

Project 2015-16

Project Dissertation

School of Computing & Information Engineering

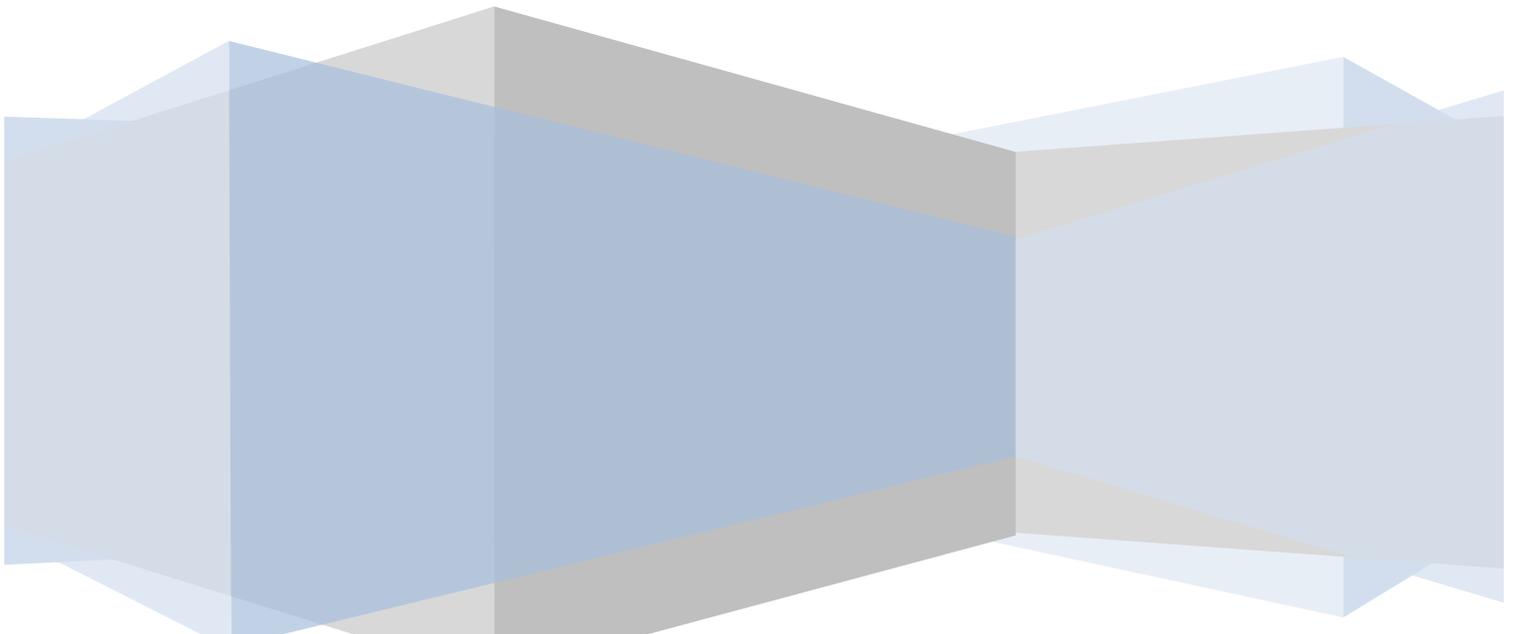
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“When submitting your work you are agreeing with the following statement: I declare that this is all my own work and that any material I have referred to has been accurately referenced. I have read the University’s policy on plagiarism and understand the definition of plagiarism. If it is shown that material has been plagiarised, or I have otherwise attempted to obtain an unfair advantage for myself or others, I understand that I may face sanctions in accordance with the policies and procedures of the University. A mark of zero may be awarded and the reason for that mark will be recorded on my file.”

Abstract

This report aims to address the issue relating to feedback among university students. Currently there is not a method in place for students to provide anonymous feedback to their course coordinators; they instead have to resort to arranging meetings with lecturers or emailing. Neither of these options allow for the student to voice concerns or raise issues in a concealed format.

A private portal for messaging lecturers at any point during the academic year is required so students can contact their course coordinators in a safe, controlled environment. Students therefore should have the capability to securely log on to the system and select the appropriate university module, and then have the capability to provide suggestions or message the coordinator at a time that suits both the student and the module coordinator. An admin will also have the role of overseeing the portal and to review comments flagged to the admin user.

This report will analyse the problem currently at hand with feedback in Universities whilst providing a solution as well as providing some additional non functional requirements that the designed feedback system may have incorporated into it. Sample templates have also been created which show how the system is to perform for front and back end users such as the student and admin respectively. Storyboards showing a path of the sample user experience have also been depicted as well as the architecture and implementation of the development of the web based system. Testing and Evaluation strategies for the developed webpage are evaluated as well as recommendations for the Suggestion Box for any future changes.

Introduction

The Problem

According to the Higher Education Statistics Agency (2016), the number of students currently studying at UK Universities is 2.2 million, and student feedback is a crucial element of most university courses. The National Student Survey is one such tool used mainly to gain feedback from final year undergraduate students and has a response rate of 7 out of 10 (StudentSurvey, 2016). In Universities response rates are relatively low whilst opinions and feedback can be argued as being rarely useful despite the time and effort students allocate to provide such feedback. Other problems exist with the data provided after completion of student surveys such as if students do not attend lectures, how can the university know whether or not to take seriously comments from students who did not attend?

The Guardian 2014 discusses that feedback from students 'genuinely boils down to whether students like the class or not', but rarely offers much about why students are genuinely not well quipped to 'assess teaching standards'. Casual feedback replying is another problem as students often do not provide constructive criticism on a service they are paying between GBP 3,000.00 – 9,000.00 for.

To exchange and share knowledge between students and lecturers is a fundamental role of a university, alongside research and development; therefore, to transfer this knowledge to the next generation it can be argued that students should have the feasibility to voice how teaching and learning is provided. Any feedback, clear or not clearly discussed should be sufficient to raise questions as this is an integral part of academic practice.

Students pay fees to be educated in a specific subject area by an expert who is highly knowledgeable about the course and its learning methodology, therefore students should be provided with an approachable knowledgeable individual.

However, leaving all power to peer assessments for example may disregard one of the main principle ideas about higher education. They are public institutions and on some level they are accountable to society; this society includes students who are arguably key stakeholders in Higher Education.

As students ultimately are paying large sums of money to undertake a degree or postgraduate study, they are entitled to the best education available. Yet many students don't practice as they preach, they miss lectures, do not do the required work expected for the module, miss deadlines and may not complete work set in tutorials, especially if the work asked does not count towards their final mark or degree classification. Here too feedback can be taken with a pinch of salt; if students lack dedication why should their opinions be taken seriously?

It can also be argued that University staff are paid to do quite a bit more than teach. Staff take time to help students in need who may have personal issues, for example, students with mental health or family bereavement issues. Lecturing staff are also heavily involved in research and performing tasks directed by management, to name but a few.

If students complain in feedback about certain topics that they find boring or uninteresting, these topics can be revised and improved by the lecturing staff. But topics which students are finding challenging or difficult is a different matter, as even future doctors or legal professionals could miss out on extremely valuable course content. This material should not be eliminated, but may be re-evaluated as a result of feedback. Ultimately students may be looking for the 'easy life' approach allowing degrees to resemble A levels as much as possible within student's comfort zone. Having a challenging degree programme will ultimately benefit the future employability of graduates looking to undertake specific job roles in a highly competitive marketplace.

Feedback should be a guide and not a burden on staff; it should also be done before the student has had a chance to absorb or reflect on the course and not at the end of topics taught within a module. It can also be used by universities to have meetings and look at areas that can be improved, which is the core focus of student feedback in the form of surveys, for example. Teaching can change a lot over the years and can be put to good use. Some comments may be deemed redundant but it is important to look past these comments and focus on the ones that can ultimately aid improvement.

Student feedback can also have positive impacts on lecturers, as the feedback can be useful to help lecturers fine-tune course content. It can be used as a resource to inform teaching,

help identify issues and help develop lecturer competence to add value to student learning. The delivery of material can be improved so that the students are able to learn material easier. With a positive view on feedback students will engage more with the course and the end result will be a better experience all round.

Having anonymous feedback is fundamental as there is no direct way of knowing who gave feedback, but it does pose a potential threat. There is no way of knowing if that member is a regular attender to class or someone who rarely attends and is not interested in the course. A comment from the former group is worth considering, but from the latter could be set aside. A potential issue is that university lecturers with anonymous feedback do not know whether the students writing the feedback attended the class or not.

Perhaps feedback should be collected from students in the previous academic year prior to teaching in the forthcoming year to help the lecturer shape and organise the course. Feedback could also be gathered mid-way through the course so any mistakes being made can be identified before it is too late. Feedback can also be collected at the end of the academic term for new starts undertaking the module, and if the correct questions are asked and asked at the right time in the academic calendar this feedback may prove invaluable to lecturers.

Once surveys/feedback are collected another potential issue arises in large class sizes as sampling can be undertaken, larger sample sizes enable clear patterns to be identified in results and smaller sizes may not raise issues that perhaps should be escalated.

There is no forum or portal currently devised which allows students to give feedback to university lecturers at any particular point in time. Lecturers or course directors that ask for feedback usually do so at the end of the semester and generally the number of respondents is minimal. Students are not fully engaged in completing surveys on courses they undertake during a semester. Lecturers may ask for feedback at the end of term, which may overlap with assignment deadlines, university examinations or term holidays when student responses to surveys will be reduced.

A possible explanation for the problem of poor feedback and Rich Picture

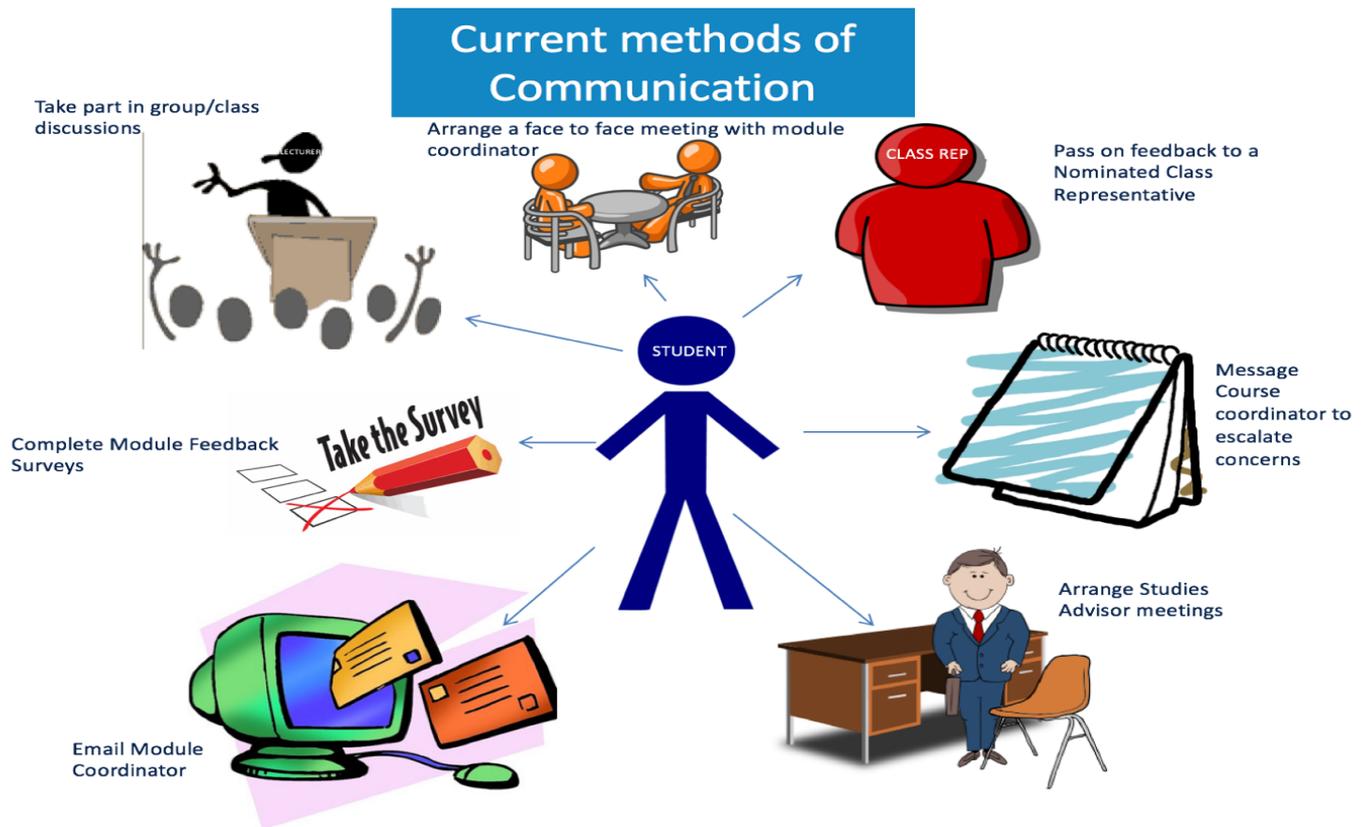
Students may not feel confident or comfortable in raising concerns in class directly to their lecturer and might prefer to come forward with anonymous suggestions or concerns to the module coordinator, as can be seen from the Rich Picture diagram below. Students are not aware of the anonymous platforms that are available to provide feedback and as such only see meeting face to face, speaking to a class representative and emailing as the only way to provide feedback to lecturers so that problems can be raised and can be addressed and amended by teaching staff at their earliest convenience.

Some students may prefer to remain anonymous if they are raising issues or re-asking questions to lecturers for further clarity, for example. Students may be asking for answers to tutorial exercises, guidance on work or to provide constructive feedback to lectures and may see the university email system as an inefficient tool as the opportunity to remain anonymous is not an option. Therefore, having a tool with the option to communicate anonymously would be of great benefit to students.

In order to provide feedback to lecturers and teaching fellows, students may have the option to put forward problems to an elected class representative, as depicted in the Rich Picture diagram below. Such an individual has a duty to provide feedback to lecturers on how the class is performing in modules in the hope of escalating issues up the chain of command. A potential conflict of issues exists because the class representative may not have the same concerns about raised issues and thus may not be addressed by lecturers.

Overall, students may not feel comfortable raising concerns to lecturers in class or by email therefore an anonymous portal for students to do so would be advantageous.

At present students only have the option of providing feedback to a module coordinator at the end of a module or at varying milestones throughout a course. This webpage is designed to allow students to generate instant feedback in real time and eliminates the problem where students don't have the option of providing feedback and suggestions during the academic year in an anonymous way.



Rich Picture diagram to show the current methods of student feedback

Problem statement

To create a system which allows students to communicate with module coordinators and course directors anonymously through the creation of a web based application. This system would have the ability to be run off any device with the capability of having a web browser to maximise target audience for all students of universities. Therefore, the proposed solution will not be android/iOS specific. The website will be linked to a database which in turn stores all the required information registered for the website including each individual student, their module listings as well as the corresponding lecturer for each of the unique module codes. The user will therefore be able to select and choose their appropriate module and message the coordinator deems appropriate. This allows for a secure private and anonymous platform for students to contact lecturers at any time or place.

The Solution

According to the National Student survey 2015, Ulster University achieved '89% on the overall satisfaction score' (Ulster 2016) boasting a cohort of approximately '27000 students to meet personal and professional ambitions'.

