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**Enhancement of Teacher- Student communication through real-time feedback and its effects on educational curricula change and attendance monitoring.**

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A dissertation submitted in partial fulfilment of the University of Greenwich's  
**Computing BSc Hons**

## **ABSTRACT**

This project focuses on whether technological tools can innovate and be beneficial in assisting a teacher's delivery methods in a collaborative process with the students themselves. The project scope is focused towards exploration into a real- time communication system by using computer devices in lecture time. The Project investigates traditional teacher- student communication methods and existing feedback system technologies in the University environment, to create an interactive feedback system for undergraduates whilst determining feedback criteria in order to enhance teacher-student communication. In order to overcome the drawbacks of a lack of student verbal feedback in the current lecture system, this project is developed to allow for anonymous, or identified by name students' feedback data, to be used in order to adjust the teacher's approach. Collected data outcomes are visually displayed in the form of graphical charts, as a result of which the teacher will have an opportunity or increase teaching time on material that is deemed particularly difficult or to use an alternative approach in teaching the subject matter due to its current lack of comprehension. Before developing this project, the concept of real-time feedback in educational environments will be studied and the knowledge gained of the topic. Likewise, methodology, tools and techniques are evaluated and compared to produce a successful project. As a result, DSDM Atern framework, project schedules and UML diagrams are chosen as methods to manage the project. Moreover, Node.js Express framework Socket.IO and React.js selected in order to develop a web application that can manage an unlimited number of responses within the duration of one second in real-time. Also, 80/20 rule, MoSCoW prioritisation and time boxing methods will be used to control the development aspect of this project. The report consists of number of chapters that cover all aspects of development in detail.

## PREFACE

As a final part of the undergraduate programme, after careful consideration and an agreement with the programme leader and supervisor Keeran Jamil, the real-time web application was chosen to provide lecturers to get feedback from students in real-time which serves to enhance student experience, professional development of lecturers and to an enhance pedagogy.

Thorough research in this area has enabled the project to identify and specify the main issues with current teaching methodology and its effects on educational curricula change. This has led to the design of a software product to an appropriate level of professional competence. Product implementation was a challenging task because the latest technologies had to be learned in order to complete the project, however this served to enhance my skills and to meet the requirements set by undergraduate programme at the University. Comprehensive testing of the software and appropriate documentation was developed to professional standards using technical terminology as well as written in a jargon free language for the user. A personal interest in enhancing pedagogy played a big role in the creation of this unique software. Self-motivation and determination enabled me to investigate and critically evaluate the work of others and apply related findings where appropriate. After research on similar current present technologies and the literature review, developing ideas and constantly improving up on them enabled me to create unique version of this software. Working independently using planning and organisational skills was key to achieving the aims set out in the project during the program of study. T comprehensive written sets out to detail all aspects of the development as well as critically evaluating the product and its process of production. The enjoyment of the development has indirectly enhanced my technical computing skills, collaboration with others, self-management and more importantly working towards deadlines. The lessons learned during the course of the project are to apply iterations while developing the software and use time wisely. To produce the best possible software, prioritisation of the tasks was necessary but proving to be the most difficult to achieve, nevertheless with an understanding MoSCoW methodology and eighty twenty rule and a bit of practice the new skill was learned and applied to the best of the ability on a daily basis. By applying academic, creative and technical practice, the product outcome and the process of its production met the description of the set project objectives, which fulfil the main aim of the Project within an undergraduate programme requirement.

In the past year, academic learning development was proving to be challenging but at the same time very interesting. It has reinforced my knowledge of critical analysis, interpretation and evaluation of complex information and concepts involved within system development practices. It has improved my cognitive and practical skills to a more advanced level by addressing the problem from scratch and involving interacting factors. Being able to identify system and project management implications and

act on it using appropriate methods proved to successfully achieve the requirements of the National Qualification Framework.

In summary, this project includes the development of the software product to meet business requirement in an educational sector. This has provided an appropriate use of a set of the technologies and development methodology as well as reflection upon the success of the web application system development. I am mindful that the current version of this report will always be a work in progress, and I welcome your comments on any aspect of it. You can reach me by e-mail at [irina.zureiqi@btinternet.com](mailto:irina.zureiqi@btinternet.com). I hope you will.

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I would like to thank my main project supervisor Keeran Jamil who guided and helped me to achieve 80% of my project delivery with 20% of my effort. Her valuable and constructive feedback throughout /during the planning and development of my final year project enabled me to manage my time efficiently and for me/as well as to produce this report to the highest standard.

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I would also like to express my gratitude to my specialist mentor and study skills support tutor Arslan Ashraf who dedicated his time to assist me and helped me to get organised in a difficult time throughout the period of this project. Without him, you would not understand what you are reading right now, so I thank him for his proof reading and assistance with my dyslexia.

I extended my special thanks to all those teachers and students in school, colleges, and universities during my teaching assistant placement, who have helped me to understand the real current educational issues regarding my final year project topic by answering my various questions about feedback in educational environment. This has had a very positive impact on my research.

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# **1 INTRODUCTION**

## **1.1 Introduction**

It is important to understand how lecturers and students can improve their professional or academic development by using new technologies. This enhancement of teacher-student communication through real-time feedback can also have positive change on educational curricula.

The author is a highly experienced and versatile, professional dance teacher having taught in their field for the last decade providing classes to all ages and for all levels. Teaching naturally centres on interacting and communicating in real-time in the dance studio, which is beneficial for the progress of the students and in producing outstanding results. This occurs in phases and is imperative that feedback take place not just from the teacher to the student but vice-versa.

An illustration of this concept is through the demonstration of movements and the collaboration between teacher and student. For instance, the movements demonstrated by the student will be a form of feedback for the teacher. By watching and analysing the student's performance with real-time feedback, each student will be responsible for their own learning through 'learner-active practice'. However, when the author experienced the type of passive, as opposed to active learning that occurs in a lecture theatre at the educational environment of University it's appears that no feedback is giving in real-time and this is because there is no real-time collection of the feedback from the students. This suggests that lecturers can improve teaching methods at the time of the lecture and may improve student understanding on the topic before it gets too late and student fall behind. Therefore, not producing better grades overall could be seen as the barrier to the main aim of an educational curriculum. This can be resolved by using technology that has changed the nature of education and the jobs of educators (Schinkten, 2016). Feedback systems require different methods to help students learn and teachers to evaluate themselves and adapt if needed.

If there is direct communication in real-time and lecturers can engage the students' there is a dual benefit to both teacher and student in performing their roles better. Collaboration is one of the keys to effective learning and making the learning experience more dynamic and interactive. This also can help teachers update their methodology, approach and skill sets to teach effectively using a feedback system. Incorporating latest digital technology into the educational environment will give opportunity for the university to produce better outcomes because this will satisfy customer needs and if customers (students) are happy this means there's more chance to get better results.

There are several issues that can be considered, outside of the dancing environment, such as in the educational settings such as classroom interactions or lecture theatres. These issues revolve around the concept of student feedback, and the lack of quality that can arise due to poor communication between

students and teachers. These problems of teacher –student communication need to be carefully considered here because students value good assessment feedback. For example, in the year 2015 The University of Greenwich Quality Assurance Agency (QAA) for Higher Education Review (HER) document that only 67% of students agree that they have received detailed comments on their work and only 50.5% agree that the feedback on the assessment is clear, on time and allows them to improve their work. (Brooks, 2015)

Furthermore, it states that in terms of structure, timing and content of the report, the feedback is inconsistent as well as students reported dissatisfaction because feedback is not sufficiently detailed and students feel uncomfortable going back to the tutors for feedback clarification which leads to frustrations and slow progress on the assessments. However, University initiatives trying to resolve this issue, such as online feedback have improved turnaround in some programmes, but the University still seeking a way to allow students to report on the quality of tutoring which improves the quality of assessment. The topic of enhancement of teacher-student communication through real-time feedback, will not just produce better results in awarded marks but also built an efficient student teacher communication system in real-time of the lecture or tutorial. Therefore, there is a clear need to help the University establish a system for effective feedback and not just at the end of each course but also in real-time within the lecture. The culture of academic environment could change by introducing realtime feedback system between teacher and student to increase openness in communication.

During the authors teaching experience they learnt the vital importance of feedback and communication, specifically in order for students to achieve excellent results. For example, 99% of students received Honours, and as such, amongst other factors real-time feedback and communication are essential in the learning environment. The given opportunity of this topic provides the author with satisfaction of knowing that this idea could be taken forward into the development and actual results could be seen with time, where students are comfortable about their learning progress and enjoy lectures without feeling left out or their opinions and concerns side-lined.

The particular interest in this topic arose during the author's college studies, where availability to receive the necessary guidance and feedback in order to progress learning was unavailable. This motivated the author to impact and try to enable others to have the essential support that will determine their success. Furthermore, it has been established that organisations and institutions using feedback systems have found it very beneficial for lecturers as well as students. (Medicine Exeter University, 2015) (Crtviewpoint, 2016) However, there are not many educational practices that utilise real-time systems and this serves as the primary reason for the implementation of this project.

had iterated various ideas of the real time design such as building a radio frequency device or a pen with virtual clicker that transmits information within 0.20 seconds, it was considered to build

interactive cloud pulling system between student and teacher which uses dynamic events or even designing a student smart phone pulling application in order for the lecturer to receive electronic feedback and view results immediately in visual charts. But most appropriate design appears to be a web application using newly Node.js framework because it provides non-blocking, once threaded pooling operation. All of those designs can be beneficial by integrating Learning Tools Interoperability (LTI) into the feedback application as well as the Learning Management System (LMS) integrating into the university platform model. This can provide instantaneous feedback where student engagement and effectively change teacher's performance.

The implementation will focus primarily on using the application that are easily accessible using devices by students and lecturers in real time. To achieve this, the combination of technologies will take place in the development of Polling application with Socket IO and React.js using Node.js Express Framework. These technologies fulfil the purpose which is to build an interactive full stack polling application that uses data in real time. The web base application will allow lecturer to start a presentation and interact with the students by asking questions and graphing their responses. Incorporating handling of the real-time data sharing and building user interfaces will be followed up by the factoring components for ES6 integration. Additionally, this application can either be accessed by students through the web browser or by mainly using that QR Code. QR readers will have to be installed on student devices. In simple terms, as soon as the QR Code was scanned by students, the questions will be visible with possible answers on the devices. After students input the response, data will be passed through a polling real-time web application process and display an unlimited number of aggregated responses in visual charts. The charts will indicate result of simple true or false questions, multiple choice or numerical responses.

The outcome of this project will be to enable students to use other methods of communication to enhance their learning. To illustrate this concept, mobile technologies will promote the ability for students to have a flexible communicative effort with aiding their understanding and learning of educational concepts. Real-time feedback, as previously mentioned has been under applied in the educational setting and therefore by conducting this project there will be broadened methodologies that can acquire not only better results for students but also for teachers. For instance, teachers will be able to guide their students more effectively for peer learning. On the whole, this will enhance universities as a business as these methods will not only improve results but also the public perception of these educational institutions.

## **1.2 Background information**

Teachers spend a great deal of time in lectures explaining and teaching subject material which is not always fully grasped by the students as it is presented through the medium of a singular teaching method or approach. Receiving feedback from students is a vital resource and of great benefit for teachers as well as students. However, this is not always possible in the current process where students give feedback verbally and this can be complicated and complex as a result of individual differences and the nature of the processes involved in doing so. Students will often not respond in front of the other students if they do not understand the task at hand or they may not want the teacher to know that they did not understand as many students believe that this can have a direct effect on the teacher's judgement of the student in the long run. Leaving students 'uncertain' in regards to their work can produce poor assignments/results and as stated by (Powell, 2013) "*teachers spent a year of their lives marking work, it must be worth the effort in terms of impact it has on the students subsequent learning*". The primary audience whose satisfaction must be gauged must be learners and students. The efforts of teachers, head teachers, inspectors or parents must be present to satisfy learner's needs and therefore there will be less marking and better grades. Hence, the solution to this problem is to design a way in which rapid real-time feedback can take place from the students to the teacher, allowing an improvement in the quality of teaching, and thus having a significant impact in the educational curricula.

## **1.1 Definition of the problem**

The University of Greenwich is an organisation which provides students in higher education from the age of 18 of any gender the opportunity to learn. Provides lessons, lectures, and tutorials to improve or develop their skills. It enables students to participate in examinations and graduate as an outcome. So the purpose of the educational organisation is to intake students from all over the world who all share the same interests in particular subjects and are all willing skills learn and work together as a team to achieve success. The University is a business located in Greenwich 21,950 students of different backgrounds in academic year 2013/14. (University Guige, 2016) This indicates that the end user are students who will be frequently using the system as well as the University staff lecturers. There will be other end users such as, those who are interested in looking up data and analyse data for better improvement, such as CIS Department. The problem at the moment is the method of teacher student communication where real time feedback is not a common practice that can improve student active learning and enhance teacher performance. The current system of singular teaching and no efficient feedback from the students within lecture environment cause teacher student communication distant and not interactive. There even issues with student surveys feedback that have significant delays in time and can take semester or even a year to take place. Recourses costing a lot of money, and each survey are time-consuming and is not generating enough student's feedback at desired times. Gather accurate information are becoming a big problem for the business, as this is the only method that has

been thought of. Surveys are a long term promotion, however we need something which is more beneficial not just for the student, but the teachers and the University as a whole. A system that which give student power to express their wants and needs and system that will attract students to participate in feedback to improve their own potential.

## 1.2 Problem areas

The energies of this report will be focused on exploring whether real-time feedback will improve teacher-student communication in a lecture within the educational environment. This report will identify techniques and strategies for teachers to obtain student feedback instantaneously and thus improve their interactions with students. It aims to provide an efficacious solution to giving feedback in real-time and the impact that this will have on teacher development and teaching differentiation to improve teaching practice.

## 1.3 Scope of the project

In order to have successful business model the scope of the project was defined where mainly intention is to provide undergraduate students with the opportunity to give feedback to the lecturer at the time of learning and receive feedback conveniently. Thus, lecturer **start presentation** by entering the name and title of the presentation and **invite students** to join in. Teacher are able to **monitor attendance** of the participants **in real time** of the lecture. Students are able to visit feedback website by using their devices and **join the presentation anonymously** or by entering their **full name** to identify themselves to the lecturer. Students are able to **view active question set by a lecturer with a list of multi choice answers**. As soon as each student **submit one answer**, a lecturer can **view all students' answers** on **visual graph** and display to students if necessary. This graph accurately **collects and measure students' feedback to improve teacher's performance**. A part from this, all the data is stored in the database for future data analysis.

Other points to consider:

- To convert the system from traditional verbal feedback to a computerised one to give the opportunity to improve business performance.
- To offer a comprehensive explanation of the real time communication system using computerized system design.
- To provide system requirements, detailed documentation of design and propose two alternative solutions followed by technical documentation for the developers and user guide for the user.
- To develop a database to receive and store data from the student's devices into MongoDB that is compatible with Node.js web application.
- To generate reports of within 'real time' definition. (under 1 second) □ To develop feedback system that teachers and students can access instantly.
- To finalise outcomes and suggest further possible future development.

Moreover, created solution to giving problem using alongside existing academic University policies and environment, enhance communication model between teacher and student. Testing of the key features, in real-time remote student learning instantaneously, provides a monitoring system that will show clear results in the form of visual dynamic charts in any Internet enabled terminal devices. Received data stored in the database for future use and for analytical and evaluation purposes. Accurate and quantifiable measurement of this unique system will be essential in creating desired outcomes. Evaluation of this effective solution can prove that teachers can minimise their efforts and expenditure to achieve the desired learning results within time.

## 1.4 Product audience

At the University Real-time feedback system between teacher and student. The main audience is:

- Undergraduate students who are using the system to give lecturer feedback via their personal device.
- Teachers who are receiving feedback and be able to adjust their performance if needed at the time of the lecture at the University.
- Educational Management Department who can view produced statistics results and evaluate outcomes and the time of the lecturer or at any time with this semester or academic year and amend an educational curriculum if required.

Using the real-time digital technologies enable to see immediate feedback effect in reduced time and unable quick responses that may be both fast as well as convenient for all product audiences.

## 1.5 Project Information

Name	Email	Phone number	Responsibility
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<b>Aditi Rawal</b>	<a href="mailto:a.rawal@gre.ac.uk">a.rawal@gre.ac.uk</a>		Second marker - The University of Greenwich Faculty of Architecture, Computing & Humanities
<b>Yusra Sarkar</b>	<a href="mailto:yusra6@greenwich.ac.uk">yusra6@greenwich.ac.uk</a>		Testing prototype with agreement with project supervisor Keeran Jamil
<b>Greenwich University Academic Council</b>	Academic Council - the University of Greenwich	02083317867	To develop approaches to feedback that impact positively upon learning and deliver improvements to student outcomes. To maximise achievement in learning, teaching and assessment. (Academic Council, 2012, p. 6)

Figure 1- Project User Information

## 1.6 Aims and objectives

Main Aim is to provide the University with a real-time feedback system that is characterised by enhancing teacher-student communication at the time of teaching and reviewing its impact on the performance of learning, teaching and educational curricula.

As the major aim of the real-time feedback system is to produce successful and effective system to the teachers and students, the requirements had to be correctly identified. Moreover, this system can be maintainable and extendable, i.e., allowing future enhancements and amendments. With the intention to achieve goal, the objective described below are needed to be identified and accomplished.

The strategy sets out improved six objectives, each with set of goals, to transform the curriculum and its delivery, providing a dynamic learning environment in which students can achieve their full potential and gain better progress in their learning.

### 1.6.1 Benefit business outcomes

1.6.1.1 To develop and implement approaches to feedback and assessment in educational environment at the University that maximise learning and student outcomes, complies with principles of fairness and transparency. [2.0]

1.6.1.2 To develop approaches to feedback at the lectures at University, that impact positively upon learning and deliver improvements to student outcomes by 24<sup>th</sup> of April 2016. [0.1]

- 1.6.1.3 To develop ‘computer device application’ feedback system for education environment that provides undergraduates with their expectation of high quality teaching and positive difference in themselves within lecture time. [0.2]
- 1.6.1.4 To establish close ties with the University of Greenwich to engage in development of the University student program evaluation in the form of frequent feedback by 24<sup>th</sup> of April 2016. [10.0]
- 1.6.1.5 To support diverse and flexible approaches to learning with effective experience that enhances learning in flexible or face-to-face model by 24<sup>th</sup> of April 2016. [15.0]
- 1.6.1.6 To build up on a well-articulated developmental approach that supports program through review and approval, including enhancing the processes by which the University engages
- 1.6.1.7 To find about student feedback and the ways this feeds into learning by 24<sup>th</sup> of April 2016. [10.0]
- 1.6.1.8 To develop enhanced use of mobile and web technologies to promote flexible learning in educational environment within lecture time. [0.2]
- 1.6.1.9 To make effective use of ICT to encourage and improve communication and networking between students, staff and the community within academic year. [10.0]
- 1.6.1.10 To develop and implement approach to feedback that improves student outcomes and maximise active learning within lecture time as well as within academic year. [7.0]
- 1.6.1.11 To provide all students with an effective experience that enhances learning in flexible mode in educational environment. [12.0]
- 1.6.1.12 To establish a pedagogic service to support the design and delivery of through real time feedback at the training sessions at the end of the development. [20.0]
- 1.6.1.13 To give undergraduate students the confidence to make use of communication technologies within the lecture time at the University. [0.2]
- 1.6.1.14 To enhance teacher-student communication in real time within lecture, by teacher responding effectively in the lecture environment and realise their full potential and to succeed by producing better results. [0.2]
- 1.6.1.15 To embed teacher-student communication activity in the University programme aimed at building confidence and understanding self in preparation of the work. [1.0]

1.6.1.16 To support approaches that make learning more effective through active enquiry within a lecture time. [0.1]

1.6.1.17 To communicate clearly and effectively in a form of feedback, taking to account different audiences in academic environment within academic year. [5.0]

1.6.1.18 To enable student anonymously give feedback data in order to adjust immediately teacher's performance. [10.0]

1.6.1.19 To enable student, provide feedback and identifying themselves, in order for the teacher to provide more specific support to individual in need at the same time of the giving feedback [1.0]

1.6.1.20 To enable lecturer to view collected data in form of charts to enhance professional development by reducing or increasing teaching and learning time. [1.0]

1.6.1.21 For teacher to be able adjust given challenge within the lecture based of the capabilities of student and keep the students in 'flow' zone (80%) at all time in educational environment. [1.0]

1.6.1.22 To be able to analyse data provided by the students that stored in the database and to review its impact/effect on student, teacher and educational curricula respectively after a lecture, semester or academic year. [5.0]

1.6.1.23 To enhance the University practice in collecting and analysing student's feedback from undergraduates within the lecture timeframe. [2.0]

1.6.1.24 To support good communication, clear boundaries, trust and confidence between teacher and student within academic year. [12.0]

1.6.1.25 To align capital investments with the needs of students and the learning, teaching and assessment design in the curriculum in CIS at the University. [5.0]

## **1.6.2 Maximise student achievement**

1.6.2.1 To research existing strategies that maximise the impact of giving and receiving feedback on student achievement within lecture time and its effect on produced work within a semester at the University of Greenwich. [12.0]

1.6.2.2 To research how to enhance teacher student communication in educational environment that will impact that the results within academic year. [2.0]

- 1.6.2.3 To investigate efficacy of the feedbacks giving by the students and its effects on student performance, as well as investigate efficacy of the immediate feedback given by the teacher and its effect on the students' performance within the lecture time. [0.1]
- 1.6.2.4 To investigate how to initiate real-time feedback communication between teacher and a student to fulfil student needs and build student confidence to give frequent feedback to the teacher with ease at the within lecture time. [0.1]
- 1.6.2.5 To establish use of current feedback methods that are present the University of Greenwich in the lecture environment in the academic year 2015 – 016. [1.0]
- 1.6.2.6 To enable students to express their wants or needs in educational environment within lecture time by using the real-time feedback system because it will improve their learning outcome [0.1]
- 1.6.2.7 To empower students to develop their potential as individuals at the University within academic year by participating in a real-time feedback system because it indirectly will improve their learning outcomes. [0.1]
- 1.6.2.8 For the teacher to provide students with formative feedback as soon as results are collected from all students at the time of questions and answers in the lecture, providing that the real-time feedback system was used to unable teacher to view results and evaluate necessary change. [2.0]

### **1.6.3 Enhance teacher's delivery**

- 1.6.3.1 To inform the teacher at the University that changes in the delivery of the teaching have to be made in the provision of the lesson, by using real-time feedback system, in order to apply change more or less and improve students learning there and then.
- 1.6.3.2 For a teacher to improve a teaching delivery method if needed, within the lecture time at the University, based on the results of the collective feedback for the students to accomplish the learning outcomes at the end of the lecture. [2.0]
- 1.6.3.3 For teachers to improve personal and professional development at the University within academic year, by understanding how to use effectively real-time feedback system, within the lecture, which will greatly benefit student, teacher and educational institution for teachers to improve communication with students at the University within academic year by using real-time feedback system at their lectures because it will fulfil one of the requirements set by Academic Council. (Academic Council, 2012) [2.0]

- 1.6.3.4 For teachers to save marking time of their students' work at the University by using time real-time feedback system while teaching and make sure that the students are in the level that teacher wants them to be. [1.0]

#### **1.6.4 Improve teacher-student communication**

- 1.6.4.1 To research journal articles, books, websites and the University of Greenwich public documentation regarding set aims and objectives regarding teacher-student communication improvement within lecture, semester and academic year. [5.0]
- 1.6.4.2 To critically evaluate existing real-time teacher student feedback systems, that are present in the educational environment at the Universities around the world, to have better understanding of the system positive and negative effects on the teacher, student or academic institution. [2.0]
- 1.6.4.3 To investigate various already available teaching methods used in the last five years in the educational environment, such traffic light cups for assessment concept at schools (Paper Cup Company, 2014) . This, and compare findings that provided teachers with a real-time feedback from the students and apply founding's in order to improve already existing system. [2.0]

#### **1.6.5 Using innovating technology**

- 1.6.5.1 To research on current technologies that are used between teacher and student in the educational environment, and within a week identify and improve real-time feedback communication system requirements list for the University. [1.0]
- 1.6.5.2 To provide QR code accessible with the opportunity to give students quick access to real time feedback system web application through their mobile device within the lecture time at the University. [1.0]
- 1.6.5.3 To analyse real-time systems and programming languages that supports data transfer in the real-time, under one second from unlimited resources and to be able to communicate officially to gather responses and stored them locally. [0.4]
- 1.6.5.4 To investigate real-time systems (such as Cloud) in order to better understand the real time concept using Cloud and whether it is suitable for use in the enhancement of the teacherstudent communication in real-time at the University. [0.1]
- 1.6.5.5 To get to access to the system by providing Internet connection at the University for a teacher and students to be able to wirelessly connect all their devices in the same time of

lecture, this will enable successful use of the system and reliable collection of students' giving feedback in order for the teacher to receive unlimited responses from students'. [2.0]

- 1.6.5.6 The product shall provide simple instructions near the QR code to give incentive rather than just slapping a QR code to let students know what they will gain from scanning the code.
- 1.6.5.7 At the time of the technological research to perform quality of and quantitative research or on existing real-time web applications available on the wide world web, followed by comparing and evaluating outcomes which are unable elicitation of the requirements for the real-time feedback system. [2.0]
- 1.6.5.8 To document overview, appearance and usability of the real-time systems available on the web in order to see graphical user interface and functionality that can be improved and used in real-time student teacher communication. [1.0]
- 1.6.5.9 To research and to relate existing real-time student teacher feedback system within a week to the new improved system requirements in order to set requirements that will be used to implement the system. [1.0]
- 1.6.5.10 To take consideration regarding accessibility within the real-time feedback system at the University, whether the different features, functions and the resources can be accessed by students with disabilities at the time of this system use. [8.0]

#### **1.6.6 Apply Legal, Social, Ethical and Professional considerations**

- 1.6.6.1 To apply legal consideration for respondent students to be able to preserve their anonymity while using real-time feedback system in the lecture at the University, if the system provides them with this anonymity functionality, withheld information from the teacher of their identity to ensure privacy of answers and to prevent fellow students from identifying the responses of other class mates. [2.0]
- 1.6.6.2 To apply ethical obligation for the product to ensure that everyone has access to the real-time feedback system within the lecture time at the University, which will enable all the students to have equal opportunity to participate giving answers to the questions in the same time the teacher evaluate students' feedback, based on accurate and complete data that was provided by the students. [2.0]
- 1.6.6.3 The product shall have management system and online platform, that is compliant with accessibility laws, this is if the system is hosted before 20<sup>th</sup> of March 2016 [4.0]

- 1.6.6.4 The product shall have accessibility documentation and resources available for the Greenwich University in order for the teacher to be able to access desired information prior to the lecture as well as with time real-time feedback system is in use. [2.0]
- 1.6.6.5 To apply social and ethical considerations in the lecture theatre at the University by teacher preserving anonymity of respondents which will build trust and strong communication relationship between student and teacher by using real-time feedback system. [2.0]
- 1.6.6.6 To apply professional consideration to store and use of the data provided by the teacher and students at the University, in compliance with data with Data Protection Act 1998. (Legislation.gov.org, 1998) [2.0]
- 1.6.6.7 Social impact on using real-time feedback systems in educational environment at the University will improve any students learning experience and made new connections of communication with the teacher, which will increase productivity of the student. [0.1]
- 1.6.6.8 To apply students and teacher information professional considerations such as (and here) set in data protection principles. (Legislation.gov.uk, 1998) [0.5]
- 1.6.6.9 To apply security into the real-time feedback system and prevention of abuse by the users by implementing validations and encryption in system development by 24<sup>th</sup> of April 2016. [1.0]
- 1.6.6.10 Additionally, if needed, to obtain consent from individuals taking part in the research (There was no need to obtain these consents because the development has no real client and no one taken part in the research). [0.0]
- 1.6.6.11 To ensure that staff uses real time feedback system apply professional integrity in educational environment at the University [0.1]
- 1.6.6.12 to establish real-time feedback system user-testing impact within the lecture and its impact on social dynamics in the classroom at the University [0.1]
- 1.6.6.13 To evaluate and analyse real-time feedback system potential professional risks to the business at the University. [0.2]

### **1.6.7 Project Desirables.**

- 1.6.7.1 To research and investigate the best methodologies that can be used in managing real-time feedback system for the University from the 28<sup>th</sup> of September 2015 to 24<sup>th</sup> of April 2016. [5.0]

- 1.6.7.2 to provide availability of all the resources and technologies that are needed in order to accomplish the successful delivery of this system by provided the deadline, 24th of April 2016. [1.0]
- 1.6.7.3 Research best Methodologies that apply to real-time feedback project [0.4]
- 1.6.7.4 Management planning using Microsoft Project 2013 software and integration of DSDM Atern with clear tasks for each increment iterative development from the 28<sup>th</sup> of September 2015 to 24<sup>th</sup> of April 2016. [0.2]
- 1.6.7.5 Research on impact of DSDM Atern framework on prototyping of real-time feedback product before implementation of the Gantt chart for the project [0.1]
- 1.6.7.6 Use of MoSCoW model and its integration with the DSDM Atern methodology [0.2]
- 1.6.7.7 Pre-Project [7.0]
- 1.6.7.8 Project Proposal [7.0] (24 of October 2015)
- 1.6.7.9 Write project proposal [7.0] (9 of November 2015)
- 1.6.7.10 Preparation for the project pitch [14.0] (16 of November 2015)
- 1.6.7.11 Project pitch [1.0] (7 of December 2015)
- 1.6.7.12 Literature review/discussions/definitions [14.0]
- 1.6.7.13 Writing literature review [5.0]
- 1.6.7.14 Gathering the Requirements [14.0]
- 1.6.7.15 Formulate and record a possible outline of the project specifications such as definition of the problem, system overview, product perspective and user characteristics [0.1]
- 1.6.7.16 User characteristics [0.1]
- 1.6.7.17 Investigate by interviewing and recording transcript followed by analysing current system [14.0]
- 1.6.7.18 Collect system requirements by interviewing about new system followed by summary [14.0]
- 1.6.7.19 Software requirement analysis [2.0]
- 1.6.7.20 Produce two alternative solutions that has been analysed in order for the “client” to see whether or not it suits the “client’s” requirements. Including feasibility and cost followed by evaluation and recommendations [1.0]
- 1.6.7.21 Detail the scope that developer assume ahead of the project management requirements and business requirement specification such as project assumptions and dependencies and constraints, security, Maintainability, Portability and Design evaluation [1.0]
- 1.6.7.22 Identify the factors that contribute to the process of project requirement selection such as Timescale, quality and implications of the project [1.0]
- 1.6.7.23 Timescale, quality and implications of the project [1.0]
- 1.6.7.24 Produce a system specification requirement using prioritisation and 80/20 rule for the realtime feedback system. [1.0]
- 1.6.7.25 Determine resource requirements. [1.0]
- 1.6.7.26 Requirements Analysis. [14.0]

- 1.6.7.27 List of Functional requirements for the real-time feedback system. In order for the developer to complete this project by 24th of April 2016. [8.0]
- 1.6.7.28 List of non-functional requirements, general, and other requirements for the real-time feedback system. In order for the developer to complete this project by 24<sup>th</sup> of April 2016. [8.0]
- 1.6.7.29 Outline the planning and monitoring methods used in project [0.0]
- 1.6.7.30 Apply framework DSDM Atern using MoSCoW and 80/20 rule. [0.5]
- 1.6.7.31 Design Documentation of the system, web design, test design for the real-time feedback system before implementation stage of the project. [14.0]
- 1.6.7.32 Design documentation of the real time feedback information processing system, including the response time will need to meet the need of the user [0.0]
- 1.6.7.33 Prototype Development [30.0]
- 1.6.7.34 Demonstration of prototype [0.1] (7 of December 2015)
- 1.6.7.35 Initial contextual report [7.0] (18 of December 2015)
- 1.6.7.36 Further implementation and parallel testing of the real-time feedback system. [5.0]
- 1.6.7.37 Test new system three times in educational environment at the University. [0.0]
- 1.6.7.38 Encourage educational organisation to test the system. [0.2]
- 1.6.7.39 Fix errors. [7.0]
- 1.6.7.40 Evaluate the system. [0.4]
- 1.6.7.41 Technical Documentation. [7.0]
- 1.6.7.42 User guide. [2.0]
- 1.6.7.43 Document the process of the system production. [2.0]
- 1.6.7.44 Reflect on expected results against actual results. [2.0]
- 1.6.7.45 Interim report. [6.0] (13 of February 2016)
- 1.6.7.46 System Deployment. [2.0]
- 1.6.7.47 To use real-time feedback system between teacher and a student. [1.0]
- 1.6.7.48 Deliverable Presentation. [0.7]
- 1.6.7.49 Demonstration and Viva. [1.0] (18 of March 2016)
- 1.6.7.50 Final report upload. [0.1] (18th of April 2016)

## **1.7 General constraints**

### **1.7.1 User constraints**

There should be no restrictions imposed by the software on users. Only policy such as permissions, access privileges can prevent any user from accessing any part of the system from remote station. Functionality should be presented to the users using similar user interfaces. However, user interfaces should clearly reflect access modes and operating levels.

### **1.7.2 Hardware constraints**

The designed solution is running on one device such as iPhone or iPad within time constraint provided by the lecturer. Additional devices can be used by the lecturers to lead their presentation in future development providing that primary device desktop computer is performing outcomes to the specification of the system. Collaborative applications must meet their hardware requirement in the way for web-based system to work correctly.

### **1.7.3 Software constraints**

One of the constraints is to make components to be easily combined into an integrated system using the new advanced technologies in real-time. Because of choosing Node.js technology to produce realtime system the software developer will be challenged because of use of their latest technologies that are re-evolve in 2015, and only four Hosting Servers have capability to host web application environment, such as Azure.net. This hosting services is not free of charge to use and cost around £60 per month for deployment and services. (Microsoft Azure, 2016). Time constraints in the software delivery because it must be delivered to the deadline 24<sup>th</sup> of April 2016, to report and record all errors for both internal and external sources as well as should be developed by maintaining accurately change logs if there are developer modifications to the software. Comprehensive documentation delivery constraint for the software because even though using agile methodology there is only one person who represented each member of the team and did all the work of the internal and external documentation. If the software does not provide full access to all set functionalities to any user, it will not fulfil the main aim of the project. The required of each interface is listed in the functional requirements specifications for each user. Not meeting the above can have negative impact on the final product delivery and business value.

### **1.7.4 Design constraints**

Requirements of the software running on different layers, for example, real-time control is restricted. The use of external devices means that the integrated systems can be tested and developed independently for the target hardware.

### **1.7.5 Project constraints**

Time constraints can affect time boxed releases of product which can effect scheduled start are of the new timebox and overall to satisfy other scheduling demands.

## **1.8 Assumptions and Dependencies**

In case of Wi-Fi is not available, the Requirements Specification would then have to change accordingly. Dependencies that affect design process and the requirements such as access to current technologies and device application product that require a frequent software update and upgrade for the best performances. The project depends on the knowledge and skill of each team member that is

represented by one person in this case in agile DSDM Atern methodology of project management. Integration of the technologies. Moreover, complete device application must be built by 18<sup>th</sup> of March 2016 and hosted by Azure.net service provider as well as users can connect wirelessly before the system can be tested.

## 1.9 Keywords

Keywords: [Teaching and Learning Enhancement through Technology, teacher, student, real time, feedback, communication, curricula, education, learning, strategy, efficacy, development, marking, change]

## 1.10 Acronyms, Abbreviation, Definitions

DSDM	Dynamic Systems Development Method
UI	User Interface
OS	Operating System
A&G	Acquisition and Guiding
MongoDB	Database Management System
GUI	Graphical User Interface
LAN	Local Area Network
WAN	Wide-Area Network
Atern	Agile Framework DSDM methodology
MoSCoW	Technics used in Agile Framework to prioritise must, should, could, would requirements
80/20 rule	80 % of value by 20% of effort
Wi-Fi	Wireless Internet connection
RPi	Raspberry Pi computer device
CIS	Computing, Information Systems
TSFS	Teacher Student Feedback System
URL	Uniform Resource Locator <a href="http://example.com">http://example.com</a>
SRS	Student Response System
IRC	Investigation Refinement Consolidation
cmd	Command prompt window

## 1.11 Overview of chapters

### Chapter 1. Introduction

Introduce the content and real-time feedback system topic of this report, broad information and problem areas of the student teacher communications in educational environment at the University. Provides scope, product audience and more importantly aims and objectives. Covering constrains, assumptions and dependencies of the project.

## **Chapter 2. Literature Review**

Discusses literature review on the topic and areas required for implementing real-time feedback system for the University. The concept from student, teacher and University was researched and many comparisons on findings, methodologies, tools are carried out.

## **Chapter 3. Research**

Comparison of the traditional or web based models are research to find the most suitable available in current market, that can be applied used and improved in the implementation of the Real-time feedback system in educational environment. Project determined on six suitable filters defined by technical research and finding the right approach to take forward in the design and implementation stages.

## **Chapter 4. Legal, Social, Ethical and Professional Issues**

Defined legal, social, ethical and professional issues that should be consider in the development of the real-time feedback system. This thorough investigation provided solid understanding of the key themes and issues.

## **Chapter 5. Alternative Solutions**

Proposing two real time communication solutions that gives comprehensive overview of different possibilities of the design and implementation. Based on that, real-time teacher student communication system was chosen based on a valuation of two alternative solutions.

## **Chapter 6. Requirements**

Requirements elicitation following process of gathering, negotiating, and understanding the requirements that the system is required to solve a problem and has a direct effect on product quality. Requirements analysis listing functional requirements, non-functional requirements, software technical requirements specification.

**Chapter 11. Project Management Chapter 12. Design Chapter 13. Development Chapter 14. Publishing Chapter 15. Testing Chapter 16. Evaluation Chapter 17. Reflection Chapter 18. Deployment Chapter 19. Technical Documentation Chapter 20. Further Reading**

At the end of the project providing a list of further reading, pointing to key journals, books and other sources where this project can take forward on this topic in greater depth.

## **Chapter 21. Conclusion**

**A comprehensive review of the software development of the real-time feedback system that was covered in previous twenty chapters.**

## **Chapter 22. Bibliography**

A list of the comprehensive scholarly reference surveying the literature of information system read by the author. This list can be used as a starting point for further research.

### **Chapter 23. References Chapter**

A list of the comprehensive scholarly reference surveying the literature of information system read and used by the author in this project. This list can be used as a starting point for further research.

### **Appendix**

List of documents and additional information that was used within the project timeline.

### **1.12 Chapter Summary**

In this chapter, background information of the real-time feedback system is explained in detail. So, its students and the teacher communication through the real-time feedback system, allowing an improvement in the quality of teaching, and thus having a significant impact in the educational curricula. Followed by identifying problem areas which are pointing out the reasons why real-time feedback system was proposed. Next, scope of the project is clearly described types of functions that are needs to be included and shows business process in order for the system to be successful. Finally, aims and objectives are justified, types of constraints are identified, as well as assumptions and dependencies, therefore increased chance to deliver the successful project.

## **2 LITERATURE REVIEW**

### **2.1 Introduction**

As the scope of my project is based in the field of education and technology, in particular looking at the positive impact technology can have in facilitating learning and communication. Thus, especially in case of teacher and student communication and interaction through the medium. By exploring work that carried out previously by others in topic area, concerning real-time teacher-student communications in educational environment and whether feedback improving teacher-student communication and learning outcomes. There is large number of different types of the feedback can be giving from student to teacher and a teacher to the student in so many different ways. Thus, investigates deeper into core topic of the feedback concepts and strategies that are used which have an effect on teacher development and student active learning.

The challenges faced in doing so, the energies of t through his literature review will be focused on an analysis of a few salient and relevant pieces of academic literature on this theme.

### **2.2 Approach to literature searching**

By setting objective hypothesis I have used questionnaires, quality of and quantitative analysis as well as criteria and baseline by using online journals, books, magazines and webpages. Comparing relevant studies by critically review product of teacher-student communication research. This essential information also comes from physical books and physical journals that are relevant. Searching is divided on four sections for better understanding the issue within each as well as for each smart objective within each section there are time allocated in format [day, hour] taking to consideration that one day eight working hours. In particular, the research of articles was performed using Science Direct, and Emerald.

### **2.3 Literature review**

As demonstrated by the research literature in recent years (D.H. Tracey, 2006), technology is a tool to enhance learning and development. Other positive effects being providing greater access to information, supporting learning by improving teaching quality, motivating students and enhancing their self-esteem. As elucidated by (C.K. Kinzer, 1997) the positive effects of technology is two-fold and impacts on both learning in specific content areas, as well as on the learning how to use technology itself. Kinzer and Leu analysed the power of multimedia technologies at various levels, showing that young students made statistically significant improvement in their recognition and use of elements such as main ideas, supporting details, and cause and effect relationships (C.K. Kinzer, 1997). The success of this has resulted in the trend in higher education in the last year towards an increase in the use of technology for teaching purposes. In general the top issues for 2015 (Smith,

2015), for universities wishing to stay updated with technological changes were hiring and retaining qualified staff and updating the knowledge and skills of existing technology staff, optimizing the use of technology in teaching and learning together with academic leadership and the appropriate level of technology to use, developing IT funding models that sustain core service supporting innovation and facilitating growth and improving student outcomes by leveraging technology through a strategical institutional approach as well as demonstrating the business value of information technology and how technology and the IT organization can help the institution achieve its goals.

Whilst a general consensus exists that the appropriate level and use of technology in the field of learning, teaching and education in general is a positive thing (Salinas, 2007), however specifically for our purposes one needs to particularly focus on the role of giving an interview and receiving feedback within this context to assess what impacts this may have on the dynamics of classroom teaching and teacher and student interaction. Firstly, what is being proposed is a technological tool which will allow all feedback to be anonymous and therefore bypass the barriers of shyness and directly challenging the hegemony of the teacher, which many learners often find to a barrier to the comprehension of material taught in class.

It is therefore pertinent here to analyse the differences between direct and anonymous feedback. Direct Feedback can essentially take any form and it is totally dependent on the student's willingness to give feedback to the teacher. This type of feedback is usually focused on the teaching material, and the overall experience in class with the possible advantage of being not anonymous and therefore open to further discussion. The difference between direct and anonymous feedback is significant. Direct feedback is defined as open communication from students to teachers, in the form of emails and conversations in and out of the classroom or any other method that discloses the identity of the students. Some universities in the world have already implemented electronic platforms to allow students for assessing the quality of the teaching and give a judgment about the overall learning experience (Laryea, 2013).

Other institutions just leave the organization of students' feedback to the teacher, who can develop appropriate methods of assessment, allowing students to give their opinion on the course (Noel Entwistle, 1990). In recent years, online platforms for student evaluation of the course have been introduced by higher education institutions in many developed countries in order to monitor the quality of teaching as perceived by the students.

The anonymous, online student evaluation of a course is a quick and efficient way to collect the opinions of the learners and assess the work of the teacher. There are several types of online feedback, offering different types of evaluation. For example, the University of Illinois, in US has structured its Quality Online Course Initiative valuation platform as a list of forms to be downloaded and filled by the students in order to give their evaluation (Corelli, 3 July 2015)

In most instances universities have endeavoured to develop internal platforms to ensure evaluation criteria uphold the institutions standards. Confidentiality is at the basis of such an evaluation system. The online course evaluation system uses current technology security measures to ensure the security of the data, the anonymity of the participants, and the confidentiality of the results. Because the online course evaluation system disassociates the information that identifies the student at the time the survey completion is marked in the system, no identifying information such as name, school, or programme is included in the results stored in the system or seen by the instructor.

In both the above instances, students are allowed to express their own valuation, however these forms whilst subject to anonymity are not conducted in real-time while on the contrary direct communication that does take place in real-time does not allow for anonymity. Students evaluating a course or the teaching conducted after it has concluded may be too late for learners to express their concerns vis-à-vis the comprehension of material taught therein. So the challenge is how anonymous feedback can take place in real-time and this is a realm in which technology can be successfully employed.

Looking at and evaluating existing technologies which may similar to my solution are the third party platforms for teaching aid, the most popular probably being Blackboard (Laryea, 2013). This platform enhances the learning experience, from the design of the course and material to assessment and student evaluation.

Commonly there is a consensus that student evaluations are beneficial. So what are the features that best define an efficient student-feedback platform? First of all, there should be more than just an end-of-course final evaluation. The students should be given the opportunity to give one or more intermediate valuations as well as the course progresses, in order to give the chance to the instructor to make appropriate changes to the learning experience i.e. in real-time within each individual lecture, class, seminar or tutorial itself.

Having established therefore the merit of real-time feedback as a constructive possibility, other vital questions that need to be asked are what are the possible reactions to feedback and how do they impact on the overall quality of the learning experience? The answer to these questions depend on many factors and of course on the nature of the feedback and the means by which it is ascertained. However, if this technological solution is to be successfully implemented in the classroom it would mean a general acceptance of this technology by teachers and educational institutions.

(Corelli, 3 July 2015) Posits three types of teacher's behaviour can be identified and listened, according to their reaction to feedback:

1.     Mostly open: Teachers who accept almost all the criticism from students and are keen at modifying large parts of the course, in order to satisfy their needs.
2.     Critical thinkers: Teachers who are selective in choosing the appropriate opinions from students, rejecting some of them, however being open to most of them.

3. Identity liker: Teachers who prefer to only implement changes suggested by direct feedback from students, rejecting all the anonymous criticism.

It is evident that the type of teacher and the training given to them in how to interact with this classroom technological innovation is a key factor for its success or lack thereof, such as types 1 and 2 above would do better with our solution than 3. Contemporarily Educational Institutions endeavour to train their teachers to be critical thinkers if they want to create a democratic and egalitarian milieu for their students and teachers alike. The overall learning experience is inclining towards a greater trend of building trust between educators and the educated, whereby the analysis of student feedback is critical to pedagogical and teaching success (Lillie, 2008) in (Bill N.Schwartz, n.d.)

Technology plays a crucial role in that sense, in that gives the chance for the students to answer appropriate questions and useful opinions about the course and teaching approaches. Moreover, the speed of technology and development of efficient platforms does not require for teachers to make their own systems for receiving and analysing student feedback, hence optimizing their use of time, and allowing them to concentrate on course preparation, delivery and applying the most appropriate teaching styles and methods. Fundamentally this technologically advanced method of obtaining feedback and evaluation goes ensures anonymity and therefore impartiality in the feedback disclosure.

In conclusion it can be remarked that learning is a complicated process involving various processes and dependant on specific behaviours. Additionally, technology is the key to success in the digital era of education bringing to the fore new tools and processes that enhance the learning experience. Hi-tech educational support forms the bedrock of a new approach to learning which is more student-centric than previously. Of course, strict and intelligent monitoring of educational technology is essential in order to ensure quality in knowledge and the best outcome from the experience, for all the parties involved. The support of technology in education also applies to feedback, intended as an evaluation of the teaching given by students. In recent times this part of the learning experience has become central and important for universities and direct and indirect feedbacks from students have a different impact on the overall behaviour of teachers.

From the most accepting to the less open teacher, the fact is that still much has to be done by institutions in order to make students' assessment more useful and effective without compromising the authority and independence of the teachers. The new challenge for universities in the digital era seems then to be a full integration with online sources of education. Whether from a third party platform or from an inside-projected environment, systems of online learning and online evaluation are at the basis of modern credibility and reputation of the universities and their standards of teaching (Report, 2015).

Other challenges faced by my device would be the costs involved, teaching students and teachers alike how to use and interact with this new technology, the limited number of multiple choices than can be presented as feedback and as with any technology the likelihood of it malfunctioning and the time and costs associated with its repair.

### **2.3.1 Identifying feedback systems**

Traffic light systems are used in educational environment as well as professional corporate businesses as an application that are available in physical and web base format. It is a secure approach. (J.P.Knight, 2015). They are systems that can receive feedback by device application, voice recognition, verbal feedback and other such as email. Universities, Schools, businesses conferences, and even voting system uses real time systems as well as flight control centre. I always wonder why politicians shouting in the parliament when they can quietly press the button which not only will store their response in the database, but also will keep them awake. Teacher student communication systems are designed and are based on real time feedback using computer devices. The purpose is to enhance teaching and learning by collecting data to produce better grades in educational curricula.

At the moment there are feedback systems in place at the University of Greenwich in the form of surveys that is given to the students while cause has not finished, therefore, cannot be properly evaluated. The current system of feedback must come from student representatives who ask questions their fellow students to gather feedback. Overall students suggest that surveys must be done at the end of the course and not for weeks before the cause finishes. (CIS, 2015) Moreover, “At the University of Greenwich feedback responses towards positive or extreme negative. If the students are doing okay, they will not spend time to give feedback because they have better things to do”. (Blake, 2015). This is concluding reasons why there is not sufficient feedback been received by the lecturers within CIS department at the University of Greenwich. However, at the student union meeting the strong points of view was expressed with the wishes for the old feedback system to be revived, which a positive step was taken by the University. (Blake, 2015). Academic standards of the University using feedback is where students are encouraged to respond to the Department surveys, which report on student perceptions of the quality of their educational experience. (PMR, 2014-2015). This provides feedback from students at the program and course level, but not at the level of the lecture timeframe which is playing particular attention to the quality of teaching and learning. The results of the feedbacks received from the students (Survey, 2014-2015) showed overall 94% satisfied with the quality of the program and had improved student’s communicational skills as well as staff are good at explaining the curriculum in lectures. Though, the University can benefit from them new real-time feedbacks teacher student communication system to give extra support to students who found some courses challenging. This change can provide greater range of lecturer input as a clause control and monitoring of students’ progress.

Implementation of an additional feedback system changes could be made to address issues rise by students. Negative comments from students such as amount of time taking for lecturer to give feedback on the work. could be prevented by students have an opportunity to express they wants and needs in real-time of arising issue and therefore lecturer could speed up the process of marking in order to satisfy students’ to prevent negativity at the end of the course or the academic year. To

support students learning experience ‘the University regulations state the belief that assessment methods should be varied and should ‘measure’ appropriately the learning outcomes.’ (PMR, 2014-2015, p. 8) Because actual learning is conducted through lectures, real-time feedback system could provide more support for their development of the learner as well as lecturer.

### **2.3.2 Challenging teacher through feedback system**

Teacher’s reactions on the feedback system from the students impacts their attitude, this is very interesting concept to investigate. Most of the teachers think that they always right, well they should be academically speaking. However, perfection comes with experience and experience comes out from trying out new things such real-time feedback system.

Real-time feedback system providing a reader will form of feedback from students to the teacher, of informing the teacher how well it is understood and grasped by students in the first instance, and whether the material needs to be re-taught with a different teaching approach or method, based on the feedback received.

A recent research paper undertaken by (Corelli, 3 July 2015) at Bursa University in Turkey entitled “Direct vs. Anonymous Feedback: Teacher Behaviour in Higher Education, with Focus on Technology Advances” analyses how feedback and valuations from students’ impact on the behaviour of the teacher. By offering a broad view on the effectiveness of feedback, based on the direct experience of the author, and the discussions and. interviews held in the previous years with other faculties.

The teacher’s responses will vary depending on a variety of factors which can be based on experience, individual differences and willingness for change. To illustrate this concept, take into consideration that a teacher who has been in the teaching industry for a long period of time may be set in their ways and hesitant to adapt behaviours based on student feedback. In contrast, teachers who have only recently been teaching, or who are committed to improving their teaching skills may take a different approach and be enthusiastic about changing their behaviours to help student satisfaction. One important concept to understand here is the enormous variance in individual differences; for instance: particular personality types will result in different engagement and reaction to the student-feedback process.

The paper conducted in-depth analysis of the student’s reaction to various learning methods and how their opinion and feedback are formed. The behaviour of teachers is then discussed, to the actual feedback received by the students, especially relating to how the form of feedback impacts the attitude of the teacher to accept and implement it. Additionally, a delineation of the role of technology is taken into account with in depth analysis of the impact of such a methodology on the general behaviour of the teacher. For example, some teachers do not like use new technology and preferred traditional methods of teaching.

The findings from this and other research papers and journal articles, analysed and cross referenced with the interests, aims and methodologies of proposed technological innovation in the classroom.

### **2.3.3 Challenging students through feedback system**

In order to challenge students and ensure that they are not only understanding the content of the topic, but that they can also apply this knowledge it is important to consider Bloom's Taxonomy, as shown on figure 2.

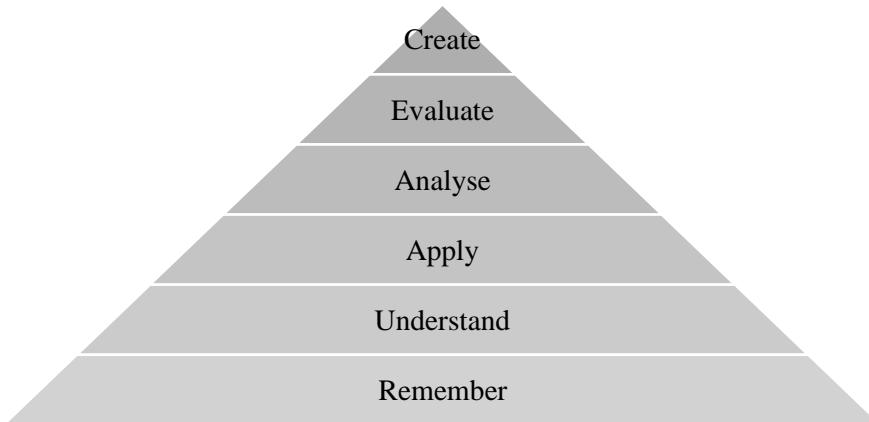


Figure 2. Bloom's Taxonomy

The bottom step represents lower level thinking skills, such as remember and understand. This can be assessed by using multiple choice questions that will provide foundation of the subject area.

Nevertheless, challenging students to use higher order thinking skills such as analyse, evaluate and create often help students to take ownership of the course and become engaged. (Learning and Teaching, 2016)

### **2.3.4 Enhancement of teacher student communication and interactions from student point of view**

Majority of students can be very surprised if teacher's actually wants to hear student's opinions.

Specific feedback is what teacher good at and what teacher is not good at. From teachers' point of view, they want to be there (or not) to fulfil student's needs, it's all depends on the teacher. Lectures are judging students by giving not precise feedback, such as 'do more work' instead of specifically explain to the student exactly what you want him to do. Such as 'concentrate on literature review by searching articles'. This is smart feedback. Other than overloading students with learning material, the teacher must understand that when students are leaving, they will remember only one thing. (How to give feedback to students the right way, 2015)

#### **2.3.1 Enhancement of teacher student communication and interactions from teacher's point of view**

Teacher will not admit that they get 'nervous' when getting their feedback. (Method of Effective Teaching: Student Feedback, 2015) Consolidated feedback and change will change the lesson to suit the flow of the students in lecture. By students pushing teacher to change performance, where without

feedback there will be no change. If you don't change anything, nothing will be changed. Process for learning must be for both! It's not only all about evaluation, it's about professional growth. In improving teacher's performance there is evidence that teacher saying that her teaching is better because she gets feedback immediately (Multiple Measures of Effective Teaching, 2015) Evaluation using any system where by observation teacher gets feedback will benefit student, teacher and education as a business. There is not technological feedback in real time that teachers have access too. Given students opportunity to integrate the feedback to produce a better product.

This analysis is from the teacher's point of view, if there is a need to know whether student understand material or not? In order for the student to intake information in the long term memory, the information must be repeated. Students are in different levels and teacher already knows that. Some students want to move on and some want teacher to repeat.

