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Group Project Report

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A DECLARATION

I ALTER THIS TO PLEDGEARISM AND GROUP WORK BREAKDOWN, Avanindra Singh, declare that this thesis titled, 'My Thesis' and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

B ABSTRACT

This document focuses on mock objects. It defines mock objects as a technique in software development commonly used in unit testing. A brief list of when to use mock objects is presented. The differences and a clear definition of each type of "simulated object" is given for dummy objects, fake objects, stub objects and mock objects. Mock objects insist on behaviour verification as opposed to other types of objects which usually are state verification. A practical example is illustrated using EasyMock in Java. The application of mock objects in unit testing is then discussed. It is concluded that using mock objects can be a advantage or disadvantage depending on the context of the system under test.

Key Words: Avy, Is, Cool.

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1 Introduction

In South Africa there are many services such as electricity, water and healthcare which are freely available to citizens or at low cost. The distribution of these basic resources could be defined as "service delivery". This project is aimed at providing a means to monitor service delivery in our country through the usage of a software application to conduct surveys and collect feed back from any citizen who utilises any service in healthcare. In South Africa, it has been publicised in media that healthcare service delivery has an impact on millions of peoples lives including their mortality [1]. Obtaining feedback on the health care system is critical to improving all citizens experiences of the health care system.

The requirements of this project is to obtain feed back from the local community utilising the health care systems in order to improve them, specifically through developing a software application which can be used to conduct surveys. By conducting surveys efficiently and through a software application data can be obtained and analysed to provide appropriate reporting on how efficient the service delivery of health care in a particular area. South Africa as a third world country faces unique challenges such as connectivity to the internet [2] which imposes challenges from a application development point of view.

1.1 Project Requirements

The purpose of this project is to design a software application which will be used to gather information on the public health care service delivery and provide appropriate reporting. The surveys will be conducted in areas with little internet connectivity. This means that application must cater for capturing data "offline" and then uploaded centrally for reporting.

2 Literature Review

2.1 Existing Solutions

There is a large number of solutions that exist in the market in terms of software applications which can be used to conduct surveys. Some of the solutions on the market do satisfy the basic project requirements [3]. SurveyGizmo [4] is a web application (software as a service) platform which features 28 different customizable possible survey question and answer combinations. This solution satisfies all requirements in particular the off-line capability, custom reporting and developer integration. SurveyMonkey [5] is similar to SurveyGizmo in that it offers a similar feature set. It also offers the ability to create custom reporting with text analysis. SurveyMonkey also features telephonic surveys where users are able to create surveys and have respondents answer using voice.

2.2 Standards, Regulations and Policy

Depending on the information that is captured through survey questions there could be standards, regulations and policies which need to be adhered to. An example of this would be in the health care sector where the Act of 1996 (HIPAA) could be applied. The Act of 1996 (HIPAA) is a set of rules to be followed by health plans, doctors, hospitals and other health care providers [6]. It is essential to adopt the standards for electronic health care transactions and identifiers for providers, health plans, and employers. To date, the implementation of HIPAA standards has increased the use of electronic data interchange [6]. HIPAA also contains a privacy rule

which protects any data gathered from patients in the health care environment. Therefore to comply with HIPAA it essential for any software to have security so that patients are not compromised in terms of the act. Software should comply completely with HIPAA if it is to be used in a health service delivery environment.

3 Project Framework

3.1 Business Case:

By conducting surveys, one can identify the misalignment between services required by communities and services rendered by its designated service providers. The result of gathering information about service delivery (in this scenario specifically health care) is that insights and observations can be gained in order to improve service delivery. This could have a variety of impacts including improving people's ability to receive high levels of service and possibly have an impact on their quality of life. Increasing the amount of engagement with the community allows for feedback to be provided to improve service delivery.

3.2 Scope of the Application:

The scope of the application will progressively change with each iteration. As an iteration is successful more features and improvements can be added to each version of the project.

Key Users

- **Surveyors:** These are the individuals who will utilise the application to capture surveys and get responses from the community.
- **Administrators:** These are the business owners who define questions and will create surveys and utilise the reporting features of the application to gain insights from the communities responses.

Stakeholders

- **Community:** These are the actual people who utilise services and who will provide feedback on the service delivery through the survey project. The community by voicing their concerns and opinions will enjoy improved services (e.g. health care) provided by the service provider based on the feedback gathered.
- **Application Administrators:** Provide administrator services, maintenance and creation of surveys.
- **Surveyors:** Users who conduct surveys through the platform.
- **Development Team:** Responsible for creating and maintaining the platform.

