A Report on the Development and Design of an Online Messaging Forum

Web Programming one

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Introduction

This report aims to explain the development and design of a web-based university forum that supports Create, Read, Update and Delete (CRUD) functionality that allows students to post questions and allows teachers to modify Student accounts, student questions and modules. This report discusses the design process of the forum system especially its pages, navigation structure and visual design, the technology used in HTML5, CSS and JS and its associated frameworks such as Bootstrap. It will also discuss the legal, social, and ethical requirements to store data on the website and how it adheres to the rules of the General Data Protection Regulation (GDPR)

It will show how the system meets the minimum viable product requirements through a walkthrough of annotated screenshots of the pages. This report covers the design and the quality assurance process using a testing schedule that includes input validation/control and iterative improvements.

Design and development

The university forum system initiates from I-drive, directing users to a registration and login interface by a user from an online forum (Razormist, 2021), implemented based on lecture slides (Prichard, 2023). The key landing page, land.php, accessible post-login, uses a design template by Traversy, originally for a frontend web development course, repurposed for the university's forum. The thought process behind designing the system was focused on easy navigation and user-centric features. By using a basic grid layout, focusing only on essential elements required for functionality, this approach minimises user fatigue.

Layout & design

The student section and admin section share similar design principles and layout they both utilise a separate parent layout file and a shared styling file and site, ensuring consistency across the forum.

The admin and student sections shared the same grid layout, and the main content of functionality features is in the middle of the page, this creates a border of white space on the left and right-hand side of the page, which focuses the user's attention solely on the intended purpose & function of the page and makes the content more digestible and less cluttered.

Colour scheme

(see appendix 1)For minimalism and simplicity, black and white was used for the background and main information sections. This creates a high contrast, therefore enhancing the readability of the text. To enhance visual interest, blue accents were used in key interactive buttons to highlight against the black and white background. This colour scheme was used in the student section as the students are familiar with it from the landing page, this helps reduce any unnecessary cognitive load as the student further navigates into the website more
However, in the admin section, the secondary colour that was chosen was yellow as it serves as a constant reminder to the admin to handle with caution as they are handling sensitive and important student data, helping mitigate any potential error whilst handling data.

Navigation Bar & Footer

To adhere to the heuristic the system includes a consistent navigation bar and footer between the student and admin sections, despite the different purposes of individual pages. The student's navigation bar features four buttons: Home; Message List; Add Message; and Contact Us. Additionally, admins have access to the buttons: Modules, Add Modules, Users, Add Users and Log Out.
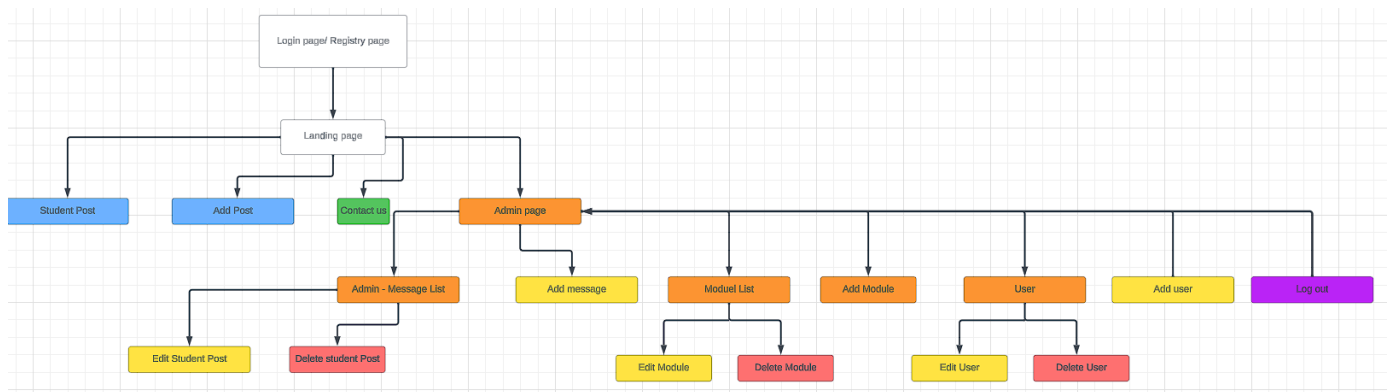
Student Design Section

