WJEC GCE Computing CG4 - Extended Project

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Contents

Part I

Analysis

This initial part of the documentation features detailed information on the analysis that was performed on the business. It includes background information pertaining to the business, as well as an in-depth investigation on the current system in place, featuring questionnaires, interviews, and observations. Also included is a problem definition, wherein the broad aims of the project are outlined; this definition also makes reference to the limitations of the solution. Finally, detailed objectives are clearly laid out, providing an overview of exactly what the solution should achieve.

1 Background

1.1 About the Business

The Priory School is a medium sized secondary school located in Shrewsbury, Shropshire. The school is a founding member of the Salop Teaching Alliance, and employs over 100 teaching staff, with approximately 900 pupils on roll. Pupils range in age from 11 - 16, and each belongs to an individual form group. During it's previous two inspections, Ofsted judged the school to be Outstanding, the highest possible rating. Additionally, the school has the highest attendance rate in the county, and achieves exam results well above the national average.

A change of leadership in January 2015 resulted in the previous headteacher, Ms Candy Garbett, leaving the school; Mr Michael Barrett, previously of Adams Grammar School, Newport, became the new principal. Following this change in leadership, the school has sought to embrace the advantages of technology, and has invested in several new systems, including an online homework tracker, a virtual learning environment, and a library tracking system. This newfound acceptance of technology opens the way for this project.

1.2 About the Project

Like many schools, The Priory School makes use of a form time in the afternoon. During this process, students are registered, bulletins are read out, and a timetabled activity is carried out; these activities usually include silent reading, a group debate, and quizzes. These quizzes are usually designed by the head of year, and include a range of topics, from current affairs, educational matters, and simple trivia.

Currently, these quizzes are delivered to the forms on a Microsoft Word document, via the school's LAN. The members of the form work together to arrive at what they believe to be the correct answer, and once all questions have been answered, the form tutor marks the quiz and returns the result to the head of year, usually orally. Which would aid in following the school's new policy of "togetherness".

2 Investigation of the Current System

This section details the in-depth investigation that was performed on the current quiz system used by the school. Initial contact with the school was made via an email to one Mr Nick Bucknall, currently head of Year 8, on the 30th June 2015. Following a brief email exchange, the details of which can be found below, Below can be found the different aspects that were investigated.

2.1 Interviews

A number of interviews were held with staff at the school. Three form tutors were interviewed, in order to gain an insight into how they believe form times could be improved through the use of interactive quizzes, and to get an idea of how they would like such a system to work. Additionally, Nick Bucknall, a head of year at the school, was interviewed; he was chosen in order to gain information on what results the system should calculate, and how best to integrate such a system within the school. He was also chosen to get a further idea of the faults with the current system. Full transcripts for each of the interviews are included below.

2.1.1 Bryan Warr

2.1.2 Katrina Smith

2.1.3 Wendy Blower

2.1.4 Nick Bucknall

2.2 Questionnaires

An online questionnaire was created for students of the school to fill in, detailing their opinion on form times, how it could be improved through the use of quizzes.

2.2.1 Questions

The following questions were included on the questionnaire, distributed to students at the school:

1. How satisfied are you with your current form time experience? 1 2 3 4

2. "My form times are always well structured." How far do you agree or disagree with this statement? 1 2 3 4 5

3. Out of the following activities you selected, which do you enjoy the most?
   - •Silent reading
   - •Knowledge quiz
   - •Group discussion
   - •Board games
   - •Physical activities
   - •Other

4. Approximately how often do quizzes feature in your form times? 1 2 3 4

5. "My form times would be improved if we did quizzes more often." How far do you agree or disagree with this statement? 1 2 3 4

6. "I find that quizzes improve the relationship between me and the rest of my form" How far do you agree or disagree with this statement? 1 2 3 4

7. Which topics have you been given quizzes on? Select all that apply.
   - •General knowledge
   - •Media
   - •Sports
   - •History
   - •Literature
   - •Relationships
   - •Brainteasers
   - •Other

