KV6003 : Individual Computing Project

### Project Terms of Reference

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General Computing Project

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1. Project Title

***Investigate the effective ways to improve hospital/ care-home nurse coordination with the use of a web application.***

1. Background to Project

I have chosen to investigate how medical / care home settings can use modern technology to aid the elderly and hospital patients. Primarily looking at call systems for staff to respond in a timely manner to an incident. A study across 36 hospitals identified three key targets for improving the efficiency of nursing time management: “documentation, medication administration, and care coordination.” (Hendrich, 2008). For my project I will be undertaking the development of a web-based system that will attempt to combat the issue of care coordination in a suitable way.

Nurses spend an average of only 31% of their time with patients and some studies suggest greater use of computers may reduce time spent on non-essential nursing functions. (Hendrickson, Doddato and Kovner, 1990) Undoubtably the use of technology has improved since 1990, however a more recent study (Bagheri Lankarani, 2019) focusing on care coordination and wasted time outlined the need for hospital information systems that can analyse the workload. One of the study’s reason for wasted time was the hospital information systems, showing this trend towards better use of technology is still relevant.

The proposed project is of interest as in the UK there is severe strain on the National Health Service and its resources. Since 1997 the number of nurses leaving the profession has outstripped the number of entrants (B Finlayson, 2002). Leaving less nurses to handle more patients, resulting in less time spent with patients.

This project aims to research and develop a web-based application that could combat the strain on health services by taking advantage of the devices most people already own. Throughout the project it will push me to use everything I know and to learn new things to develop a working product that can be accessible and easy to use for my target audience (staff and people in care). I additionally will explore how my solution could be scaled and configured to a larger user base and used in multiple settings.

The requirement for design is even more specific when creating a system for less traditional or diverse users. The natural process of aging comes with an array of degenerative ability concerns, including visual problems, hearing loss, motor skills may be impaired, and the retention of memory may affect the operation of a new application. Despite these concerns the statistics seem to show an unexpected trend. From 2012 to 2015 elderly (65+) smartphone users have almost doubled in the UK (A Berenguer, 2017). This indicates that as we move into a more technology driven world, more and more elderly people and patients in hospitals will have access smartphones / tablets.

The design of applications for diverse users, such as the elderly or impaired is very important, however the method of training to use the application could be just as vital for specific users. A study (Mykityshyn, Fisk and Rogers, 2002) showed that older participants struggled to retain the training for a home medical device when compared to a younger age group. Additionally when the elderly users were given video training rather than a manual they performed almost as well as the younger age group at retaining the ability to use the device. This shows how a visual tutorial has a greater impact for specific user demographics than plain text manuals.

1. Proposed Work

I will perform necessary research and develop a web-based application/ service that would allow a user to request assistance from a member of staff expanding the existing call system in care homes and hospitals. Where my idea improves on current systems is the request would be made using an application on a smartphone/ tablet and the staff using the same application would be able to see any current requests. This would allow staff with the use of the app to prioritise care and easily see all current requests and how they are being handled in the palm of their hand. Additional optional information could also be sent with the request, for example one patient may be experiencing extreme pain whereas another may have a question for a member of staff, with the system I plan to develop brief information will be available for the staff allowing specific prioritisation as each request happens.

One of the first tasks will involve a questionnaire that will aid the design process. The questionnaire will be targeted at the staff that will be using the web application. This will be crucial in determining the specific functionality of the application as it will be an insight into how the nurses work, but crucially how they can work better with my application.

My literature review will address necessary aspects of the workflow of a nurse to ensure the application is fit for purpose. Furthermore I will need to research the potential issues that may arise when developing an application for the elderly and disabled, for example accessibility and user experience design.

I will generate extensive design documentation that will guide me through the development of the application, giving me specific requirements when programming the front end. During the development of my web-based application I will be using the most relevant methods to achieve my goals. I will be developing the front end of my application using HTML, JavaScript and CSS as I would like to consider multiple browsers and compatibility with devices. My application must be accessible on all screen sizes to encourage easy use for my target demographics.

I will make use of a MySQL web-based database to securely store and access relevant data. In conjunction with the database PHP will be used to deliver the content to the user and encrypt sensitive information to and from the database. Security will be a key aspect of the system as it will be dealing with potentially sensitive data, I will need to overcome this throughout the project.

