

The Risks and Benefits of Social Media, and Its Place in Higher Education

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Abstract—This study examines the effectiveness of a purpose-built social media platform for supporting learning and social interaction in higher education. A mixed-methods approach was used, including qualitative and quantitative surveys, to compare the new platform to the student portal. The results indicate that the social media platform showed promise for enhancing student engagement and collaboration, but further research is needed to fully evaluate its potential. These findings suggest that social media-style platforms could be a valuable addition to traditional student content delivery systems.

Index Terms—Social Media, Social Networking, Higher Education.

I. INTRODUCTION

This paper looks at the utility that social media platforms can provide in a university setting as a means to justify, design and develop an institutional social media site to aid in the academic and social aspects of university life.

Social media is all around us, and the vast majority of us use social media in some way or another very frequently. Many studies have taken place to explore the impact social media could have on students when they have been encouraged to use existing platforms as a contact and collaboration tool as part of their course.

Finding your place socially at university can be very daunting, especially if you have been unable to find your way into any large social events, or onto any student-run social channels such as Discord [1] etc, if any such things are in place at all. Failure to find such places can have a major impact on not only the university experience but also their mental health, as they can find themselves isolated.

Lockdowns and isolations during the pandemic left many students segregated and created an environment in which many had left home to find themselves unable to socialise and find their new student cohort, as such, there is a need for better online socialization tools to be adopted by universities.

This paper researches into the question; could and institutionalised social media platform benefit the academic and social aspects of university life?

A. Roadmap of this paper

In section II a review of past work and literature is conducted to first understand how social media has been implemented in a university setting, followed by an observation of previous literature exploring the effects of social in an effort to comprehend the impacts it can have to ultimately develop an artefact that is positive in nature.

Section III is an evaluation of both tiers of the related work. Section IV outlines the design elements of the prototype social

media platform artefact, including user interface elements and technological stack. Section V looks at the development process of the social media platform as well as the testing of artefact performance.

Section VI explains the research methodology chosen for this study including legal, social and ethical considerations. Section VII observes the experimental results. Section VIII discusses the results and implications of this paper and contained research. Section IX looks at the potential for future study within this area accounting for limitations encountered within this iteration and Section X concludes with a summary of findings.

II. RELATED WORK

This literature review investigates the risks and benefits attached to social media and the potential advantages that it could bring forward as a tool in higher education and pedagogy. Social media has made a massive impact on society in many ways, and using it one way or another has become commonplace in most of our lives, but do we fully understand the risks and advantages that it presents? This literary analysis of recent (2010-2022) research papers aim to explore the findings on the possible side effects of social media to weigh the pros against the cons regarding the integration of social media with higher education (HE) and pedagogy. I hypothesize, that with proper application, social media could become a valuable tool within HE institutions and could help increase engagement with learning materials and courses.

A. Social Media in Higher Education

Liu [2] acknowledges that each social media platform comes with its own set of strengths and weaknesses and that the integration of such into pedagogy must be planned cautiously, ensuring that it is the strengths of the platform that are leveraged and not the potential distractions and difficulties that could hinder student learning. Liu talks of each social media platform being a tool, each in its own specific right and each with its designated purpose, so a one size fits all approach would only bring about nuisance. The author notes, for instance, that we could capitalize on Facebook's ubiquity and capabilities for collaboration. Liu [2] and Baruah [3] both talk about the integration of social media into higher education and both conclude by sharing their thoughts on that it would be an advantage to implement social media elements as tools within higher education. Baruah further empowers Liu's point about different platforms providing different tools, by discussing how much easier collaboration becomes when using online facilities. Online mediums that provide features

allowing users to co-draft documents, organise members, arrange meetings, spread information, and gauge opinion, all while having the capability to reach audiences all over the world. Baruah concludes that there will be a greater capacity for groups to participate in collective action, going on to say that it is the hallmark of civil society.

Kelm [4] also implemented social media into their course and noticed an increase in engagement from their students and reported a greater sense of team ethic between classmates. Kelm concluded with a note stating that the secret for educators is to observe how technology is used in everyday life and then implement that use into our education systems. Wang et al. [5] mention in their paper that there is a call for an approach to try and better balance the relationship between social media and academic study but pays a great deal of respect to the potential benefits that it can offer. The paper goes on to mention that students are very likely to be affected by social media, whilst it provides a world in which to make new friends and release pressure, it can absolutely impact students' lives and grades, calling for the aforementioned balance.

Evans [6] encouraged students to interact with him and their peers through Twitter and found that the amount of Twitter usage was associated with increased student engagement. Course-related tweeting showed no evidence of being related to interpersonal relations between students and their tutors, and finally that Twitter usage did not relate to class attendance.

Williams [7] talks of the capabilities that social media brings forward as advantages in enhancing learner engagement in a very efficient way and reiterates the points provided by Junco et al [8]. The paper from Junco et al. follows a similar experiment to Evans and his 2014 paper [6] but in a slightly more robust and comprehensive fashion. This was achieved by using two separate groups, the first consisting of 125 students, half of whom were required to use Twitter while the other half were required to use Ning, whereas the participation of Twitter and Ning usage was voluntary for study group 2. The study recognised greater motivation towards engagement from study group 1 (those required to use Twitter and Ning). The paper concludes by stating that new technologies being incorporated into contemporary classrooms is an important development in an effort to produce more effective learning strategies and outcomes, while calling for contemporary students to improve their capacity to engage in more self-directed collaborative practices in order to better take ownership of their learning.

Tripathi [9] observed that nearly two-thirds of the faculty at their institution had used social media in a class session, some even posting content for students to further read outside of classes, which saw promising levels of engagement while other members of the faculty ask students explicitly to utilise social media as part of course assignments. On an end note the paper reaffirms that the presence of social media within HE is increasingly visible as instructors continue to further employ technology to enhance their teaching methods and promote active learning for students.

Haythornthwaite, Paulin, and Gruzd [10] discuss an overview of the measures and potential of a multi-method approach for studying learning through means of social media, based on a workshop held at the 2014 Learning Analytics

and Knowledge conference. The paper pays vast respect to the implementation of social media into both teaching and learning being new, but still advancing rapidly. It is recognised that learners are already present on these channels and are already capable of information search and acquisition, learning community support, knowledge building, and engagement. In one of the final notes of the paper, there is mention that different settings of formality would call for different considerations to be made. In a formal setting, the intent of the instructor must be taken into consideration while examining the discussion formation comparatively against the desired communication and pedagogical outcomes. Whereas in more informal settings, we must consider the impact of things on a more societal level of mass learning and how the balance of the development of sustained learning communities is affected by massively distributed learning and the 'just-in-time learning' associated with social media exchanges.

B. The Effects of Social Media

The paper by Amedie [11] mentions that, ironically, social media is in effect turning us into one of the most antisocial generations yet. The paper talks about the connection between social media and anxiety – It states that social media causes depression and anxiety in two ways. Chronic stress causes depression and anxiety. Being constantly alert for new social media messages, to your instinctive fight-or-flight limbic system, is the same as being on continuous alert for predators, which causes a release of the stress hormone cortisol. The second cause of depression anxiety is constantly trying to maintain an unrealistic and unachievable image of oneself on their chosen social network. The paper also mentions that social media can pave the way for criminal activity, by putting to use the freedoms offered by social media to hide their identity and engage in things like cyberbullying, cyber terrorism, human trafficking and drug dealing, though only talks in depth of cyberbullying, criminal and terrorist activities as they are the most common illicit activities. Amedie concludes that despite the positive benefit of rapid information sharing, social media enables people to create false identities and superficial connections, causes depression and is a primary recruiting tool for criminals and terrorists. It also mentions that the negative impacts of social media are rarely discussed, while the benefits are often emphasized.

Kuppuswamy and Narayan [12] recognise that social media sites provide function for individuals to create and maintain social ties, which can be of great benefit in both academic and social settings. It is also observed that these same sites present a risk to individuals' privacy, health, safety and professional reputations if the platforms are not used responsibly.

In a 2012 paper by Tariq et al [13], the authors observed that more than 90% of college students use social media [14] and they found social media to be having a negative impact on education. Tariq et al believe this to be due to social networks capturing the total attention of their users and redirecting them towards non-educational, inappropriate and unethical activities such as "useless chatting, time killing by random searching and not doing their jobs". The paper goes on to note that social

networking sites quite often play host to attractive activities such as gaming or advertisements, enticing people to sign up or simply waste time, it is the over-indulgence of such activities that cause users to develop social media addiction. It states that providing the ubiquitous facilities of social networks is a straight invitation to addiction for any teenager and even an adult, as academic satisfaction is not enough got those students who suffer from social isolation [15].

A study conducted by W.Akram and R.Kumar [16] observes both the negative and positive impacts of social media on society and business. The paper notes the merits presented by social media while also recognising that it has some faults. Touching on social media within higher education, Akram et al discuss that social media allows individuals to share thoughts with others on the other side of the planet instantly is a massive positive, and in many cases, this shared information then becomes easily available for many others to see and benefit from. The literature saw that social media helped in development towards simply being more prepared, stating that social media is fundamentally about showcasing and taking part in current trends around the world, further enabling students to plan or gauge an idea of what might be expected of them. In contrast to those points, the paper outlines that social media could aid in reduced learning and research capabilities.

With a growing dependency on information being easy to find, this could hinder the development of research skills. In most cases, people tend to use slang or abbreviated language on social media as most relationships between individuals tend to be interpersonal, coupled with an increased reliance on spellcheckers and auto-correction, which decreases their charge over the dialect and formal writing abilities. Another valuable note from the paper shines a light on time wastage, while social media and the internet, in general, are a boon for education, it opens the door to many distractions if the right amount of self-discipline is not present. While social networking has improved the quality and rate of coordinated efforts from students, it remains important to be responsible and understand the possible negative effects that social media brings forward. A consensus is established with Tariq et al's [13] points on the factor of distraction before concluding that people are advised to adopt the positive aspects of social media while avoiding the negatives, to benefit from the latest and emerging technologies.

Kaur and Bashir [17] reiterate that there are many benefits to social media use for adolescents and that there are also multiple potential risks that can act in detriment to their mental health and well-being. Some of the positive impacts outlined were access to health information, enhanced communication and learning opportunities, while the negatives involve stress, depression, suppression of emotional awareness, fatigue, on-line harassment, a decline in intellectual ability and a shrinking capacity for concentration. The paper goes on to express that these risks could be navigated successfully with proper handling, such would call for education around social media abuse being provided (expressly to parents to mitigate the risks for children and adolescents), but a greater awareness of the capacity for potential harmful effects that these platforms can inflict must be attained.

Bashir and Bhat [18] touch on these points again exploring the psychological effects of social media, asserting that excessive use of social media can lead people to disastrous results, starting with anxiety and leading to depression. They saw in Pantic et al.'s study [19], mirrored by a study conducted by Rosen et al. [20], that depression and time spent on Facebook by adolescents were directly correlated and those that spent most of their time engaging in online activities were among those with major depressive symptoms. The paper concludes to suggest that social media can have an epidemic-like on any individual. Social networking sites should be constrained to an age limit and any social media application that does not have a positive impact and enables such things as discrimination, violence and racism should be dissolved at once, completely.