Why should students give feedback?

Students can contact lecturers about general problems, for example below, and when students wish to receive more structured individual feedback from lecturers the lecturer can respond to the more bespoke individual query on marks or past exam performance.

According to the University of Sussex, the purpose of feedback at university is so students can 'understand areas they are doing well in', areas they 'require more attention to be spent on' and how they can 'improve and progress'.

Good feedback therefore allows students to:

- Assess their learning and reflect on their development
- Discuss learning with lecturing staff
- Understand what is expected of a student of their level
- Progress and expand their knowledge base
- Become more motivated and encourage the student to think positively about their learning
- Provide feedback, which in turn gives lecturing staff an opportunity to reflect and shape their lecturing style

Feedback is not:

- A justification of the student's mark. Feedback on particular work assessments allows suggestions for students to consider for future work streams, the comments

therefore are not a justification for the student's mark as the mark reflects achievement on that work

- A comment on every aspect of assessment. Feedback given from lecturers to students highlighting areas performed well in and highlights areas to improve. Feedback is therefore carefully selected to help students learning
- An end of a process. Therefore, feedback should be used to develop the student so that for further assessments the student can use previous feedback to improve upon for the next piece

The Proposed Solution

A forum for students to provide feedback to university lecturers at any time during the university calendar should be comprised and not just when lecturers or course directors decide that a survey should be completed.

The devised platform will allow students to give feedback/suggestions to lectures at any stage, thus problems raised can be addressed by the lecturer when they become apparent instead of waiting to the end of semester. This will allow for improvements in teaching, helping the class to learn, as students may ask for further resources, for example.

Students should have a platform developed that allows them to log on and select the module from a list of modules; then allow the student to message the lecturer with any feedback, problems or general queries. The student should also have the option to remain anonymous while messaging the lecturer. The results should be fed back to the course coordinator after the suggestions have been submitted as discussed further below.

This system can be accessed by a having a unique password, logging on and viewing any messages from students to the lecturer. The lecturer can then respond to queries or concerns to the student who is nameless. As a possible add on to the suggestion box, the student user could complete feedback surveys mid-term and at the end of a semester/module as an add on if required.

This platform can also be supervised to prevent spam messages by an administrator, for example, who has overall access to the platform and can see who the messages are coming from. To provide maximum security and to protect confidential information this should only be used in the most extreme of cases where an issue is flagged by the lecturer who would like to see who the comments have come from to proceed with disciplinary action. The administrator should have the option to login to the system to view comments as appropriate whilst upholding the university data protection requirements and the privacy of confidential information between students to their lecturer.

The development of a platform to provide feedback is not just about negativities or problems, it can also be reported back about the highlights of studies on a week by week basis. Students may commend lecturers on a class held, they may discuss other available resources that aided them in their studies and thus communicate this to the lecturer, for example; a student locates a coding website online and wants a means to share this with their lecturer and thus their class peers.

Currently students communicate as a class over Facebook groups – such as MSc Professional Software Development 15/16 where the majority of the class on Facebook can come together and discuss work due and any problems they are facing with their studies. Not all members of a class have access to Facebook and others may be hard to locate on Facebook by the group creator as they may have private profiles. WhatsApp groups can also be used but not all members of university classes have access to mobile devices and are willing to pay an annual fee of GBP 0.69 after 1 year of using WhatsApp.

Objectives

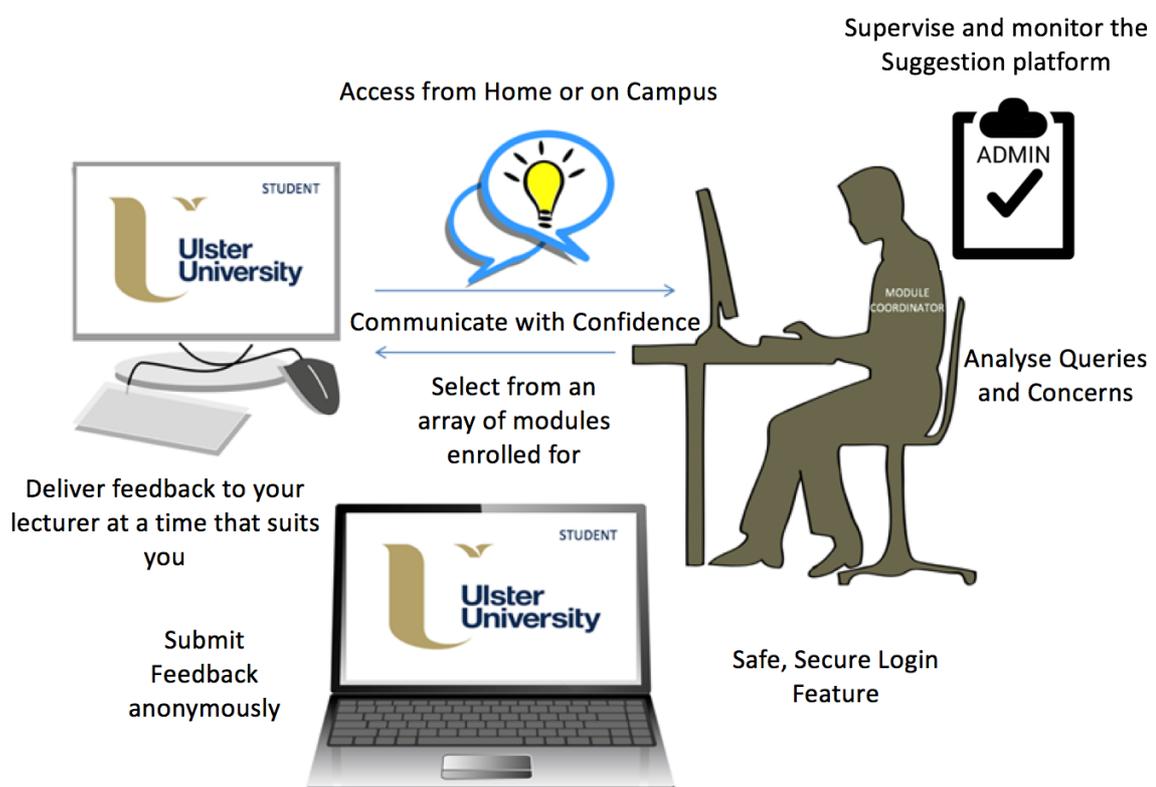
The key objectives set for the conception for the development stages include:

- Research in the Analysis of the project is to be conducted on alternative methods for students to communicate to their lecturers through online feedback systems such as the National Student Survey and Suggestion Ox. These tools will be analysed to aid the developer in the creation of a system which allows its users to communicate in an anonymous platform.
- Functional and Non Functional Requirements will be further generated by the developer to aid in the development of the Suggestion Box
- A simple, user friendly and intuitive platform which consists of the user capabilities set out in the Functional requirements will be created allowing students to message lecturers and a lecture to log in and view their corresponding suggestions for their associated modules.
- A testing strategy which will include a testing questionnaire among users and various in-house testing will be conducted so the system will be tested among various testing methods.

In Summary and Rich Picture Diagram

The core design of the system is that a student should have the capability to message lecturers anonymously, as the Rich Picture depicts this message should not be visible to the rest of the class. For example, if a student is struggling in a module and wishes to contact the module coordinator anonymously to ask for advice he/she should be able to log on to the system, choose the appropriate module and compose a message to their lecturer, whilst this message would not be visible to the remainder of the class. The student would have the capability of messaging anonymously to have their name credentials invisible to the lecturer. This allows for the student to message confidentially and a system is in place that ideally would be simple for the users to use so that they can have any problems resolved in confidence.

This system could also allow students to complete feedback at times the lecturer chooses if additional extensions to the proposed solution are implemented, for example: mid semester and at the end of the semester for a particular module. From the Rich Picture diagram below, this allows students to have an all encompassing platform as a means to communicate and provide feedback to their course coordinators at any time they please.



Analysis

Current Methods of Communication:

If the student decides that he/she wishes to voice concerns regarding a particular module the student may do or arrange any of the below and from the Rich Picture in the Problem Section above;

Face to Face meetings arranged between lecturer and student;

- **Pro** – Meet in class and ask questions at a time that suits the student to resolve problem quickly
- **Con** – Lecturer may not have the time to answer questions and may not have the answer at hand for the student

Group meetings in class between lecturer and students discussing modules and structure of course content and any issues the class are concerned about;

- **Pro** – Lecturer can raise concerns and get a general overview from class members to quickly resolve an issue or look for general feedback
- **Con** – Students may not wish to speak out to the class, other members may withhold how they really feel and overall the results may show bias

Email from student to the lecturer where face to face meetings or phone calls may be arranged if necessary;

- **Pro** – Student has time to think up and ask a question of their lecturer and can do so confidently in their own time
- **Con** – Lecturer may not respond to queries or concern and Student does not remain anonymous

Survey from lecturer to class – handed out in class and collected (QUB) or a survey online for class to complete and submit online;

- **Pro** – Instant feedback from class on general issues or concerns, survey can be anonymous
- **Con** – Students do not have the time or space to answer truthfully under time pressure such as in a lecturer where the survey may be given to complete in a time frame of 10 minutes, for example

Class Representative meeting therefore allowing a nominated individual to voice general concerns;

- **Pro** – A concerned student can voice concerns to a nominated class leader and have issues raised anonymously
- **Con** – Class representative may not fully relay concerns if she/he does not agree with the issues being raised. Students may not feel confident raising concerns and asking another class member to speak on their behalf

Studies Advisor meetings can be arranged at any time to suit both the student and the elected University individual;

- **Pro** – Arguably the best way to raise concerns as students can confidently speak to a senior member of staff in private and voice concerns or speak about how they really feel
- **Con** – Concerns may not be relayed to the lecturer from the studies advisor fully

Emailing Course Director with concerns so the course director can be aware and speak directly to the Lecturer;

- **Pro** – Issue is escalated to the course leader who will ensure this issue is followed up on
- **Con** – Students may not wish to contact a senior figure for an issue that can be resolved using alternative methods discussed above

Therefore, it is of paramount importance to have a new designed portal system that allows the student an all in one platform to contact the lecturer directly and voice concerns, as well as perhaps completing surveys for the module for forthcoming students; this would be a highly valued tool for students to be able to avail of.

Current Methods of Feedback

Surveys are currently the primary platform for lecturing staff to receive feedback from students; this process usually takes place at the end of a semester.

The National Student Survey

This is an opportunity for students to give feedback on their course and institution. The information given helps future students choose which courses and institutions to apply to, and it advises before the survey commences that 'The survey should only take a few minutes to complete' (Student Survey, 2016).

The National Student Survey allows students to simply work through a survey. The student ticks the appropriate box which have ratings above them to answer whether they Definitely Agree or Definitely Disagree with the survey question.

Ratings are allocated 5 Definitely Agree, 4 Mostly Agree, 3 Neither Agree nor Disagree, 2 Mostly Disagree, 1 Definitely Disagree and finally N/A Not applicable.

Below are the topics with sample questions from the National Student Survey:

- **Teaching on the course:** The course is intellectually stimulating / Staff make the subject interesting / Staff are enthusiastic / Staff are good at examining things
- **Assessment and Feedback:** Assessment criteria is clear / Feedback is prompt / Detailed comments were received / Assessment arrangements and marking is fair / Feedback helped clarify issues and helped understanding
- **Academic Support:** Sufficient advice and support was received / The student has been able to contact staff when needed / The advice given was of a sufficient standard to help aid decisions

- **Organization and management:** Timetable is efficient / Changes to the course and teaching are communicated effectively / The course is well organized and runs smoothly
- **Learning Resources:** Library resources and services are adequate / General IT resources are available / Study rooms available or alternative facilities
- **Personal development:** Course helping student gain confidence in presenting / Communication skills Improved / Taking unfamiliar problems confidently
- **Overall satisfaction with the course rating**
- **Positive or Negative experiences** are also allocated a large box each for the past student to highlight

Overall, the National Student Survey asks past students a selection of 22 unique questions in a simple and efficiently organized structure that is easy for students to complete.

Ulster University Module Feedback

On the Ulster University portal students are required currently to complete a survey for the end of semester modules. This survey is reported as being 5 minutes in duration and states it can have a 'significant impact on how modules are taught' within Ulster University. The survey is also stated as being 'quick, accessible and can be completed from anywhere at anytime'.

In the Module Feedback Survey students have the opportunity to rate the quality of teaching on modules for each semester, letting teaching staff know what has worked and what might need improved in the future.

It states; 'Unlike other surveys, your feedback is delivered to lecturers in real time. Immediately after your feedback is completed, lecturers can review responses.'

The Ulster university student feedback on the university portal emphasizes the power of the student voice, as opinions can really make a difference.

The survey within Ulster University is specifically a module feedback survey and is run at week 11 of each semester. This internal module evaluation therefore runs three times per annum allowing students and staff the opportunity to 'speak out' and 'to let academic staff know what you like about the way your modules are taught and to make suggestions for changes that you would like to see in the future.'

Similar to the National Student Survey discussed above the module feedback survey within Ulster University consists of 14 closed statements and 2 open questions which allows students to comment upon different aspects of their module experience. When students log on to the Portal and enter the survey they are faced with the below topics:

- **Module delivery:** The module was delivered clearly in accordance with stated learning outcomes / Learning experiences were interesting and engaging / Appropriate learning resources available to support the module
- **Assessment:** The assessment requirements and criteria were clear / Assessments were fair and reasonable
- **Feedback:** Feedback was provided within 3 weeks / The feedback received was constructive
- **Learning resources:** The student was fully engaged and found the topics interesting and valuable
- **Module coordinator:** Lecturers seemed well prepared and presented material in an organized manner / Contact the lecturers when needs for support and guidance / The tutor was enthusiastic and presented material in an organized manner
- Students are also asked if they are satisfied with the overall quality of the module.
- Students also have 2 boxes for each module to discuss the pros and cons regarding each module after the question 'What do you think was particularly good about the module', and 'Please suggest any improvements that could be made to this module'

This survey, similar to the National Student Survey, is anonymous, and it is therefore 'not possible for your lecturers, course coordinator or head of school to see who said what in the evaluation'. Students are advised that the survey should be completed in a professional

manner and for comments to be given in a constructive manner as feedback shapes the quality of teaching allowing for improvements to be made for the future.

The Ulster University Survey is completed online, thereby allowing students the opportunity to complete it at a time and place to suit themselves. It also allows the students to spend time thinking of answers and provide constructive feedback instead of completing the feedback in a short period if the survey was printed and handed to a class to complete inside a lecture or tutorial class.

After submitting the Ulster University Survey students have the opportunity to see the ratings of each question against the remainder of their class. Students in a class of 39, for example, can see the number of surveys that have been completed and can see the ratings of each module (from 1 – 5) that classmates gave. Students cannot see comments in the text fields from other class members. Once the student is satisfied with their survey they can log out and close the webpage down as advised by Ulster University 'Verify', for security reasons.

Suggestion Ox

The Suggestion Ox is an anonymous system which would show basic similarities to the expected developed platform specification. Suggestion Ox is a '100% web based private system' that is quick and 100% anonymous which allows the 'recipients to hear the truth' whilst knowing that their identity is protected. (SuggestionOx, 2016) The Suggestion Ox also benefits from being a private and secure webpage which only grants one user and any nominated users the option to view suggestions. Feedback can be submitted very quickly as the Suggestion Ox reports it is 'very simplistic'. Users can set up the Suggestion Ox in under '15 seconds'. This allows the owner to start getting feedback 'immediately'.