3.3 Project Requirements

Specification By Example
Specification by example (SBE) is a collaborative approach where by the team defines requirements and business orientated functional tests for software based on capturing and illustrating requirements using realistic examples. This method was utilised to obtain the specific requirements of the project. Table 1 shows a list of the specifications by example that are applicable to the project. Appendix A features the detailed specifications by example.

Table 1 : Table showing a list of specifications by example.

Use Case	**Description**
1	Conducting a Survey
2	Reporting
3	Offline Mode
4	Survey Administration
5	User Access

3.4 Project Constraints

- The project has a time constraint.
- The project does not have unlimited software development resources and each member of the team has different skills.
- The project should be intellectually challenging and must allow for each member of the team to learn new tools, techniques and programming skills.
- The project must contain 25% original source code.
- The project solution must be able to function in an environment with little or no connectivity.

3.5 Project Assumptions

- The users specifically the surveyors are honest and do complete surveys and do not fraudulently answer the surveys themselves.
- The surveyors do not necessarily have internet connectivity when doing surveys in the community.
- The surveyors have the equipment and resources necessary to utilise the project solution in order to conduct surveys in the community.
- The data is uploaded to a central point for analysis and reporting. This means that it is not required to generate reporting at the point of surveying.

3.6 Success Criteria

3.6.1 For the users

- Surveyors
  - Surveyors are able to capture answers in the form of yes/no questions, free form text and a selection with predefined answers.
- Administrators
  - Administrators should be create any surveys with the desired answer options.
  - They should be able to authenticate and login in to the platform.
  - Administrators should be able to view reporting information on the surveys which have successfully uploaded to the system.

3.6.2 For the project

- The solution must be able to capture surveys in a off-line mode with the ability to upload

to a central point for reporting.
- Be able to capture surveys on multiple channels and multiple devices.
- The device of choice preferably being Android should support as many devices as possible.
- Analytics of the data should be centralised.
- Surveys are dynamic and can be refreshed in field (given internet connectivity).
- There is no custom configuration necessary on any device that the surveyors utilise. This means they can be provisioned in-field.
- The system can handle multiple surveyors in the field gathering responses.
- The system can also handle multiple types of surveys.
- Training guides and development guides should be documented.

3.7 Licensing Requirements

This project should utilise MIT licenses and free licences where possible.

4 Project Execution

A software project's successful execution relies heavily on the project team meeting all desired success criteria defined in the project requirements. To make sure the project team remains on track a specially role is required within the project team, this is commonly known as a software project manager.

The project manager role is to manage all of the organizing and planning of a project. This may entail formalizing task allocation and tracking the estimated effort vs. the actual effort expended. While tracking the teams effort the budget and cost analysis also needs to be considered as business or sponsors of the initiative require the PM to report back on progress vs. project budget spent. CITE

The effective communication to all project stakeholders forms part of the project managers base responsibilities. Clearly and regularly communicating the risks, concerns and progress on a project to the appropriate stakeholders, allows for adjustments and decisions to be made in smaller increments thus allowing the team to adapt and remain on track to achieve the projects goals.

4.1 Project Methodology

Project methodologies in the author's opinion should not be dictated but should rather be discussed and adapted to the team's preferences. During the first meeting the team members stated numerous technologies could achieve the business vision and requirements. However this also lead to scope discussions and possible future scope changes as early as the first planning session.

Due to the highly volatile scope discussions within the team the decision to adopt a crafted quality methodology CITE started to present itself as front runner and methodology of choice. The project team agreed that the SCRUM methodology CITE would be implemented and the role of the project manager would change to be a SCRUM master.

4.2 Sprints

With the project vision and project deadline defined the high level planning allowed for allowed for eleven sprints CITE where one sprint would run for seven days. While de-constructing the requirements the high level deliverables were prioritized in the backlog and marked for delivery in specific sprints. These high level deliverables are shown in figure CITE and the detailed sprint planning can be viewed in appendixCITE.

4.3 Project Team

4.4 Project Estimation and Costing

During the project initiation the business stakeholders will review estimations and high level costing before committing to assigning the budget. The estimations for the proof of concept where based on variable scope and requirements. Due to the variability in requirements the estimation accuracy will not be at a high confidence level. Therefore the POC could result in either an over estimation or under estimating. The proof of concept was estimated at a total of 825 effort hours and 5 resources were assigned. The team calculated that a single weekly sprint would consist of 75 hours, this would in turn be the project teams weekly burn rate. Therefore if we assume an average blended resource rate of R500 an hour the cost per sprint can be calculate as follows.

Table 2 : Table showing the effort placed into the project and its cost.