Naslund et al. [21] found in their paper that in young people, many benefits of social media were recognised. Among these benefits were elevated self-esteem and more opportunities for self-disclosure. Some of the negative aspects observed were increased exposure to harm, depressive symptoms, social isolation and bullying. The paper concludes by highlighting that social media has become an important part of the lives of many individuals living with mental disorders and that many of them use social media to share lived experiences regarding mental illness, seek support from others, find treatments and recommendations as well as access to mental health services. It also recognises that social media platforms could be used to allow individuals to access evidence-based treatments and support. The authors end on the recognition that to fully close the gap in mental health services integrated into social media, it would require researchers to work closely with clinicians to make sure that the benefits of such things on social media platforms would outweigh any possible risks.

III. EVALUATION

A. Social Media in higher Education

Almost all papers found positive outcomes with integrating social media into higher education and in most cases, the utility and ease of collaboration are at the centre of praise. It is recognised that each platform has something different to offer and we are perhaps better off seeing them as tools each in their own regard, built for their own purpose. With that said, one characteristic shared among these platforms is the opportunity to easily reach others from across the globe whilst still making effective team management and organization possible and instant. The studies observed noted an increase in team ethic with the introduction of social media in their courses and a direct correlation between social media usage and course engagement while their online activities showed no evidence of being related to interpersonal relationships between students and their tutors.

Another consensus is that to fully leverage social media within higher education, a balance must be found. Social media sites play host to many distractions and irrelevant activities and nonsensical information, calling for the responsibility of domain selection, and responsibility for proper use. In the same vein as striking balance, setting and formality must be taken into consideration, different approaches and rule

sets may need to be applied between settings of different formalities and would not be a one size fits all scenario. To fully employ social media in pedagogy, the staff and faculty would be at the heart of operations, it would require a small degree of technical competence and familiarity for teaching staff to use such platforms effectively and engagingly.

All literature reviewed conducts a study on existing mediums of social media where distractions already exist and the courses may have altered slightly to fit into social media space. For this research project, I will build a platform expressly for use within higher education, and conduct my study in the same fashion as those previously mentioned.

B. Effects of social media

All studies reviewed seem to agree that there is a need for a greater understanding of the risks of social media to fully be able to leverage its many benefits. Social media sites if left unmonitored can be the prime environment for negative things to thrive such as bullying and discrimination. There are also the less directly harmful aspects to consider, such as excessive amounts of advertisements that cause distraction and promote time-wasting and other non-productive activities. It is engaging in these activities and succumbing to the lure of these advertisements that gives social media its addictive nature, which if left unchecked can lead to conditions such as depression and anxiety. To satisfy the concerns outlined by the literature, a platform would need to be created with these points at the forefront of its design. It would need to be engaging but not distracting, a place safe from harm and free from discrimination and bullying, and host activities on which time spent is time well spent.

IV. ARTEFACT DESIGN

The title of the platform is “myUniSocial”, the core of which the system is an evolution of my work carried out in developing a previous social media system [22]. The previous system or ‘myCircle’ [23] is built around interests and hobbies as opposed to simple media reposting to navigate the negative impacts observed in the above review of past literature and the comparison culture that exists in modern society. In recognition of the distraction factor mentioned by many in the literature review, it felt like somewhat of a responsibility to minimise possible distractions on the platform, and if they do exist, to make them a benefit to engage with and for it to be relevant to their course. To achieve this, in place of the interest groups or ‘circles’, course modules are displayed allowing users to quickly access course content and helpful materials. Work from my other platform ‘myUni404’ [24] is built in as a feature to aid students in various fields of computing, this platform offers users the ability to post coding, programming and tech related questions which users can in turn reply to answer with code snippets to supplement their answers, and is browsable by speciality ie. - Web Development, Game Development, Robotics and so on. ‘myUni404’ is built with a beginner-friendly focus and this will be a great step in the direction of making the social network educational while building confidence in expertise. The layout

of the user interface of the platform is designed to have a familiar feeling experience to what users have generally come to expect from social media platforms, with myUni404 being an improved version of the myCircle user interface, the myCircle elements were updated to include the improvements to achieve a consistent feel of quality across the platform. Colour schemes that somewhat align with the university were used to give users a sense of what the platform could feel like if the platform was backed by the university and was the new standard for a student portal-based platform. Initially, university logos were on the platform login and navigation bar, but were removed after taking trademarks and other such things into consideration.

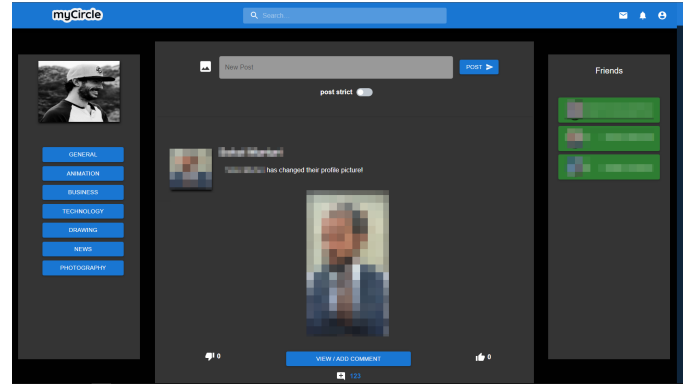


Fig. 1. myCircle user interface

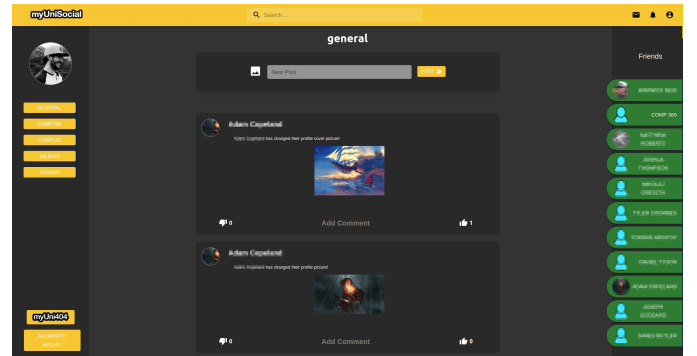


Fig. 2. myUniSocial user interface

In appendix D figure 11 a class diagram shows the base system, with the main functionality coming from ‘App.js’ and being passed into functional child components. This class diagram is a derivative of the previously mentioned ‘myCircle’ system with the relevant adjustments before the merging of the myUni404 platform, as is the same for the Use Case Diagram which can be seen in Appendix E figure 13. The growth of the system after introducing the second platform can be observed by comparing Appendix D figure 9 with Appendix D figure 12.

A. Technological Stack

The stack used for the platform is a React.js front-end [25] making use of Material UI for styling [26], alongside a Node

powered back-end [27] with Express for server functionality [28]. The project utilises a mySQL database for its capabilities of working with data relationally. Other technologies are at play as dependencies such as Axios for front end to back end requests, a full list of technologies can be found on the project github link in Appendix H.

V. ARTEFACT DEVELOPMENT

As this project was an evolution of the merging of two projects (myCircle and myUni404) it took around 12 weeks to finish development to a satisfactory level. The front-end or user interface of the platform was built in React using JSX, making use of Material UI for some styling, while the back-end and server-side code was written in Javascript with endpoints being made using Express. The development cycle was carried out using an Agile approach utilising weekly sprints to add and refine functionality. The overall layout of the user interface for myUni404 was based on that from myCircle with some improvements. A CSS grid was used to allow for on-screen elements to scale proportionally regardless of screen size or resolution. Using the improved and more evolved form of the layout across the entirety of the platform was a necessity as it looked a great deal better and increased functionality, the refactoring of the myCircle components took precedence at the start of development. Following suit with the user interface, the back-end and server-side codebases of the two platforms were combined. myUni404's server code was built on top of its predecessor, so the vast majority of the front-end components were built to plug directly into back-end code base with the exception of some renaming of variables or endpoints. The original myCircle server code was one file consisting of around 1200 lines which grew considerably with the introduction of the code from the second platform. Having learned better practices and striving to meet and maintain industry standards, a large refactor was essential, endpoints were grouped by area of responsibility (ie relating to account settings, fetching or working with feed data etc.) and split into separate modular files. This resulted in a massive increase in codebase maintainability and making the project much easier to work with. Further improvements to the back end of the site refining how browser sessions were implemented. Browser sessions allow the web browser to store small pieces of data about the platform so that the website can remember things like the users' username, profile picture and whether or not they have an active session, removing their need to log in after every page refresh and in turn improving the overall user experience of the platform. The previous version of the chat system relied on the page making a request to the back end and updating regardless of there being any new messages or updates waiting. Granted this system worked but in its nature added an unnecessary load on the server. In its place, the new system utilised web sockets to allow for real-time updates with no extra requests to the server as there is a single pipeline of communication established between the two users.

With the system being available to users throughout the experimental phase, system security was of the highest priority. As such the server and hosting solution was altered to use

HTTPS protocol to add encryption to HTTP requests and responses, vastly increasing end-user security while using the platform. A 'Sign out & delete data' button was also added for users to be able to wipe all of their data from the server on completion of their participation.'

A. Testing of artefact performance

Artefact front-end components were subject to unit tests which can be seen in Appendix B figure 8. The most frequently used and constant of components were tested and all testing suites produced passing outcomes. Google Lighthouse was used to test overall page performance and accessibility for the feed page, the output of this test can be seen at Appendix B figure 9.

The login form was also stress tested with 10,000 requests at a rate of 200 requests per second. Login information for a test user was passed into the test to see how the login form and database handled the load of such a volume of requests. Given that hosting solutions were limited and the server played host to important files and other projects, it was not an option at this time to stress test the deployment on the production server, this test was performed on a local deployment. The command could be performed in the same fashion seen in Appendix B figure 10 on a staging environment, the figure shown displays the output given for the local instance.

B. Validation and Verification

To ensure the validation and verification of the proposed system, the application will be built in line with ISO/IEC 25010 [33] standards. These standards ensure that elements such as functionality, performance, security, maintainability etc. are satisfactory to ensure the development of a high quality system.

The product quality model defined in ISO/IEC 25010 consists of the quality categories seen in figure 2, below.

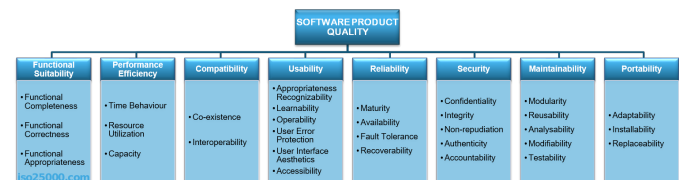


Fig. 3. Quality Characteristics of ISO 25010 - <https://iso25000.com/images/figures/en/iso25010.png>

VI. RESEARCH METHODOLOGY

A. Research Question

Could an institutionalised social media platform benefit the academic and social aspects of university life?

B. Hypotheses

1) *Hypothesis:* The prototype platform has a positive effect on the social and academic aspects of university life.

2) *Null Hypothesis*: The platform has no effect, or a negative effect on the social and academic aspects of university life.

C. Philosophical Position

Having great applications within sociology and psychology, the philosophical approach of this study was taken from an interpretivist point as the application of this platform and the observations of its utility somewhat align with the social sciences and as such will require a socio-scientific approach. This interpretivist approach by its nature called for a qualitative method; often criticised for its generalisability and flaws in reliability, quantitative and qualitative methods were combined in order to increase the reliability and validity of findings ultimately making this a mixed-method study.

