MOLO PROJECT PROPOSAL

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1. ABOUT MOLO

It is well recognised around the globe that the sharing and decentralisation of information creates an opportunity for development. However, there are still societies that do not have a "digital voice". There are demographic groups that do not contribute to the information available to the rest of the globe. This could largely be due to the limitations regarding their mobile phone.

However, due to the limitations that come with owning a mobile phone in Sub-Saharan Africa, contributing content has been relatively difficult. The three major issues being network availability, the cost of data and airtime, as well as technical problems such as using an alpha-numeric keyboard.

Praekelt, a foundation focused on creating development via decentralising information, has embarked on a project that provides a platform for users to author content in an environment where the three major issues, mentioned above, have been addressed.

2. AIMS OF MOLO

2.1. Research

Even though this project manifests itself more as a software engineering project than a research one, there are several questions that this project aims to provide an answer for.

This first of these questions being, "Will the content contribution of users increase if the limitations regarding their mobile phone are addressed?" The aim of answering this question is to find out whether the MOLO prototype will be of enough value to the user that they feel they can contribute more, or contribute more efficiently.

The second research question is, "Are users more willing to contribute with a better human computer interface? In a previous Praekelt project, Young Africa Live (1.8 Million South African users), all the users had to contribute via was a single text field in which they were able to write a whole paragraph. Our question is will creating a better human computer interface improve user contribution.

Lastly, another research question is, "Will reimbursing users for the costs they have accumulated related to contributing increase contribution or be of any real benefit or value to them?". The aim of this question is to find out more information about which method of reimbursement is best for the user.

2.2. Requirements

To research these questions, users will need a platform that addresses the issues mentioned above. They need a way of working around the poor network availability, some sort of reimbursement for their costs, and a human computer interface that is

simple and easy to use, but that still provides the functionality needed in order to contribute.

Our client, Praekelt, requires that this project be created in a fully open-source environment that uses open-source tools only. They require that the prototype be stored in a GitHub repository and that the prototype uses a GitHub repository to store information, as well as that a schema is used between the back and front end. Our client requires this to ensure consistency between their ongoing projects and this one.

Both the users and the client requires that the prototype work on a low-end Android device.

3. MOLO PROTOTYPE

The MOLO prototype can be divided into two main parts, namely the back-end and the front-end. The front-end entails the user interface, and everything that the user can see happening on their screen. The back-end can be described as everything else that happens behind the scenes.

3.1. The Back-End

The prototype proposed is one where users get reimbursed for their contribution. The back end will have to keep track of how much is each user has contributed and make an evaluation on the cost that their contribution accumulates to. The back-end will have to communicate with the front-end in order for this to happen correctly and efficiently.Whether the users will be reimbursed via a cryptocurrency such as Stellar, or via automatic airtime top-ups, for example, is a problem yet to be solved.

The stories that the users will upload will be stored as JavaScript Object Notation (JSON) files in a central GitHub repository. This will make collaborative contribution easier as Github has builtin tools that focus on collaboration. Github is also used widely by Praekelt to keep their code versioned. A tool called Elastic (previously known as ElasticSearch) will be used to search the repository when users want to view a specific story. Elastic was chosen due to its efficient behaviour with JSON files.

Due to the open source nature of this project, a major challenge here is deciding how to implement collaboration. It is proposed that the original writer of the story has final say over what happens when there is a merge conflict. However, this is a problem that is in discussion and is yet to be solved.

The main programming language for the backend of this prototype will be Python. Python will be used to control the flow of information between all the backend entities.

The back-end will be evaluated by how fast it can get the information required to the front-end, and whether or not the correct information is being exchanged.

3.2. The Front-End

The first phase in this project for the front-end is the task analysis phase. In this phase, the tasks that the mobile application will have to fulfil will be analysed in depth. A rough design of the interface, containing a representative collection of the prototype's components, will be sketched out. This includes a general layout of how

the prototype's interface will be structured. The specifications of the target mobile device and the requirements for the target user will also be taken into consideration when sketching out the application interface pages.

