BCCH Terms of Reference

Team Info

Team Name: Future Star
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Document Information

Revision History

Date	Version	Status	Prepared by	Comments
Jan. 10th, 2020	0.01	Initial outline.	Nick Birtch	Added Licence statement.
Jan. 11th, 2020	0.1a	1st draft.	Jiayao Chen,Lang Cheng,Nick Birtch	N/A
Jan. 12th, 2020	1.0	1st version finished, edited down.	Jiayao Chen, Nick Birtch	Completed constraints, assumptions and approach.
Feb. 23rd, 2020	1.1	Feedback Revision	Nick Birtch	Schedule update, readability, expand on costs

Document Control

Role	Name	E-mail	Telephone
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Project Description

Project Overview

The H-Behaviors Lab in BC Children's Hospital would like to develop a new way to collect patients' assessments by a combination of new video technologies as well as the Internet. This enables patients' observations in a home setting and greatly reduces the difficulties of disorder diagnosis and continuous monitoring of treatment regiments.

Goals Overview

- To achieve a most viable product, our team will first develop a mobile friendly web-based data collection system for the WeSleepSmart Research Project, which

supports the storage, retrieval and analysis of patients' assessments, including sitting, playing/gaming and sleeping data.

- To provide better user experience on mobile, our team will extend the project to have native mobile support, using either a cross-platform technology or native development toolkits for iOS and Android.

Features Summary

- **Collection and storage of four types of data:**
    - **Patient data:** Login credentials consisting of username and password and brief patient information including sex, gender and date of birth. Login credentials will be managed by BCCH. The system should keep track of a unified identifier for each patient along with session updates marked by timestamps.
    - **Video Data:** Videos in MP4 format which has a length of up to 10 minutes and size up to 100MB. The system should validate the names and the format of the videos.
    - **Selfies:** Pictures in separate sessions tagged by a specific patient.
    - **Surveys:** A set of both quantitative and qualitative surveys outlined in Appendix A.
- **Data grouping**
    - The system must be able to group data types into pre-defined assessments (Appendix B).
    - The system must be able to group arbitrary assessments collected during a single session and tag it to the appropriate patient and date and timestamp the session.
- **Research Lookup for database navigation**
    - The system should allow users to query the database and extract database required. It should support data partition by different criteria such as gender, sex age range, assessment type (AppendixB) and date of session
    - The system should be able to output the results in CSV format for further analysis.
- **System Extensibility**
    - The system should allow BCCH research to add new surveys and assessments as needed.

Project Constraints, Assumptions & Risk Analyses

Constraints

- The project should use an open source database.
- The teams are expected to create synthetic sample data to test their database and system design.
- Performance requirements for nonfunctional tests:
    - Up to 10,000 patient records of an average of 20 activity records per patient

- Response time to upload 100MB video in less than 1 minute for average wifi based internet access.
- Search on records should be less than 10 seconds for a fully populated database.

Assumptions

- It is assumed that the project will be mobile friendly and web based with a possible extension to native support. No guarantee to support native iOS or Android applications.
- It is assumed that the security of patient login credentials will be handled separately by BCCH.

Risks

Risk ID	Risk Description
1	Ensuring login security (while keeping it extendable for BCCH future efforts).
2	Transition to Mobile app (Stretch Goal) could destabilize our app, widens scope across all roles/facets of project.
3	Survey extensibility, may only support certain formats.
4	Performance degradation under high loads.

Summary Risk Assessment

Risk ID	Risk Assessment
1	**HIGH** - Patient confidentiality is a major concern in the health sector. - Include a heavy emphasis on login security in QA testing suite. - Augmentable security design so that its easily extendable/modifiable.
2	**HIGH** - BCCH places high value on mobile functionality, and ties in with photo/video based data storage for ease of use. - Introduce ‘Mobile Compatibility Product Owner’ to ensure that front end design is mobile friendly and reliable. - If time and project stability permits, attempt mobile specific prototype.
3	**LOW** - Design surveys and survey questions such that new types of surveys can be easily added and expanded upon later.
4	**MEDIUM** - Performance benchmarks well defined. - Include a heavy emphasis on performance in QA testing suite, database

	design.