D. Experimental Design

To gather information on the effectiveness of my platform, I conducted a between-groups study involving two study groups. An ideal sample size of 52 participants (2 groups of 26) was recommended by G*Power to establish statistical significance with a confidence interval of 95% for this study. See figure 4 for a depiction of a central and noncentral distribution plot, see Appendix F figure 18 for full G*Power output. Both groups were given the same set of tasks to complete, group A were asked to fulfil these tasks on the existing online university portal ie. Learning Space or Moodle while group B were asked to do so on the prototype platform. An online survey was used to collect information on the test users' experiences of both platforms in an effort to gauge how much of a benefit they felt the systems offered in both the learning and social aspects of university life. The survey was conducted in a similar manner to studies explored in the review of literature [2] [3] [5] [6] [16], the results obtained from those papers seemed proficient and I felt it well justified the survey as a means for collecting data. A between-subjects study was chosen as each group was testing only one platform as a cohort and were asked to test all functionalities of the system as per the tasks. Users were asked to complete a Likert Scale style survey and a qualitative survey to fully convey their experience.

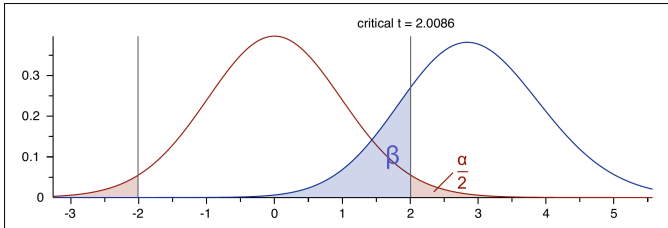


Fig. 4. Central and noncentral distributions G*Power plot

E. Legal, Social & Ethical considerations

1) *Legal*: Database entries for users, required for functionality of the artefact were handled responsibly. Users' passwords were hashed and salted to ensure that in the event

of a database breach, the entries that the attacker would see could not resemble the actual data, and a server-side pepper was also at play to prevent such breaches from occurring. All regulations defined by GOV.UK and the Data Protection Act 2018 [34] were met and abided by throughout the development and life of the platform. More sensitive information such as race, ethnic background, religious beliefs and other more sensitive categories mentioned on the cited website were not stored for functionality of the platform as such information is irrelevant for the platform to function properly. A full privacy policy and cookie policy was available to users via the footer on the login screen or through the account settings menu, informing users that their data was to solely be used for functionality within the platform, such as displaying their name, email for log in authentication and so on.

ICO (Information Commissioners Office) [35] Data protection self-assessment for Data Controllers, Data Processors and Information Security checklist reports gave an overall rating of green, with all required Data Control and Security measures set to be in place and that there are no other parties receiving, processing or controlling user data from my platform. Any data held as part of research conducted was held to such standards, regulations and was considered an utmost priority.

2) *Social*: All measures were taken to ensure that opportunities for unwanted or harmful behaviours to take place (ie. bullying and discrimination) were minimised during testing and data collection to ensure that the platform was a safe space for its users.

3) *Ethical*:

a) *Informed Consent & Voluntary Participation*: Participants were required to complete a consent form before commencement of their participation. This consent form outlined the general purpose of the study, the purpose of the project and how the findings will be used while also ensuring their understanding that their participation is voluntary and that they maintain the freedom to withdraw their participation at any point and for any reason without explanation.

b) *Do no harm*: The evaluation process was carried out in such a manner to minimise any potential causes of harm (unintentional or otherwise) to participants. These potential harms could have taken form by subjecting users to undue stress, pain, anxiety, diminishing of self-esteem or invasions of privacy. These risks were mitigated by ensuring that no required tasks or questions required as per the data collection survey were invasive, controversial or damaging in nature and were generally everyday tasks that students and users would typically perform as part of their student life.

c) *Confidentiality*: Any identifying information of participants, within my research data and the prototype platform, have not been made available to or accessed by anybody apart from myself. As such all documentation and reports exclude any identifying user information in due respect to both participant and user confidentiality.

d) *Anonymity*: Participants' data submissions were anonymous and no identifying factors were necessary or

relevant as part of the questions or tasks that users were asked to perform.

e) Only assess relevant components: Only relevant components of functionality were assessed as part of this study, as such users were only asked to complete tasks which were able to be accomplished on both platforms being tested to avoid any biases that could come about by tailoring the questions in favour of one platform over another.

F. Data management

Data for this study was collected by means of an online survey which consisted of both qualitative and quantitative questions. An online survey was chosen for this study to follow suit with studies conducted in previous research within this area [2] [3] [5] [6] [16]. The quantitative questions were in the form of a Likert scale, asking users to rate their experience of performing a certain task on a scale of 1 (least favourable/difficult) to 7 (most favourable/easy), while the qualitative questions asked users to explain a little about their experience of performing that task.

Submissions were collected by using Microsoft forms and kept securely in a Microsoft Onedrive. At the end of the experimental phase any remaining identifying factors were removed from the dataset to ensure the security of participant data while working with any results on my local machine.

VII. RESULTS

The survey to collect data consisted of both qualitative and quantitative questions. These questions were generally coupled with a quantitative question first, asking them to perform a task and then rate their experience of doing so on a Likert scale, followed by a qualitative question asking them to explain a little about their experience of performing the task. Two exceptions to this are questions 6 and 7 which ask how likely the user would be to engage with the community and how likely they would be to engage with course-related content respectively.

The quantitative questions are as follows:

Question No.	Question Text
Q1	Rate the difficulty of finding course related content on the platform.
Q2	Rate the difficulty of finding a forum/ conversation about your modules on the platform.
Q3	Rate the difficulty of accessing your account settings on the platform.
Q4	Rate how much you feel the platform might benefit your education.
Q5	Rate how much you feel the platform might benefit your social life at university.
Q6	How likely are you to engage with the community on this platform?
Q7	How likely are you to engage with course related material on this platform?

A. Data Analyses

With the Likert scale ranging from 1 (least favourable answer) to 7 (most favourable answer) users generally had a higher overall satisfaction rate on the prototype platform 'myUniSocial' with the exception of the final question, "How likely are you to engage with course-related material on this platform", which came in at a very close second. Figure 4 displays the mean scores of all quantitative questions with group A representing the existing student portal and B depicting the scores from the prototype platform.

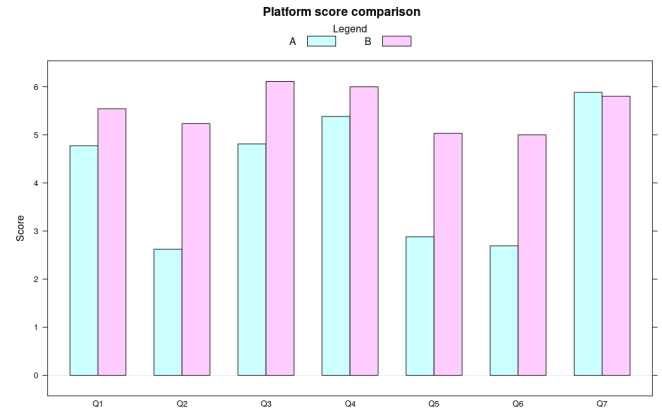


Fig. 5. All quantitative question scores across both platform. A = Student Portal, B = Prototype Platform

Comparing figures 6 & 7 shows that there is generally a widespread within the results, but the majority of the more favourable results are still claimed by the prototype platform. This is especially prevalent in any questions related more toward the social aspects of university, most notably questions 2, 5 and 6. The student portal scored higher on question 7 which asked users how likely they were to engage with course-related content on the platform.

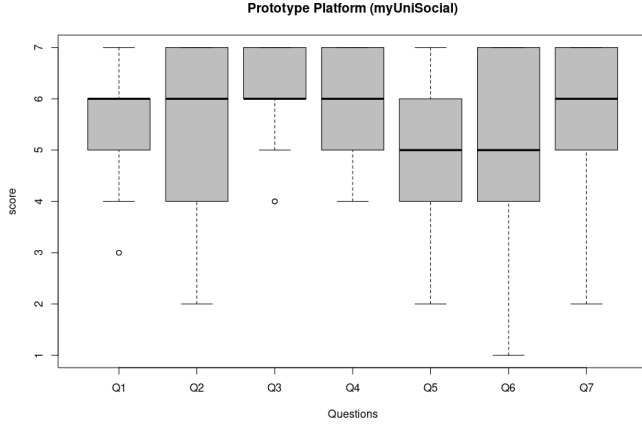


Fig. 6. All quantitative question scores for prototype platform

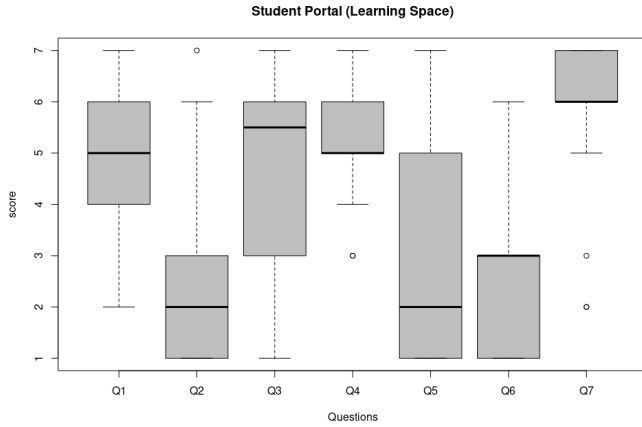


Fig. 7. All quantitative question scores for the student portal

VIII. DISCUSSION

With the prototype platform generally having a higher overall score across all questions, it is suggested with some significance that an institutional social media platform centred around the university could indeed be of a benefit to both social and academic aspects of university life. Participants reported that even having used the existing student portal for some years, they were either unaware of the forum functionality that was in place or that it was simply not enticing to use without it being a criterion for sessioned work. The consensus was that participants saw very little to no benefit to their social lives within the student portal.

Some of the lesser scores for the prototype platform were generally more centred around finding course-related content or using the platform as a general aid for their studies as they would the student portal, and were typically coupled with qualitative responses explaining that they could not find course content specifically relating to them or their chosen track of study and modules. For this study to gain more concrete results there would be a requirement for extra clearance and permissions to access university-wide module and student lists or information in order to populate the modules with the correct students, in turn being on equal footing with the

student portal and not ultimately comparing a literal against a hypothetical.

The prototype platform witnessed a good level of engagement with some users posting questions into the myUni404 space, changing account profile pictures, posting and generally engaging with other students. This level of interaction could further support Kelm's [4] study in which social media was incorporated into course material and noted an increase in course engagement and sense of team ethic. Participants seemed to have no issues finding their way around the prototype platform or with any aspects of the usability of the system, evidence for this is suggested in the quantitative results as users appear to have experienced more difficulty in navigating certain features of the platform within the student portal than on the prototype social media platform.

Qualitative results from the prototype platform also mention that having to sign up and register as a user, in contrast to students already having an account pre-registered on the student portal at their arrival to university, left participants feeling that it would be another platform to manage in addition to the social media sites that they regularly use during their everyday lives.

Improvements could be made to pull more robust outcomes should the study be iterated over again in an effort to remove any potential unconscious biases. Improvements that I would make would include; making Likert scale range from -4 to 4, or perhaps removing the numbers from the scale entirely in favour of a slider that starts at a neutral position and implementing some Human Computer Interaction (HCI) analytics software to generate heat maps regarding mouse movements while using the platform to gauge how easily participants were able to navigate the platform.