In designing the Student Post display page, the focus was on highlighting key content and encapsulating each post in a card. This structure dynamically displays the post's content, an associated image, and additional details like category, posting date, and poster information, this format was chosen as it is more engaging to students. However, the admin section did not have this because that section was purely designed to be functional and engaging.
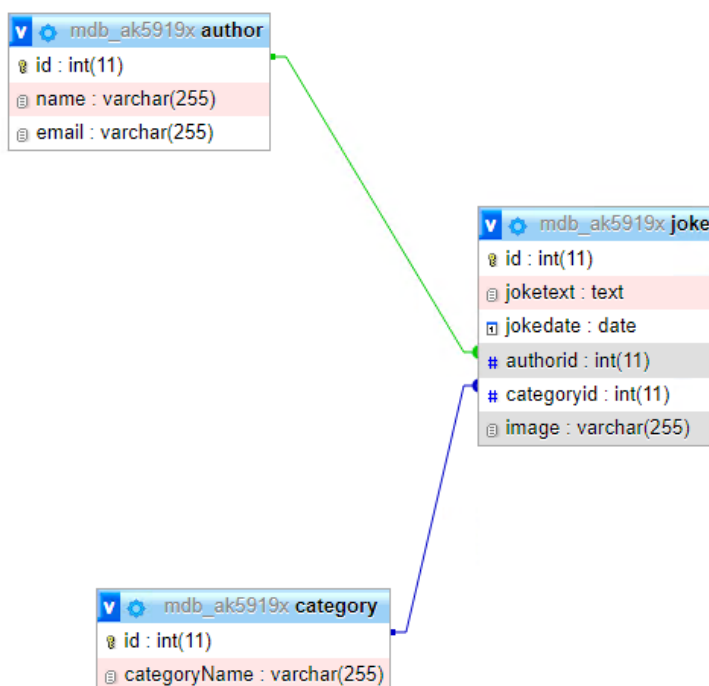
In the add post and contact us page the text box was purposefully designed to be giant to visually stand, this made it a focal point of the page, this allows users with a visual impairment to easily identify their page, the title of the page uses a large font size & bold typography against a white background to allow easy readability, this allow student to post meeting the crud functionality requirement and web accessibility inclusivity guidelines
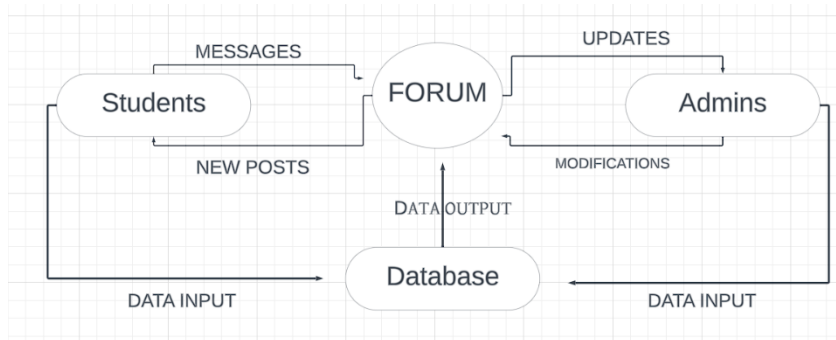
Data Diagrams

Navigational structure

Entity relation diagram

Context Diagram

MESSAGES

UPDATES

Students

FORUM

Admins

NEW POSTS

MODIFICATIONS

DATA OUTPUT

Database

DATA INPUT

DATA INPUT

Discussion of the technologies used

HTML (Hypertext Markup Language) is a web markup language used to create structured page layouts by organising content structure into a hierarchical system of tags. The header, body, and footer sections can be organised more by nesting further tags within it like headings, paragraphs, and links. This is important to digest content and readability.

This was primarily implemented in the system by designing a parent layout file for the student and admin sections. This provided a consistent file structure. The use of the parent file instead of an individual file was it streamlined the modification, maintenance and revisions because changes to the parent file automatically apply to all linked pages, offering time and resource savings for a site with numerous pages and frequent updates.Html layout was used to structure content parsed from PHP files and organising it into a cohesive and user-friendly format. It also standardises semantic elements such as the headers, footers, and navigation menus to all the website pages, this approach helps to establish student familiarity with the website and ensures and easy & clear navigation (Sufiyan, 2023).