**Green line** is the students and **red** is the teacher and students are white spots. Students that inside **red circle** are the ones who understanding subjects- approximate zone. Ones brains is tackle something students to the right **want to move** on. Showed in Figure 3.

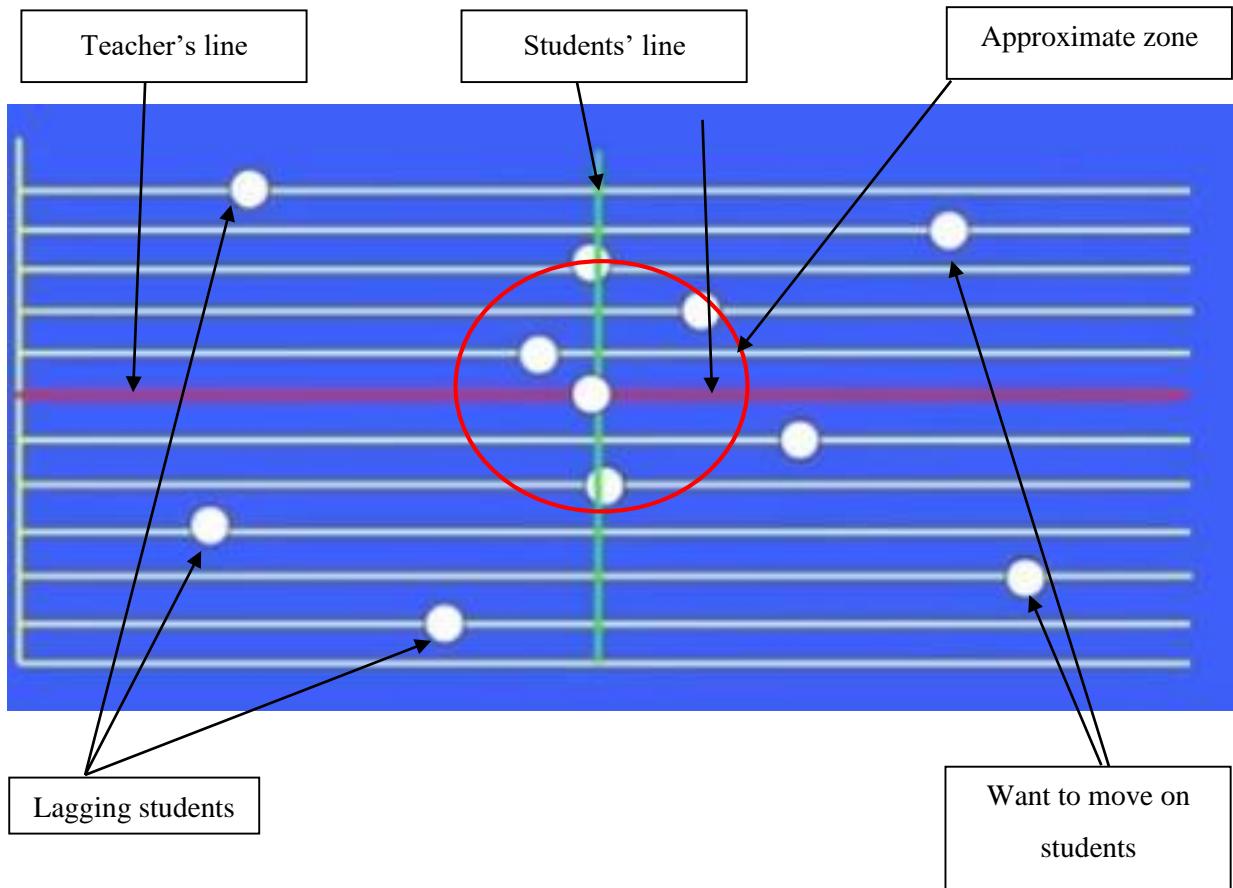


Figure 3. Effective Teaching  
(Multiple Measures of Effective Teaching, 2015)

Therefore, the new feedback system should concentrate to bring **lagging** students to perform better? Or shell teacher moves on? What is more important, to bring lagging students to perform better or satisfy majority of students who wants to move on? In my opinion it all depends on the percentage of the lagging students. How address all of the students' needs and bring students to approximate zone? It is very important to continually teaching students on their approximate zone. (Csikzentmihalyi, 1990)

Work suggest in his book 'Flow 'the physiology of optimum living' which saying that when the student is in flow mode everything fades away, loose truck of time. The golden line is to be in flow zone as much whenever student can. Student skill set is different from low to high. As the teacher set a challenge the flow differs because of student capabilities.

The proposed real time feedback system can indicate to the teacher accurate information of their individual skills. When student presented with the challenge just about their capability level they will be in flow zone. Showed below figure 4. In red circle is the students with low capability and might demand to repeat information. These students are not able to possess the challenge. Should teachers do something about it? By taking them out of 'distant' zone. There also a student with much higher capability.

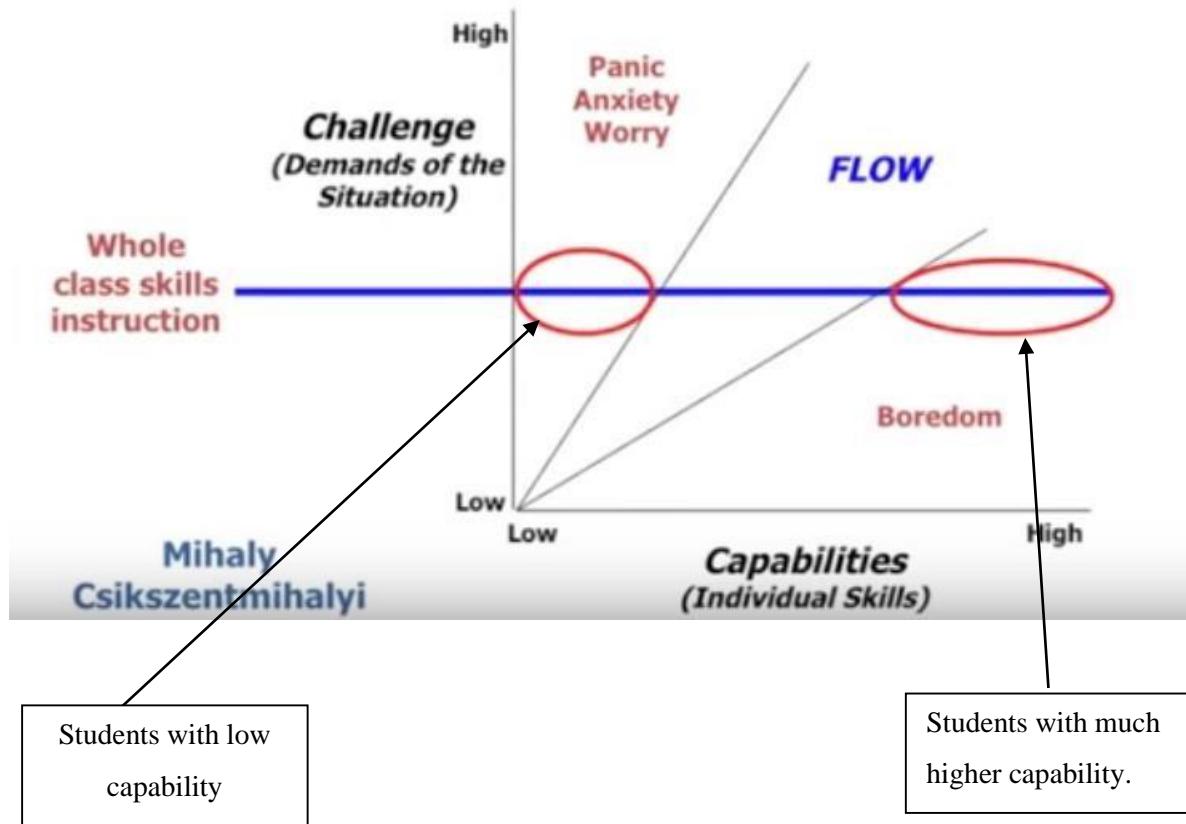


Figure 4. Teachers challenge students carb capabilities skills

(Multiple Measures of Effective Teaching, 2015)

From the illustration on Figure 4, it is clear that by designing and implementing a teacher-student real time communication system, students can let the lecturer to be aware of the response by answering correct questions set by a lecturer. For example, presume this system has three buttons: red and green. Students click **red** button on their device if they did not grasp core material and students click **green** button for teacher to move on. So there is probity that around 80% of the students will click green and teacher will move on. In this case the question is at what percentages teacher must change practice? In teacher's perspective 20% of lagging students is acceptable to move on, but interest enough students think that at 20 % of lagging student's teacher must stop and repeat, however 10% was acceptable. In my opinion if the teacher set challenge to high, the number of low capability student will increase as well as if the teacher lowers the challenge then there is less not understanding students and more bored students. The proposed system enabling teacher to 'levelling up' from one level to success level. Each level is differentiated by difficulty and by challenge, which is keeping students in flow zone and increase capability, therefor students have to build study skills. Current zone expands therefor an approximate zone expands.

How can proposed system can keep students in flow zone? Simply by indicating accurate data from students to the teacher, therefor by creating a differentiating learning environment through problem base learning which is to provide many activities just above student's ability level. Teacher should amend challenges in order to improve capabilities, this suggests that curricula pace should be carefully structured to suit capability and performance of teacher. Moreover, this indicates that course structure of presenting the curricula are adjusted to more suitable curricula. Teacher must ensure that the student understand content at all times and this can happen by simply asking students a question, whether it is specific based or general one, teacher adjusts explanation of the topic. In reality teacher undertake a large topic for students to achieve particular skills within a semester and then breaks down to every week subtopics and only then teach each at the time in the lecture environment. Study suggest that students cannot handle subskills to put final good performance unless all the skills put together was learned. The purpose of real time feedback system is to see how it will impact on my student learning and teacher's performance by utilising a lot of skills and building up. Teacher must ask question on total performance to check capability of individuals' skills. The other solution is to promote Application of Content though Problem-Based Learning which is to ensure student engagement with content. (Glasso, 2013) This suggest that teacher cannot control learning and that students choose to learn. The main conditions that have positive effect our sense of belonging, students feel that they belong to a group and feel save so they chose to learn. Freedom of choice in decision making and independence. For example, if students making a decision on when they will do it or how they will do it, making suggestions or ideas will give students sense of power. And lastly by in the region was content and exploring content in value-added you of ways students must have fun in order to have a feeling of wanted to learn. This conditions are fits into proposed Teacher Student Feedback System (TSFS). Providing this the communication between teacher and the students will be more productive by providing above teacher can ensure that students 'choose' to learn through problem- based learning. Enhancement of teacher student communication and interactions from the University point of view remove Focus on providing a feedback from the one teacher to another because they want to be a better practice as well as providing assessor presents in lecture theatre and giving verbal feedback to the lecturer. (VAM) Value Added Measures student grows in over time. Students doing a survey (feedback takes time) on the courses, but there is not in place feedback system where students have an opportunity to participate in real time or even after lecture to express they thoughts because 'level 6' include independent study. But the question here should be how to enhance teacher performance, student learning and communication at any level of the university. Therefor it led to believe that students are primary learned in need should be valuable. At the current moment the University receiving positive student feedback on overall experiences and seems that there is no need for additional real time feedback system, but improving existing survey system will be beneficial, which is mid and end year computerised surveys.

Characteristics of good feedback in higher education. (Characteristics of Good Student Feedback, 2015) The objective is improving student learning therefore the feedback system must be effective: specific, actionable, respectful and timely - the most effective feedback is immediate and frequent. The current feedback practices in higher education have problems with timeliness where they fail to obtain feedback accurately within the time needed.

### **2.3.2 Methods of effective teaching**

## **2.4 Literature outcomes**

Followed objective research in education and technological and project management sectors there is clear literature, articles, websites and books, videos, sound recordings available on each objective. Based on the literature review, views from student, teacher and institution perspectives was analysed. They stated the facts of the positive impact on the learning process for all which indicates overall positive attitude toward real-time technology systems. This led to believe that the new system will benefit not only students, teachers as individuals, but also student and teacher communication in the real-time as well as possibly have impact on educational curricula change which depends on pedagogy of the teacher. The outcome:

- In order for students to achieve better results at University, the design of sufficient real time communication system the most important factor of this project.
- In this way, this system will replace current system of verbal feedback to more appropriate user friendly system that will enhance teacher explanation and student active learning.
- Communication technology is an advanced user to improve learning and achieving better results.
- Improving feedback system by providing instant response to unlimited number of students.
- To do that there is a need for database.
- Additionally, the idea of monitoring attendance in real-time is an excellent idea.

## **2.5 Key issues to use in the design and implementation**

Taking into consideration literature outcomes, this system must be designed to suit real-time communication. Real time communication defining in this project is under one second. Providing unique features in the same time, simple way to operate to ensure that teachers and students are happy to use the system. In initial design simple system functionality preventing cluttering design with unnecessary functions that the system can live without.

## **2.6 Dynamic System Development Method (DSDM)**

DSDM is a framework rather than a methodology and it is formed by modelling rapid application development (RAD). Unlike RAD, it is fast processes can be performed in a short period of time, within six months by estimation of controlled project environment. This framework is very popular

because of its flexibility than the traditional methodology and allows iterative and incremental approach. Success of the project, depending on the team effort and use of knowledge of the business requirements and technical skills. High quality demands fitness for purpose, as well as technical robustness. Resources must be spent wisely developing the features of most value to the business. (Tudor, 2010) In order to understand, communicate, plan, control and deliver the project in the development life cycle DSDM is suitable because it offers five phases: feasibility study phase, business study phase, functional model iteration phase, system design and build iteration phase, implementation phase. DSDM techniques such as 80/20 rule, prototyping, MoSCoW prioritisation and Timeboxing adding value to this framework. Atern life cycle is both iterative and incremental, short on figure 5. This enables to constantly evaluating task in hand, comment on it and make changes during the development of an increment of the solution.

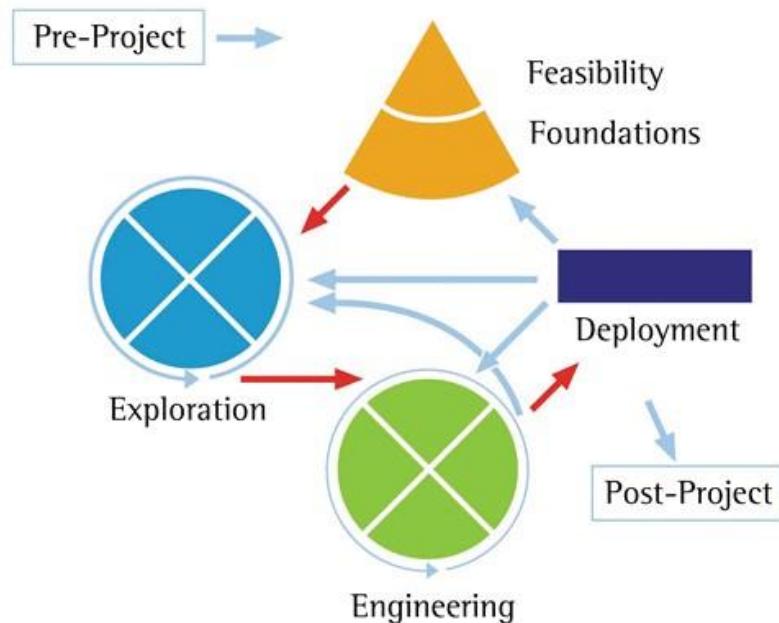


Figure 5. The Atern Lifecycle process  
(Tudor, 2010)

The project process, as shown on the figure above, has been fully integrated by the author into the Microsoft Project 2013 and provides comprehensive Gantt chart, network diagram, resources, timeline of the project and much more. Referee to Appendix B.

### 2.6.1 Strength

DSDM embraces the concept of active user involvement that are very important. So the 80/20 rule are very powerful tool where 80% of functions can be obtained at 20% of the time, because the most essential functions can be delivered rapidly and regular intervals. Development time will not be behind project schedule and the required system can be timely delivered without exceeding the allowed budget.

In addition, Unified Modelling Language (UML) and prototyping is used to ensure that user requirements are correctly captured. MoSCoW techniques are applied to prioritise the functional requirements and to emphasize on the most important processes. Later, requirements with the large potential profits I firstly developed with the help of Timeboxing techniques to be able to deliver them with the fixed time scale. Moreover, since in DSDM is a product base view, it is concentrates on frequent delivery of the working parts of the system and this can solve the immediate needs of business as soon as possible.

## **2.6.2 Weaknesses**

DSDM is not a good solution for computationally complex application and project which are going to develop for a new and innovative technology. In the lifeline of the development all the users are involved throughout development process, they understanding of the requirements are increasing. Therefore, they change their requirements. Again and again and they also want to add other extra functions. This can have an effect on the developers, time, and money that will be a risk to not to deliver a project in time and budget.

## **2.7 Tools**

Artefacts are used in information system development. In case of real-time feedback system between teacher and student communication, programming languages and database need to be evaluated and chosen. In developing dynamics website application that can fulfil the requirements Node.js Socket.IO Express framework are used, including React.js, bootstrap with integration to ES6. MongoDB is cross platform document - oriented database is an open source development model.

## **2.8 Conclusion**

Chapter 2, discusses about the literature review on the things and areas required for implementing realtime feedback system for the University. The concept from student, teacher and University was researched and many comparisons on findings, methodologies, tools are carried out.

In conclusion it can be remarked that learning is a complicated process involving various processes and dependant on specific behaviours. Additionally, technology is the key to success in the digital era of education bringing to the fore new tools and processes that enhance the learning experience. Hi-tech educational support forms the bedrock of a new approach to learning which is more student-centric than previously. Of course, strict and intelligent monitoring of educational technology is essential in order to ensure quality in knowledge and the best outcome from the experience, for all the parties involved. The support of technology in education also applies to feedback, intended as an evaluation of the teaching given by students. In recent times this part of the learning experience has become central and important for universities and direct and indirect feedbacks from students have a different impact on the overall behaviour of teachers.

From the most accepting to the less open teacher, the fact is that still much has to be done by institutions in order to make students' assessment more useful and effective without compromising the authority and independence of the teachers. The new challenge for universities in the digital era seems then to be a full integration with online sources of education. Whether from a third party platform or from an inside-projected environment, systems of online learning and online evaluation are at the basis of modern credibility and reputation of the universities and their standards of teaching (Report, 2015). Other challenges faced by my device would be the costs involved, teaching students and teachers alike how to use and interact with this new technology, the limited number of multiple choices than can be presented as feedback and as with any technology the likelihood of it malfunctioning and the time and costs associated with its repair.

As a result, in depth knowledge of requirements to adopt real-time feedback system, is gained and right solution could be chosen. To manage the project and analyse the requirements, DSDM and UML will be applied. Moreover, real-time feedback system will be implemented using real-time modern technology Node.js and MongoDB database will be used to store data.

## 3 RESEARCH

### 3.1 Introduction

This is a review of existing technologies that are gathering customer/ student feedback which is encouraging customer feedback that lead to better business relationships and stronger customer retention.

### 3.2 Traditional feedback method

#### 3.2.1 Overview

Traditional method is to tick suggestion boxes that leave mountains of paper to sort through, while email forms produce unorganized data that is hard to visualize and difficult to respond to in a formal manner. See figure 6 of an example.

### **3.2.2 Appearance**



Figure 6. Traditional method of feedback

### **3.2.3 Usability**

Very popular method of feedback even at present time, where technologies is overpowering traditional methods. Giving feedback is by answering question by ticking boxes on a paper.

## **3.3 Web based application – UserVoice**

### **3.3.1 Overview**

User Voice creates a simple forum for your users to submit and vote on feedback. (UserVoice, 2015) ‘This is helpful because it allows you to gauge which ideas your customers really want implemented and which problems are isolated issues versus widespread situations.’ (Catone, 2011) The app is not free to a business, but offers customer support with customization which I could not get through in any way or form. See figure 7.

### **3.3.2 Appearance and Usability**

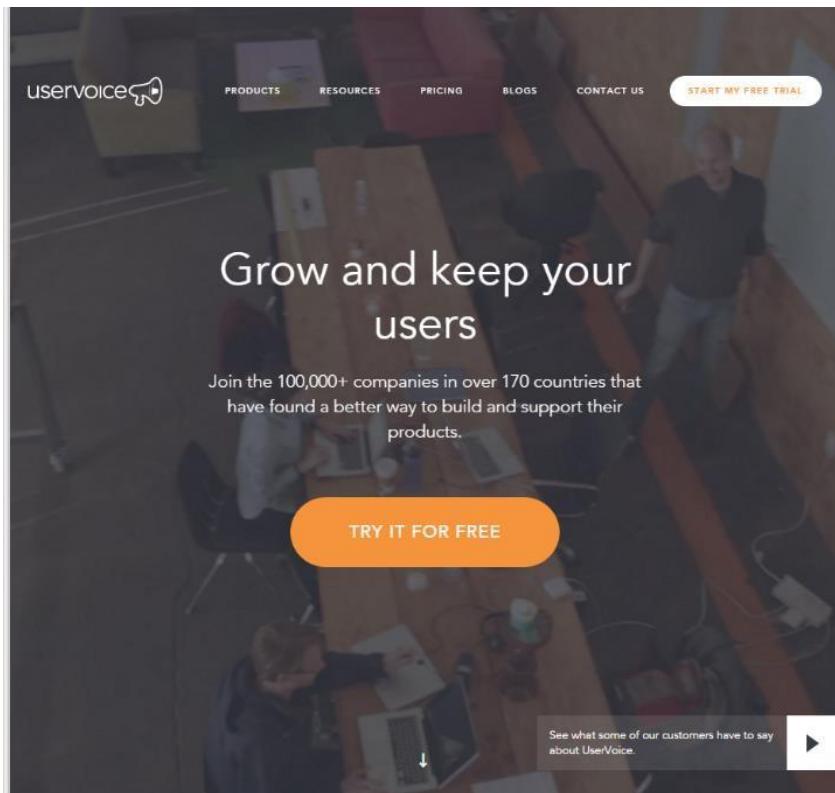


Figure 7.

Registration process. See figure 8.

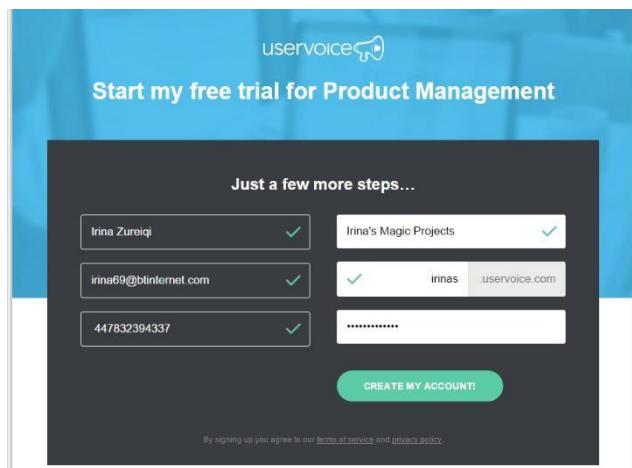


Figure 8.

The choice is given to the business to use feedback by adding it to their website, iPhone, iPad, or Android application. See figure 9.

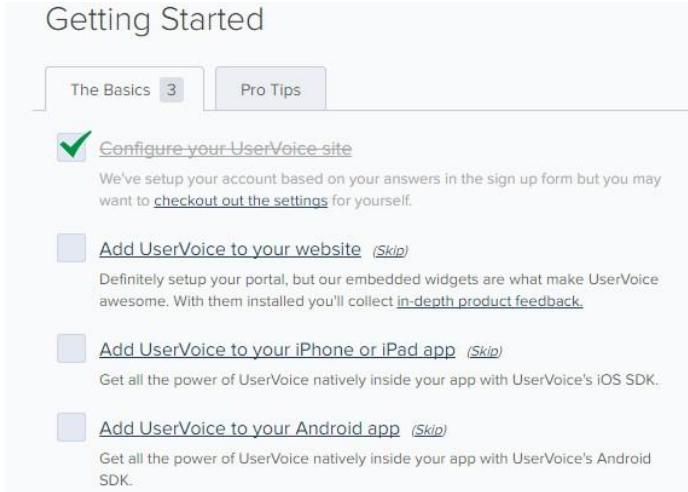


Figure 9. Traditional method of feedback

The installation is not strait forward and demo version are lacking most of the features and not usable as describe on the help application. See figure 10.

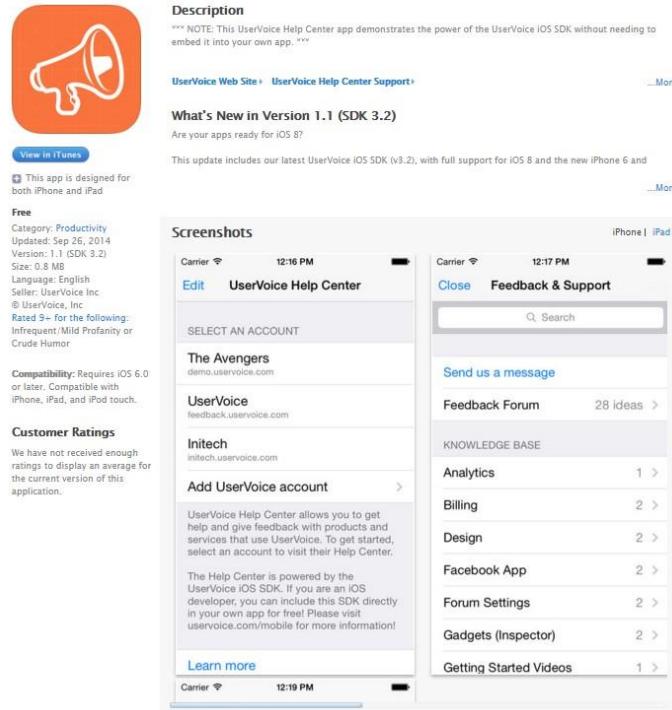


Figure 10.

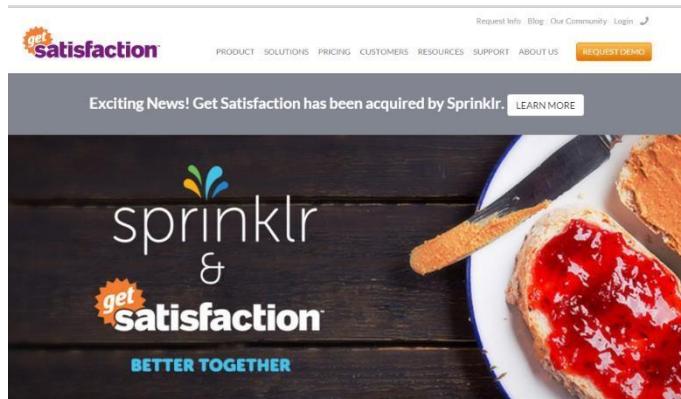
### 3.4 Web based Application - “Get satisfaction”

#### 3.4.1 Overview

It is not free application for business. See figure 11. This application is user support community where customers are able to create a page for any company that isn't already in the system. (Get Satisfaction, 2015) For the university, the app can provide a forum-like help page for students and staff to ask question, submit ideas, gets support and give props by providing official answers to user's questions.

Integration with the Facebook app where students can integrate support directly into University Facebook Page.

### 3.4.2 Appearance



Online Community. The Shortest Distance Between  
You and Your Customer

Figure 11.Home page

Is there's a chance the University of Greenwich might already have a page? By clicking on try it for free I will try login. See figure 12.

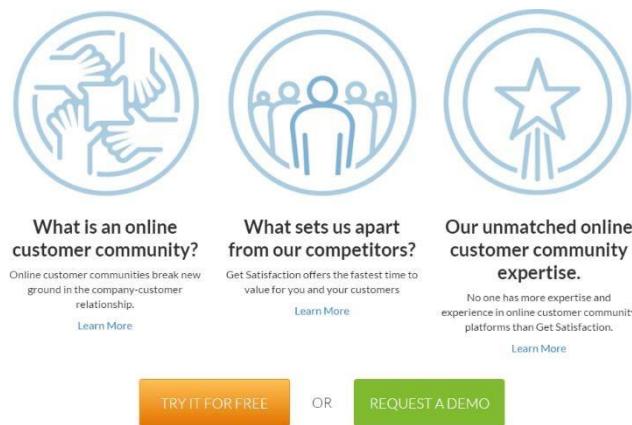


Figure 12.

Conformation page is displayed. See figure 13.

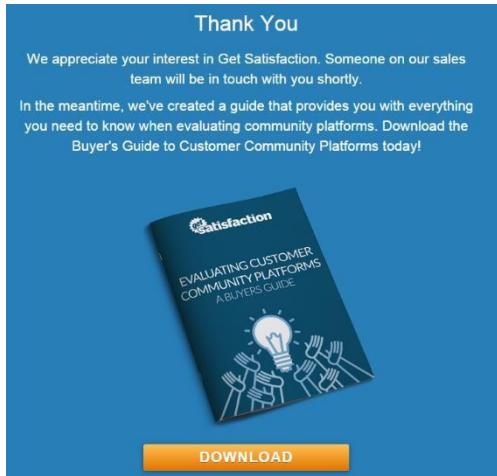


Figure 13. Evaluating customer platforms

### 3.4.3 Usability

For the university, this application is providing forum-like help page for students and staff to ask question, submit ideas, gets support and give props by providing official answers to user's questions. By integrating with the Facebook application a students' can integrate support directly into University Facebook Page.

## 3.5 Web based application – Feedbackify

### 3.5.1 Overview

Free to the business it is a real-time feedback from the website visitors. (Feedbackify, 2015) See figure 14.

### 3.5.2 Appearance

Figure 14.

### 3.5.3 Usability

Registering and sign in the following displayed. It was a fast easy proses to register. This site states that no credit card is required. See figure 15.

The screenshot shows the Feedbackify! Feedback Dashboard. At the top, it says "irina zureiqi signed in |". Below that is a navigation bar with "Feedback Dashboard | My Feedback Forms | My Account". The main area is titled "Feedback Dashboard" and contains two filter dropdowns: "Filter Form: All forms" and "Filter Category: All categories". A message says "You haven't received any feedback yet." Below it, a link "Have you edited and deployed your feedback form?" is underlined and has a red arrow pointing to it from the text above.

Requesting to upload feedback form in order to get feedback.

Option to create a new form is available.

The screenshot shows the "My Feedback Forms" page. It has a table with columns "Form Name", "Feedback Items", and "Actions". There is one row for "Default Form" with "0" feedback items. The "Actions" column contains links: "Rename", "Edit", "Deploy", and "Delete". A red arrow points from the text "Option to create a new form is available." to the "+ Create a new form" button at the bottom right of the table.

Figure 15.

It offers simple clear instructions such as give a name to your form.

The screenshot shows the "Create a New Form" page. Step 1 asks "Would you like to start from scratch or copy one of your existing forms?". The "Start from scratch" option is selected. Step 2 asks "What name would you like to give the form?". A note says "This name won't appear on the actual form, it'll just be used to identify the form within your dashboard." Below is a text input field with "Name: Student Real Time Feedback system HE". At the bottom are "Create this form" and "cancel" buttons. A red arrow points from the text "It offers simple clear instructions such as give a name to your form." to the "Name:" input field.

It was successful.

My Feedback Forms »

## Create a New Form

Congratulations, your new form "Student Real Time Feedback system HE" has been created!

You can now edit the form, and then deploy it to your website.

To see deep into functionality I had to not just to create the form, but also edit it and deploy.

## Feedbackify!

Feedback Dashboard | My Feedback Forms | My Account

My Feedback Forms »

### Student Real Time Feedback system HE

Edit Form

Deploy Form

#### Edit Form

You can edit all aspects of your feedback form below, including uploading your company logo, editing the text, and defining the feedback categories and sub-categories. When you have finished editing, click the 'Save Changes' button at the bottom of the page.

##### Your Company Logo

Upload your logo to reinforce your brand and give your visitors extra reassurance they are submitting feedback directly to you. JPEG, PNG, & GIF formats supported. File size must be less than 200Kb. Images greater than 50 pixels height will be resized to fit.

Upload New Logo

Preview Form

##### Custom Text

You can customize all the text that is shown on the feedback form below, including button and error message text, so feel free to customize the form or translate it into any language you wish.

Select screen to customize:

Screen 1: Submit Feedback ▾

Preview Form

##### Heading text:

Hello, we'd love to hear your feedback about our website...

##### Intro text:

**Rating question text:**  
Firstly, how likely would you be to recommend our website on a scale of 0 - 10?

**Feedback category intro text:**  
Now, if you have any specific feedback, please select a category below...

**Feedback textbox intro text:**  
Please enter your feedback in the box below and then press 'Send Feedback'.

**"Send Feedback" button text:**  
Send Feedback

**"Cancel" link text:**  
or cancel

**Validation:**

- Visitor must select a score OR select a category/subcategory ▾
- Visitor must enter feedback text, if category/subcategory selected

**Error message - No score or category selected:**  
Please select a score or choose a feedback category...

**Error message - No subcategory selected:**  
Please select a subcategory...

**Error message - No feedback text entered:**  
Please enter some feedback text...

### Feedback Categories

Categories are shared amongst all forms in your account. Use the checkboxes to select which ones to include in this form. You can grab the handle on the left of a category to re-order.

[Create New Category](#)
[Preview Form](#)

<input type="checkbox"/> <b>Problem</b> No subcategories selected	<a href="#">Edit</a>	<a href="#">Delete</a>
<input type="checkbox"/> <b>Suggestion</b> No subcategories selected	<a href="#">Edit</a>	<a href="#">Delete</a>
<input type="checkbox"/> <b>Compliment</b> No subcategories selected	<a href="#">Edit</a>	<a href="#">Delete</a>
<input type="checkbox"/> <b>Other...</b> No subcategories selected	<a href="#">Edit</a>	<a href="#">Delete</a>

Into text was added: Student free download and install feedback application in any type of student device such as iPhone, iPad, Android, Windows desktop. Student answer teachers question by using tree buttons: Green - for "I understand and would like to move on", Yellow - for "I kind of understand" and Red" - for "I do not understand, please repeat "Teacher can view student outcomes on computer display which enables the teacher to viewing visual charts in real-time.

Deployment of the form is a “set up a stylish feedback tab on your site, which will open your feedback form when clicked. If you prefer, you can follow the instructions in Method 2 below to open your feedback form in any way you like, including from a simple text link.” (Feedbackify, 2015)

## Student Real Time Feedback system HE

[Edit Form](#)[Deploy Form](#)

### Deploy Form

On this page, you can use our simple Feedback Tab Configurator to quickly and easily set up a stylish feedback tab on your site, which will open your feedback form when clicked. If you prefer, you can follow the instructions in Method 2 below to open your feedback form in any way you like, including from a simple text link.

#### Method 1: Feedback Tab Configurator

The easiest way to start getting feedback on your site is to use our simple 'Feedback Tab' configurator below. Simply choose the position and color of your tab (our handy preview shows you how it will look), then click the 'Update Code Below...' button, and finally copy and paste the custom generated code into your site HTML.

**Step 1: Tab Settings**

Position:  Left  Right

Color: #FF1F3A

[Update Code Below...](#)

**Tab Preview:**



#### Step 2: Feedback Tab Code

Now, copy & paste the following code into your HTML directly before the closing </body> tag.

```
<script type='text/javascript'>
var fby = fby || [];
fby.push([ 'showTab', {id: '10497', position: 'right', color: '#FF1F3A'} ]);
(function () {
    var f = document.createElement('script'); f.type = 'text/javascript'; f.async = true;
    f.src = '/cdn.feedbackify.com/f.js';
    var s = document.getElementsByTagName('script')[0]; s.parentNode.insertBefore(f, s);
})();
</script>
```

#### Method 2: Using a Custom Link

If you don't wish to use our feedback tab to launch your feedback form, don't worry, there are limitless other ways for you to launch it. The first step is for you to include our feedback form code, as follows...

#### Step 1: Feedback Form Code

Copy & paste the following code into your HTML directly before the closing </body> tag.

```
<script type='text/javascript'>
var fby = fby || [];
(function () {
    var f = document.createElement('script'); f.type = 'text/javascript'; f.async = true;
    f.src = '/cdn.feedbackify.com/f.js';
    var s = document.getElementsByTagName('script')[0]; s.parentNode.insertBefore(f, s);
})();
</script>
```

Then, whenever you wish to launch the feedback form, you just need to call the 'showForm' method as follows:

#### Step 2: Example Link

Insert the following code into your HTML to launch the widget from a simple 'Give Feedback' text link...

```
<a href="#" onclick="fby.push(['showForm','10497']);return false;">Give Feedback</a>
```

I have successfully created feedback to my webpage ‘meet the teachers’ of the [www.ukacademy.co.uk](http://www.ukacademy.co.uk)

**UK DANCE ACADEMY**

## Meet the teachers

**Principal of UK Dance Academy**

UKDA Principal and a dance teacher, my name is Irina. I have a passion for dance and I became a dance teacher in the Ukraine. I moved to UK in 1996. Not long after I opened a dance school in Ashford which I named UK Dance Academy. I have many students at the school of vastly different ages and abilities. I am a member of the Imperial Society of Teachers of Dancing (ISTD) and United Kingdom Alliance (UKA), Street Dance International (SDI), which enables my students to take their dance exams, compete in National and International Dance competitions, take part in dance shows and other events. I love to teach Dance and never stop dancing myself. I teach Disco Freestyle, Hip Hop, Street, Rock'n'Roll, Salsa, and many others styles.

**Salsa Dance Teacher**

I am Nelson Campos. I began to dance Salsa dance from the year 2001. Our team won a lot of competitions all over the world and participated in international championships or festivals. Come along to my Salsa Dance class. Great fun.

The following form was displayed

Hello, we'd love to hear your feedback about student real-time feedback system at lectures at University

Student (you) upload free feedback application in any type of device such as iPhone, iPad, Android. At the lecture you will be asked to answer a question: Do you understand? (Specific content). Student answer teachers question by using tree buttons: Green - for "I understand and would like to move on", Yellow - for "I kind of understand" and Red - for "I do not understand, please repeat". Teacher can view students outcomes on computer display which enables the teacher to viewing visual charts in real-time and adjust teaching to suit your needs.

Firstly, how likely would you be to be willing to use student feedback system on a scale of 0 - 10?

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Now, if you have any specific feedback, please select a category below...

Powered by Feedbackify™ Send Feedback or cancel

of the Imperial Society of Teachers of Dancing (ISTD) and United Kingdom Alliance (UKA), Street Dance International (SDI), which enables my students to take their dance exams, compete in National and International Dance competitions, take part in dance shows and other events. I love to teach Dance and never stop dancing myself. I teach Disco Freestyle, Hip Hop, Street, Rock'n'Roll, Salsa, and many others styles.

**Salsa Dance Teacher**

I have clicked on 10 as my test option and reply is where it works both ways: anonymously by just clicking on the submit button or enter name, email and phone numbers.

**Many thanks, your feedback has been submitted.**

If you'd like us to follow up on your feedback, please enter your email address below. We will never use your email address for any other purpose.

Name:

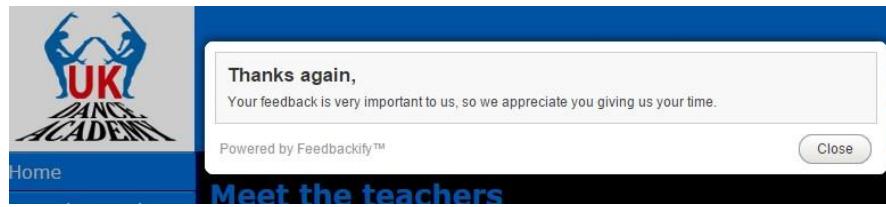
Email:

Phone:

Powered by Feedbackify™ Submit Contact Details or close

I have a passion for dance and I became a dance teacher in the Ukraine. I am now based in the UK and I still teach dance. I am currently teaching at the UK Dance Academy.

Click on Submit



Email was received

Feedbackify Alerts <alerts@feedbackify.com> To irina69@btinternet.com Today at 11:25 PM

Hi there,

You're receiving this email because you're a nominated recipient of feedback alerts.

You just received a new item of feedback! The details are as follows:

Time: 23:22 Saturday, 12th December 2015  
 Form Name: Student Real Time Feedback system HE  
 Url: <http://www.ukdanceacademy.co.uk/meettheteachers.html>  
 Email: [irina69@btinternet.com](mailto:irina69@btinternet.com)  
 Name: Irina Z  
 Score: 10  
 Category: no category selected

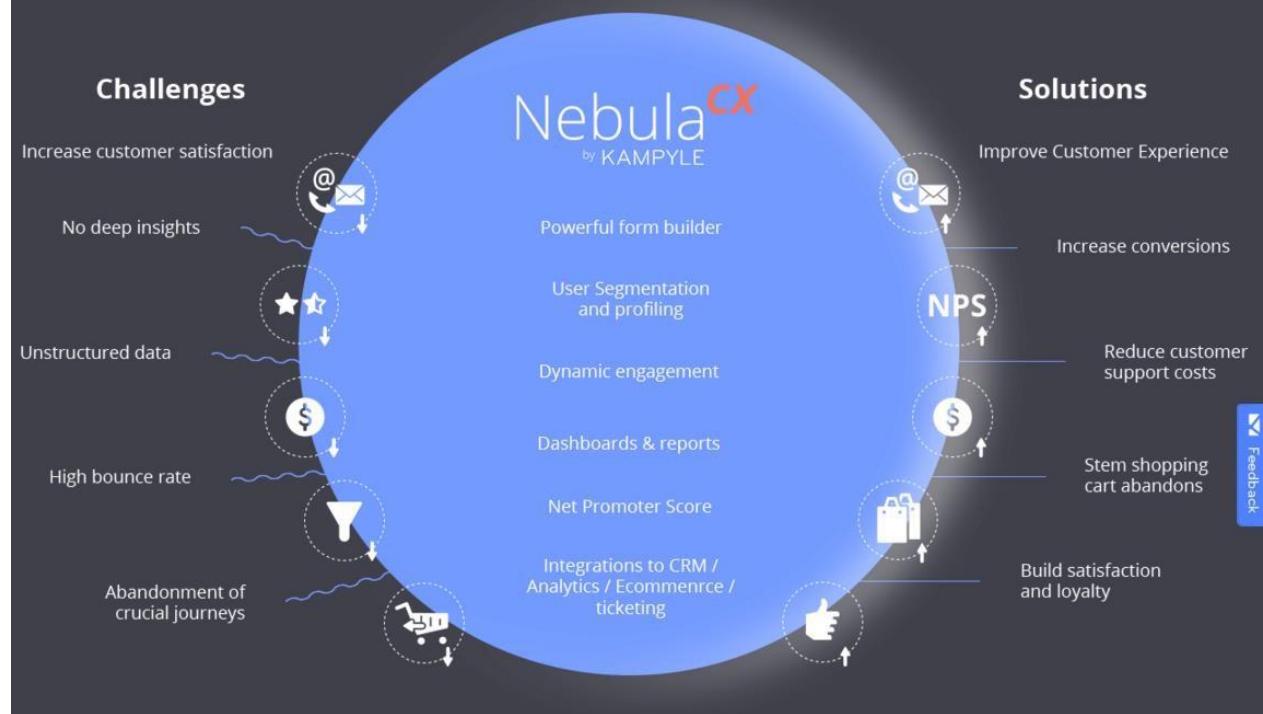
Web based feedback form is extremely easy to use, the feedback received by email and it could take time to view all the emails large number of students and analyse data.

### 3.6 Web based application - Nebula Kampyle

#### 3.6.1 Overview

Not a free to the business platform, but offers rich content to the customer. (Kampyle, 2015) The form can be displayed on any device platform.

#### 3.6.2 Appearance



Registration process:

First name \*

Irina

Last name \*

Zureiqi

Business email address \*

irina69@btinternet.com

Phone number \*

+447832394337

Company \*

UK Dance Academy

What's your main goal in implementing VoC? \*

✓ Understanding our users better

When are you planning to implement VoC? \*

✓ In next 3 months

Password \*

.....

Confirm password \*

.....

Min 8 characters with at least one letter, one digit and one special character

By registering you agree to the [Terms & Conditions](#)

[Join Now](#)

Password needed to have an extra /. <” for better security which was made me trust this site strait away at registration process. Checking out demo account to see the functionality.

### 3.6.3 Usability

Plan, implement and optimise the voice of the customer program ensuring of the successful outcomes.

The screenshot shows the Kampyle interface. On the left is a sidebar with navigation links: Dashboard, Inbox (537), Reports, Forms (selected), Actions, and Automation. The main area is titled 'Forms' and contains two cards. The first card, 'General Feedback', has a toggle switch at the top. The second card, 'Standard NPS', also has a toggle switch at the top.

Using a form builder enables to customise feedback form in minutes.

The screenshot shows the Kampyle form builder for the 'Standard NPS' form. The left sidebar is identical to the previous screenshot. The main area shows the form structure with tabs for 'Add Field', 'Field Settings', and 'Page Settings'. Below these tabs is a grid of field icons: Text Input, Text Area, Radio Buttons, Checkboxes, Drop Down, Rating, NPS, Date, Email, URL, Text, Image, and Section Break. To the right, a preview window shows the final form design. It features the UK Dance Academy logo at the top. Below it is a dropdown menu labeled 'Select your Lecturer \*' with the placeholder 'Please Select Option'. The main question 'Do you understand? (specific topic)' is followed by a rating scale with five colored smiley faces (red, orange, yellow, green, blue) and a note 'Please select your answer'. At the bottom are 'Close' and 'Send Feedback' buttons, and a 'Powered by KAMPYLE' footer.

Preview shows as following

The image shows four sequential screenshots of a feedback form from the Kampyle platform. 
 1. The first screen shows a dropdown menu 'Select your Lecturer' with 'Please Select Option' and a rating scale from 1 to 5. Below it is a question 'Do you understand? (specific topic)' with a required field note 'Rating \*' and a 'Please select your answer' note. Buttons for 'Close' and 'Send Feedback' are at the bottom.
 2. The second screen shows the lecturer selected as 'Keeran Jemil - Project' and the rating increased to 4. The question and notes remain the same.
 3. The third screen shows the rating increased to 5. The question and notes remain the same.
 4. The fourth screen shows the rating increased to 4 again. The question and notes remain the same. A 'Thank You For Providing Feedback' message is displayed at the top right.

Real time user profiling and segmentation Engagements with the customer are based on their profile and status which is increase probability to react. Dashboard statistics for giving feedback by detailing what customer had experience and why.



There is a smart inbox that manages easily and effectively where Feedback details and metadata, sort can be sent in real-time to the shareholders for fast resolution if needed. Kampyle can be integrated with Google Analytics, Ticketing and e-commerce platforms (Kampyle, 2015)

## 3.7 Standalone clicker devices - Turning Point

### 3.7.1 Overview

Turning Point Clickers / responds cards.

Clickers are hand-held devices in a remote personal response system to transmit and record student feedback to interactive questions. Registered to a student, clickers allow instructors to track involvement and retention, understand attitudes and preconceptions, facilitate discussion and instruction and provide meaningful assessment. Iowa State has standardized on the Turning

Technologies audience response system which includes both the hardware (clickers and receivers) and software components (Turning Point and Turning Point Anywhere). (Keepad Intractive, 2016)

### 3.7.2 Appearance

Here is the picture of the clicker devices

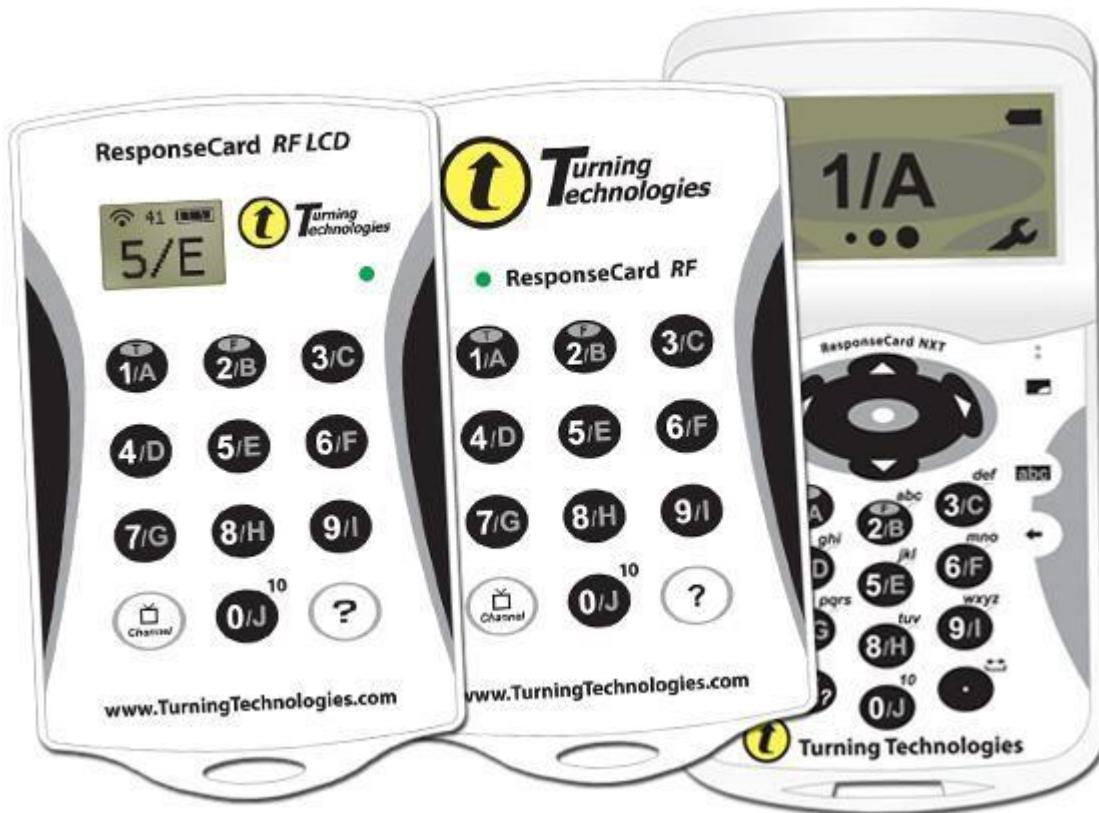


Figure 16. Turning point clicker's devices

### 3.7.3 Usability

#### 3.7.3.1 From the University point of view

##### 3.7.3.1.1 Summary

Case study of using TurningPoint and ResponseWare at the Faculty of Humanities (Middleditch, 2015) The Faculty of Humanities eLearning team conducted a pilot of TurningPoint and ResponseWare, in response to academic demand by staff seeking a system that would provide the same benefits of a standard classroom response system, but utilising the advantages of student owned mobile devices.

### 3.7.3.1.2 Solution

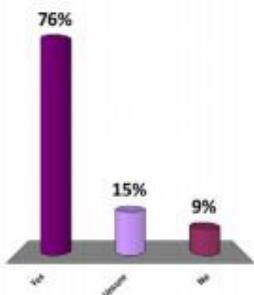
Turning Technologies develops educational technology aimed at increasing interactivity and engagement in face-to-face teaching by allowing instructors to pose questions within their lecture to drive two-way feedback and discussion. ResponseWare interfaces and builds upon the TurningPoint polling software and ResponseCard keypads that University of Manchester faculty and staff already have in place. ResponseWare allows students to respond through their own mobile devices as an alternative to the keypads.

### 3.7.3.1.3 Outcomes

This project found that ResponseWare easily fits within existing teaching practices. The PowerPoint® integration provides for ease of use, faculty licensing capabilities support the university's purchase model and the integration with existing ResponseCard keypads upholds inclusivity. Evidence collected through surveys of students in Dr Paul Middleditch's Macroeconomic Principles, ECON10042 with 633 enrolled students indicate that students see this tool as providing an enhancement to satisfaction and learning.

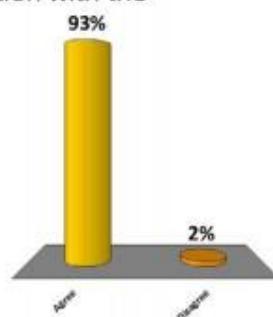
Do you think it was useful to use your own device in the sessions?

- A. Yes
- B. Unsure
- C. No



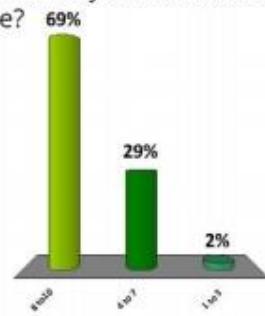
The voting system has enhanced my level of satisfaction with the programme.

- A. Agree
- B. Disagree



How strongly (1-10) do you believe that the system will enhance your satisfaction of the programme?

- A. 8 to 10
- B. 4 to 7
- C. 1 to 3



How satisfied are you to receive feedback in this manner using your own device?

- A. Very Satisfied
- B. Satisfied
- C. Neutral
- D. Dissatisfied

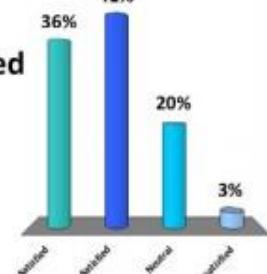


Figure 16.1. Case Study University of Manchester. TurningPoint and ResponseWare at the Faculty of Humanities (Middleditch, 2015)

### 3.7.3.2 From teachers' point of view.

The benefits of the TurningPoint5 expressed by academics that already using this system since 2006 and see definite increase in A grades from 20% to 40%, the same number on Bs and decrease on C grade, however 12% of the class always fails because they do not come to class. Feedback from the lecturer who using the system and if more than 70% students answer that they do not understand, then she is improving. Interaction with the students is two-way flow of communication. (Turning Technology, 2015)

### 3.7.3.3 From students' point of view

Student's reaction to clicking solution is positive because they are interacting with the teacher within the time of the lecture and more importantly are learning. They are exited for the class and for them to give a feedback they haven't need to expose those answers to the rest of the class. They get the idea of where they stood in the class without losing their animosity. Students are happy to use this system in verity of faculties with in the University of Arizona. (Turning Technology, 2015)

University of Manchester student (Middleditch, 2015) said: "Brilliant idea. We often turn to our phones when we lose concentration, interest or when the lecture becomes incomprehensible, so I think including our devices will keep us alert and participating, as well as checking if our understanding is correct." In summary of clicker technology is that if it's not working it is a teacher's fault.

## **3.1 Review of the key issues to use in the design and implementation**

Based on the review of the technologies, design and implementation of response system, there is clear that functionality of the good feedback system is the main goal. By offering students to respond to not only keep them awake, but also keep them engaged and interested in session material. The feedback system can be implemented to any environment, because it's a web-based application there will be no installation, confusing software bulky hardware required. The website must handle response from start to finish by guarantee a smooth, effective event.

## **3.1 Review of technology**

I have to take to consideration research that already been done, such as cups system using within primary school, traffic light systems using in educational environment. I have documented what is available, and for what purpose, and who is it been used by. By looking at how can I improve what's already been done I have meaningfully applied new ideas into my product. The key players in my area are companies providing similar system but for different purpose through Internet web based applications. Other organisations that are using the real-time feedback systems such as who wants to be a millionaire audience feedback, TV show X factor feedback. The Practitioners who used similar system and theorists who write about it. This system was used at school, but in physical form such as

cups, cards or visual display on iPads. As far as my research I can say that my product is not used at school.

### **3.2 Conclusion**

In this chapter 3, whether traditional or web based models is suitable for real time feedback project or not is determined based on six suitability filters defined by technical research. It is found that web based application is the right approach to take forward. So, legal, social, ethical and professional issues will be discussed of real-time feedback system in detail in chapter 4.