Given the small window of time to build the artefact and conduct this study, this research could be regarded as a viable precursor to a seemingly promising area of research. With more time, mitigation of limitations such as; having support and access to resources from the institution regarding permissions to effectively redistribute course content, student records to facilitate automatic profile and account generation as well as populating modules on the platform with the correctly enrolled students, we could definitively answer the research question: Could an institutional social media platform be of a benefit to the social and academic aspects of university life.

IX. FUTURE WORK

If this study were to be continued and explored further, adjustments should be made to improve the prospects of acquiring more meaningful results. Modifying the survey Likert scale to range from -3 to 3 or removing numbers from it entirely in place of a slider with a neutral origin could help remove any unconscious biases.

Making the research question more targeted towards a single and more definitive answer, "benefiting social and academic aspects of university" is perhaps too broad for one study, or this may in fact be grounds for A B style testing to measure those metrics separately.

Limitations and restrictions would need to be mitigated for this study to continue any further, access to module and

enrolled students or building a system that simply ‘plugs in’ would serve this study well, as students not being able to find their course or module ultimately hampered my results. University logos on the platform would help users feel more immersed in an online university environment and accounts being pre-registered could in turn pacify users that reported feeling like it would just be another social media platform to maintain. Permission to use and essentially redistribute course material, in lieu of a system that ‘plugs in’, would vastly improve the quality of this study as in doing so would remove the current need to compare a literal (the university student portal) with a hypothetical (the prototype platform).

Even with such limitations, restrictions and areas for improvement, this remains an interesting area of study and users took the prototype platform well. Even with the platform being a hypothetical, students embraced what it could be and engaged with the available content, posted questions and collaborated with one another on a system that they felt to be intuitive and somewhat natural to use. This is evident in both the qualitative and quantitative data, but it would be advantageous to run some Human-computer interaction (HCI) analytics to measure this more candidly.

X. CONCLUSION

Acknowledging that this study compared a literal university student portal with a hypothetical prototype student portal, it cannot be concluded with certainty that an institutional social media platform could benefit both social and academic aspects of university life. Nonetheless, I feel that given the results, there is evidence to suggest that if studied further with the previously mentioned limitations and restrictions mitigated that it would be a welcome evolution of systems currently being used and in turn see an increase in student/course engagement while promoting student collaboration. The prototype platform saw good levels of engagement with users updating their profile information, changing profile and cover pictures, posting and making use of the ‘myUni404’ section of the platform which allows users to post programming or tech-related questions that include a code snippet as well as users also replying to such content. This behaviour is promising in terms of the potential for collaboration that such a platform could provide and seemingly calls for a redesign or reformat of how student portals function for students at university.

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REFERENCES

- [1] Discord. <https://discord.com/>
- [2] Liu, Youmei *Social Media Tools as a Learning Resource* Journal of Educational Technology Development and Exchange (JETDE): Vol. 3 : Iss. 1, Article 8, 2010
- [3] Baruah, Trisha Dowerah *Effectiveness of Social Media As a Tool Of Communication And Its Potential For Technology Enables Connections: A Study.*, New York, NY, USA: Springer, 2007.
- [4] Kelm, Orland R. *Social Media: It's What Students Do.* Business Communication Quarterly, Volume 74, Number 4, December 2011.
- [5] Wang, Qingya / Chen, Wei / Liang, Yu *The Effects of Social Media on College Students.* MBA Student Scholarship, Paper 5. 2011.
- [6] Evans, C. *Twitter for Teaching: Can Social Media Be Used To Enhance The Process Of Learning?* British Journal of Education Technology Vol 45, No 5, 2014.
- [7] Williams, R. Thomas *Social Networking Services (SNS) In Education* Asian Journal of advances in Research. 17(1): 1-4, 2022.
- [8] Junco, R. / Elavsky, C. Michael / Heiberger, G. *Putting Twitter to the test: Assessing outcomes for student collaboration, engagement and success.* British Journal of Education Technology. Vol 44 No 2 2013
- [9] Tripathi, Dr. Sheel Nidhi *Social Media in Higher Education* Communication Today, January-June, 2022.
- [10] Haythornthwaite, C. / Paulin, D. / Gruzd, A. *Analyzing Social Media and Learning Through Content and Social Network Analysis: A Faceted Methodological Approach.* Journal of Learning Analytics, 3(3), 47-71. 2016.
- [11] Amedie, J. *The Impact of Social Media on Society.* Advanced Writing: Pop Culture Intersections. 2 2015.
- [12] Kuppaswamy, S /Shankar Narayan, P. B. *The Impact of Social Networking Websites on the Education of Youth.* International Journal of Virtual Communities and Social Networking, 2(1), 67-79. 2010.
- [13] Tariq, W. / Mehboob, M. / Khan, M. Asfandiyar / Ullah, F. *The Impact of Social Media and Social Networks on Education and Students of Pakistan.* International Journal of Computer Science Issues, Vol. 9, Issue 4, No 3. 2012.
- [14] Ellison, N. / Steinfield, C. / Lampe, C. *The Benefits of Facebook "friends:" Social Capital and College Students' Use of Online Social Network Sites.* Journal of Computer-Mediated Communication, Vol 12, 4. 2007.
- [15] Pempek, Tiffany A / Yermolayeva, Yevdokiya A. / Calvert, Sandra L. *College students' social networking experiences on Facebook.* Journal of Applied Developmental Psychology, Vol. 30, Issue 3, page 227–238. 2009
- [16] Akram, A. / Kumar, R. *A Study on Positive and Negative Effects of Social Media on Society.* International Journal of Computer Sciences and Engineering, Vol 5, 10. 2017
- [17] Kaur, R. / Bashir, H. *Impact of Social Media on Mental Health of Adolescents.* International Journal of Education, 5, 22-29. 2015
- [18] Bashir, H. / Bhat, S. A. *Effects of Social Media on Mental Health: A Review* The International Journal of Indian Psychology, Vol 4, Issue 3. 2017
- [19] Pantic, I. / Damjanovic, A. / Todorovic, J. / Topalovic, D. / Bojovic-Jovic, D. / Ristic, S. Ristic/ Pantic, S. *Association Between Online Social Networking and Depression in High School Students: Behavioural Physiology Viewpoint.* Psychiatry Danubina, 24(1), 90-93. 2012.
- [20] Rosen, L.D. / Whaling, K. / Rab, S. / Carrier, L.M. / Cheever, N.A. *Is Facebook Creating "iDisorders"? The Link Between Clinical Symptoms of Psychiatric Disorders and Technology Use, Attitudes and Anxiety.* Computers in Human Behaviour, 29, 1243-1254. 2013.
- [21] Naslund, John A. / Bondre A. / Torous J. / Aschbrenner, Kelly A. *Social Media and Mental Health: Benefits, Risks, and Opportunities for Research and Practice.* Journal of Technology in Behavioral Science 5:245-257. 2020.
- [22] Daley, D. *A Creative Approach to Social Media*
- [23] myCircle <http://dd252935.kemeneth.net:9010/>
- [24] myUni404 <http://147.182.247.158:9010/>
- [25] React JS <https://reactjs.org/>
- [26] Material UI <https://mui.com>
- [27] Node JS <https://nodejs.org>
- [28] Express JS <https://expressjs.com>
- [29] Agile Development Method <https://www.atlassian.com/agile>
- [30] Jest JS <https://jestjs.io/>
- [31] Mocha JS <https://mochajs.org/>
- [32] SuperTest <https://www.npmjs.com/package/supertest>
- [33] ISO 25000 Software and data quality. <https://iso25000.com/index.php/en/iso-25000-standards/iso-25010>
- [34] Gov.UK. <https://www.gov.uk/data-protection>
- [35] Information Commissioner's Office. <https://ico.org.uk/for-organisations/sme-web-hub/checklists/data-protection-self-assessment/>

APPENDIX A REFLECTIVE REPORT

This project “myUniSocial” is an evolution of my previous project “myCircle”. Since starting my journey to become a web developer this type of project was always an area of interest for me as I feel social media systems, as we have come to know them, incorporate a vast range of elements and processes that I see to be at the core of many web applications. Overcoming challenges such as; how to store a users “friends list” without storing more than one name in a database field, Implementing real-time chat systems, Ensuring database data is kept securely, browser sessions, implementing HTTPS protocol for security and Restricting content based on a particular users’ friend list were all part of bringing this project to life. In overcoming these challenges and acknowledging the broader applications of these elements and challenges, I can say that I chose the right project to pursue and feel that it has made me a better developer.

A. Cognitive

Having attempted to build a social media platform for my final second-year personal project, I approached the development of this platform with the knowledge of what parts to build. The first version worked well for the most part, but parts of the system had much room for improvement. Parts of the user interface were unsatisfactory, the layout was inconsistent across screen resolutions, the server code was all in one file and the chat system worked by sending a request to the back end every 5 seconds or so regardless of any updates that may or not be waiting. Acknowledging these issues along with the required components and moving parts, I knew exactly what the new system needed to feel more complete and boast a higher quality, and how to go about it. I understood that the front-end system needed to be built in a more modular way to get a satisfactory user interface across all screen resolutions. Working with the previous server codebase taught me to make modular server files from the get-go to achieve an easier and more maintainable development environment. Web sockets in place of the old chat system allowed for real-time communication while also reducing load on the server. All of these valuable updates came from the knowledge and understanding gained from the first iteration of building a social media system. An appropriate smart goal to further improve in this area could be to take more time to whiteboard and wireframe system architecture or components to better plan how the system or components should be made for the group project currently in development.

Specific: I will take time to whiteboard and plan new components for the group project to increase quality of system architecture.

Measurable: This could be measured by observing a tidier codebase, cleaner solutions and a better system architecture.

Achievable: Seeing how the implementation of a modular approach effected this project, applying that more rigorously to this project is very achievable

Relevant: Being able to think and plan around system architecture is very important to be a successful and competent web

developer.

Time-bound: The group project has a deadline for a little over a month away, giving this goal a concrete deadline.

B. Procedural

The “friends list” problem was one of the challenges to overcome within developing the platform. Being poor form to store more than one item of data in any given field in an SQL database, figuring out how to store or gather a list of users’ friends required a lot of thought. Whiteboarding the problem, I ultimately had the idea of storing ‘friendships’ in their own separate table. These friendships weren’t attached to the users’ table but stood aside from the users consisting of two fields, user1 and user2. With this in place, to gather a user’s friends list ‘Get all entries from the friendships database where user1 or user2 matches the username of the logged in user’. With that data gathered ‘remove all names from that returned list that matches the logged in user’s username, leaving only the names of the users names. This way around the problem felt particularly clean as it works across the board and for all users. Storing multiple names in a friend list field instead would create a massively bloated database, taking into consideration people in the same friend circles that would have a similar friends list and essentially be a lot of duplicate data. The implementation I went with ensured that no data is repeated, is minimised ultimately being a clean solution to what could have been a messy problem. Overcoming this challenge made me recognise a great deal of self-development and vastly increased my confidence in problem-solving which I see to be vital as an aspiring web developer.

A smart goal for this area could be to read more documentation. Reading more documentation could reduce the need to think around problems like this, as there is more than likely tried and true industry standard ways of dealing with them.

Specific: I will read documentation for the technologies and libraries used as part of the group project.

Measurable: With a list in the project of what technologies are currently at play within the group project, this goal can be measured accurately against it.

Achievable: This goal is very achievable as for the most part the documentations are easily accessed, and I have a list in the repository of what has been used.

Relevant: As a web developer, a good understanding of technologies and frameworks is incredibly important making this goal very relevant to my career.

