions that Would be implemented as part of future development to improve the system. [25]

3.2.1. Functional and non-functional requirements

Req. no.	Requirements Description	Req. Type	MoSCoW
1	The solution must automate and simplify the process of selling and buying goods, such as second-hand books, within the University of Surrey environment. <i>aim of the project is to reg system</i>	Non-functional	M
2	The centralized database that contains the products must update automatically and <u>daily</u> . <i>only?</i>	Non-functional	M
3	The solution must update the list of products so that a product becomes unavailable after a user purchases it.	Functional	M
Seller/Buyer requirements			
4	The solution must ask the users (buyers & sellers) to agree with 'The Sales of Goods Act 1979' and adhere to it: <i>"traders must sell goods that are as described and of satisfactory quality"</i> [4], [5]. The Terms & conditions must be accessible, meaningful and fair.	Non-functional	M
5	The solution won't require the users to register. The login process will be based on the existing Active Directory (AD) groups. New users will be automatically added in the database.	Functional	W
6	The solution must validate the user information upon registration e.g. text fields that require information and valid email that contains '@', '.'.	Functional	M
7	The solution must allow the users to search products based on categories e.g. books or room swaps.	Functional	M
8	The solution must provide a search functionality (text-box search) to allow the users enter keywords.	Functional	M
9	The solution should enable the users to sort the products based on price (Low to High, or High to Low).	Functional	S
10	The solution must provide information about the product: Title, Description, Price, Category and Seller contact information.	Functional	M
11	The solution must ask the seller to fill specific fields regarding the product: Title, Description, Price, Category and Seller contact information such as email address and/or mobile phone number.	Functional	M
12	The solution should provide a 'My profile' area for each user. <i>with is?</i>	Functional	S

13	The solution should allow users to bookmark items.	Functional	C
14	The bookmark functionality must protect users' bookmarks and follow data privacy policies. <i>such as</i>	Non-functional	M
15	The solution won't allow items to be purchased online (PayPal services) provided that the users are students that live on campus and they'll meet for the delivery and payment of the product. <i>does not make sense</i>	Functional	W
16	The solution won't provide delivery charges, stages involved in ordering process and dispatch information.	Functional	W
17	The solution won't provide refund functionalities.	Functional	W

3.2.2. Feasibility analysis

Feasibility study [9] is conducted as part of the assessment process. The aim of the project analysis was to identify trade-offs and outline alternative options. The feasibility analysis helped recognise issues and potential risks in the early stages of the software development system. One of the first risks identified was that the Service Team might not accept the deployment of the website to the University of Surrey intranet. After the discussion of the project with the Service Team, the feasibility of the project was also discussed with the project supervisor and the decision made was to go ahead with the development of the digital Pinboard.

Even though the Pinboard website ~~could not~~ be deployed on the University's intranet, it was an opportunity for the final year computing student to plan and deliver the project through the different phases of systems' development lifecycle. It was also an opportunity to achieve a challenge and develop a project based on a new Framework without previous Spring MVC experience.

3.3. Summary of deliverables

I might not include the summary of deliverables as the key deliverable is the full development of the website (including the report and video). Those deliverables are assumed. *Report & video*

Deliverable name	Description
Project Design	The structure of the solution and the plan to implement the functional and non-functional requirements in order to meet the project objectives.
Definition of functionalities and services	The services delivered by the project should be clearly defined for the benefit of: i) the customer: to describe how navigate thought and use

Specification of Roles and responsibilities	the website; ii) the IT team: that will be responsible for the maintenance of the website if the deployment of the solution is accepted.
	Clear specification of roles and responsibilities of: i) the user and the policies that must adhere; ii) the IT Team that will be responsible for the maintenance of the website if the deployment of the solution is accepted.

3.4. Stakeholders

Stakeholders [8] are individuals or organizations with interest in a project. Typically they are internal or external investors, employees, customers and suppliers. Stakeholders of the digital Pinboard solution include the target audience, which is a subset of students; sellers of second-hand books and seekers of room swap on campus.