To use the Suggestion Ox the owner of the suggestions or feedback creates a question or statement for the users to provide feedback on. The owner is then provided with a webpage link which can be sent to the users and they can provide the feedback and submit.

Once the users submit the feedback the owner is notified via email and can review the suggestions on the Suggestion Ox webpage. The Suggestion Ox displays the date and time of the comments as well as a tally of the number of submissions generated by users.

This Suggestion Ox platform is similar to the envisaged platform to be developed by the developer. It differs in that the projected platform will allow the users to log on to a specific system at a time that suits the user, not just when the lecturer decides that feedback should be gathered. Suggestion Ox offers the capability of emailing the lecturer or owner of the suggestions while the developer for the Suggestion Box will allow the lecturer to log on and see the list of comment ID's and the date and time of the new comments.

The Suggestion Box envisaged and projected for development will be similar in concept to the Suggestion Ox, but as it is projected to be created for University students to communicate with their lecturers at a time that suits the student it varies in its unique conceptual design. The developed platform will ideally allow students to select modules which is not an available feature of the Suggestion Ox as it is not specifically for students.

Possible Extension to the Proposed Solution

The developed platform could have the function of allowing students to complete module feedback in the form of a survey. This is not a core functional requirement of the Suggestion Box but could offer a possible extension to the system developed.

This platform could be devised to have the capability to allow any student who finds websites, textbooks, video tutorials to share this with class members on this platform to aid the class in their learning, whilst the course coordinator can supervise and approve websites if they deem them relevant.

This platform may also have the capability to tally the number of users who access it; if a lecturer places notes or a comment to the complete class he/she can see the number of people who have viewed the comment to keep a record of the portal's use (i.e. – lecturer writes a notification and only 29/39 view the notification).

Target Audience

The Target Audience for this web based solution is all levels of students within universities across the UK and Ireland. This Feedback webpage can be integrated as part of Ulster Universities' students primarily. Therefore, students in year 1, through to final year and placement students may log on and contact their lecturing staff at a time that suits the student. It can also be used for Masters students within Ulster University.

The system admin will also have the capability to access and review student queries and avail of the systems feature of identifying students from comments and will be provided with the full names and student ID's of the student. It should be noted that the platform will be available for students, teaching staff and admin to access this from home and within the university itself.

Professional Issues

Technical Benefits

- A responsive website will be developed which has a monitoring system using a Content Management system
- Access to webpage to allow communication between students and lecturing staff at the click of a button
- Login to allow students a secure environment to contact module coordinator privately
- Easily accessed portal for student to login and submit feedback
- This feedback has the capability for the student to submit the suggestions anonymously for their selected module to their module coordinator/lecturer.

Overall this feature will allow a safe secure environment to message module coordinators with the confidence that feedback, queries/concerns are held and managed in a secure protected environment.

Cost

The Student feedback webpage is not intended as a commercial website and therefore does not aim to make any financial profit for its developer by selling a service to potential users. Financial gain generated by third party advertisement is not envisioned for this web page.

The webpage was developed using existing hardware and software which is readily available at little or no cost in order to complete the aim and objectives as described above. The following assets were required in order to proceed with the development of the application.

- Laptop/desktop computer which has the capability of running a development package for designing and creating websites
- Xampp, which is a free open source cross platform web server package consisting of an Apache Server, MySQL Database and interpreters for web scripts written in programming languages such as PHP
- A tablet (Such as a Samsung Galaxy Tab) which will allow the system to be tested on a handheld device platform
- Web space will be available from the developer's student account as a student of Ulster University, therefore the webpage can be developed using this University web space
- Developer knowledge of programming languages such as HTML, PHP, MySQL and JavaScript

Project Risks

Risk is defined as the 'possibility of loss or injury' (PM4ID, 2016). Project risk therefore is an uncertain event or condition that, if it occurs, has an effect on at least one project objective.

Risk management strategies focus on identifying and assessing the risks to the project and managing those risks to 'minimize their impact on the project'. It is very challenging to identify any project which poses as being 'risk-free' because there are an infinite number of

events that can have a negative effect on the project. Risk management therefore within this webpage development is not about eliminating risk but about identifying, assessing, and managing risks which may be faced.

Risk Source	Likelihood*	Severity*	Risk = L x S	Contingency Plans
Physical Risks				
Developer becoming ill	1	3	3	Allocating structured time to meet deadlines
Technical Risks				
Computer failure	1	3	3	Access to multiple computers
Internet service failure	1	2	2	Access to multiple sources of broadband service
Web hosting provider issues	1	3	3	Selection of a reliable host will be ensured by research and careful considerations
Data corruption / loss	2	4	8	Regular backup of personal storage is planned and will only select a web hosting provider that offers backup facility using Google drive cloud storage, email storage and Memory pen storage
Project Management Risks				
Developer unforeseen circumstances	1	2	2	Agile methodology with early working prototype to ensure minimum delivery
Dissertation files corruption or loss	2	3	6	Perform regular backup of all these files using Google drive cloud storage, email storage and Memory pen storage
Project overrun	1	4	4	Planned intermediary reports and Excel checklist/timeline will ensure that progress is maintained and deadlines met on time

Assessment of the physical, technical and project management risks associated with the project are presented in the table above together with intended contingency plans.

**Using scale of 1 to 5. 1 = lowest / 5 = highest*

Ethical Considerations:

An ethical approval form submission will be made for this project but as the project does not involve invasive interaction with people it does not require a full ethical review; this project is expected to be classified as category Z by the University Ethics Committee. All risks and ethical procedures will be considered and the project will be conducted at all times in compliance to description outline of the research and in accordance with the University's requirements on recording and reporting. This application has not been submitted to or rejected by another committee. Feedback from the research questionnaires and from the final testing of the website will be provided by teaching staff and students only.

Requirements Analysis

Functional Requirements

The functional requirements for this system indicate what the system must have for users when the webpage is being accessed. This system itself can be broken down into 3 categories;

1. The students who are the end users of the system and primarily benefit from the generation of the system. The student should be able to log in to the system after entering a password, the student should have the option to select the module which he/she wishes to generate suggestions for, the student should then be able to generate suggestions whilst having their identity hidden from the lecturer
2. The lecturers who are also end users and who are providing a support function to class participants. The lecturer should be able to log in to the system after entering a password, the lecturer should then have the option to view comments from students in an array of modules he/she may be teaching in. The lecturer should be able to review comments and flag to the admin if necessary
3. And finally the system administrator who governs the system as a whole. The administrator should be able to log in to the system after entering a password as a differing functionality from the student/lecturer, the administrator should then be able to oversee comments made with student's details if a potential issue is raised by a student or lecturer, whilst protecting the sensitivity of information at hand

The system should also allow all members to securely log out of the system and be re-directed to the Log-in homepage.

Story	Title	User	What is required	Functional Requirement
1	User Log on	Student	A user can enter their username and password to access the feedback system	Unique log on names and passwords specific to each account
2	User Redirect	All	Each of the users will be redirected to their appropriate homepage based on their user data. The lecturer will be redirected to the lecturer page for example.	Redirect to appropriate homepage
3	Module Selection	Student	Student should be able to select one of their modules from the list in the dropdown from a dynamic dropdown populated by the database	Dropdown created linked to Database to select module
4	Write Suggestions	Student	Student should be able to write a Suggestion in a text box and submit anonymously	Create text box and link to Suggestion Box database. Student name or ID should not be displayed
5	Display Suggestions	Lecturer	Lecturer can log on to their unique account and select a appropriate comment ID and display feedback	Display comment ID and date of comment for lecturer and display the suggestion and the date the suggestion was posted
6	Display Suggestions and records	Admin	For security and safety reasons an admin must be able to oversee comments protecting the sensitivity of information and see post's username and user ID	Admin function to control the site and be able to have access to view all comments and the sender information displayed from the database
7	Log out	All	All users will be able to log out of the system	Log out of the system and redirect to homepage

Non Functional Requirements

Non functional requirements for the website are less focused on what the core functions and possessions of the website are to achieve but is greater aligned with the system content relating to the performance of the system. Non Functional Requirements also relate to the ease of navigation through the system for users. Hence these requirements discuss how the software carries out its functional requirements and they are evaluated differently based on user preferences. Non functional requirements include: Performance, Availability,

Maintainability, Reliability and Compatibility. Stellman & Grenne 2005 discusses the core non functional requirements below:

- **Availability:** The system's availability, or uptime, is the amount of time that it is operational and available for use. This is specified because some systems are designed with expected downtime for activities like database upgrades and backups. The student feedback system is thought not to have downtime periods such as this because students should have the option to contact lecturing staff throughout the complete academic year. Possibilities of downtime can be between semester 3 and 1 of the new academic calendar. The system will also need to be amended after each semester to allow for the enrolment of additional modules in semester 2 for example
- **Efficiency:** The efficiency of the system specializes in how well the software utilizes scarce resources available to it such as CPU cycles, disk space, memory and bandwidth
- **Flexibility:** This system is thought to offer additional functions after its deployment such as offering portal forum system to class members and other additional requirements that may be envisioned. These elements are being raised from the beginning of the systems launch as it influences choices made during the design, development, testing, and deployment of the system
- **Portability:** The portability of the feedback system specifies the ease with which the software can be installed on all necessary platforms, as the expected platform is a web page then the system should have maximum portability as it is not just limited to either an android or IOS device
- **Integrity:** Integrity is a core requirement of the feedback system as it defines the security attributes of the system, certain restricting access features will be implemented as well as privacy of data to certain users thus protecting the privacy of data entered into the software

- **Reliability:** The reliability of the system specifies the capability of the software to maintain its performance over time. The software therefore must not be unreliable, as this software fails frequently. Certain tasks are more sensitive to failure which is also a consideration for this robust system
- **Scalability:** Again this software should be scalable in that it has the ability to handle a wide variety of system configuration sizes. The system should therefore be expected to scale up by increasing hardware capacity for example
- **Usability:** Ease-of-use requirements of this system are of paramount importance as they address the factors that constitute the capacity of the software to be understood, learned, and used by its intended users. This system is envisioned to be a simple and easy to use portal to provide anonymous feedback in the most supportive way to the user

Additional Non Functional Requirements

Comments for the Suggestion Box may be displayed in order of the most recent comment to the lecturer first. This capability is not a core functionality for the system to run, but would be beneficial for the lecturer to see if any new suggestions are available for their review.

Displaying the time and date is another capability the system may incorporate but is not a core functionality the system is to contain for day to day running of the Suggestion Box, it can be included as an additional feature.

Having the user's name and course the student is enrolled for displayed is again a requirement which is not necessary for the underlying platform but to aid the user in their navigation through the portal.

Design

Sollenberger (2012) discusses some important User Interface Design Fundamentals and does so discussing the use of a consistent visual layout and interface, this allows users to gain better understanding of how things work, thus 'increasing their efficiency'. The use of visual hierarchy also allows for a clear path through the organization and manipulation of words and pictures; this allows a clear path to understanding whilst 'reducing the appearance of complexity'. The designed system for the feedback webpage is to be designed using Ulster University's current colour pallet and logo branding. Clear concise labelling will be a part of this engaging webpage for actions contained in a succinct user interface.

The designed interface should be easily maintained and any additional updates or new features should be added during the times the webpage may not be available to users (as part of the non functional requirements).

As the User Interface (UI) Design focuses on anticipating what users might need to do it ensures that the interface is easily accessible and elements are understood. UI therefore brings together concepts from interaction design, visual design, and information architecture.

The interface design for the feedback webpage will avail of input controls, such as buttons, text fields, check boxes and dropdown lists whilst also including informational components such as message boxes and icons as well as notifications for the university module coordinator to receive notifications on messages sent to him/her.

Problem Outline

Currently in Universities there is not an effective means of communication for students to provide feedback or voice concerns to their tutors in an anonymous controlled environment. It can be difficult for students to provide feedback as the current ways include emailing, filling out feedback reports or via a nominated class representative; these raise concerns of not being anonymous, being completed in time pressured environments at inconvenient times or issues may not be raised and in a constructive manner by a second party respectively.

Alternative systems are available to provide feedback such as 'SuggestionOx' online where a web address can be posted and feedback generated and emailed anonymously to the lecturer who is ultimately in control of the feedback. But this platform is not platform specific to University students. The generated Suggestion Box platform aims to allow university students to sign in and register using their university credentials and view user specific information relative to their 'course' and 'modules' they undertake. Such data is held within a database and can be updated/added to with the new registration of users and the generation of comments by users (students). The platform aims to allow the lecturing staff the ability to login and view any new comments relative to their faculty and modules they teach, and display any newly generated comments by the students which are stored within the Database. As an admin, capabilities of an overview controlled nature can supervise the Suggestion Box webpage from any illicit activity.

User Interface Design

The graphical user interface of the Suggestion Box platform has evolved with the goal of being simple, intuitive platform with a consistent flow. Design aid was aligned with Shneiderman's 8 'golden rules' of interface design as shown below; (UW Faculty, 2014).

Ben Shneiderman's

Eight Golden Rules of Interface Design

- 1. Strive for consistency**
- 2. Enable frequent users to use shortcuts**
- 3. Offer informative feedback**
- 4. Design dialog to yield closure**
- 5. Offer simple error handling**
- 6. Permit easy reversal of actions**
- 7. Support internal locus of control**
- 8. Reduce short-term memory load**

Shneidermans 8 'Golden Rules' of Interface Design

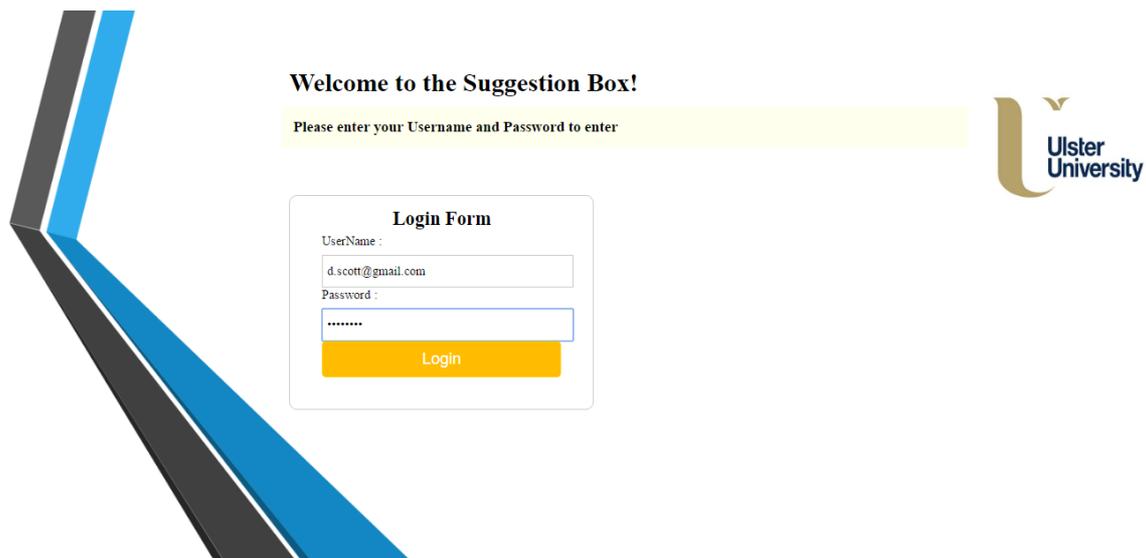
Navigation

By implementing the use of Navigation Bars the user can simply navigate through the website by clicking submit or by clicking the required section they wish to enter, for example: when a student enters their suggestions and is looking to submit the message. This results in the submission of the relative information and a notification to the user that comments have been successfully submitted. It then inserts these suggestions to the desired section of the database.