Time-bound: The deadline for the group project is a little over a month away, giving this goal a set deadline to be completed in.

C. Affective

Developing the platform was something that I genuinely enjoyed doing. Seeing the platform grow and the components working as intended felt like achievement after achievement. That said, the want to keep building and get things ‘just right’ may have got in the way of other areas of this project. Wanting research participants to use and see the platform as envisioned ultimately delayed the research part of this study

and forced hasty decisions to be made such as quantitative survey questions that would have benefited from more time and thought. In the end my pride and perfectionist approach to developing the artefact reduced the significance of the overall study whereas having users fulfil the research phase on a minimum viable product would have produced better results. The scope for this project was definitely ambitious and given the opportunity to do it all again I would still choose a project of this nature, but I would manage myself slightly more strictly in terms of getting carried away on the artefact and pay more attention to the other elements of the study.

A smart goal for this could be to more strictly focus on producing an MVP for the group project right away to avoid other areas of the project being neglected.

Specific: Focus more on producing an MVP.

Measurable: This could be measured by having a working platform with reduced functionality sooner, rather than refined components being ready immediately.

Achievable: This is very achievable and only requires a shift in focus.

Relevant: This focus is very relevant to web development as it would increase client satisfaction by seeing working systems sooner.

Time-bound: The group project is due in just over a month, making this goal comfortably time sensitive.

D. Dispositional

Lack of engagement certainly was not an issue with this research and development project. As previously mentioned working on this project was something that I genuinely enjoyed and I was proud to be building what I felt to be a giant compared to other projects I have worked on both individually and as part of a team. With that in mind, and again previously mentioned, I may have been carried away with the development of the artefact. The vast majority of my time over the past 3 months have been devoted to the platform's development whilst also making some time for other engagements such as work on other projects and internships. Building something like a social media platform is a reasonably large task, and I felt that if it was missing any element that we have generally come to expect from a social media platform, that absence of that element would be all that people see. With that in mind I was very motivated to make sure that the platform had all of the common features that one would expect to see, with the exclusion of voice or video chat.

A smart goal to better manage this would be to adhere to sprint goals more closely, getting a lot of work done can be good, but sometimes can get too ahead and cause more work for the following sprint. This could be applied to the group project.

Specific: Following sprint goals and controlling how many hours per day I work.

Measurable: This could be measured by ticking off my given tasks according to the current sprint cycle.

Achievable: This goal is very achievable as it ultimately gives me more free time.

Relevant: Sticking to sprint and essentially 'following the brief' is very important as a web developer and is vital for

controlling workflow.

Time-bound: With remaining development time for the group project being around a month, there is a strict timeframe to work with on this goal.

E. Interpersonal

Having built a good rapport with university staff, my supervisor and the available expertise, good communication and engagement was essential in the development of this project. Building a social media platform with university elements built into it to try and show potential for its place within an academic setting comes with its own set of risks and potential pitfalls. Being able to communicate with staff to discuss ideas and avoid any sort of privacy or legal issues was paramount. At all stages I tried to obtain a well-rounded group of opinions and suggestions from my peers, staff and supervisor to help form what the platform ultimately came to be. All communications from both staff and my supervisor were treated as expert opinions, such as a prompt to remove university logo's from the platform to avoid any trademark issues regardless of the context of the project, were actioned accordingly although somewhat unfortunate as the platform felt more external and removed some university-style immersion. As such guidance from peers, staff and my supervisor have been an integral part of this research and development project.

As a smart goal, I will improve communication with other team members on the group project which ends next month.

Specific: I will speak to the team once a week throughout the rest of development and note any ideas, issues or concerns.

Measureable: This can be measured by taking notes, doing so will help solidify any suggestions or concerns.

Achievable: I generally do not have an issue speaking up to the group, but a more conscious effort to increase communication cross the team is very achievable.

Relevant: Communication skills are very important as a web developer as it helps gain a true understanding of projects, while also making me a better team member.

Time-bound: With the deadline for team project being next month, there is an explicit time-frame to achieve this goal.

F. Practice

With my first attempt at developing a social media platform resulting in a codebase with large files and becoming difficult to maintain and work with, I made a conscious effort to take a more modular approach to building the server and an object-oriented approach to front end components. This drastically improved the quality of not only the server and front-end components in themselves, but also the quality of maintainability and development environment too. Finding problematic code became much easier, in turn making bug fixing an easier process, resulting in a cleaner workflow and greater quality in the project as a whole. A well-kept development environment inspired more commenting and clean up in an effort towards keeping the project lean and easy to access components. Taking more pride in this space inspired me to follow good practices such uniform variable, function and class naming conventions to uphold code readability as

well as ensuring that any useless code was removed. Lessons learned from previous project made a huge difference in the overall quality of this platform taking form in more modular files, code maintainability and readability.

As a smart goal, I will strive to further improve the quality of my work through means of code maintainability and best practices by the end of development of the group project next month.

Specific: The goal is to improve quality of work through means of following best coding practices and codebase maintainability.

Measurable: The success of this goal can be measured by observing code maintainability on the group project.

Achievable: I have started to work within these practices as part of this project, that becoming second nature is very attainable.

Relevant: To become a good web developer, developing these good habits is a must for success in the industry.

Time-bound: With the deadline for the project being next month, there is a definitive time and date to measure this goal to.

G. Conclusion

In conducting this experiment and developing the artefact, I can say with certainty that I have learned a lot. The self development has presented itself in contrast between my past few projects and has given me a great deal of confidence in the face of problem-solving and approaching issues that I might not immediately know how to solve. In light of self development, I will strive to continue down a growing path and complete the SMART goals set out above. Taking time to whiteboard and think about system architecture, reading documentations for used software, focusing more on producing a minimum viable product, adhering to sprint goals more closely, increasing communication across the team and striving to improve codebase quality are all goals I will achieve in the weeks to come and will most definitely be a better developer because of it.

APPENDIX B

ARTEFACT TESTING ADDENDUM

```

PASS src/components/SocialHome/HomeLeft.test.js
PASS src/components/myUni404/components/home/HomeLeft.test.js
PASS src/components/signIn/SignInForm.test.js
PASS src/components/postActions.test.js
PASS src/components/navBar.test.js

Test Suites: 5 passed, 5 total
Tests:       16 passed, 16 total
Snapshots:   0 total
Time:        2.877 s, estimated 3 s
Ran all test suites.

```

Fig. 8. Front end unit tests

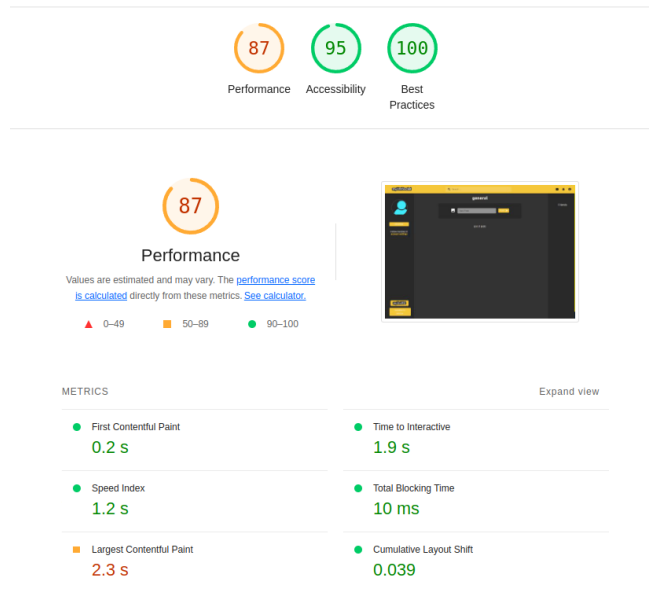


Fig. 9. Google Lighthouse test output

```

danny@danny-IdeaPad5:~$ loadtest -n 10000 -c 10 --rps 200 --data '{"email": "testuser@email.com", "password": "test123"}' -T 'application/x-www-form-urlencoded' -m POST http://localhost:3001/auth/signin
[Thu Mar 30 2023 11:56:00 GMT+0100 (British Summer Time)] INFO Requests: 0 (0%), requests per second: 0, mean latency: 0 ms
[Thu Mar 30 2023 11:56:05 GMT+0100 (British Summer Time)] INFO Requests: 899 (9%), requests per second: 180, mean latency: 3.7 ms
[Thu Mar 30 2023 11:56:10 GMT+0100 (British Summer Time)] INFO Requests: 1899 (19%), requests per second: 200, mean latency: 3.3 ms
[Thu Mar 30 2023 11:56:15 GMT+0100 (British Summer Time)] INFO Requests: 2899 (29%), requests per second: 200, mean latency: 3.3 ms
[Thu Mar 30 2023 11:56:20 GMT+0100 (British Summer Time)] INFO Requests: 3899 (39%), requests per second: 200, mean latency: 3.2 ms
[Thu Mar 30 2023 11:56:25 GMT+0100 (British Summer Time)] INFO Requests: 4900 (49%), requests per second: 200, mean latency: 3.4 ms
[Thu Mar 30 2023 11:56:30 GMT+0100 (British Summer Time)] INFO Requests: 5899 (59%), requests per second: 200, mean latency: 3.4 ms
[Thu Mar 30 2023 11:56:35 GMT+0100 (British Summer Time)] INFO Requests: 6899 (69%), requests per second: 200, mean latency: 3.2 ms
[Thu Mar 30 2023 11:56:40 GMT+0100 (British Summer Time)] INFO Requests: 7899 (79%), requests per second: 200, mean latency: 3.3 ms
[Thu Mar 30 2023 11:56:45 GMT+0100 (British Summer Time)] INFO Requests: 8899 (89%), requests per second: 200, mean latency: 3 ms
[Thu Mar 30 2023 11:56:50 GMT+0100 (British Summer Time)] INFO Requests: 9899 (99%), requests per second: 200, mean latency: 3.3 ms
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Target URL: http://localhost:3001/auth/signin
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Max requests: 10000
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Concurrency level: 10
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Agent: none
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Requests per second: 200
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Completed requests: 10000
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Total errors: 0
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Total time: 50.504277179999995 s
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Requests per second: 198
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Mean latency: 3.3 ms
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO Percentage of the requests served within a certain time
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO 50% 3 ms
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO 90% 4 ms
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO 95% 5 ms
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO 99% 6 ms
[Thu Mar 30 2023 11:56:51 GMT+0100 (British Summer Time)] INFO 100% 32 ms (longest request)
[Thu Mar 30 2023 12:24:18 GMT+0100 (British Summer Time)] INFO Requests: 0 (0%), requests per second: 0, mean latency: 0 ms

```

Fig. 10. Login form stress test

APPENDIX C FULL R CODE

```

1 # Import lattice
2 library(lattice)
3
4 # Create data
5 gfg <- data.frame(Score = c(4.77, 5.54, 2.62, 5.23, 4.81, 6.11, 5.38, 6, 2.88, 5.03, 2.69, 5, 5.88, 5.80),
6                     # Outline question numbers for reference
7                     grp = rep(c("Q1", "Q2", "Q3", "Q4", "Q5", "Q6", "Q7"),|
8                               # Two groups per question
9                               each = 2),
10
11                     subgroup = LETTERS[1:2])
12
13 # Create grouped barplot using lattice
14 barchart(origin=0,
15           main="Platform score comparison",
16           auto.key=list(
17             space="top",
18             columns=2,
19             points=FALSE,
20             rectangles=TRUE,
21             title="Legend",
22             cex.title=1),
23           Score ~ grp, data = gfg, groups = subgroup)
24
25