## **4 CONSIDERATIONS OF LEGAL, SOCIAL, ETHICAL AND PROFESSIONAL ISSUES**

### **4.1 Introduction**

In designing real time feedback system each legal, social, ethical and professional issue are taking to consideration which comply with the policies in education, technical, professional and Internet sector. List are defining each issue that used in the software development product.

### **4.2 Key issues**

1. Preserving the anonymity of respondents.
2. Making sure that the means by which the feedback is given is constructive and not in breach of a sound ethical student-teacher relationship.
3. Ensure that the device is secure from abuse.
4. Confirms to data protection principles.
5. When design ensure that the device is secure from abuse and malpractice.
6. Confirms to data protection principles.
7. Undermine the professional integrity of the teacher or lecturer in the classroom.
8. What impact this will have on the educational and social dynamics of the classroom.
9. How outcomes may be mitigated through sound risk management procedures.
10. Ethics committee an explicit explanation of the nature and scope.
11. Given to any individuals taking part in the research when their consent is obtained.
12. Policy of the relationships between staff and their students.
13. The integrity and objectivity of the lecturer.
14. Breach of this policies.
15. Student trust and confidence in the lecturer.
16. Teaching and assessment policy.
17. Teacher-student communications.
18. Students from different countries and diverse backgrounds.
19. Supportive networked environments.
20. Improve student learning.
21. University policies. You
22. Interactive real-time feedback system.
23. Curricula policy, enrichment of curricula.
24. University's practice in collecting and analysing student feedback.
25. The engagement of students in formal learning.
26. Retention and student success.
27. Maintaining confidentiality.

28. Of good practice regarding the professional rights and responsibilities of academic staff.
29. Teacher's personal development.
30. Professional relationships between staff and their students.
31. Clear boundaries, trust and confidence.

### **4.3 Review of the key issues to consider e design and implementation**

Legal, social, ethical and professional considerations are taking into account when designing teacher student communication system and implementing it in the lecture theatre, preserving the anonymity of respondents and making sure that the means by which the feedback is given is constructive and not in breach of a sound ethical student-teacher relationship.

When design, producing and implementing the system ensuring that the device is secure from abuse, malpractice, confirms to data protection principles, and is not in any way prodding results and data visualisations which will undermine the professional integrity of the teacher or lecturer in the classroom environment. Identifying user-testing issues such as what impact this will have on the educational and social dynamics of the classroom and how any possible undesirable outcomes may be mitigated through sound risk management procedures. Besides, clearance sought from the ethics committee an explicit explanation of the nature and scope of the project might be thoroughly given to any individuals taking part in the research when their consent is obtained. In the real-time feedback system, the consent was not obtained because this project does not have a real client even though it is designed for the University.

Preserving anonymity of students and making sure that the means by which the feedback is given is constructive and not in breach of the sound ethical student-teacher relationship. Tested product will have impact on educational and social dynamics of the classroom and possible undesirable outcomes through sound risk management procedures.

Policy of the Relationships between Staff and Their Students (The University of Greenwich, 2015) clearly all undermine the integrity and objectivity of the lecturer to ensure that students do not give rise for more or less favourable treatment which relates to teaching and support functions. For example, enhanced teaching using real-time feedback system and of any form of non-anonymous assessment as well as decisions concerning student progress which is included in teacher student communication system. The breach of this policy undermine student trust and confidence in the lecturer and the University of Greenwich.

Enhancement of teacher-student communications through real-time feedback system will have influence on positive difference in students, staff and overall community. Maximising achievement and providing transformation of learning, teaching and assessment policy emphasis on good teaching, which is the main aim of the University of Greenwich. By getting feedback from students from

different countries and diverse backgrounds who expect a high quality, exciting student experience in stimulating and supportive networked environments. The University benefit from the use of interactive real-time feedback system, which can improve student learning and teachers performance, as well as review curriculum and aim to increase the number of students graduating with good honours degrees greater than 65% by 2017 as predicted by academic Council. (Academic Council, 2012) The proposed system of the real-time feedback system within the lectures meeting requirements in transformation and enrichment of curricula, transformation of program delivery and learning environments, especially meeting requirement 3.3.3 (DVC( Academic Development), VCO, 2012, p. 8) , which is to enhance the University's practice in collecting and analysing student feedback. The engagement of students in formal learning using technology situations can maximise the retention and student success.

Maintaining confidentiality with regard to information about students participating in an anonymous feedback system is one of the principles from Code of Good Practice Regarding the Professional Rights and Responsibilities of Academic Staff (The University of Greenwich, 2008) . This policy support willingness of teacher's personal development and students, acknowledging their feedback input, which should be lecturers practice to reply to communications from students promptly for student to gain maximum learning benefit.

Teacher -Student communication system comply with Professional Relationships between Staff and Their Students - Policy (The University of Greenwich, 2015) because this system, characterised by digital communication with clear boundaries, trust and confidence therefore expects good professional communication between academic staff and students within the classroom and laboratory.

#### **4.4 Conclusion**

Chapter 4, defined legal, social, ethical and professional issues that should be consider in the development of the real-time feedback system. This thorough investigation provided solid understanding of the key themes and issues.

### **5 PRODUCTION OF TWO ALTERNATIVE SOLUTIONS PROPOSITION OF THE NEW SYSTEM**

#### **5.1 Introduction**

Using creativity and ideas to fulfil real-time feedback system aim and objectives, two alternative solutions are proposed.

## 5.2 Solution 1 – Real Time Feedback Pen device

### 5.2.1 Overview

The proposed system uses three forms of communication from the student to the teacher. The first is a pen-like device with multiple buttons to show how much the student understands the subject material. This data is transferred by a Bluetooth transmitter at the top the device, each button having its own frequency. Once the Bluetooth device is transmitting, a specialist Raspberry Pi under the desk will receive the Bluetooth data and create a simple file, depending on the Student's choice. Bluetooth is a one-to-one (1-to-1) short-range communication method, therefore attempting to connect multiple students to the teacher directly using this method was not practical. The Raspberry Pi will be connected to a Wi-Fi range extender on one or more walls (depending on the size of the classroom). This Wi-Fi network will connect the Raspberry Pi to the Teacher's computer. When the file is created, the Raspberry Pi will transfer it to a pre-mounted remote directory on the teacher's machine. Once all student's files have been transferred, the teacher will then run the program on their computer. This program will take advantage of a call to the command line, which will merge all of the Student's files into one file. At which point, the program will create a chart that shows the number of students who understand fully, understand partly or do not understand at all. Performing tests at different distances will be done as well as with different levels of interference to see how this affects the speed of the communication.

### 5.2.2 Appearance



Figure 16. Pen Clicker Device to be used in lecture teather

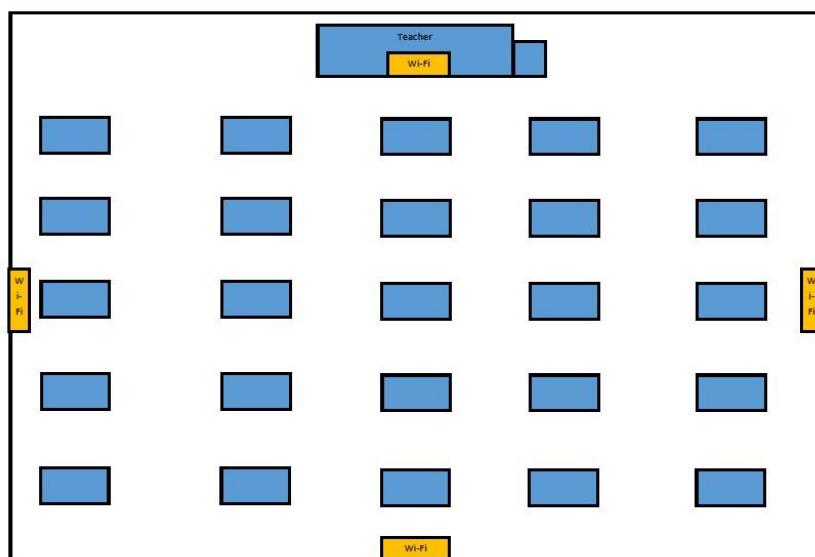


Figure 17. Classroom preliminary design and visual explanation for the feedback system.

If there are one hundred students therefor 100 pens, and because Bluetooth is one to one connection there are a need to one hundred RPis as well as four Wi-Fi range extenders and teacher computer.

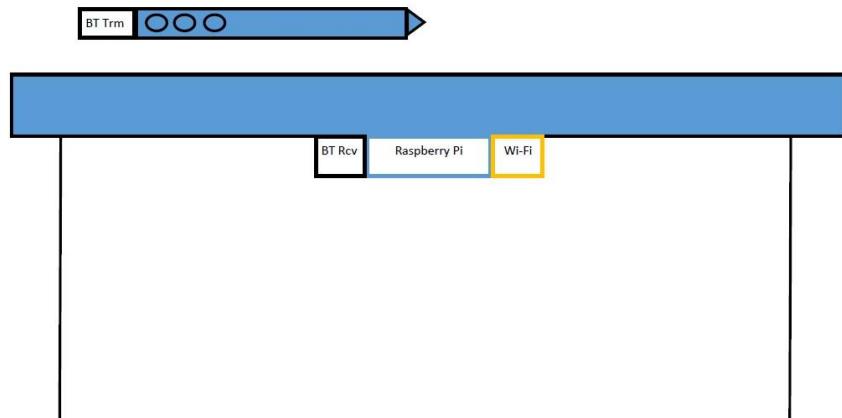


Figure 18. Pen device with three buttons and Bluetooth transmitter.

Classroom desk (front view) with Raspberry Pi, Blue tooth receiver and Wi-Fi mounted under the desk.

Teacher display question for student to view.

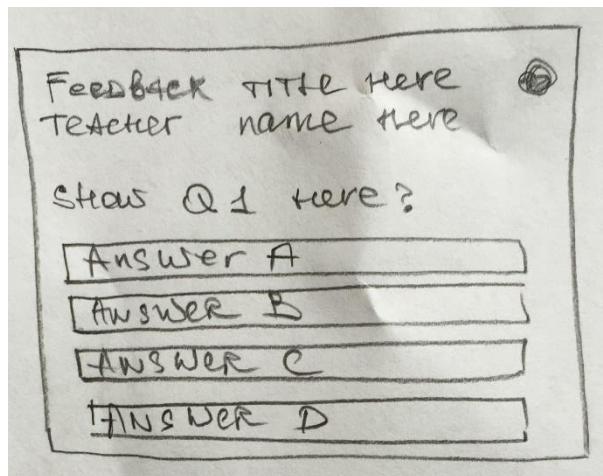


Figure 19. An example of the web User Interface poling application for the student.

Teacher will be able to view graphical chart of their answers

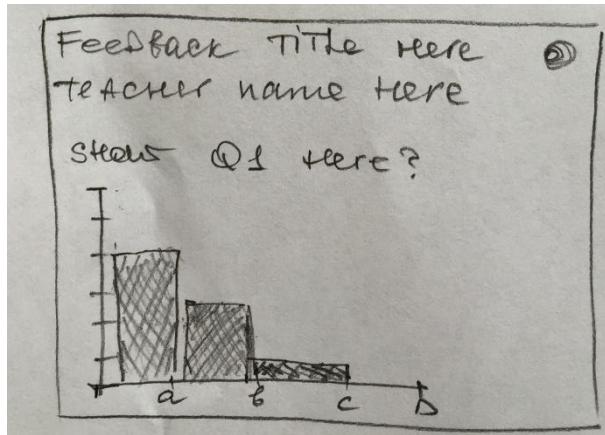


Figure 20. An example of the web User Interface poling application graphical representation

### 5.2.3 Review of solution 1 – Pen device

Different implementation ideas, was taking to consideration. In my uploaded project proposal, I have specified implementation of a pen like device that will use Bluetooth to connect to the raspberry pi and using extendable Wi-Fi system sent data to the teacher in real-time. After carefully evaluating this design I have come to the conclusion that it will be not feasible at all because each student must have one pen that connect to one raspberry pi, therefore, two hundred students in a lecture must have two hundred pens, therefore, two hundred raspberry PIs. Even though it's possible, cost is extremely high and automatically making this design not feasible.

## 5.3 Solution 2 – Real –Time Feedback Web Application

### 5.3.1 Overview

Polling App for enhancement of teacher-student communications through real-time feedback can be developed by using HTML5 which will be compatible with Android and integrate real-time into the website. Additional implementation of QR reader will be beneficial in order to access website from remote devices and be able to interact in real time. QR reader will direct. When the user input the submission it will redirect to the website page where poll will be.

### 5.3.2 Appearance

Teacher start lecture by entering name and presentation title.

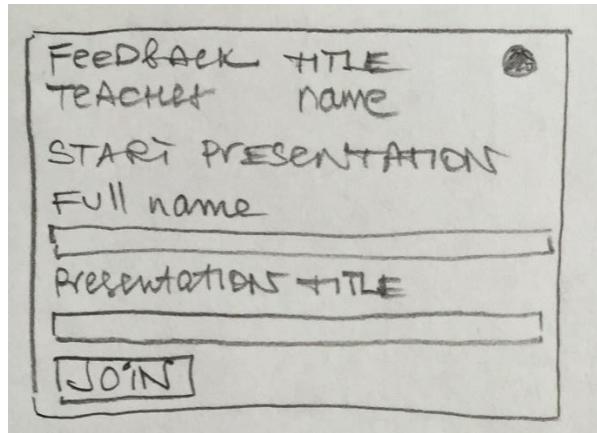


Figure 21. Example of the web User Interface poling application for the teacher.

Teacher entering the questions that he would like to ask the students.

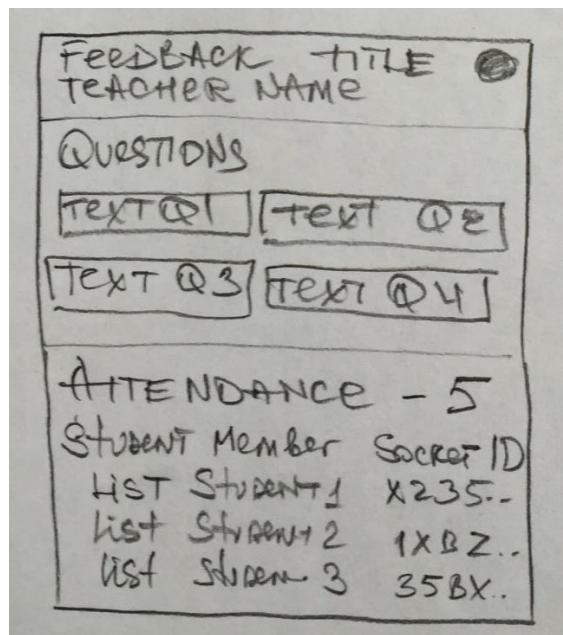


Figure 22. Example of the web User Interface poling application questions.

By clicking on choosing question to display the teacher will see the following screen.

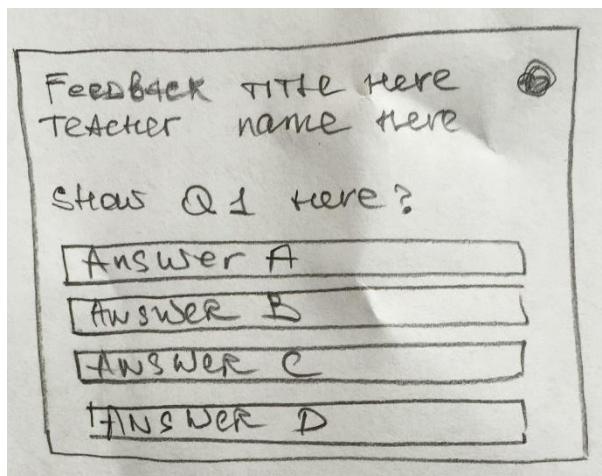


Figure 23. Example of the web User Interface polling application for the student.

Teacher display QR record for students to scan in order to access to the teacher's screen instantly.  
Can be obtained at QR code generator the website. (QR-Code-Generator, 2016)

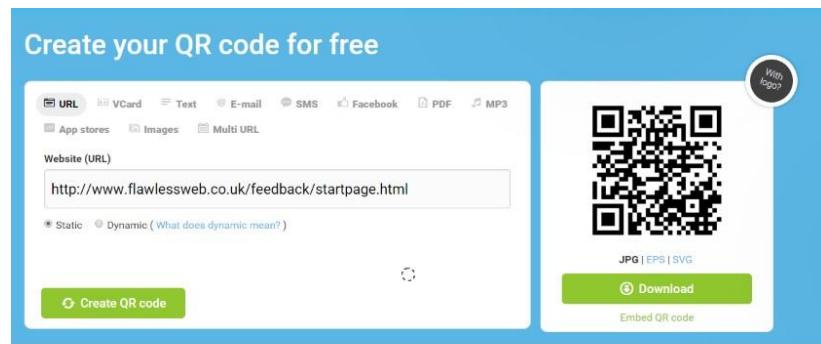


Figure 24. Example of the webpage QR code generator.

User Interface polling application for student to Scan.

Students can view the question and have an option to select from a multiple-choice answer.

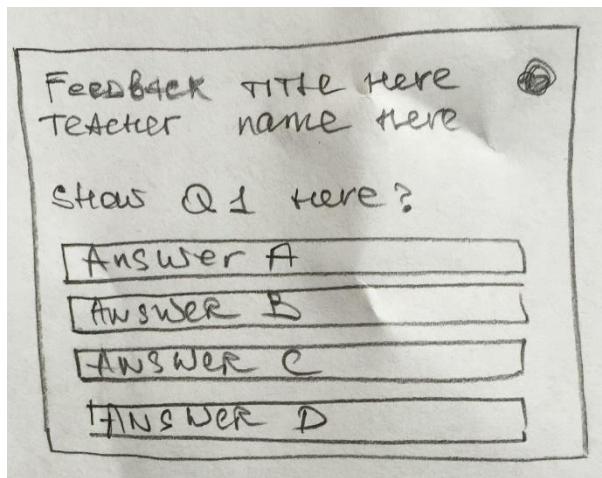


Figure 25. Example of the web User Interface polling application for the student.

Followed student's response the teacher able to view graphical representation and adjust to his or her liking.

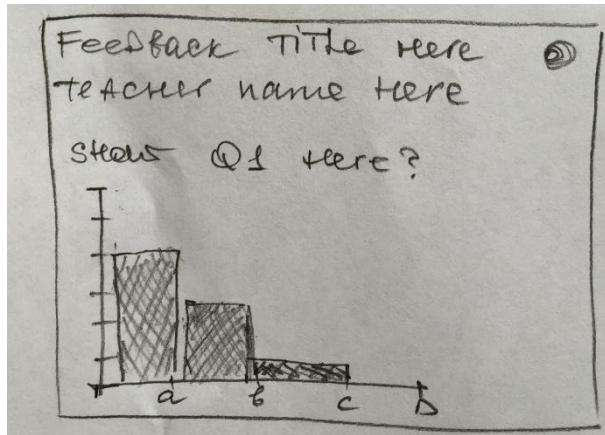


Figure 25. Example of the web User Interface poling application graphical representation.

### **Review of solution 2 - Real –Time Feedback Web Application**

Building a polling application with Socket.IO and React.JS. The purpose of this built is to develop an interactive full stack polling application that uses data in real time. The app will allow a teacher to start a presentation and interact with audience members by asking questions and graphing the responses. To build this application using a combination of technologies. To start by set up Express App with Node.js and followed by incorporating Socket.IO tool handle real-time data sharing. On the client side using React, in order to build system user interfaces. And finally by the factoring React components for ES6 integration of working socket application that handles real time data creatively.

Developer tools and new programming languages to use:

Learn Express App with Node.js (awarded certificate) (Lynda.com, 2016)

Node.js essential training (awarded certificate) (Lynda.com, 2016)

Learn Java Script essential training (awarded certificate) (Lynda.com, 2016)

Learn React.js (awarded certificate) (Lynda.com, 2016)

Learn React Tools for Google Chrome ((awarded certificate) (Lynda.com, 2016)

Building a polling application with socket IO and React.js (awarded certificate) (Lynda.com, 2016)

Design their web by adding dynamics at QR codes. (Lynda.com, 2016)

Lean HTML responsive design

Dreamweaver

Visual Studio 2015

Visual Studio Code

VMware Player

Ubuntu Desktop Linux

Sublime Text 3

Linux Terminal

Windows Terminal

Broadband Internet connection required for online services. In order to create a website, access to a high-speed Internet connection can be vital.

A server to host website on to make sure that it is available all the time for anyone trying to access it.

## **5.4 Key issues to use in the design and implementation**

Using Dreamweaver to implement HTML user interfaces and include questions and answers and other components. Once all the components are created on the first page, I am going to do a second page which will be statistics of every button pressed and display visually by chart in order for the teacher to view it. Additionally, teacher can display page with questions and answers for all the students to view it and enhance their learning based on the answers of other students. So, there will be two pages - first page question-and-answer and the second page is the visual chart where teacher can see the percentage of the students' answer using traffic light button system. In order for the teacher to adjust his/her teaching methods and in order to help students he needs to know how many students for example do not understand the task in hand. Teacher must see what percentage of the group did not understand the subject and teach at student pace. The whole process of the real-time feedback is to make teacher to know giving feedback in the real-time.

As a minimum requirement in my view there should be just a visual chart for the teacher. However, introducing student interactions with each other by reviewing their answers will also have positive impact on their active learning. Moreover, this system is anonymous, but student should be able to ID themself if requested by the teacher. For example, to register attendance. Therefore, I have QR code for each page. In this case a teacher has to use his device in order to access or using desktop to access website page to see visual chart. And students will have to use another one QR code to access questions and give answers web page. The questions and answers page will have a submit button as well as can include statistics page. It also can say thank you for using this application. In case the students want to identify themselves. There should be a login.

This alternative design was evolved based on the costs and deadline of my project where careful consideration to each factor was taken which explained in feasibility of the product.

After product is created students will be able to download and install application and use it on any type of device such as iPhone, iPad, Android, Windows desktop. Teacher can view their outcomes on their computer by accessing URL which enables viewing charts from the database that imports from this student application in the real-time using iCloud. Feasibility, in this case is more appropriate because each student has their own devices, or they can use devices available to them at University. Therefore, there is no need to buy a device. Furthermore, in the future I think there will be iPads embedded into the student desks so my product could be used in a long run.

Creating polling application with Socket.IO and React DS is up-to-date technology that is available as open source, therefore there will be no costs involved. This solution is achievable and will be easy to

use by teachers and students minimising time and effort. The basic functionality will be enough to prove the point of student and teacher communication and its impact on teacher's performance, as well as student active learning. However, additional implementation and interactions could be developed. For example, automation of student attendance.

## 5.5 Compare alternative solutions

Requirement	Solution method	
	Real Time Pen Clicker Device with RPi	Real-time website application
The new system will need to be based on the internet	Good. ✓ Can be access worldwide and therefore interact unlimited number of students.	✓ Good As the site can be access worldwide and therefore interact unlimited number of students.
The teacher and students' must be able to access the system under 1 second	No This system cannot be access and the one second because of the Bluetooth, infrared or Wi-Fi technology constraints.	Yes ✓ The feedback page can be accessed by scanning QR using QR record reader on student devices. The separation is 0.20 seconds
The system is feasible	Not ✓ Pen devices, Raspberry Pi is and extend of routers are very expensive	Yes ✓ low-cost of hosting website application and maintenance
Is this system unique	Yes ✓ pen clicker devices and not available in the current market to use with response systems	Yes ✓ this system provides unique features of real-time that enable teacher to improve performance based on student's results

Teachers and Students should be able to navigate their way around the new system with ease	Yes ✓ By clicking about on the pen device, the response will be captured on the teacher's board in real-time	Yes ✓ Simple GUI providing students to join presentation of view questions and said need the answer. As well as it's providing teachers to start the presentation, choose the question and you students results in visual graph.
The system should be able to connect unlimited number of users in the real-time	Not Good the maximum number of students could be collected is the number of students can be present at the time of the lecture	Yes ✓ Unlimited number of students can be access this system that at present in the lecture and outside the lecture theatre
Providing the functionality in the realtime communication between teacher and student successfully	Yes ✓ This system providing efficient teacher-student communication in real time	Yes ✓ This system providing a fishing teacherstudent communication in real time
This system must be cost effective	Not Good The system will need each then click device and one raspberry pi for each student. This is not cost-effective	Yes ✓ Simple implementation of real-time system based on the web
The new system must be completed by 24 <sup>th</sup> April 2016	Yes ✓	Yes ✓
The system should allow for the teacher to	Yes ✓	Yes ✓
collect feedback data using database for future statistical analysis.	This system can store data in the database	This system can store data in the database

## **5.6 Recommendation**

Justified requirements, which was answered yes, shows that this system, as necessary functions to satisfy the requirements of real-time feedback system between teacher and student in educational environment. After analysing and evaluating the table above there are ten requirements that have been answered yes for the web application and only seven of the requirements answered yes for the pen clicker device using raspberry pi. Based on this, recommendation of using web application real-time system is suggested for the main reason of its feasibility and cost ability.

## **5.7 Conclusion**

Proposing two real time communication solutions gave comprehensive overview of different possibilities of the design and implementation. Based on that the real time, teacher student communication system was chosen based on a valuation of two alternative solutions

# **6 REQUIREMENTS**

## **6.1 Introduction**

Discover the requirements is a very difficult time consuming process that is determined successful build on the system. Requirement elicitation is a critical phase of real-time feedback system development to gather and understand information. (Sodhi, 2003) This activity mainly is to do elicitation of the requirements from the literature review Chapter 3, technological research Chapter 4 and out of the two alternative solution proposals Chapter 6. Therefore, in practice elicitation and analysis performed iteratively and often in parallel, as shown on the Gantt chart appendix B. By understanding a business problem requirements are providing a solution for it. The real art of requirements is discovering the real problem which is to let teacher receive feedback from unlimited students under one second and improve teacher-student relationship enhance communication.

## **6.2 Elicitation of the requirements**

By generating and interpreting requirements, the developer understands basics of thought transfer and the idea exchange. Fact finding mechanism is used which gave observation of the operational environment as showed in Appendix A - project proposal. Reviewing those another set of requirements are evolved. Thus, observation, scenarios, models of the system and meetings with the team members have guided for successful eliciting of the requirements. Additionally, not formal verbal investigation was performed with the lecturers at the University and teachers at school in order to consider requirements as an outcome.

Literature review gave a good elicitation of the necessary requirements in case of finding the business events, user cases, functional, non-functional requirement criteria and more importantly enable iterative development of those by doing technical research. Based on six existing systems, see chapter 4, requirements elicitation was extracted and identified. Using those in production of alternative solutions modelling and comparing solutions, again more clear elicitation of requirements was made. Here is the least of an example of some requirements, just to show how elicitation is done.

### **6.2.1 Business events.**

- 6.2.1.1 Business event is for one lecturer to collect feedback responses from many students at the University. (Must)
- 6.2.1.2 Business event is for the students to give feedback to the lecturer at the University. (Must)
- 6.2.1.3 Business event is for the department to view results data of the sessions at the University. (Should)

### **6.2.2 System requirements in order to create new account for a lecturer**

- 6.2.2.1 The product is display product management screen for new lecturers to be able to register to the system. (Could)
- 6.2.2.2 The product shall allow a new lecturer to enter their name. (Must)
- 6.2.2.3 The product shall allow new lecturer to enter their email address. (Could)
- 6.2.2.4 The product shall allow new lecturer to enter the contact telephone number. (Would)
- 6.2.2.5 The product shall allow a lecturer to select the department. (Should)
- 6.2.2.6 The product shall allow the lecturer to enter their name username. (Would)
- 6.2.2.7 The product shall allow their lecturer to enter their desired password (Could)
- 6.2.2.8 The product shall advise a lecturer to read terms of service and privacy policy that are displayed on login page as links. Text display: by signing up you agree to our terms of service and privacy policy. (Could)
- 6.2.2.9 Is to be able for lecturers to access the system. (Must)
- 6.2.2.10 The system should be secure. (Must)
- 6.2.2.11 The product shall allow student to join the presentation. (Must)

6.2.2.12 The production allowed to display User friendly interface. (Must)

### **6.2.3 Review elicitation of the requirements**

Using MoSCoW prioritisation the requirements that are signed to Must, are the ones that has to be considered in the next chapter by using 80/20 rule. By doing so, those requirements will be narrowed down by using MoSCoW prioritisation and placed in the timebox that are relative to life cycle of the project. The following Must requirements examples elicitation from the requirements listed above:

- 6.2.3.1 Business event is for one lecturer to collect feedback responses from many students at the University. (Must)
- 6.2.3.2 Business event is for the students to give feedback to the lecturer at the University. (Must)
- 6.2.3.3 The product shall allow a new lecturer to enter their name. (Must)
- 6.2.3.4 Is to be able for lecturers to access the system. (Must)
- 6.2.3.5 The system should be secure. (Must)
- 6.2.3.6 The product shall allow student to join the presentation. (Must)
- 6.2.3.7 The production allowed to display User friendly interface. (Must)

### **6.2.4 Conclusion**

To elicit requirements was a time-consuming process nevertheless elicitation process provided with better understanding of the requirements, record a fact finding, and clarify the requirements from models by applying elicitation techniques. Prepare this elicitation will establish better requirements in the requirement analysis chapter 5.

## **6.3 Context of the system**

The University of Greenwich receiving information from students can use this information in real-time and have direct benefits because information can be given back to students and therefore improve the business as a whole. Use of computer devices, people, departments, and the University and possibly others who is interested in teacher-student communication systems within the educational environment will be involved in its business aspects too. The following diagram shows who is involve and process between them showed on Figure 27., as well as business events and responses showed on figure 28.

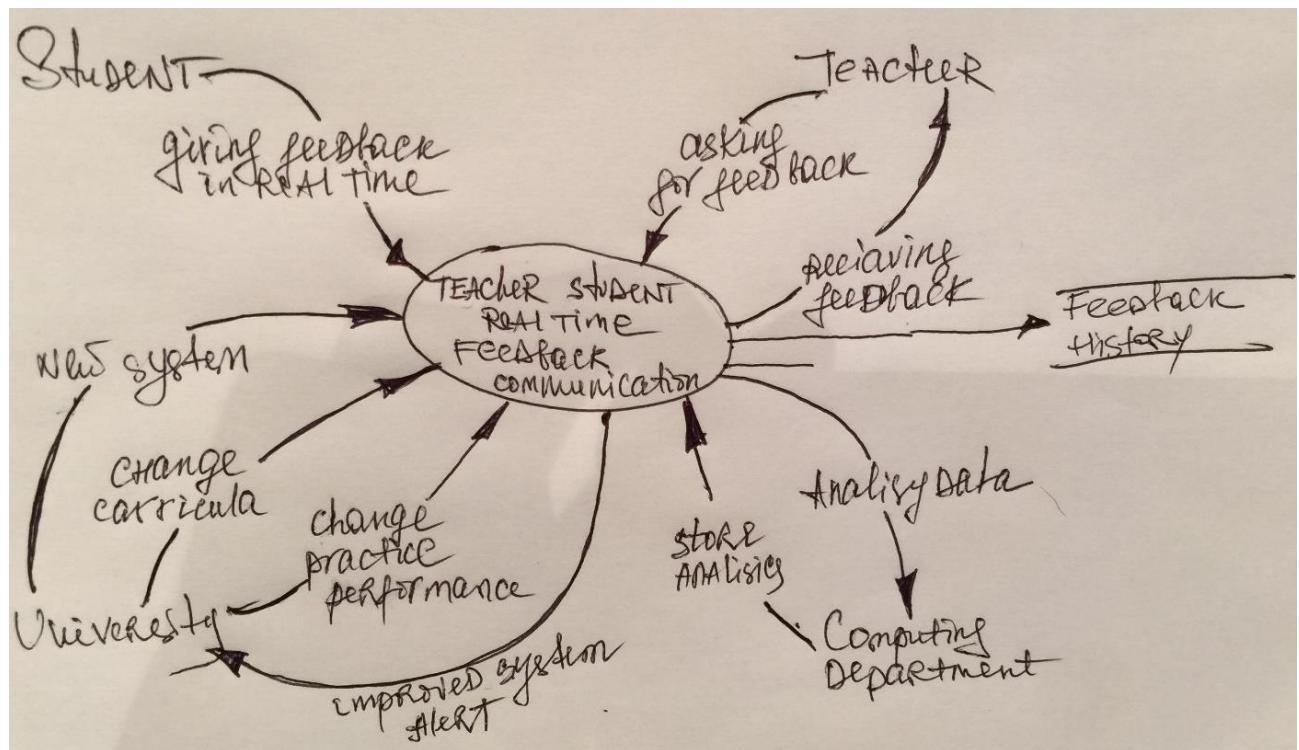


Figure 27. The Context diagram.

The central area of the diagram represents the focus of study and the final product. The named arrows represent flows of information between the adjacent systems and the work. In this work context diagram, noting the limited, but nevertheless crucial aims of the model demonstrate flows of information. This way, one is able to make better use of the model for determining the business events affecting the work, delivering data or to receive data from the system, which contains the processes or to consume and produce data.

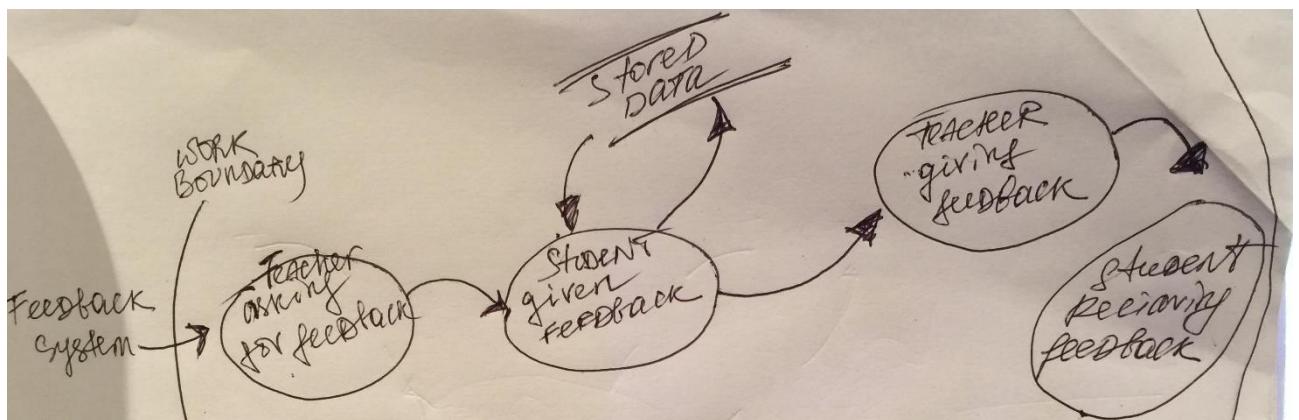


Figure 28. Business events and responses

Large number of student whose first language if not English, from different cultural backgrounds, nationalities and learning abilities will be able to engage with the lecturer by using unified 'push the button' language. This will give them opportunity and enable to learn to their own pace, when the

lecturer may have to repeat task at hand. This will decrease teachers marking feedback for the student to improve his work as necessary explanations can take place at the right place and at the right time.

## **6.4 System Benefits**

- Easy and accessible web application was responsive design in any device such as Android, iPhone, Windows OS, and Mac etc.
- And one second fast results of the feedback both ways.
- Efficient visual graph report.
- User friendly interface.
- Highly reliable, portable.
- Helpful to Computing department to see the received data for future analysis □ Can be used anywhere at any time with if internet is present.
- A limited number of students can join within one second
- attendance can be monitored at the same time, the system is in use
- There's possibility that the student does not need to speak English to use teacher-student realtime communication system.

By creating a real-time web application there will be no need for students to download and install software on the devices. This real-time communication web application can be viewed using any type available to student device such as iPhone, iPad, Android, Windows desktop. Teacher can view student's responses on his / her computer by accessing URL which enables viewing charts from the local storage /database in the real-time. Feasibility, in this case is more appropriate because each student has their own device, or they can use devices available to them University. Therefore, there is no need to buy a device and the system proving to be cost effective. Furthermore, in the future I think there will be iPads embedded into the student desks so my product could be used in a long run. Choose the best community platform for your University business, features and functions that are essential to attracting students and facilitating their active participation in the community – and simultaneously delivering value to them self's as well as University business in the form of lower service costs, increased feedback, deeper student insight.

## **6.5 Functional requirement**

### **6.5.1 System**

6.5.1.1 The system shall provide webpages - home page of the application by going to 'http://localhost:3000 page 'index.html'

- 6.5.1.2 System shall provide a second page called index2.html with contents for teacher to start presentation
- 6.5.1.3 The product shall have online platform that is complaint policies of ethical, social, legal and professional laws by 18th of March 2016
- 6.5.1.4 The product shall allow users to access through web browser using Internet connection at the University
- 6.5.1.5 The product shall allow users to connect through wireless network connection
- 6.5.1.6 The product shall provide QR Code for students' quick access to real-time feedback system web application through the any mobile device
- 6.5.1.7 The product shall use Node.js, Java Script programming language that supports data transfer in real-time
- 6.5.1.8 The product shall provide students anonymity functionality by withholding of their identity
- 6.5.1.9 The product shall provide optional functionality for students to enter their identity if requested by teacher
- 6.5.1.10 The product shall provide teacher to identify students' names if students enter the identity for attendance monitoring
- 6.5.1.11 The system shall provide text hyperlinks to navigate to other pages.
- 6.5.1.12 The product shall provide teacher with the number of students that are connected to the system
- 6.5.1.13 The product shall provide teacher with the student socket ID that relates to student identity
- 6.5.1.14 The product shall provide teacher with the student socket ID in cases where identity was withdrawn from the teacher
- 6.5.1.15 The product shall allow unlimited number of students have equal opportunity to access in the same time feedback system
- 6.5.1.16 The product shall provide under one second real-time feature functionality, from the time respondent click a button and the teacher receiving answer in visual graph from unlimited number of students.
- 6.5.1.17 The product shall run on the local host server to serve web files

6.5.1.18 The product provides stored information of users who joined the presentation and displace using command prompt every single activity taking place

6.5.1.19 The product will provide graphical user interface for each web page. Related to audience, board, speaker and error.

6.5.1.20 The product shall preserve anonymity of respondents

6.5.1.21 The product shall operate as an iPad, iPhone, android and blackberry app.

6.5.1.22 The product shall allow teacher and student to communicate of giving feedback in real-time.

6.5.1.23 The product shall display student responses within the selected time parameters under one second

6.5.1.24 The product shall have a 2D bar QR code that's dynamic generated for the front page of the real-time feedback system, present marketers with the opportunity to give customers quick access to real time feedback system web application through their mobile device, which will enable to speed up the process for students to be connected to the system.

6.5.1.25 The product must make have mobile friendly destination, because people are scanning the code with a mobile device from a long distance, such as 60 m

## **6.5.2 Teacher/ Presenter / Speaker**

6.5.2.1 The product will provide user with an ability to access the system and its features

6.5.2.2 The system shall provide teacher to view connection status, connected, disconnected

6.5.2.3 The product shall have graphical user interface, which indicates connection status and display “start a presentation” and “open the board” links.

6.5.2.4 The product shall allow teacher to start a presentation by clicking on “Start the representation” button.

6.5.2.5 The system shall enable teacher to enter full name and presentation title

6.5.2.6 This system shall provide the teacher with set default four questions

6.5.2.7 The system shall enable teacher to select one question in order to show to the students

6.5.2.8 The system shall provide teacher with an ability to display QR Code to the students by using a board

6.5.2.9 The system shall provide teacher to enlarge QR record for students to be able to scan from a far distance

6.5.2.10 The system shall provide teacher with a view of all the students' full names and socket ID, that will enable teacher to monitor student attendance

6.5.2.11 The product shall allow teacher to open board page by clicking on "Go to the board".

6.5.2.12 The system shall provide teacher to view question and answers, this is the same page that students will see on their devices

6.5.2.13 The system shall provide the teacher to be able to view visual board

6.5.2.14 The system shall provide teacher to view students' answers displayed on the visual board and one second time

6.5.2.15 The system shall provide the teacher to learn student outcomes and change teaching performance to suit students' needs /improve student learning

6.5.2.16 The product shall allow teacher to view graphical user interface of an empty fields for their full name, presentation title, and submitting button called "Join"

6.5.2.17 The product shall allow teacher to view text "enter your full name..." inside the text box for the Full Name.

6.5.2.18 The product shall allow teacher to view text "enter a title for this presentation...." Inside the text box for the Presentation Title.

6.5.2.19 The product shall allow teacher to enter a name into Full Name text box.

6.5.2.20 The product shall allow teacher to enter presentation title into Presentation Title text box.

6.5.2.21 The product shall provide error message to the teacher "please fill in this field" if the teacher leaves Full Name text box empty.

6.5.2.22 The product will provide error message to the teacher. Please fill in this field. If the teacher leaves Presentation Title text box empty.

6.5.2.23 The product shall allow for teacher to submit full name and presentation title by clicking on a button "Join".

6.5.2.24 The product shall allow to redirect teacher to question page after teacher clicked on "join" button on the speaker page.

### **6.5.3 Student /Audience**

- 6.5.3.1 The system shall provide all students present in a lecture with an ability to use any device to access the system by scanning QR code, using QR code reader on the device
- 6.5.3.2 The system will provide students with ability to view this system on their laptop or desktop by entering system URL
- 6.5.3.3 The product shall have graphical user interface for the student, which indicates connection status and enable for students to enter the name and click join button
- 6.5.3.4 The product shall allow student not to enter their identity name by typing any text into full name, text box
- 6.5.3.5 The system will provide students to be able to see a page displaying teacher's name, presentation title, text box to enter full name (if needed) and be able to see a button named "Join"
- 6.5.3.6 the system shall provide student to see the questions page by connecting to the system, before teacher asked the question. This provides students to be ready and saves time.
- 6.5.3.7 The system shall provide all students will be able to view a page with one questions and four possible answers displayed by the teacher
- 6.5.3.8 the system shall provide students be able to select one answer from four possible answers
- 6.5.3.9 the system shall provide students with ability to see conformation page after clicking on one answer
- 6.5.3.10 the system shall provide students with conformation page displaying teachers full name, presentation title, the copy of the student given answer
- 6.5.3.11 the system shall provide students with automatic page refreshed on the screen when the teacher asks a different question
- 6.5.3.12 the system shall provide students to be able to view results of answers given by all other students on the visual graph displayed on the board by the teacher
- 6.5.3.13 the system shall be able students to collaborate with each other by discussing the given answer and possibly change they point of view.

6.5.3.14 The system shall be able for students to answer the same question after collaboration and discussion, and to view results on visual graph displayed on the board by the teacher

6.5.3.15 the system shall provide students with useful active learning and fun to use

6.5.3.16 this system shall provide students with analysing if the teachers performance is meeting students satisfactory

6.5.3.17 this system shall provide students to answer the teacher's questions. In order to enhance teacher's methods used and explanation given at the lecture

#### **6.5.4 The visual graph /the board**

6.5.4.1 The system shall provide a page to display a board in 2D

6.5.4.2 The system shall provide visual graph of collected student answers by giving 1.4 each answer to relative a; b; c; d; answer

### **6.6 Non-functional requirements**

#### **6.6.1 Look and feel**

6.6.1.1 The product must look professional and easy to read.

6.6.1.2 The product shall provide a pleasing user experience.

6.6.1.3 The product shall have a business logo implemented on each page

6.6.1.4 The product shall have headings and subheadings.

6.6.1.5 The product shall have design layout is presentable, including text and font are readable

6.6.1.6 To test whether the colours on the website are black, white, green and red

#### **6.6.2 Usability**

6.6.2.1 The product shall have user interface that easy to use.

6.6.2.2 The product shall be able to be used by different nationalities in the lecture theatre who do not speak the English language.

6.6.2.3 The product to you have easy to read phones with a lot of contrast

### **6.6.3 Humanity**

6.6.3.1 The product shall have the colours that readable by colour-blind users.

6.6.3.2 The product shall have features, functions and resources accessible by students with disability

6.6.3.3 The product shall have features related to vision, hearing, motor or cognitive impairments.

6.6.3.4 The product shall have alt tags and a site that set up with appropriate headers, image description and links so that they can be read by a screen reader.

### **6.6.4 Fast**

6.6.4.1 The product shall provide fast process of the real-time system under one second, where unlimited number of students' can provide teacher with their answer

### **6.6.5 How safe**

6.6.5.1 The product shall be Safe to use by using standards set by the user website. Use as well use of the computer devices.

### **6.6.6 How many**

6.6.6.1 The product shall allow unlimited devices to be connected at the same time.

### **6.6.7 How available.**

6.6.7.1 The product shall be available at the time of the lecture to the students and lecturer in educational environment.

6.6.7.2 The product shall be available to the lecturer at any time in educational environment.

### **6.6.8 How accurate**

6.6.8.1 The product shall collect only one response from each device (student), for each question in a session by clicking submit button.

6.6.8.2 The product shall have visual chart (graph) that will accurately display results based on the collected responses giving by their students.

### **6.6.9 Operational**

6.6.9.1 The product shall be operated in educational environment at their lecture theatre.

6.6.9.2 The product shall be available to all the students present in a lecture.

6.6.9.3 The product shall be available to the lecturer at the lecture time.

### **6.6.10 General requirements**

6.6.10.1 The product shall meet functional requirements and completed by 18th of March 2016

6.6.10.2 The product shall allow the teacher to create a new additional session.

6.6.10.3 The product shall allow the teacher to edit a session.

6.6.10.4 The product shall allow the lecturer to delete a session of the poll from the system.

6.6.10.5 The product shall allow the lecturer to add new questions to the newly created session.

6.6.10.6 The product shall allow the teacher to edit the questions in already existing session.

6.6.10.7 The product shall allow the teacher to delete a question in already existing session.

6.6.10.8 The product shall allow their lecturer to search for a session.

6.6.10.9 The product shall allow their lecturer to search for a question.

6.6.10.10 The product shall allow the lecturer to choose what selection of the formats of the possible answers going to be used in the newly created session.

### **6.6.11 Time needed to make changes**

6.6.11.1 The product shall allow the lecturer to make above changes within the lecture time which is the time to amend a question.

6.6.11.2 The product shall allow the lecturer to make the changes prior to the lecture.

### **6.6.12 Support**

6.6.12.1 The product shall provide simple instructions near QR code

6.6.12.2 The product will have accessibility documentation

6.6.12.3 The product shall provide support to the lecturer by facility of help menu.

6.6.12.4 The product shall provide support to the lecturer by prompting in each text box.

6.6.12.5 The product shall provide support to the student, by advising them to refresh the screen in order for them to move to the next question screen.

6.6.12.6 The product shall allow supports to the student by confirming the submitted answer.

6.6.12.7 The product shall provide support availability only at the time of product use.

### **6.6.13 Security**

6.6.13.1 The product shall provide authentication of each student by full name or socket ID

6.6.13.2 The product shall provide a role-based accessibility to the pages that are relevant only to that user

6.6.13.3 The product shall provide login to the system

6.6.13.4 the product shall have security implemented into the code

6.6.13.5 The product shall allow lecturer to login to the system.

### **6.6.14 Access**

6.6.14.1 The product shall will be used by lecturer and students only secure educational environment.

### **6.6.15 Confidentiality**

6.6.15.1 The product shall provide confidentiality to the respondent's student by anonymously when they give they answer.

### **6.6.16 Recoverability**

6.6.16.1 The product shall provide recoverability of the question page to the students by a refreshing the page.

6.6.16.2 The product shall provide recoverability of the question page to the students by a scanning QR code.

6.6.16.3 The product shall provide recoverability of the question page to the students by restarting web application.

### **6.6.17 Cultural and political**

6.6.17.1 The product shall be able available for any nationality of the students.

6.6.17.2 The product shall provide translation to 5 other languages.

6.6.17.3 The product shall provide respect to different cultures

6.6.17.4 The product shall provide consideration to different customs of people who are using the system.

## **6.6.18 Legal**

6.6.18.1 The product shall follow the law and standards that apply:

6.6.18.2 The product shall provide online pages include information that in conjunction with ethical and legal, professional and social issues

6.6.18.3 Preserving the anonymity of respondents

6.6.18.4 Making sure that the means by which the feedback is given is constructive and not in breach of a sound ethical student-teacher relationship.

6.6.18.5 Ensure that the device is secure from abuse

6.6.18.6 Confirms to data protection principles

6.6.18.7 When design ensure that the device is secure from abuse and malpractice

6.6.18.8 Confirms to data protection principles

6.6.18.9 Undermine the professional integrity of the teacher or lecturer in the classroom

6.6.18.10 It will also need to be examined through focus groups?

6.6.18.11 User-testing

6.6.18.12 What impact this will have on the educational and social dynamics of the classroom

6.6.18.13 How outcomes may be mitigated through sound risk management procedures

6.6.18.14 Ethics committee an explicit explanation of the nature and scope

6.6.18.15 Given to any individuals taking part in the research when their consent is obtained.

6.6.18.16 Policy of the relationships between staff and their students

6.6.18.17 The integrity and objectivity of the lecturer

6.6.18.18 Breach of this policies

6.6.18.19 Student trust and confidence in the lecturer

6.6.18.20 Teaching and assessment policy

6.6.18.21 Teacher-student communications

6.6.18.22 Students from different countries and diverse backgrounds

6.6.18.23 Supportive networked environments

6.6.18.24 Improve student learning

6.6.18.25 University policies

6.6.18.26 Interactive real-time feedback system

6.6.18.27 Curricula policy, enrichment of curricula

6.6.18.28 University's practice in collecting and analysing student feedback

6.6.18.29 The engagement of students in formal learning

6.6.18.30 Retention and student success

6.6.18.31 Maintaining confidentiality

6.6.18.32 Anonymous feedback system

6.6.18.33 Of good practice regarding the professional rights and responsibilities of academic staff

6.6.18.34 Teacher's personal development

6.6.18.35 Professional relationships between staff and their students

6.6.18.36 Clear boundaries, trust and confidence

## **6.6.19 Technological requirements**

6.6.19.1 The product shall interact with the database.

6.6.19.2 The product shall be handling database interaction wire an Internet connection.

6.6.19.3 The product has a need to establish a secure Internet connection.

6.6.19.4 The product shall allow devices to remotely connect to the product using QR code.

## **6.7 Additional Unique future development requirements**

The product shall have facility for checkboxes in order for students to give feedback by ticking them.

M

The product shall have facility for radio buttons. M

The product shall have facility for being able to reorder the options. M

The product shall have additional facility for displaying caricature faces with different emotions for students of different nationalities to be able to answer the particular question without speaking English.

## **6.8 Constraints**

The full document of the software product must be available at the beginning of April month 2015. The product prototype must be available on the 14<sup>th</sup> of March 2015.

The product shall run on every device such as desktop, laptop, iPad, iPhone, android, blackberry and other computer device.

Product user guide?

## **6.9 Review requirements**

Iterative development method was used to gather the requirements above. However, iterative delivery made some requirements redundant. By absorbing requirements process into the development of the project life cycle is very important because developer needs to understand the user business problem, and what the product has to do to solve this problem. Every functional requirement showing something that final product must do to support user business while non-functional requirement specifies quantification of how well it must carry out its functionality for it to be successful within the user's environment.

## **6.1 Conclusion**

The requirements of the system and project management are evolving from past experience, interviews, transcripts, research of books and articles and common sense. There are functional and non-functional requirements that are carefully planned using appropriate methodologies in the process of requirements elicitation. All listed requirements are SMART using MoSCoW prioritisation and 80/20 rule in the requirements specification and time management, where 20% of my effort produced 80% of the requirements results. Finally, requirements are listed for each timebox within project DSDM Atern Life cycle development.

## **7 PROJECT MANAGEMENT**

### **7.1 Management summary justification**

My project idea is what I have always wanted to do and this makes me feel good about myself, happy and self-driven motivated manager I start project in the right direction at an earlier time. The product idea is worth pursuing as it is as possible to deliver before 14<sup>th</sup> April 2016, resources are available, it did meet user requirements and project feasibility. There are tasks in my project that I did not like, nevertheless I did them knowing they are relating to the bigger picture. By working together with staff and system users at the University of Greenwich it was possible to achieve good result with a smile on my face. Project management as well as software development skilled staff are the key players in delivering the product. However, in this instance I have no choice as to show my knowledge of all the key players. The following methods will be used:

DSDM Atern

Prototyping

MoSCoW prioritisation

80/20 rule

Timeboxing

Followed my iterative thinking thought-out and incrementing first stages of the project I have successfully revise my Aims, objectives and more importantly used prioritisation of the requirements in the timeboxes' of my project management schedule.

Through a thorough evaluation of real-time feedback system, it becomes evident that the most common features in the design, creating and implementation provides end user satisfaction and efficient management produce the project within the deadline. As a result of applying a sound methodology and framework by using dynamics system development method (DSDM) Atern. Agile project delivery framework approach to deliver solution on time, within budget and collaborate between team members in order to focus together on the outcome. DSDM supported business solutions that required delivery with high-speed, high quality and within tight timescale. Its benefits from business value driven plan which is iterative development, and evaluation of project throughout its life-cycle, and implementation of incremental deliverables. The main aim, of delivering product by stages, concentrating on high level requirements and delivered a prototype that has value to the business as early as possible, was achieved. By facilitating workshops and work in close collaboration between all team members and use of modelling techniques by offering visual communication provided effective way of working. The features such as Moscow prioritisation, facilitated workshops, iterative and incremental development, modelling and prototyping, as well as Investigation Refinement Consolidation (IRC) Timeboxing. By using this simple framework. It's provided fast moving approach within specified time for each deliverable.

By taking responsibility to get project on time and without compromising quality was one of the principles that was used to manage the project. Prototyping is also achieved through iterative development informed by user testing and feedback from end-users which enables to refine the solution and identify the problem as clearly as possible. This enables to make changes, tidy up loose ends, as well as allow effective built in risk management procedure that guided the project to a successful outcome. Overall, the project had competent skilled management and web development team to evolve teacher-student real-time feedback system. By applying principles of DSDM framework within agile project delivery methodology, the following behaviours was encouraged throughout the project, which are proving to be effective and competent management. Thus, through identification of key failures and suggestions for more appropriate resolutions are made. The following table showing framework, methodology, principles and techniques was used in project life cycle. Also, using Microsoft Project 2013, showed in Appendix B, defined comprehensive detail the life-cycle of the project through its visibility and foundation stage, exploration, engineering stages that showing milestones, Timeboxing that breaks the project down in increments at the low level and high level. Even though exploration and engineering development stages are separated there was a stronger relationship between those stages.