Stakeholder	Support Role
A subset of University of Surrey students /and academics	A group of volunteers that wish to test the application and are interested in the functionalities that the application offers.
University of Surrey IT and Service Desk	The support team if the deployment of the solution is accepted.
Chara Katiri	Computer Science Student, the developer.
Dr Steve Wesemeyer	Professional project supervisor and coordinator.

4. System design

4.1. Design method

The chosen development approach is Waterfall (over Agile) in combination with Rapid Application Development (RAD). In the project environment, Waterfall methodology can be easily understood not only by the developer but also the client. Waterfall is easier to manage due to its structure and the way major tasks can be divided in achievable chunks through numerous phases. In contrast to Agile methodology, Waterfall follows a linear approach in software development where the complete scope of requirements is known in advance.

RAD methodology enables the developer to share working software and visual prototypes with the client in early stages of the development cycle. Therefore, the stakeholders engage with the project and can provide useful feedback to the developer.

4.2. Design plan

The modular design of the website ensures flexible maintenance and allows for the website to be expanded later in time if required. The RAD methodology allows the developer to offer iterative and incremental delivery of the project, collaboration with the stakeholders and future improvements of the core if necessary. The Waterfall development cycle is described as follows:

1. Planning
2. Requirements analysis
3. Design
4. Development
5. Testing
6. Implementation
7. Maintenance

The main resource that the development plan was based on is the final year student - developer (CK) and the supervisor (SW) that supports and guides the project.

4.3. Technology options

4.3.1. Architecture and programming language

The system architecture is separated in several layers to achieve efficiency and maintainability of the website.

- *Presentation layer*: is responsible for the (i) View and (ii) the presentation of data.

- (i) The View, which is also known as JSP pages in Web MVC terminology, generates responses and forwards them to the controller. The controller then sends the response to the client.

- (ii) The presentation of data is achieved by HTML5 and CSS. In order to ease maintenance and achieve maximum efficiency, the Style, Behaviour and Structure are clearly separated. The Style includes links of imported style sheets or external CSS files. The Behaviour includes links to local script elements or imported JavaScript files. Finally, the Structure includes the HTML structural elements.

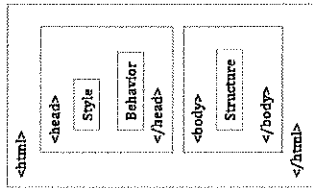


Figure 4: Separation of Style, Behavior, Structure

- *Security layer*: it deals with security concerns and it's implemented in layers using a number of technological controls. First, the use of the University of Surrey email address restricts access only to students and staff of the University. Then, upon login, authentication of the user and authorization to access the website is applied. Spring MVC framework libraries also provide security. Finally, Hyper Text Protocol Secure (HTTPS) is used as a communication protocol for secure communication over the network.
- *Business logic*: it consists of Spring MVC framework controllers and services. The business logic receives the incoming information, performs specific operations and defines the content that needs to be returned to the user ensuring that the required functionalities are always available.
- *Database layer*: it consists of the Web server, the Application server, and the MySQL database.

Unsure if it's better to separate the layers in a different way: Application layer (business logic), DAO (database services), ORM (data mapping), Data source (connection pool), database (data).

4.3.2. Security levels

- *Security defence - SQL injection*: Login is required for buyers in order to view the list of available items, and for sellers in order to add new items. There's no need for the users to register as they're using their University email account. During the login process the students provide their username (email) and password. The submission of their personal information generates an SQL query [13]. The query is then executed on the database and the user's

account is authenticated and authorised to allow access to the website. Text submitted by the user is always treated as suspicious thus not only client side but also server side validation was applied. Lack of validation will allow cybercriminals to submit specifically crafted SQL commands (known as SQL injection) aiming to attack the application and reveal information about the database's structure such as numbers and names of tables. The knowledge of such information will allow them to manipulate the tables, create admin accounts to manage the database and access users' private information.

In order to defend such operations from attackers, the SQL query is parameterised to prevent execution of malicious code. ~~This secures the database from common attacks such as the 'Little Bobby Tables' [28].~~ Explains

- *Form validation:* The jQuery validator [14] plugin is used to validate the input submitted by users through the login form. The customisation options offered by the plugin provide easy validation of input content. These include ready-made validation methods such as email validation and delivery of prepared error messages.