The sketches will subsequently be used to build a low-fidelity paper prototype. The paper prototype can then be tested by users for usability of the interface, effectiveness of the structure, as well as feedback on the design and and any further suggestions. Sheets of paper which are approximately the size of a mobile phone screen will be used to represent the different screens of the interface.

With this paper prototype, a user will use the prototype to perform certain user scenarios as if they were using the real application itself. Examples of user scenarios are: viewing user stories, editing a user story, entering and posting a new story. Once feedback has been received for the paper prototype, it will be taken into consideration and possible changes will be made accordingly.

The interface features that are illustrated in the paper prototype will be incorporated into the mobile application, that will be compatible with the target mobile device. HTML 5 will be the main programming language for the front-end of the MOLO prototype.

The prototype will then be given to a representative sample of users who will test it on the target android devices. Users will have the opportunity to give feedback on the application and be reimbursed for the testing of the prototype. It is worth noting here that the prototype will run on a server provided by Praekelt.

Once the feedback has been collected, it will then be included in the final report and further changes to the prototype will be made.

4. ETHICS, PROFESSIONALISM AND LEGALITY OF MOLO

Although Praekelt will be listed as the authors of this project, it is a completely open source project and therefore anybody is allowed to copy the project, add to it, or even change it completely. There is a culture of open-source projects within the field of ICT4D, and the majority of Praekelt funders either mandate open-source, or strongly prefer it.

However, because we will test our prototype on people, we will need to attain ethical clearance from the Science Faculty Ethics Committee at the University of Cape Town. We will not test the prototype with children under the age of 18. Therefore users can sign a declaration of indemnity themselves and do not require their parent or guardian to do so. We do not foresee the prototype having any after effects, whether positive or negative, on the user with regards to testing the prototype.

5. RELATED WORK

For a better understanding and knowledge of the proposed project, various related projects were researched and reviewed. Researching these projects have provided valuable insight into the difficulties and challenges that comes with a project like MOLO. However, it also provided a means of comparing the ideas proposed by Praekelt with the ideas described below.

Story Bank, "A repository - Story Bank - to allow a community to create and share audio- visual stories [Jones et al. 2007]", uses a central location where users can add stories on a desktop computer. However, due to low computer literacy levels, they created a tool for 'cameraphone story authoring and access' where users could author and share stories via bluetooth. Their research found that their was no need to extend access to Story Bank via a desktop computer where conventional computer interfaces are disabling. Due to the majority of Praekelt's users being in Sub-Saharan Africa, and as state above most users in Africa own mobile phones rather than a computer, it could prove to be more limiting to use a desktop instead of a mobile phone, even though desktop or laptop computers have greater features and a wider range of abilities.

A key feature of a low-end Android device is the ability to connect to the internet. However, many Sub-Saharan African regions have low bandwidth so the limited ability to connect to the internet is limited once again by the bandwidth. A research project aimed at characterising technology used in Kenya had this to say about limited bandwidth,

> "Our participants consistently told us how the scarcity of Internet bandwidth affected their ICT use. Even in environments where a given location (such as an office) had good local connectivity, available bandwidth to international websites (such as free mail providers) is limited by undersea fiber capacity [Wyche et al. 2010]".

The limited bandwidth means that even though feature phones have the ability to record video, using video for storytelling is not necessarily a viable option due to the wait time it would take do upload or stream videos, even compressed ones.

There have been many ICT4D projects that use interactive voice systems (IVRs). IVRs have been used for citizen journalism [Thies et al. 2012], agricultural discussion forums [Chittamuru et al. 2010], community dialogue [Agarwal et al. 2009] and many others [Vashistha et al. 2012]. However, these projects have mostly been aimed at the developing world and not necessarily the third world. Limitations on bandwidth have to be taken into consideration as well as others such as cost and technological limitations. We learn from these projects that it is crucial to take into consideration these limitations.

6. ANTICIPATED OUTCOMES

Overall, we expect users to find it easier to contribute using our prototype than using the platform they are currently using. We anticipate that this would lead to more stories being contributed.