Number	Principles	Project Requirement	Justification
	DSDM Atern		
Principle 1	Focus on the business need	<p><b>Each of the following requirements are detailed in Gantt chart as well as in project objectives</b></p> <p><b>1.6.1.1 To develop and implement approaches to feedback and assessment in educational environment at the University that maximise learning and student outcomes, complies with principles of fairness and transparency. [2.0]</b></p> <p><b>1.6.1.2 To develop approaches to feedback at the lectures at University, that impact positively upon learning and deliver improvements to student outcomes by 24th of April 2016. [0.1]</b></p> <p><b>1.6.1.3 To develop ‘computer device application’ feedback system for education environment that provides undergraduates</b></p>	<p>To understand the true business priorities.</p> <p>To deliver the business that needs to be delivered.</p>

	<p>with their expectation of high quality teaching and positive difference in themselves within lecture time. [0.2]</p> <p><b>1.6.1.5</b> To support diverse and flexible approaches to learning with effective experience that enhances learning in flexible or face-to-face model by 24th of April 2016. [15.0]</p> <p><b>1.6.1.7</b> To find about student feedback and the ways this feeds into learning by 24th of April 2016. [10.0]</p> <p><b>1.6.1.8</b> To develop enhanced use of mobile and web technologies to promote flexible learning in educational environment within lecture time. [0.2]</p> <p><b>1.6.1.9</b> To make effective use of ICT to encourage and improve communication and networking between students, staff and the community within academic year. [10.0]</p> <p><b>1.6.1.10</b> To develop and implement approach to feedback that improves student outcomes and maximise active learning within lecture time as well as within academic year. [7.0]</p> <p><b>1.6.1.11</b> To provide all students with an effective experience that enhances learning in flexible mode in educational environment. [12.0]</p> <p><b>1.6.1.12</b> To establish a pedagogic service to support the design and delivery of through real time feedback at the training sessions at the end of the development. [20.0]</p> <p><b>1.6.1.13</b> To give undergraduate students the confidence to make use of communication technologies within the lecture time at the University. [0.2]</p> <p><b>1.6.1.14</b> To enhance teacher-student communication in real time within lecture, by teacher responding effectively in the lecture environment and realise their full potential and to succeed by producing better results. [0.2]</p>	
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		<p><b>1.6.1.15</b> To embed teacher-student communication activity in the University programme aimed at building confidence and understanding self in preparation of the work. [1.0]</p> <p><b>1.6.1.16</b> To support approaches that make learning more effective through active enquiry within a lecture time. [0.1]</p> <p>1.6.1.19 To enable student anonymously give feedback data in order to adjust immediately teacher's performance. [10.0]</p> <p>1.6.1.20 To enable student provide feedback and identifying themselves, in order for the teacher to provide more specific support to individual in need at the same time of the giving feedback [1.0]</p> <p>1.6.1.21 To enable lecturer to view collected data in form of charts to enhance professional development by reducing or increasing teaching and learning time. [1.0]</p> <p>1.6.1.22 For teacher to be able adjust given challenge within the lecture based of the capabilities of student and keep the students in 'flow' zone (80%) at all time in educational environment. [1.0]</p> <p>1.6.1.23 To be able to analyse data provided by the students that stored in the database and to review its impact/effect on student, teacher and educational curricula respectively after a lecture, semester or academic year. [5.0]</p> <p>1.6.1.26 To align capital investments with the needs of students and the learning, teaching and assessment design in the curriculum in CIS at the University. [5.0]</p> <p>Guarantee the minimum subset (part of) [2.0]</p> <p>Seek continues business sponsorship and commitment. [2.0]</p>	
	DSDM Atern Project phase	<p><b>Pre– project stage.</b></p> <p>The research project idea.</p> <p>Complete project proposal</p> <p>Terms of reference</p> <p>Project roles summary</p>	<p>To describe the business problem to be addressed To identify a business sponsor and business visionary</p>

			To confirm that the project is in line with business strategy To score, plan and the resource the feasibility phase
DSDM Atern Project phase	<p><b>Feasibility</b></p> <p>Create an outline plan listing ten business requirements.</p> <p>High level of risk analysis</p> <p>Researching project.</p> <p>Literature review</p> <p>Pitch is preparation</p> <p>Feasible solution approach</p> <p>Identify expected benefits</p> <p>Outline approach for timeline of delivery – how many days for the whole project.</p> <p>Estimate cost.</p> <p>Terms of reference.</p> <p>Plan for the project.</p> <p>Feasibility assessment</p> <p>Project role summary</p> <p>To plan and agree resources and time boxes for their foundation phase new line provide a very high level outline for the first increment and a list with proposed date of deployment of later increments. Pitch</p>	<p>To establish whether there is feasible solution to the business problem described in terms of reference defined during the preproject</p> <p>To identify benefits likely to arise from the delivery of the proposed solution</p> <p>To outline approach for delivery included project management</p> <p>To describe the organisation and governance aspects of the project. The state timescale and cost of the project overall</p> <p>To plan and the resource the foundation phase.</p>	
DSDM Atern Project phase	<p><b>Foundations</b></p> <p>Create schedule of Time boxes with a resource required</p> <p>Defined approach to be used in project development</p> <p>Agree strategy for deployment</p> <p>List high level requirements using Moscow Feasibility assessment</p> <p>Solution foundations</p>	<p>To baseline the high level requirements for the project and described the priority and relevance to the business needs.</p>	

	<p>Business earlier definition, delivery project definition system architecture definition.</p> <p>Management foundations</p> <p>Project schedule</p> <p>Project finance</p> <p>Delivery plan</p> <p>Prioritised requirement list</p> <p>Project roles summary</p> <p>Delivery to control pack</p> <p>Risk register</p>	<p>To describe the business processes to be supported by the proposed solutions</p> <p>To identify information used, created and updated by the proposed solution</p> <p>To describe the strategy is for all aspects of solution deployment</p> <p>To detail the business case for the project.</p> <p>To design in the solution architecture by identifying the physical or infrastructural elements of the solution.</p> <p>To define technical implementation standards</p> <p>To describe how quality will be assured</p> <p>To describe the solution development life cycle and techniques applied.</p> <p>To describe, access and manage risk associated with the project</p>
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	DSDM Atern Project phase	<p><b>Exploration and engineering</b></p> <p><b>Increment 1</b></p> <p><b>Deployment plan</b></p> <p><b>Timebox 1</b></p> <p>Kick-off meeting</p> <p><b>Investigation</b></p> <p>Identify</p> <p>Review</p> <p>Evolve</p> <p>Plan</p> <p><b>Refinement</b></p> <p>Identify</p> <p>Review</p> <p>Evolve</p> <p>Plan</p> <p><b>Consolidation</b></p> <p>Identify</p> <p>Review</p> <p>Evolve</p> <p>Plan</p> <p><b>Close timebox one</b></p> <p>Timebox plan document</p> <p>Timebox review record document</p> <p><b>Delivery plan</b></p> <p>Project finances document</p> <p>Project schedule document</p> <p>Project status reporting document</p> <p><b>Prioritised requirement list</b></p> <p>Prioritised requirement list document</p> <p><b>Delivery control</b></p> <p>Issue register the document</p> <p>Risk register document</p> <p><b>Solution assurance</b></p> <p>Testing log document</p> <p>Project roles summary document</p> <p><b>Close increment one</b></p>	<p>To elaborate on the requirements captured and baseline in the Prioritised Requirement List During Foundations stage.</p> <p>To explore in full detail of the business need and provide detailed requirements for the evolving solution. To create a functional solution that demonstrably meets the needs of the business. To give the wider organisation on every view of the solution that will be eventually operate, support and maintain. To evolve the business area definition and system architecture definition products of the foundation phase into models that describe how the solution works and how it supports all impacted business processes and systems.</p>
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	DSDM Atern Project phase	<p><b>increment 2, 3, 4, 5, 6, 7 and 8</b></p> <p><b>Deployment plan</b></p> <p><b>Timebox 1</b></p> <p>Kick-off meeting</p> <p><b>Investigation</b></p> <p>Identify</p> <p>Review</p> <p>Evolve</p> <p>Plan</p> <p><b>Refinement</b></p> <p>Identify</p> <p>Review</p> <p>Evolve</p> <p>Plan</p> <p><b>Consolidation</b></p> <p>Identify</p> <p>Review</p> <p>Evolve</p> <p>Plan</p> <p><b>Close timebox one</b></p> <p>Timebox plan document</p> <p>Timebox review record document</p> <p><b>Delivery plan</b></p> <p>Project finances document</p> <p>Project schedule document</p> <p>Project status reporting document</p> <p><b>Prioritised requirement list</b></p> <p>Prioritised requirement list document</p> <p><b>Delivery control</b></p> <p>Issue register the document</p> <p>Risk register document</p> <p><b>Solution assurance</b></p> <p>Testing log document</p> <p>Project roles summary document</p> <p><b>Close increment one</b></p>	Repeating by incrementing, each increment around two weeks and fully documented with start date, finish date, who is responsible and predecessors.
	DSDM Atern Project phase	<p><b>Deployment</b></p> <p><b>Solution assurance Testing log document Delivery plan.</b></p> <p>Project finances document</p> <p>Project schedule document.</p> <p>Project status reporting document.</p> <p><b>Delivery control</b></p> <p>Issue register document. Risk register document</p> <p><b>Project review report</b></p> <p>Project review report document</p>	To confirm the ongoing performance and reliability of the project and preplan as required. To deploy the solution (or increment of it) into the live business environment.

		<p><b>Project roles summary</b> Project the role summary document.</p> <p><b>Increment 9</b></p> <p><b>Deployment plan</b> Schedule plan document</p> <p><b>Deployed solution</b> Timebox plan document</p>	<p>To train the endusers of the solution and/or provide necessary documentation to support the life operation of the solution in the business environment. To train and/or provide documentation for operations and support staff who will be responsible for supporting and maintaining technical aspects of the solution.</p> <p>To access whether the deployed solution is likely to enable the delivery of intended elements of business Benefit describe in the business case.</p>
	DSDM Atern Project phase	<p><b>Post-Project</b></p> <p><b>Increment 10</b></p> <p><b>Deployment plan</b> Schedule document</p> <p><b>Benefits assessment</b> Benefits assessment document</p> <p><b>Project review report</b> Project review report document</p>	<p>To access whether the benefits describes in the business case (objectives) have actually been achieved through use of the deployed solution.</p>
Principle 2	Establish a sound business case	Main Aim is to provide the University with a real-time feedback system that is characterised by enhancing teacher-student communication at the time of teaching and reviewing its impact on the performance of learning, teaching and educational curricula.	

		Seek continues business sponsorship and commitment	
Principle 3	Deliver on time	<p>Project Proposal approved 30/09/15</p> <p>Demonstration of prototype 16/12/15</p> <p>Initial contextual report. 18/12/15</p> <p>Interim report on 3/12/16</p> <p>Demonstration of the final product 18/13/16</p> <p>Final report upload 18/14/16</p>	All the deliverables must be in time of the lifetime of the project.
Principle 4	Collaborate	<p>1.6.1.4 To establish close ties with the University of Greenwich to engage in development of the University student program evaluation in the form of frequent feedback by 24th of April 2016. [10.0]</p> <p>1.6.1.6 To build up on a well-articulated developmental approach that supports program through review and approval, including enhancing the processes by which the University</p> <p>7.1.1.1 To enhance the University practice in collecting and analysing students' feedback from undergraduates within the lecture timeframe. [2.0]</p> <p>Daily meetings were all team members. Email information update to the supervisor collaboration with supervisor regarding project idea, project proposal, project pitch, contextual report, and demonstration of final product. Face-to-face meetings with supervisor in five iteration collaborating about the project deliverables.</p> <p>Workshop facilitated especially for all team members to collaborate to get best results by never compromise quality.</p>	

Principle 5	Never compromise quality	By prioritising functional requirements, each increment provides selecting the most necessary features.	
Principle 6	Built incrementally from fear foundations	In the Gantt chart specified 10 increments within the project life cycle. Each one provided development of new features and adding new functionalities	
Principle 7	Develop iteratively	By iterating each of the 10 increments, by following the same techniques in each, this system is improving week by week and deliver business value	
Principle 8	Communicate continuously and clearly	<p>1.1.1.1 To communicate clearly and effectively in a form of feedback, taking to account different audiences in academic environment within academic year. [5.0]</p> <p>7.1.1.2 To support good communication, clear boundaries, trust and confidence between teacher and student within academic year. [12.0]</p> <p>Each team member communicates by using the values of methods, such as messaging, emails, meetings, and special one-to-one communication in person.</p> <p>To document and keep records of each communication with each member of the team.</p>	
Principle 9	Demonstrate the control	Project Gantt chart, using Microsoft project 2013 are customised to suit DSDM Atern. To start project on the 28/09/15 and end the project on 11/14/16	It is very important to have control in all aspects of project management; therefore, Gantt chart was created
	Facilitated workshops		
		<p>To facilitate 12 workshops</p> <p>To create 12 agendas and email to all team members</p> <p>To document agenda outcomes</p>	
	Investigation Refinement Consolidation (IRC) Timeboxing technique		
		To create 12 timebox, each time box in line with each iteration and increment.	To fulfil principle 1

		Comprehensive Gantt chart specifies in detail each time box, deliverables and documentation. This including start date and finished date, responsible team member and predecessors.	
	80/20 rule	<p>1.6.7.30 Apply framework DSDM Atern using MoSCoW and 80/20 rule. [0.5] To provide 80% of the project outcome by using only 20% of the effort</p> <p>Detailed example of 80/20 rule are documented in prioritisation 6.2.1 business events, 6.2.2 system requirements and specially in 6.2.3 review elicitation of the requirements.</p> <p>To find 80/20 ratio to maximise performance To find products requirements that generate the most income (the 20%) and drop the rest (80%) that only provide marginal benefits To improve product significantly by using skills and leaving the tasks that are outside. Reward the best employees well and read off the worst.</p>	
	MoSCoW Prioritisation		
		<p>1.6.7.6 Use of MoSCoW model and its integration with the DSDM Atern methodology [0.2]</p> <p>To use MoSCoW prioritisation in the elicitation of the requirements, see chapter 6.2</p> <p>A comprehensive example of the prioritisation of the business events and review requirements, using must, should, could, would words against the requirement.</p> <p>Students unable to identify the most important requirements to take forward. Refer to full documentation of the requirements, using prioritisation are explained in 6.2.1 business events, 6.2.2 system requirements and 6.2.3 review elicitation of the requirements.</p>	<p>Moscow technics used in Agile Framework to prioritise must, should, could, would requirements</p> <p>Used to control the development aspect of this project.</p> <p>Practice the new skill was learned and applied to the best of the ability on a daily basis. This enables to constantly evaluating task in hand, comment on it and make</p>

			changes during the development of an increment of the solution.
	Modelling		
		To use software development models, which is agile model, iterative model. Overall, in project management using DSDM Atern Agile model other models specified in this table are choosing because of its benefits project outcomes.	This methods of modelling were choosing because there is a set deadline to produce product using iterative and incremental development
	Prototyping	To prototype the system by building, testing and then reworking as necessary until an acceptable prototype is finally achieved from which the complete system can be developed.	Before complete system can be developed the prototype and is necessary to find out what's worked out and what needs to be done. If complete prototype is functional correctly the final complex system can be developed.

Figure 28.1. DSDM Atern project management table.

The high well to insert to what we are what are the way of the girl to worry on dog for and a lot of them are formed. So there and then the there was a pulses and so on the courses stored in the form so on. I called up all and I set out in this proved to the less predictably, testing, to improve you

## 7.2 Project timeline

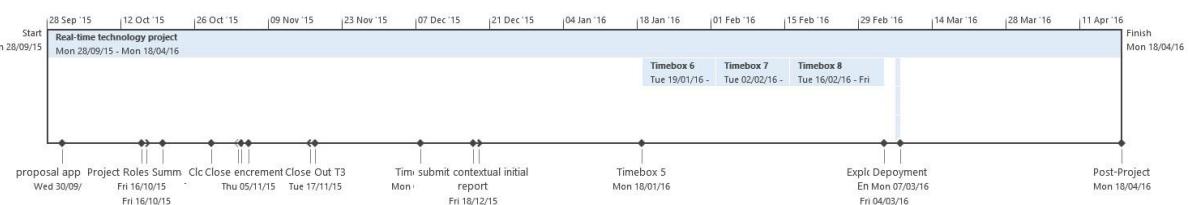


Figure 29. DSDM Atern Project management timeline

## 7.3 Recourse sheet

	Resource Name	Type	Initials	Max Unit	Std. Rate	Ovt. Rate	Accrue At	Base Calendar	Text1
1	Director Business Sponsor	Work	IZ	100%	£30.00/hr	£40.00/hr	Start	Standard	business interests
2	Business Visionary	Work	IZ	100%	£10.00/hr	£15.00/hr	Prorated	Standard	business interests
3	Technical Coordinator	Work	IZ	100%	£10.00/hr	£15.00/hr	Prorated	Standard	solution/technicalinterests
4	Project Manager	Work	IZ	0%	£40.00/hr	£50.00/hr	Prorated	Standard	managementinterests
5	Business Analyst	Work	IZ	100%	£10.00/hr	£20.00/hr	Prorated	Standard	business interests and solution/tec
6	Software Team Leader	Work	IZ	100%	£40.00/hr	£50.00/hr	Prorated	Standard	managementinterests
7	Business Ambassador	Work	IZ	100%	£10.00/hr	£20.00/hr	Prorated	Standard	business interests
8	Solution Developer	Work	IZ	100%	£20.00/hr	£30.00/hr	Prorated	Standard	solution/technicalinterests
9	Solution Tester	Work	IZ	100%	£20.00/hr	£40.00/hr	Prorated	Standard	solution/technicalinterests
10	Business Advisor	Work	IZ	100%	£50.00/hr	£50.00/hr	Prorated	Standard	business interests
11	Technical Advisor	Work	IZ	100%	£50.00/hr	£50.00/hr	Prorated	Standard	solution/technicalinterests
12	Workshop Facilitator	Work	IZ	100%	£100.00/hr	£150.00/hr	Prorated	Standard	business interests
13	DSDM Coach	Work	Keeran	100%	£50.00/hr	£50.00/hr	Prorated	Standard	Process interest

Figure 30. Resource sheet

## 7.4 Timetable

Once the objectives, tasks, milestones and deliverables have been defined, they were arranged in the form of a comprehensive custom build Gantt Chart. Estimate how many hours each task is require and over what period of time it will be completed. Set of each milestone and deliverable are achieved. This is showed on the Gantt Chart given constraints of time and cost, predecessors and who is responsible for a specific job.

## 7.5 Overview



Figure 31. DSDM Atern Gantt Chart

## 7.6 Pre-project stage



Figure 32. DSDM Atern Pre-Project Stage

## 7.7 Feasibility stage

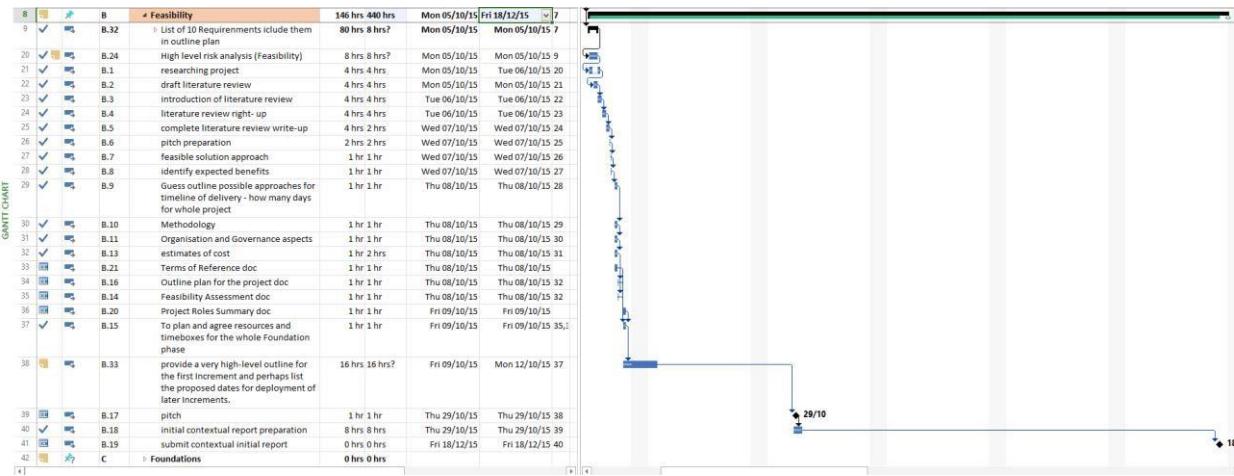


Figure 33. DSDM Atern Feasibility Stage

## 7.8 Foundation stage

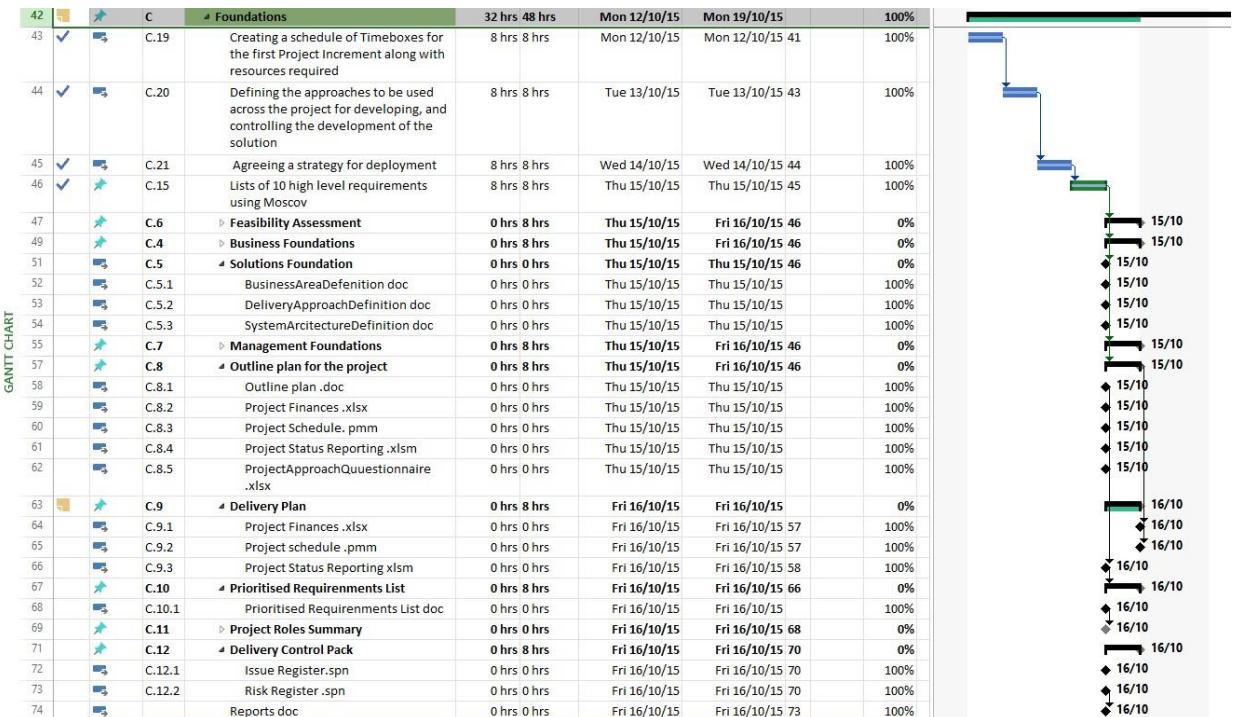


Figure 34. DSDM Atern Foundation Stage

## 7.9 Exploration and Engineering stage



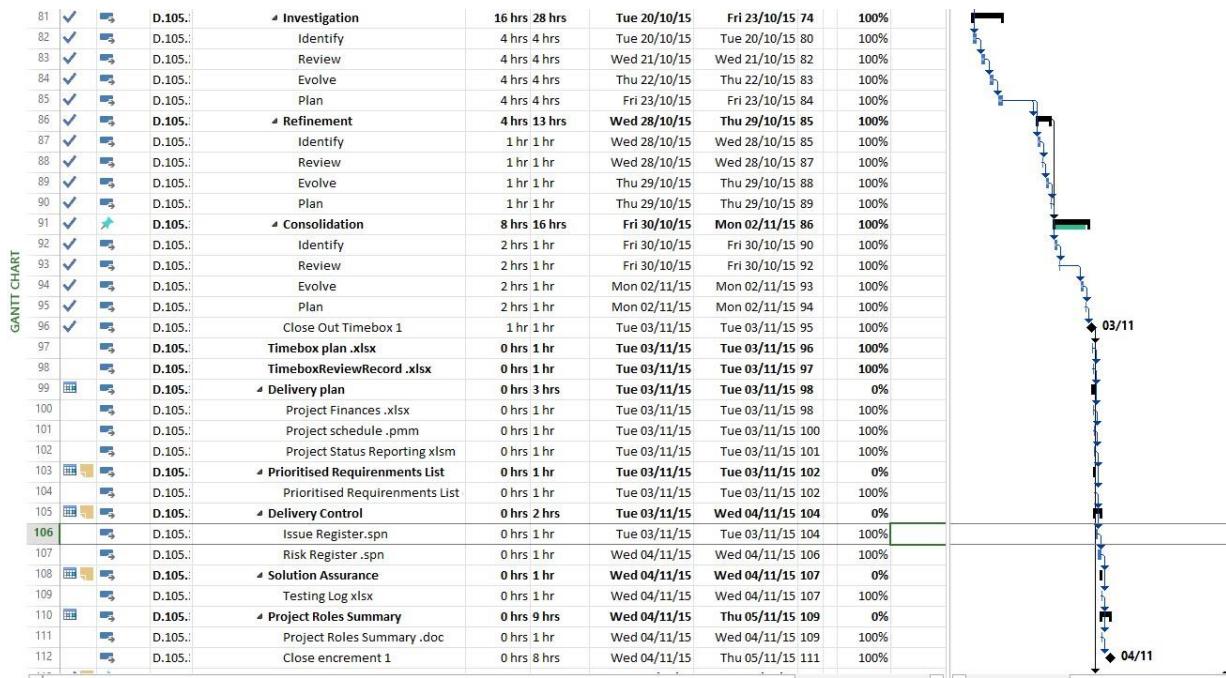


Figure 35. DSDM Atern Exploration and Engineering stage

## 7.10 Tracking Gantt chart

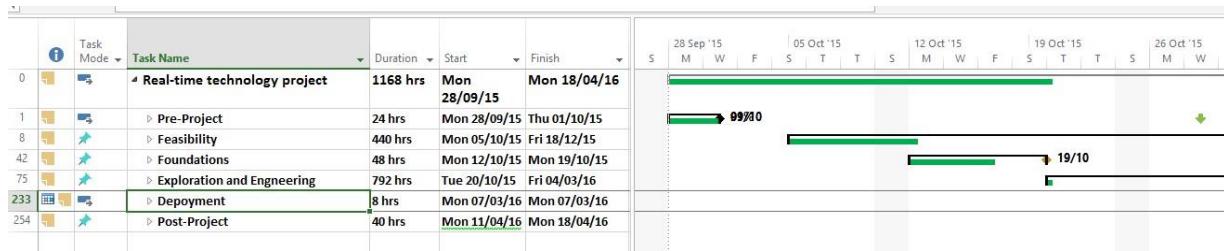


Figure 36. DSDM Atern Tracking Gantt Chart

## 7.11 Project planning progress

Several of interviews and feedbacks from users and experienced teachers as University programme leader and supervisor was performed on weekly basis. Initial project idea was agreed. After a communication issues for due to a misunderstanding I led to believe that my idea will not be supported, therefore, a new idea was evolving nevertheless, still within student teacher communications in educational environment. Eventually, my final idea (C) was accepted by supervisor and immediate appropriate steps were taking with speedy recovery. Project proposal was made and was agreed by formal acceptance. Written and verbal feedback was giving by two supervisors and thumbs up to go ahead. Scenes then I was working on aims and objectives, specifying what methods will be used, and illustrating idea drafting design. Moreover, literature review and research are done and documented. Comprehensive Gantt chart was developed, see Appendix.

I have come up with different implementation ideas and had to evaluate my knowledge in order to deliver my product on time. Number of UML diagrams was made for different implementations in

order to see feasibility and time needed in each one. Logbook of the day-to-day progress was documented that included lecture materials, templates, tutorials and my own thorough research.

Well, in this scenario this project is ambitious because in reality there will be only one person playing roles, not just of ten departments, but also each person within each department. Taking into account DSDM Atern method that's required parallel tasks performed at the same time, and teamwork as an essential factor to iterative development, feasibility is not ambitious. But again there is only one person in the team which automatically making project ambitious within specified deadlines, unless (not advised) waterfall methodology will be used and real time management will be plan. In order to produce my software development system it's not ambitious, but for one person (me) to represent parallel tasks or be in different locations in the same time is not feasible.

Extremely careful planning and use of methodology was necessary to use in order to accommodate all those parallel tasks and to deliver a product to specification and time.

Full Gantt chart are made. There is difficult to say whether this project over ambitious or under ambitious. At the moment I can say that it will be challenging due to the restriction knowledge in distributed software applications as well as SQL database. I will have to take this to consideration and allocate time in my project management for their special staff training in those areas.

## 7.12 Project risk analysis

Factors that playing a major role in failure are:

- Staff availability, due to the health issues project can be stalled at times, taking to consideration is one-person project (in teamwork development)
- Time pressure and project scheduling due to not availability of the resource.
- Staff training costs to learn and get knowledge in the specific areas of implementation stage.
- Costs involve in the web hosting.
- I have all the necessary equipment that's associated with the project management and software development of the product. However, updated versions from Visual Studio 2012 of the software to Visual Studio 2013 are recommended for the best and quicker outcomes.
- I don't have appropriate skill in software development and software project management, but additional training will be required in specific areas such as implementation of distributed application.
- I do have access to any team members involved in the project, which is me and myself and I. There also will be an audience, students over eighteen years and less than sixty-five years of age as well as Supervisors at University.
- I have access to the locations that at the moment I'm aware I need to use, but there could be cost issues due to low budget.

- I do have access and permissions to use materials, but it's less likely that I will use them due to the travelling costs involve between main office and the primary location of the University.

## **7.13 Quality plan Success criteria**

The success of actual outcome must match expected outcome which is efficacy of the feedback given by students to the teacher in the real-time among other success factors such as students managed to express their wants and needs and teaches enhance their personal development and both student and teacher communication effective in educational environment.

# **8 DESIGN**

## **8.1 Introduction**

In order to complete this design stage on the fundamentals of feedback system, the most important is to spend some time upfront planning and designing. Prioritising design requirements and performing incrementing and iterative development of the design by using Timeboxes' provide an effective way to save a lot of frustration in the implementation and testing stage. By modelling design, using UML diagrams is proving to be great benefit to understand system in more detail. (Šilingas & Butleris, 2015) Careful consideration was taken in cases such as record student attendance under one second at the lecture theatre of unlimited number of students present at the lecture theatre. The main objective is to design interactivity that will be suitable in the real-time teacher student feedback system. Providing anonymous or student full name system design, teacher and student can decide on the lecture whether identification of full name is necessary. Making sure that the contents and graphics are appropriate to suit educational environment and fast operation of the system. Moreover, correct design must be fit for purpose, which is to provide the University with a real-time feedback system that is characterised by enhancing teacher-student communication at the time of teaching and reviewing its impact on the performance of learning, teaching and educational curricula.

## **8.1 Server architecture**

Node.js server at high level of an Event-driven, non-blocking I/O, shown on figure 37

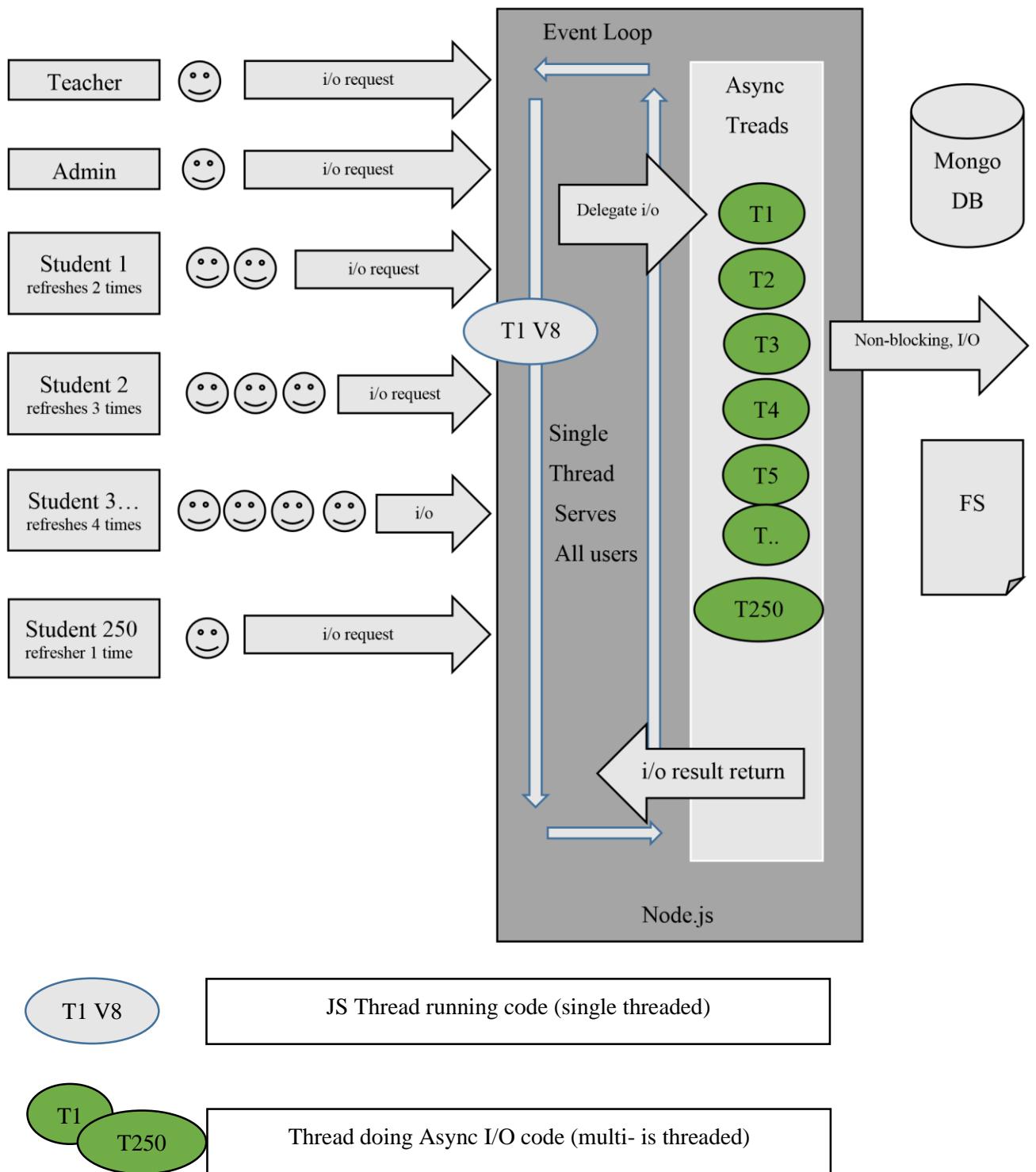


Figure 37. Node.js server

As shown on picture 37, this server has two parts. Front end to chrome V (single threaded), event loop and libraries that around JS code and listen to HTTP/TCP requests. Back end includes libraries that provide asynchronous I/O.

In the implementation stage. It is important to understand that a request is made from the browser, mobile device is running on main threat of the V engine that is checks if it is an I/O. If it is an I/O it immediately delegates that to the kernel level of the server where one of the threads in the thread pool

actually makes Async I/O. This enables to start accepted the new requests or events because the main straight is free.

## 8.2 Generator for JavaScript diagram

the module is made to generate the class diagram for JavaScript, node, HTML and CSS.

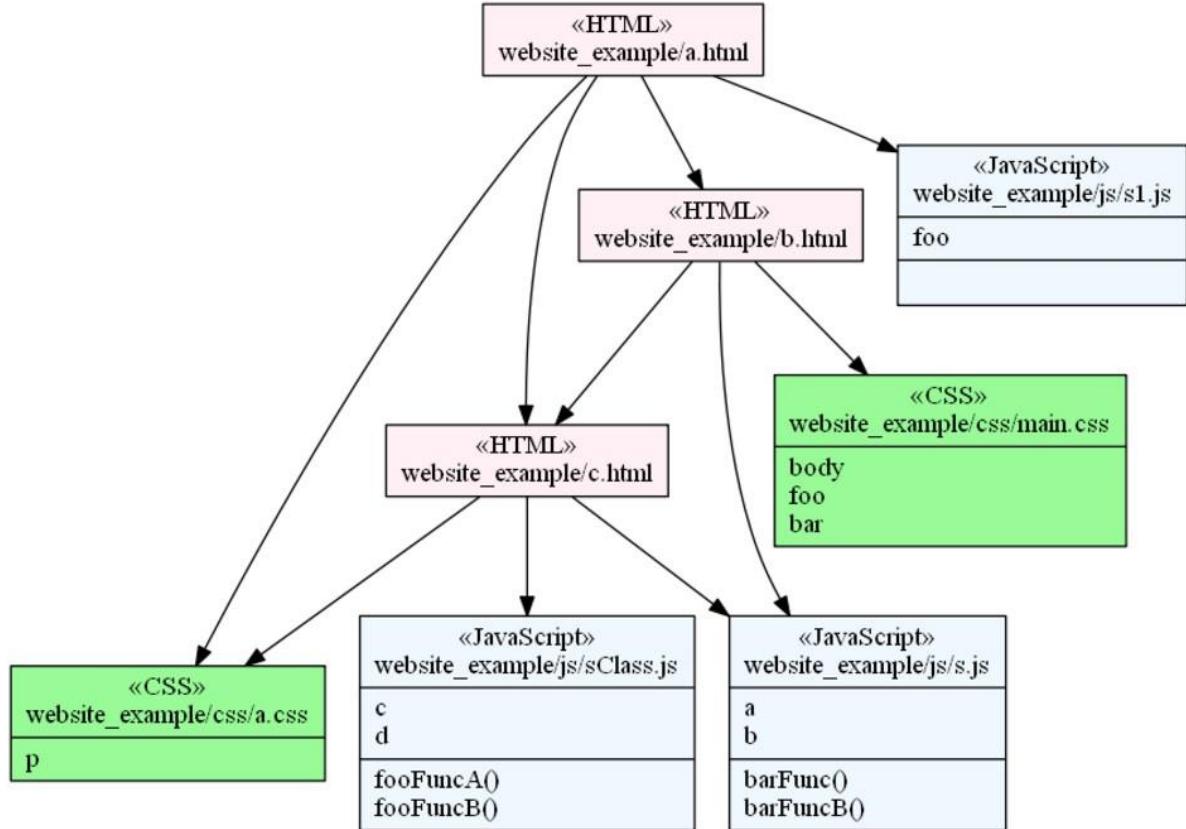


Figure 38. Generation of JavaScript class diagram

## 8.3 Application state

using React and combining with web sockets provided sharing real-time data between the server and many clients. In the real-time feedback application, the following datatypes are needed. In the lecture environment. Students will want to know who the speaker is and what the present is called. The object will be needed to store speaker information as well as variable to hold the presentation title. Students in the lecture are joining presentation, to object to track how many students are connected as well as information about each student member. This polling application is designed for students to be able to answer each question. This will be done by the application that will need to store questions and collect students' responses and store that as well. As a default there will be predefined list of questions. The speaker/lecturer, presentation title, students and questions will be stored in memory on the server.

There will be a need to make sure that data stays in sync with each client and every user is viewing the most accurate and up to date data.

When a new client connects welcome to the presentation screen should be done by sending each student current data from the server. Every time a new student joins the presentation this stage of the students will change. This change will then broadcast to all connected clients. Each client application component will update it stayed based upon the change and the pass those state values down to child components and properties. When the lecturer asking a question, the question will be broadcast to each of the students. When each student answers the question, the answer will be broadcasted. The below diagram shows how to keep state variables in sync between their client and the server by using socket IO and React.

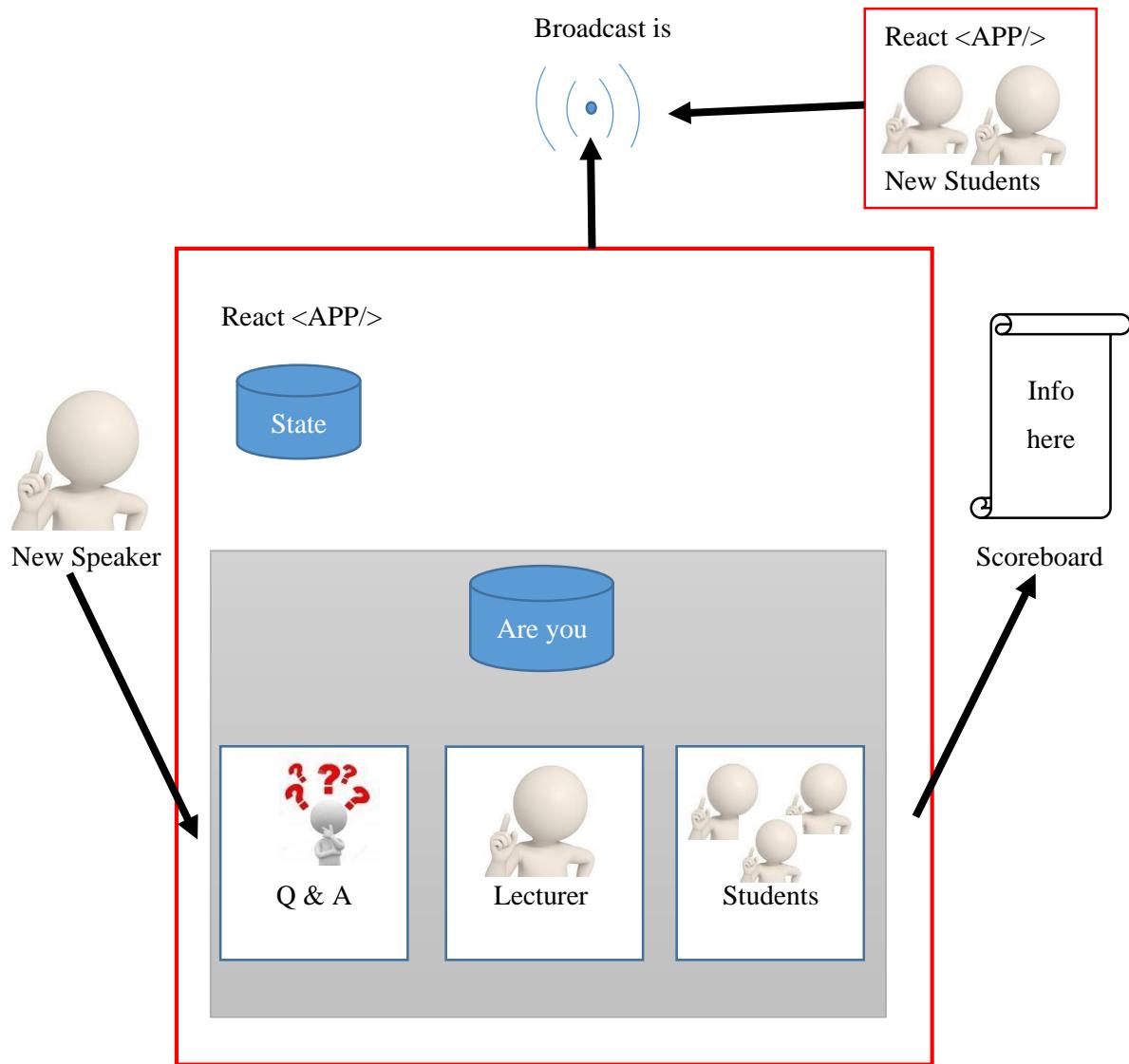


Figure 39. Real time teacher-student communication application state

#### 8.4 Storyboard design

Adding storyboard outlined to show how content will be displayed on the website. Shown on figure 40 hand drawing.

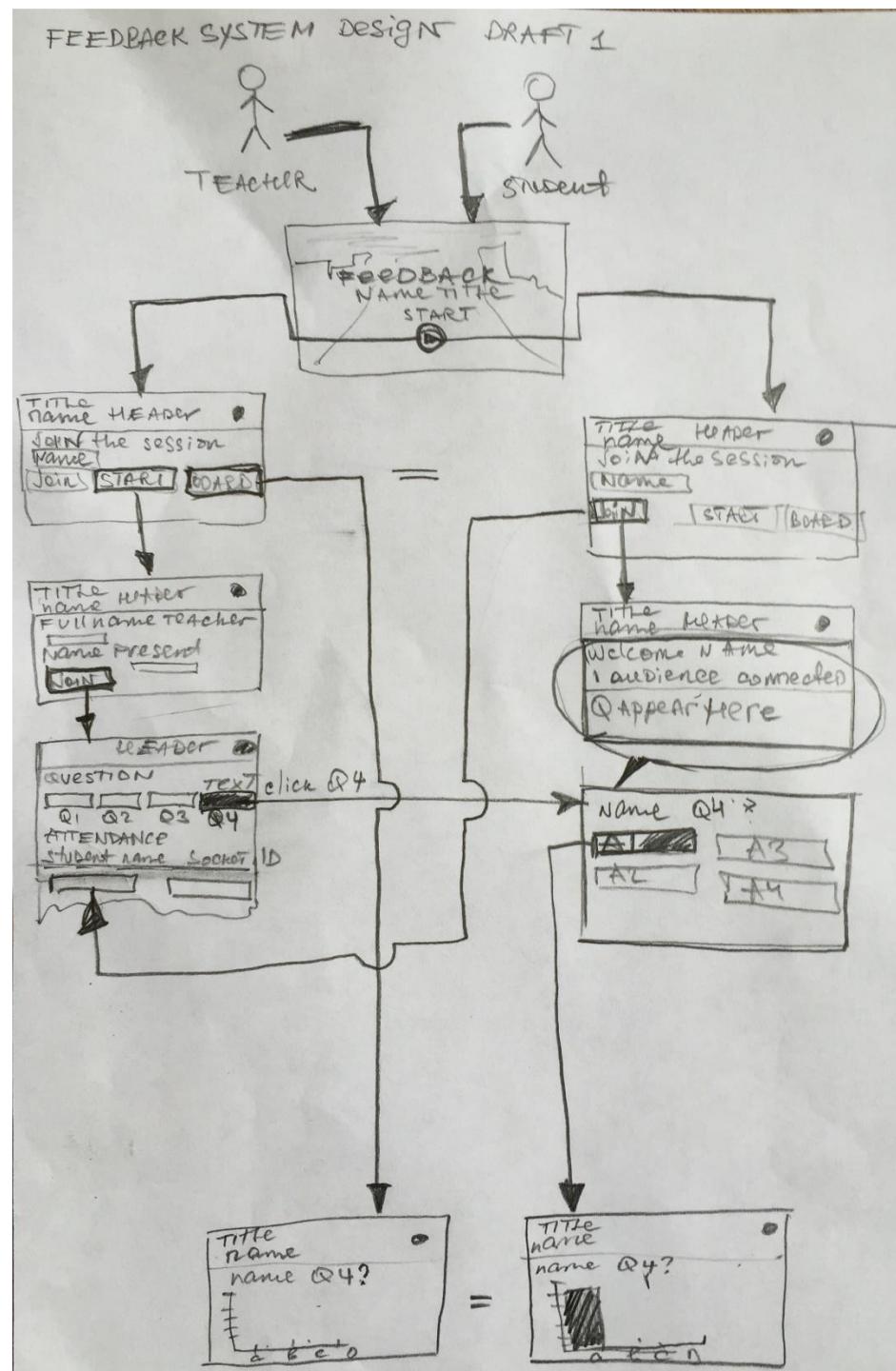


Figure 40. Feedback system storyboard

Each page will consist a header containing title of the presentation and teacher's name. Graphical user interface (GUI) is simple user-friendly design of each page showing connectivity between them.

## 8.5 User Interface Web page design

Home page is the first page the lecturer will come to in order to start presentation. Shown on figure 41

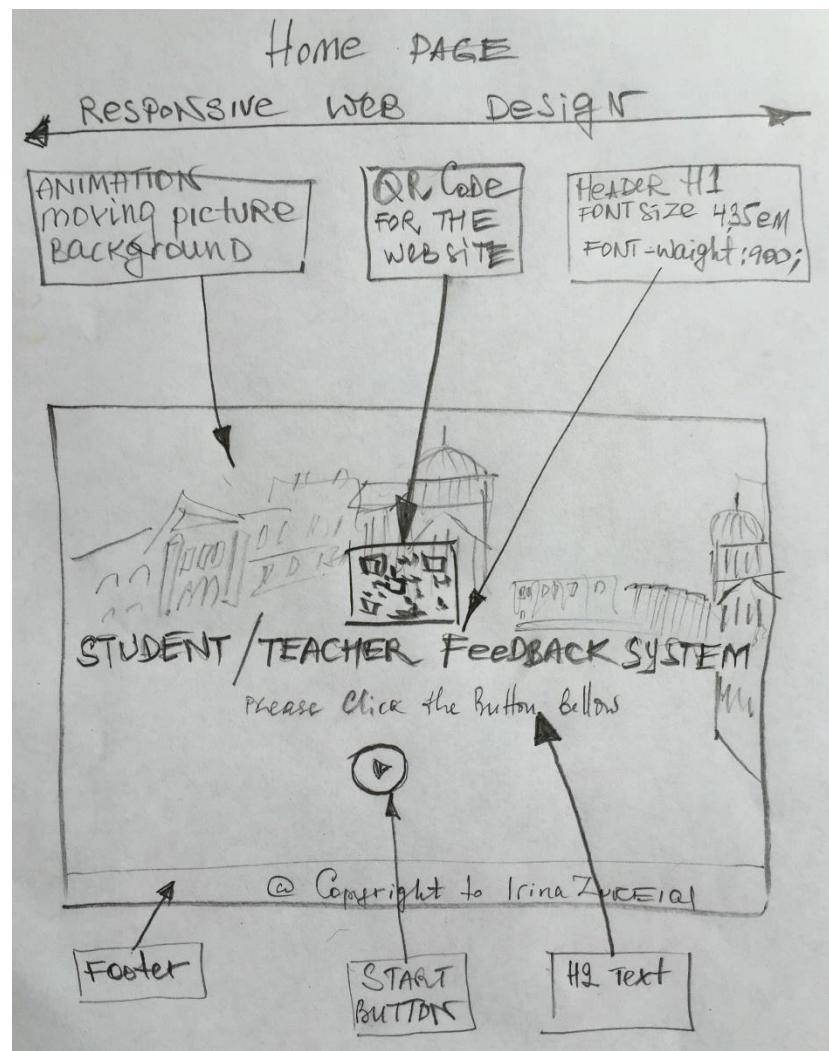


Figure 41. Home page design

Main page for the teacher to be able to start presentation.

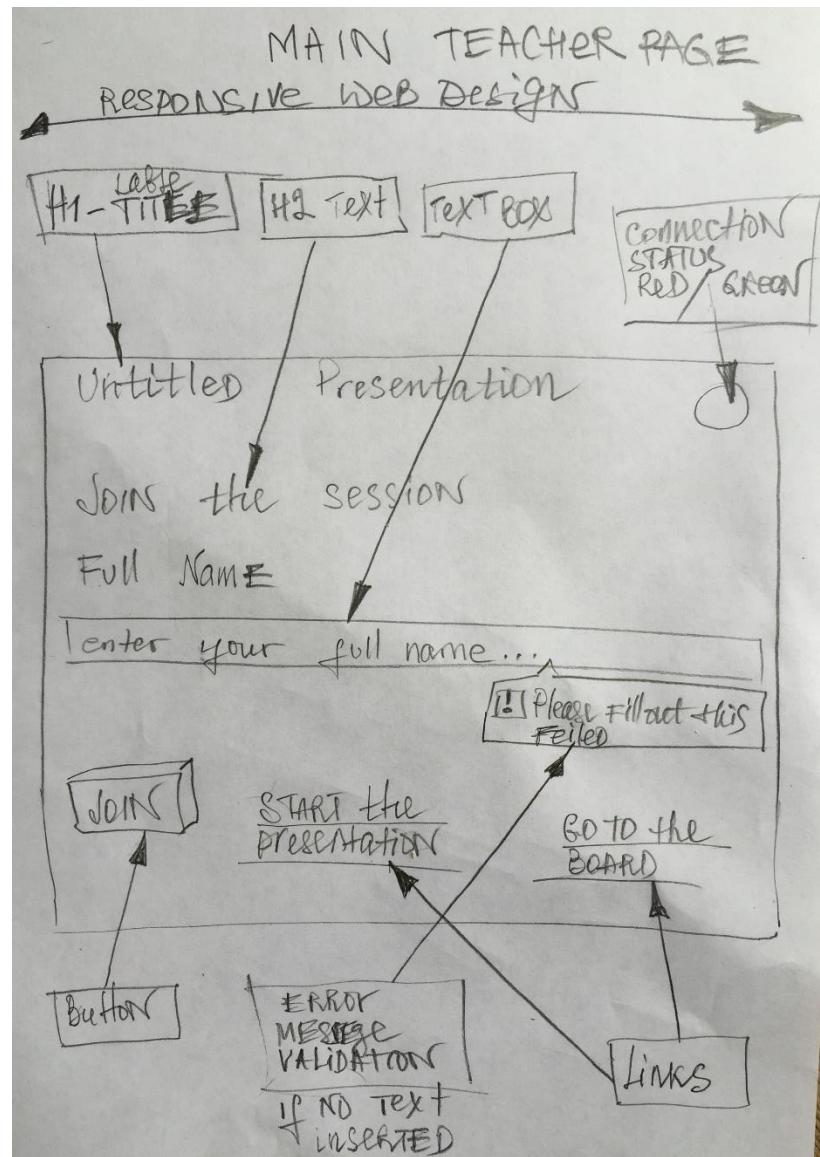


Figure 42. Main teachers page webpage design

Teacher start lecture by entering name and presentation title and click on join button.

Figure 43. Example of the web User Interface poling application for the teacher.

Teacher entering the questions that he would like to ask the students.

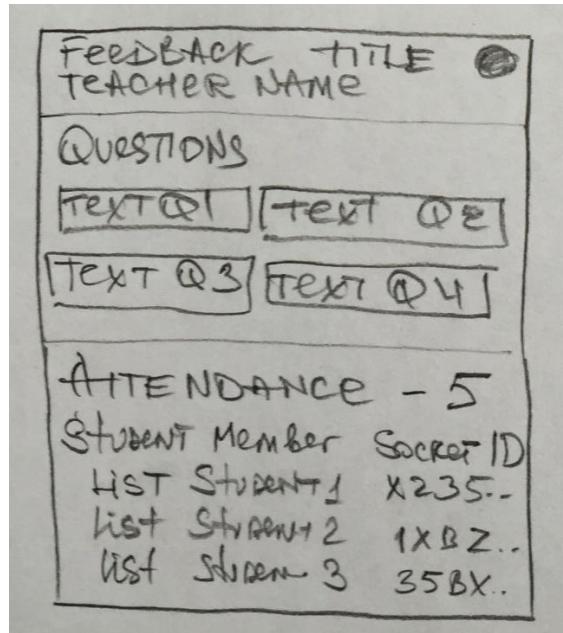


Figure 44. Example of the web User Interface poling application questions.

By clicking on choosing question to display the teacher will see the following screen.

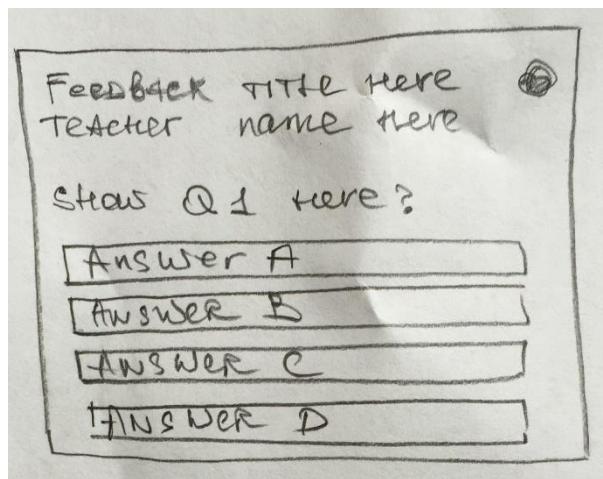


Figure 45. Example of the web User Interface poling application for the student.