Each link is defined as a text hyperlink with the relevant section title being displayed once the user has navigated to their desired section.

Suggestion Box Development:

After creating and developing a database as well as gathering the required files/applications necessary for the development of the Suggestion Box webpage, the developer has created a login for the user to successfully submit their credentials and login to the system, using their username and their unique password. This allows for a redirect to a new webpage in which their forename is displayed as well as their Course along the top and then a dropdown menu so the student can select their desired module from the list of modules they are enrolled for. The student will then have the option to write suggestions in the comment box and submit the comments relative to the module they have selected. The student has the option to logout of the system after comments have been submitted or during, as they may change their mind and decide not to leave feedback at that particular point in time.



Welcome to the Suggestion Box!

Please enter your Username and Password to enter

Login Form

UserName :
d.scott@gmail.com

Password :

Login

Ulster University

Depending on the user type the different user (Student, Lecturer or Admin) may be redirected to their unique developed page. This redirection allows for all of the users to login through the same welcome screen and once their unique username and password have been entered they will be redirected accordingly.

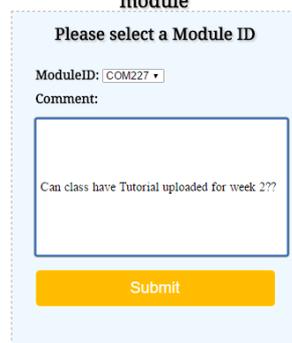
A separate webpage has been developed linking as above to the database for the submission of comments to the lecturer for the student. The student can submit a message to the lecturer for a desired module. This data is currently added to the database.



Welcome : *David*
You are studying: *Software Engineering*

Log Out

Please leave a suggestion for your chosen module



Please select a Module ID

ModuleID: COM227

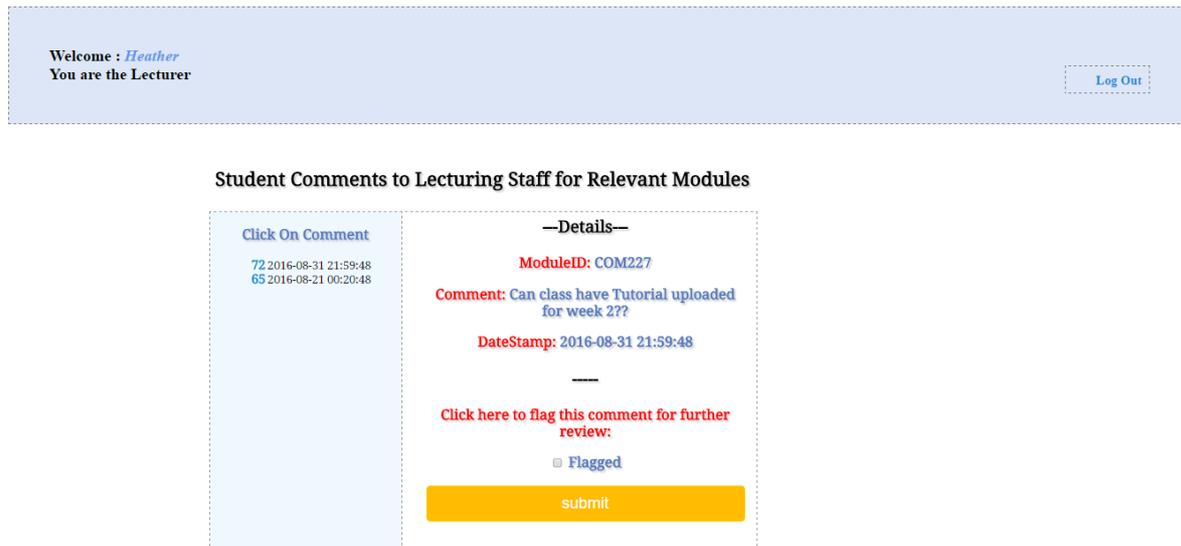
Comment:

Can class have Tutorial uploaded for week ???

Submit

The comments are uniquely displayed for the lecturer who is a module coordinator of that module. In the developed system the developer has allowed for the most recent comments to be displayed first to the user alongside their unique comment ID and the date in which

the comments were posted. Once the lecturer selects the comment they wish to view, the lecturer views the Module ID, Comment and Date Stamp. The lecturer can then review the suggestion and take action, if necessary. Below this the lecturer has the option to flag any comment they feel is inappropriate or would require further review from the admin of the Suggestion Box.



As the above screenshot displays, the lecturer's name is displayed alongside their profession and the suggestions can be selected from the panel along the left hand side of the webpage. From this selection, comments can be displayed alongside the module and the date and time stamp.

When an admin logs in to the Suggestion Box they are redirected to the homepage for the admin. This homepage displays the admin's name alongside a message that the user logged in is the system admin. The admin has the capability of seeing all comments submitted to all lecturers registered in the system and stored in the database. The admin can select a comment ID which again is displayed in chronological order which is displayed alongside the corresponding timestamp.

Once the lecturer has selected a comment to view they have the capability to see the comments alongside the date and module ID. As the admin has the position of overseeing the complete system they have also the function to view who the comments are from, and

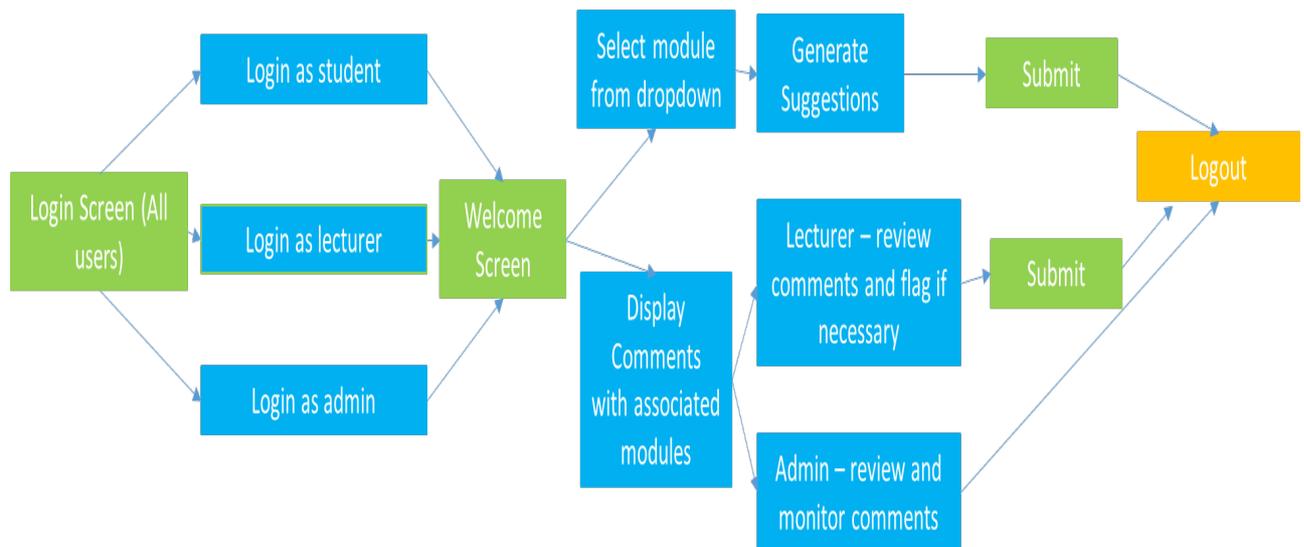
are hence provided with the username and the user ID of the student who submitted the comments. Comments that are flagged are also noted to the administrator.



Student Comments to Lecturing Staff

Click On Comment	—Details—
72 2016-08-31 21:59:48	UserID: B0010
71 2016-08-31 21:57:54	Name: DavidScott
70 2016-08-31 18:33:22	Flagged: No
69 2016-08-31 16:21:47	ModuleID: COM227
68 2016-08-31 16:20:13	Comment: Can class have Tutorial uploaded for week 2??
67 2016-08-31 16:14:49	TimeStamp: 2016-08-31 21:59:48
66 2016-08-21 00:29:46	
65 2016-08-21 00:20:48	
64 2016-08-21 00:20:12	

The flow chart below shows the developer's process flow for the development of the Suggestion Box. The developer has tracked the development of each of the below stages and has implemented the functionality of the complete flow diagram below. This development has allowed for the creation of a user friendly platform for the students to message tutors in a safe user friendly environment and the lecturers to review suggestions. If lecturers would like to flag any comments they can do so and the admin may review and take further action if necessary.



Development Timeline for the Suggestion Box

Final System:

Below is a prototype website design that was aimed to act as a template for the developer to create the finalised user system for students to effectively deliver anonymous feedback to their lecturers.

The first diagram shows what the student and lecturers will be welcomed with once they navigate to the student suggestion webpage. The user may enter their username and their associated password and then click the 'Submit' button. Once the user enters this data, based on their user Type, they will be redirected to the appropriate webpage location.

Student

The second diagram shows the location for a student who logs in to the Suggestion Box if the user credentials are correct after data validation is performed. If the data is incorrect the user will be prompted for new details to enter.

Once the student has logged into the system they will be welcomed by their name displayed and the Course that they are enrolled on. The student will have the option to logout and return to the login page at any stage of their use of the Suggestion Box. Below the welcome information the user has the option to select a module from the list of modules they are enrolled for in relation to the course they are studying. The student can select a module and

continue to provide feedback or may logout or return to the homepage if they change their mind.

After the student selects their module they can fill out feedback for their lecturer and submit. This information will be stored in the database where the lecturer can view feedback but does not have the capability to view who the feedback is from. The dropdown can be seen below in image 2 and the suggestion Box and submission can be seen in the third image below.

Lecturer

If the lecturer enters their username and password into the first screen below they can enter the Suggestion Box and view any corresponding comments relative to the modules they are the module coordinator of.

Once the lecturer has successfully logged into the system they can select a Comment ID which is in chronological order and view the comment as well as the Date stamp and the Module ID. The module ID is displayed because a Lecturer may teach more than one module and this feature is fundamental so the lecturer is aware of what module the suggestion is referring to. The date of the comments allows for the most recent comments to be displayed to the lecturer first. This can be seen from diagram 4 below, where the relative suggestions are displayed to the right hand side of the comment ID. Once the lecturer has reviewed their Suggestions they may logout of the Suggestion Box.

Admin

When the system Administrator logs onto the Student feedback portal they have a view similar to that of the lecturer. The main difference is that the Admin has the capability of seeing the details of the student who submitted feedback to their lecturer. This function has been provided as a safety precaution to monitor inappropriate behavior on the Suggestion Box. Lecturers may flag comments to the admin that they feel are inappropriate or require further review. The admin therefore is able to see the same contents as the lecturer, including the Comment ID, comment, Date Stamp and Module ID, as well as the Students Name and Student ID. This demonstration can be seen from the fifth diagram below.

The final design for the Suggestion Box is a Student Feedback survey. This element of the webpage allows students to provide feedback on stated aspects of a module and can be seen in the sixth diagram below.

Welcome Student Feedback Portal



Login

Username

Password

- ✓ 100% Anonymous
- ✓ Private & Secure
- ✓ Easy to use

The Student Feedback portal is an anonymous online suggestion box that gives your tutors information they can act on today

Welcome **David Scott**
You are studying **Software Development**

[Logout](#)



Select your module

Dropdown ▾

- COM 557 (8629)
Computer Hardware. 2015 – 16.
- COM 558 (8630)
Profes Software Development I. 2015 – 16.
- COM 808 (8634)
Operating Systems Fundamentals. 2015 – 16.

Welcome **David Scott**
You are studying **Software Development**

[Logout](#)



COM 558 (8630)
Profes Software Development I
2015 – 16

Message

[Submit](#)

Comments Successfully Submitted

Welcome **Brenda Fyfe**
You are a **Lecturer**

[Logout](#)



Select a Comment ID to view Student Comments

12
14/06/2016
9
01/06/2016
4
13/05/2016

Details

Module ID: Com225

Comment: Can we have assistance with the tutorial?

Time Stamp: 14/06/2016

Click to flag a comment then Submit

Flagged

[Submit](#)

Welcome **Dorris McHale**
You are the **Admin**

[Logout](#)



Select a Comment ID to view Student Comments

12
14/06/2016
11
01/06/2016
10
13/05/2016
9
11/05/2016

Details

User ID: B0011

Name: Kelsey Patton

Module ID: Com227

Comment: Sample answers to class test in week 6?

Time Stamp: 11/05/2016

Welcome **David Scott**
You are studying **Software Development**

[Logout](#)



Take the Survey
Profes Software Development I

Teaching
My Lecturer has made the subject interesting
My lecturer is good at explaining new concepts
The course is intellectually stimulating

Assessment & Feedback
Criteria used in marking is clear in advance
Feedback is prompt (within 3 weeks) and is detailed
Feedback helped me clarify what I did not understand

Academic Support
Support & Advice is adequate
Staff are easily contactable/approachable

Any additional comments

1	2	3	4	5	N/A
<input type="checkbox"/>					
<input type="checkbox"/>					
<input type="checkbox"/>					
<input type="checkbox"/>					
<input type="checkbox"/>					

Please select one box
1 = Strongly disagree
2 = Disagree
3 = Neither Agree nor Disagree
4 = Agree
5 = Strongly Agree
N/A = Non Applicable

Comments

[Submit](#)

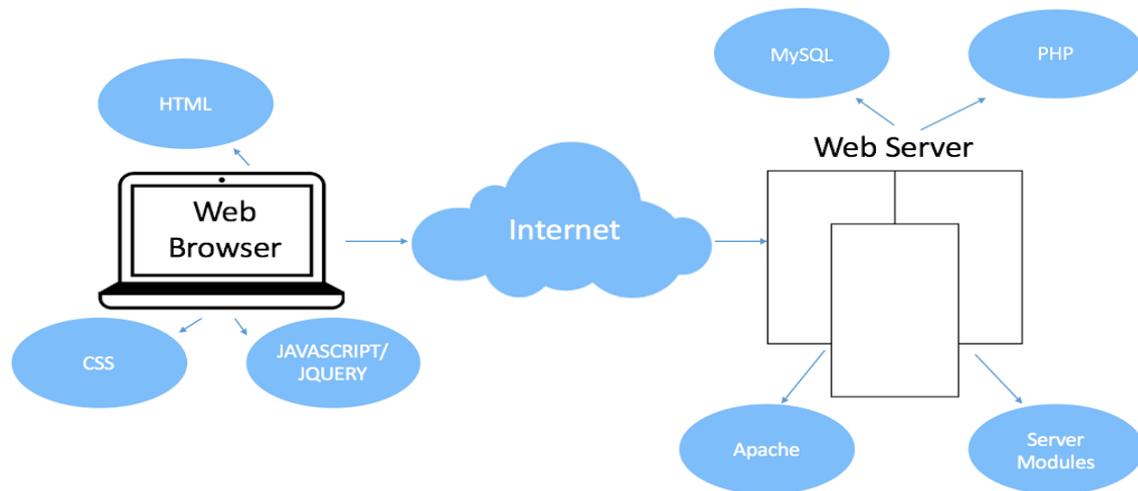
Architectural Design

The developed system has been created using a variety of different platforms and technologies which coherently work alongside each other. This functionality is a key area for developing and creating the final product for both the students and lecturers to communicate effectively. The following section defines the components and their relationships for the proposed application.