We expect the prototype to have addressed the main problems that currently limit users in contributing. We expect the prototype to allow for reimbursements of the cost accumulated whilst contributing, for the prototype to work well even in environments where network bandwidth is quite low, and for the prototype to work well even on a mobile phone with limited technology. We will judge the success of the prototype based on how well they address these three factors.

7. PROJECT PLAN

7.1 Risk and Risk Mitigation and Management Strategies

While the project is being undertaken, the risks that could be encountered are analysed, along with the strategies needed to manage them.

Difficulty finding users for usability tests

It could prove to be difficult to find users that are willing to take part in user testing. This could be due to a number of reasons such as lack of interest and lack of incentive, for example.

However, Praekelt has run usability tests before where users have been called into their office and asked to complete a usability test there. This will be the case with this project as well, except users will be given reimbursement for their contribution.

Compatibility Issues

Not all low-end Android mobile devices have the same specifications and abilities. Some have less ability than others. There is a risk that for the proposed functionality of the prototype will not be compatible with a large number of Android devices.

To avoid this, the design of the interface will be relatively simple so that it is compatible with the majority of android devices. Unfortunately it is unlikely that a prototype will be created that works well on every single Android device. However, a device will be chosen that is believed to be a representative of the majority of Android devices out there, and the prototype will be designed and developed to work well on this device.

Gold-Plating and changing client requirements

It is possible that features are included in the specification of this project that users do not want or need. It is also possible that along the way extra features are added that users do not require.

It is critical that the functionality needed for this prototype remains relatively the same throughout this project. However, the main functionality has already been decided on by both the client and the developing team. This ensures that both entities can hold each other accountable to the functionality agreed upon.

Lack of communication and/or support from client

It could prove to be difficult to communicate effectively with our client, Praekelt. This is due to the fact that Praekelt is an external entity from the University of Cape Town. It is also possible that due to their ongoing projects, they might not give the MOLO project the support it needs.

However, this has been discussed and the support and communication level required has been clearly communicated. Praekelt has made this project a high priority in their list of project and has given ample support his far, as well as made their Cape Town office available for work on this project.

Difficulties between developers and/or individual difficulties

It is possible that developer could fall sick, have arguments, not put in enough work for their side of the project. This could heavily affect the outcome of the project.

It is for this reason that the division of labour is very clear and very independent. Each part, back-end and front-end, can be evaluated individually. This ensures that each student gets mark according to his/her own efforts.

7.2 Required Resources

The main resources needed to complete the testing of the proposed prototype are a two low-end android devices and a dedicated server. These will both be provided by Praekelt. Praekelt will also provide the reimbursements given to users when testing our project.

7.3 Deliverables

Background/Theory Chapter (based on Lit Survey)

This deliverable will describe the background of the project using other related

First Implementation/Experiment/Performance Test Writeup

For this deliverable, the experiment to test the prototype that has been built will be described and analysed in detail. The writeup will include the purpose of the experiment, to the description method used to test the method, the results and their discussion, and the conclusion drawn from the results and the future work. The results recorded will be taken from the experience of the user as they utilise the application prototype to perform certain tasks. These results would be interpreted in terms of what they reveal about the performance of the prototype. This is what will lead to the conclusion and the future work that is outstanding, in particular for the final prototype to be tested.

Final Prototype/Experiment/Performance Test + Writeup

This writeup will describe the experiment to test the final built prototype on low-end android mobile phones by users of low-end android mobile phones. The writeup will have a similar format to the writeup of the first prototype, describing the purpose of the experiment, the methods and procedures, results and discussion finishing off with the conclusions drawn and future work going forward.

Final Complete Report

The report will evaluate the strengths and weakness of the project and determine overall whether the project was a success or not, and whether it was able to address the research questions that were stated earlier in the project.

Poster

The poster will contain a summary of the project, it's purpose and a brief description of the solution that was built as well

Website

This deliverable will show the site of the project will the documents that were produced during the project.

Reflection Paper

The reflection will be an evaluation of the team members, how they performed, and the lessons learned from the project.