When the application is at a level where functionality is useable, testing will be very important. Regular testing will help guide any changes as I approach the end of development, this should eradicate any problems that have been overlooked during the design phase. User testing will tie all of the testing together giving a more real world look at how people use my application with very little instruction. My application should be intuitive enough for people to make requests and respond to requests without formal training. So as I develop, I will be thinking of tasks that could be user tested.

1. Aims of Project
   1. Investigate if hospital/care home alert systems could be improved with the use of a web application in line with smartphone adoption trends.
   2. Develop an advanced web service/app to help staff prioritise patient requests in unique hospital and care home settings.
2. Objectives
3. Perform a literature review of HCI and accessibility for the elderly and disabled, to determine the unique considerations for each group.
4. To research relevant information on both staff and patient users to ensure that the application is fit for purpose.
5. Gather information from people with experience in care home or hospital environments using a questionnaire. And ask questions about their workflow and current systems in place for patients to alert a member of staff.
6. Produce high quality design documentation to aid the development of my application. Including wireframes and photoshop mock-ups, as well as technical diagrams to show the movement of data and relationships in the database.
7. Develop an accessible patient call system application interface that is fit for my user demographic. I will use latest trends in design to achieve a visually appealing look.
8. Implement a MSQL database for storing data needed by the application.
9. Securely connect the front end and database to display relevant information from the database in real time.
10. Generate a list of tasks for volunteer test users to perform, testing normal and abnormal use of the application, to ensure it is fit for purpose.
11. To produce a test plan when performing meticulous product testing, and user testing of my application.
12. Evaluate the final application to determine how it meets my brief, taking into consideration all research and requirements.
13. Skills

Throughout the project I will need to rely on many of my skills, many that I have gained from university study and personal development outside of study. Also I may have to build on my skills. Below is a table of the expected skills in this project.

|  |  |
| --- | --- |
| **Skill** | **Acquired / Will Acquire by** |
| Web Programming (HTML, PHP, SQL) | Relational Databases Module (KC4000), Web Programming Modules (KF5002, KF4009), Personal Web Development for Clients. |
| Web Design (Photoshop, CSS) | Personal Web Development for Clients, Web programming module. (KF4009) |
| Research Skills | Most University Modules have included Report/ essay writing. |
| Interpersonal Skills | Effective communication with participants of user testing/ questionnaire. Attained from pervious group tasks and client communication outside of university. |
| Organizational Skills | Previous assignment deadlines have taught me the importance of this skill. |
| Testing code | Testing and profiling Programming throughout University projects. (KF5012, KF5008) |
| User Testing | I will improve my skills in this area by reading relevant books from Northumbria library. |
| Web Security (SSL) | It may be beneficial to learn about the use of SSL to further defend my application. |

1. Sources of Information / Bibliography

Hendrich, A. (2008). A 36-Hospital Time and Motion Study: How Do Medical-Surgical Nurses Spend Their Time?. *The Permanente Journal*, [online] pp.25-34. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3037121/.

Finlayson, B. (2002). Mind the gap: the extent of the NHS nursing shortage. *BMJ*, [online] 325(7363), pp.538-541. Available at: https://www.bmj.com/content/325/7363/538.extract.

Berenguer, A., Goncalves, J., Hosio, S., Ferreira, D., Anagnostopoulos, T. and Kostakos, V. (2017). Are Smartphones Ubiquitous?: An in-depth survey of smartphone adoption by seniors. *IEEE Consumer Electronics Magazine*, [online] 6(1), pp.104-110. Available at: https://ieeexplore.ieee.org/abstract/document/7786986.

Mykityshyn, A., Fisk, A. and Rogers, W. (2002). Learning to Use a Home Medical Device: Mediating Age-Related Differences with Training. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, [online] 44(3), pp.354-364. Available at: https://journals.sagepub.com/doi/pdf/10.1518/0018720024497727.

Hendrickson, G., Doddato, T. and Kovner, C. (1990). How Do Nurses Use Their Time?. *JONA: The Journal of Nursing Administration*, [online] 20(3), p.31. Available at: https://europepmc.org/abstract/med/2313373.

Bagheri Lankarani, K., Ghahramani, S., Roozitalab, M., Zakeri, M., Honarvar, B. and Kasraei, H. (2019). What do hospital doctors and nurses think wastes their time?. *SAGE Open Medicine*, [online] 7, p.205031211881368. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6503588/ [Accessed 19 Nov. 2019].