Client/Server Relationship:

Servers are instrumental in the management of databases and file applications. Web servers act as a mechanism to control access, deliver requested information from resources using and availing of applications which it displays to. A web server stores web content and delivers this data to the user when it is prompted to deliver. For the Suggestion Box, data held in the database such as the user comments will need to be displayed to the lecturing staff so that they can see comments specific to their modules and make changes, therefore having a client/ server relationship is paramount for the delivery of the system.

In this system a client is the user interacting with the server. A desktop PC or even mobile devices are examples of a client within this relationship. For this relationship to be maintained the client relies on the delivery of requested information from the server in order for its tasks to be completed. Users as such would access the server through the PC or mobile device through browser software and display the requested web pages which consist of text files written in programming languages such as HTML, CSS, PHP and JavaScript. The files are accessed by a unique web address so that they can be displayed. See the figure below which displays the client server relationship.



Client Server Relationship for the Suggestion Box

Database Design:

The designed and created database for the Suggestion Box allows for the storage retrieval and organisation of data and was generated with the aid of an Entity Relationship Diagram (ER) diagram. This ER representation allows for a visual representation of the information required for storage and the establishment of the relationship between the tables. See the below figure which shows the relationship between the 4 tables.

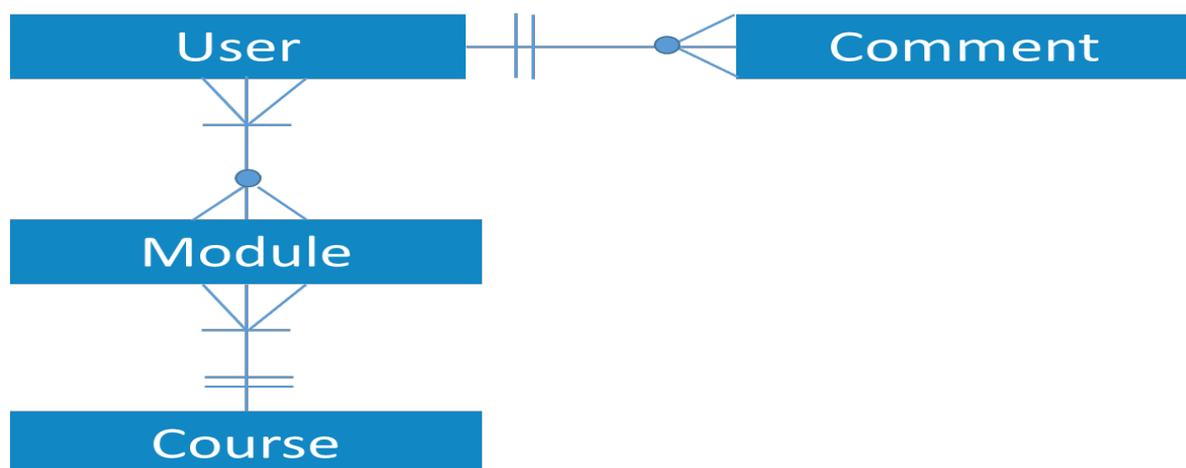


Figure to show the relationship between the Database tables

The created database currently consists of 4 tables including a user table, course, module and comment table. The tables will each be analysed in the below section.

Each of the displayed tables has a unique identifier as well as a unique name to identify each of the tables within the Database – Suggestion Box. Within each entity attributes have been assigned which can be described as properties/characteristics of each entity. Within each table there is a primary key which is used to uniquely identify individual tuples in the Suggestion Box entities/tables. Having such features adds to the integrity of the data as data is not 'Null' and there is no duplication of data held within the database.

With the assignment of the relevant primary keys comes the allocation of foreign keys within the database entities, this allows for relationships between the data to be established. The foreign key of the module table for example would be the primary key of the course table. Incomplete/inaccurate data is avoided as every Non Null foreign key must match an existing primary key to preserve referential integrity of the data held within the database and the relationships between the 4 unique tables has been created in the Php MyAdmin database.

User Table

The user Table consists of all of the information needed for the login for the three users and holds information such as the user's forename, surname and their unique student ID that it provides to them when they begin university and acts as a unique identifier for the student. This student ID acts as the primary key for the user table. In the user table fields including the username (email address) and their unique created password are stored. The user table also contains data for the student's course ID that they are enrolled on, and finally it contains the numerical data for the user's type. For example: a student is of user type 1 and a lecturer is of user type 2 whilst the admin is of user type 3. This data is fundamental in the development of the Suggestion Box as it allows for the redirection of users and the display of data for each of the specific users of the Suggestion Box as multiple user data may be stored within the database.

Module Table

The Module table contains only 4 unique rows which include the Module ID, Module Name, Course ID and User ID. The Module ID acts as the primary key for the module table, as it is a unique identifier for the specific modules a user may enrol for. The module name is included to provide the user a clearer definition for what each module refers to, for example: 'Introduction to accounting'. As a particular user (lecturer) is involved in the teaching of a specific module the user ID is linked as a foreign key to the user table to provide this tabular link. The course ID is also included as a foreign key from the course table as it links to this table so that information can be shared and transferred through this linkage.

Course Table

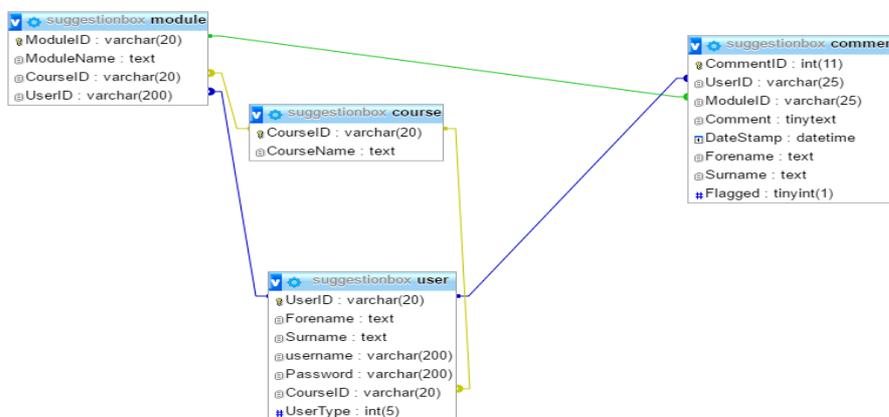
The course table contains information relative to the courses available for users to be enrolled on. This table contains a primary key as the CourseID and information about the course name, for example Accountancy, and the Faculty ID as a foreign key.

Comment Table

The comment table stores all the required information for the student to provide suggestions to their selected module coordinator. This table consists of a unique comment ID, which is an automatically incremented value for the comments which are stored within the database. This comment ID is then used as a unique identifier for the lecturer to display the comments or for the admin to display user comments for their review. The user ID and module ID act as foreign keys as they are the primary keys in the user table and the module table respectively. The comment and the date stamp are further fields which are represented in the Comment table. The comment is a text field which stores the comments that the student writes for the lecturer to see and review. Whilst the date stamp is automatically generated when a comment is submitted to the Suggestion Box. This date stamp includes the time at which the comment is submitted. When the lecturer views the comments they are ordered by the newest comment first so that the lecturer can see the newest comments at the top of the system when they log in. The student surname and forename is taken from the user table as their name can be displayed for the admin if this

user is required to review any flagged comments. Lastly, within the comment table there is a flagged section which holds Boolean values: if a comment is not flagged it will hold a value of false and if the comment is flagged then this value will change to true. This will allow the admin to review comments that are flagged as inappropriate or that the lecturer would like a further review on.

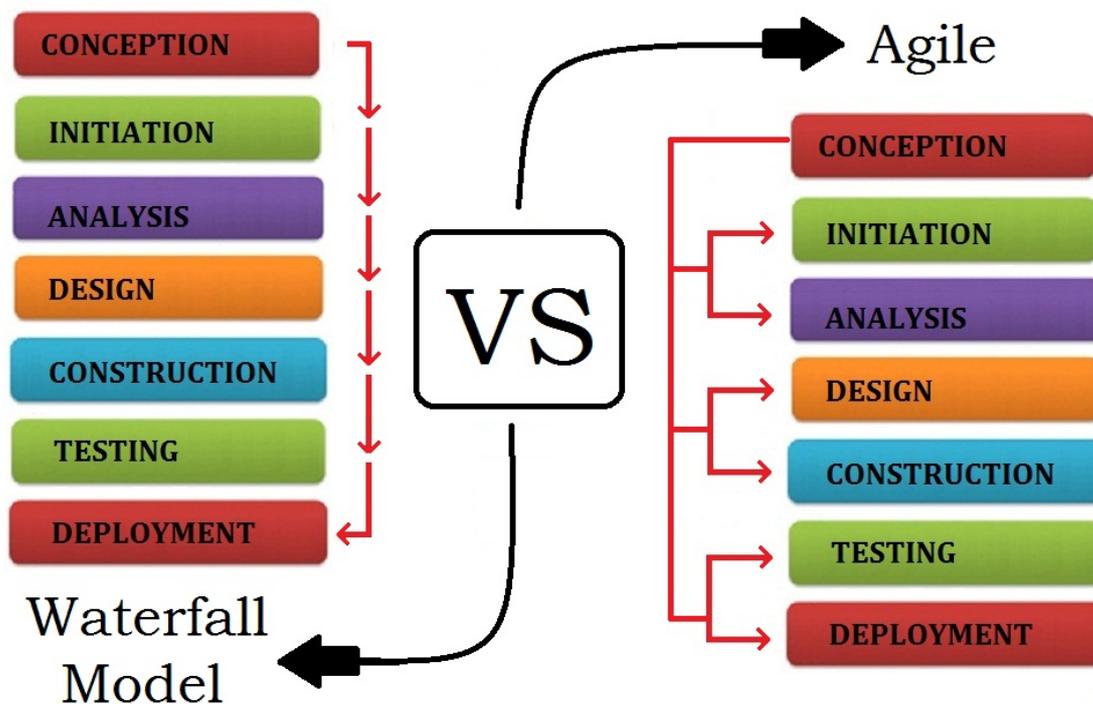
The diagram below shows the design view of the created Suggestion Box database, showing each table/entity being established as well as the primary keys and the relationships that exist between each table.



Updated Database Design View

Implementation

SDLC (2012) discusses the benefits of implementing 'Agile Framework' development over the 'Waterfall' approach. The Waterfall approach to software development is based on the 'predictability process' whereas Agile development focuses on 'adaptability and response time to changing requirements'. Agile development is beneficial to the Suggestion Box as it allows for the recurrences of work patterns as modifications can be made to completed stages/cycles in Agile development which is not part of Waterfall development, as can be seen from the comparisons below.



Source <https://www.sdmc.ws/agile-vs-waterfall/>

For the Suggestion Box, implementing agile development allows for backward scalability as the developer can review and amend decisions and implementations under previous stages, such as the analysis and design stages. This flexibility is not as widely acceptable in the Waterfall approaches as bug/error checks can be made throughout instead of at the end of the development module. The Agile framework allows for greater flexibility for the creation

of the Suggestion Box as Waterfall does not allow for any modifications to be made once the module has been completed.

Overall Agile development improves the quality of the software package as testing begins from day 1, thus reducing risk as feedback can be received and amendments can be made as there is a clear vision of what the software package is to be developing which is why the developer has decided to implement this development strategy.

It is envisaged that Agile Methodology framework will be employed throughout the duration of this development as the waterfall framework leads to poor quality of testing and thus encourages more risk within a project as it treats each individual stage as a fixed stage rather than not knowing whether the correct system is being created until the end of the stage when it would be too late to make any changes. Agile development therefore allows for better quality and visibility from the outset in the flexible environment allowing changes to be made without great expense as the building of the website is properly tested and created to a high standard. Having short term development sprints the implementation of the webpage is segmented instead of one large project delivery in Waterfall approach. This allows for the revisit of stages and testing before moving to the next project sprint. The developer has also implemented an agile development frame as this is what is best suited to the developer from past projects and developments as well as the developer being a solo individual to develop the webpage.

Development Steps

The breakdown of stages of the proposed solution will be portioned into the areas below:

1. Analysis and Design

The primary stage of the development involves problem identification and research of potential solutions as well as alternative systems that aim to provide a possible solution to provide anonymous feedback to lecturers from students. Investigation of alternative systems will need to be performed such as those alternative systems offer. After an analysis has been performed a design of the proposed solution can be generated in which the user interface will be created and the platform built

2. Coding/Building

Coding the solution is the second stage of the development steps as a prototype platform will be created using agile methodology availing of PHP and MySQL as the tools for creating the database with Notepad ++

3. Implementation (to include testing)

Testing will be an ongoing process but will be formally performed in stage three of the development process. Errors and user reports will be checked for and tested whilst a survey and focus group will be comprised to further test the product and thus provide feedback on the created platform

4. Software Release

After feedback and testing has been completed any additional changes can be incorporated into the system whilst adhering to the project risks discussed in the Professional Issues. The released website will primarily be available to Ulster University

5. Future Implementations

Future developments may be incorporated and are welcome in the system to make the system as user friendly as possible, suggested improvements from focus group testing will be considered in this stage. Site maintenance will need to be adhered to as site traffic increases

Development Tools

XAMPP

Cross-Platform, Apache, MySQL, PHP and Perl is used by the developer to create a local web server for testing and deployment purposes. As most web server deployments use the same components XAMPP avails of this allows transitioning from a local test server to a live server extremely easy as it shows a real world example of how the website looks throughout its

development. XAMPP avails of a 'simple, light-weighted Apache server' that makes it 'extremely easy' for the developer to create a local http server (Quora, 2016).

As Apache is a free public domain open source web server, the developer has the opportunity to develop, store, retrieve and deliver information to the user (Student, Lecturer or Administrator) immediately upon request. HTTP files utilise commands such as POST and GET (as can be identified by the code developed for the Suggestion Box). These commands are read by the server allowing for communication between the client and the server (APACHE Software Foundation, 2016). XAMPP avails of PHP My Admin to create a the database and Apache to act as a local host for the webpage to hold the information required for the database and website development.

Programming Languages: PHP, SQL and JavaScript:

PHP is a server scripting language implemented by the developer to create and build the Suggestion Box. PHP allows for the creation of a dynamic website with database integration. Developed programmes can be written and run by the server and as an important aspect the connection is achieved between the database and the server. PHP is embedded within HTML as it allows the developer to add features otherwise not achievable by HTML itself.

When code is executed by the server the out coming result is then output to the client and displayed on the client's browser in HTML format. One such advantage of availing of the use of PHP is that all pages can be stored and easily accessed within the database and requested/delivered when required/requested without local memory being consumed if the data is stored locally.