Project Governance & Approach

Roles: Front End, Back End, QA (test suite, risk management), Database (performance, design), Project Manager, Mobile Compatibility Product Owner (ensure mobile reliability), PC Client Product Owner, CI/CD.

- Nick Birtch - Role: Full Stack
- Jiayao Chen - Role: Project Manager, Full Stack, Database
- Lang Cheng - Role: Full Stack, PC Client Product Owner
- Kaiti Mok Rong - Role: Front End, QA
- Alexander Svatukhin - Role: Full Stack, CI/CD
- Jiawei Tan - Role: Full Stack, Mobile Compatibility Product Owner
- Julie Zhu - Role: Front End, QA

Approach

The project will be a typical web application with external connections to BCCH servers with some of the most popular open source tools. Below is a short summary of technical choices for the main component with detailed development, testing and building tools omitted.

- Language
    - **Front end**: React.js
    - **Back end:** Node.js (JavaScript)
    - **Database:** MySQL

Estimated Schedule

Milestone	**Start**	**Complete**
Terms of Reference	January 10th, 2020	January 14th, 2020
Draft Project Plan	January 14th, 2020	January 22nd, 2020
Requirements Document	January 17th, 2020	January 30th, 2020
Design Document	January 24th, 2020	February 6th, 2020
Finalized Key Documents	February 1st, 2020	February 18th, 2020
Final Test Plan	February 1st, 2020	February 18th, 2020
Proof of Concept build ready for Preview Site (Development)	February 1st, 2020	February 18th, 2020
MVP Build (Development)	February 18th, 2020	March 7th, 2020
Finalized Build (Development)	March 7th, 2020	March 24th, 2020
System Delivery w/ final improvements (Development)	March 24th, 2020	April 7th, 2020 + Warranty Period (April 23rd, 2020)

Project Cost

There is no expectation of any significant monetary costs. All development is being done under an open source license using open source software and frameworks. We should have no server or upkeep related costs, as our external servers and connections will be provided by BCCH.

We expect the project to take approximately 50 hours for design and documentation, 100 hours for development and an additional 100 hours for testing, DevOps and maintenance.

License

Appendices

Appendix A: Surveys

Note, all surveys will have an instructions header which details how to perform the survey and associated task. These will be provided by the H-behaviors group and do not require any input from the participant. Following are a list of surveys and their required participant input (though may change as we continue development).

1. Karolinska Sleepiness Scale
    a. On a scale of 1 (extremely alert) to 10 (extremely sleepy), rate your sleepiness: _____ (must be an integer from 1 to 10)
2. Vigilance Pong Scoresheet
    a. In 30 seconds, how many total throws were made? _____ (can be unknown, otherwise must be non-negative integer)
    b. In 30 seconds, how many successful throws were made? _____ (must be nonnegative integer)
3. Task-Switching Paradigm
    a. Time taken to complete a single task exercise: _____ (must be provided either in seconds or in MM:SS format)
    b. Number of incorrect answers in single task exercise: _____ (must be nonnegative integer)
    c. Time taken to complete task switching exercise: _____ (must be provided either in seconds or in MM:SS format)
    d. Number of incorrect answers in task switching exercise: _____ (must be nonnegative integer)
4. Stroop Test Scorecard
    a. Average Speed for congruent trials: _____ (copied from a separate Stroop test app, must be in milliseconds)
    b. Average speed for incongruent trials: _____ (copied from a separate Stroop test app, must be in milliseconds)