Teacher display QR record for students to scan in order to access to the teacher's screen instantly.

(QR-Code-Generator, 2016)

User Interface poling application for student to Scan with QR Code reader application on their mobile device.

Students can view the question and have an option to select from a multiple-choice answer on the screen of their mobile device.

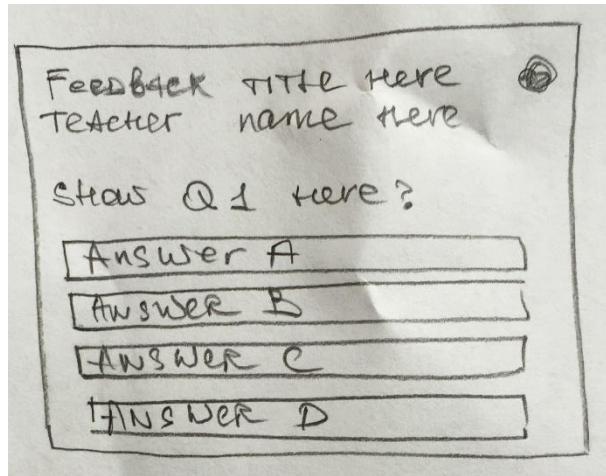


Figure 46. Example of the web User Interface poling application for the student.

Followed student's response the teacher able to view graphical representation and adjust to his or her liking.

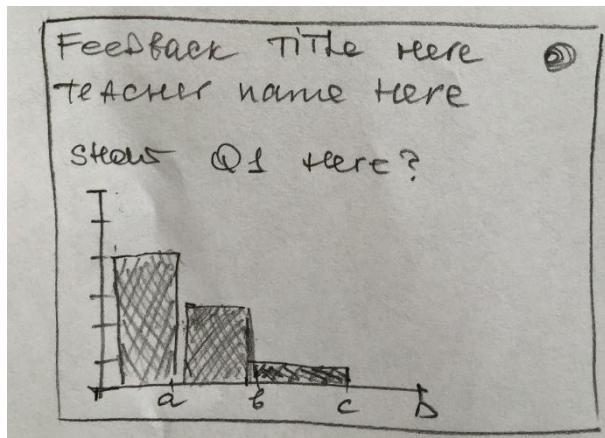


Figure 47. Example of the web User Interface poling application graphical representation.

## 8.6 Rich picture 1

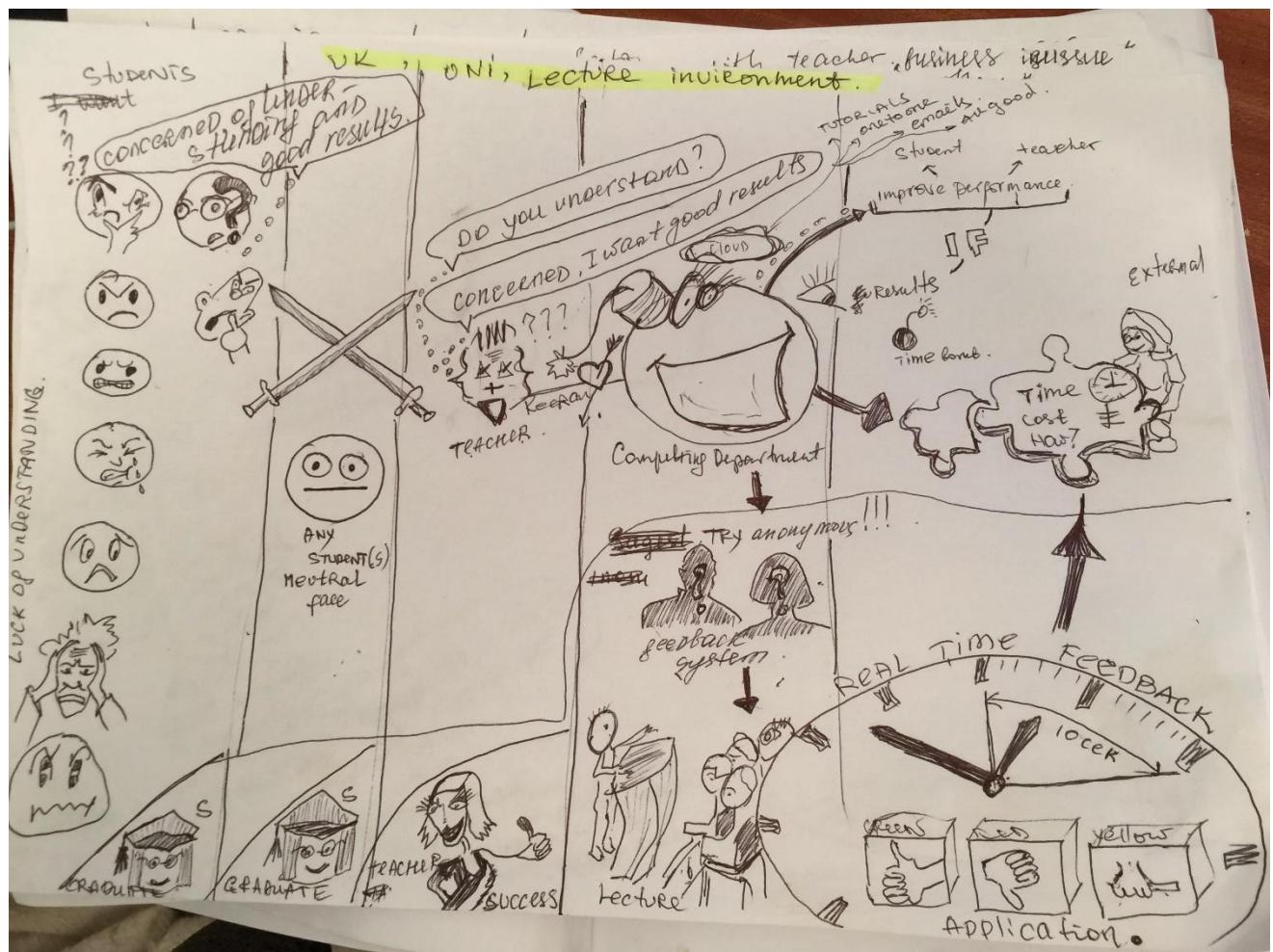


Figure 48. Rich picture 1

### 8.1 Rich picture 2

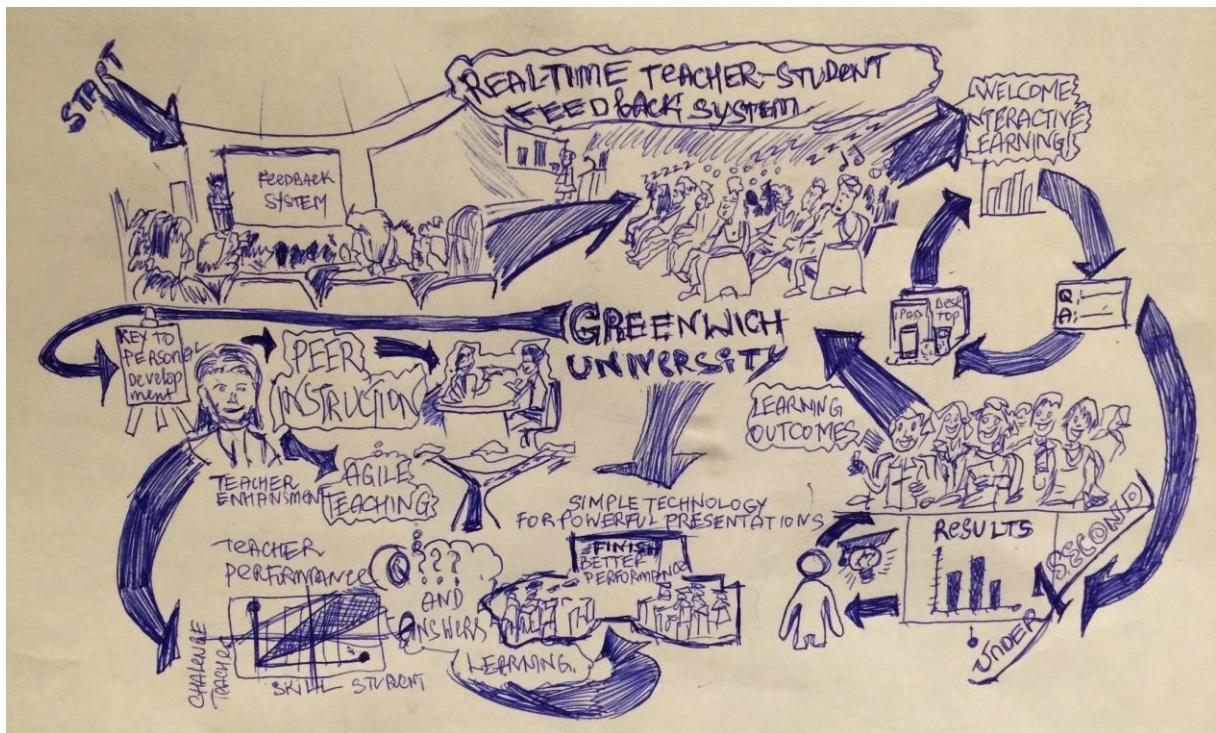


Figure 49. Rich picture 2

## 8.2 Use Case Diagram

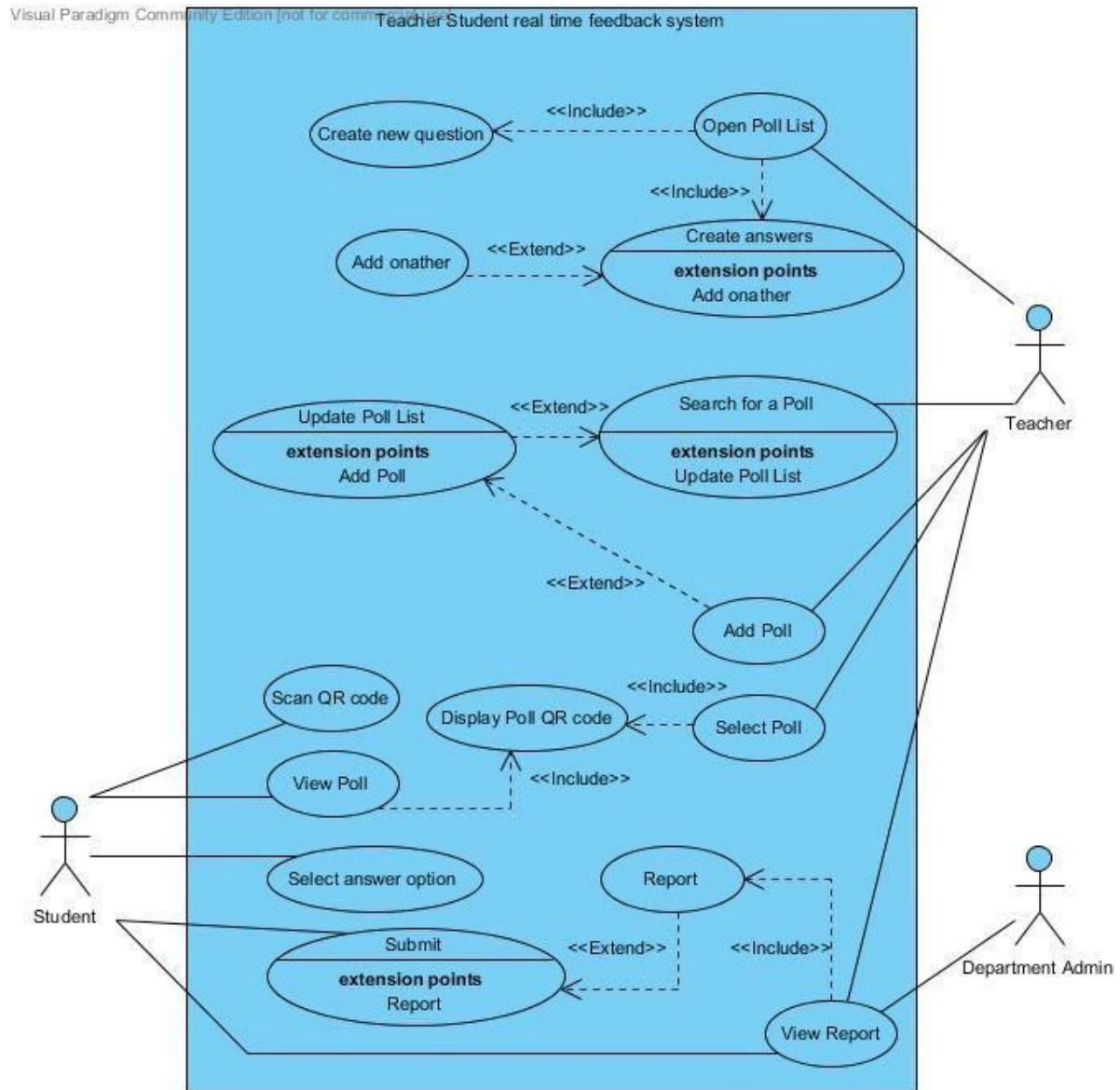


figure 50. Use case diagram

### 8.3 Class diagram

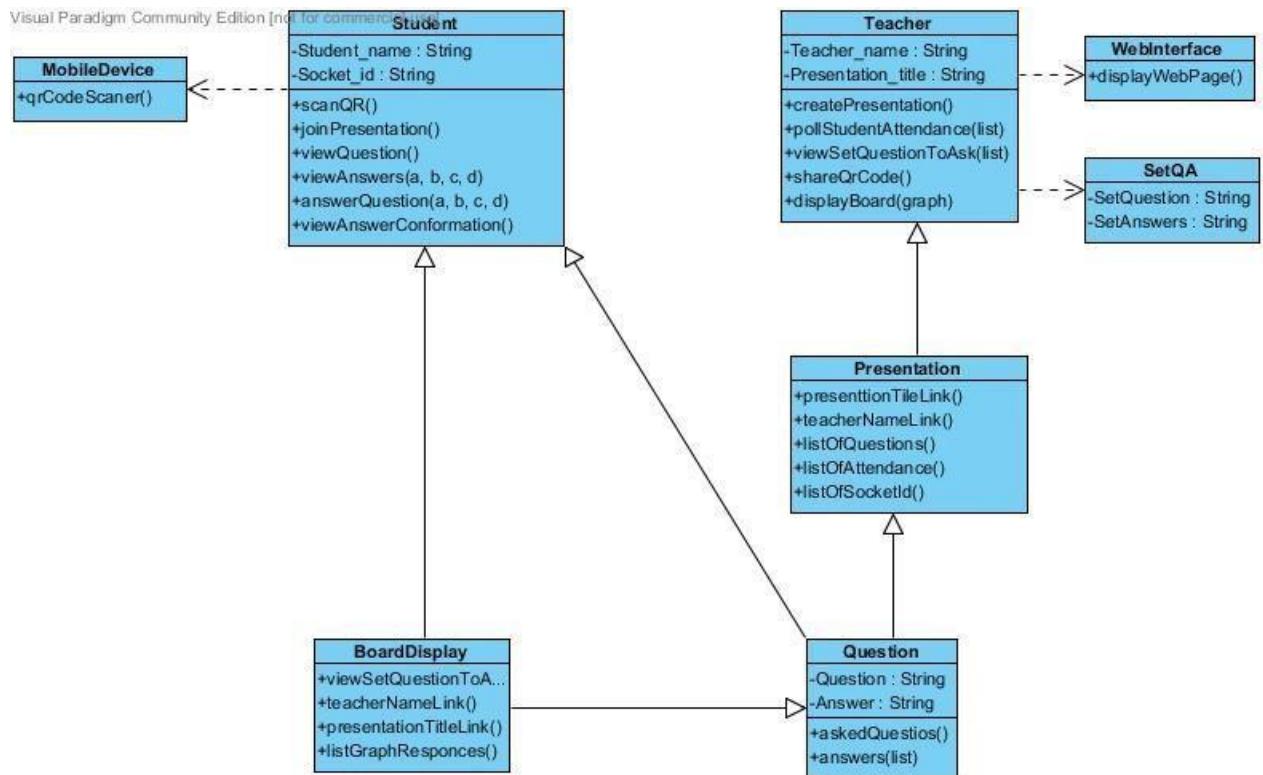
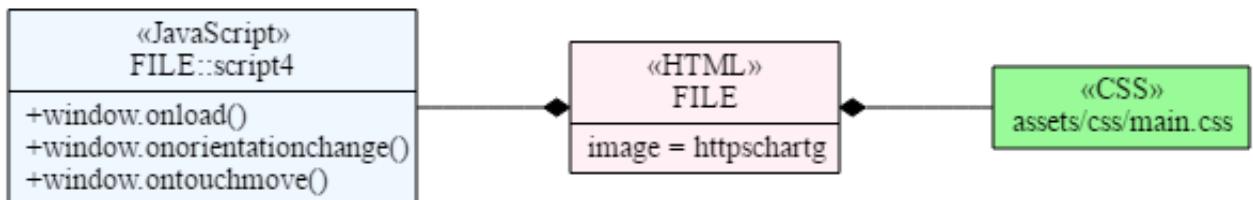


Figure 51. Class diagram

### Index.html



### Index2.html



### App-server.js

```
«JavaScript»  
FILE  
  
+audience : string = audience  
+currentQuestion : boolean = false  
+currentQuestion : string = currentQuestion  
+currentQuestion : variable = question  
+id : NULL  
+module.exports : variable = app  
+questions : string = questions  
+results : string = results  
+server : variable  
+speaker : NULL  
+speaker : string  
+speaker.type : string = speaker  
+title : string = UntitledPresen  
+title : string = title  
audience : Array  
connections : Array  
newMember : object  
results : object  
speaker : object  
speaker.id : object  
speaker.name : object  
title : object  
  
+app()  
+io(server)  
+member(audience, )  
+results(NULL)  
+speaker(NULL)
```

### App-client.js

```
«JavaScript»  
FILE  
  
+DefaultRoute : string = DefaultRoute  
+NotFoundRoute : string = NotFoundRoute  
+Route : string = Route  
+routes : variable
```

## 8.4 Sequence Diagram Overall system

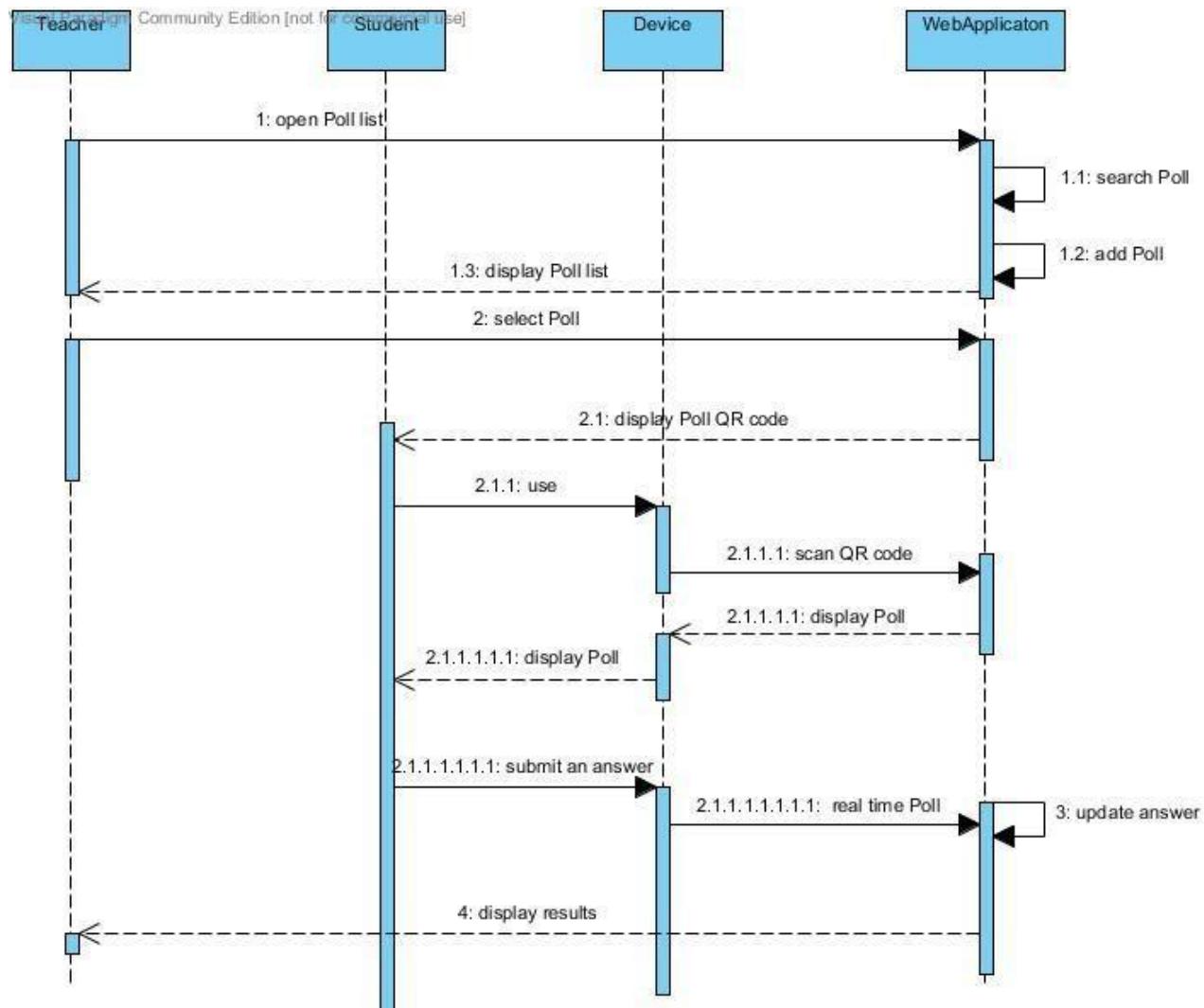


figure 52. sequence diagram.

## 8.5 ERD Diagram

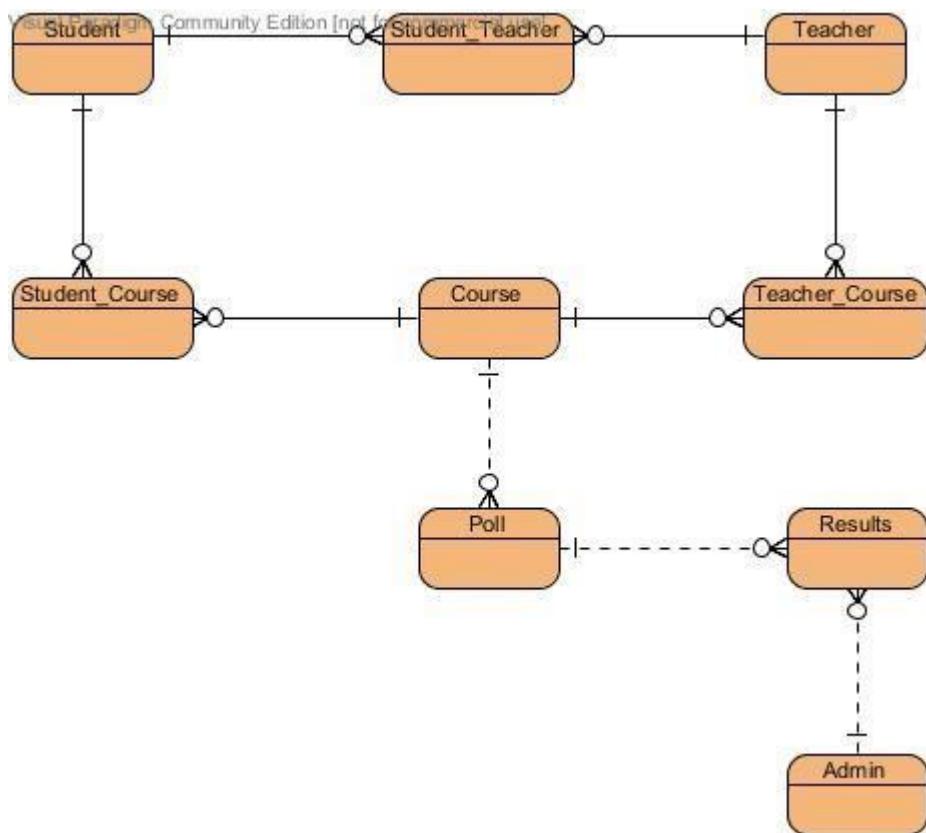


Figure 53. ERD Diagram

## 8.6 Key issues detector implementation stage

In the implementation stage it is important to understand that a request is made from the browser, mobile device is running on main thread of the V engine that checks if it is an I/O. If it is an I/O it immediately delegates that to the kernel level of the server where one of the threads in the thread pool actually makes Async I/O. This enables to start accepted the new requests or events because the main thread is free.

## 8.7 Error Validation

The system will contain error messages on the text boxes for the student and the teacher. Help in form of the text to help the user is displayed so they make correct entries. I developed these error messages so that the user could see whether the information has been inputted using correct format.

Attribute	Data Type	Validation type	Rule	Error message

Teacher Name	Text	Presence check	A name must be present in the field.	Please fill out this field...
Teacher enter Presentation Name	Text	Presence check	A name must be present in the field.	Please fill out this field...
Students name	Text	Presence check	A text must be inputted (of real name or any other text for being anonymous)	Please fill out this field...
Student answer	Text	Presence check	Only one answer could be selected from four possible answers	Please select only one answer

## 8.8 Design constraints

Designing and identifying functionality, that must be present in order to the system to function correctly, there is a time constraint because the design stage has a deadline.

## 8.9 Issues found in the design for improvement

- QR Code should be able to expand on the whole page by clicking on it, or redirecting to another web page where students can see, from longer distance QR Code and be able to scan with the lecture theatre at the University Mobile device in t that's expand.
- In to footer of the home webpage should say 2016 @ Copyright Flawless Web.

## 8.10 Test Plan Design

Tes t Nu	What to test	How to test	Expected results

mb er			
	Accessibility		
1	To test if the system accessibility by using the Internet	I ensure that I am making a website which will go on the internet and to test it I will open every browser to check that my system will be functional in all the browsers	All pages will successfully open in all browsers on different devices and will be graphical user interface will be responsive
	Teacher		
2	To test whether or not the client can access the system and use all functionalities	Ask client to use the system and fill out the feedback form	Client feel out feedback form specifying whether or not he can access the system and all the features
3	To test if the teacher can start presentation by clicking on the link “start presentation”	On the speaker page click “start presentation”	The link is working correctly and teacher and only gated to the next page of questions to select
4	To test if the teacher can enter the name and presentation title	Input data on teachers, TextField as well as presentation title	The text of their teacher's full name and presentation title are entered successfully
5	The test if the teacher can view default four questions	Create default four questions and display to the teacher on speaker page in order for the teacher to select the question who wants to display to the students	The teacher can view four default questions
6	To test if the teacher can select one question in order to show to the students	Only one question can be selected from four questions	Teacher can click on the question and view this question and four

			answers that belong to this question
7	The teacher can display QR Code to the students by using a board	Display QR Code of the feedback system website in the homepage	The teacher can display QR Code to the students by using a board
	The teacher can enlarge QR record for students to be able to scan from a far distance	The QR Code can be in a large to full-screen on the teacher's board for students to be able to scan from far distance	The teacher be able to enlarge QR Code to fullscreen on the board for students to be able to scan this scored from a far distance
8	To test if the teacher can see students fall names and socket ID that will an enable teacher to monitor student attendance	Connect each student to system and enable for teacher to see who is taking part in how many students participating, this also monitoring student attendance	Teacher can see students name unless this presentation is anonymous, teacher can be you students socket ID and the total number of students participating in the feedback system
9	To test if teacher can view student answers displayed on the visual board	Student answers must be displayed on visual board	Teacher can view all students answers that are displayed on visual board
10	To test if teacher learned student outcomes and changed his teaching performance to improve student learning	Teacher must analyse students' outcomes by viewing visual graph and be able to amend their teaching methods if necessary	Teachers can understand students wants and needs and based on this information improve pedagogy
	Student		
11	To test if students can use any device to access the system by scanning QR code	Select various devices and check if they can scan QR Code by using QR Code Reader	Desktop, laptop, iPad, iPhone, blackberry phone, and other devices can scan QR Code by using QR Code Reader and instantly see the web page on the device

12	To test if students can use desktop or laptop and access the system using the URL	Select various devices and check if they can access the system by entering the URL through the install browser on the device	Students can use any device that has a browser to access URL of the feedback system
13	To test if student can see the page with teacher's name, presentation title, textbook to enter their full name (and if needed). Check if student can see, but can called "join"	Visually check if the teacher's name, presentation title and text box to enter full name present. As well as the bad and called "join"	Students can see on the devices teacher's information, presentation title, text box to enter their full name (if necessary) and they can click on button called "join"
14	To test if students can view the page with one question and four possible answers	The page for the students must consist of one question and for answers for them to answer	Students can view the page with one question and for answers on the device
15	To test if students can select one answer from four answers	Make sure that the only one answer can be selected from multiple-choice answers	Student can select only one answer
16	To test if student can submit selected answer by clicking on the submit button	The submit button must be functional	Students can submit selected answer by clicking on the submit button
17	To test if student can see conformation page after they sent me their answer. Conformation page must have teachers full name, presentation title, copy of given answer.	Conformation page must display teacher's name, presentation title, and a text of the answer that they gave	Student can see conformation page that displays teachers full name, presentation title and their submitted answer
18	To test if student will see page refreshed to the new question if teacher change the question	The page must be refreshed automatically when teacher changing the question	the student can see automatically a new question as soon as teacher change the question

19	To test if student is able to view results of answers given by all the students on visual graph displayed on the board by the teacher	Board must display all the results submitted by all students	Students are able to see results of answers given by all the students in a visual graph displayed on the board by the teacher
20	To test if students can collaborate with each other by discussing they answer and change they point of view, following answering the same question and see visual graph displayed on the board by the teacher	Ask students to give different answers to discuss why they gave these answers, and ask the students the same question again to see if they done anything and have changed their point of view by giving different answer to the students	Students in the hands they learning by collaborating with each other and learning outcome changing they answer
21	To test if students are found feedback system helpful and fun to use	By using the feedback system asked student question if they found feedback system is helpful and fun to use	collect answers from students and take a screenshot of students' experience graph where they state whether or not they found feedback system helpful and fun
22	To test if students are found performance of the teacher to their satisfactory after letting teacher now they answer. Whether or not teacher enhanced his teaching methods to improve students learning	By using the feedback system asked student a question if they think that the teacher improved teaching. For example, by explaining topic again. And whether it's improved students' understanding	Collect answers from students and take a screenshot of students' experience visual graph
	Website tests		
23	To test whether there is a business logo implemented on each page	We look at each page of the system to check if there is a business logo present.	There will be a business logo implemented on each page.
24	To test whether the system has headings and subheadings	Visually check and identify the headings and subheadings to see if there is an organised layout.	There will be headings and subheadings present with an organised layout

25	To test whether the design layout is presentable, text and font	Visually identify whether the design has the correct structure, text and font are coordinated with each other	The presentation of the design must collaborate between each other
26	To test whether the hyperlinks on the text are in working order.	Click on each hyperlink to see if it refers to the required page.	The hyperlinks on the text and images are working.
27	To test if system can store information and display to the teacher using cmd	Make sure that all information is stored locally	This system can store information and display information to the teacher using cmd
28	To test whether the new system meet functional requirements and completed by 18th of March 2016	Be on schedule	The system will be completed by 18 <sup>th</sup> of March 2016
29	To test whether the online pages include information that in conjunction with ethical and legal, professional and social issues	To carefully check each requirement regarding, ethical, social, legal and professional issues	All the pages must comply with ethical, social, professional and legal policies
30	To test whether the colours on the website are black, white, green and red	Look upon the website and see whether these specific colours have been used.	The colours black and white are used for the text and background; green and red are used for collection or disconnection status

## 8.11 Critical Review of the Design

comprehensive analysis and design of the feedback system was performed. There is UML diagrams providing basic understanding was involved in the system, how the system work, design constrains, error validation and comprehensive design of the test plan. In designing additional consideration was giving to record student attendance in the real-time and for unlimited number of students to be connected and the one second. The design providing interactivity between teacher and student by both ways: anonymous and by identifying them themselves. In the design contents and graphics are appropriate to suit educational environment. Overall, the design is fit for purpose, which is to provide University with the design of the real-time feedback system that is

characterised by enhancing teacher-student communication as well as improving teachers' performance that can impact on student learning. The new feature was designed that is inexpensive to generate and implement, and do not require close proximity to be recognized as long as they can be identified by the mobile device. When the students' sees a QR code, they can scan the code if they have a free QR code reader app on their phone.

## **8.12 Conclusion**

Design fulfil main concepts of website design and applying creativity is an important factor for the designer and the developer when designing and developing interactive websites. Prior to any physical design there are number of steps that were taken is to identify function and analyse purpose for a website; consider any constraints, decision on the tools to be used and to check whether website needs to comply with a specific colour, layout or image; interactivity with issues of bandwidth and how it relates to data rate and the amount of the time it takes to download information from the Web; Methods of building interactivity into the Web pages using HTML, JavaScript, CSS. Although website designer considers the whole process from identification of need, design, implementation, testing, maintenance and review, it is important that you do not just develop skills in specific techniques but are also able to select when and where techniques are most appropriate, basing this decision on user needs. In the design Website comprehensive understanding of the relevant legislation and guidelines was used. Using Node.js non-blocking architecture provides high-performance by saving I/O cost, and memory usage, as well as it uses JavaScript language for both client and server.

# **9 DEVELOPMENT**

## **9.1 Introduction**

by using DSDM Atern agile methodology approach the development of the eight prototype took place. By incrementing on using iterative development at the end of each time box the new features, new ideas were refined. Development of the project followed specific timeframe that has a deadline and fully documented in comprehensive project Gantt chart in chapter 7.

## **9.2 Implementation**

```

Your environment has been set up for using Node.js 5.9.0 (x64) and npm.

C:\Users\Irina>cd ../..
C:\>cd git
C:\git>dir
 Volume in drive C has no label.
 Volume Serial Number is 3EF4-777D

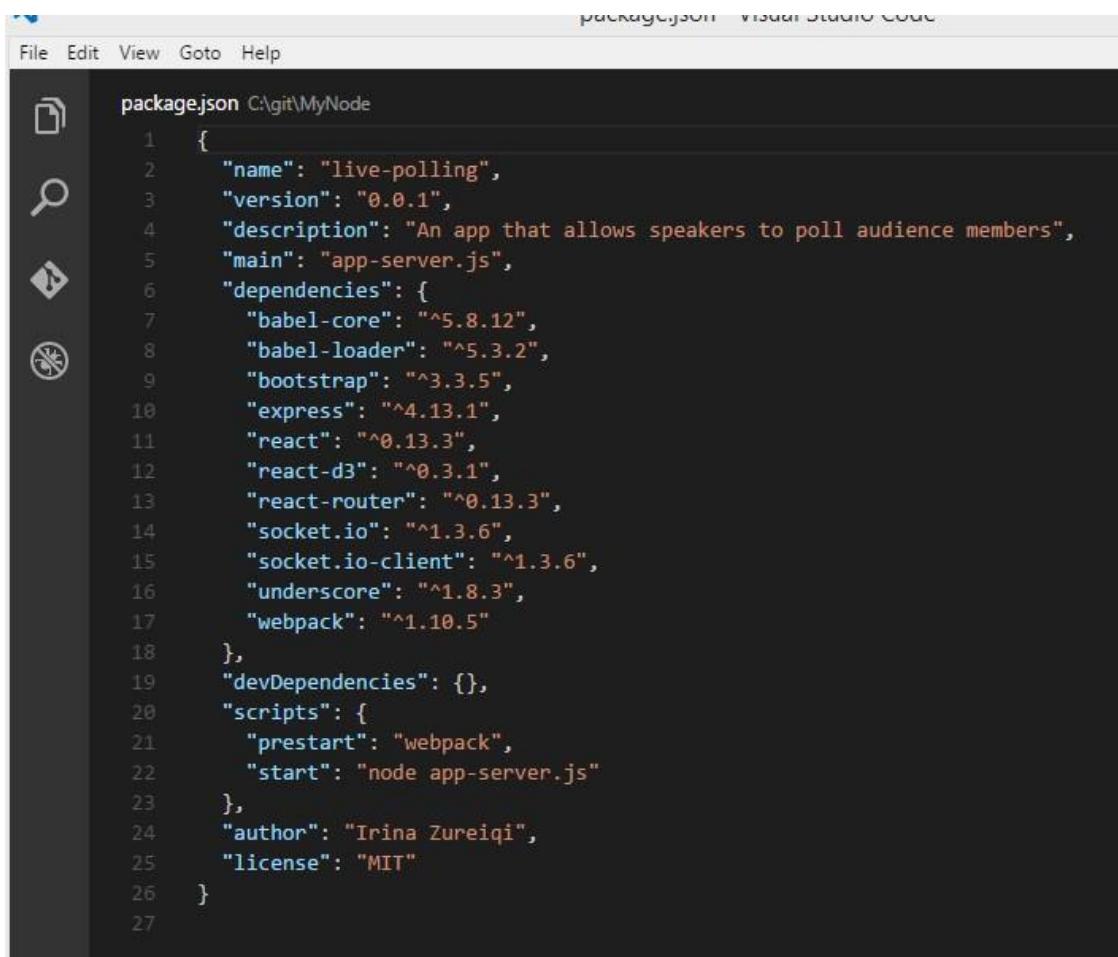
 Directory of C:\git

25/03/2016  20:23    <DIR>          .
25/03/2016  20:23    <DIR>          ..
              0 File(s)           0 bytes
              2 Dir(s)  799,445,782,528 bytes free

C:\git>mkdir MyNode
C:\git>cd MyNode
C:\git\MyNode>code package.json
C:\git\MyNode>

```

Visual Studio Code will open empty file ‘package.json’ that will be populated with information and dependencies as follow:



The screenshot shows the Visual Studio Code interface with the title bar "package.json - Visual Studio Code". The menu bar includes File, Edit, View, Goto, Help. The left sidebar has icons for file, search, and refresh. The main editor area displays the following JSON code:

```

{
  "name": "live-polling",
  "version": "0.0.1",
  "description": "An app that allows speakers to poll audience members",
  "main": "app-server.js",
  "dependencies": {
    "babel-core": "^5.8.12",
    "babel-loader": "^5.3.2",
    "bootstrap": "^3.3.5",
    "express": "^4.13.1",
    "react": "^0.13.3",
    "react-d3": "^0.3.1",
    "react-router": "^0.13.3",
    "socket.io": "^1.3.6",
    "socket.io-client": "^1.3.6",
    "underscore": "^1.8.3",
    "webpack": "^1.10.5"
  },
  "devDependencies": {},
  "scripts": {
    "prestart": "webpack",
    "start": "node app-server.js"
  },
  "author": "Irina Zureiqi",
  "license": "MIT"
}

```

In the command prompt make sure all the dependency are installed by using the following command:

```
C:\git\MyNode>npm install
live-polling@0.0.1 C:\git\MyNode
`-- git@0.1.5 extraneous
npm WARN live-polling@0.0.1 No repository field.

C:\git\MyNode>_
```

All dependencies are installed now.

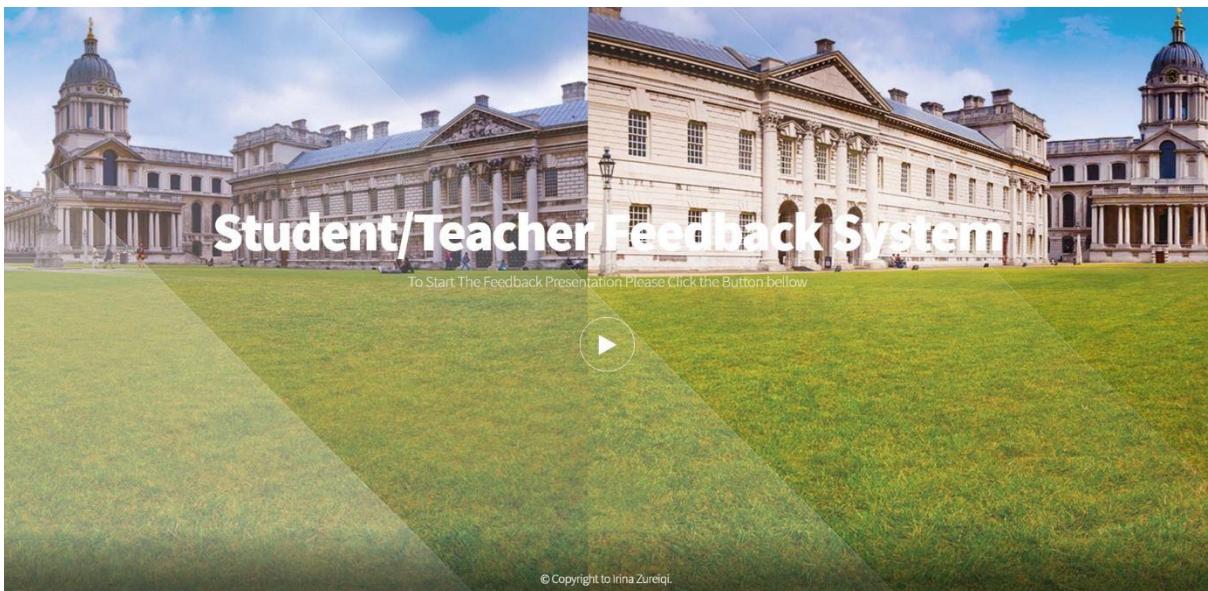
Create app.

Create index.html.

To run application run the following command and click enter. Result is server is running

```
C:\git\MyNode>node app-server.js
Polling server is running at 'http://localhost:3000'
```

Open Browser and type <http://localhost:3000/>. Result is below



This concludes app-server.js function.

### To add my application to GitHub.com

Error: git command is not recognised in the command prompt. Resolution is ...

1. Go to **My Computer => Local Disk (C:) => Program Files(x86) => Git => cmd**
2. Right Click the **git => Select Properties**
3. Under the **location** Copy the text e.g. - C:\Program Files\Git\cmd
4. Come back to the Desktop
5. Right-click **My Computer**
6. Select **property**
7. Open **Advanced**
8. Click **Environment Variables**
9. In the System Variables Find the Variable Call **Path**
10. Click the **variable**
11. Click the **Edit Button**

12. Select the **Variable value** Text Box.
13. Go to the edge of the text and put **semicolon (;**)
14. Then Right-click and press Paste
15. Press Ok

Use command prompt again.

```
npm WARN live-polling@0.0.1 No repository field.

C:\git\MyNode>git init
Initialized empty Git repository in C:/git/MyNode/.git/
C:\git\MyNode>
```

Followed by

```
C:\git\MyNode>git status
On branch master

Initial commit

Untracked files:
  (use "git add <file>..." to include in what will be committed)

    README.md
    app-client.js
    app-questions.js
    app-server.js
    components/
    node_modules/
    package.json
    public/
    webpack.config.js

nothing added to commit but untracked files present (use "git add" to track)
C:\git\MyNode>_
```

Use the following command: ‘git add.’ ‘Click Enter.

```
warning: LF will be replaced by CRLF in public/assets/js/ie/html5shiv.js.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in public/assets/js/ie/respond.min.js.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in public/assets/sass/ie8.scss.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in public/assets/sass/ie9.scss.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in public/assets/sass/main.scss.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in public/bundle.js.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in public/index2.html.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in public/style.css.
The file will have its original line endings in your working directory.
warning: LF will be replaced by CRLF in webpack.config.js.
The file will have its original line endings in your working directory.
C:\git\MyNode>_
```

>git commit -m “Initial Commit”

```

create mode 100644 public/assets/css/images/ie/footer.png
create mode 100644 public/assets/css/images/ie/footer.svg
create mode 100644 public/assets/css/images/overlay-pattern.png
create mode 100644 public/assets/css/images/overlay.svg
create mode 100644 public/assets/css/images/qr.jpg
create mode 100644 public/assets/css/main.css
create mode 100644 public/assets/fonts/FontAwesome.otf
create mode 100644 public/assets/fonts/fontawesome-webfont.eot
create mode 100644 public/assets/fonts/fontawesome-webfont.svg
create mode 100644 public/assets/fonts/fontawesome-webfont.ttf
create mode 100644 public/assets/fonts/fontawesome-webfont.woff
create mode 100644 public/assets/fonts/fontawesome-webfont.woff2
create mode 100644 public/assets/js/ie/PIE.htc
create mode 100644 public/assets/js/ie/html5shiv.js
create mode 100644 public/assets/js/ie/respond.min.js
create mode 100644 public/assets/sass/ie8.scss
create mode 100644 public/assets/sass/ie9.scss
create mode 100644 public/assets/sass/libs/_functions.scss
create mode 100644 public/assets/sass/libs/_mixins.scss
create mode 100644 public/assets/sass/libs/_skel.scss
create mode 100644 public/assets/sass/libs/_vars.scss
create mode 100644 public/assets/sass/main.scss
create mode 100644 public/bundle.js
create mode 100644 public/index.html
create mode 100644 public/index2.html
create mode 100644 public/style.css
create mode 100644 webpack.config.js

```

C:\git\MyNode>\_

To add my application to Azure from GitHub.com to get continuous integration by push it to GitHub

Login and create new repository called ‘MyNode’, public.

Copy created URL <https://github.com/Discostar/MyNode.git> to command.

```

C:\git\MyNode>
C:\git\MyNode>git remote add https://github.com/Discostar/MyNode.git
usage: git remote add [<options>] <name> <url>

-f, --fetch           fetch the remote branches
--tags                import all tags and associated objects when fetching
                      or do not fetch any tag at all (<--no-tags>)
-t, --track <branch> branch(es) to track
-m, --master <branch> master branch
--mirror[=<push|fetch>]
                      set up remote as a mirror to push to or fetch from

C:\git\MyNode>git remote add origin https://github.com/Discostar/MyNode.git
C:\git\MyNode>

```

Now local repository knows where remote repository origin on the GitHub is. Pull

master error

```

C:\git\MyNode>git pull origin master
fatal: Couldn't find remote ref master
C:\git\MyNode>_

```

Try Git push

```

C:\git\MyNode>git push origin master
Counting objects: 5883, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (5284/5284), done.
Writing objects: 100% (5883/5883), 9.44 MiB / 187.00 KiB/s, done.
Total 5883 (delta 748), reused 0 (delta 0)
To https://github.com/Discostar/MyNode.git
 * [new branch]      master -> master

```

Refresh GitHub Repository and see files are updated.

File	Type	Description	Last Commit
components	Initial Commit		25 minutes ago
node_modules	Initial Commit		25 minutes ago
public	Initial Commit		25 minutes ago
README.md	Initial Commit		25 minutes ago
app-client.js	Initial Commit		25 minutes ago
app-questions.js	Initial Commit		25 minutes ago
app-server.js	Initial Commit		25 minutes ago
package.json	Initial Commit		25 minutes ago
webpack.config.js	Initial Commit		25 minutes ago

## 9.3 System implementation

When running <http://localhost:3000/#/>

Presentation Screen to join the session by asking full name

Speaker's page

In the text box that provided in the above picture enter your name. And click join.

The following screen will be displayed.

Insert picture 2 that says welcome Keeran Jamil here.

# Untitled Presentation



## Welcome Keeran Jamil

1 audience members connected

Questions will appear here.

On the screen above there's nowhere to go nothing to press

I will run application again by restarting the application

When I stopped application in visual studio 2012 by clicking on stop debugging the following screen displays Notifying lecturer that application is disconnected by ensuring you the red icon.

Functional requirement

Shall allow use of usually to see whether the product active or not active in other words connected or disconnected.

Their product shall have a visual icon indicating status of the system

disconnected



If I click on start representation

# Untitled Presentation

Start the presentation

**Full Name**

enter your full name...

**Presentation Title**

enter a title for this Presentation...

Join

Enter name and presentation title, click Join

# Untitled Presentation

Start the presentation

**Full Name**

Irina Zureiqi

**Presentation Title**

My Presentation

Join

The following screen displayed

# My Presentation

Irina Zureiqi

## Questions

How much of your true potential are you using?

How much money would you like to make?

How much money would you like to put down?

Who do you want to be your boss?

## Attendance - 0

Audience Member

Socket ID

Lecture choose a question from the list (question is highlighted when hover)

# My Presentation

Irina Zureiqi

## Questions

How much of your true potential are you using?

How much money would you like to make?

How much money would you like to put down?

Who do you want to be your boss?

## Attendance - 0

Audience Member

Socket ID

Above When I click on the question nothing happened. But if I click ‘back’ the following displayed Answers to question 1 desktop format

# My Presentation

Irina Zureiqi

How much of your true potential are you using?

a: none of my true potential

b: some of my true potential

c: most of my true potential

d: all of my true potential

Answers to question 1 desktop format.

Responsive web design.

# My Presentation

Irina Zureiqi

How much of your true potential are you using?

a: none of my true potential

b: some of my true potential

c: most of my true potential

d: all of my true potential

Select d: all of my true potential by clicking on it.

The following screen displayed

# My Presentation

Irina Zureiqi

You answered: d

all of my true potential

<http://localhost:3000/#/speaker>

Select question 2

# My Presentation

Irina Zureiqi

## Questions

How much of your true potential are you using?

How much money would you like to make?

How much money would you like to put down?

Who do you want to be your boss?

## Attendance - 0

Audience Member

Socket ID

this button does not work

Press back

The answers will be displayed

# My Presentation

Irina Zureiqi

How much money would you like to make?

a: no money

b: some money

c: most of the money

d: all of the money

Select b: by clicking on it

# My Presentation

Irina Zureiqi

You answered: b

some money

Question3

# My Presentation

Irina Zureiqi



## Questions

How much of your true potential are you using?

How much money would you like to make?

How much money would you like to put down?

Who do you want to be your boss?

## Attendance - 0

Audience Member

Socket ID

Answers for question 3

# My Presentation

Irina Zureiqi

How much money would you like to put down?

a: more money than I have

b: all of my money

c: some of my money

d: no money at all

Selected a:

# My Presentation

Irina Zureiqi

You answered: a

more money than I have

Question 4

# My Presentation

Irina Zureiqi

## Questions

How much of your true potential are you using?

How much money would you like to make?

How much money would you like to put down?

Who do you want to be your boss?

## Attendance - 0

Audience Member

Socket ID

Answers desktop to question 4

## My Presentation

Irina Zureiqi

Who do you want to be your boss?

a: someone bossy

b: someone who knows what they are doing

c: I'm my own boss

d: no boss at all

Answers question 4 I Pad Responsive design

# My Presentation

Irina Zureiqi



Who do you want to be your boss?

a: someone bossy

b: someone who knows what they are doing

c: I'm my own boss

d: no boss at all

Select answer C:

# My Presentation

Irina Zureiqi

You answered: c

I'm my own boss

If page cannot be found it, for example <http://localhost:3000/#/answers> the following screen displays

# My Presentation

Irina Zureiqi

## Whoops...

We cannot find the page that you have requested. Were you looking for one of these:

- [Join as Audience](#)
- [Start the presentation](#)
- [View the board](#)

There are 3 options: <http://localhost:3000/> - / Join as Audience

[http://localhost:3000/ - /speaker](http://localhost:3000/-/speaker) Start Presentation

[http://localhost:3000/ - /board](http://localhost:3000/-/board) View the board

[http://localhost:3000/ - /](http://localhost:3000/-/) Join as Audience

# My Presentation

Irina Zureiqi

## Join the session

**Full Name**

enter your full name...

**Join**

[Start the presentation](#)   [Go to the board](#)

[Start Presentation](http://localhost:3000/-/speaker)

# My Presentation

Irina Zureiqi

## Questions

How much of your true potential are you using?

How much money would you like to make?

How much money would you like to put down?

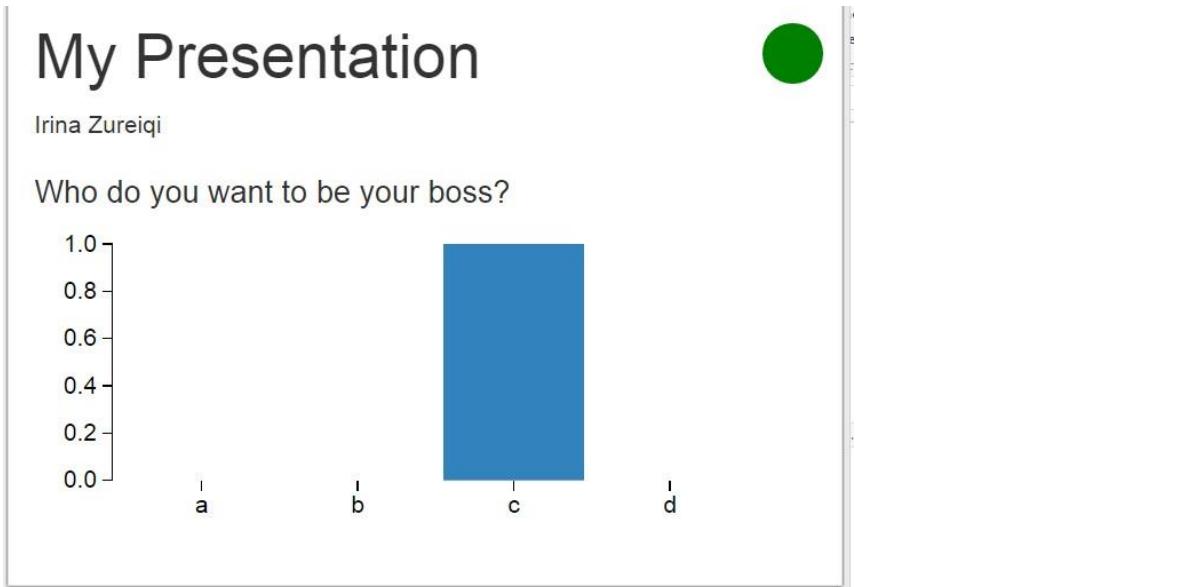
Who do you want to be your boss?

## Attendance - 0

Audience Member

Socket ID

<http://localhost:3000/-/board> View the board



Viewing functionality of the implemented system

### Questions session

Teacher Student Feedback System

Who do you want to be your boss?

a      b      c      d

Teacher Student Feedback System

Who do you want to be your boss?

a: someone bossy      b: someone who knows what they are doing  
c: I'm my own boss      d: no boss at all

Teacher Student Feedback System

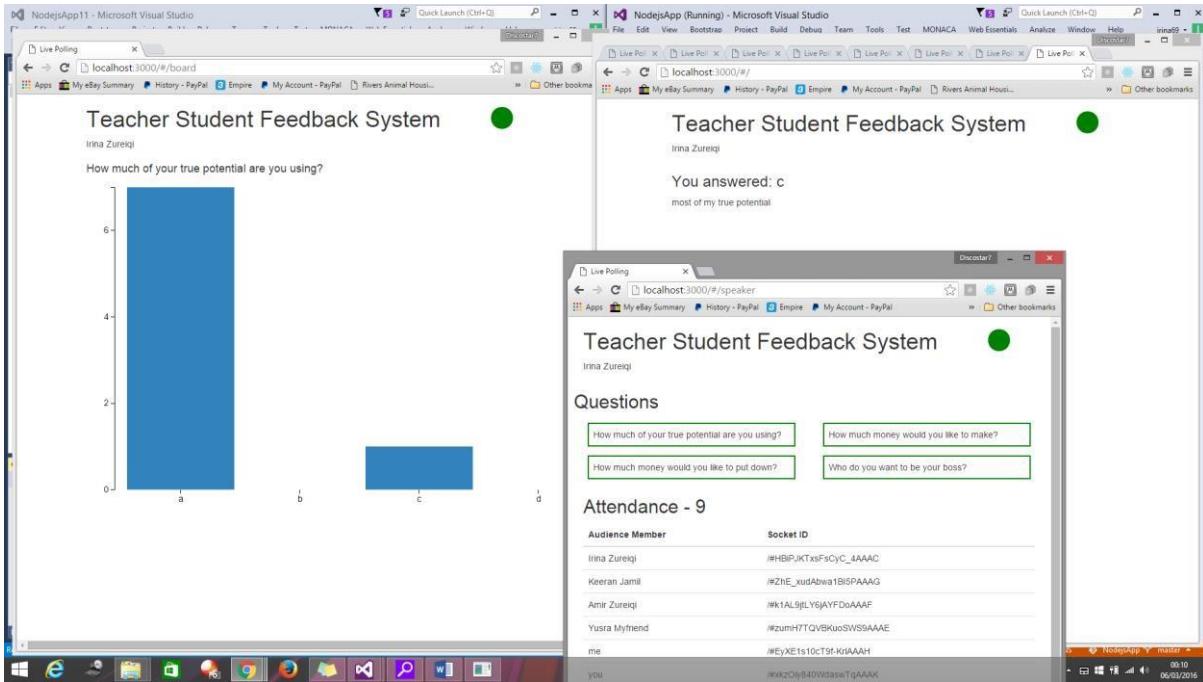
Questions

How much of your true potential are you using?      How much money would you like to make?  
How much money would you like to put down?      Who do you want to be your boss?