Total Project Estimation	825 Hours
Total Sprint Effort Hours	75 Hours
Total Cost per Sprint	R 37 500
Total Cost of POC	R 412 500

With the POC costing R 412 500 as an estimate the project continued and executed at the required weekly burn rate. However as the requirements become more detailed and clear the project team realized that the estimation had been under quoted. In this scenario depending on the how the contract for this project was drawn up the whether it be a Fixed price or time and materials based contract, would have a direct impact on the teams involved in the project. In the fixed price contract the business stakeholder would pay a single fee regardless of the under or over estimation. The benefit to the software team would be the quicker and cheaper they deliver the working POC the more profit they would make from this software application. If the contract was time and material, specifically with variable requirements the software team will be able to request further funding and the business would need to manage the allocation of additional funding via a formal process (Change request or change note).

4.5 Project Tools

Various tools were used to enable communication and collaboration within the group. A high focus was placed on this as the size of the group, distributed resource location, current work commitments, scope changes, technology challenge specifically the upskilling required on the chosen technology all required real time communication to the project team. The tools the project team agreed to use are listed in Table CITE.

Project Communication was implemented via gathering all the contact details for the project team, these were shared and used to create email and whatsappCITE groups for real time feedback. Formal Meetings where held weekly to track progress against the sprint planning vs the resource progress and formal meeting minutes where then sent. The formal meeting minutes are detailed in AppendixCITE. The team Collaboration was controlled by the use of trello boards CITEthis allowed task assignment, task tracking and progress updates without the need for formal face to face meetings. Managing the developers source code, the development resources agreed to implement GitHub. This tool allows the resources to align source code, track changes and backup source code.

4.6 Testing

Testing for the project is performed from an acceptance testing level, where the project requirements are directly used to create acceptance tests (http://www.extremeprogramming.org/rules/functionalt
In the context of this project, this level of testing is deemed appropriate as the goal of this project is to identify that the software is capable of achieving the desired client functionality. The executable specifications produced in the requirement specification are directly utilised in defining the test cases. The advantage noted by doing this is that no additional test case creation phase is required at acceptance level phase and the software is tested using what was jointly agreed upon as the scope and functionality of the project.

5 Engineering the project solution

5.1 Overall Architecture

considered multiple POCs and selected the most appropriate to meet all requirements

5.2 Web Server

5.3 Web Client

5.4 Android Client

5.5 Licences used in solution

6 Overall Critical Analysis and Evaluation

6.1 Critical Analysis

6.1.1 Project Execution

6.1.2 Project Solution

6.2 Estimates verses Actual effort

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6.3 Economics and Cost Model

The last element to the cost model is to look at Commercial Off The Shelf Solutions (COTS), please refer to the section titled Existing solutions. In this case the business stakeholders should be guided by the software architects as perhaps the cost of starting the POC compared to purchasing a COTS product might not make financial sense. The reason for this is due to the economics of scale, the POC would be a custom application and assumingly used by only the business entity. Whereby the COTS products are used by numerous customers globally that have the same basic requirements. In this case the research into the existing solutions has confirmed that they meet the expected minimum requirements therefore the benefit of adopting a COTS would mean that the solution would be available immediately instead of the 825 estimated hours to build the POC and the COTS software teams would be maintain the application and support the business stakeholders via the annual subscription fees. The current assumption is that the business stakeholder would be able to use the COTS products for +-37 years for the same price the POC cost.

6.3.1 Licensing of Prototype

6.4 Evaluation of Output Solution

7 Future Work

Future features of the application might include geospatial information, most modern devices are equipped with a built in GPS.The coordinates can be used to plot the location where every survey has been captured. This information can be plotted onto a map showing the exact location where the survey was captured. This will provide a quick overview of how many surveys have been conducted in a specific area.

As an enhancement to the current application it should be able to translate the survey questions into the relevant language of the person being surveyed. This will allow people to describe a situation they have experienced in their mother tongue and assist the customers in understanding the problems better.

The application has been built dynamically so that the application can be used for any industry to gather and report on surveys captured.

Using proprietary software can be very expensive , often large organizations are given massive discounts and are encouraged to use a certain vendors software. Universities and academic organizations are often allowed to use software free of charge. This project is intended for for use by the public sector so hence the budgets will not be available for expensive proprietary systems. The goal has been to use open source and free software as far as possible to keep the solution relatively cost efficient. Using open source and free software the solution is able to avoid unnecessary software licensing costs and ensures that the application can be easily distributed on any platform.

8 CONCLUSION

A conclusion may review the main points of the paper, but do not replicate the abstract as the conclusion.