    c. Stroop effect: _____ (copied from a separate Stroop test app, must be in milliseconds)
    d. Number of errors in congruent trials: _____(copied from a separate Stroop test app, must be a non-negative integer)
    e. Number of errors in incongruent trials: _____ (copied from a separate Stroop test app, must be a non-negative integer)
5. Baseball Tag Scorecard
    a. Number of batting attempts: _____ (must be a non-negative integer)
    b. Number of hits: _____ (must be a non-negative integer)
6. Sleep Log
    a. Number of hours slept the previous night (to the nearest half hour): _____ (must be non-negative in increments of 0.5)
    b. Number of hours since you woke up (to the nearest half hour): _____ (must be non-negative in increments of 0.5)
7. Vigilance games and wake-a-thon participant feedback
    a. How was your experience at the wake-a-thon on a scale from 1 (poor) to 10 (awesome): _____ (must be an integer from 1 to 10)
    b. Which vigilance games did you participate in tonight?: (checklist of the four current games we employ: Baseball Tag, Stroop Test, Vigilance Pong, and Task Switching Paradigm)
    c. How did you hear about the wake-a-thon? (checklist including: e-mail, flyer, newspaper, online ad, word-of-mouth, teacher / school, and other. The other option should include a space to put an open-ended response that can be left blank).
    d. What did you learn about the effects of sleep on cognitive performance?: _____ (open-ended, can be left blank)
    e. Any further comments on how to improve future wake-a-thons?: _____ (open-ended, can be left blank)

Appendix B: Assessments

These assessments are individual elements that contain associated data types (videos, selfies, surveys). Multiple assessments can be included in a single experimental session.

1. Selfie Rating
    a. In this session, participants will take a selfie of themselves and rate how tired they are on the Karolinska scale. This will, in the future, allow us to use machine learning techniques to identify facial features associated with sleepiness, and also make participants aware of the physical effects of sleepiness.
    b. Types of data included:
        i. Selfie Photo

        ii. Karolinska Sleepiness Scale (Appendix A.1)
2. Vigilance Pong
    a. Pong is a motor control task that can be quantitatively scored to assess performance. It is thought that motor control deteriorates with sleepiness.
    b. Types of data included:
        i. Video of participant playing pong
        ii. Pong Scoresheet (Appendix A.2)
3. Task-Switching Paradigm
    a. Task-switching is a cognitive task that requires shifting focus depending on the task at hand. Thus, comparing the speed and accuracy at a single task vs. shifting between multiple tasks assesses higher cognitive functions.
    b. Types of data included:
        i. Video of participant performing task switch paradigm game
        ii. Task Switch Survey (Appendix A.3)
4. Stroop Test
    a. The Stroop test is a classic psychological test that demonstrates the effect of cognitive interference. In this test, participants are shown the word of a color that is also shaded with a color. If the word of the color and the color shade are the same, then information is congruent and easier to identify. If the word of the color and the color shade are different, the information is incongruent and there is a delay in identifying one or the other (typically the shaded color).
    b. Types of data included:
        i. Video of participant performing Stroop test
        ii. Stroop test Scorecard (Appendix A.4)
5. Baseball Tag
    a. Batting in baseball requires a number of cognitive skills such as motor skill and reaction time. This test is meant to assess these skills in a fun and interactive manner for participants.
    b. Types of data included:
        i. Video of participant AT BAT
        ii. Baseball tag scorecard (Appendix A.5)
6. Sleep Logging
    a. Sleep logging is a simple method of keeping track of one's sleep schedule and assessing the long-term quality of sleep. Clinicians typically recommend at least 7-9 hours of sleep per night.
        i. Sleep Log (Appendix A.6)
        ii. Karolinska Sleepiness Scale (Appendix A.1)
7. SIT / SCIT assessment
    a. Standardized (clinical) immobilization tests are used to assess restlessness and hyper-motor behaviors. These could point to an underlying psychological disorder such as attention deficit hyper-active disorder or restless leg syndrome.

    b. Types of data included:
        i. Video of participant performing SIT / SCIT
        ii. Karolinska Sleepiness Scale (Appendix A.1)
8. Wake-a-thon feedback
    a. The H-behaviors lab runs wake-a-thons for secondary school aged children to educate them on the effects of sleep deprivation. This assessment will be used to provide feedback to the administrators on future experiences.
    b. Types of data included:
        i. Sleep Log (Appendix A.6)
        ii. Karolinska Sleepiness Scale (Appendix A.1)
        iii. Vigilance games and wake-a-thon feedback (Appendix A.7)