W3schools (2016) discusses the benefits of using PHP for website development as PHP is implemented in the Suggestion Box development it allows a system to add, delete and modify data held within the database. Users can control user access which is a core functionality of the Suggestion Box as it is a platform designed to be secure and provide anonymous feedback to lecturers by their respective students. PHP also allows for the creation, opening, reading and closing of files on the server and has the capability to 'collect form data' as can be seen from the development of the Suggestion Box.

SQL is a structured query language used in relational dataset management systems, allowing users to access and manipulate databases whilst using a server side scripting language such as PHP. SQL allows for the Suggestion Box to retrieve the data required to make the user interface as creative, simplistic, user friendly and intuitive as possible. SQL queries can be created and inserted to perform tasks such as updating or retrieving data held within the database.

JavaScript is a cross platform object orientated programming language which is implemented in the creation of the Suggestion Box online web portal. JavaScript allows for the 'creation of interactive effects' within the web browser itself. For the purposes of the Suggestion Box the users can populate websites with 'dynamic content' such as adding suggestions to a text box and submitting these comments, it also allows for 'interactive documents and imagery' (Grossman, 2010). The use of JavaScript can be aligned to the validation checks from inputted information into the website in the user login to be stored in the database to make sure it conforms to what the database expects, for example; both a username and a password must be inserted for the user to login to the Suggestion Box.

HTML and CSS:

HTML (Hyper Text Mark-up Language) is the primary basis of the programming language used in the creation of the Suggestion Box webpage and it enables developers to define the structure and content of the text to be displayed via various tags and attributes. In the Suggestion Box development developed can also define where files are stored and their location for access. Notepad++ is used to conduct the development as a text platform; alternative platforms such as Adobe Dreamweaver may be used. Plain text editors can be considered as disadvantageous as coding from early stages can be slow for development. Development by Notepad++ provides the ability to generate the required webpages faster as a limited knowledge base is required in HTML.

CSS is short for 'Cascading Style Sheets', and is the preferred way for setting the 'look and feel of a website'. Colouring, size and position of text define the style of the document while the HTML files define the content and how it is organised. The cascading element of CSS

files relates to the styles applied to parent files will also apply to the children elements. The benefits for the Suggestion Box to be developed using CSS is that coding required to create the website is minimised, and it is essential for the functionality of the browser to achieve multiple browsers which can be interconnected. (W3C Initiative, 2016)

Cycle Process Implementation

Agile principles are related to the relationship and communication between developers and users. The end users of the Suggestion Box aim to be students who provide suggestions to their lecturers.

The following Agile principles were applied in the implementation of the website:

- Working software is the primary measure of progress: website first implemented on web host with only a few webpages then continuously upgraded with additional webpages and features meeting more requirements
- Welcome changing requirements, even late in development: late implementation of the Suggestion Box

The implementation process was based on the Agile software development model by continuously repeating the following three step cycle:

1. Analysing: identification of requirements or improvements to be implemented were made by prioritisation and estimating the quantity of coding and time required
2. Developing: developing programmes and methods algorithms; coding in HTML, CSS, PHP as required; creating/updating database tables and queries and processing pictures
3. Testing: new implemented programmes and features and their inter relations with features ones were tested

The table below presents a summary of the different cycles that were exercised for the implementation of the Suggestion Box website in chronological order.

Sprint	Implementation	Sprint Length / Date
1	Create Database for four tables including Comment, User, Module and Course	2 weeks 23/04/16 – 07/05/16
2	Homepage including Ulster University Logo, and Login fields for insertion of user data. Background also inserted content.	1 week 23/05/16 – 29/06/16
3	Redirect to each of 3 user pages	1 week 30/05/16 – 05/06/16
4	Navigation Bar – to display user name and Course	3 Days 06/06/16 – 08/06/16
5	Student – Comment Box to insert and submit a Suggestion to be stored in the database	1 week & 4 days 09/06/16 – 19/06/16
6	Lecturer – retrieve specific comments relative to modules associated with lecturer	2 weeks 20/06/16 – 03/07/16
7	Admin – display all comments	Included in Sprint 6
8	Student – display a dropdown to select modules enrolled for in course	2 weeks 04/07/16 – 17/07/16
9	Lecturer – flag a comment to the admin which requires further review by the admin	1 week & 3 days 18/07/16 – 27/07/16
10	CSS styling for text boxes and visual displays	4 days 28/07/16 – 31/07/16
11	Logout and return to homepage	Included in Sprint 3

Implementation Cycles

The below section will discuss the development stages (Sprints) implemented by the developer to create the Suggestion Box webpage.

Sprint 1

The first sprint in the Development of the Suggestion Box was the development of the Database. There are 4 tables in the database. For the developer the Php MyAdmin had to be downloaded and installed and then the database design had to be created to incorporate all the specific fields and links necessary for the storage of and manipulation of data held in the database. The structure of the database as well as the specific 4 tables has been included below.

Table	Action	Rows	Type	Collation	Size	Overhead
comment	★ Browse Structure Search Insert Empty Drop	3	InnoDB	latin1_swedish_ci	16 KiB	-
course	★ Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	16 KiB	-
module	★ Browse Structure Search Insert Empty Drop	3	InnoDB	latin1_swedish_ci	16 KiB	-
user	★ Browse Structure Search Insert Empty Drop	8	InnoDB	latin1_swedish_ci	16 KiB	-
4 tables	Sum	16	InnoDB	latin1_swedish_ci	64 KiB	0 B

Structure of the Suggestion Box Database for the 4 tables

The Comment Table is designed to store the unique reference ID of each comment in the database, the User ID of the student, the Module ID, the specific comment/suggestion as well as the time and date the comment was submitted at. The developer has also included a copy of the student's name to be stored alongside their comment which is not displayed to the lecturer and is only available to the admin of the Suggestion Box. If the comment is flagged or not (a Boolean value) is also included in the database.

+ Options									
		CommentID	UserID	ModuleID	Comment	DateStamp	Forename	Surname	Flagged
	Edit Copy Delete	66	B0011	COM225	Class struggling with week 2 tutorial!	2016-08-21 00:29:46	Kelsey	Patton	0
	Edit Copy Delete	65	B0011	COM227	Can we have a revision class before the final exam...	2016-08-21 00:20:48	Kelsey	Patton	0
	Edit Copy Delete	64	B0010	COM225	The class is struggling with the week 2 Tutorial!	2016-08-21 00:20:12	David	Scott	0

The Course Table contains the unique Course ID as well as the Course Name which is stored for all the courses available to students.

- Options			CourseID	CourseName
	Edit Copy Delete		PY2016	Pharmacy
	Edit Copy Delete		SE2016	Software Engineering

The Module Table below shows the unique Module ID as well as the module name of each of the modules available within a specific course. The User ID of the module coordinator (of user Type 2) is also stored in the Database in the Module Table.

+ Options		ModuleID	ModuleName	CourseID	UserID
<input type="checkbox"/>	Edit Copy Delete	COM111	Maths	SE2016	A0025
<input type="checkbox"/>	Edit Copy Delete	COM225	Introduction to Computing	SE2016	A0025
<input type="checkbox"/>	Edit Copy Delete	COM227	Computer Hardware	SE2016	A0026

The User Table includes all the necessary information to be stored about each of the specific users who are registered to use the Suggestion Box. It contains a user's unique User ID and their Forename as well as their Surname. The user table also contains their unique username which is the student's unique email address which has a password associated with it (this data is inserted to log into the Suggestion Box). A Course ID is included for the specific course the student is enrolled in and the User Type has been developed by the developer to act as a redirect function based on the user being logged on as a student, admin or a lecturer.

+ Options		UserID	Forename	Surname	username	Password	CourseID	UserType
<input type="checkbox"/>	Edit Copy Delete	A0025	Brenda	Fyfe	b.fyfe@gmail.com	password	SE2016	2
<input type="checkbox"/>	Edit Copy Delete	A0026	Heather	Bradley	h.bradley@gmail.com	password	SE2016	2
<input type="checkbox"/>	Edit Copy Delete	B0010	David	Scott	d.scott@gmail.com	password	SE2016	1
<input type="checkbox"/>	Edit Copy Delete	B0011	Kelsey	Patton	k.patton@gmail.com	password	SE2016	1
<input type="checkbox"/>	Edit Copy Delete	B0012	Aaron	Anderson	a.anderson@gmail.com	password	SE2016	1
<input type="checkbox"/>	Edit Copy Delete	B0018	Melissa	Smith	m.smith@hotmail.com	password	SE2016	1
<input type="checkbox"/>	Edit Copy Delete	B0020	Claire	Hull	c.hull@gmail.com	password	SE2016	1
<input type="checkbox"/>	Edit Copy Delete	C0010	Dorris	McHale	d.mchale@gmail.com	password123	SE2016	3

Sprint 2

The homepage allows the users to login to the Suggestion Box using their unique User ID (which is the user's email address) and user password.

```

if (isset($_POST['submit'])) {
    mysql_connect("localhost", "root", "step123hen") or die(mysql_error());
    mysql_select_db("suggestionbox") or die(mysql_error());

    $username=$_POST['username'];
    $password=$_POST['password'];

    $query= "SELECT * FROM user WHERE username='".$username."' and password='".$password.'";
    // echo $query;
    $result=mysql_query($query) or die ("error: ".mysql_error());

    if (mysql_num_rows($result)==1) {
        session_start();
    }
}

```

If the user enters their data and clicks the submit button displayed on the webpage the database will be connected to. The user's details will be searched for in the database and if the details are found then the session will start with the unique user details for the Suggestion Box.

Sprint 3

For Sprint 3, the developer aimed to create a redirect function for separating the three different users to access their specific user data specific user type. As can be seen from the User Table above in a final column the User Type is set for each of the users registered for the Suggestion Box, including; Student, Lecturer and Admin.

```

if ($row['UserType']==1) {
    $username=$row['username'];
    $forename=$row['Forename'];
    $surname=$row["Surname"];
    header("location: profile.php");
}
elseif ($row['UserType']==2) {
    $username=$row['username'];
    $forename=$row['Forename'];
    $surname=$row["Surname"];

    $_SESSION["username"]=$username;
    $_SESSION["Forename"]=$forename;
    $_SESSION["Surname"]=$surname;

    header("location: lecturer.php");
}
elseif ($row['UserType']==3) {
    $username=$row['username'];
    $forename=$row['Forename'];
    $surname=$row["Surname"];

    $_SESSION["username"]=$username;
    $_SESSION["Forename"]=$forename;
    $_SESSION["Surname"]=$surname;

    header("location: admin.php");
}
}

```

The code above shows how the developer implemented the code to redirect the users to their specific user pages. For example; User Type 1 = Student, User Type 2 = Lecturer and User Type 3 = Admin. From the previous sprint (Sprint 2) and using the session data the user table is scanned to check if the user type field contains the value 1, if it does contain this

then the user will be redirected to the 'profile.php' page – which is the welcome page for the Suggestion Box for the student.

If when the table is searched and the user type does not contain the value 1 but instead contains the value 2, then this means that a lecturer is logging in to the Suggestion Box. If the lecturer is logging in, then they will be redirected to the 'lecturer.php' file which is the welcome screen for the lecturer after logging in to the Suggestion Box.

Lastly, using the 'else if' function, if a user type contains the value 3 stored associated to the user in the database, then the admin will be redirected to the 'admin.php' page on the Suggestion Box.

Sprint 4

Creating the navigation bar was the 4th sprint in the creation of the Suggestion Box for the developer. This navigational aid welcomes the user to their welcome screen and is displayed on each of the 3 user's homepage after being redirected from the login.

This navigational aid welcomes the user with their name which is stored as a session variable and for the student it displays the course they are enrolled on, whilst for the lecturer and the admin it displays their user level, i.e. lecturer or the system admin.

The screenshot below of the Notepad ++ file shows the display of the name and course for the student.

```
<b id="welcome">Welcome : <i><?php echo $login_session; ?></i></b><br />
<b id="title"> You are studying: <i><?php echo $course_name; ?></i></b>
<b id="logout"><a href="logout.php">Log Out</a></b>
```

Sprint 5

Sprint 5 for the developer included the creation of the Suggestion Box itself where comments/suggestions could be submitted by the student in the 'profile.php' page in Notepad ++. The first image below shows the creation of the text box.

```

<!-- <input class="input" name="ModuleID" type="varchar" value="<?php echo $ModuleID; ?>" -->
</label>Comment:</label>
<input class="inputcomment" name="Comment" type="text" value="">

```

The second image shows the insertion of the suggestion/comment after the user has successfully clicked to submit their suggestions. All of the relevant fields required to populate the database in the Comment Table are included and data is inserted using the 'INSERT INTO' query below. It should be noted by the developer that all SQL queries were tested in MySQL PHP MyAdmin before being brought into the coding for the Suggestion Box.

```

if($UserID != '' || $ModuleID != '' || $Comment != ''){
//Insert Query of SQL
$query = mysql_query("insert into comment(UserID, ModuleID, Comment, Forename, Surname) values ('$UserID', '$ModuleID', '$Comment', '$login_session', '$Surname'
echo "<br/><br/><span>Your suggestions have been delivered successfully!</span>";
}
else{
echo "<p>Insertion Failed <br/> Some Fields are Blank...!!</p>";

```

Sprint 6

For the lecturer to have their module specific comments displayed to them that were submitted by the student for the module that they selected from the dropdown the following code was implemented. A list of all the Comment ID's for the unique comments were displayed alongside the date the comments were submitted so that the lecturer can select from this list the comment they wish to view.

```

$query = mysql_query("SELECT CommentID, DateStamp FROM comment INNER JOIN module ON comment.ModuleID =
module.ModuleID INNER JOIN user ON module.UserID = user.UserID
WHERE username = 'user_check' ORDER BY DateStamp desc;", $connection);
while ($row = mysql_fetch_array($query)) {
echo "<b><a href='\"lecturer.php?id={$row['CommentID']}'\">{$row['CommentID']}</a></b>";

```

As from the image above, the lecturer can select the Comment ID displayed to view the comments. The SQL statement was inserted to select the correct data to be displayed to the lecturer in an array.

Below is a screen-shot of the code the developer created to display the suggestion, this is displayed after the Comment ID has been selected and retrieves the information variables.

```
if (isset($_GET['id'])) {
$id = $_GET['id'];
$query1 = mysql_query("select ModuleID, Comment, DateStamp from comment where CommentID=$id", $connection);
while ($row1 = mysql_fetch_array($query1)) {
```

As the above code displays, the developer has allowed for the selection of the Module ID, the suggestion and the date stamp to be displayed to the lecturer when they select the Comment ID they wish to view.

Finally, for this 6th sprint the display of the above data for the Lecturer is presented by the below code.

```
<?php echo $row1['ModuleID']; ?>
```

```
<?php echo $row1['Comment']; ?>
```

```
<?php echo $row1['DateStamp']; ?>
```

Sprint 7

The seventh sprint in the development of the suggestion box was the display of all the user comments to the admin. The developer created this in a similar fashion to the development of the lecturer suggestions above in Sprint 6.

```
$query = mysql_query("select CommentID, DateStamp from comment ORDER BY DateStamp desc", $connection);
while ($row = mysql_fetch_array($query)) {
echo "<b><a href='\"admin.php?id={ $row['CommentID'] }'>{ $row['CommentID']}</a></b>";
```

The above code was implemented by the developer to allow the admin to select the Comment ID from the complete list of suggestions/comments stored in the Suggestion Box database. These comments are displayed for all the modules and are again displayed in descending order. The below code displays the comments from the comment table in the Suggestion Box database.