Cascading style sheet (CSS) is a stylesheet language used to define a web page's visual style, including fonts, colours, layouts, and spacing. It separates content from presentation, making website maintenance easier to navigate and categorise .it works by using declarations, which are rules that define the styling of different elements on the page. Each declaration has a selector, which tells the browser which elements to style, and a set of properties and values, which determine how those elements should look.

The use of this language established the visual layout & style of the forum website, it primarily allowed use to facilitate Nielsen's Usability Heuristic of Aesthetic and Minimalist Design, mainly focusing on pure functionality by only implementing visual elements that will add highlight key functions. The chosen use of blue accents for important call-to-action buttons CRUD system shows this (Domantas, 2023).

Hypertext Preprocessor (PHP) is a server-side scripting language used for web development for creating dynamic web pages. PHP is used to add, delete, and modify data in the database by storing the database sequels of statements and storing them as functions for ease of access to be called on the website. PHP's role was executing server-side tasks such as handling form submissions, interacting with the MySQL database to retrieve and store data, and rendering dynamic content. It facilitated that users could add, edit, and delete jokes, view categorized content, and interact with the forum (Astari, 2023).

JavaScript (JS) is a client-side scripting language that handles the logic side of webpages, allowing for interactive functionality. It was used in the forum for client-side validation of form inputs, ensuring it meets requirements before submission, this prevents unnecessary server requests and improves data quality, JS was used to dynamically give users confirmations or errors like a message being successfully sent or input data not meeting the requirements, it was used for users, modules drop-down menu and was used to update any changes to them and automatically update the list (Moriss, 2023).

MySQL is a relational database management system that uses SQL for managing data. A relational database organizes data into tables which can be linked by common attributes, making it efficient for storing and retrieving interconnected data. In the context of a student message forum, MySQL was essential for storing and managing posts, user information, and responses. Its relational nature allowed for the effective linkage of related data, like connecting users to their respective posts and comments, and facilitating complex queries and updates crucial for maintaining the dynamic and interactive nature of the forum. The choice of MySQL facilitated data management, enabling complex queries for retrieving, updating, and displaying forum content dynamically. This was essential for features like displaying messages, updating users and modules, or deleting user accounts and posts (Drake, 2020).

Web standards are a set of best practices & guidelines for developing and designing a website, to ensure that all web content is accessible & usable across different web browsers and devices. This means that websites can be created to perform and viewed the same whether on a desktop or phone. The performance and efficiency increase because standard-compliant websites use clean efficient code, file sizes and formats which load content faster (Crestodina, 2022).

Legal, social, and ethical issues of web accessibility.

Web accessibility is the techniques, tools and practices that are designed/developed so that people with disability can use websites without any issues. (**WCAG**) is a set of guidelines created by W3C WAI. These guidelines provide a framework for making web content more accessible to people with disabilities WCAG is based on four principles: Perceivable, Operable, Understandable, and Robust (POUR) (Consortium, 2023).

In the UK, the Equality Act 2010 mandates that websites be accessible to all users, including those with disabilities. This legislation requires site owners to make 'reasonable adjustments' to ensure their sites are accessible. It emphasizes the need for service providers to foresee and accommodate the needs of potential disabled customers, ensuring a fair and equal experience for all users. This legal framework underscores the importance of web accessibility as both a legal obligation and a societal responsibility for site owners. (Collins, 2022)
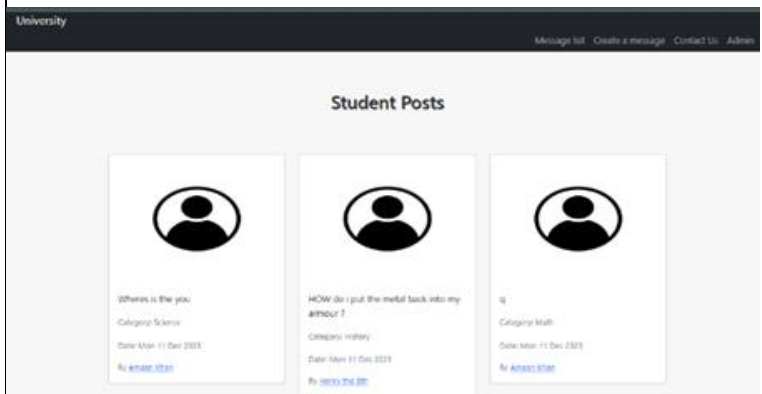
Web accessibility is the techniques, tools and practices that are designed/developed so that people with disability can use websites without any issues. The social requirements of web accessibility focus on ensuring that all individuals, regardless of their abilities or backgrounds, have equal access to digital content. This can include many disabilities and features, including Auditory, Cognitive, Neurological, Physical, Speech, and Visual Accessibility. (Consortium, 2023)