```

Fig. 11. Grouped bar plot in R Studio.

```

1 # Create data with score from each participant for each question
2
3 df <- data.frame(Q1 = c(5,6,6,5,7,5,5,3,6,6,7,6,6,7,6,3,5,6,4,5,6,5,4,6,7,7),
4                   Q2 = c(3,6,5,7,7,7,4,7,7,6,7,5,4,6,7,3,3,4,3,5,6,2,2,6,7,7),
5                   Q3 = c(5,6,6,7,7,7,7,6,6,6,7,6,6,7,7,5,4,5,5,6,7,6,7,4,7,7),
6                   Q4 = c(5,7,6,6,7,6,5,7,7,6,7,5,4,6,7,6,4,7,5,5,6,6,6,6,7,7),
7                   Q5 = c(3,7,5,5,6,3,6,6,7,3,5,5,2,2,6,5,5,6,5,5,4,6,4,6,7,7),
8                   Q6 = c(6,7,4,7,7,5,5,5,6,3,7,4,1,3,6,4,3,7,4,3,3,6,5,5,7,7),
9                   Q7 = c(7,7,5,6,6,7,2,7,7,7,5,5,7,6,7,4,4,6,5,6,5,6,6,4,7,7)
10  ))
11
12 # Pass data and build boxplot
13
14 boxplot(df,
15         main="Prototype Platform (myUniSocial)",
16         xlab="Questions",
17         ylab="score",
18         col="gray",
19         border="black"
20        )
21
22

```

Fig. 12. Prototype platform Box plot in R studio.


```

1 # Create data with score from each participant for each question
2
3 df <- data.frame(Q1 = c(6,6,3,5,3,4,6,3,4,6,7,7,5,3,6,2,4,5,4,5,5,3,6,6,5,5),
4                   Q2 = c(3,6,5,7,1,4,1,3,1,2,1,3,3,2,1,1,3,6,1,3,2,2,2,2,1),
5                   Q3 = c(6,6,6,7,6,4,3,7,2,6,7,7,7,2,5,1,1,6,5,4,6,1,7,5,3,5),
6                   Q4 = c(5,6,6,6,6,4,5,5,3,5,7,7,6,3,5,4,5,5,7,6,5,6,7,4,5,7),
7                   Q5 = c(4,4,5,2,3,7,3,1,1,2,1,1,1,1,1,1,5,5,1,2,2,5,2,3,5,7),
8                   Q6 = c(3,5,3,3,4,6,2,1,1,2,1,1,1,1,2,2,3,5,1,3,3,4,1,3,3,6),
9                   Q7 = c(6,7,6,7,6,7,6,7,2,7,7,7,5,3,6,2,6,6,7,6,6,6,7,5,6,7
10  ))
11
12 # Pass data and build boxplot
13
14 boxplot(df,
15         main="Student Portal (Learning Space)",
16         xlab="Questions",
17         ylab="score",
18         col="gray",
19         border="black"
20 )
21
22

```

Fig. 13. Student Portal Box plot in R Studio.