The Suggestions are displayed to the admin and the fields that are available to view include the User ID of the student that submitted the comments as well as the student's name. The specific Module ID is then available for the admin to view and the Suggestion with the corresponding date/time stamp, as displayed in the below code.

```
$query1 = mysql_query("select * from comment where CommentID=$id", $connection);
while ($row1 = mysql_fetch_array($query1)) {
?>
<div class="form">
<h2>---Details---</h2>
<!-- Displaying Data Read From Database -->
<p><span>UserID:</span> <?php echo $row1['UserID']; ?>
<p><span>Name:</span> <?php echo $row1['Forename'], $row1['Surname']; ?>

<p><span>ModuleID:</span> <?php echo $row1['ModuleID']; ?>

<p><span>Comment:</span> <?php echo $row1['Comment']; ?>

<p><span>DateStamp:</span> <?php echo $row1['DateStamp']; ?>
```

Code above to show the display of suggestions to the Admin of the Suggestion Box

Sprint 8

The dropdown selection of modules which are specific to the student logged into the Suggestion Box was the 8th sprint implemented by the developer in Week beginning 04/07/2016 for 2 weeks. The developer implemented the use of an SQL statement to retrieve the required fields to populate the dynamic (database populated) dropdown.

The below code extract is located in the 'profile.php' file and contains the relative code implemented to create the dropdown and populating these fields with the modules each student is enrolled in. The student can then select the Module ID from this dynamic dropdown list and store this to then continue to write their suggestion.

```

$result = $conn->query("select DISTINCT ModuleID
from module
inner join course
on module.courseID = course.CourseID
inner join user
on course.courseID = user.CourseID
where username = '$user_check'");

echo "<html>";
echo "<body>";
echo "<select name='ModuleID'>";

while ($row = $result->fetch_assoc()) {

    unset($id, $ModuleID);
    $id = $row['ModuleID'];
    $ModuleID = $row['ModuleID'];

    echo '<option value="'. $ModuleID. '">'. $ModuleID. '</option>';

}

echo "</select>";
echo "</body>";
echo "</html>";

```

Once the user is ready to submit their suggestion for their selected module they can submit. Once they select their module the below code allows the user to input the Module ID to their suggestion and it is stored in the database for the lecturer to login and retrieve the suggestion.

```

if($UserID != '' || $ModuleID != '' || $Comment != ''){
//Insert Query of SQL
$query = mysql_query("insert into comment(UserID, ModuleID, Comment, Forename, Surname) values ('$UserID', '$ModuleID', '$Comment', '$login_session', '$Surname')");
echo "<br/><br/><span>Your suggestions have been delivered successfully!</span>";
}
else{
echo "<p>Insertion Failed <br/> Some Fields are Blank...!!</p>";
}

```

Sprint 9

The 9th sprint was created by the developer to allow the lecturer to flag comments to the admin for the admin to see when they log into the system. The code below shows this development which took the developer 1 week and 3 days to create in July 2016.

```

if(isset($_POST['submit'])){

    if(isset($_POST['Flagged']) && ($_POST['flagged'] == 0)){

        $queryUpdate = mysql_query("UPDATE comment
        SET Flagged = '1'
        WHERE commentID = $id", $connection);

        mysql_query($queryUpdate) or die(mysql_error());
        echo "This message has been flagged to the Admin successfully!";

    }

}

```

The lecturer can flag a comment and update the comment table with a flag value of 1 or 0, after the lecturer selects to flag the comment the database is updated with the 'UPDATE' of the value from 0 to 1 which will then be output to the admin when they view the Suggestion Box. Once the update has been made a message is output to the user to say the flag has been successfully delivered to the admin.

Sprint 10

The styling of the webpage was created by the developer and took a total of 4 days to develop. The CSS styling of the webpage was coded by the developer to update the style of text boxes and the background imagery to allow for a consistent format to be achieved in a continuous flow throughout the Suggestion Box in accordance with the guidelines for design set in the design of the Suggestion Box.

Below is a sample of code which allowed for the creation of form styling and text box styling as well as the font for the headings text for the webpage.

```
.title {  
width:100%;  
height:70px;  
text-shadow:2px 2px 2px #cfcfcf;  
font-size:16px;  
text-align:center;  
font-family:'Droid Serif',serif  
}  
.divA {  
width:70%;  
float:left;  
margin-top:30px  
}  
.form {  
width:400px;  
float:left;  
background-color:#fff;  
font-family:'Droid Serif',serif;  
padding-left:30px  
}  
.divB {  
width:100%;  
height:100%;  
background-color:#fff;  
border:dashed 1px #999  
}  
.divD {  
width:200px;  
height:480px;  
padding:0 20px;  
float:left;  
background-color:#f0f8ff;  
border-right:dashed 1px #999  
}
```

Code to show a sample of CSS styling for the Suggestion Box

Sprint 11

The final sprint for the development of the webpage for the Suggestion Box was the logout function. This sprint was included when the developer created the redirect function for the 3 users and was incorporated into the third sprint's sprint length.

```
<?php
session_start();
if(session_destroy()) // Destroying All Sessions
{
header("Location: index.php"); // Redirecting To Home Page
}
?>
```

The above code shows the redirection of the user to the homepage where the user can login to the Suggestion Box again or close the browser. This code will be implemented when the user selects the 'logout' button in the user's homepage. This function is available to each of the three users (Student, Lecturer & Admin).

Implementation Summary

The above breakdown shows the individual sprints implemented by the developer to build the designed platform required for creating an anonymous Suggestion Box for students to anonymously communicate their views and concerns to their lecturers. The designed platform also included the necessary precautions outlined in the design that the admin should have the function to see all the suggestions and see the student's name alongside it to protect against spam or inappropriate messages. The developer has implemented all of the above 11 features broken into the sprints across the course of this year and has shown that the aims and objectives set have been met.

Testing and Evaluations

Introduction

During the implementation of the webpage there has been a continuous testing environment. In order to ensure that this is efficient, time has been managed accordingly allowing for suggestions and changes to be made throughout development of the webpage.

This chapter outlines and details the testing process implemented by the developer and displays the results obtained from functional tests and focus group testing to users who were asked to comment and review certain functionalities of the devised webpage.

Testing

The testing environments implemented have included the testing on alternative browsers such as Google Chrome, Firefox and Internet Explorer. Testing has also been conducted on particular sections of the webpage on the focus group via questionnaires. This process has been fundamental at this implementation stage and has allowed for features to be reconsidered and evaluated with the end-users' requirements of primary importance. In particular, testing on the focus group has ensured that the objectives of the web page are met accordingly. This continual testing environment has ensured that the end result will be much more refined and has met the end-user requirements as suggested.

In order to ensure that the end result functioned appropriately, the developer decided that the entire functionality of the application should be tested and evaluated. The developer conducted such research in self testing as a developer, testing across platforms and internet browsers and through focus groups which will be shown in the below sections.

Functionality Testing

In-House Functional Testing

In house testing was performed by the developer to determine if all the core elements of the implementation had been developed precisely in accordance with the set specifications. Issues arose in this stage for the developer as the initial database had to be rearranged from the initial design in order to incorporate the user comments in a table stored with the User

ID which linked to the user table. Such an issue was not envisaged in the initial outline plan and as such brought minor delays to the project's expected timeline.

Each individual stage of the project development was catalogued and then was systematically examined and tested so that the developer was certain the intended functionality had been achieved. This in house testing has been documented in the table below. Each functional stage therefore shows it was achieved and passed before the developer progressed to another development stage.

As data protection and privacy are of paramount importance in the development of the webpage, testing with messages from the students to their lecturers was created. This testing showed that no private records such as the user's name or email address passed to the lecturer when comments were submitted.

As the admin has a role to monitor the system as a whole, records such as the user's name are displayed for this user only. If any harmful comments are generated and submitted from the student the lecturer then has the option to highlight/flag these comments so the admin can review as the lecturer has no way of seeing who the comments are from, only having comments displayed for modules they are enrolled to teach.

The tables below show the requirements and testing involved in the generation of the Suggestion Box for each of the three users – Student, Lecturer and Admin.

Student Login

Functionality	Completed	Additional Comments
Login using data stored in Database	Yes	Login details must be included in database for suggestion box
If data incorrect – Notify user	Yes	If data is not held in the database a notification 'Incorrect username or Password' is output
Redirect after user Login to student homepage	Yes	Student redirected to the student page displaying dropdown and text box etc.

Logout functionality	Yes	Student has the option to logout at any stage once redirected
Display and functionality of Legislative Text	Yes	Clear concise directions for user
Display Students name and Course	Yes	Results displayed for specific student logged in
Selection of relative modules to specific student in Dropdown	Yes	Modules displayed for student relative to course enrolled for
Student comment submission	Yes	Suggestions can be written in the large text box provided
Submission of comments	Yes	Student can submit comments relative to module selected for suggestions
Inform user comments are submitted successfully	Yes	User is informed 'Comments successfully delivered'
Logout	Yes	Again, the student can now logout of the portal
Redirect to login	Yes	Once logged out – student is redirected to the login page

Lecturer User

Functionality	Completed	Additional Comments
Login using data stored in Database	Yes	Login details must be included in database for suggestion box
If data incorrect – Notify user	Yes	If data is not held in the database a notification 'Incorrect username or Password' is output
Redirect after user Login to Lecturer homepage	Yes	Lecturer redirected to the lecturer page displaying comment Id's and dates etc.
Logout functionality	Yes	Lecturer has the option to logout at any stage once redirected
Display and functionality of Legislative Text	Yes	Clear concise directions for user
Display Lecturer's name and inform that they are a lecturer	Yes	Results displayed for specific student logged in
Display Comment ID, Comment Date and Time with most recent records first at top	Yes	Most recent comments displayed at top so lecturer can select comment ID and view suggestions
Lecturer Select Comment ID	Yes	Lecturer can select Comment ID and display the required results

Display of results relative to user logged in	Yes	Only Module ID, Comment and Date Stamp are displayed
Flag of inappropriate comments functionality	Yes	Lecturer can flag comment to report to the admin and Submit
Logout	Yes	Again, the lecturer can now logout of the portal
Redirect to login	Yes	Once logged out – lecturer is redirected to the login page

Admin User

Functionality	Completed	Additional Comments
Login using data stored in Database	Yes	Login details must be included in database for suggestion box
If data incorrect – Notify user	Yes	If data is not held in the database a notification 'Incorrect username or Password' is output
Redirect after user Login to Admin homepage	Yes	Admin redirected to the admin page displaying comment Id's and dates etc.
Logout functionality	Yes	Admin has the option to logout at any stage once redirected

Display and functionality of Legislative Text	Yes	Clear concise directions for user
Display Admin's name and inform that they are a admin	Yes	Results displayed for specific student logged in
Display Comment ID, Comment Date and Time with most recent records first at top	Yes	Most recent comments displayed at top so admin can select comment ID and view suggestions
Admin Select Comment ID	Yes	Admin can select Comment ID and display the required results
Display of results relative to user logged in	Yes	User ID, User name, Module ID, Comment and Date Stamp are displayed
Flag of inappropriate comments functionality	Yes	Admin can view flagged comments
Logout	Yes	Again, the admin can now logout of the portal
Redirect to login	Yes	Once logged out – admin is redirected to the login page

Focus Group Testing

Testing Strategy

Throughout the testing phase of the development of the system a focus group will be invited to test the prototype system.

This focus group will assess a number of areas of the system, namely the Usability, interface, integrity and performance of the system;

- **Usability** - Users will be asked to comment on how practical and the ease of use of the system. Does the system meet the expected outline?
- **Interface** – The users should assess the ease of use and the visual appeal of the system. Any issues of developments raised should be considered for future developments
- **Integrity** – A core element of the platform as student's message suggestions is anonymity. Passwords should protect user identities also. The confidentiality of information should also be of paramount importance in the testing stage
- **Performance** – Suggestions provided should be submitted instantly at optimal capacity. The testing with the focus groups will raise any issues (if required) in this area which can be addressed and rectified

Once the final website design was created the developer organised a focus group to evaluate and critique the final website, testing the functionality, accessibility and design of the webpage. The developer had a broad range of all-encompassing areas for careful consideration by the focus group. The table below shows the test case description which their comments were collected from as well as a Yes/No response if the developer met the specific requirements discussed.

The developer tested the application on all fifteen individuals from the focus group. However, due to repetition of results the developer has included only five detailed responses from the questionnaire in this report. The five responses include four responses

from students and one response by a lecturer and are a good representation of the results gathered from the focus group and illustrate a critical evaluation of the entire application. Each of the users who took part in the evaluation of the Student Feedback Portal felt that the webpage was a success and would highly recommend that the webpage is used for students of all levels who are undertaking taught modules.

This positive outcome supports the belief that the webpage meets all objectives outlined at the beginning of project development. In particular, the developer has paid careful consideration to the additional comments made by members of the focus group. The additional comments are outlined in the table below. It should also be noted that out of the 15 responses – 87% of user tests said they would use this system and recommend the Suggestion Box to class peers and co-workers for lecturers.

Table to show the summary of feedback from focus group.

Test Case No.	Test Case Description	Response Yes/No	Additional Comments
1	Are the objectives of the webpage clear and understandable?	Yes	Well explained with great attention to detail.
2	Is the login clear and easy to navigate?	Yes	User prompted for appropriate details and advised if incorrect. Users redirected based on being registered as a student/lecturer/admin.
3	Student – Was module selection from the dropdown user friendly?	Yes	Very clear and it only displayed modules enrolled for.
4	Should any additional comments/navigation aids be included?	No	Clear comments to login, aware the platform is anonymous which is a benefit for users. Comments were very useful to follow.

5	Is there an adequate text area for the insertion of student feedback?	Yes	Comments short and long could be inserted with no issues.
6	Is the design of the webpage attractive?	Yes	Design is very attractive due to a user friendly university themed colour scheme which is very in keeping with the use of the webpage as students/lecturers
7	As a user, is it clear that all comments are submitted anonymously?	Yes	Very clear to the users as this is the core reason students would choose to communicate in this way
8	Lecturer/Admin –Is the display if comments easy to navigate and clear?	Yes	Very clear. Benefit is the most recent comments at the top with the Comment ID and comments are displayed relative to the modules which is clear for users.
9	Any additional comments	Yes	Superb platform for students to communicate anonymously with their lecturers for relative modules
10	Any additional comments.	Yes	Easy to navigate, well aided by appropriate comments and a student themed design.
11	Any additional comments	Yes	Would use if I wanted to communicate anonymously with my tutor – this is the first I've heard of this and is a great idea!
12	Any additional comments	Yes	Every functionality I could want to have is included – for my

			specific modules and to know that my comments are safe and secure with privacy for my name to remain anonymous
13	Any additional comments	Yes	As a lecturer it is good to know that a trusted admin is available to review inappropriate comments to me and if I am concerned about any issue I can escalate this to the admin.