Validation is applied both on client and server side. Client side validation offers a smooth user experience and it helps reduce the load on server by identifying user errors. Server side validation checks the data submitted by the user to prevent SQL injection attacks of cybercriminals attempts to submit untrustworthy data.

4.4. System Challenges

A number of ~~features~~ challenges make the development of the website a challenging task.

- *Use of Spring Web MVC Framework:* The use of Spring MVC with no previous experience is a steep learning curve.
- *SSH Tunnel:* Connectivity issues due to SSH Tunnel problems from local workstation to remote server. Was provided for > 2000 connections
- *User's profile:* The user's profile must be kept secure to ensure that no other users can gain access to it and modify sensitive information.
- *Items list:* The list of items must be updated automatically so that new items are shown as available. The list of items should also be updated to exclude the latest purchased/sold items.
- *The nature of products:* Each product is unique (quantity=1), thus a unique reference to each item must be created. Why?
- *Risk of non-deployment of the website on the University of Surrey intranet:* If the Service Team/IT Services Team does not accept the deployment of the website, volunteers cannot test the web application or provide feedback for improvements.

4.5. System risks and issues

4.5.1. System risks

- If the deployment of the website on the University of Surrey intranet is not approved, the deployment to early adopters cannot be completed and neither feedback can be collected.
- UAT depends on testers being available when required (CS students, volunteers).
- End user expectations unrealistic compared to solution.

Contingency plan to mitigate risks: The development of the website is based on Rapid Application Development (RAD) which allows visual prototypes to be shown to the stakeholders. This keeps stakeholders engaged and feedback can be received in early stages of the development lifecycle.

4.5.2. System issues

Collection of junk emails: One of the initial aims of the system was to collect the number of the junk emails sent within the University. Then, the plan was to analyse the number of emails sent before and after the deployment of the website in order to measure the efficiency of the website through the functionalities it offers. A request was submitted to the IT services team to extract the average number of junk emails exchanged on Surrey's network. In response the team explained that there is no way to pull out the junk emails as all Surrey accounts are automatically listed as 'safe senders' and they can't be filtered as junk unless those emails are marked as junk by the receivers. (The email trail can be found in section 10. Appendix).

Mitigation?

4.6. System constraints, dependencies and timescales

4.6.1. System constraints

- Time constraints due to 5 other modules that run in parallel with COM3001. All the modules are assessed based on at least one coursework and an exam. This is a risk?
- Time scales for set up, development and deployment of the website are aggressive in order to meet the demands of COM3001 Professional Project deadlines and deliveries. Things to risk?

Contingency plan to mitigate risks:

- Timescales were set up with the work required by other modules in mind.
- If for any reason the timescales shift, the requirements categorised as 'Could' will not be implemented.

Constraints are:

Java 7 is needed
Chara Katiri | 6166668

Teamwork is required

MySQL needs to be used

4.6.2. System dependencies

I could only think of dependencies as the issues described in section '4.5.1' System

Risks: Can I remove the system dependencies section?

Depend on authentication service.

4.6.3. System timescales

Following the gathering and definition of functional responsibilities a project plan is developed. Time limits for scheduling were created to ensure that the required time is allocated for the completion of each task. Milestones and deliverables were defined to keep track of the project progress and help get closer to the finished product. Then the Critical Path was defined. Activities included in it are critical and any delay in delivering those will have a negative impact on the rest of the project and will result delay in the delivery of the project [29].

The aim of the project plan was to ensure balance between timescales and project quality. Details in the R&D phase were important but it was equally important to avoid destructions and remain focused on the project goal [30].

The detailed project plan including Milestones and resources allocated for each task is shown in the Gantt chart below. The optimal timescales for system's development is 25% Research and Design, 45% Development and 30% Testing.