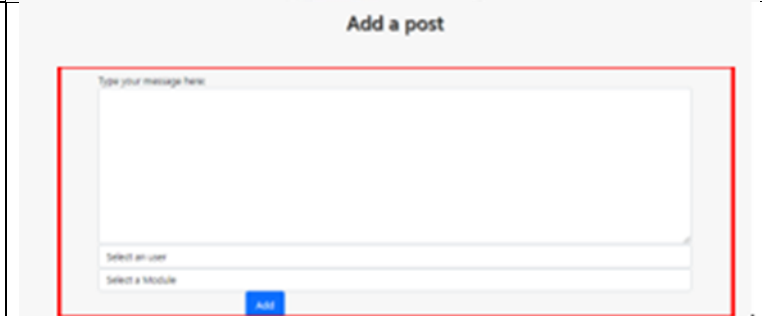## General Data Protection Regulation

The General Data Protection Regulation (GDPR) is a regulatory framework that establishes rules for collecting and processing personal data of individuals within and outside the European Union, emphasizing their privacy rights and data protection (FRANKENFIELD, 2020). One of the most significant impacts of Brexit on GDPR is how data is transferred between the EU and the UK. Initially, there were concerns that the UK would become a 'third country' under GDPR, which would have complicated data transfers. However, the EU has granted the UK an adequacy decision, meaning the EU recognizes the UK's data protection laws as providing a level of protection essentially equivalent to that under EU law. This allows for the free flow of personal data from the EU to the UK. (Murray, 2017). Under the Data Protection Act 2018, individuals have the right to control how their data, including email addresses, is collected, processed, and shared. This ensures that students' email addresses, which are sensitive pieces of information, are protected from being shown without their consent. The act requires organizations, including educational institutions, to implement robust data protection measures to prevent breaches of privacy and unauthorized access to student email addresses (Government, 2023).
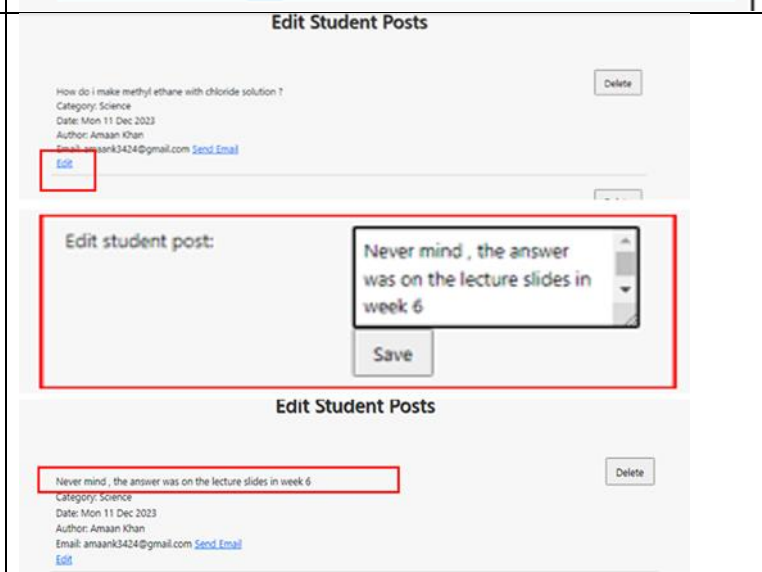
Overview and annotated screenshots