The 25- point usability website testing

Among the previously demonstrated testing methods (In-house and focus groups) a further test has been devised to develop and maintain a fully functional system. The 25-point usability test carries out a range of website tests, unit tests and browser compatibility tests. Such tests particularly aid the developer to see where perhaps any errors have been made in the development of the system that may not have been picked up from the In-house Testing methods. As such errors may be revisited after the 25-point usability test and any amendments necessary may be made to improve the overall functionality of the website.

This test was used to test the usability factors of the website. It involves 25 checklist questions of which a majority applied to the current website in question. There were some questions that were not related and therefore are assigned a value of N/A. This gives the developer an insight into how user friendly the website is and places an importance on the usability considerations that need to be taken into consideration when developing any website.

Scoring	
Website does this successfully	YES
Website does not do this successfully	NO
Not applicable	N/A

Table above to show the Key for the 25 Point Usability Testing

Table below to show the scoring for the 25 Point Usability Testing

Accessibility	Rating	Comments
1. Site load time is reasonable	Yes	Loads in under 1 second
2. Adequate text to background contrast	Yes	Dark text on light shaded background
3. Font size/spacing easy to read	Yes	Large font, padding, easy to read
4. Flash and add on used sparingly	N/A	N/A
5. Images have appropriate ALT tags	N/A	N/A
6. Site has custom not-found/404	N/A	N/A

Table to show the accessibility factors

Identity	Rating	Comments
7. Logo is prominently placed	Yes	Ulster University Logo in appropriate location
8. Tagline makes company's purpose clear	Yes	Login Page displays info about website and purpose
9. Home screen digestible in 5 seconds	Yes	Clear it is a university login to provide anonymous feedback
10. Clear path to company information	Yes	Login clear for university – Ulster University
11. Clear path to contact information	N/A	N/A

Table to show the identity factors

Navigation	Rating	Comments
12. Main navigation easily identifiable	Yes	User can submit or logout if applicable
13. Navigation labels clear and concise	Yes	Large clear submission text fields
14. Number of buttons/links reasonable	Yes	Lots of content displayed on one page with text fields for admin and user and lecturer
15. Company logo linked to home	N/A	N/A
16. Consistent links	Yes	Consistent links between pages as user progresses
17. Site search easy to access	N/A	N/A

Table to show the navigation factors

Content	Rating	Comments
18. Headings clear and descriptive	Yes	CSS styles and meaningful titles
19. Critical content is above the fold	Yes	Dropdown menus displayed for students and no scrolling for students. Most recent comments displayed primarily for lecturer and admin
20. Styles and colours are consistent	Yes	Blue and white colour with similar tables and page layout
21. Emphasis used sparingly	Yes	Bold/italics only used for some headings or key information e.g. Name or Course studied
22. Ads pop-ups undistruptive	N/A	N/A
23. Main copy is concise and explanatory	Yes	Yes
24. URL's meaningful	N/A	N/A
25. Activity screen titles explanatory	Yes	Heading at top of each screen and text to guide the user through

Tables above to show the 25-point checklist for website design/creation.

Summary of the 25-point checklist

It is evident that with the website successfully adhering to all the appropriate steps in the checklist that it has been developed to a relatively high standard. It was developed with usability and functionality as a priority for students, lecturers and the admin. Users of this application would be availing of this portal if they are perhaps struggling or looking to pass on information to their lecturer for example, therefore would not be using it on a regular day to day or even weekly basis.

The student therefore can login to write feedback at a time that suits them or may be requested to provide feedback on this system at the end of a module or at mid-term. For such purposes the website has been developed as straight forward and as user friendly as possible, so that it is relatively easy and painless for the user to provide feedback when they may be in times of need or may be struggling and would like to remain anonymous in asking for assistance on certain areas.

There were a number of not applicable answers in the above table as they did not directly relate to the website developed by the developer but the remaining answers showed the website to be meeting its targets in relation to accessibility, identity, navigation, content and user friendliness.

Browser Testing

As previously highlighted in the Testing section above there is a wide array of different website browsers available to users which they may perhaps decide to launch the Suggestion Box webpage on.

For the Suggestion Box, the importance of browser testing is to ensure that the website will look and feel the same across each browser with minimal differences whilst minimising the chance of error for a user. Firefox, Safari, Internet Explorer and Google Chrome make up 98% of the internet browser market.

For the developer, browser testing involves testing how the website looks like and works across a number of different browsers. Testing the webpage in alternative browsers is of

paramount importance if the developer has implemented the use of padding in their CSS files. Firefox and Chrome for example read padding similarly while Internet Explorer adds extra padding to that area which may affect the layout of the website. For this reason, among others, the developer has tested across the multiple browser platforms. Table below shows the results from testing certain elements of the developed webpage across browsers.

Cross Browser Testing

Criteria (Tested Across All Sections)	Google Chrome	Mozilla Firefo x	Internet Explorer
Website Layout Consistent	✓	✓	✓
Colour Consistency	✓	✓	✓
Images Rendered As Intended	✓	✓	✓
Login Functionality and Display	✓	✓	✓
Navigational Comments	✓	✓	✓
Display Of Legislative Text	✓	✓	✓
Legislative Texts Functionality	✓	✓	✓
Student Comment Box and Dropdown Functionality and Display	✓	✓	✓
Comment Submission for Students	✓	✓	✓
Lecturer display of comment ID and Date for selection	✓	✓	✓
Lecturer view of required/selected data	✓	✓	✓

Admin display of comment ID and Date for selection	✓	✓	✓
Admin view of required/selected	✓	✓	✓
Student/Admin/Lecturer Logout Functionality and Display	✓	✓	✓

Table above to show the Cross Browser testing for the Suggestion Box across Chrome, Explorer and Firefox

Summary

This chapter detailed the in depth testing performed by the developer in In-house testing and the presentation of such results in tabular format. These results showed that the webpage had been developed precisely in accordance with the set specifications in a cross platform environment. In addition to this testing an evaluation using the 25-point usability website testing was also generated showing that the website had generated a fully functional system. Availing of focus groups was perhaps the cohesive element in the testing and evaluation section as the results from the feedback further reinforced the conclusion that a successful implementation had been achieved as the feedback was overall highly recommended by the users; any issues or comments were also taken into careful consideration by the developer.

Conclusion and Recommendations

Introduction

The final chapter for the Suggestion Box summarises all the development stages carried out for the project. Results are then critically assessed to analyse whether the website met the user requirements set out as Functional Requirements if the Suggestion box allows for an anonymous portal for students to provide suggestions and feedback to module coordinators. This final chapter states also if the project successfully achieved the project aim and objectives and concludes through the presentation of any possible features/content that could be implemented as improvements or future developments if the project was to be extended

Project Summary

Initial Research

Initial research studies were conducted into the importance of having a system for University students to provide anonymous suggestions or feedback to their lecturers at a time that suits the student and lecturer to avail of the system. Problems in alternative methods of providing feedback were addressed as some feedback may be collated at a time that does not suit the student and also in some cases the possibility of providing anonymous feedback is unlikely. Through the use of the Suggestion Box students have the option to provide unique module specific feedback directly from the student at a time that suits the student to provide suggestions.

The Suggestion Box allows students the flexibility to provide feedback at any stage during the academic calendar – not just at the end of a module or even the end of an academic year. This core design function of the Suggestion Box offers students the chance to raise any queries or concerns whenever they become apparent so that any issues can be resolved at the earliest convenience. The student always has the option to remain 100% anonymous from their lecturer when providing suggestions or feedback.

It should be noted that the admin has the capability of viewing comments with the name and details such as the Student ID if a comment is deemed inappropriate or requires further review and therefore should be escalated to the appropriate individual within the university. The confidentiality of students' information is key to the successful functioning of the implementation and as a result the admin will adhere to strict guidelines for data viewing and usage in the Suggestion Box.

Alternative Platforms

Existing platforms such as the National Student Survey are available at the end of the module to assess the learning and teaching strategies of the modules. This method of feedback offers a more in depth review of module specific detail in generic questioning about all aspects of the modules but does not allow for a student to provide feedback at a time when they need it most. This time could be after a difficult class in a particular module where the student has identified that there should be a greater explanation of concepts for the class. This example could be identified across the Suggestion Box in real time and not once the module has concluded. This is a benefit to the Suggestion Box as it allows unique suggestions to be generated at a time that suits students to message their lecturer in an anonymous manner.

Alternative methods of feedback do also exist, for example, if a student was concerned then they could voice any concerns to a nominated class representative who would be able to escalate concerns or feedback to the relative lecturer at their earliest convenience. But problems may not be transferred between the class representative and the lecturer in the correct circumstances or may not be passed to the lecturer at all. Emailing a lecturer to provide suggestions does not allow for an anonymous message to be sent, which is one of the core functions of the Suggestion Box as comments are sent to the lecturer anonymously. Face to face meetings do not offer the student the option to be anonymous also and lecturers may not have answers to hand when they are questioned on a particular issue which is why the lecturer can view comments on the Suggestion Box and respond to the class or make amendments in their own time.

From the research questionnaires it is clear that the Suggestion Box offers a platform that students feel provides a highly effective means for students to message lecturers in an anonymous format as it is an easy to use website specific to the user logged in. The respondents of the questionnaire provided essential feedback and the recommendations were instrumental in the website content and user features available. The combination of the competitive analysis above and the research undertaken allowed for the construction of a list of functional and non-functional requirements to be incorporated into the overall design and implementation of the website.

Website design

The design of the website was influenced by the W3C initiative alongside Shneiderman's 8 'golden rules' of interface design as they provided guidelines of usability and accessibility of the website. The devised website provides a relatively straight forward platform with a consistent flow as well as offering informative feedback when users submit comments, for example. Implementing the W3C initiative allowed the developer to create a consistent User Interface structure.

As the projected target audience is students who will be availing of this platform (as outlined in the analysis section of the report) it was envisaged that the target audience would be provided with an efficient system and a positive user experience to make passing on suggestions as pain free and easy to the user as possible. Projected screen designs were constructed in the design phase of the development to define the presentation of the website in terms of layout, colour scheme and font to be used throughout which would help expedite the implementation process of development for the Suggestion Box. It should be noted that minor differences can be highlighted between the design screens and the developed web application as the developer has now created a web page that meets the required needs of the users which may not have been fully envisaged in the design stage. This further adheres to the agile framework of undertaking a project as minor revisits have been made to make the user experience as user friendly and intuitive as possible. Navigation was also a core development area and was also demonstrated in the storyboard as to how the user would simply and intuitively progress and navigate through the website

as one of the three user types (Student, Lecturer and Admin). Overall the use of storyboarding aided the developer to outline the core functionalities of the developed software and the alternative testing strategies implemented. So too, alongside the storyboards, a site map detailed the relational database specifications.

Client server relationship

The client server relationship was defined and detailed in the implementation stages of the project as it defines the interweaving programming languages that have been used to develop the website. From the client side perspective programming languages such as HTML, CSS and JavaScript were implemented for use and PHP was introduced for the connection to the relational database (Suggestion Box). PHP was used in conjunction with MySQL as this allowed for database manipulation to be carried out via MySQL queries. Example queries are shown in the Implementation section of the report as statements in MySQL allow for the insertion of comments into the database and the display of records from the database to the user such as their name and their course of study. The combination of programming languages allowed the developer to develop a website that ensured a resolute client server relationship as the communication between the client and the server allows for a highly responsive and intuitive website as data can be loaded on the client side whilst the server requests are responded too rapidly and accurately.

Storyboards and design specifications were fundamental guidelines for the developer in creating a user friendly and intuitive environment in its structure and presentation through the use of HTML and CSS. Time was a limiting factor in this development as the functionality was first developed then the review of the design in the storyboards and its implementation was developed by the developer. For the development of the Suggestion Box each underlying element in the creation was consistently analysed, developed and tested as this allowed any issues to be raised and revised if necessary.

Testing

The Suggestion Box underwent a rigorous series of testing, as discussed in the previous section as once the initial development code had been created the developer then introduced a series of testing techniques to test the strength of the code developed. This was through adding more dummy data to the Suggestion Box and inserting additional comments as the code progressed to check that the functionalities worked in every circumstance. As such the Suggestion Box was subject to an in-depth and detailed testing environment. This consisted of in-house testing, cross browser testing and cross platform testing as well as external testing administered to users with the questionnaires to complete and feedback to the developer. The 25-point checklist for website design was also used as a testing method in the project.

The in-house testing allowed for each element of the website to be tested systematically across different platforms and browsers (such as Firefox and Chrome). The external testing consisted of issuing questionnaires to the users who consisted of sample students and lecturers where the software is tested via scenario based tasks. From this, valuable feedback was gained as the users were encouraged to leave additional comments/feedback which can be seen in the Testing and Evaluation section above.

Results Assessment

The Functional and Non Functional Requirements as outlined in the Analysis report were compiled for the website based on comments and feedback as well as recommendations made by respondents in the initial research. Upon completion of this project it has been established that each of the fundamental requirements has been successfully implemented in the completed Suggestion Box.

The results gained from in house functional testing demonstrates that the platform allows for cross browser and cross platform capabilities and the external testing conducted via user testing showed that the objectives have been met as positive results were gained. This indicates that the project was implemented successfully based on the initial feedback and recommendations from users.

Objectives and Achievements

The key objectives outlined at the conception in the development stages breakdown of the project have been achieved, including:

1. Research in the Analysis of the project was conducted on alternative methods of students communicating to their lecturers and through online feedback systems such as the National Student Survey and Suggestion Ox. These tools were analysed to help the developer create a system which allowed its users to communicate in an anonymous platform.
2. Functional and Non Functional Requirements were further generated by the developer to aid in the development of the Suggestion Box.
3. A simple, user friendly and intuitive platform which consisted of the user capabilities set out in the Functional requirements was created allowing students to message lecturers and a lecturer to log in and view their corresponding suggestions for their associated modules.
4. A testing strategy, which included a testing questionnaire among users, was generated and the system was tested among developer testing methods.

Recommendations

Recommendations for expansion possibilities and future developments include:

1. Lecturers could have separate screens for the alternative modules they may teach so that comments are not all appearing on one list for the lecturer to view.
2. Students could have the possibility to submit a module feedback survey to the lecturer in further developments for specific modules as well as having the current capability of providing anonymous suggestions to their lecturer.
3. Student could have the capability to message a specific lecturer held in the database and not just message the module coordinator to provide suggestions.

4. Admins could have the option to remove comments.
5. A message of how many new comments have been added to a lecturer's list could be inserted from their last login time or an email notification of a new comment added.

With further development time the developer would have the opportunity to plan and implement the future developments stated above.

Summary

The Suggestion Box project was aimed at Students in university as a means for these students to communicate anonymously with their lecturers to provide suggestions on modules at a time that suits the student and the lecturer. The system offers greater advantages over its competitors as suggestions can be compiled at any stage of the academic calendar, not just at the end of a module like alternative systems. A suitable design was created by the developer based on research undertaken and recommendations. The developed website was successfully implemented on time, meeting the development strategy implemented. The site was effectively tested both in-house and externally on a variety of browsers and platforms.

The project therefore has achieved all its set objectives and thus has provided an anonymous platform for students to provide suggestions to their lecturers, whilst the comments can be monitored by an elected admin by the university. The provision of such a tool enables the students to successfully message their lecturers at a time that suits them when they may have issues that need raised with workloads or even complications in class for example and has been recommended by the focus groups as a success and has been highly recommended.

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