Circle model!
Time is 30, 30, 30, 10
Design
Development
Testing
Contingency

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Tasks

Name	Begin date	End date	Coordinator
External Dependencies, Modules, CW, Vacations	06/10/14	23/06/15	
S1, S2, FY	06/10/14	23/06/15	
S1, Semester 1	06/10/14	06/02/15	
S1, COM3001, COM3014, COM3016, COM3017	06/10/14	06/02/15	
S1, W11: COM3017 CW	24/11/14	08/12/14	
S1, W8: COM3016 CW	01/12/14	08/12/14	
S1, W11: COM3014 CW	08/12/14	16/12/14	
S1, Christmas Vacation	22/12/14	09/01/15	
S1, W12: Revision Week	29/01/15	02/02/15	
S1, W13-15: Exams	09/02/15	23/02/15	
S2, Semester 2 (2 modules)	09/02/15	23/02/15	
S2, Spring Vacation	31/03/15	22/04/15	
--- FYP Analysis	06/10/14	28/10/14	
S1, Beginning of FY	08/10/14	08/10/14	
S1, W1: Selection of Keywords	10/10/14	17/10/14	
S1, W3: Allocation to supervisor	20/10/14	20/10/14	
S1, W3: Confirmation of FYP topic	24/10/14	27/10/14	
--- FYP Set-up	28/10/14	28/10/14	
S1, W4: GitHub and NetBeans setup	28/10/14	11/11/14	
S1, W4-W5: Request for Tomcat server, MySQL from IT	28/10/14	28/10/14	
--- Requirements Gathering	28/10/14	28/11/14	
S1, W4: Set up timescales and deadlines	28/10/14	11/11/14	
S1, W4: High-level architecture/layout	28/10/14	11/11/14	
S1, W4: Requirements gathering and creation of BRD	28/10/14	11/11/14	
--- Design & Development	28/10/14	27/03/15	
S1, W6: Basic Homepage development	11/11/14	18/11/14	
S1, W7: Log in development	17/11/14	24/11/14	
S1, W8-12: Database development and validation	24/11/14	30/01/15	
S2, W7: Bookmark functionality creation	03/02/15	12/02/15	
S2, W7: Handling products by date submitted	16/02/15	27/02/15	
--- Testing	27/02/15	03/03/15	
S2, W7: Securing the application	03/03/15	10/03/15	
S2, W7: CK UAT including testing on various Web Browsers	10/03/15	10/03/15	
--- Deployment & Hand-Over activities	07/04/15	10/04/15	
S2, W7: Creation of User Guides	10/04/15	22/04/15	
S2, W7: Ring-fenced deployment?	10/04/15	24/04/15	
S2, W7: Feedback and Improvements	10/04/15	27/04/15	
S2, W7: Analytics Post deployment	27/04/15	01/05/15	
--- Other Assessed Activities	20/11/14	26/05/15	
S1, W7-8: Preparation for Internship Discussion	20/11/14	27/11/14	