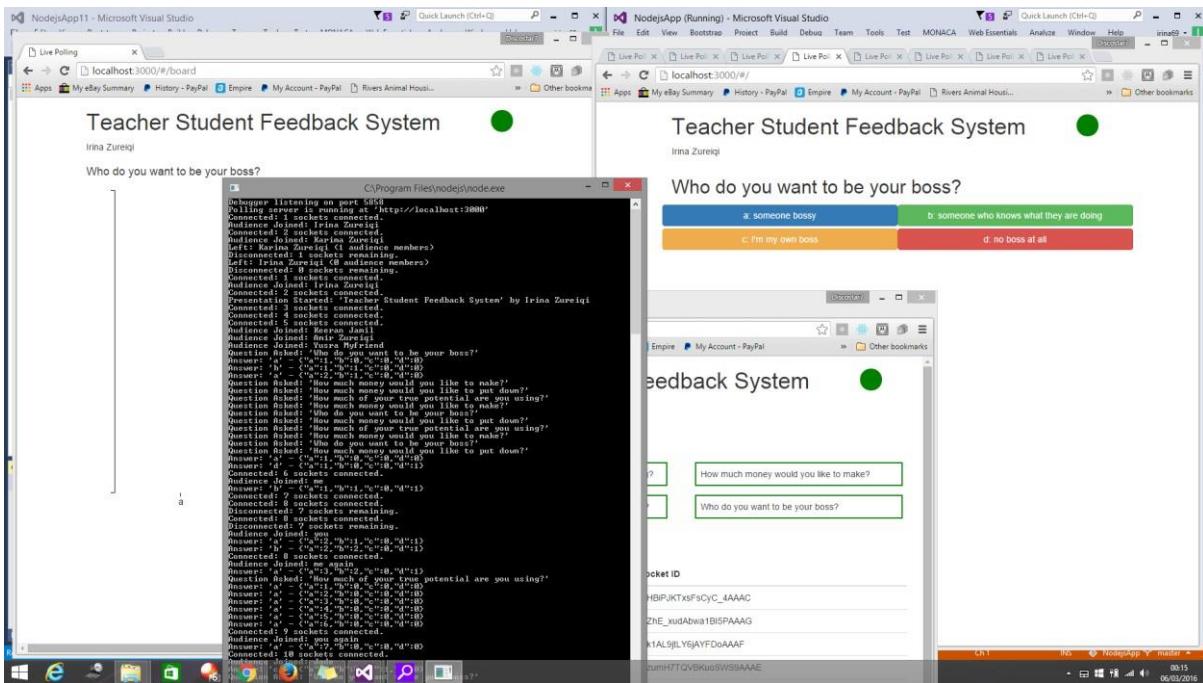
Attendance - 9

Audience Member	Socket ID
Irina Zureiqi	/iHBiPjKTxsFscYc_4AAC
Keeran Jamil	/iZHE_xudAbwai1Bi5PAAAG
Amir Zureiqi	/iK1AL9LjYgAYFD0AAAF

Results of NodejsApp



View command prompt



### 9.3.1 Review of the technologies used in the implementation

About what technology have I used to develop my system prototype of the teacher-student communication in real-time.

Node.js is used to develop an application that make heavily use of their ability to run JavaScript both on the client as well on the server side and therefore benefit from a reusability

of code and the lack of context switching. Node is being packaged compilation of Google V8 Java script Engine. I have for you is not because Node is aiming to create real time website and push capability. It's a tool for working in the non-blocking, event driven I/O model. Node allowed me to create web application with real time, two-way connection. Basically in one sentence node is real time web application employing push if knowledge is over web sockets. This allowed to exchange data freely between client and on the server. Node is a platform that feels a particular need. The benefits of using node in my web application is that it's really good when there is a need of a building fast, scalable network application because it's capable of handling a huge number of simultaneous connections with high throughput, which equates to high scalability. Note handles event base call back on single thread. I have used express web development framework for Node.js. Socket I/O is a server side component.

Node.js operates under basic principles: reacting to events, handling many concurrent connections and maintaining fluidity in the user experience.

I will check out Mongo DB, use uniform data serialisation format across the client, Server and database.

### 9.3.2 Issues

The problems I had while developing my project is given a logical fallacy technical. Clash on computer low memory storage complicated combination of technologies versions of the software used is not compatible with other versions on other computers. The other problems arise from knowledge and limitation of resources as well as the cost of the software that is required for implementation of student teacher feedback system.

Another technical issue that I come across while installation stage is that the path to long warnings keep coming up while installing npm web pack, express, bootstrap or babel-loader or react tool. My numerous attempts to resolve this warning issue was not successful in many occasions.

Another issue technical problem in implementation stage is that I cannot update NPM packages because the project folder contains one or more path that exceeded 260-character limit and visual studio does not fully support such projects. This is run in the issues building and publishing my project as well as interference with other visual studio and node.js tools features. I have tried to resolve this issue but I'm in 'npm dedupe' on their project but it was unsuccessful. There is nothing I could have done more. On my expressApp1 project file json is not listed in package.json which is not able me to use my development successfully. To add to my implementation issues there is a big problem even after watching of 1/2 hours'

video about how to resolve this issue. Note the modules are basically in each submodule therefore there is a lot of them and it's making create part much longer than 260 characters.

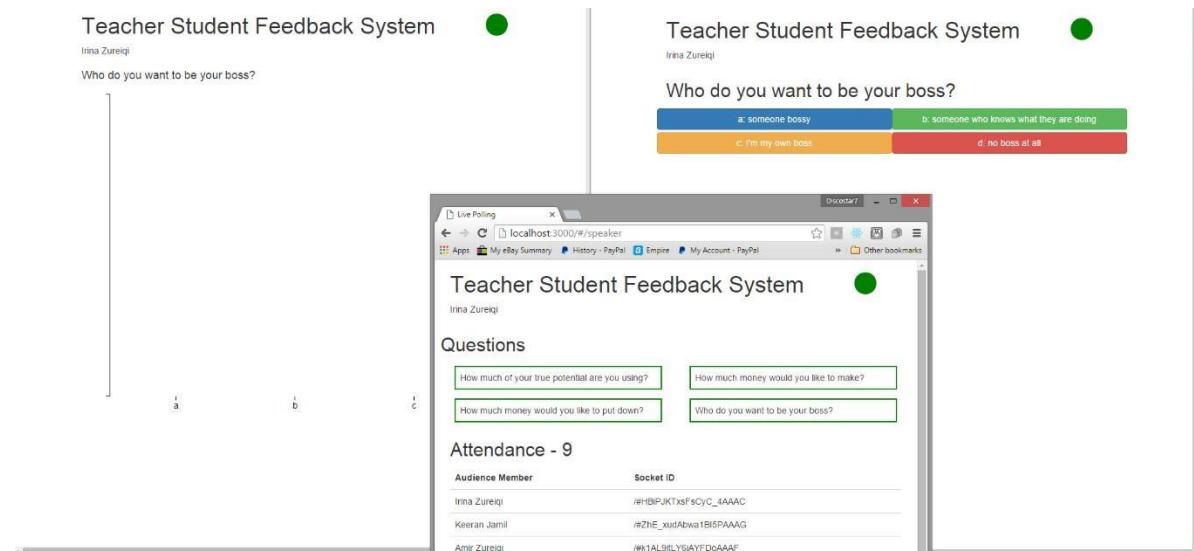
## Project Migration

Localhost problems

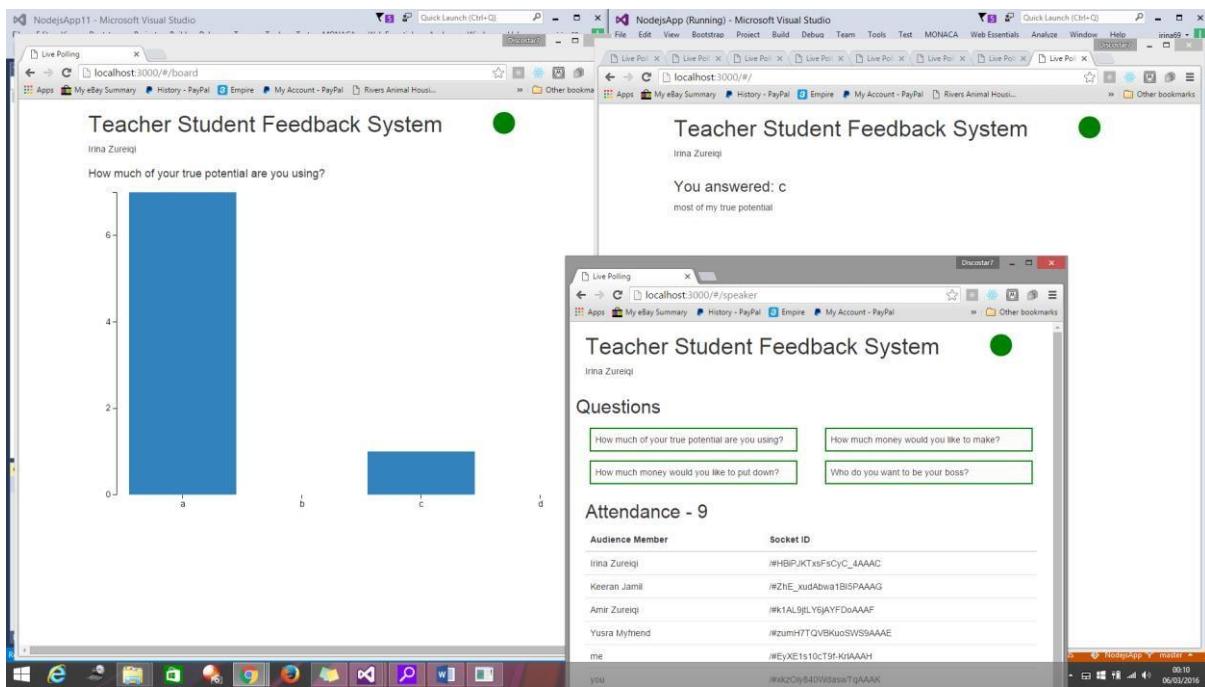
Deploying Problems

## 9.1 Development results

teacher student feedback system represents main page for the teacher, board view of collected results and a student page.



Results of NodejsApp



## 10 PUBLISHING

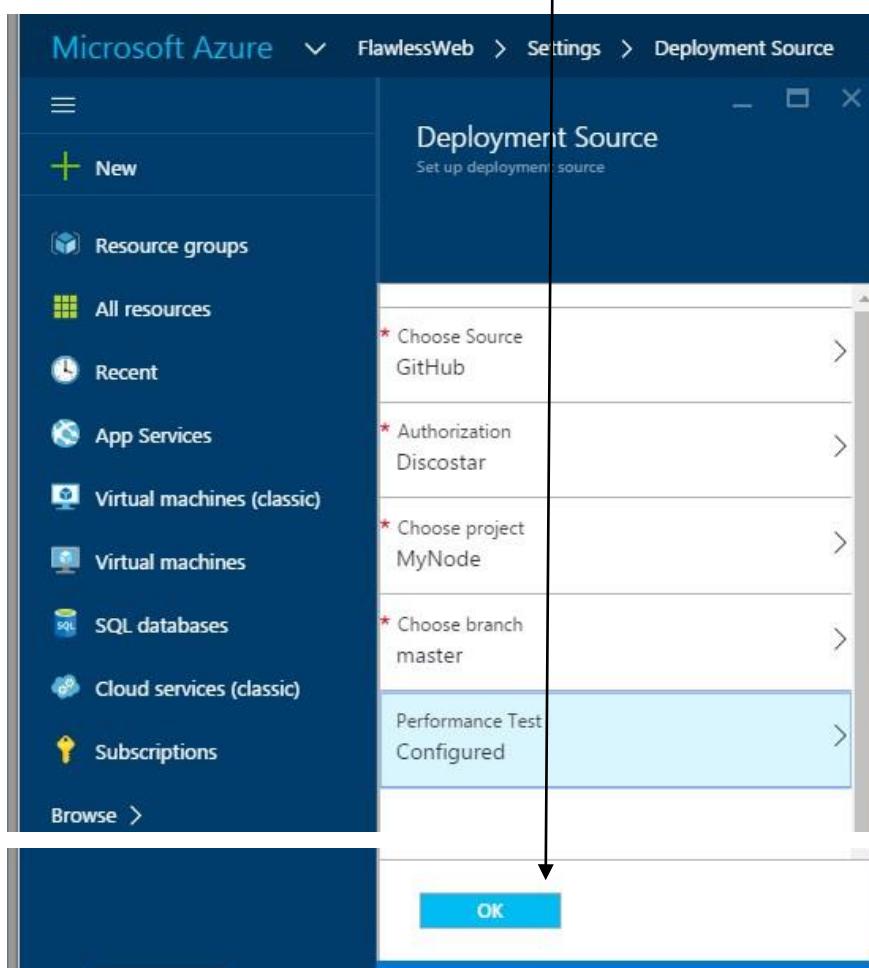
### 10.1 Publish to Azure

Open <https://portal.azure.com/>

Sign in by Microsoft Account

Create URL <https://flawlessweb.azurewebsites.net> And

set to sync the files from GitHub. Click Ok.

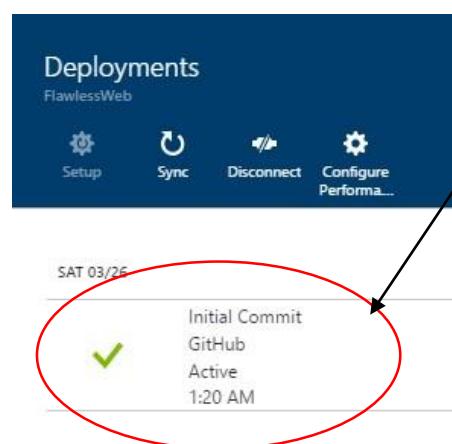


Files are transferred to  
Azure.

Files will now be being downloading



When its finish downloading it has been published.



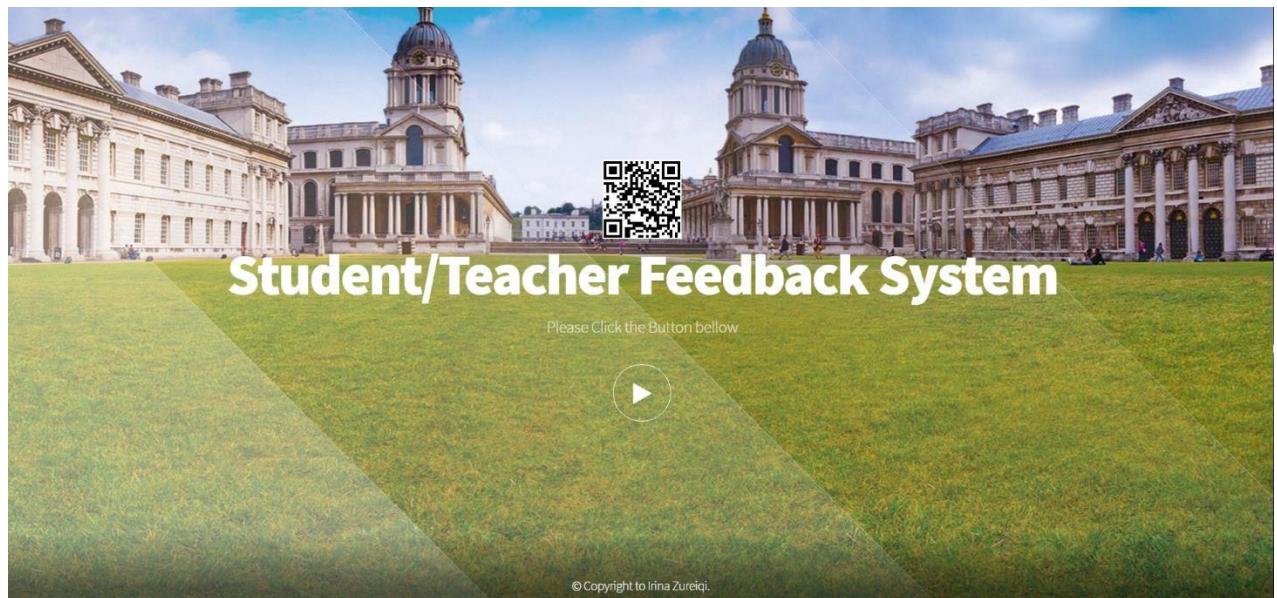
In command prompt

```
C:\git\MyNode>npm start
```

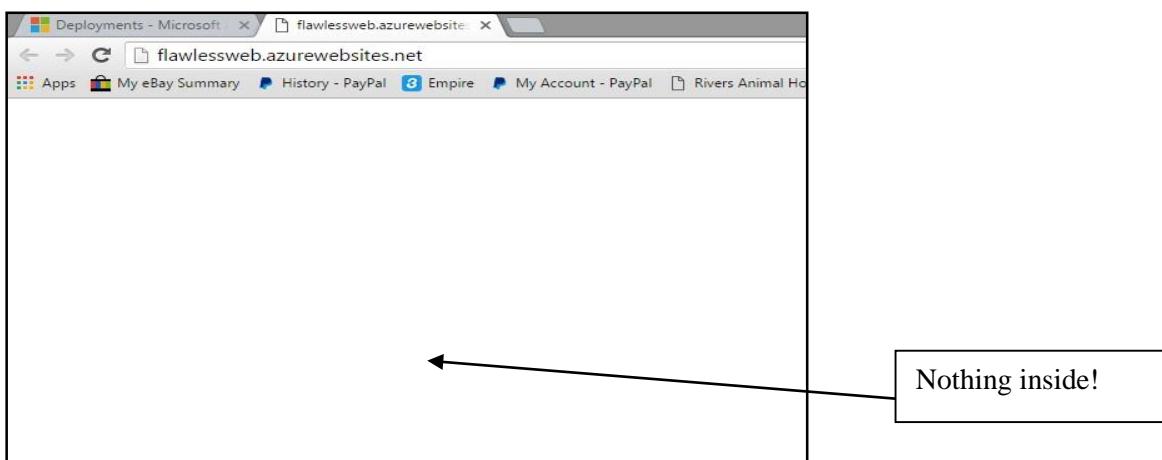
Or

Click on <http://flawlessweb.azurewebsites.net>

And view completed site



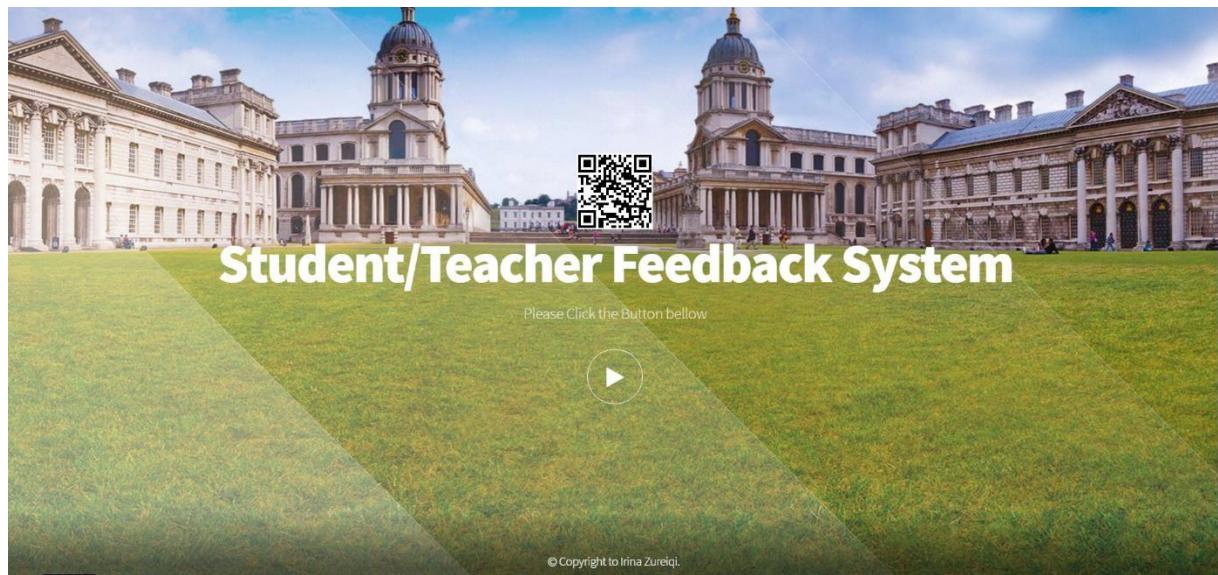
### Publishing issues



### Contact Azure Support Line

Azure customer support line resolves the webconfig file that needed some changes. And view completed site again

Pic here



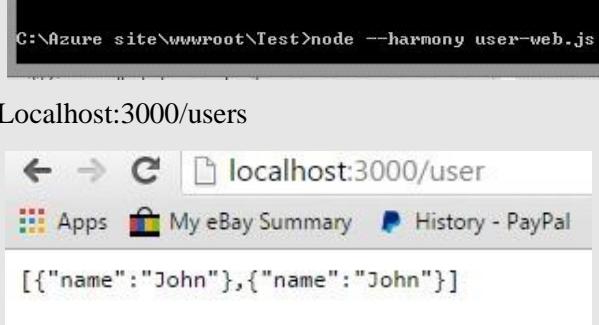
# 11 TESTING

## 11.1 Introduction

To test and document Real time web application solutions I design a test plan to ensure the correct operation of Teacher student real time feedback web application. I carried out test plan taking care to document the results of testing.

## 11.2 White box testing

Requirement Number	Requirement	Expected Result	Actual Result	Pass / Fail
WB-1	Start the sever to serve web files	Pooling server is running at http://localhost: 3000	Servers running  DEBUG CONSOLE node --debug-brk=6001 --nolazy app-server.js Debugger listening on port 6001 Polling server is running at 'http://localhost:3000'	Pass
WB-2	To check that there is always plus one (+1) from the previous count of users, after saving the new user;  testing data layer	New user can be argued and saved by using a rule +1.  Techniques write test first by get a new account, save new user and get new user account components	Creating test outcome  C:\Azure site\wwwroot\Test>mocha  user data ✓ should have +1 user count after saving user web ✓ should have +1 user count after saving (47ms) 2 passing (62ms)	Pass
WB-3	Test user web API;  testing Web layer	Co-Supertest is used to test user web; getting user account from web using the rule +1.  Expectation of certain result which	Co-Supertest outcome  C:\Azure site\wwwroot\Test>mocha  user data ✓ should have +1 user count after saving user web ✓ should have +1 user count after saving (47ms) 2 passing (62ms)	Pass

		is (200) responds other ways to fail		
WB-4	Test the application receiving users:  human testing.	Open local host:3000 and see an array of users names	Type command Council is working as possible as you are on CMD Azure web app folder  	Pass

By creating white box testing I have a good understanding of creating test driven development with Node.js By creating steps of tests to identify user data workflow the above tests were performed.

Care was taken to document the results of testing based on the test plan design to ensure the correct operation of real time web application. Including the following components in my program testing: input testing, load testing, communication testing (between server and client) and handling of errors. As shown on the table above, actual results of the testing in match expected results based on the requirements. Moreover, prototype of this real-time web based application between teacher student communications all components are working together as a single system.

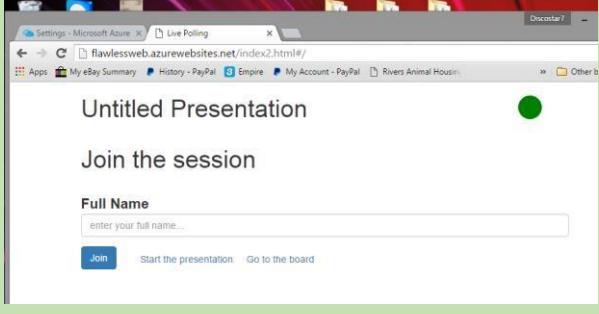
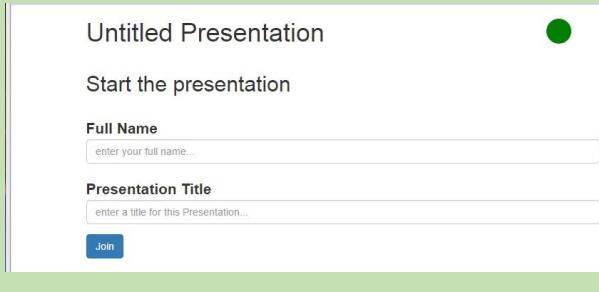
### 11.3 Black Box Testing

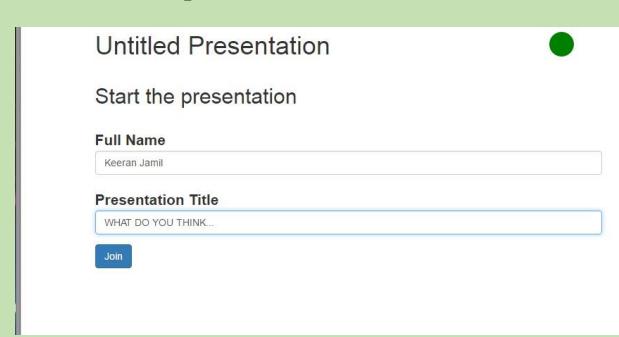
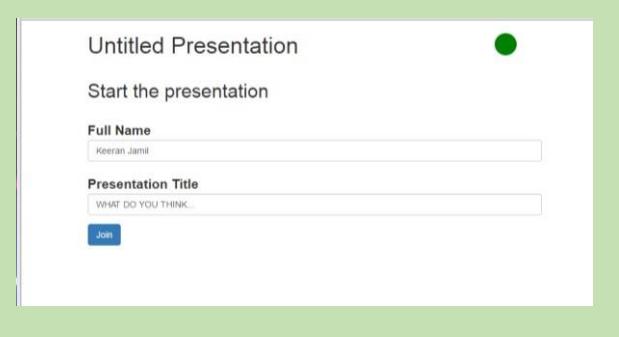
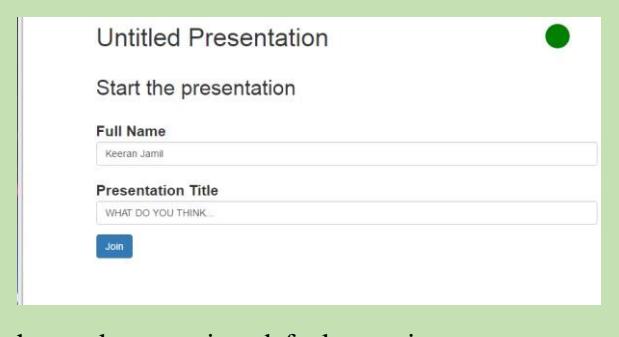
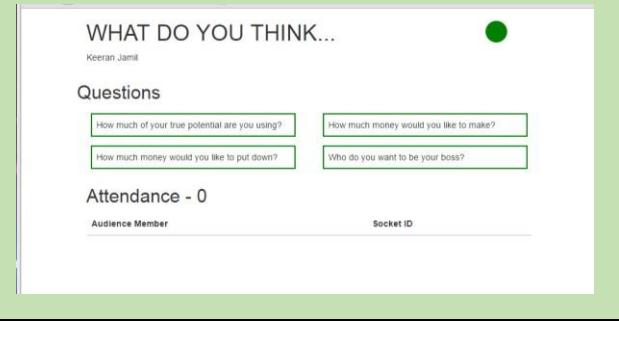
Black box testing is to check usability of clear outputs for each inputs looking at functional effects and critical usability issues. To check what each button and does against its functionality as well as thinking over all of the design of the system and placements of each buttons and text boxes. These testing achieved business goals and the product as it's been delivered.

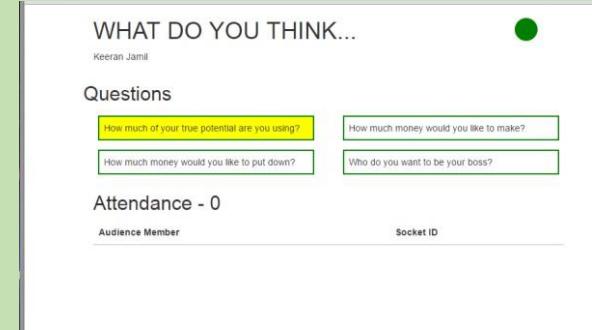
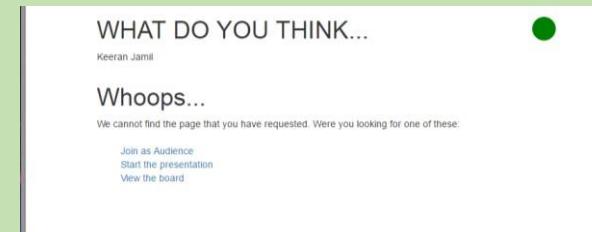
No	Requirement	Expected Result	Actual Result	Pass / Fail
	System shall provide webpages - home page of the application	The user able to view website by using web browser		Pass

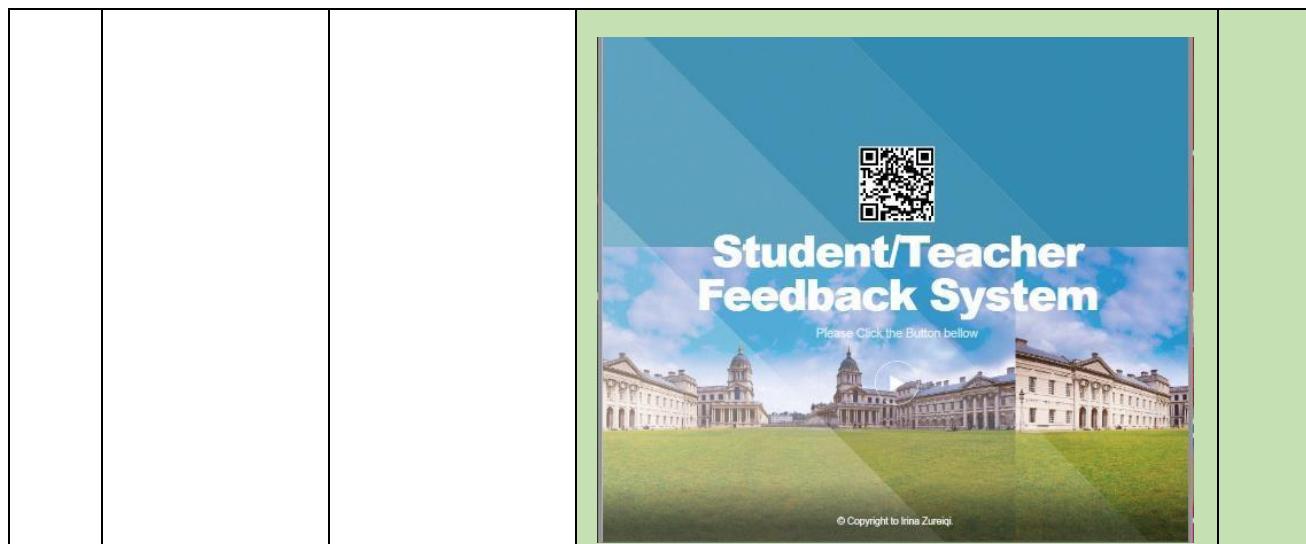
	by going to 'http: //localhost:3000 page 'index.html'			
	System shall provide a second page called index2.html with contents for teacher to start presentation	Client is able to click on the arrow button on the home page to enter next page 'index2.html'		Pass
	To test if the system accessible by using the Internet	All pages will successfully open in all browsers on different devices and will be graphical user interface will be responsive	Test performed by using Google Chrome  Test performed by using Internet Explorer  Test performed by using Firefox Test performed by using Mozilla test performed by using Opera	Pass
	Teacher/ Presenter			
	To test that tester -user can access the system and use all functionalities	Client feel out feedback form specifying whether or not he can access the system and all the features	Feedback form supplied by the tester user explaining in detail what features available and what features needs improvement. Based on this form (see attached Appendix) This test passed	Pass

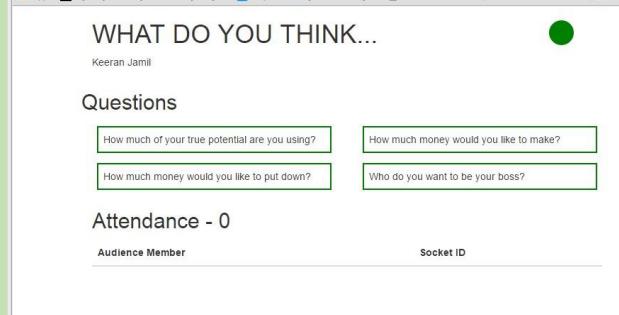
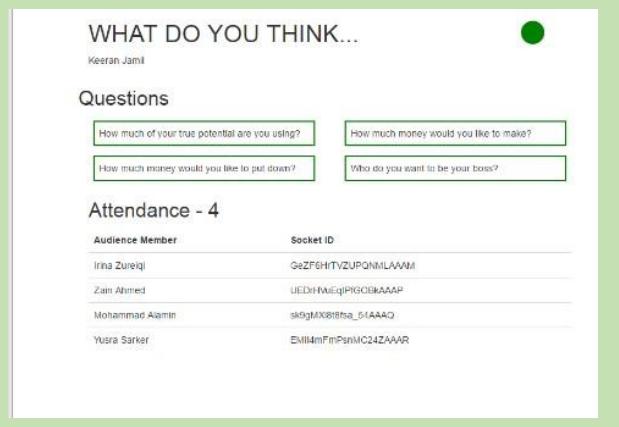
	To Test if teacher / student can view connection status	If teacher or student are not connected screen display red icon;  If teacher or student are connected screen display green icon;	<b>Disconnected</b>  disconnected   <b>Connected</b>  WHAT DO YOU THINK...  Keeran Jamil	Pass
--	---	--	---	------

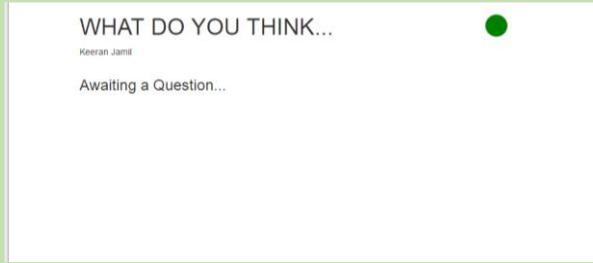
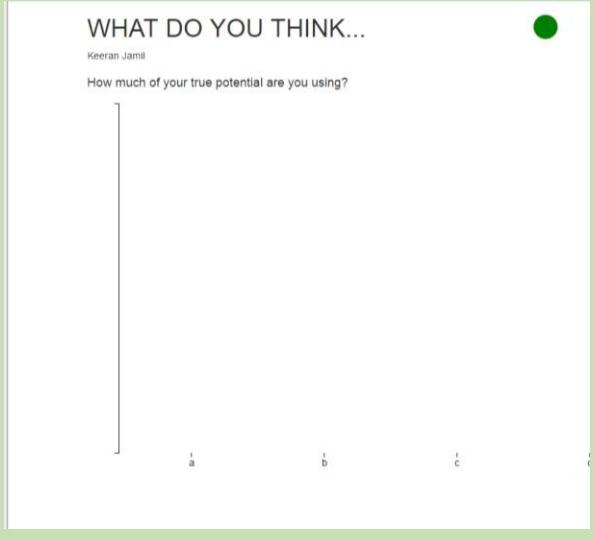
	To test if the teacher can start presentation by clicking on the link “start presentation”	The link is working correctly and teacher directed to the next page of questions to select	<b>Click on start the presentation link</b>    <b>the lecturer navigated to new page</b>  	Pass
--	--	--	---	------

	To test if the teacher can enter the name and presentation title	The text of their teacher's full name and presentation title are entered successfully by submitting clicking on "join" button	<p>Full name and presentation titled are entered</p>  <p>Click on "join" button</p> 	Pass
	The test if the teacher can view default four questions	By clicking on "join" button The teacher can view four default questions	Click on "join" button	Pass
			 <p>the teacher can view default questions</p> 	

	To test if the teacher can select one question in order to show to the students	Teacher can click on the question and view this question and four answers that belong to this question	<p>Teacher selects one question</p>  <p>This question will appear on student's devices that logged in as student</p> 	Pass
	The teacher can display QR Code to the students by using a board	The teacher can display QR Code to the students by using a board	The teacher displays QR Code to the student using the board	Fail

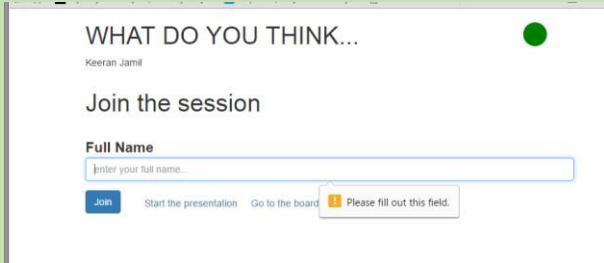
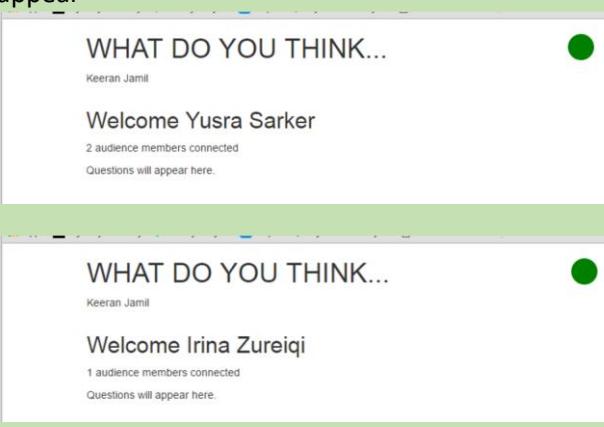


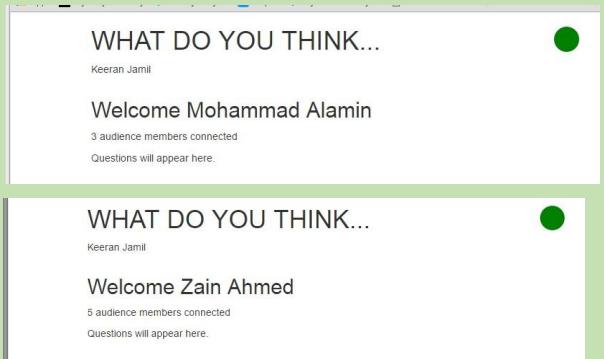
	The teacher can enlarge QR record for students to be able to scan from a far distance	The teacher be able to enlarge QR Code to fullscreen on the board for students to be able to scan this scored from a far distance	<p>The teacher can enlarge QR Code to a full-screen</p> 	Fail
	To test if the teacher can see students' full names and socket ID that will enable teacher to monitor student attendance	Teacher can see students name unless this presentation is anonymous, teacher can be you students socket ID and the total number of students participating in the feedback system	<p>On speaker's page teacher can view area for student attendance and a number of attendees</p>  <p>On speaker's page teacher can see students' names and socket ID as well as attendance number.</p>	Pass
				

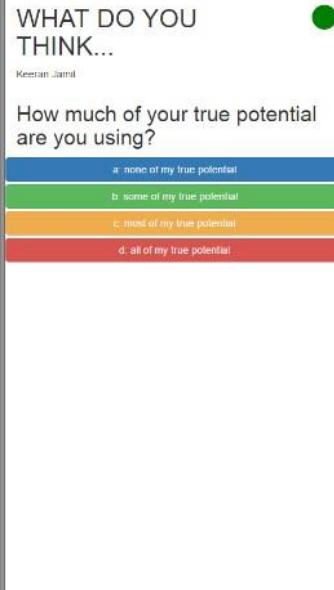
	To test if the teacher can open the board	Teacher can click on the link to the board	<p>Board opens and waiting for student's input</p> 	Pass
	To test if the teacher can view question and answers, the same page that students will see	teacher can view question and answers, the same page that students will see	<p>teacher can view question and answers</p> 	Pass
	To test if teacher can view the visual board	Teacher can view the board	Teacher can view the board	Pass
			<p>WHAT DO YOU THINK...</p> <p>Keeran Jamil</p> <p>How much of your true potential are you using?</p> 	

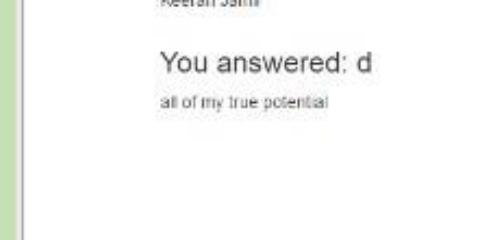
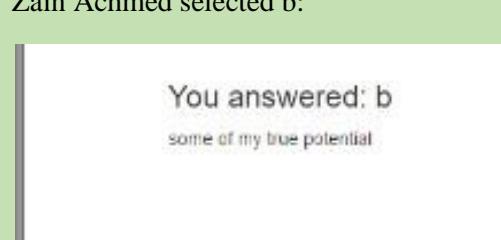
	To test if teacher can view student answers displayed on the visual board	Teacher can view all students answers that are displayed on visual board	<p>Teacher can view all students answers that are displayed on visual board</p> <table border="1"> <thead> <tr> <th>Response</th> <th>Approximate Value</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>1.8</td> </tr> <tr> <td>b</td> <td>0.8</td> </tr> <tr> <td>c</td> <td>0.6</td> </tr> <tr> <td>d</td> <td>0.7</td> </tr> </tbody> </table>	Response	Approximate Value	a	1.8	b	0.8	c	0.6	d	0.7	Pass
Response	Approximate Value													
a	1.8													
b	0.8													
c	0.6													
d	0.7													
	To test if teacher learned student outcomes and changed his teaching performance to improve student learning	Teachers can understand students wants and needs and based on this information improve pedagogy	<p>By seeing results, the teacher knows that most of the students answer a: none of my potential. Teacher can explain the importance of working hard to achieve learning outcomes. This can have positive effect on the student performance in the same time its enhanced teacher's development.</p>	Pass										
	<b>Student</b>													
	To test if students can use any device to access the system by scanning QR code	Desktop, laptop, iPad, iPhone, blackberry phone, and other devices can scan QR Code by using QR Code Reader and instantly see	IPad and iPhone and iPhone 6 Plus was used to test	Pass										

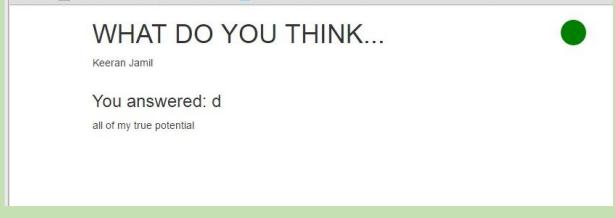
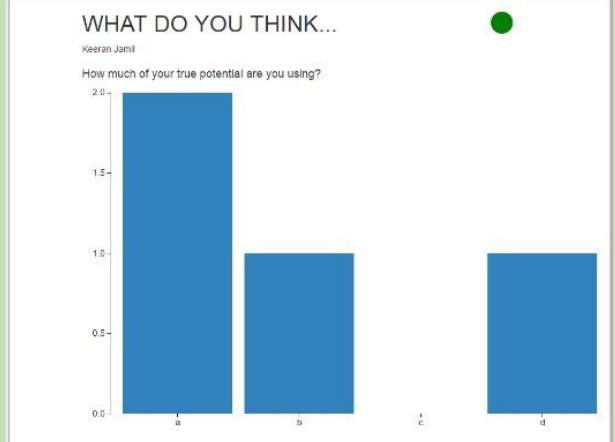
	the web page on the device			
	To test if students can use desktop or laptop and access the system using the URL	Students can use any device that has a browser to access URL of the feedback system	<p>Test performed by using Google Chrome Test performed by using Internet Explorer Test performed by using Firefox Test performed by using Mozilla test performed by using Opera</p>	Pass

	To test if student can see the page with teacher's name, presentation title, textbook to enter their full name (and if needed). Check if student can see, but can called "join"	Students can see on the devices teacher's information, presentation title, text box to enter their full name (if necessary) and they can click on button called "join";  Student login	<p>Student can view the information</p>  <p><b>Click on "Join"</b></p> 	Pass
	To test if students can see the questions page before teacher ask the question.	Student's question page reassure student that "Questions will appear here"	<p>After student log in the following conformation will appear</p> 	Pass

				
--	--	--	--	--

	To test if students can view the page with one question and four possible answers	Students can view the page with one question and for answers on the device	<p>Students can view the page with one question and for answers on the device</p>  <p>On mobile devices student can see the following screen</p> 	Pass
	To test if students can select one answer from four answers	Student can select only one answer	Irina Zureiqi click on d:	Pass

			<p><b>WHAT DO YOU THINK...</b></p> <p>Keeran Jamil</p> <p>How much of your true potential are you using?</p> <table border="1"> <tr> <td>a: none of my true potential</td><td>b: some of my true potential</td></tr> <tr> <td>c: most of my true potential</td><td>d: all of my true potential</td></tr> </table>	a: none of my true potential	b: some of my true potential	c: most of my true potential	d: all of my true potential	
a: none of my true potential	b: some of my true potential							
c: most of my true potential	d: all of my true potential							
			<p>To prove that the d: answer is working for following appears</p> 					
			<p>Yusra Sarker selected a:</p> 					
			<p>Mohammad Alamin selected a:</p> 					
			<p>Zain Achmed selected b:</p> 					
	To test if student can see conformation page after they sent me their answer.	Student can see conformation page that displays teachers full name, presentation title and their submitted answer	Student can see conformation page that displays teachers full name, presentation title and their submitted answer	Pass				

	Conformation page must have teachers full name, presentation title, copy of given answer.	and their submitted answer												
	To test if student will see page refreshed to the new question if teacher change the question	the student can see automatically a new question as soon as teacher change the question		Pass										
	To test if student is able to view results of answers given by all the students on visual graph displayed on the board by the teacher	Students are able to see results of answers given by all the students in a visual graph displayed on the board by the teacher	<p>Students are able to see results of answers given by all the students in a visual graph displayed on the board by the teacher</p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>2.0</td> </tr> <tr> <td>b</td> <td>1.0</td> </tr> <tr> <td>c</td> <td>0.5</td> </tr> <tr> <td>d</td> <td>1.0</td> </tr> </tbody> </table>	Category	Value	a	2.0	b	1.0	c	0.5	d	1.0	Pass
Category	Value													
a	2.0													
b	1.0													
c	0.5													
d	1.0													

	To test if students can collaborate with each other by discussing they answer and change they point of view, following answering the same question and see visual graph displayed on the board by the teacher	Students enhanced they active learning by collaborating with each other and learning outcome changing they answer	<p>Teacher ask the students to pair up who gave opposite answers, and discuss why that gave that answer.</p> <p>After storming stage pass, the teacher asking the same question to see if students are change they mind (understanding the they have to use all their potential to sussed)</p> <p>The following result was successful</p>	Pass										
			<table border="1"> <thead> <tr> <th>Response</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>0</td> </tr> <tr> <td>b</td> <td>1</td> </tr> <tr> <td>c</td> <td>2</td> </tr> <tr> <td>d</td> <td>3</td> </tr> </tbody> </table>	Response	Count	a	0	b	1	c	2	d	3	
Response	Count													
a	0													
b	1													
c	2													
d	3													
	To test if students are found feedback system helpful and fun to use	Collect answers from students and take a screenshot of students' experience graph where they state whether or not they found feedback system helpful and fun	Not Done this test because of form to ask number of students was not attained.	N/A										

	To test if students are found performance of the teacher to their satisfactory after letting teacher now they answer and whether or not teacher enhanced his teaching methods to improve students learning	Collect answers from students and take a screenshot of students' experience visual graph	Teacher again explanation gave a positive student learning outcome and because student collaborate with each other they have learned what others not just think but also why	Pass
	Website tests			
	To test whether there is a business logo	There will be a business logo	There is not a business logo implemented	Fail

	implemented on each page	implemented on each page.		
	To test whether the system has headings and subheadings	There will be headings and subheadings present with an organised layout	There will be headings and subheadings present	Pass

	To test whether the design layout is presentable, text and font	The presentation of the design must collaborate between each other	<p>Each page has the same structure, text font Screen 1</p> <p>Screen 2</p> <p>Screen 3</p>	Pass
	To test whether the hyperlinks on the text and images are working.	The hyperlinks on the text and images are working.	Link 1: Hyperlink “Start the presentation” is working	Pass

			<p><b>WHAT DO YOU THINK...</b></p> <p>Keeran Jamil</p> <p><b>Join the session</b></p> <p><b>Full Name</b> enter your full name...</p> <p><b>Join</b> Start the presentation Go to the board</p> <p><b>Click on it</b></p> <p><b>WHAT DO YOU THINK...</b></p> <p>Keeran Jamil</p> <p><b>Start the presentation</b></p> <p><b>Full Name</b> enter your full name...</p> <p><b>Presentation Title</b> enter a title for this Presentation</p> <p><b>Join</b></p> <p><b>Link 2: “Go to the board”</b></p> <p><b>WHAT DO YOU THINK...</b></p> <p>Keeran Jamil</p> <p>How much money would you like to put down?</p> <p>a b c d</p>	
	To test if system can store information and display to the teacher using cmd	This system can store information and display information to the teacher using cmd		Pass



	To test whether the colours on the website are black, white, green and red	The colours black and white are used for the text and background; green and red are used for collection or disconnection status	<p>More colours are used for answers to display to students to be able to differentiate between them</p>  <p>The rest of the application uses white for the background, black for the text; green and red are used for collection or disconnection status.</p>	Pass
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## 11.4 Azure Performance Test

URL: <http://flawlessweb.azurewebsite.net>

Generate load form - Server West Europe

State – completed

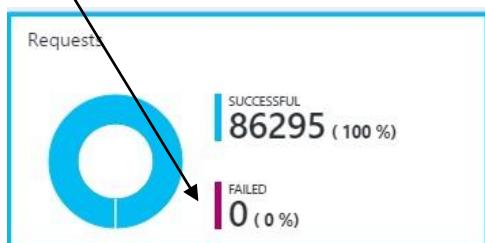
Duration -five minutes

User load - 250 concurrent users

TYPE	SOURCE	LAST MESSAGE
Info	Other	1250 virtual-users minutes will be charged for this run. Learn more about usage and charges at <a href="http://go.microsoft.com/fwlink/?LinkId=393740">http://go.microsoft.com/fwlink/?LinkId=393740</a> .
Info	Validation	This load test will run using 1 Internet Protocol (IP) addresses.
Info	Validation	This load test will run using 1 agent cores. Learn more about agent core allocation here: <a href="http://go.microsoft.com/fwlink/?LinkId=393741">http://go.microsoft.com/fwlink/?LinkId=393741</a> .
Info	Other	This run was requested by 'Irina Zureiqi' using the Visual Studio Team Services Account 'FlawlessWeb'.

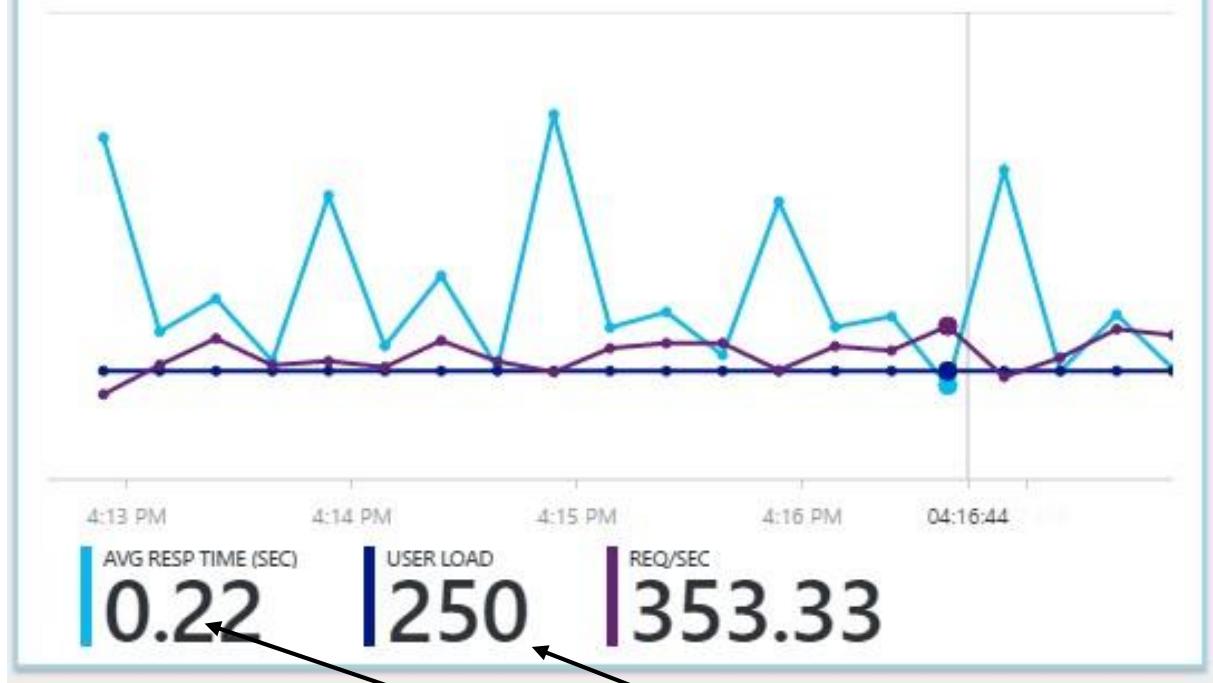
Request Failures

No Errors for the run



Performance under load

## Performance under load



Average response time is perfect which only 0.22 sec with 250 user load.

## Metrics

CPU Time and Memory working set past hour



METRIC	AVERAGE	MINIMUM	MAXIMUM	TOTAL
CPU Time	3.04 s	0 ms	33.75 s	3.04 m
Memory working...	56.22 MB	11.66 MB	166.21 MB	3.37 GB

## 11.5 Final testing of product by users and clients

### 11.5.1 Tutor feedback 1

I have demonstrated my programming solution to my tutor and I have noted the feedback in the template below.

**Application Name:** Enhancement of Teacher- Student communication through real-time feedback and its effects on educational curricula change and attendance monitoring

**Feedback by:** Keeran Jamil

**Date:** 14/03/2016

I have successfully downloaded file .exe, installed and configured software for Ashford library. The distributed software is server - client application and have GUI at client side.