8. To what extent do you interact with other forms in your year during form time? 1 2 3 4

9. Do you believe form times would be improved by interaction with other forms? Yes No

10. If you wish, please expand on your answer to the previous question.

2.2.2 Results

The following results were collected after the quiz had been live for 10 days. They were automatically generated using the

2.3 Observations

Having been a member of the school community for over five years, I am well placed to provide an observation on how the school currently goes about creating, setting and analysing quizzes used in form times. Currently, no formal system is in place; an ad-hoc system is used, following this general pattern:

1. The head of year creating the quiz thinks of a set of questions and possible answers, usually following a theme, and then writes them down on a Microsoft Word document. The correct answer is marked out, to aid the form tutor in marking the quiz. This document is then saved to a drive on the school's LAN.
2. The head of year then notifies the individual form tutors of the quiz, usually at one of their weekly meetings, and tells them to conduct the quiz with their form group on a certain date.
3. When the date is reached, the form tutor opens the document from the network, ensuring that the document is kept hidden to avoid members of the form viewing the correct answers.
4. The form tutor reads each question out in turn, and the members of the form work together to attempt to work out the answer. They either come up with their own answer or choose from a list of options, depending on whether or not the question is multiple choice. The form tutor marks down the answer they chose, and this process repeats until the quiz is completed.
5. Once all the questions have been answered, the form tutor adds up the total number of marks achieved by the form.
6. The form tutor then passes the mark onto the head of year, either by email or when passing them in the corridor or the staffroom. This task is sometimes performed by a member of the form themselves, occasionally with the expectation that the mark achieved will be exaggerated somewhat.
7. After receiving all the results, the head of year works out which form achieved the highest result, and which the lowest. This result is reported back to the year in the weekly assembly, often with a small reward for the highest achieving form.

2.4 Document Inspections

2.5 Similar Systems

There are a number of systems available, both free and at a cost, that would allow the school to improve their current method of quiztribution (*quiz distribution*). Several popular options are outlined below.

2.5.1 Quiz Creation Websites

A number of websites exist that allow users to design, play and share their own quizzes. These websites, including *QuizWorks*, *ExamTime* and *QuizBean* generally follow the same pattern: the user creates an account, is directed to an interface wherein they can design a quiz, and is then given a link with which they can share the quiz with others. For basic quiz creation, these websites are free, though for more advanced usage (*QuizWorks* defines an "advanced" quiz as one containing more than 15 questions), paid plans are available.

As these systems are websites, they can be accessed from practically any computer or mobile device, as long as there is an internet connection in range. This means that users can continue to work on their quizzes, whether designing or answering them, outside of their place of work.

Though these systems are undoubtedly useful, and could, with a few compromises, be easily integrated into the school's routines, they lack an awareness of the structure of a school. There is no concept of "form groups" or "heads of year", both are which are vital concepts if the system is to meet what the school desires. Additionally, they lack the ability to display a detailed analysis of the results (at least, not without paying a somewhat exorbitant fee - £60 per month in the case of *QuizWorks*), a side effect of their focus on individuals as opposed to groups.

2.5.2 Quiz Creation Software Packages

Similar to quiz creation websites, quiz creation software packages allow the user to design and play a quiz. However, these systems are desktop applications (the majority are designed for Microsoft Windows), and so can only be accessed from a single desktop or laptop system. Examples of these systems include *Wondershare Quiz Creator*, *Tanida QuizBuilder*, and *Articulate Storyline 2*. Unlike the mostly free websites, these software packages are often very expensive: the three systems mentioned range in price from $99 - $1846 for a single license, with additional licenses costing even more.

To compensate for the high prices, these desktop applications contain a vast feature set. Quizzes of every imaginable type can be created, from drag-and-drop,

multiple choice, word bank quizzes, and many more. Images can be included, points assigned, and complex animations can be set to make the quiz as visually appealing as possible. In addition, reports can be generated with tremendous amounts of data, showcasing practically every data point imaginable.