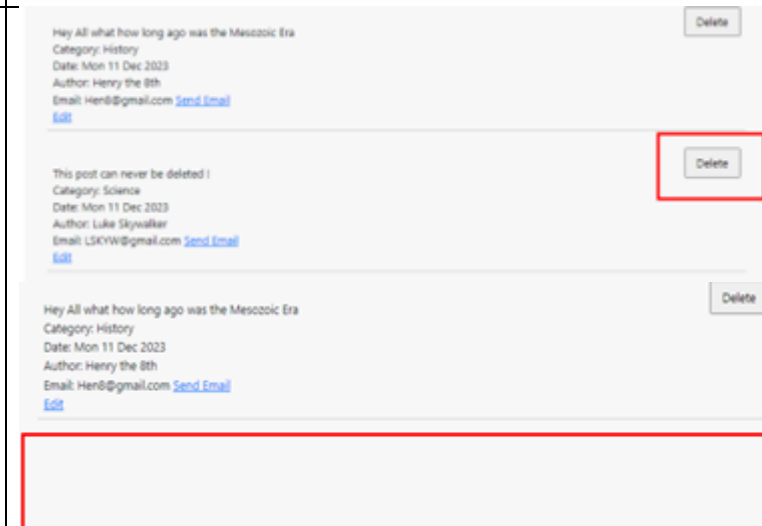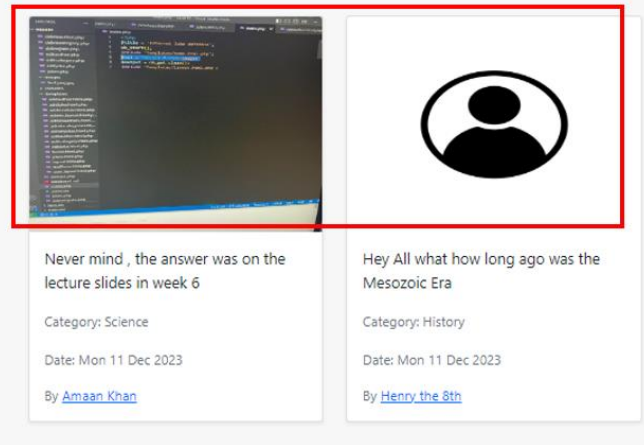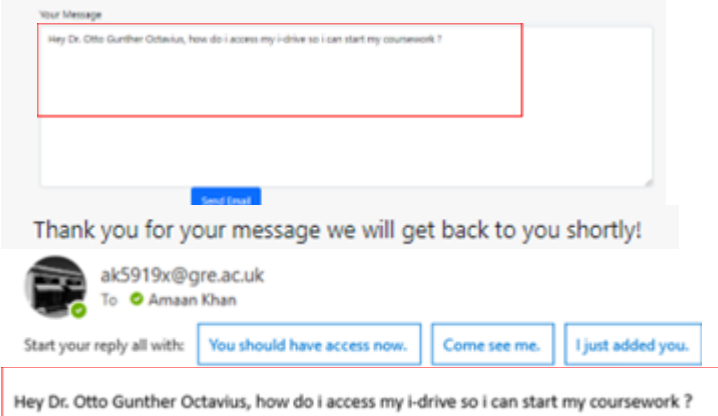|	
The webpage features student posts in cards with content, images, key details	
Users can add posts through a text box, categorization dropdowns, and an 'Add' button	
.Edit Student Posts allows users to modify posts with a text area to change it	
'Delete' button next to each post for removal	