7.4 Milestones and Timeline (Gantt Chart)

The tasks that are to be completed later in the project are listed below with a Gantt Chart thereafter being included to show the dates and the timelines for each task.

1) Initial Feasibility Demonstration

2) Background/Theory Chapter

3) Complete Design Chapter

4) First Implementation/Experiment/Performance Test + Writeup

5) Final Prototype/Experiment/Performance Test + Writeup

6) Chapters on Implementation and Testing. Final implementation (optimised, etc.) with testing and Coding completed

7) Outline of complete report: chapter and major section headings with 1-2 sentence descriptions for missing sections

8) Final Complete Draft of Report

9) Project Report Final Submission

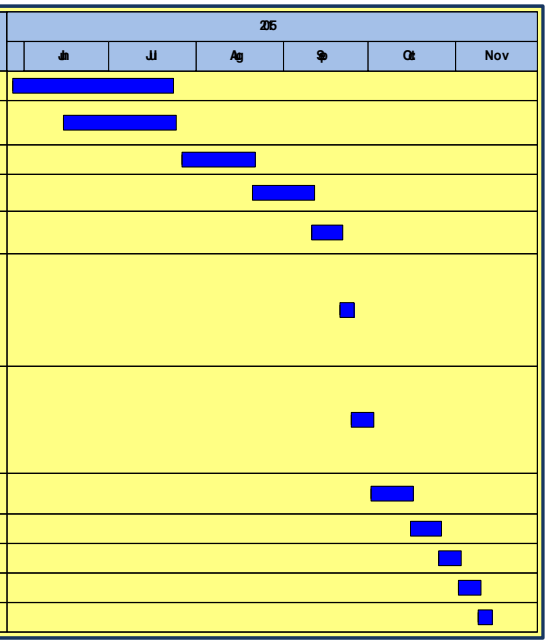
10) Poster

11) Website

12) Reflection Paper

Gantt Chart

ID	Task Name	Start	Finish	Duration
1	Initial Feasibility Demonstration	28-May-15	23-Jul-15	8w 1d
2	Background /Theory Chapter (based on Lit Survey)	15-Jun-15	24-Jul-15	6w
3	Design Chapter completed	27-Jul-15	21-Aug-15	4w
4	First Implementation /Experiment / Performance Test + Writeup	21-Aug-15	11-Sep-15	3w 1d
5	Final Prototype /Experiment / Performance Test + Writeup	11-Sep-15	21-Sep-15	1w 2d
6	Chapters on Implementation and Testing . Final implementation (optimised , etc) completed , testing completed . Coding complete	21-Sep-15	25-Sep-15	1w
7	Outline of complete report : chapter and major section headings with 1-2 sentence descriptions for missing sections	25-Sep-15	02-Oct-15	1w 1d
8	Final Complete Draft of Report	02-Oct-15	16-Oct-15	2w 1d
9	Project Report Final Submission	16-Oct-15	26-Oct-15	1w 2d
10	Poster Due	26-Oct-15	02-Nov-15	1w 1d
11	Website	02-Nov-15	09-Nov-15	1w 1d
12	Reflection Paper	09-Nov-15	13-Nov-15	1w



7.6 Work Allocation

As mentioned before, the body of work will be split into two sections: the back-end and front-end. Codie Roelf will be responsible for the back-end in its entirety, and Cuthbert Chidoori will be responsible for the front-end in its entirety.

The back-end entails creating the data repository using GitHub and pushing a number of the stories that Praekelt has already collected to the repository. A schema will be created in the back-end as well as a database in order to keep track of the schema and user information. A means of reimbursing the users for their contribution will largely be handled by the back-end. However, the major task that will be handled by the back-end is the collaboration of users to create a story. This will mostly be handled by GitHub.

The front-end section will involve the building of the main application user interface for an android mobile device which users will use to post, share and view user stories. One of the main objectives in this section will be to design an interface that is convenient and usable in terms of its functionality, as explained earlier in the document. HTML 5 will be the main programming language of the front-end.

There is a clear division of labour between the back-end and front-end and therefore these two entities can be assessed and tested individually.

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