Elements	Comments
User Interface	Add “Help” Menu and “How to” information in order to navigate the user. Developer information can be added, including version of the program.
Design of navigation	Layout suits the design overall. All functions are working.
Security of application	Login form could be implemented.
Basic user requirements	Necessary information is present
Advanced features	Graphics are in suitable place, but could improve by adding images. Imbedded database to the program will be useful

### 11.5.2 Tutor Feedback 2

**Application Name:** Enhancement of Teacher- Student communication through real-time feedback and its effects on educational curricula change and attendance monitoring

**Feedback by:** Aditi Rawal, Keeran Jamil

**Date:** 18/04/2016

Elements	Comments
User Interface	Text font is good; components are set in the form proportionally. User interface is loaded and easy to follow.

Design of navigation	Simple Layout, basic and easy to operate
Security of application	Validation are used
Basic user requirements	All the requirements are functional
Advanced features	Use of database is recommended

### **11.5.3 Feedback from developer**

While writing the feedback program code, mainly using JavaScript programming language, I have successfully achieved expected outcomes based on the client requirements and achieved set objectives. The process included fixing bugs, making the software more efficient and easy to use by extending functionality when required.

# **12 EVALUATION**

## **12.1 Review of the product**

The product met all the objectives and set requirements in full, as well as its responsive web-design accessible on any device such as various mobile phones, iPad, desktop, laptop, notepads devices that are working on Windows or Mac operating systems and on any browser.

This product proven to be very useful for the teacher as well students to enhance teaching performance or active learning. The product can be developed further to provide additional features and functionality stated in future development. Thus, will take this system to the next level and possibly its implementation, can be reviewed by the University with hence to use it at lecture and tutorial times. In the provided time giving by the course deadlines, this comprehensive web application was a bit ambitious, especially when all team members represented by one person. Nevertheless, the system proven to be a business-like, providing professional outlay and features that are necessary for teacher to ask students a question by giving multi choice answers and receiving responses from unlimited number of students and one second. Fully documented report covering all aspects of the development and project management of the system are proving to be comprehensive and fulfil system requirements. This system provides additional implementation of monitoring student attendance in the real-time. The system provides an easy access for the students to view questions and answers on their devices by using QR Code displayed by the teacher on the board. The codes are inexpensive to generate and implement, and they do not require close proximity to be recognized as long as they can be identified by the mobile device. When the students' sees a QR code, they can scan the code if they have a free QR code reader app on their phone.

## **12.2 Evaluate your SOLUTION**

By evaluating this stage of the software development process, which required the client and developer to review the software, I can confirm client - server distributed software met the user requirements.

<b>Criterion</b>	<b>Sub-criterion</b>	<b>Notes – to what extent is/does the software...</b>
<b>Usability</b>	<b>Understandability</b>	And easy to operate Graphical User Interface (GUI of them, offer the user varies choices to input and output task. It is easy to use understand basic functions of the program.
	<b>Documentation</b>	Comprehensive, appropriate, well-structured user documentation is attached.
	<b>Buildability</b>	Visual Studio 2015 development tool was used to build

	<b>Installability</b>	The system files are uploaded to hosting server. No installation necessary
	<b>Learnability</b>	Teacher student feedback system is easy to learn how to use all the functions, GUI provides notations to each button to advice user of its purpose.
<b>Sustainability and maintainability</b>	<b>Identity</b>	Real-time teacher student feedback system is custom based which make its identity clear and unique.
	<b>Copyright</b>	Application does not inform the client's its copyright due to this application was developed for the learning objectives and not for public use.
	<b>Licencing</b>	No licence is not required to use this system, but in order to make changes if needed, appropriate software development tool can be downloaded and licence obtain.
	<b>Governance</b>	As a whole the project is easy to understand how it is run, and development of the software can be managed because all the documentation is included and all the files of the application are provided.
	<b>Accessibility</b>	The file is available to public on GitHub
	<b>Testability</b>	Visual Studio 2015 provides features to test application correctness and source code. Debugger can be used to check step-by-step of all the functions as well as by creating a JUnit test, which can be used to check the bugs in the runtime environment of the application. Project has automated test to check conformance for coding standards.
	<b>Portability</b>	At the moment the developed software is designed to run on any browser, any device, anytime and anywhere.
	<b>Supportability</b>	The forms of user and developer feedback for the software was provided while developing the software and was noted in the documentation. Future development support will not be provided and user have to find alternative ways to support distributed software application or referred to technical documentation.
	<b>Analysability</b>	Two analyse the software source code is easy due to the implementation architecture. Individual source code files and how they fit into the implementation architecture is provided in technical documentation such as class diagrams, development tool is used.
	<b>Changeability</b>	Easy to modify and contribute changes to developers. Modifications easily can be applied to the web application and source code can be changed with ease

		due to the structure of the files and their operation within node JS JavaScript development.
	<b>Evolvability</b>	Currently, the application has reached its purpose and no further development are required.
	<b>Interoperability</b>	The software is designed using appropriate standards. Third party components will be required, such as web browser to host locally and the server to store data.

## 12.1 Future development

- The point consider is to additionally develop tracking student progress and performance.
- Creating culture of learning, where students are communicating and collaborating with one another. Maximising the amount of giving feedback from the teacher and students.
- Students can type the questions to the lecturer and the end of lecture making lecture aware on points that they did not understand.
- Lecturer's response answers could be by email sent to all the students.
- To add MongoDB database
- To add statistic page
- To add more security features
- To enable teacher to add new questions
- To enable teacher to add new answers
- To enable teacher to swap questions place
- To create options of checkboxes

Adding interactivity to the system: ID, calendar, clock, dynamics/animation, security password, graphics, automated translation of the question to the preferred language, improved design that must be fit for purpose. And better management view for the audience response system.

The management view for the audience response system. For example, To create a new session and

The screenshot shows a web-based management interface for 'The Ray Stoneham Sessions'. At the top, it says 'The Ray Stoneham Sessions' and '7 sessions'. Below that, there's a table with columns for 'courseID' (COMP1640), 'week' (7), and 'session name' (Reporting and presentations). A blue button labeled 'add new session' is visible. The 'Reporting and presentations' button is highlighted with a blue border.

Edit a session

The screenshot shows a form for editing a session. It has a table with three columns: 'courseID' (COMP1640), 'week' (7), and 'session name' (Reporting and presentations). The 'session name' field is highlighted with a blue border. To the right of the table are three buttons: 'control session', 'view session', and 'single ques'.

Create a question for text input

Enter new question [make multiple choice](#)

[Create question](#)

[leave editing - back to session list](#)

### Make it multiple choice

0 questions

Enter new question [make multiple choice](#)

What makes a good presentation

Responses

- A Animation?
- B Lots of text?
- C Bullet points?
- D Lots of images?
- E Lots of pages?

### Make the session live

0 questions

view session single ques.

What makes a good presentation

edit respon

What is your Unique Selling Point?

edit respon

### Make it available to the audience

**What makes a good presentation**

398146712

QR code

A.  Animation?

B.  Lots of text?

C.  Bullet points?

D.  Lots of images?

E.  Lots of pages?

[submit response](#)

[Show responses](#)

## 12.2 Review of the process of the project

At the beginning of the project careful consideration was given to project management because project needs to be set up correctly from the outset to ensure success. At the pre-project phase, I have formalised a proposal for the project and placed it in context of the teacher student feedback system

and the University. At this stage, I had identified the purpose and justifying and prioritising in a short statement. See project proposal in Appendix B. Throughout the project the viability continue only access, ensuring that the benefits predicted from the use of end product of the project outweigh the cost of delivering them. I have taken the opportunity for decided whether the proposed project is viable from both a business and technical perspective by means of high level investigation of the potential solution, cost and time frames. I have kept visibility stage short and sharp because it's purpose is to justify progress in to the foundation phase where I have established the and enduring foundations of the project. I have combined street essential perspectives on business, solution and management in order to provide a clear project focus that is a robust and flexible. Thus, demonstrated how my solution will meet the needs of the business. In the exploration phase I used to iteratively and incrementally investigate detailed business requirements and I have translated them into a viable solution. Focusing on demonstrating that it will deliver what is needed, whilst fitting precisely with changing detail of overall need. At this stage, that closely integrated with engineering, ensure technical acceptance criteria such as performance, capacity, security, supportability and maintainability and met. Add the deployment phase. The main objective is to get this solution of teacher student feedback system into life use by deploying in Azure.net. At this stage the product was ready and by hosting. I had tested and reviewed the product which indicated to me key points for future development work. Throughout the project critical review of each increment delivery of overall solution was refined and extended increment of its deployment as noted in the Gantt chart. Post-project phase that will start as soon as the value can be measured, plan to be done after street to 6 months of completion of project. Nevertheless, I have reflected on the performance of the project in terms of actually achieved business value so far.

## **12.1 Taken project forward**

because detailed comprehensive documentation providing for the product included project management, including system files, I would like to take this project forward by implementing additional features and functions that set throughout the project as well as in future developments section. I believe that this project can not only change teacher's performance, but more importantly enhance students' active learning within lecture or tutorial at University environment. This report included technical documentation section that provides necessary information to reevaluate the project and improve it. knowledge to manage this system in the future.

## **12.2 Comment on the strengths and weaknesses**

### **12.3 Strengths**

- Benefits of using the Responsive web application is that is usual when it comes with a huge time and cost savings. Because of website opens in any browser, the code is written once, and application will work everywhere. The only investment is that there waiting called automatically adapts to the content's layout for the size of the user device. This benefit will allow for the developer to fix the code once, and it will change in any browser that opened it.
- Because the web is an open platform anyone one can access it without any proprietary software or operating system.
- Publishing product on that their web makes it much more future proof than a native app.

### **12.4 Weaknesses**

- Approach of the Responsive web application development has Disadvantages such as criticisms of HTML 5 and CSS web applications of their slow performance. For example, if the user trying to load a website on her smart phone cellular network. It can be very slow.
- By accessing web applications through the browser, every page and every piece of data has to be downloaded as the user requested. Therefore, user won't be able to have an off-line mode since the web requires an Internet connection
- Because web application is open in a browser, there are constraints to its capabilities. This means that for touch interfaces on smart phones and tablets, users can use basic gestures like tapping and follow a link or swiping between in the slideshow. Bad, many other gestures either don't work in those browsers or are served for navigating the browser, itself.

Double tapping in Safari on the iPod will scroll into the area of content, which will not be possible to use double tapping gesture for user interactions.

The drawbacks to browser-based web application is that mobile browsers only have limited access to a device's capabilities.

### **12.5 Optimisation**

For speed optimisation only use images if there are really necessary, such as QR code Up to mice QR code to the smallest file size possible. In.

## **12.6 Schedule amendments**

I have a week by week schedule of my development work. When I have changed it. I have the variations to show how I have adapted. Refer to appendix B showing reflection on how well I kept schedule and what changes was made

## **12.7 Recommendations for improvements**

Due to the fact that development tools constantly providing new features, error corrections, performance improvements, and novel technologies in order to be successful. Therefore, my recommendation is to use improved updated versions of the hardware, software and development tools in the future.

Feedback web application could be improved by including eye-catching graphics, different fonts to increase readability. The form itself could have more colour, nevertheless in professional software development there is no need to make colourful applications which could confuse the user.

Images could be added and could be playing a big role in the feedback system because they can be used as questions or answers. This can provide more ways for active learning.

Realistically to improve application the additional functions will be beneficial to the user if Search option is added to the application. Provide Search option is advised because the program can hold large amount of items and user might spend extra time to find the inserted item. Realistically to improve application the additional features can be beneficial to the business and have positive impact on final product of teacher-student feedback system. Overall, the product suited for the purpose.

If the database implementation take place, application can be improved by requesting authentication from a client before a server return data. Database is confidential information and it is important only service authorised clients. Moreover, for security reasons it is important to protect passwords and other data through encryption, reducing the risk of the password been compromised.

## **13 DEPLOYMENT**

Real-time feedback system between teacher and student deployment.

```

1~ {
2~   "value": [
3~     {
4~       "id": "/subscriptions/c6093e40-ed94-4bdc-98ec-d86af9c91729/resourceGroups/Default-Storage-WestEurope/providers/Microsoft.Web/sites
/FlawlessWeb/deployments/b7163435e4c616e120861593820185ee1590b544",
5~       "name": "FlawlessWeb/b7163435e4c616e120861593820185ee1590b544",
6~       "type": "Microsoft.Web/sites/deployments",
7~       "location": "West Europe",
8~       "properties": {
9~         "id": "b7163435e4c616e120861593820185ee1590b544",
10~        "status": 4,
11~        "status_text": "",
12~        "author_email": "irina69@btinternet.com",
13~        "author": "Irina Zureiqi",
14~        "deployer": "GitHub",
15~        "message": "Initial Commit\n",
16~        "progress": "",
17~        "received_time": "2016-03-26T01:09:53.3803616Z",
18~        "start_time": "2016-03-26T01:09:53.6653373Z",
19~        "end_time": "2016-03-26T01:20:40.0632344Z",
20~        "last_success_end_time": "2016-03-26T01:20:40.0632344Z",
21~        "complete": true,
22~        "active": true,
23~        "is_temp": false,
24~        "is_READONLY": false,
25~        "url": "https://flawlessweb.scm.azurewebsites.net/api/deployments/b7163435e4c616e120861593820185ee1590b544",
26~        "log_url": "https://flawlessweb.scm.azurewebsites.net/api/deployments/b7163435e4c616e120861593820185ee1590b544/log",
27~        "site_name": "FlawlessWeb"
28~      }
29~    ]
30~  }
31~ }

```

Figure 54. Deployment information

## 14 CONCLUSION

This report summarises some main design concepts that have been related to the real time web application for a given problem. This report, discussed various concepts which are important for the design and implementation of node.js applications. Explanation of client and server distributed application and secure communication in distributed system. Guidelines are provided which identify the key considerations and decisions, explaining the components and data and file structures, accompanied by implementation of the programme. The use of services permitted standardise behaviour across application and entire system. Implementation solution was based on a prepared design, relationships between components identified and opportunities for error handling and reporting implemented. Test plan was vital and proven to be overall successful, the actual results fulfil outcome against expected results. Independent feedbacks were taking in order to improve distributed software applications and recommendations for improvements was made, followed by user and technical documentation for the developed distributed software application.

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## **APPENDIX A - Original Project Schedule**

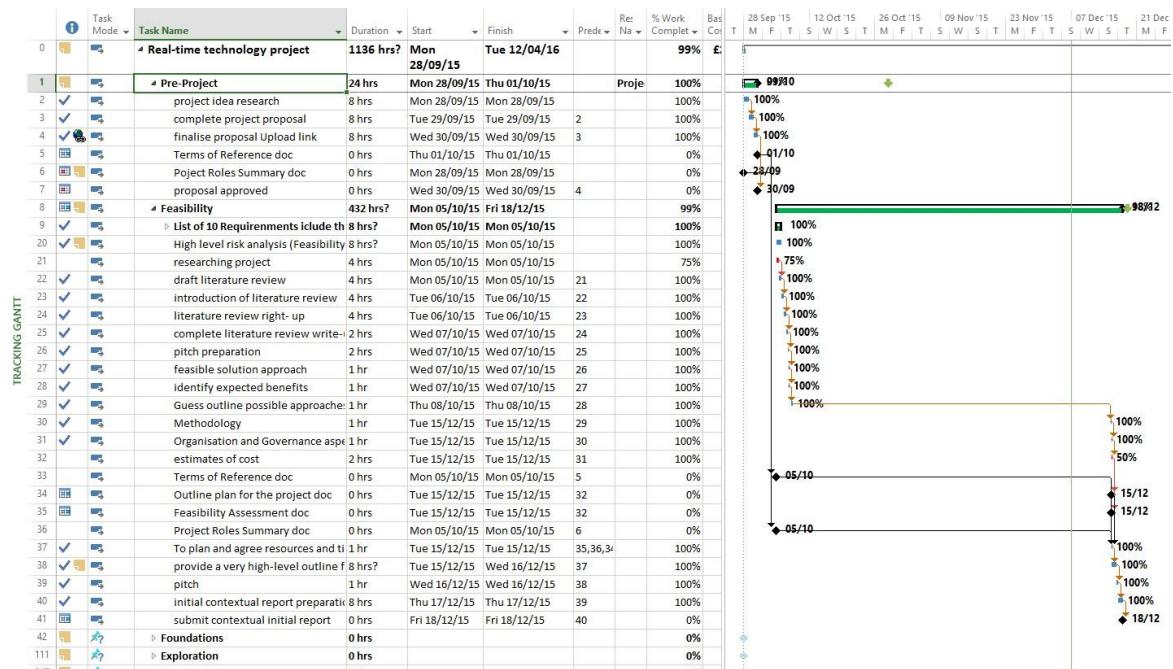
## 1 Original schedule

4	✓	A.3	finalise proposal Upload link	8 hrs 8 hrs	Wed 30/09/15	Wed 30/09/15 3		100%
5	█	A.4	Terms of Reference doc	0 hrs 0 hrs	Thu 01/10/15	Thu 01/10/15		0%
6	█	A.5	Project Roles Summary doc	0 hrs 0 hrs	Mon 28/09/15	Mon 28/09/15		0%
7	█	A.6	proposal approved	0 hrs 0 hrs	Wed 30/09/15	Wed 30/09/15 4		0%
8	█	B	▫ Feasibility	134 hrs 432 hrs?	Mon 05/10/15	Fri 18/12/15		99%
9	✓	B.32	• List of 10 Requirements include them in outline plan	80 hrs 8 hrs?	Mon 05/10/15	Mon 05/10/15		100%
20	✓	B.24	High level risk analysis (Feasibility)	8 hrs 8 hrs?	Mon 05/10/15	Mon 05/10/15		100%
21	█	B.1	researching project	4 hrs 4 hrs	Mon 05/10/15	Mon 05/10/15		75%
22	✓	B.2	draft literature review	4 hrs 4 hrs	Mon 05/10/15	Mon 05/10/15 21		100%
23	█	B.3	introduction of literature review	4 hrs 4 hrs	Tue 06/10/15	Tue 06/10/15 22		100%
24	✓	B.4	literature review right- up	4 hrs 4 hrs	Tue 06/10/15	Tue 06/10/15 23		100%
25	✓	B.5	complete literature review write-up	4 hrs 2 hrs	Wed 07/10/15	Wed 07/10/15 24		100%
26	✓	B.6	pitch preparation	2 hrs 2 hrs	Wed 07/10/15	Wed 07/10/15 25		100%
27	✓	B.7	feasible solution approach	1 hr 1 hr	Wed 07/10/15	Wed 07/10/15 26		100%
28	✓	B.8	identify expected benefits	1 hr 1 hr	Wed 07/10/15	Wed 07/10/15 27		100%
29	✓	B.9	Guess outline possible approaches for timeline of delivery - how many days for whole project	1 hr 1 hr	Thu 08/10/15	Thu 08/10/15 28		100%
30	✓	B.10	Methodology	1 hr 1 hr	Tue 15/12/15	Tue 15/12/15 29		100%
31	✓	B.11	Organisation and Governance aspects	1 hr 1 hr	Tue 15/12/15	Tue 15/12/15 30		100%
32	█	B.13	estimates of cost	1 hr 2 hrs	Tue 15/12/15	Tue 15/12/15 31		100%
33	█	B.21	Terms of Reference doc	0 hrs 0 hrs	Mon 05/10/15	Mon 05/10/15 5		0%
34	█	B.16	Outline plan for the project doc	0 hrs 0 hrs	Tue 15/12/15	Tue 15/12/15 32		0%
35	█	B.14	Feasibility Assessment doc	0 hrs 0 hrs	Tue 15/12/15	Tue 15/12/15 32		0%
36	█	B.20	Project Roles Summary doc	0 hrs 0 hrs	Mon 05/10/15	Mon 05/10/15 6		0%
37	✓	B.15	▫ To plan and agree resources and timeboxes for the whole Foundation phase	1 hr 1 hr	Tue 15/12/15	Tue 15/12/15 35,:		100%
38	█	D.22	▫ provide a rough high level outline for	0 hrs 0 hrs?	Tue 15/12/15	Wed 16/12/15 27		100%
39	✓	B.17	pitch	1 hr 1 hr	Wed 16/12/15	Wed 16/12/15 38		100%
40	✓	B.18	initial contextual report preparation	8 hrs 8 hrs	Thu 17/12/15	Thu 17/12/15 39		100%
41	█	B.19	submit contextual initial report	0 hrs 0 hrs	Fri 18/12/15	Fri 18/12/15 40		0%
42	█	C	▫ Foundations	0 hrs 0 hrs				0%
43	█	C.19	Creating a schedule of Timeboxes for the first Project Increment along with resources required	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
44	█	C.20	Defining the approaches to be used across the project for developing, and controlling the development of the solution	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
45	█	C.21	Agreeing a strategy for deployment	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
46	█	C.22	<New Task>	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
47	█	C.23	<New Task>	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
48	█	C.18	<New Task>	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
49	█	C.17	<New Task>	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
50	█	C.13	• List of 100 Requirements include them in outline plan	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
74	█	C.15	▫ Lists of 10 high level requirements using Moscow	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
75	█	C.15.1	Planning and high level analysis (Foundations)	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
76	█	C.15.2	<New Task>	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
77	█	C.15.3	<New Task>	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
78	█	C.6	▫ Feasibility Assessment	0 hrs 0 hrs	Mon 28/09/15	Mon 28/09/15		0%
80	█	C.4	▫ Business Foundations	0 hrs 0 hrs	Mon 28/09/15	Mon 28/09/15		0%
82	█	C.5	▫ Solutions Foundation	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
86	█	C.7	▫ Management Foundations	0 hrs 0 hrs	Mon 28/09/15	Mon 28/09/15		0%
88	█	C.8	▫ Outline plan for the project	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
94	█	C.9	▫ Delivery Plan	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
103	█	C.10	▫ Prioritised Requirements List	0 hrs 0 hrs	Mon 28/09/15	Mon 28/09/15		0%
105	█	C.11	▫ Project Roles Summary	0 hrs 0 hrs	Mon 28/09/15	Mon 28/09/15		0%
107	█	C.12	▫ Delivery Control Pack	0 hrs 8 hrs?	Mon 28/09/15	Mon 28/09/15		0%
110	█		Reports doc	0 hrs 0 hrs	Mon 28/09/15	Mon 28/09/15		0%
111	█	D	▫ Exploration	0 hrs 0 hrs				0%
847	█	E	▫ Engineering	0 hrs 0 hrs				0%
1138	█	F	▫ Deployment	0 hrs 0 hrs				0%
1301	█	G	▫ Post-Project	0 hrs 0 hrs	Mon 11/04/16	Mon 11/04/16		0%

## 2 Recourses list

		Resource Name	Type	M L E	I L E	Max Unit	Std. Rate	Ovt. Rate	Cost	Accrue At	Base Calendar	Code	Text1
1		Director Business Sponsor	Work	IZ		100%	£30.00/hr	£40.00/hr	£0.00	Start	Standard		business interests
2		Business Visionary	Work	IZ		100%	£10.00/hr	£15.00/hr	£0.00	Prorated	Standard		business interests
3		Technical Coordinator	Work	IZ		100%	£10.00/hr	£15.00/hr	£0.00	Prorated	Standard		solution/technicalinterests
4		Project Manager	Work	IZ		0%	£40.00/hr	£50.00/hr	£0.00	Prorated	Standard		managementinterests
5		Business Analyst	Work	IZ		100%	£10.00/hr	£20.00/hr	£0.00	Prorated	Standard		business interests and solution
6		Software Team Leader	Work	IZ		100%	£40.00/hr	£50.00/hr	£0.00	Prorated	Standard		managementinterests
7		Business Ambassador	Work	IZ		100%	£10.00/hr	£20.00/hr	£0.00	Prorated	Standard		business interests
8		Solution Developer	Work	IZ		100%	£20.00/hr	£30.00/hr	£0.00	Prorated	Standard		solution/technicalinterests
9		Solution Tester	Work	IZ		100%	£20.00/hr	£40.00/hr	£0.00	Prorated	Standard		solution/technicalinterests
10		Business Advisor	Work	IZ		100%	£50.00/hr	£50.00/hr	£0.00	Prorated	Standard		business interests
11		Technical Advisor	Work	IZ		100%	£50.00/hr	£50.00/hr	£0.00	Prorated	Standard		solution/technicalinterests
12		Workshop Facilitator	Work	IZ		100%	£100.00/hr	£150.00/hr	£0.00	Prorated	Standard		business interests
13		DSDM Coach	Work	Kee		100%	£50.00/hr	£50.00/hr	£0.00	Prorated	Standard		Process interest
14													

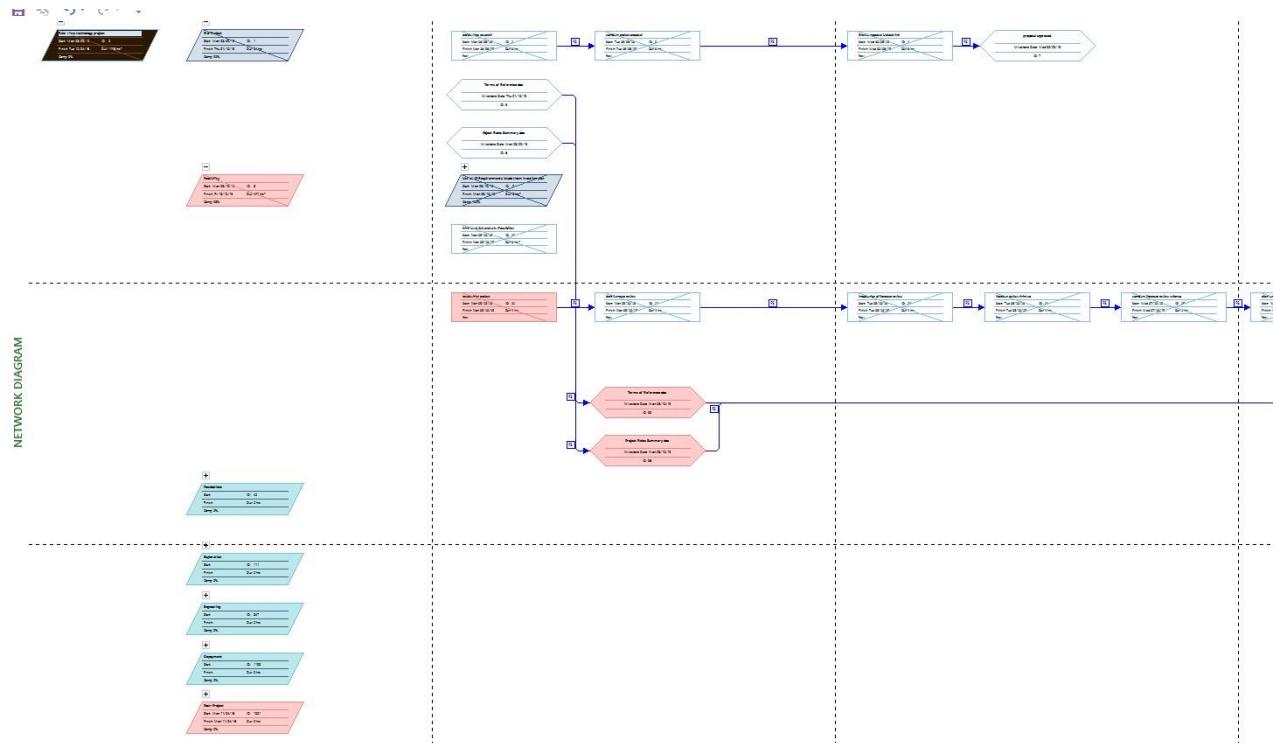
## 3 Tracking Gantt Cart



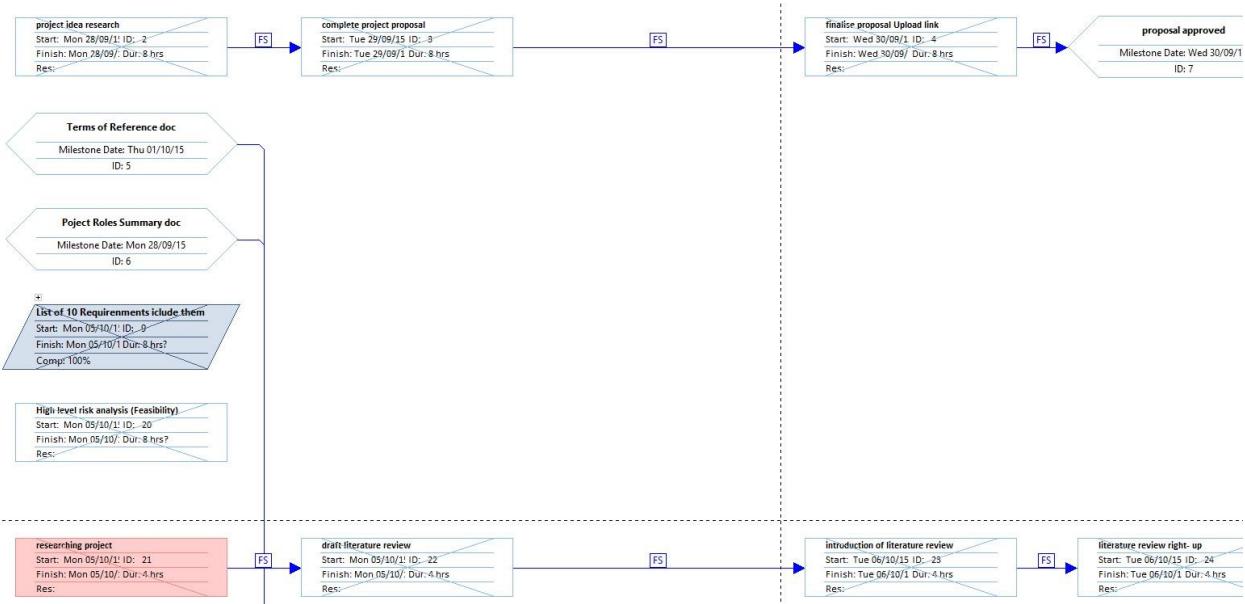
## 4 Timeline



## 5 Network diagram



In more detail:



## 6 Milestone Report

# MILESTONE REPORT

MILESTONE REPORT

## LATE MILESTONES

Milestones that are past due.

Name	Finish
Terms of Reference doc	Thu 01/10/15
Project Roles Summary doc	Mon 28/09/15
proposal approved	Wed 30/09/15
Terms of Reference doc	Mon 05/10/15
Project Roles Summary doc	Mon 05/10/15

## MILESTONES UP NEXT

Milestones due in this month.

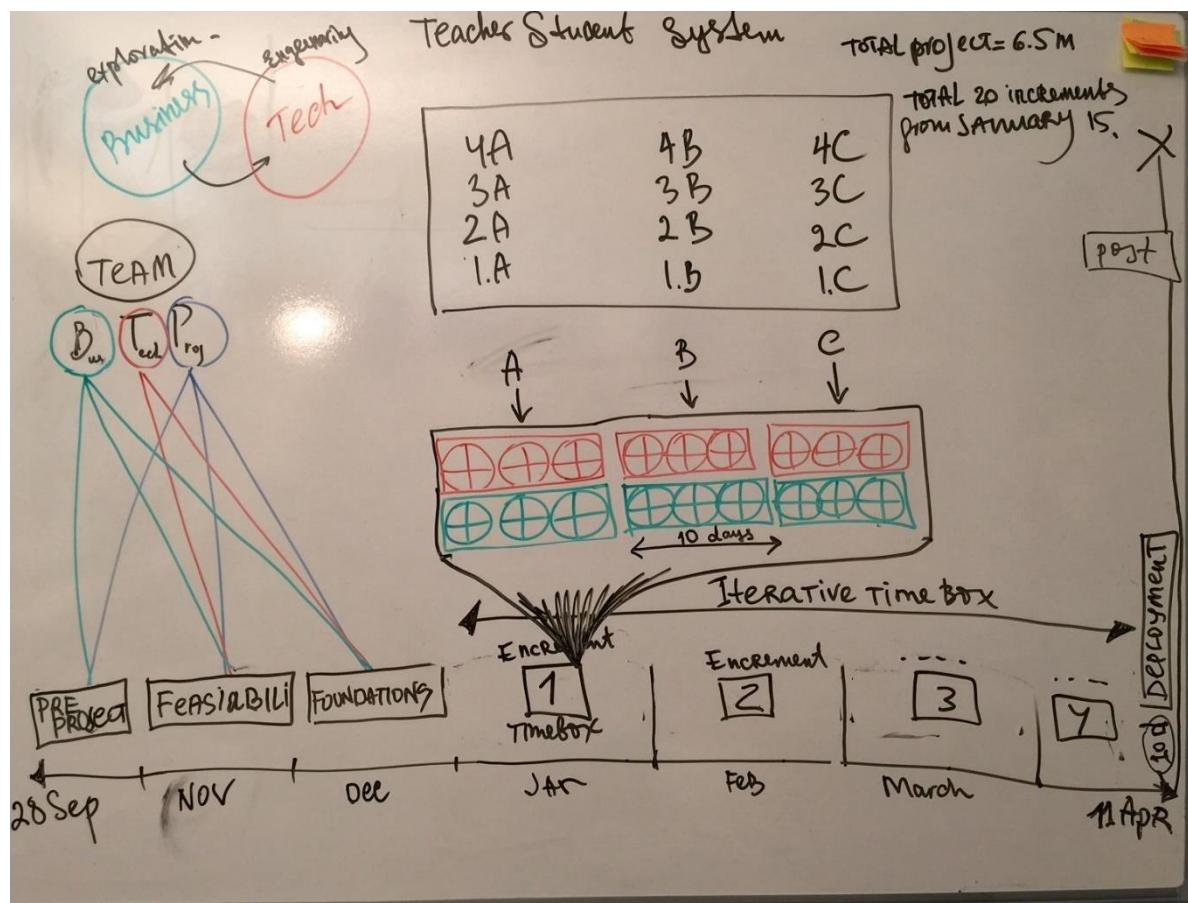
Name	Finish
Terms of Reference doc	Thu 01/10/15
Project Roles Summary doc	Mon 28/09/15
proposal approved	Wed 30/09/15
Terms of Reference doc	Mon 05/10/15
Outline plan for the project doc	Tue 15/12/15
Feasibility Assessment doc	Tue 15/12/15
Project Roles Summary doc	Mon 05/10/15
submit contextual initial report	Fri 18/12/15

## COMPLETED MILESTONES

Milestones that are 100% complete.

Name	Finish
Terms of Reference doc	Thu 01/10/15
Project Roles Summary doc	Mon 28/09/15
proposal approved	Wed 30/09/15
Terms of Reference doc	Mon 05/10/15
Outline plan for the project doc	Tue 15/12/15
Feasibility Assessment doc	Tue 15/12/15
Project Roles Summary doc	Mon 05/10/15
submit contextual initial report	Fri 18/12/15

## 7 Project management meeting



## APPENDIX B - Formal Project Proposal

**COMP (1682) Project Proposal**  
**Enhancement of teacher- student communication through real-time feedback and its effects on educational curricula change**

**Irina Zureiqi**  
**BSc Computing**  
**000915346**

### **1. Overview**

Teachers spend a great deal of time in lectures explaining and teaching subject material which is not always fully grasped by all students as it is presented through the medium of a singular teaching method or approach. Receiving feedback from students is a vital resource and of great benefit for teachers but not always possible in the current process when students given feedback verbally, complexity individual differences and the nature of the processes involved in doing so.

Students will also often not respond in front of the other students if they did not understand task at hand or they do not want the teacher to know of their ‘not understanding’ where students might think that it can have direct effect on the teacher’s judgement in a long run. Leaving student ‘not certain’ completing their work on their own can produce poor assignments/results and as stated by (Robert Powell, 2013) “*teachers spent a year of their lives marking work, it must be worth the effort in terms of impact it has on the students subsequent learning*”. The primary audience whose satisfaction must be gauged must be learners and students. The effort of teachers, head teachers, inspectors or parents have to satisfy learner’s needs and if so there will be less marking and better grades. And therefore the solution to this problem is to design a way in which rapid real-time feedback can take place from the students to the teacher, allowing an improvement in the quality of teaching, thus having a significant impact in educational curricula.

The energies of this dissertation will be focused on exploring whether real-time feedback will improve teacher-student communication in a lecture an educational environment. This identifies techniques and strategies for teachers to obtain student feedback instantaneously and thus improve their interactions with students. It aims to provide an efficacious solution to giving feedback in real-time and the impact that this has on teacher development and teaching differentiation to improve lecture practice. This solution will be evaluated by using it alongside existing academic university policies and environment. Testing of the key feature of the real-time remote student learning instantaneously will provide a monitoring system that will provide clear results shown in the form of visual dynamic charts in any Internet enabled terminal device. Received data will be stored in the database for future use and for analytic and evaluation purposes. Accurate and quantifiable measurement of this unique system will be essential in creating desired outcomes and evaluation of this effective solution can prove that teachers can minimise their efforts and expenditure to achieve the desired learning results within time. The proposed system uses three forms of communication from the student to the teacher.

The first is a pen-like device with multiple buttons to show how much the student understands the subject material. This data is transferred by a Bluetooth transmitter at the top the device, each button having its own frequency. Once the Bluetooth device is transmitting, a specialist Raspberry Pi under the desk will receive the Bluetooth data and create a simple file, depending on the Student's choice. Bluetooth is a one-to-one (1-to-1) short-range communication method, therefore attempting to connect multiple students to the teacher directly using this method was not practical. The Raspberry Pi will be connected to a Wi-Fi range extender on one or more walls (depending on the size of the classroom). This Wi-Fi network will connect the Raspberry Pi to the Teacher's computer.

When the file is created, the Raspberry Pi will transfer it to a pre-mounted remote directory on the teacher's machine.

Once all Student's files have been transferred, the Teacher will then run the program on their computer. This program will take advantage of a call to the command line, which will merge all of the Student's files into one file. At which point, the program will create a chart that shows the number of students who understand fully, understand partly or do not understand at all. Performing tests at different distances will be done as well as with different levels of interference to see how this affects the speed of the communication.

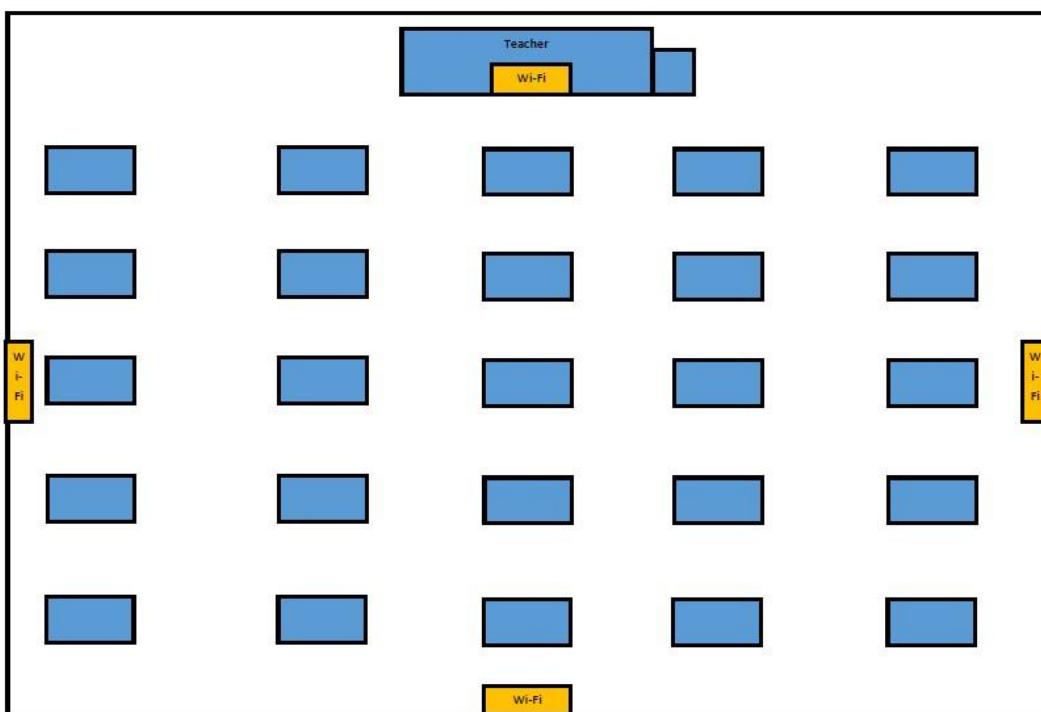


Figure 1. Classroom preliminary design and visual explanation for the feedback system. If there are 100 students therefor 100 pens, and because Bluetooth is 1 to 1 connection there are a need to 100 Raspberry Pis. Four Wi-Fi range extenders and Teacher computer.

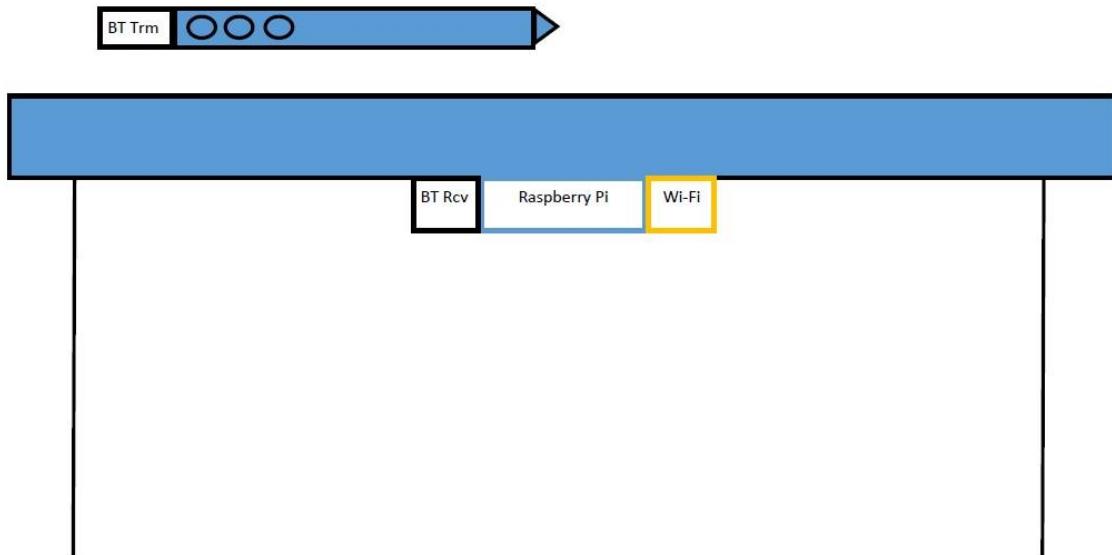


Figure 2. Pen device with three buttons and Bluetooth transmitter. Classroom desk (front view) will have Raspberry Pi with Blue tooth receiver and Wi-Fi mounted under the desk.

**Keywords:** [Teaching and Learning Enhancement through Technology, teacher, student, real time, feedback, communication, curricula, education, learning, strategy, efficacy, development, marking, change]

## 2. Aim

To develop real-time feedback system to enhance teacher-student communication.

To review how feedback real-time system impact on the need of change in educational curricula.

## 3. Objectives

### 3.1. Research report [2weeks] 19 of October

#### 3.1.1. Educational sector [1.0]

- 3.1.1.1. Research existing strategies for maximising the impact of feedback on student achievement [0.0]
- 3.1.1.2. Research how to enhance teacher student communication in educational environment [0.0]
- 3.1.1.3. Investigate efficacy of the feedbacks giving [0.0]
- 3.1.1.4. Investigate how to initiate real-time feedback communication between teacher and a student's [0.0]
- 3.1.1.5. How to enable students to express their wants or needs [0.0]
- 3.1.1.6. How to improve teacher's development [0.0]
- 3.1.1.7. How to empower students to develop their potential as individuals and to improve learning outcomes [0.0]
- 3.1.1.8. Research on how teachers can save time in marking students work using real-time feedback system [0.0]
- 3.1.1.9. Research articles on critical evaluation of existing real-time student teacher feedback systems [0.0]
- 3.1.1.10. Learning "Cups" concept that teachers use at schools [0.0]

### **3.1.2. Technological sector [1.0]**

- 3.1.2.1. Forms of communication [0.0]
- 3.1.2.2. Multiple button push devices [0.0]
- 3.1.2.3. Data transfer [0.0]
- 3.1.2.4. Bluetooth transmitter [0.0]
- 3.1.2.5. Frequency [0.0]
- 3.1.2.6. Raspberry pi real-time systems [0.0]
- 3.1.2.7. Raspberry pi receives the Bluetooth data and create a simple file [0.0]
- 3.1.2.8. Wi-Fi range extender [0.0]
- 3.1.2.9. Connect the raspberry pi to the teacher's computer [0.0]
- 3.1.2.10. Find out if any real-time student teacher systems exist and what are they [0.0]
- 3.1.2.11. Research on how to relate existing real-time student teacher feedback system to the new improved system [0.0]

### **3.1.3. Legal, Social, Ethical and Professional [1.0]**

- 3.1.3.1. Legal considerations in the classroom or lecture theatre (preserving the anonymity of respondents [0.0])
- 3.1.3.2. Social considerations in the classroom or lecture theatre is preserving the anonymity of respondents [0.0]
- 3.1.3.3. Ethical considerations in the classroom or lecture theatre [0.0]
- 3.1.3.4. Ethical student-teacher relationship is preserving the anonymity of respondents [0.0]
- 3.1.3.5. Professional considerations data protection principles [0.0]
- 3.1.3.6. Security and prevention of abuse [0.0]
- 3.1.3.7. Professional integrity of the teacher [0.0]
- 3.1.3.8. User-testing impact on social dynamics in the classroom [0.0]
- 3.1.3.9. Professional risk management procedures [0.0]
- 3.1.3.10. Obtaining consent from individuals taking part in the research [0.0] **Other research [1.0]**
  - 3.1.3.11. Contacting teacher – supervisor for support [0.0]
  - 3.1.3.12. Research best Methodologies that apply to my project [0.0]
  - 3.1.3.13. Management planning software with integration of DSDM Atern [0.0]
  - 3.1.3.14. DSDM Atern framework [0.0]
  - 3.1.3.15. Use of MoSCoW model [0.0]

### **3.2. Project Proposal**

**( started 24 of October)**

- 3.2.1. Write project proposal [7.0] (9 of November)
- 3.2.2. Preparation for the project pitch [14.0] (16 of November)
- 3.2.3. Project pitch [1.0] (7 of December)
- 3.2.4. Literature review/discussions/definitions [1.0]
- 3.2.5. Writing literature review [14.0]

### **3.3. Gathering The Requirements [14.0]**

- 3.3.1. Formulate and record a possible outline of the project specifications such as definition of the problem, system overview, product prospective and user characteristics[0.0]
- 3.3.2. User characteristics [0.0]
- 3.3.3. Investigate by interviewing and recording transcript followed by analysing current system [0.0]
- 3.3.4. Collect system requirements by interviewing about new system followed by summary [0.0]
- 3.3.5. Software requirement analysis [0.0]

3.3.6. Produce two alternative solutions that has been analysed in order for the “client” to see whether or not it suits the “client’s” requirements. Including feasibility and cost followed by evaluation and recommendations [0.0]

3.3.7. Detail the scope that developer assume ahead of the project management requirements and business requirement specification such as project assumptions and dependencies and constraints, security, Maintainability, Portability and Design evaluation [0.0]

3.3.8. Identify the factors that contribute to the process of project requirement selection such as timescale, quality and implications of the project

3.3.9. Produce a specification requirement using prioritisation [0.0]

3.3.10. Determine resource requirements [0.0]

3.3.11. Planning of the interview [0.0]

3.3.12. Questionnaire stage 1 [0.0]

3.3.13. Questionnaire stage 2 [0.0]

3.3.14. List Functional requirements [0.0]

#### **3.4. Analysis [14.0]**

3.4.1. Outline the planning and monitoring methods used in project [0.0]

3.4.2. Apply framework DSDM Atern using MoSCoW [0.0]

#### **3.5. Design Documentation [14.0]**

3.5.1. design a real time information processing system, the response time will need to meet the needs of the user [0.0]

#### **3.6. Prototype [1.0]**

3.6.1. Demonstration of prototype [0.0]

7 of December

#### **3.7. Initial contextual report [7.0]**

**18 of December 3.8.**

#### **Implementation**

3.8.1. [0.0]

#### **3.9. Development**

3.9.1. [0.0]

#### **3.10. Testing**

3.10.1. Test new system three times in educational environment [0.0]

3.10.2. Encourage educational organisation is to test the system [0.0]

3.10.3. Fix errors [0.0]

#### **3.11. Validation**

3.11.1. [0.0]

#### **3.12. Evaluation**

3.12.1. Evaluate the system [0.0]

#### **3.13. Documentation \***

3.13.1. Document the product [0.0]

3.13.2. Document the process of the system production [0.0]

3.13.3. Reflect on expected results against actual results [0.0]

#### **3.14. Interim report**

**13 of February**

#### **3.15. Deployment\***

3.15.1. To use real-time feedback system between teacher and a student [0.0]

#### **3.16. Deliverable Presentation \***

3.16.1. Demonstration and [0.0]

7 and 14 March

3.16.2. Final report upload [0.0]

18<sup>th</sup> April

#### **4. Legal, Social, Ethical and Professional**

Legal, social, ethical and professional considerations I need to take into account when designing my system and implementing it in the classroom or lecture theatre is preserving the anonymity of respondents and making sure that the means by which the feedback is given is constructive and not in breach of a sound ethical student-teacher relationship.

When design, producing and implementing my system I will ensure that the device is secure from abuse, malpractice, confirms to data protection principles, and is not in any way prodding results and data visualisations which will undermine the professional integrity of the teacher or lecturer in the classroom. It will also need to be examined through focus groups? And user-testing what impact this will have on the educational and social dynamics of the classroom and how any possible undesirable outcomes may be mitigated through sound risk management procedures. Besides clearance sought from the ethics committee an explicit explanation of the nature and scope of the project will be thoroughly given to any individuals taking part in the research when their consent is obtained.

#### **5. Planning**

Describe your approach to this project (prototyping (evolutionary, exploratory, iterative, etc.), TDD (Nunit, Junit, etc.), storyboarding, agile, RAD, UML, RUP, and so on) and propose how you plan to manage and control the project. Turn estimates above into a Gantt chart or schedule bearing in mind that some activities may have dependencies and some may run concurrently. Appendix A - schedule of Work

## **APPENDIX C - Formal Project Pitch**

### **1 Power Point slides**

Slide 1

“Enhance of teacher-student communication through real-time feedback and its effects on educational curricula change”

IRINA ZUREIQI 000915346 30/11/2015

Slide 2

## Introduction

- ▶ Irina's Magic Solutions
- ▶ We're an e-learning company that believes in the pedagogical benefits of interactive response technology. We manufacture industry leading hardware and software solutions developed to enhance learning at all levels
- ▶ Video link [click here](#)

Slide 3

## Student Feedback system

Preview shows as following

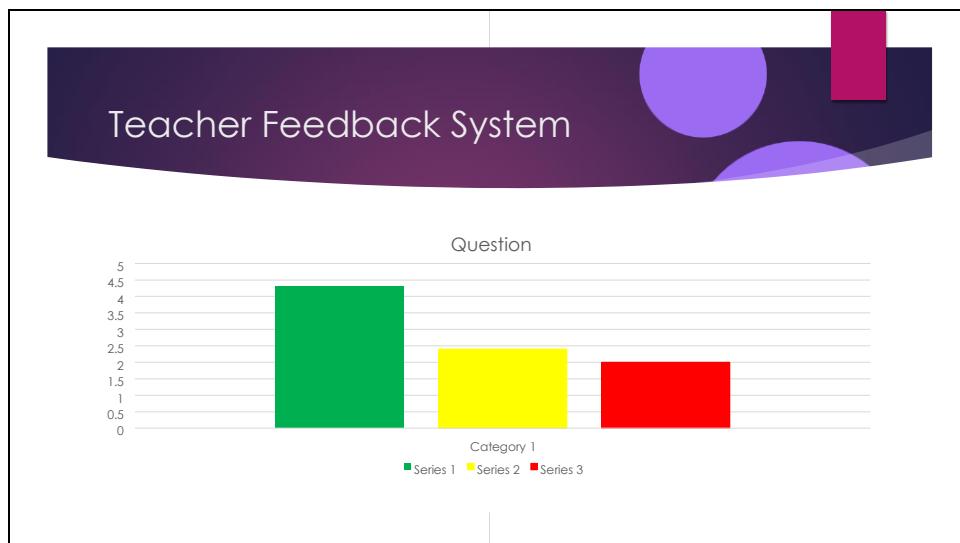
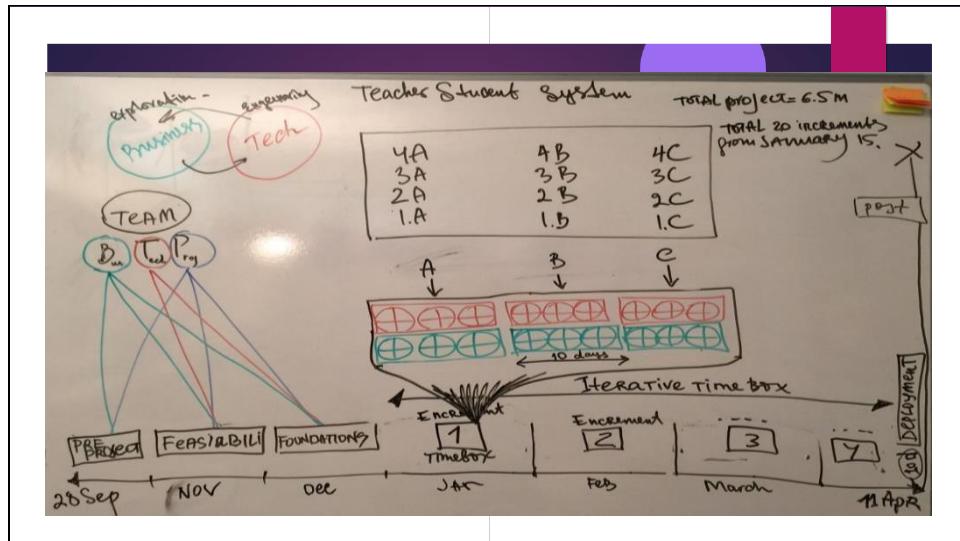
The slide displays four sequential screenshots of a student feedback system. Each screenshot features a dark purple header with the text "Select your Lecturer \* Please Select Option" and a "UK LEARN ACADEMY" logo. Below the header, the question "Do you understand? (specific topic)" is displayed, followed by a rating scale from 1 to 5. In the first three screenshots, the rating is 1 (red). In the fourth screenshot, the rating is 5 (green). The second screenshot also includes the text "Please select your answer". The bottom right corner of each screenshot shows a "Powered by SurveyC" watermark.