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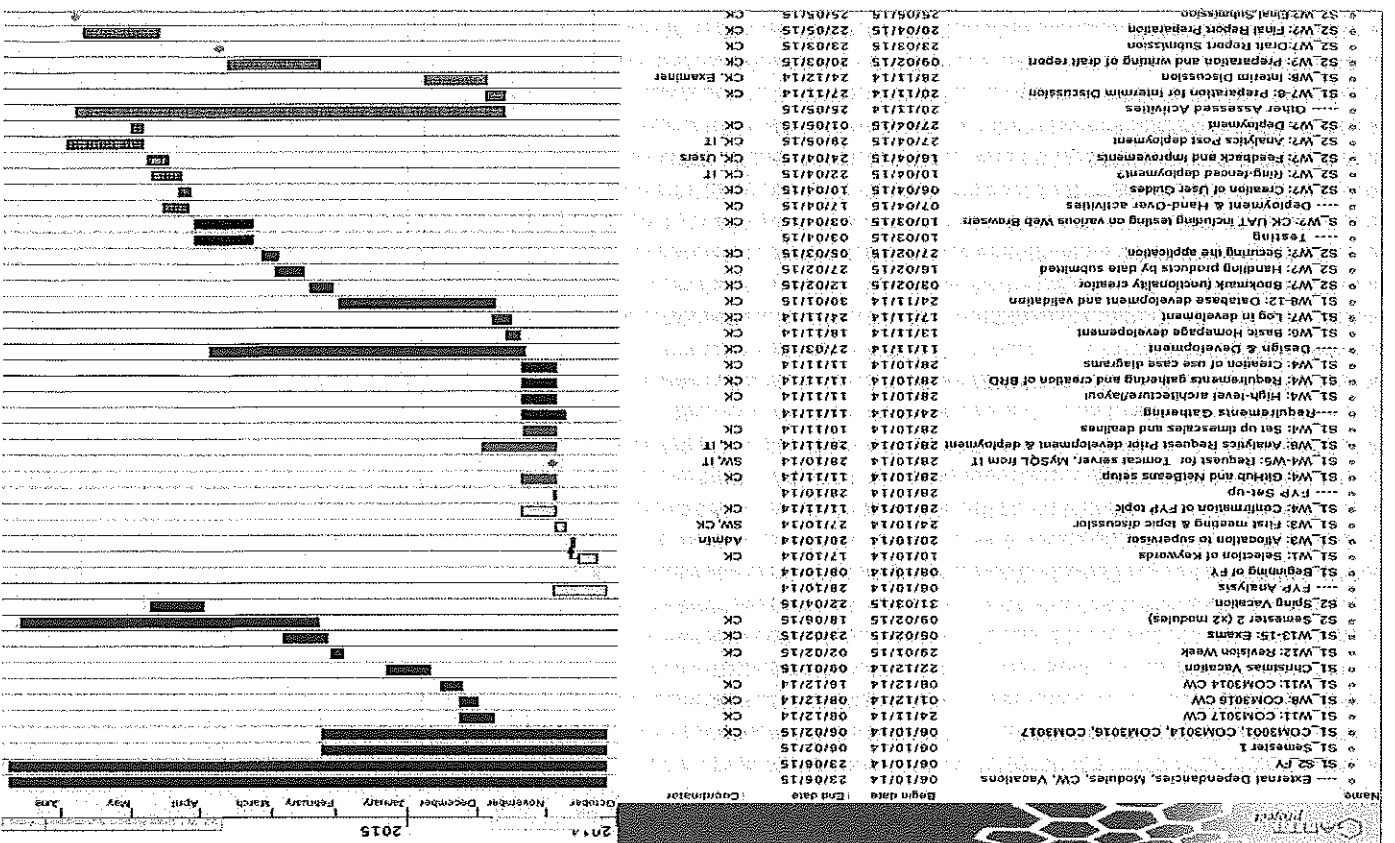
Tasks

Name

SL W8: Interim Discussion	28/11/14	26/05/15	Coordinator
SL W7: Draft Report Submission	23/03/15	22/05/15	CK
SL W7: Final Report Preparation	20/04/15	25/05/15	CK
SL W7: Final Submission	25/05/15		CK

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5. System implementation

5.1. Implementation plan

To be completed

5.2. Build tools and libraries

To be completed

5.3. Database creation and integration

5.3.1. Creation and remote connection to the database behind the firewall

Due to security reasons, direct connection to a service (database console), hosted on a protected network (University of Surrey network), is not possible [26]. The steps followed to enable the connection are described below:

1. Creation of a remote server on the protected network as well as a local workstation (a local MySQL server, database). Following the completion of the development phase on the (i) local workstation, the Pinboard website is deployed on the (ii) remote server.
2. To establish the connection between the (i) local workstation and the (ii) remote server a tunnel that uses a secure protocol is created.
3. Access to a free port can only be achieved from the localhost and not remotely [27]. For security reasons a high, local, port such as 10,000 is used and PuTTY listens to it for incoming connections.
4. The MySQL database that runs on the server listens to port 3306.

```
$ ssh ck00113@student01.eps.surrey.ac.uk -L 10000:mysql0.ee.surrey.ac.uk:3306
```

The use of '-L' states that the port is being forwarded. The use of '10000:mysql0.ee.surrey.ac.uk:3306' forwards the connections from the local port (10000) to the server port (mysql0.ee.surrey.ac.uk:3306). During this step a connection (Tunnel) is made between the local port and the server port.
5. Following the port set-up, the details for connection are pulled from the config file and the connection to the remote server is established.
6. The use of 'mysql -h mysql0.ee.surrey.ac.uk -u ck00113 -D ck00113 -p ck00113' enables the connection to the database.