APPENDIX D PROTOTYPE DESIGN UML DIAGRAMS

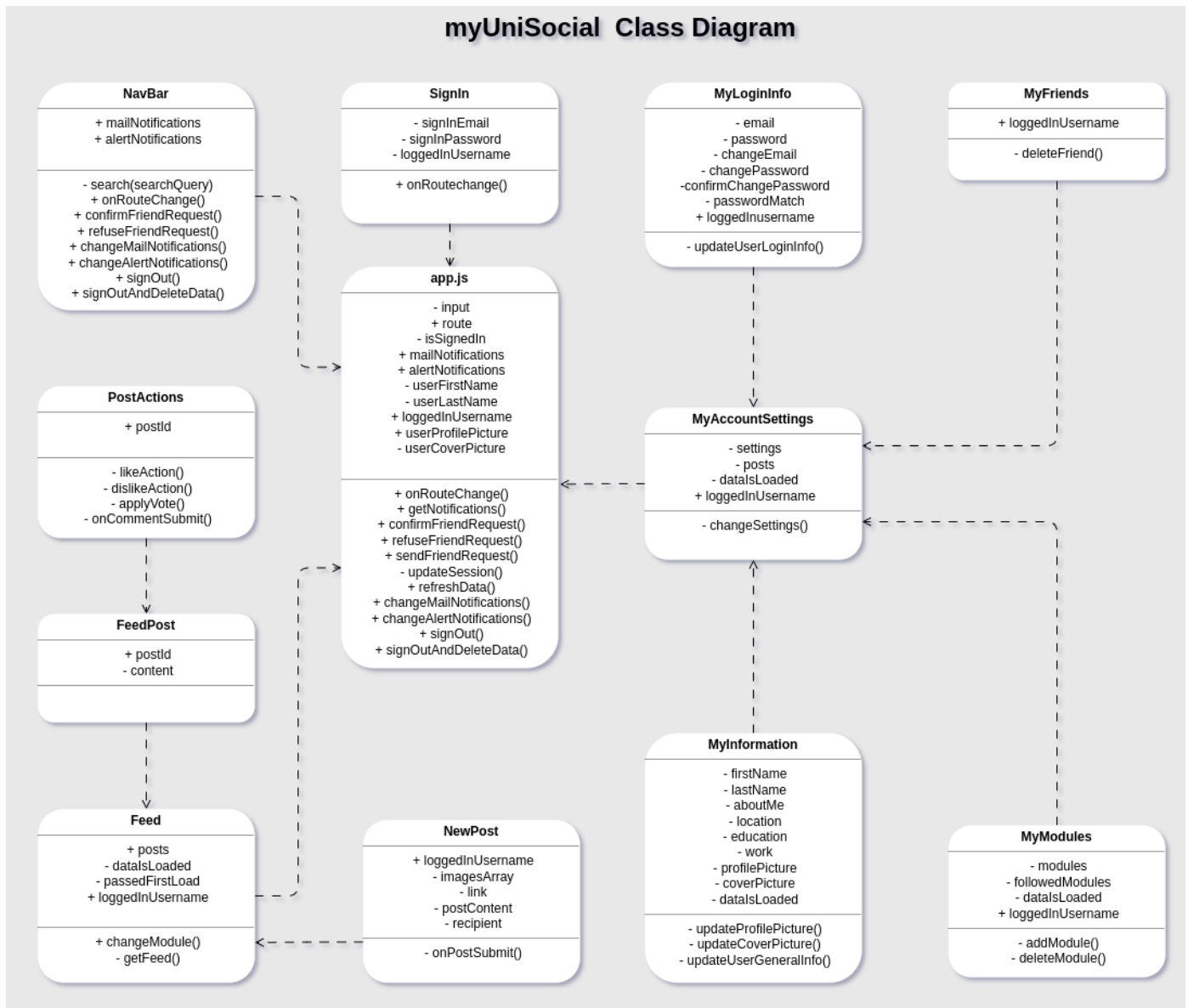


Fig. 14. myUniSocial Class Diagram

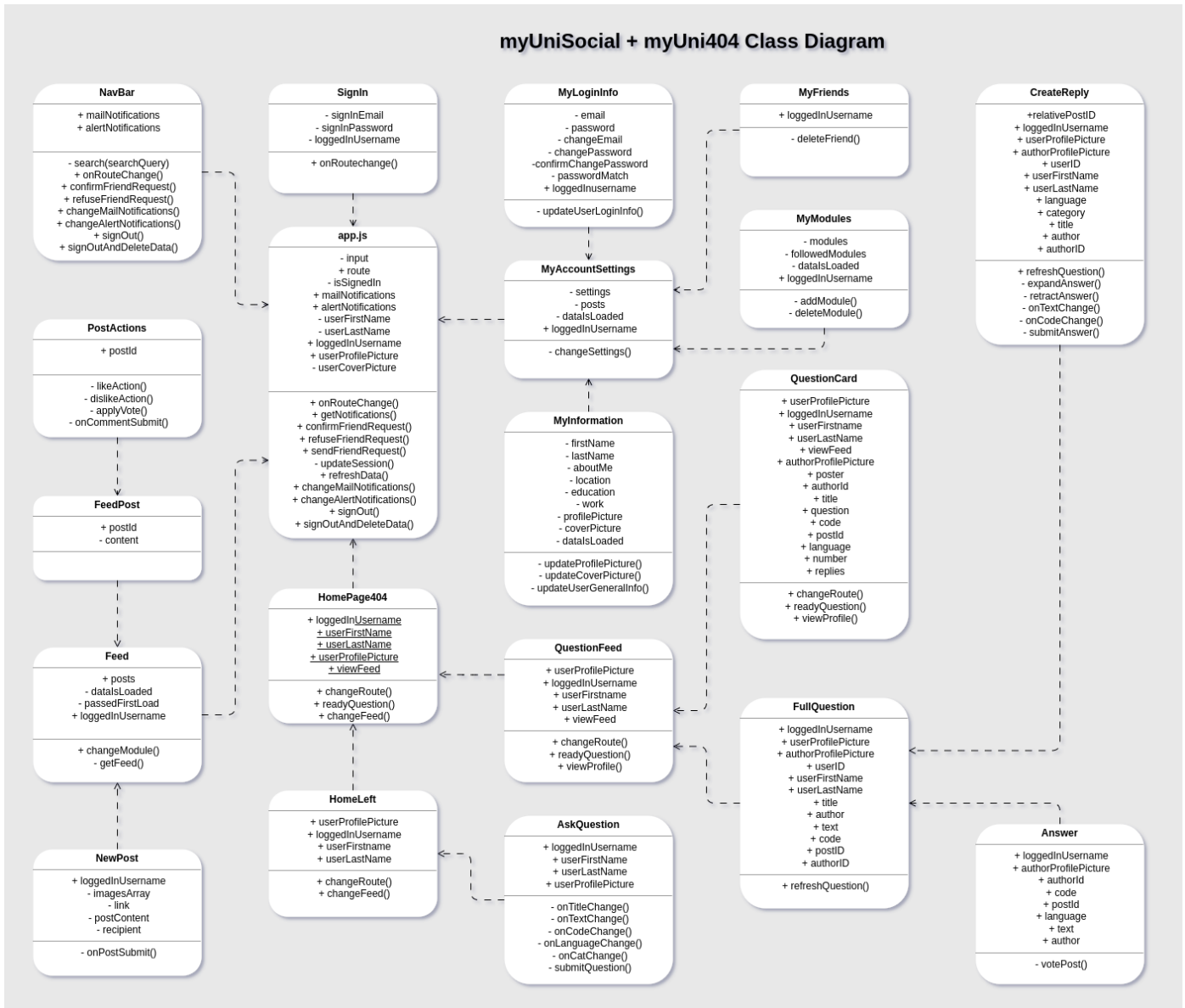


Fig. 15. myUniSocial Use Case Diagram

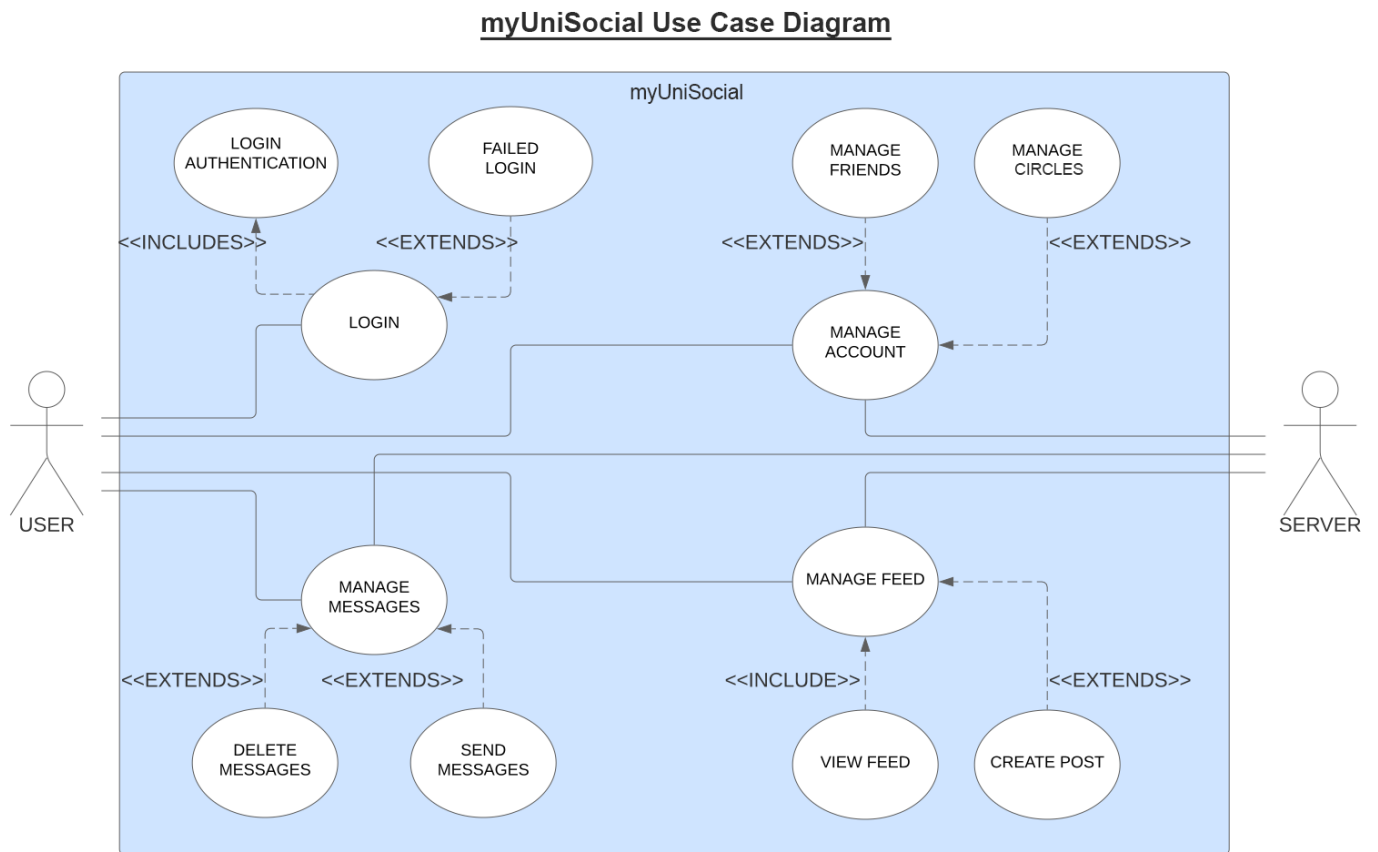


Fig. 16. myUniSocial Class Diagram

APPENDIX E

PROTOTYPE PLATFORM SCREENSHOTS

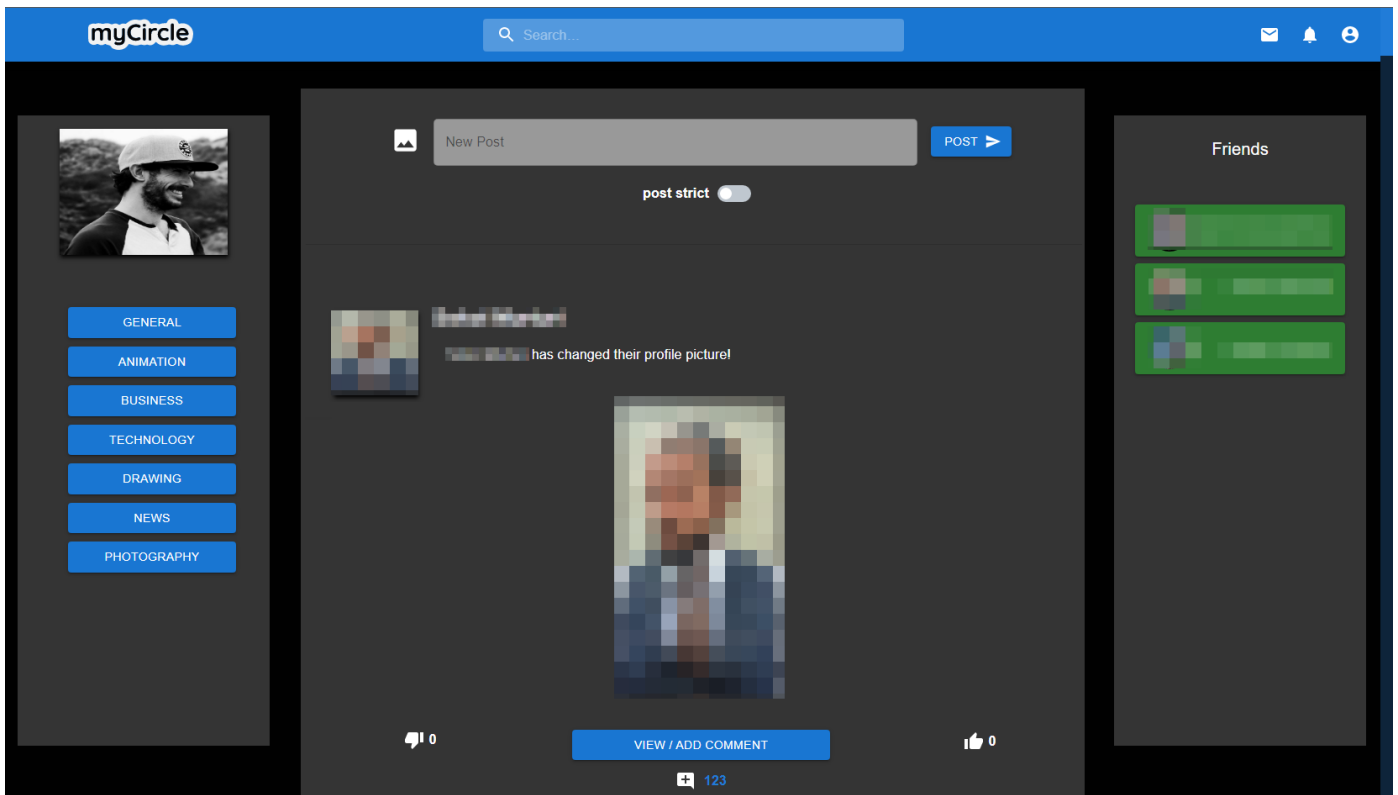


Fig. 17. myCircle user interface

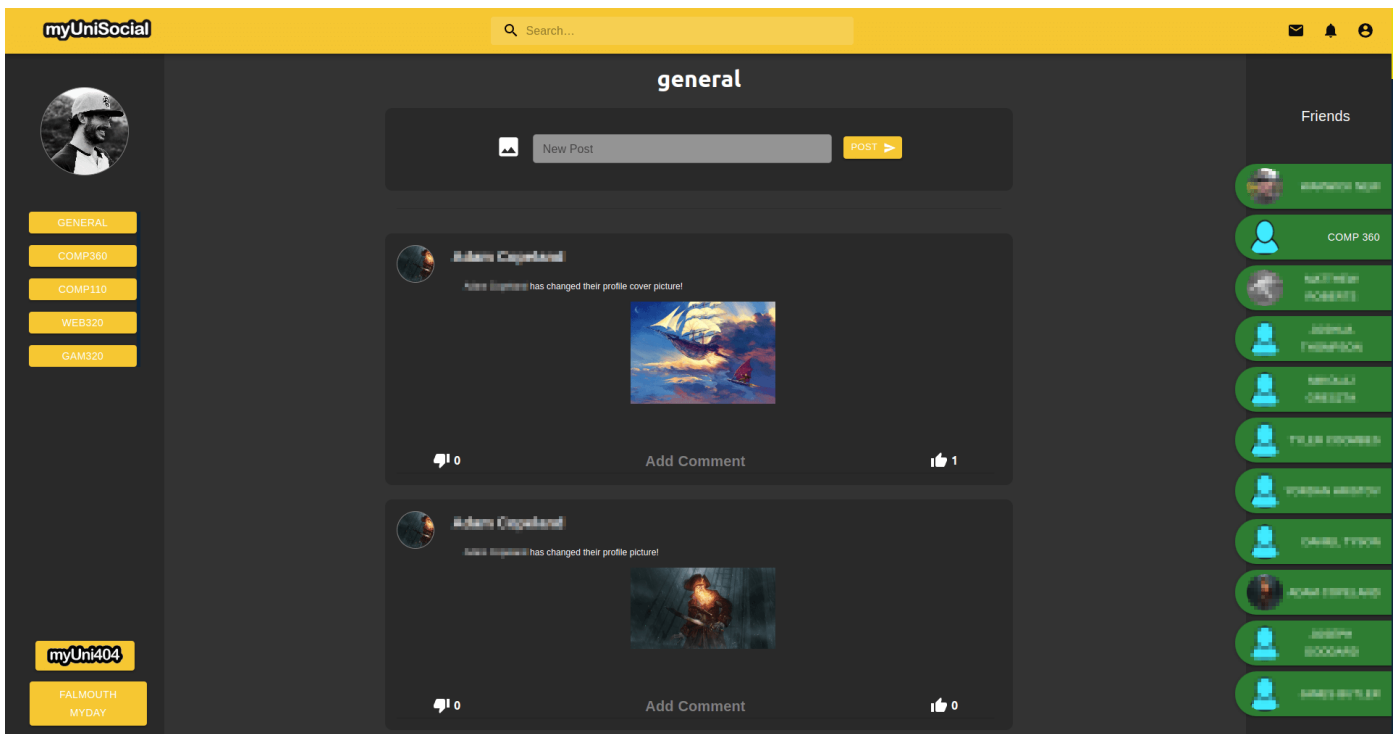
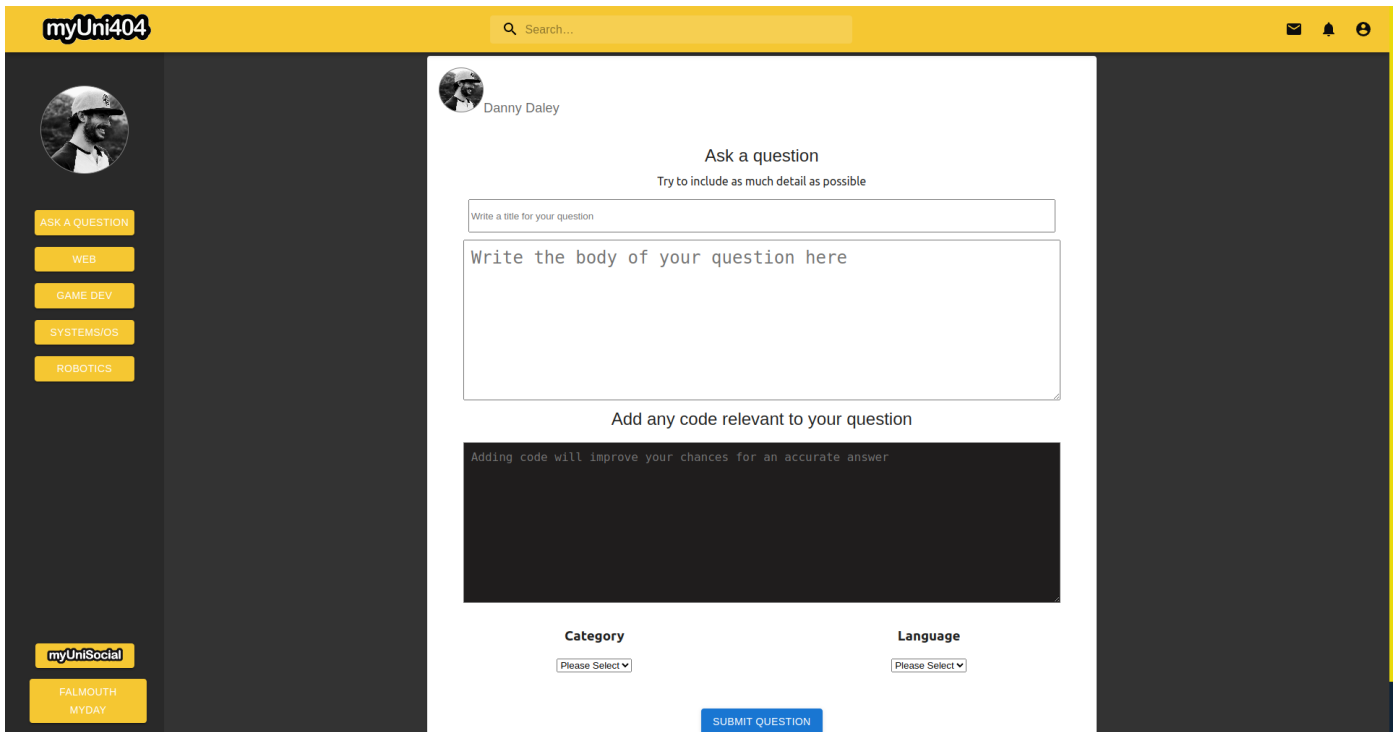
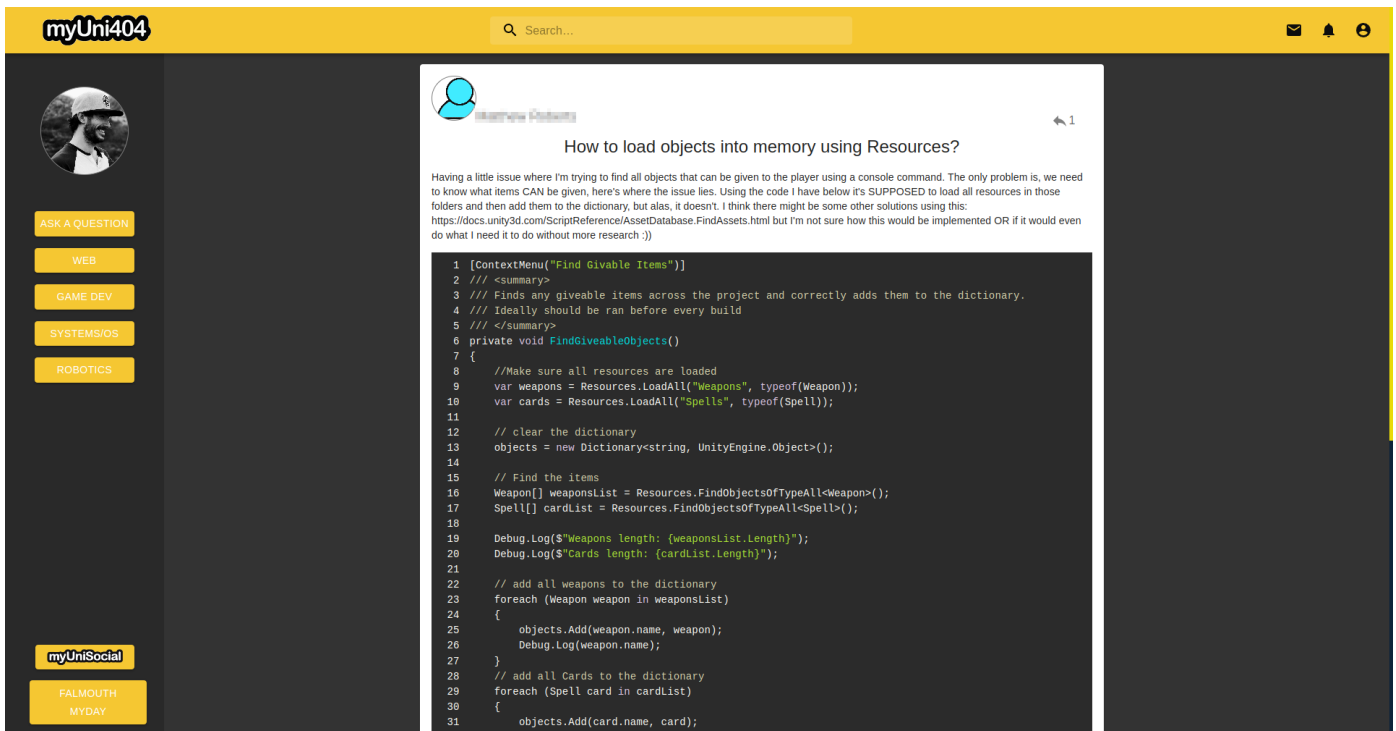


Fig. 18. myUniSocial User interface



The image shows the 'myUni404' 'Ask Question' page. The header is yellow with the 'myUni404' logo on the left, a search bar in the center, and icons for email, notifications, and a user profile on the right. The left sidebar is dark grey with a user profile picture and a list of buttons: 'ASK A QUESTION', 'WEB', 'GAME DEV', 'SYSTEMS/OS', 'ROBOTICS', 'myUniSocial', and 'FALMOUTH MYDAY'. The main content area is white and titled 'Ask a question' with the subtitle 'Try to include as much detail as possible'. It contains a text input field for the question title, a larger text area for the question body, and a code editor area for adding code. Below these are two dropdown menus for 'Category' and 'Language', and a 'SUBMIT QUESTION' button.

Fig. 19. myUni404 'Ask Question' page



The image shows the 'myUni404' 'Question' page. The header is yellow with the 'myUni404' logo on the left, a search bar in the center, and icons for email, notifications, and a user profile on the right. The left sidebar is dark grey with a user profile picture and a list of buttons: 'ASK A QUESTION', 'WEB', 'GAME DEV', 'SYSTEMS/OS', 'ROBOTICS', 'myUniSocial', and 'FALMOUTH MYDAY'. The main content area is white and displays a question titled 'How to load objects into memory using Resources?'. The question text describes a problem with loading resources into a dictionary. Below the text is a code block with C# code for finding and loading resources. The code is as follows:

```

1 [ContextMenu("Find Giveable Items")]
2 /// <summary>
3 /// Finds any giveable items across the project and correctly adds them to the dictionary.
4 /// Ideally should be ran before every build
5 /// </summary>
6 private void FindGiveableObjects()
7 {
8     //Make sure all resources are loaded
9     var weapons = Resources.LoadAll("Weapons", typeof(Weapon));
10    var cards = Resources.LoadAll("Spells", typeof(Spell));
11
12    // clear the dictionary
13    objects = new Dictionary<string, UnityEngine.Object>();
14
15    // Find the items
16    Weapon[] weaponsList = Resources.FindObjectsOfTypeAll<Weapon>();
17    Spell[] cardList = Resources.FindObjectsOfTypeAll<Spell>();
18
19    Debug.Log($"Weapons length: {weaponsList.Length}");
20    Debug.Log($"Cards length: {cardList.Length}");
21
22    // add all weapons to the dictionary
23    foreach (Weapon weapon in weaponsList)
24    {
25        objects.Add(weapon.name, weapon);
26        Debug.Log(weapon.name);
27    }
28    // add all Cards to the dictionary
29    foreach (Spell card in cardList)
30    {
31        objects.Add(card.name, card);
32        Debug.Log(card.name);
33    }
34 }

```

Fig. 20. myUni404 Question

APPENDIX F ADDITIONAL MATERIALS

A. Project Github link

<https://github.falmouth.ac.uk/DD252935/myUniSocial>

B. Refactoring

- 1) *Server Refactor Link:* <https://github.falmouth.ac.uk/DD252935/myUniSocial/commit/a0e6f0efe3ccdce7e3d7efd9ce74bae0ac874be3>
- 2) *Commit:* a0e6f0efe3ccdce7e3d7efd9ce74bae0ac874be3

C. G*Power Output

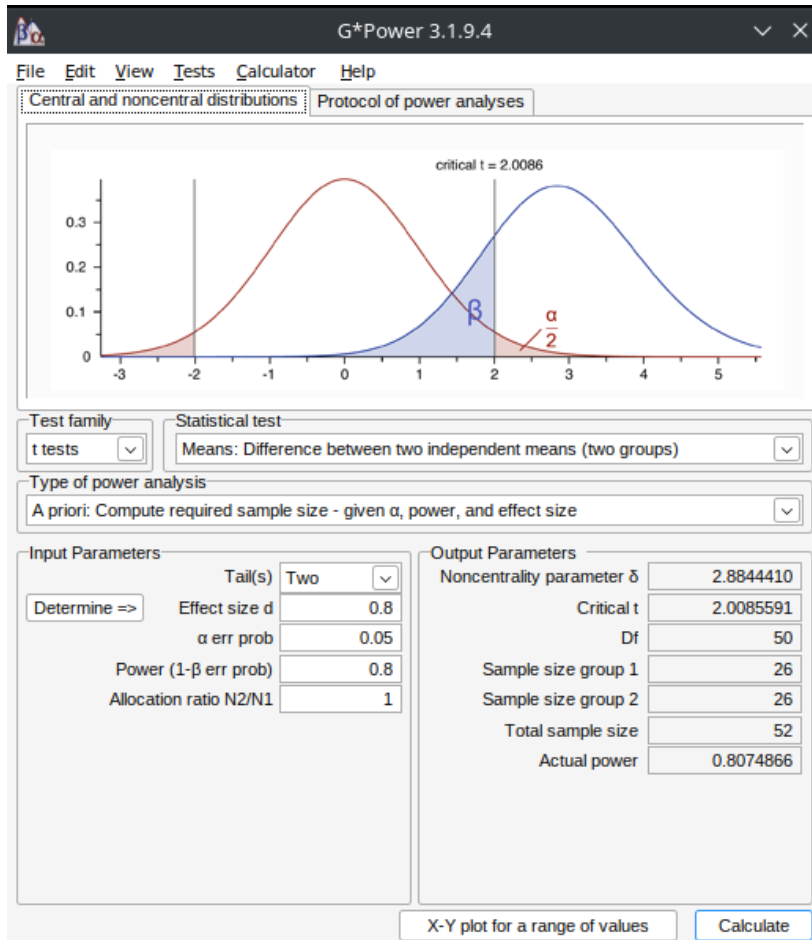


Fig. 21. G*Power output