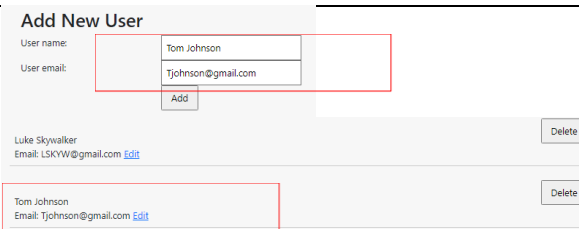|	
The website interface shows images with user posts in a card-style format	Never mind , the answer was on the lecture slides in week 6 Category: Science Date: Mon 11 Dec 2023 By Amaan Khan Hey All what how long ago was the Mesozoic Era Category: History Date: Mon 11 Dec 2023 By Henry the 8th
Website features 'Contact to admin' with a message box and 'Send Email' button for user-admin communication	Your Message Hey Dr. Otto Gunther Octavius, how do i access my i-drive so i can start my coursework ? Send Email Thank you for your message we will get back to you shortly! ak5919x@gre.ac.uk To Amaan Khan Start your reply all with: You should have access now. Come see me. I just added you. Hey Dr. Otto Gunther Octavius, how do i access my i-drive so i can start my coursework ?
The website lists user accounts with a 'Delete' button for account removal	Amaan Khan Email: amaank3424@gmail.com Edit Delete Henry the 8th Email: Hen8@gmail.com Edit Delete Amaan Khan Email: amaank3424@gmail.com Edit Delete
The page allows users to be edited.	Amaan Khan Email: amaank3424@gmail.com Edit Delete Henry the 8th Email: Hen8@gmail.com Edit Delete
Allows the new users to be added by form	**Add New User** User name: Tom Johnson User email: Tjohnson@gmail.com Add Luke Skywalker Email: LSKYW@gmail.com Edit Delete Tom Johnson Email: Tjohnson@gmail.com Edit Delete
User Dropdown': Select pre-existing usernames for a message post.	Select an user Select an user Amaan Khan Henry the 8th Harry Potter Amro el Sheikh Luke Skywalker
Module Dropdown': select from available modules	Select an user Select a Module Select a Module Science Math History Geography Web Programming
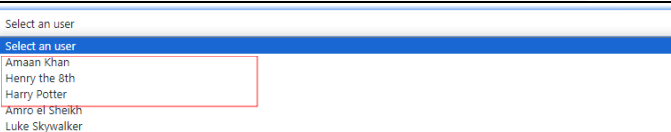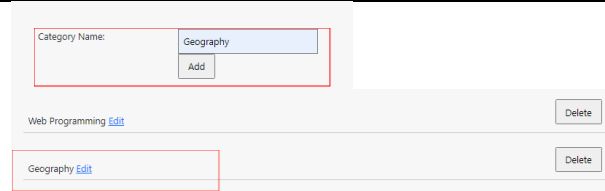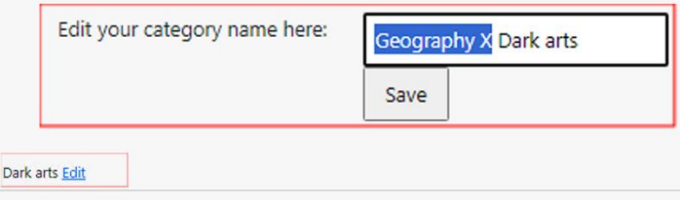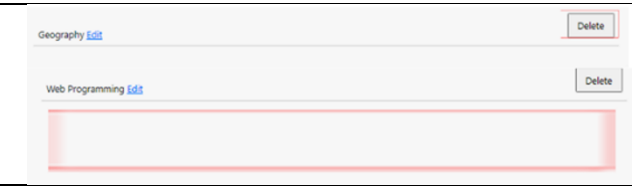
'Add' button for submitting the new module. T	
The 'Edit Module' lets you change the category name	
Each module has a 'Delete' button for quick removal.	

Testing

	What is being tested	How	Test data used	Expected results	Date	Actual results	Action taken
1	Displaying a list of posts	Viewing the message list	click	A list of student posts appears on the page	1/11/23	All posts are displayed correctly	None
2	Adding a new post	Using the 'Add Post' feature	Sample post content	A new post is added and displayed	5/11/23	The post failed to be added	Non existing form was added to update to database
3	Editing a post	Using the 'Edit' option on an existing post	Modified post content	The post is updated with new content	7/11/23	Post updated successfully	none
4	Deleting a post	Using the 'Delete' option on an existing post		Selected post is removed from the list	9/11/23	The entire page not showing	Page php file needed to be linked to the HTML layout
5	Displaying image for a pos	Viewing the message list	Image file stored in a file, posted by database	The image is displayed alongside the post	9/11/23	The image is not being displayed	Extra image file extension text was removed from the file name
6	Sending an email to admin via the Contact Us page	Filling out and submitting the contact form	Sample message content	Email is sent to admin	9/11/23	Email sent, but confirmation message missing	Removed a misspelling in the php confirmation code
7	Adding a new user	Using the 'Add User' feature	Username, email address	A new user is added to the system	24/11/23	After confirmation, brought to the module list	The redirection link was corrected to the student list
8	Editing user information	Using the 'Edit User' option on an existing user	Modified username, email address	User information is updated	29/11/23	Edit function not saving changes	Added the missing php function
9	Deleting a user	Using the 'Delete User' option on an existing user	N/A	The selected user is removed	29/11/23	The user deleted it, but related posts remained	Updated Foreign key in database to CASCADE ON DELETE