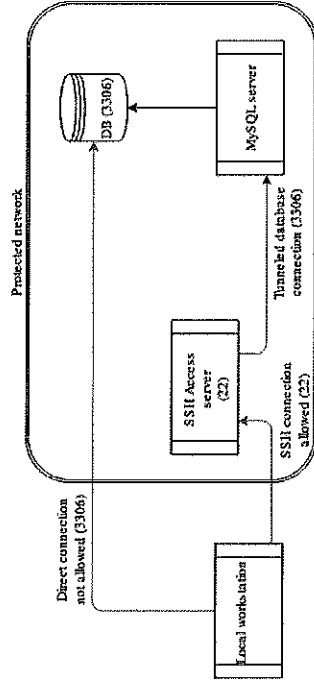


Figure 5: SSH Tunnel

5.4. Success criteria

- The deliverables and software development requirements met.
- The objectives are met.
- The website is functional.
- Delivery of final project in agreed timescale.
- System testing (requirements and UAT) is documented and completed.

6. Diagrams

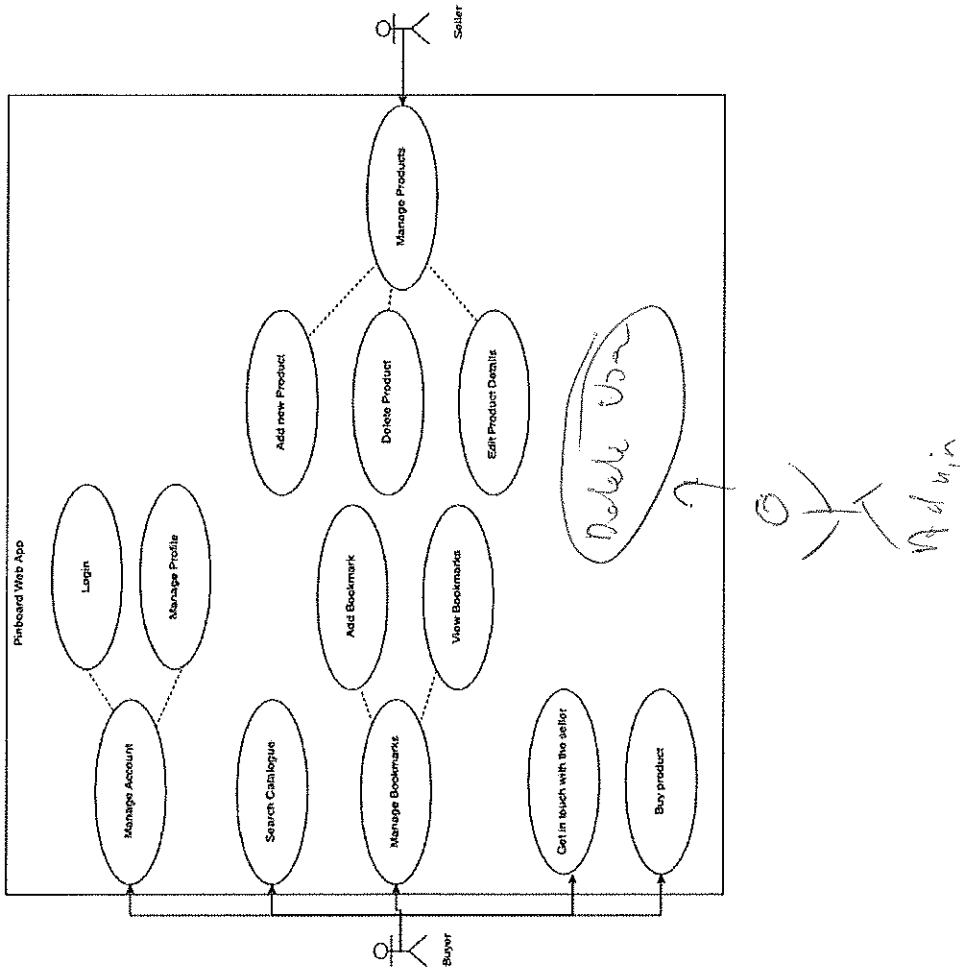
6.1. Class diagram

To be completed

6.2. Use case diagram

Use Case Name:	System Functionalities
Triggering event:	When the user browses the website
Description:	The diagram shows the functionalities available on the website.
Actors:	The user (seller and buyer)
Prerequisites:	<ol style="list-style-type: none"> 1. The user is logged in. 2. Access to the Items database and User database is successful.
Flow of activities:	<ol style="list-style-type: none"> 1. The user searches the books/rooms catalogue. 2. The items available in the database are shown to the user. 3. The user saves items of interest using the bookmark functionality. 4. The user gets in touch with the seller to purchase the item.

look up how to create proper use case documentation in Com 1028!