Useful though these features are, they are a touch overkill for what the school's purposes. The systems are not the easiest things to use in the world, something that, considering the teacher's relative lack of IT skills, is quite a drawback. Additionally, the high costs make the systems prohibitively expensive, considering the school's status as the worst funded school in the county.

2.5.3 Quizdom

2.6 Justification of Methods

2.7 IPSO Chart

This IPSO chart describes the inputs, outputs, storage locations and general processes that are associated with the system.

Inputs	**Processes**
Full name Password Form name Quiz title Quiz questions Quiz answers Forms the quiz should be sent to.	Create HOY accounts from inputs Create form group accounts Create and store quizzes Allow quizzes to be answered by forms and store answers. Prevent quizzes from starting unless all forms have joined. Mark quizzes and analyse results.
Storage	**Outputs**
Store user accounts Store individual quizzes with answers. Store mark for quizzes. Store analysis of results.	Quiz containing questions and answers. Analysis of quiz results.

Table 1: IPSO Chart

2.8 Limitations of Current System

There are evidently a large number of issues with the above method. Firstly, distributing the quizzes via a word-processed document is not a particularly efficient method. It results in the network drive being cluttered with a variety of documents, perhaps with a non-existent naming scheme. This makes it harder for the form tutors to find the correct quiz for the week, slowing the whole process down. A more effective solution would be to have everything in it's own self contained system, with its own dedicated quiz screen, which points out the correct quiz to the tutors.

Additionally, having the questions and possible answers on the same document puts the integrity of the quiz at risk. Currently, form tutors get around this by hiding the document, but this can cause complications where students forget the possible answers, as well as other issues. It word be far more effective to always have the quiz displayed on screen on the interactive whiteboard, but the current system prohibits this.

Often, teachers forget about the quiz altogether, or believe it to be on a different date than when it is actually scheduled. This is a relatively common occurrence, and means that the quiz either has to be rescheduled (which those tutors who did remember find annoying), or that particular form has to miss out on the quiz that week; this can damage their overall reputation in the school community. A dedicated system could provide them a notification, perhaps via an email, that they should hold the quiz that afternoon. Additionally, the system could be set up in such a way that the quiz only begins once all the appropriate forms have connected.

Furthermore, the current system is not particularly fair. Students can spend as long as they wish on a single question, as long as the quiz is completed within the 25 minutes given to the form time. It would be fairer if the form was given a time limit of, say 60 seconds, after which the system automatically moves on to the next quiz.

The current system is also very isolated. Following the appointment of the new principal, the school has sought to implement the principle of "togetherness", whereby students work together more often. Though the current quiz system aligns itself with this philosophy to a degree (each form works together to come up with the answer), it could be improved by allowing a degree of interoperability between the forms. For example, if a quiz was being answered by all the forms in Year 8, one form could be given the opportunity to pose a question to the other forms, perhaps referencing one of the jokes sanctioned by the school.

By allowing the form tutors themselves to mark the quiz, their is a large risk of inaccurate results being reported back, possibly altered in such a way that favours the form. Though this allows the head of year to display trust to his team of form tutors, there exists in the school a very competitive atmosphere, increasing the chance that such malpractice will occur. A safer approach would

be to allow the system to mark the form's answers, and then report this directly to the head of year.

Though the heads of year throughout the school possess many fine and admirable qualities, it would be remiss to apply to them the label of "mathematician". For simply calculating the best and worst performing forms for any given quiz, there are few issues with the current system (though it would be convenient if this was worked out automatically). It is when attempting to work out more complex results, such as the average score of a form over a period of several years, that the humble head of year falls short. A dedicated system would be able to perform a complicated analysis on the entire set of data it collects, allowing for a far more interesting report to be generated. This data could then be presented at an end of year, or even school, assembly, showcasing the best form in each category (or some other arbitrary statistic) throughout their entire school career.

3 Problem Definition

3.1 Broad Aims

The final solution should meet the following broad aims:

1. Allow heads of year to create quizzes for their form groups.
2. Allow these quizzes to be targeted at specific groups.
3. Allow form groups to answer the quizzes using an attractive interface.
4. Mark the quizzes for each form group, and store the results in a database.
5. Provide an in-depth analysis of the quiz results over a period of time, allowing for individual form results to be viewed.
6. Prevent forms from beginning the quiz until all the required forms are connected.