				from the system			
10	Assigning post to a module and user	Using drop-down menus in the post form	Select the module and user	The post is linked to the chosen module and the user	6/12/23	The assignment works but the dropdown is not updated	None
11	Adding a module name	Using the 'Add Module' feature	Module name	A new module name is added to the list	6/12/23	Module added to the list	None
12	Editing a module name	Using the 'Edit Module' option on an existing module	Modified module name	The module name is updated	7/12/23	Edit successful	None
13	Deleting a module name	Using the 'Delete Module' option on an existing module	N/A	The selected module name is removed from the list	7/12/23	Module deleted	None
14	Submitting 20000 characters in add post.	By using the Add Post feature	20000 characters	20000 characters are stored as a post in the database	12/12/2023	Internal server error, characters can't be posted, crashed the page	Set text restrictions to 500 characters

Conclusion and future recommendations

To conclude we have successfully developed a web-based message forum through the use of technology of HTML, CSS, JS, PHP and Bootstrap that achieve the CRUD criteria of the mark scheme, it allows students to post and view messages, allows administrators to post, delete and update messages, students and modules from the Database, the development and design of the system were discussed, the report explains what technology we used, why it was used like HTML for structuring of the page, CSS for appropriate styling and visual elements, PHP and JS for the required logic of the system such as storing MySQL statements as functions and calling them for the required purpose of the page and MySQL to store input and output data.

This report demonstrated it met the CRUD functionality requirements and additional adaptation was made to the system, for example, a login and registering page that stored the details in and database that can be later retrieved to log in to access the online forum. An Admin Area was added to allow new students to be registered to the system, allow the modification and deletion of modules, posts and users

structured input testing was utilised to assess the performance function, and quality of the system and the find any unexpected and expected bugs by unusual inputs e.g. 20 thousand characters in a form field to test if the database can handle a strenuous request.

Future improvements to the system can include.

- Combining message lists and adding post pages together for a more streamlined user experience.
- A login system for the administrator section to prevent unauthorized access to modifications of private & sensitive data.
- The merging of the login system and online forum database, to track individual users and remove the need for pre-existing menus to select user & module options.
- Real-time updates by notification for new posts
- The implementation of security features such as password hashing, and URLs that are only user authentication accessible by logic of the database.

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Appendices

To ensure this, the website design was based on a select number of usability and design guidelines and standards, which were picked because most relevant to enhancing the app's user experience, The 2017 study by Gonzalez-Holland et al. provides a comprehensive analysis of Nielsen's 10 usability heuristics, focusing on their development, application, and prospects in interface design. Originally developed by Nielsen and Molich as 9 heuristics in 1990 and expanded to 10 in 1994, these principles include visibility of system status, error prevention, and user control, among others. The study highlights their widespread application in various design interfaces, noting their effectiveness in identifying serious UI problems, often more so than other methods like usability testing (Emily Gonzalez-Holland, 2017).

Integrating Nielsen's Usability Heuristics into an online messaging forum enhances its effectiveness for it being easy to navigate. Consistency and standards: This heuristic when designing the forum ensures that the front end is intuitive and familiar, allowing students to easily navigate to the messaging forum and to send & read posts. Aesthetic and Minimalist Design, by reducing cognitive load, allows users to focus on essential functionality, users to concentrate on essential tasks and discussions without unnecessary distractions. User Control and Freedom: Reduces User Frustration: Ensuring users don't feel trapped by their actions on the website, this feature supports a more positive user experience, and encourages regular participation and interaction within the university community.