Slide 4

## Literature Review

- ▶ Educational
- ▶ Technical
- ▶ Project
- ▶ Point of view: student, teacher and institution
  
- ▶ Research on current technologies

Slide 5 Slide 6



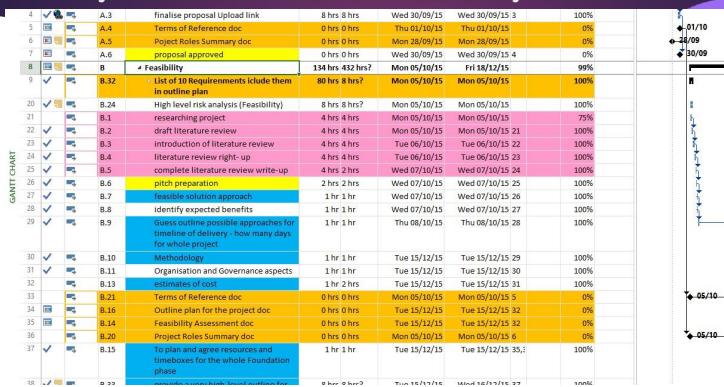
Slide 7

Slide 8

## Benefits

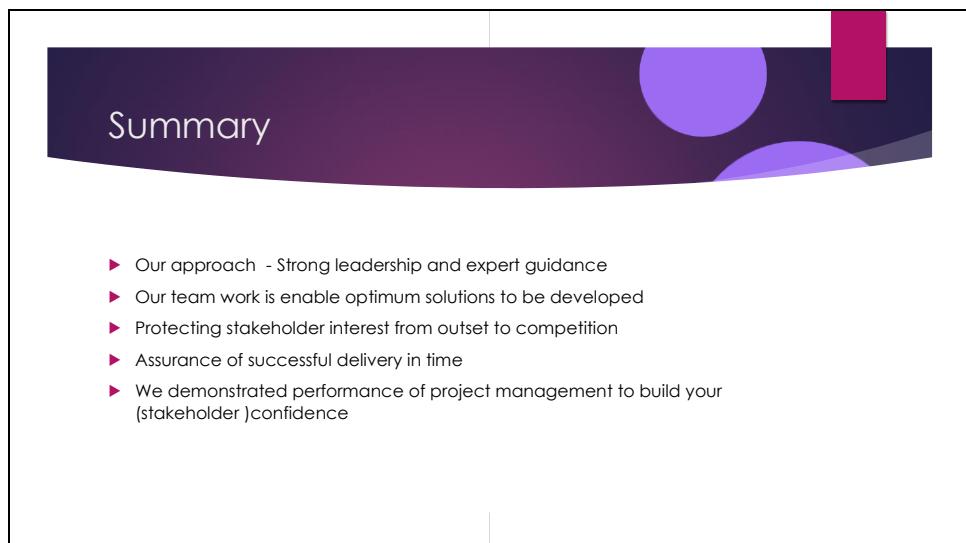
- ▶ Strong leadership from start to finish
- ▶ deliver to deadline
- ▶ Within your budget
- ▶ Enhance your performance and marking time
- ▶ Improve student awareness of their commitment and ..... Knowledge gained
- ▶ collaborative communication through out of the project
- ▶ system that respond to business change
- ▶ Seamless integration with the University
- ▶ **The best people, every step of the way**

## Project Plan – Microsoft Project Tool



Slide 9 Slide 10

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## Summary

- ▶ Our approach - Strong leadership and expert guidance
- ▶ Our team work is enable optimum solutions to be developed
- ▶ Protecting stakeholder interest from outset to competition
- ▶ Assurance of successful delivery in time
- ▶ We demonstrated performance of project management to build your (stakeholder )confidence

Slide 11

## 2 Project pitch preparations questions and answers

### My project Pitch

**Location:** The University of Greenwich

**Date:** 14<sup>th</sup> of December 2016

**Time:** 2:30

**Present:** Irina Zureiqi, Keeran Jamil, Aditi Rawal

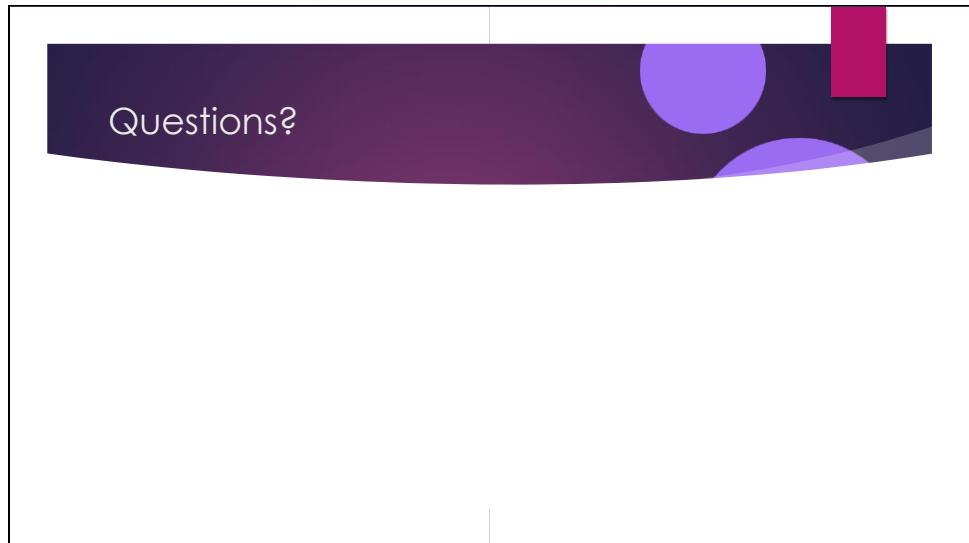
**Recourses:**

Laptop

PowerPoint

---

<b>Number</b>	<b>Requirement</b>	<b>Moscow</b>	<b>Allocation time</b>	<b>Actual time</b>	<b>Pass/Fail</b>



f	<input type="checkbox"/> Right answers to possible questions on	Could	1 hour	2 hours	Pass
---	---	-------	--------	---------	------

Gantt chart

Project proposal

Literature review

Research

My implementation Drawings

Hand in in PowerPoint to Keeran Jamil

**Preparation:** 21<sup>st</sup>

November 2015 **To**

**do:**

	my pitch presentation				
2	<ul style="list-style-type: none"> <li><input type="checkbox"/> Take old project report and adjust appropriately to the new project using maximum information.</li> </ul>	Could	30 minutes	30 minutes	Pass
3	<ul style="list-style-type: none"> <li><input type="checkbox"/> Look at assignments of distributed application you UML diagrams and relate them to your project.</li> </ul>	Could	1 hour	1 hour	Pass
4	<ul style="list-style-type: none"> <li><input type="checkbox"/> Complete Project management Gantt chart with correct deadlines to prove you can do it.</li> </ul>	Must	3 hours	3 hours	Pass
5	<ul style="list-style-type: none"> <li><input type="checkbox"/> Find five positive and five negative articles or books for literature review and read them.</li> </ul>	Must	3 hours	3 hours	Pass
6	<ul style="list-style-type: none"> <li><input type="checkbox"/> Research current technologies and compare them to each other.</li> </ul>	Must	3 hours	3 hours	Pass

7	<input type="checkbox"/> Based on current technology offer design of your system (include in your project proposal).	Must	2 hours	2 hours	Pass
8	<input type="checkbox"/> Rewrite implementation stage idea in project proposal.	Must	1 hour	1 hour	Pass
9	<input type="checkbox"/> Print final contextual (initial) report and highlight main topics to do.	Could	15 minutes	15 minutes	Pass
10	<input type="checkbox"/> Complete writing conceptual report.	would	2 days	2 days	Pass
11	<input type="checkbox"/> Upload documentation to the project upload after pitch is accepted.	would	15 minutes	2 hours	Pass

**Preparation to answer the following questions:**

**17 IS YOUR IDEA WORTH PURSUING? WITHIN A SPECIFIC TIME? RESOURCES AVAILABILITY?**

As a company director of Irina's magic solution Ltd I am going to I am convince you that my product idea is worth pursuing as well as possible to deliver within the time as well as resource are available. Proposed outcome of my idea has worth because it will meet the requirements of the project and it will prove to be feasible. My project idea is what I have always wanted to do and this makes me feel good about myself. There are tasks in my project that I don't like that I am going to do them knowing they are relating to the bigger picture. By working together with their departments related to the outcome of my project. It will be possible to achieve good result with a smile on my face.

Project management staff as well as software development staff are the key players in delivering the product. In this instance I have no choice as to show my knowledge of all the key players.

### **What progress have you made?**

For the past ten weeks I was working on my project. At the beginning I was passionate about two possible projects ideas (A and B) and had been choosing one of them based on a large number of interviews and feedbacks from potential users and experienced teachers as well as University programme leader and supervisors on a weekly basis. Initial project idea outline was emailed to project supervisor. After a communication issue due to a misunderstanding I led to believe that my idea will not be supported, therefore, a new idea was evolving nevertheless, still within student teacher communications in educational environment. Three weeks ago final idea (C) was accepted by supervisor and immediate appropriate steps were taken with speedy recovery. Project proposal was made and uploaded for acceptance. Formal verbal feedback was given by two supervisors and thumbs up to go ahead. Since then I was working on aims and objectives, specifying what methods will be used, and illustrating idea drafting design.

I have engaged in activities to the best of my ability that advance my overall purpose in my project. I know what my project is and what I should do.

## **18 CAN YOU ILLUSTRATE YOUR IDEAS?**

I have come up with different implementation ideas and had to evaluate my knowledge in order to deliver my product on time. Number of UML diagrams was made for different implementations in order to see feasibility and time needed in each one. Logbook of the day-to-day progress was documented that included lecture materials, templates, tutorials and my own research.

### **What working methods will you use?**

Based on past experience in project management. The following methods will be used:

DSDM Atern

Prototyping

Moscow

Moscow prioritisation

JAD

### **How does it address the problem that I have defined?**

Followed my iterative thought out incrementing development of the specifics of my idea in the day-today basis. I have come to the conclusion and defined exact problem that needs to be solved. This was documented in my proposal in full detail. Aims and objectives were identified, and time allocated to each one.

## **19 HOW CAN YOU PROVE YOUR THEORY IS WORTH?**

Followed objectives research in educational, technological and project management sectors there is clear literature, articles, websites and books available on each objective. Based on the literature review, such as about consolidating feedback and change the lesson to suit the flow of the students, stated that teacher needs to change performance based on the feedback which indicates without feedback there will be no change. This lead me to believe that the new system will benefit not only students, teachers as individuals, but also student and teacher communication in the real-time as well as possibly have impact on educational curricula change.

## **20 WHO IS YOUR POTENTIAL AUDIENCE?**

In the real-time feedback system between teacher and student the audience is divided in many parts:

- Students who is using the system to give teacher feedback via their device
- Teachers who are receiving feedback and be able to adjust their performance in the real-time
- Educational Head who can see the produced results in order to make changes to educational curricula if needed.

### **How did I gather my requirements?**

My requirements of the project management and the product. I came from past experience, interviews, research and common sense. There are functional and non-functional requirements that are carefully planned using appropriate methodologies for requirements gathering. All listed requirements are smart using Moscow and prioritised using 80/20 rule of time management, where 20% of my effort will produce 80% of the requirements results.

## **21 HAVE YOU DONE APPROPRIATE RESEARCH?**

Blocks was read, articles found, interviews performed, transcripts noted

## **22 AM I ABLE TO MEANINGFULLY APPLY MY RESEARCH IN TO MY PRODUCT IDEA?**

I have to take to consideration research that already been done, such as cups system using within primary school, traffic light systems using in educational environment. I have documented what is available, and for what purpose, and who is it been used by. By looking at how can I improve what's already been done I have meaningfully applied new ideas into my product.

### **Who are the key players in your area?**

The key players in my area are companies providing similar system but for different purpose, Internet. Other organisations that are using the real-time feedback systems such as who wants to be a millionaire audience feedback, TV show X factor feedback.

## **23 AS FAR AS MY RESEARCH I CAN SAY THAT MY PRODUCT IS NOT USED AT SCHOOL.**

### **Who are the practitioners/theorists?**

The Practitioners who used similar system and theorists who write about it. This system was used at school, but in physical form such as cups, cards or visual display on iPads.

### **What are the most influential cultural contexts?**

Different nationalities in UK will use common language by pressing a button, there's no need to speak in English by using my product.

### **How does my idea fit with my research?**

My idea of a product as a whole will introduce a new way and technique into the student teacher communication in the real-time.

## **24 IS MY PRODUCT FEASIBLE?**

Regarding implementation:

Different implementation ideas, was taking to consideration. In my uploaded project proposal, I have specified implementation of a pen like device that will use Bluetooth to connect to the raspberry pi and using extendable Wi-Fi system sent data to the teacher in real-time. After carefully evaluating this design I have come to the conclusion that it will be not feasible at all because each student must have one pen that connect to one raspberry pi, therefore, two hundred students in a lecture must have two hundred pens, therefore, two hundred Raspberry PIs. Even though it's possible, cost is extremely high and automatically making this design not feasible. Is

Alternative design was evolve based on the costs and careful consideration to each factor that take part in feasibility of the product and project overall.

Create, free download and install application for using in any type of student device such as iPhone, iPad, android, Windows desktop. Teacher can view their outcomes on their computer by accessing URL which enables viewing charts from the database that imports from this student application in the real-time using I cloud. Feasibility, in this case is more appropriate because each student has their own devices, or they can use devices available to them at University. Therefore, there is no need to buy a device. Furthermore, in the future. I think there will be iPads embedded into the student desks so my product could be used in a long run.

### **Is it of ambitious?**

Well, in this scenario this project is ambitious because in reality there will be only one person playing roles, not just of ten departments, but also each person within each department. Taking into account DSDM Atern method that's required parallel tasks performed at the same time, and teamwork as an essential factor to iterative development, feasibility is not ambitious. But again there is only one person in the team which automatically making project ambitious within specified deadlines, unless (not advised) waterfall methodology will be used and real time management will be plan. In order to produce

my software development system, it's not ambitious, but for one person (me) to represent parallel tasks or be in different locations in the same time is not feasible.

Extremely careful planning and use of my own methodology called “MAGIC” will be necessary to use in order to accommodate all those parallel tasks and to deliver a product to specification and time.

M

A

G

I

C

Until full Gantt chart made. There is difficult to say whether this project over ambitious or under ambitious. At the moment I can say that it will be challenging due to the restriction knowledge in distributed software applications as well as SQL database. I will have to take this to consideration and allocate time in my project management for their special staff training in those areas.

## **25 IS THERE A SINGLE FACTOR THAT CAN CAUSE PROJECT TO FAIL BECAUSE OF ITS NOT AVAILABLE TO ME?**

Factors that playing a major role in failure are:

- Staff availability, due to the health issues project can be stalled at times, taking to consideration is one-person project (in teamwork development)
- Time pressure and project scheduling due to not availability of the resource.
- Staff training costs to learn and get knowledge in the specific areas of implementation stage.
- Costs involve in the web hosting.

### **What are my critical success factor of my project?**

The success of actual outcome must match expected outcome which is efficacy of the feedback given by students to the teacher in the real-time among other success factors such as students managed to express their wants and needs and teaches enhance their personal development and both student and teacher communication effective in the real-time.

## **26 DO I HAVE ACCESS TO THE EQUIPMENT (SOFTWARE/HARDWARE) THAT I NEED?**

I have all the necessary equipment that's associated with the project management and software development of the product. However, updated versions from Visual Studio 2012 of the software to Visual Studio 2013 are recommended for the best and quicker outcomes.

### **Do I have the appropriate skills?**

Yes, I don't have appropriate skill in software development and software project management, but additional training will be required in specific areas such as implementation of distributed application.

## **27 DO I HAVE ACCESS TO ANY PEOPLE THAT I NEED?**

Yes, I do have access to any people involved in the project, which is me and myself and I. There also will be an audience, students over eighteen years and less than sixty-five years of age as well as Supervisors at University. for 80% of their support of the 20% of their effort.

### **Do I have access to any locations that I wish to use?**

Yes, I have access to the locations that at the moment I'm aware I need to use. **Do I have access/permissions to use materials that I might need?**

Yes, I do have access and permissions to use materials, but it's less likely that I will use them due to the travelling costs involve between main office and the primary location of the University.

### **What are legal and ethical issues in your project?**

Preserving anonymity of the students and making sure that the means by which the feedback is given is constructive and not in breach of the sound ethical student-teacher relationship. The application must be secure from abuse, malpractice, confirms the data protection principles. There results and data visualisations will undermine the professional integrity of the teacher or lecturer in the classroom or theatre environment. Tested product will have impact on educational and social dynamics of the classroom and possible undesirable outcomes through sound risk management procedures. Besides clearance sought from the ethics committee and explicit explanation of the nature and scope of the project will be thoroughly giving to any individuals taking part in the research when their consent is obtained.

## **28 WHAT STEPS AM I GOING TO TAKE TO ADDRESS LEGAL AND ETHICAL ISSUES?**

In designing the system each legal, social, ethical and professional issues will be taking to consideration which for example, comply with the policies, whether in education, technical or Internet sector. Make a list defining each issue that must be used in the software development product.

### **Documentation includes:**

- Gantt chart
- List of resources and the way you intend to get them from.
- Documents that the required to gain formal REC approval.
- Outline skills that I need and skills that you have two acquire and how I am intent to acquire them.
- Initial planning documents ◦ system development techniques ◦ tool
  - class diagram
  - use case diagrams
  - entity relationship diagrams
  - rich pictures

- storyboards
- wireframes
- other

## **29 PITCH PREPARATION TECHNIQUES**

Did I use random audience to pitch your project and analyse feedback given to improve?

What time it took to present your project idea?

Did I use documents to back up what I was saying?

Did I pick up the most important points to get across?

Did I repeat myself or get bogged down in details?

Did answer all the questions during the question time?

Was I organised?

## **30 DID MY AUDIENCE UNDERSTAND MY INTENTIONS?**

Did I know about my topic area?

Did I speak clearly and knowledgeably?

Did I convince them that I have done work and I am more living in the right direction?

Did I have a clear plan for my product?

Did I demonstrate that I will be able to achieve to the deadline?

Most importantly, did I explain how my product extends my understanding of my project topic: enhancement of teacher-student communications through real-time feedback and its effect on educational curricula change? Would they invest in my product?

**If you have one negative outcome of the above questions, you must do the pitch again to their random selected audience.**

Did I correct my mistakes from the feedback received from my audience?

# **APPENDIX D - Technical documentation**

## **1 How to open Node.js project**

You must have Visual Studio 2012 installed as well as Node.js on the system.

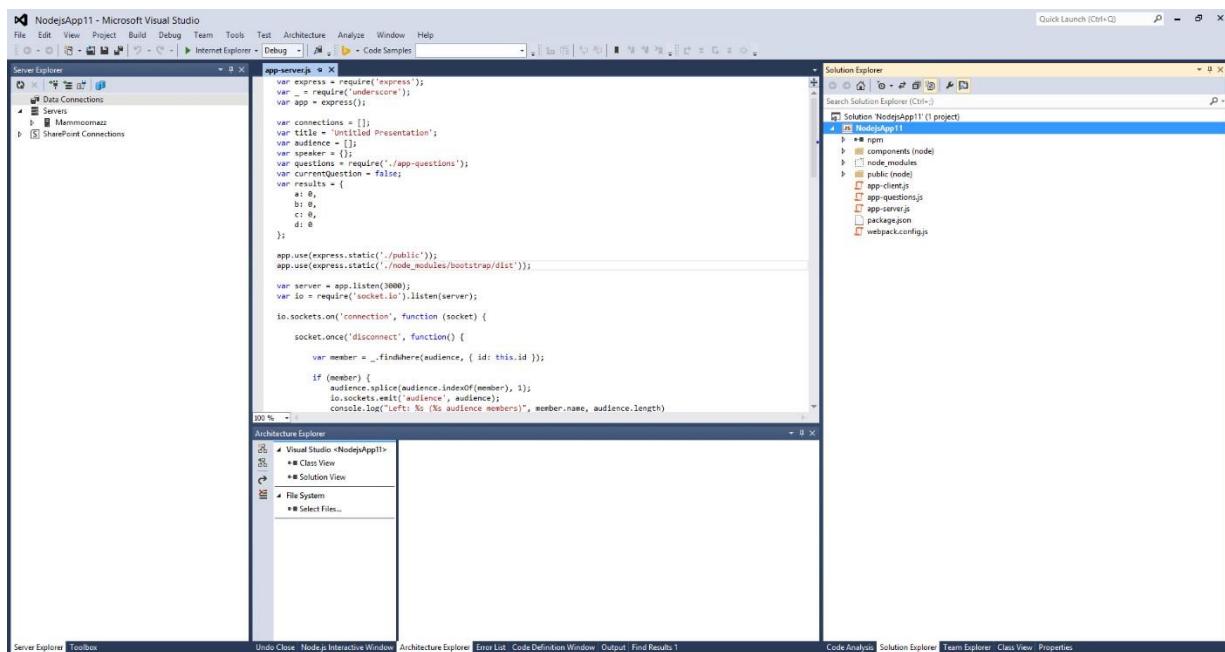
To run this web application please download N.7z or N.zip and extract folders and files to your directory.

You will see the following files in folder named N.

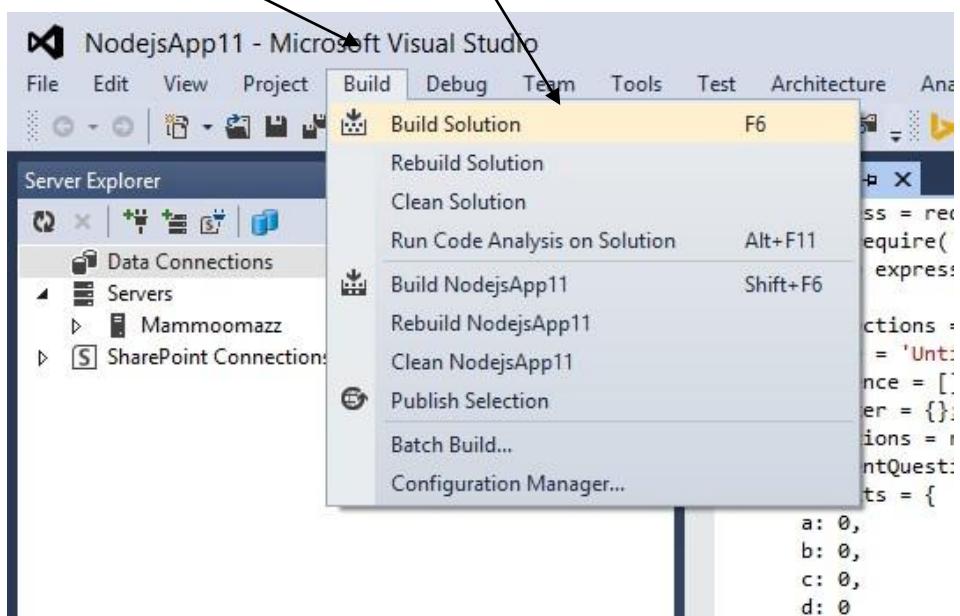
New Volume (D:) > UNI > P				
	Name	Date modified	Type	Size
	App_Data	04/03/2016 03:35	File folder	
	bin	04/03/2016 05:06	File folder	
	obj	04/03/2016 05:06	File folder	
	.ntvs_analysis.dat	04/03/2016 05:00	DAT File	283,875 KB
	NodejsApp11.njsproj	04/03/2016 03:45	Node.js Project	5 KB
	NodejsApp11.sln	04/03/2016 03:40	Microsoft Visual S...	1 KB
	NodejsApp11.v11.suo	05/03/2016 13:19	SUO File	27 KB

Click on NodejsApp.sln to open project in Visual Studio 2015.

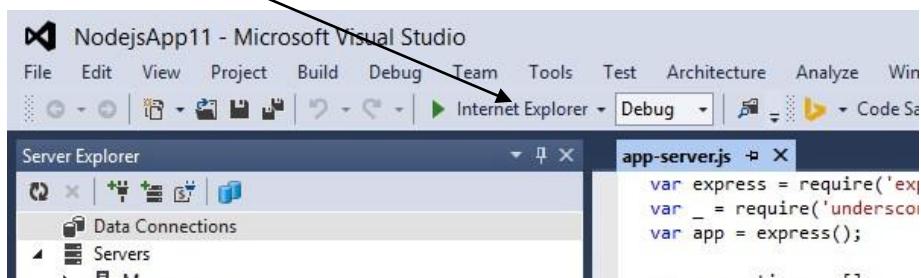
The following screen will be displayed.



Click on Build. Click on Build Solution.



Click on Internet Explorer to run host



Open Chrome browser and type: localhost:3000

The webpage will be displayed

## 2 Hosting Node application on IIS

URL: [www.flawlessweb.azurewebsites.net](http://www.flawlessweb.azurewebsites.net)

Hybrid connection

```

1 - {
2   "id": null,
3   "name": "FlawlessWeb",
4   "type": "Microsoft.Web/sites",
5   "location": "West Europe",
6   "tags": null,
7   "properties": []
8 }

```

Benefits of running Node.js on Windows Azure showing on figure 60. Node JS requests processing flow, where iisnode is the enabling component that wires are HTTP.sys on Windows with the collection of Node.exe through named pipes. At run time, Windows Azure Web Role gets translated to a Windows server instance and hence it uses the same iisnode for enabling the automated running of Node applications on Windows Azure. The following schematic shows the request processing architecture of Node.js with http.sys buffering.

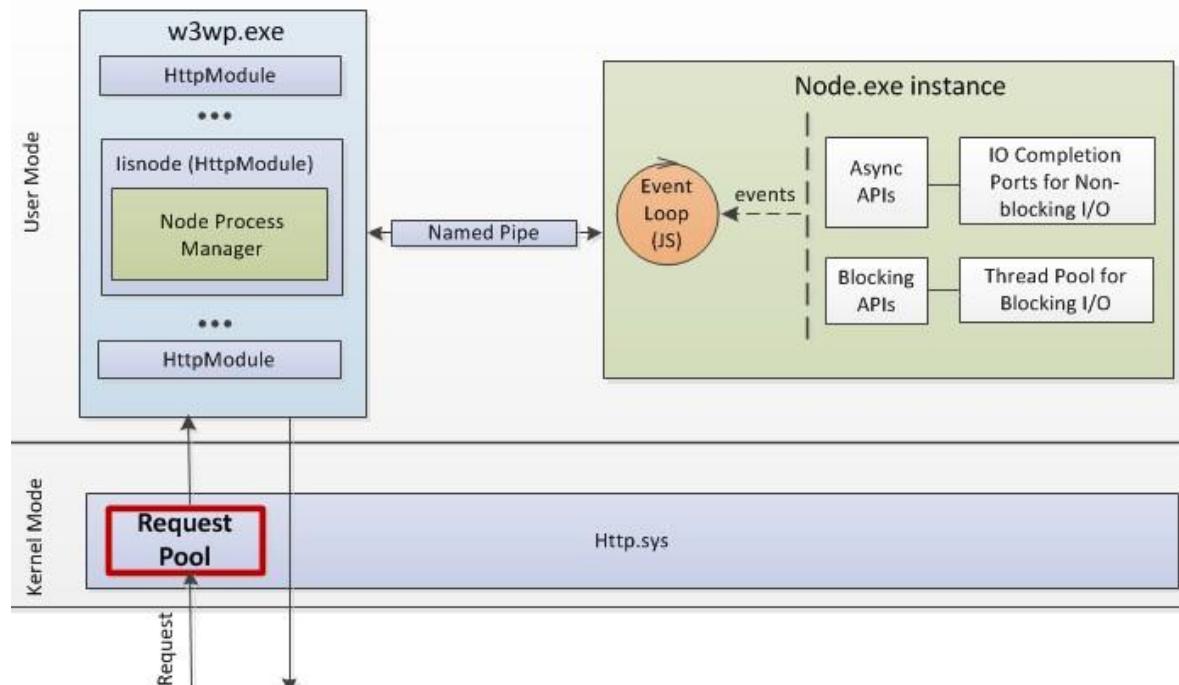


Figure 60. Azure Web Role

When a node JS website receives a request for a webpage, iisnode will spawn a node.exe process. Even that's not already done it will form a day HTTP requests through a named pipe. Node.exe will process the corresponding JavaScript file and send the response back to the web browser iisnode and http.sys. When the request and rides into the Azure service instance, http.sys is pulling them in a kernel mode request buffer before forwarding them to the Node.exe instance. http.sys a request buffering architecture will help with fuel were server errors on the high traffic websites.

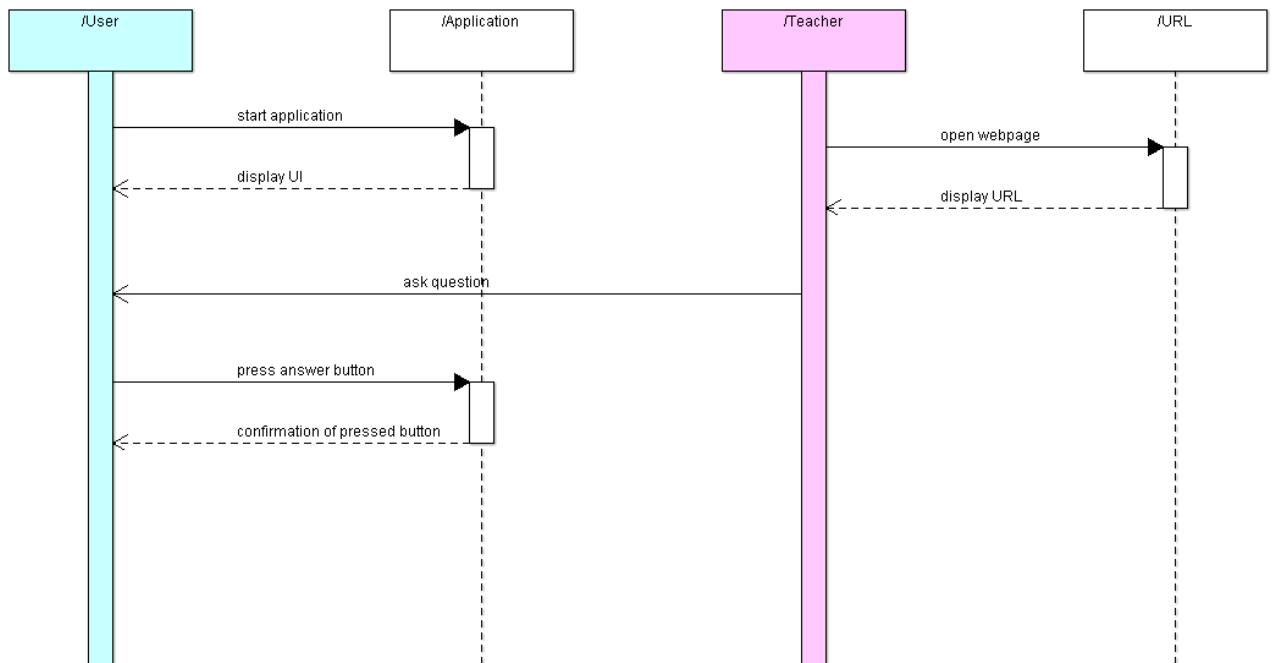
Web source controls:

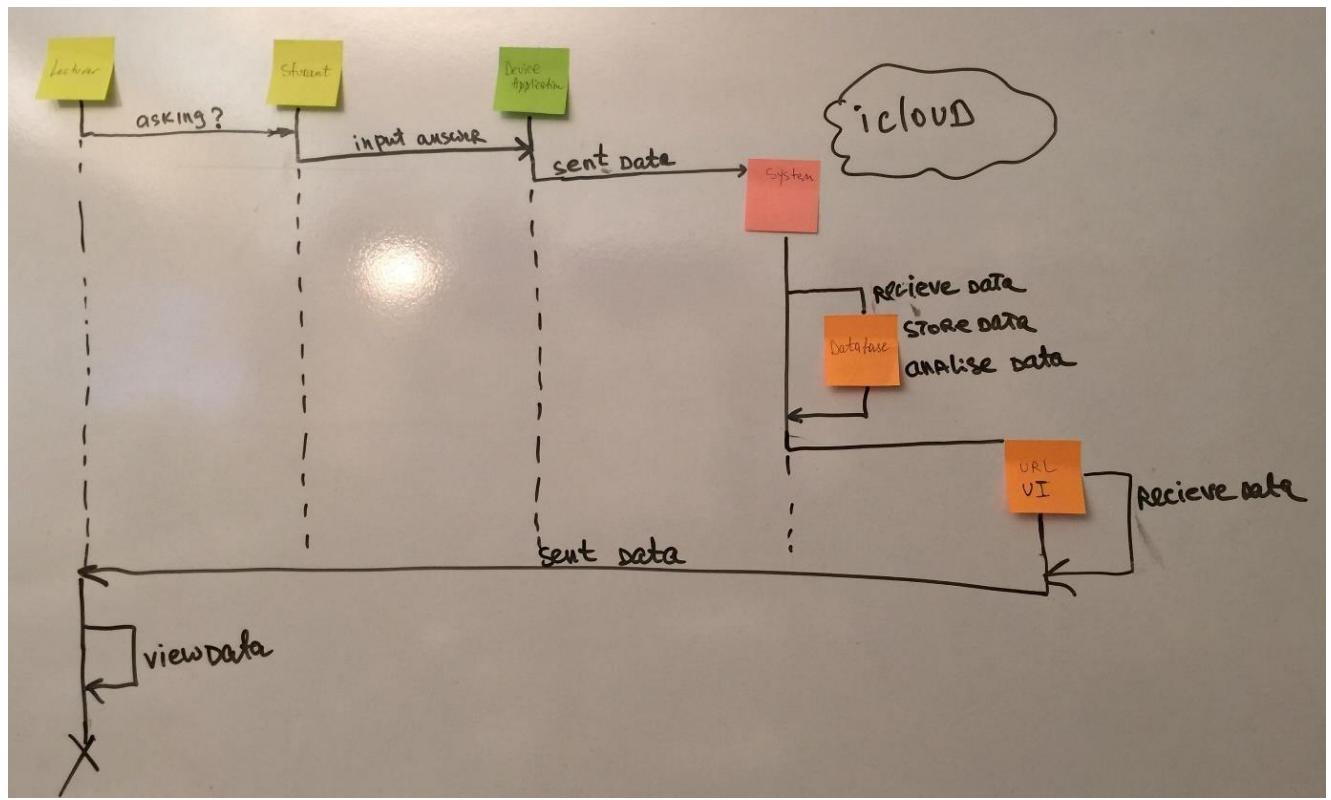
```

1  {
2      "id": "/subscriptions/c6093e40-ed94-4bdc-98ec-d86af9c91729/resourceGroups
3          /Default-Storage-WestEurope/providers/Microsoft.Web/sites/FlawlessWeb/sourcecon
4              trols/web",
5      "name": "FlawlessWeb",
6      "type": "Microsoft.Web/sites/sourcecontrols",
7      "location": "West Europe",
8      "tags": {
9          "hidden-related:/subscriptions/c6093e40-ed94-4bdc-98ec-d86af9c91729
10         /resourcegroups/Default-Storage-WestEurope/providers/Microsoft.Web/serverfarms
11             /Flawless": "empty"
12     },
13     "properties": {
14         "repoUrl": "https://github.com/Discostar/MyNode",
15         "branch": "master",
16         "isManualIntegration": false,
17         "deploymentRollbackEnabled": false,
18         "isMercurial": false,
19         "provisioningState": "Succeeded"
20     }

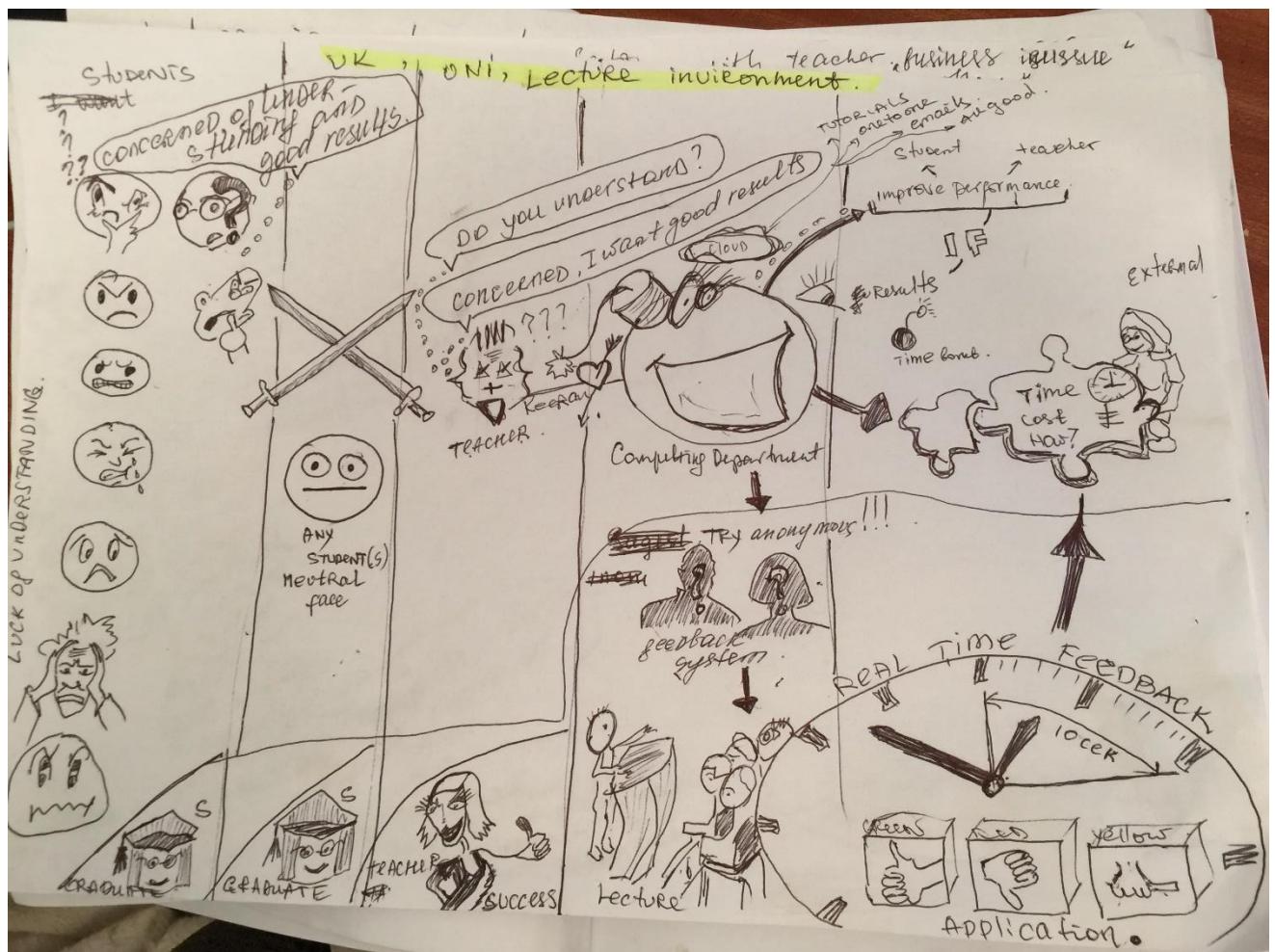
```

### 3 Sequence diagram





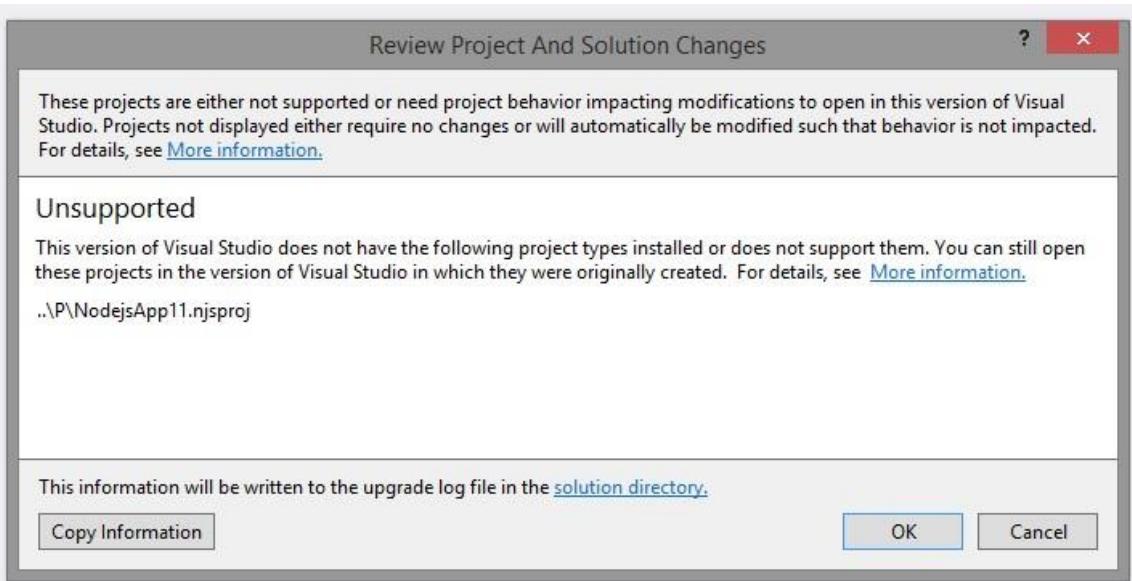
## 4 Rich picture



## 5 Source code

Source code of the main application files.

**30.1.1 Problems you might face when opening this project** When project is not opening. Click OK.



Result below

## Migration Report -

### Overview

Project	Path	Errors	Warnings	Messages
✗ NodejsApp11	NodejsApp11.njsproj	1	0	0
✓ Solution	NodejsApp11.sln	0	0	1

### Solution and projects

#### NodejsApp11

Message

✗ [NodejsApp11.njsproj](#): The application which this project type is based on was not found. Please try this link for further information [4645-B42D-1CCCA6BD08BD](#)

#### Solution

Message

ⓘ [NodejsApp11.sln](#): The solution file does not require migration.

ⓘ [Hide 1 additional messages](#)

Sorted by opening new project Node.js that's giving option to upload files but it will not let me to deploy to Azure because web.config is missing.

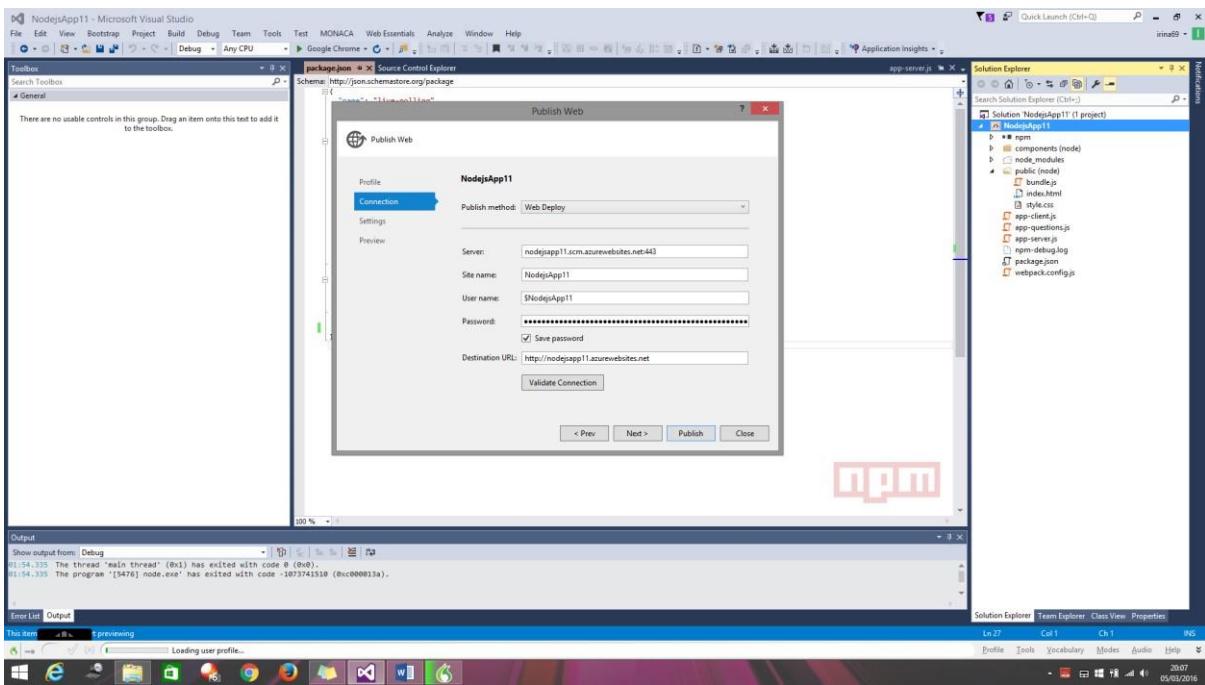
Deploy – publishing

In the solution Explorer, right click on NodejsApp11

Select option publish

Choose publish with Azure Web application option login to Azure

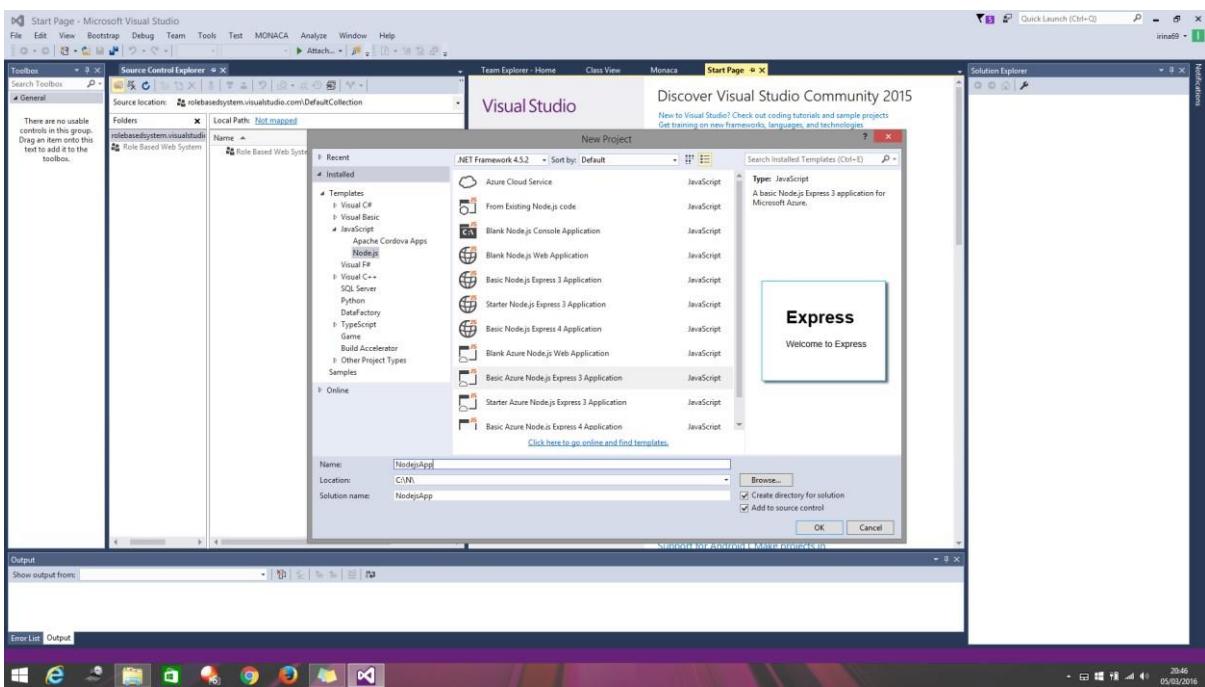
Choose the project you want to publish, which is NodejsApp11 the following screen will be displayed



Error:

web.config not found in project, to create a project to deploy to Microsoft Azure you must create an Azure Node.js project.

I start over: I have used the following

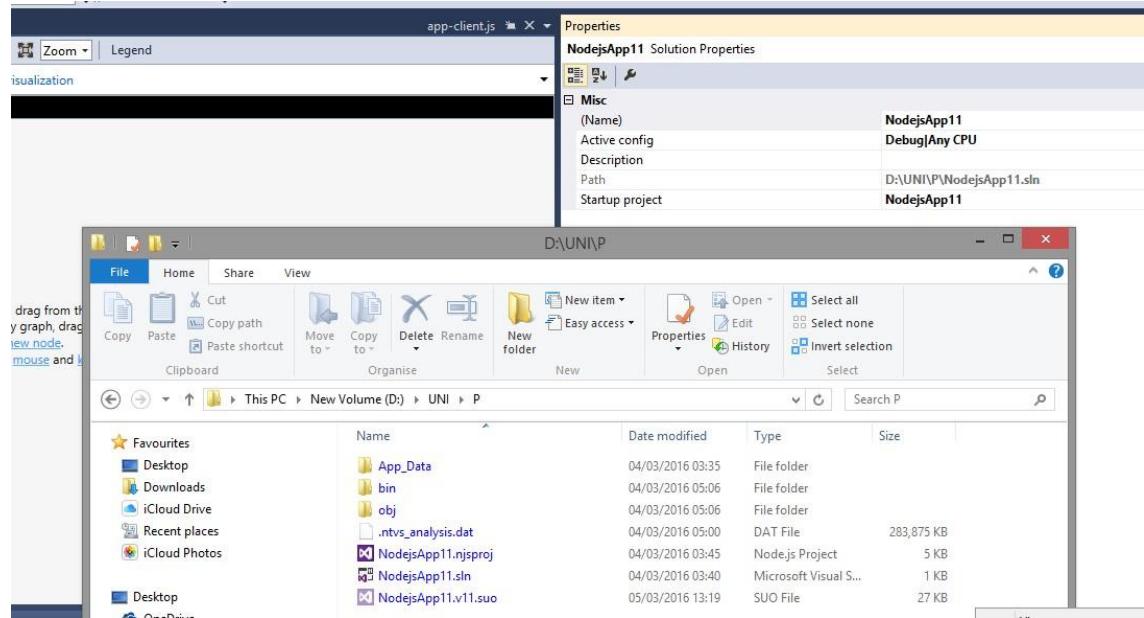


## 6 Resolution to error:

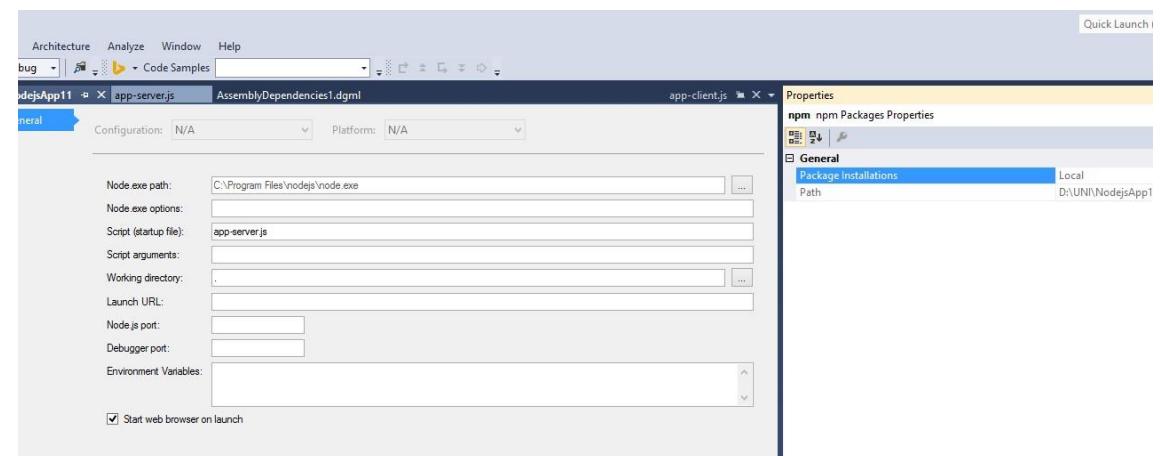
N VS2012 install tool npm

To migrate to other VS set solution properties correctly. Folders should much directory where they are.

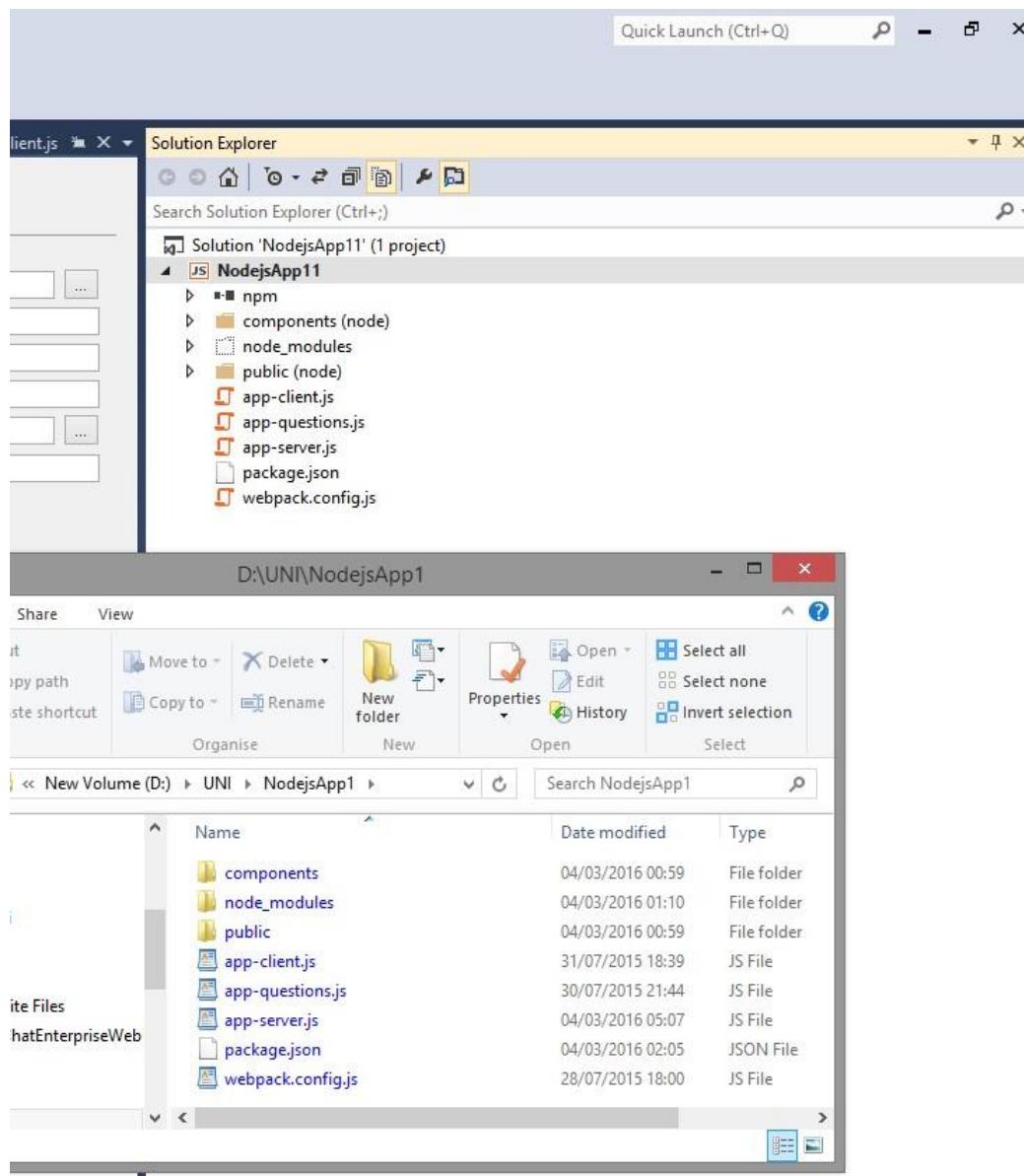
### Project Solution Properties



### And Node.js App properties



Every folder and files that are including in the and NodejsApp location



Evaluation is that Solution is in the directory: D:\UNI\P

And nodejsApp11 path:

C:\Program Files\nodejs\node.exe

And all dependency is in

D:\UNI\NodejsApp1

To link them together:

1. Download node.js from node.org

<http://archlayerspatterns.codeplex.com/> tool to allow architecture of the solution to be displayed.