1. Resources – Statement of hardware / software required

**Microsoft Office**

I will use Microsoft Word for the bulk of the report and appendices, this software is available on university machines and my personal laptop. Microsoft excel will be used for the Gantt chart and any results gathered throughout the project.

**GitHub**

This will be used for version control when producing the web application, this will be beneficial as it will make a backup that is available on any machine and all changes will be logged showing a detailed update log through the project.

**Adobe Photoshop**

This will be vital for producing low and high-fidelity designs of the application I wish to develop. Licensed access to Photoshop is available in the university labs and library.

**Personal laptop**

A personal laptop with access to required software will be necessary as it will give me the freedom to work at home or university on the project.

1. Structure and contents of project report

**Title Page**

Any necessary identifying elements of the report, title, author, module etc.

**Declaration of Authorship**

This is a signed declaration that all of the contents of the report and the work described in it are your own work. It also states ethical guidelines and a description of how the work will be used.

**Acknowledgements**

This section will describe any sources that may be acknowledged in the making of the report, for example companies, my project supervisor or university staff.

**Abstract**

The purpose of an abstract is to provide the reader with essential information relating to the report. It will also briefly summarise the basis of the report, so that a reader can easily determine the contents.

**List of Contents**

A page numbered list of the content within the report, for easier reading and navigation.

1. Introduction

The introduction will provide more information, expanding on the abstract. It will also overview the objectives and give a reason for including them in the report. I will introduce the web application I aim to develop. The aims of the project will be introduced here with a breakdown of how it will be achieved.

1. Analysis

The analysis section will comprise of three chapters, problem identified, Literature review and Software Implementation.

* 1. **The Problem**

First, I will identify the problem area of my project and explore the potential problems associated with the demographics (elderly and disabled) that I will be developing the application for.

* 1. **Literature Review**

In this section I will critically analyse existing research and literature related to the problems explored in the previous section. I will also research potential solutions to the problems in the project area that will allow the application development to take shape. I will use mostly online journals and books available in Northumbria Library for my research.

* 1. **Software Implementation**

This section of the analysis I will explain the choices when developing the web application such as tools and techniques and the rationale when choosing specific languages for development.

1. Synthesis

The Synthesis will consist of three chapters, Design, Implementation and Testing. And will discuss the work carried out to develop my application from an idea to a working tested outcome.

3.1. **Design**

Section will explain the design process in terms of how each aspect of the application relates to my initial brief. Interface Design as well as system design, as it needs to be useable and also fit for purpose (having necessary features).

3.2. **Implementation**

The process of developing the nurse call application including all technical aspects. Such as language choice, coding standards, code concepts as well as the database and security.

3.3 **Testing**

This section will involve the testing of the application throughout development and at the end when test users use my application to ensure it is fit for purpose. Throughout this process I will document any testing.

1. Evaluation and Conclusions

This section will be a summary of all that was achieved throughout the project including specific research and a detailed analysis of the final web application after testing and amendments. It is important to discuss any future direction or considerations attained from the project. Additionally I will relate to the literature that I reviewed earlier in the report using my own results and conclusions.

1. References

A list of references used to validate facts when composing my report using Harvard referencing standard.

1. Appendices
2. Terms of Reference
3. Design Documentation
4. UML Diagrams
5. Code Snippets
6. Test plan and Results
7. Gannt Chart
8. Meeting Documentation / eLogbook
9. Marking Scheme: General Computing Project

**Report: 60%**

|  |  |
| --- | --- |
| **Section** | **Weight** |
| Abstract & Introduction | 5% |
| Analysis | 30% |
| Synthesis | 30% |
| Evaluation & Conclusions | 30% |
| Presentation | 5% |

**Product: 30%**

|  |  |
| --- | --- |
| **Section** | **Weight** |
| **Fitness for Purpose**   * Accessibility & Language * Suitability of implemented functionality * Cross device compatibility | 70%  **Breakdown**  0 – 15  0 – 40  0 – 15 |
| **Build Quality**   * Code Quality * Quality of design * Quality of testing | 30%  **Breakdown**  0 – 10  0 – 10  0 – 10 |

**Viva: 10%**

1. Project Plan – Schedule of activities