3.2 Possible Limitations

There are a number of limitations that the system will undoubtedly run into, mostly due to the limited amount of time available to develop the application, or because of the complexity of a feature..

One such limitation is the inability to provide an in-depth administration view for the heads of year. Such a view would allow them to do things like update the details of individual form groups, and add new groups through a dedicated interface. Though this would undoubtedly come in useful, and would not be especially difficult to implement, it would take additional time to build and

test, time which would be better spent on improving the core quiz building and answering functionality.

Another feature that the application will not include will be the ability to automatically generate a quiz, using constraints set by the head of year. Whilst such functionality would help save the head of year time - they would not have to spend time creating their own individual quiz - it would be difficult to implement, as an algorithm would have to be written that selects the most appropriate questions for the year group, and so on. It would be a more beneficial use of time to make the actual quiz creation page easier to use, effectively avoiding the problem mentioned above.

Additionally, the application will not include quiz sharing functionality. Several other systems of this type include the ability to upload one's quiz to a publicly available site, allowing others to view and use the quiz. Though, once again, this feature would be helpful - and would actually be trivial to implement - it goes somewhat beyond the scope of the application, targeted, as it is, at a single school. A more suitable feature would be showing a list of recent quizzes and questions.

4 Objectives

They are based on research gathered in the interviews, observations and questionnaires that were carried out on the school, and so present an accurate picture of what the school believes would aid them the most. Certain additional features have been added, as they would increase the utility of the system to even greater heights. If, at the end of development, these features have not been implemented, it would be impossible to refer to the system as a real success.

4.1 Database Functionality

Many of the objectives for the application relate to database usage.

Note: *The acronym* CRUD *stands for create, read, update and delete; this refers to the four standard database operations.*

4.1.1 CRUD Iser Details

The application should include the ability to create, access, update and delete user details in a database. The application should contain the concept of two types of users: heads of years, who act as administrators of sorts, with the ability to create quizzes and send them out to form groups; and individual form groups themselves, who can receive quizzes sent down from heads of years. They should

also be able to create quizzes themselves, but should not be able to broadcast these to other form groups.

4.1.2 CRUD Quiz Details

The application should include the ability to create, access, update and delete quizzes in a database. Each quiz should contain questions and answers, stored in the database using a system of foreign keys. Each of these elements should be individually editable.

4.2 Quiz Creation Functionality

Other objectives center around the part of the application that allows users to actually create their quizzes. This functionality should exist for both types of users, but should be expanded for heads of year, owing to their more administrative roles.

4.2.1 Create Quizzes with Multiple Questions

A graphical user interface should be provided that allows users to construct a quiz. The quiz should have a title, and should contain within it a number of questions, each with an answer, and each provided by the user. Multiple question types should be catered for, to ensure that users are able to full express their quiz in the system. These question types should be:

- Multiple choice - where the user is presented with a question, and multiple answers are provided, only one of which is correct. An example of this would be:

  In what year did World War 2 begin?
  A. 1933
  B. 1940
  C. 1939
  D. 1945

- Select multiple answers - where the user is presented with a question that has multiple correct answers, and has to select all the correct ones. An example of this would be:

  Which of the following are not books by Charles Dickens?
  A. Bleak House
  B. Crime and Punishment
  C. The Idiot

- Type in custom answers - where the user is presented with a question, but is not given any optional answers; they mus type in the answer themselves. An example of this would be:

  What type of language is JavaScript?

  _____

  The correct answer to this question is *programming*, and this would be stored along with the question. If the user were to type in an incorrect answer, such as *scripting*, they would not get the question right, because JavaScript is not, never has been, and never will be, a programming language; indeed, Python is more a scripting language than JavaScript.

This way, users should be able to create any sort of question they wish. The quizzes should also have the ability to add pictures to questions, making it possible to ask such questions such as "which ruthless German dictator is being portrayed in this photograph?"