6	The solution must validate the user information upon registration e.g. text fields that require information and valid email that contains '@', '.', ' swaps.	Functional	M		
7	The solution must allow the users to search products based on categories e.g. books or room swaps.	Functional	M		
8	The solution must provide a search functionality (text-box search) to allow the users enter keywords.	Functional	M		
9	The solution should enable the users to sort the products based on price (Low to High, or High to Low).	Functional	S		
10	The solution must provide information about the product: Title, Description, Price, Category and Seller contact information.	Functional	M		
11	The solution must ask the seller to fill specific fields regarding the product: Title, Description, Price, Category and Seller contact information such as email address and/or mobile phone number.	Functional	M		
12	The solution should provide a 'My profile' area for each user.	Functional	S		
13	The solution should allow users to bookmark items.	Functional	C		

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Req. no.	Requirements Description	Req. Type	MoSCoW	Test result	Notes
1	The solution must automate and simplify the process of selling and buying goods, such as second-hand books, within the University of Surrey environment.	Non-functional	M		
2	The centralized database that contains the products must update automatically and daily.	Non-functional	M		
3	The solution must update the list of products so that a product becomes unavailable after a user purchases it.	Functional	M		
4	The solution must ask the users (buyers & sellers) to agree with "The Sales of Goods Act 1979" and adhere to it: "traders must sell goods that are as described and of satisfactory quality" [4], [5]. The Terms & conditions must be accessible, meaningful and fair.	Non-functional	M		
5	The solution won't require the users to register. The login process will be based on the existing Active	Functional	W		
Seller/Buyer requirements					
Database					

7.1. Requirements testing

7. Test and evaluation

Review

7.2. Security testing
To be completed

7.3. UAT testing
To be completed

14	The bookmark functionality must protect users' bookmarks and follow data privacy policies.	Non-functional	M		
15	The solution won't allow items to be purchased online (PayPal services) provided that the users are students that live on campus and they'll meet for the delivery and payment of the product.	Functional	W		
16	The solution won't provide delivery charges, stages involved in ordering process and dispatch information.	Functional	W		
17	The solution won't provide refund functionalities.	Functional	W		

8. Conclusion

8.1. Achievements, review of objectives
To be completed

8.2. Issues and shortcomings
To be completed

8.3. Future work (system as application)
To be completed

8.4. Final evaluation and conclusions
To be completed

8.5. Summary
To be completed

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I know that the references order in the report is messy. I will get back to this once my research is completed.

10. Appendices

Is it recommended to have Appendices section before or after References?

Reply: Ask you cite on this
in your appendix
However, I would not do
at the very end!

Date: 16 December 2014 16:04:36 GMT
Subject: IT Support Request F0377366 Updated: Project Proposal for Final Year Project
From: IT Services - User Support <usersupport@surrey.ac.uk>
To: Chara Kariri <ck00113@surrey.ac.uk>
IT User Support - Request Updated (Ref: F0377366)!

Dear Chara!

I'm afraid there is no way to pull out 'spam & junk' email statistics for emails between Surrey students (or staff). All Surrey accounts are automatically listed as 'safe senders' as they belong to this institution, hence their emails won't be filtered as spam unless a user specifically marks a sender/item as spam, but then that would only be applicable in that user's mailbox. So I'm afraid this approach won't be applicable in our situation.

We used to have a website you've described for your project idea, I think it was called 'Noticeboard', but due to the lack of interest it was taken away. This was a good few years ago though and I suspect as the digital age has moved on dramatically, it may be very useful, especially if it's institution specific!

Kind Regards
Amy Wiljoent

e-mail: usersupport@surrey.ac.uk

website: <http://www.surrey.ac.uk/university/it>

tel [int]: 9898

tel [ext]: (01483) 689898

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