REFERENCES

[1] Z. M. C. Press. "Infants die in droves due to negligence, poor healthcare facilities." http://www.news24.com/SouthAfrica/News/Infants-die-in-droves-due-to-negligence-poor-healthcare-facilities-20150524. Last accessed: 27-June-2015.

[2] MyBroadBand. "South Africas Internet access stats revealed." http://mybroadband.co.za/news/internet/85165-south-africas-internet-access-stats-revealed.html. Last accessed: 27-June-2015.

[3] TopTenReviews. "2015 Best Survey Software Reviews and Comparisons." http://survey-software-review.toptenreviews.com/. Last accessed: 27-June-2015.

[4] S. C. W. Unknown Author. "SurveyGizmo." http://www.surveygizmo.com/. Last accessed: 27-June-2015.

[5] S. C. W. Unknown Author. "SurveyMonkey." http://www.surveymonkey.com/. Last accessed: 27-June-2015.

[6] TopTenReviews. "HIPAA General Information. Centres for Medicare Medicaid Services Website. Federal Government Website." http://www.cms.gov/. Last accessed: 27-June-2015.

A Appendix: Requirements Engineering Documentation

A.1 Key Examples

Key Examples: Conducting a Survey

- Surveyor asks a yes/no question
- Surveyor ask a question with pre-defined answers
- Surveyor asks a free form question

Key Examples: Reporting

- The number of yes/no answers are tallied and displayed per question
- The number of each pre-defined answer are tallied and displayed per question
- The number of key phrases are tallied and displayed per free-form answer

Key Examples: Offline Mode

- The surveyor conducts a single survey in offline mode and syncs with the system
- The surveyor conducts multiple surveys in offline mode and syncs all of them with the system

Key Examples: Survey Administration

- The administrator adds a new survey
- The administrator edits an existing survey
- The administrator removes an existing survey

Key Examples: User Access

- A new user of the system registers
- An existing user logs into the system as an administrator
- An existing user logs into the system as a non-administrator
- An existing user changes password

A.2 Specification with Examples

Conducting a Survey

Given that a yes/no question has been defined
when the surveyor asks the respondent the question
then the surveyor can only capture an answer from the given options

Given that a pre-defined question has been defined
when the surveyor asks the respondent the question
then the surveyor can only capture an answer from the given options

Given that a free-form question has been defined
when the surveyor as the respondent the question
then the surveyor can capture a text answer, limited to 1500 characters

Reporting
Given that the user is logged in as an administrator
then the user has access to the reporting functionality

Given that the user is logged in as an administrator
and a survey has been conducted
and the survey has been submitted
and the survey contains yes/no questions
or the survey contains pre-defined answers
when the surveys results are selected
then a graph showing the responses received is displayed

Offline Mode
Given the system has no access to the internet
and the surveyor has submitted a completed survey
then the system should show how many offline surveys have been completed

Given that the system has no access to the internet
and the system has stored surveys
when the administrator syncs the system
and there is an internet connection
then the surveys get submitted with server

Survey Administration
Given that a user is logged in as an administrator
then the user has access to the create survey functionality
and the user has access to the edit survey functionality
and the user has access to the delete survey functionality

User Access
Given that a user has not been registered on the system
then the user can register on the system

Given that the user has registered on the system
then the user can log into the system using their username and password
and the user can change their password

YesNo Question

Question	Options	Acceptable Answer
Do you receive considerable amount of pressure from other family members to get health care problems taken care of promptly?	**Yes** No **Sometimes**	Yes
Do you have a favorite hospital?	**Yes** No **Sometimes**	No
Does the hospital have equipment for modern diagnosis and treatment?	**Yes** No **Sometimes**	Sometimes

Predefined Question

Question	Options	Valid Answer
If you or a member of your family have received medical care at another hospital while living in the Umfolozi area, why did you choose the other hospital?	**A specialist was available** Specialist hospital care was required that was not available at the local hospital **My physician practices there** More familiar with the hospital **Wanted a second opinion from another physician** Religious preference **Cost was too high in the local area**	My physician practices there
How satisfied are you with the skill and competency of the staff?	**Very Satisfied** Somewhat Satisfied **Neutral** Somewhat Dissatisfied **Very Dissatisfied** Not Sure	Somewhat Dissatisfied

Free Form Question

Question	Answer	Characters	Valid?
How many times have you and other members of your family been a patient in a hospital in the last 3 years?	**We have been here ten times in the last 3 years**	<= 1500	Yes
How many times have you and other members of your family been a patient in a hospital in the last 3 years?	**We have been here ten times...**	> 1500	No