Developing a Fall Rehabilitation App for Chiptech

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ABSTRACT

The growing ageing population brings a series of impacts on different social aspects, finance, employment, health and wellbeing. Many older adults experience falls at home or in the community. Injuries and trauma following falls impose negative impacts on their life. This project aims to design and develop an Android app that helps older adults rehabilitate after falls and prevent future falls. This app is developed with React Native and TypeScript, collaborating with Microsoft Azure cloud services. The project adopts Scrum for One and Kanban approaches. The app developed provides a ten-week program that guides the user to do exercises at home; the program is tailored for the user based on his health condition and can be adjusted according to his feedback and experience during the program. Older adults using this app will benefit through exercises to improve fitness, restore confidence, and prevent future falls.

Keywords: Mobile app development, Android, Scrum for One, Health benefits, Rehabilitation, Older adults

1. INTRODUCTION

Chiptech Limited is a privately owned company established in 2000, specialising in designing and manufacturing digital telecare products that help people maintain their health, independence, and safety.

Chiptech provides a comprehensive range of highly reliable and intelligent hardware for wellness monitoring of individuals in their homes (Chitech Limited, 2022).

Ara Institute of Canterbury is a government-funded institute providing world-class, tertiary-level education.

This project is a collaboration between Chiptech, Ara Institute, the Department of Business and Digital Technology, and the Department of Applied Science and Social Practice.

Figure 1-Fall Rehabilitation App poster

2. PROJECT DETAILS

The Accident Compensation Corporation (ACC) provides compulsory insurance cover for personal injury for everyone in New Zealand (New Zealand Government, 2021). ACC identified that between 1st July 2018 and 30th June 2019, 29% of injuries claimed occurred due to falls at home and in the community.

Many older adults experience falls at home and in the community. Injuries and trauma following falls affect their life quality.

Research conducted by (Sherrington, et al., 2016) found that exercises prevent falls in older adults.

Based on the study, this project aims to develop an Android app to address falls of older adults (over 65 years of age) at home and in the community, providing an in-home exercise program to help older adults rehabilitate from falls and improve fitness, restore confidence, and prevent future falls.

3. PROCESS

A hybrid approach of Scrum for One and Kanban is used for the individual development project.

Scrum for One is part of the Agile Methodology that adapts to a development team of only one person, focusing on continuous delivery of products.

Kanban is another branch of Agile Methodology, using a board to visualise the workflow. Kanban focuses on workflow optimisation by encouraging minimising developing cycle time. (Kanbanize, 2022)

The project used Scrum for One to manage the development processes. The development was completed in sprints of two weeks. As defined in Scrum, this project required the lead author to function in multiple roles, as the Product Owner, as the Scrum Master and lastly as a developer.

During the project, the lead author worked as a product owner by identifying the user requirements and creating and maintaining the product backlog; and then the lead author acted as a Scrum Master by organising the events and conducting daily Scrum.

In each sprint, the lead author served as the developer to create reasonable and achievable goals and deliver shippable products to the clients.

This project used a Kanban board to keep the backlog and visualise the development progress.

The risks of the project were managed with the Microsoft Risk Template Tool (Microsoft, 2022). This tool provides a clear and quantitative view of risk exposure so that risks can be evaluated and prioritised easily.

	Risk Statement		(Scale)	(Scale)				
#	Condition	Consequence	Probability	Impact	Exposure	Mitigation	Contingency	Triggers
1	The company ceases to operate during the project	The project will reach termination.	1%	10	0.1	No	Refer to the supervisors and course convenor for advice.	The company breaks down.
2	Scope creep	More workloads may delay the progress or even cause failure	80%	8	6.4	Research thoroughly and fully communicates with the client when gathering user requirements	Reassess the workload and update the project plan.	The product owner has new ideas about the functions of the app.
3	The student is not familiar with the development tool	Inappropriate tool may be chosen or more time is needed for the preparation before development.	70%	6	4.2	Research thoroughly and refer to the supervisors for advice before choosing the development tool. Once the tool is chosen, search for best practice and similar tutorial to acquire the skill promptly.	If the tool is not the right one, change to another one as soon as possible; If the tool is the right one, but the student spends more time learning about it than expected, try to work for more hours and catch up with the progress.	It is difficult to develop the app with the chosen development tool.

Figure 2 - Risk assessment example

The risk analysis and management were implemented every two weeks (aligned with each sprint). The risk table was updated based on the changes in risks, and the solutions to eliminate the risks or mitigate their impacts were illustrated too.

The project has carried out a quality assurance approach based on the Quality Assurance template provided by Virginia Tech (Virginia Tech, 2022).

Quality assurance activities were repeated with the project progress, especially at the critical milestones.

TABLE 21

QUALITY ASSURANCE TABLE - WEEK8 - ACADEMIC DELIVERABLES

Project deliverables	Evaluation standard	Quality assurance activities	Checkpoints or frequency	Who is responsible for the activity	Date
Project proposal	Grammarly MS word spelling check	Spelling check Grammar check	Multiple review	The student	18/03/2022
	The proposal checklist	Compare with the proposal checklist	Multiple review	The student	20/03/2022
	The marking rubrics	Review the marking rubrics	Multiple review	The student	20/03/2022

TABLE 22

QUALITY ASSURANCE TABLE - WEEK 4 - PROCESSES

Project process	Evaluation standard	Quality assurance activities	Checkpoints or frequency	Designated person	Date
User requirements gathering and feature specification	Student has understood the user's requirements clearly	Discuss with the supervisors	At the conclusion stage of user requirements gathering	The student The industry supervisor	16/03/2022

Figure 3 - Quality Assurance table example

4. OUTCOMES

A prototype of the Fall rehabilitation app was developed with React Native and TypeScript. The prototype provides the following functionalities:

- Creating, editing, and deleting user profiles.
- Creating and editing exercise plans for an individual user
- Displaying the exercise of the day
- Playing/Pausing exercise videos
- Submitting and recording the complete status of each exercise
- Submitting users' feedback
- Displaying the exercise content in the calendar

Figure 4 shows some screenshots of the app's UI.

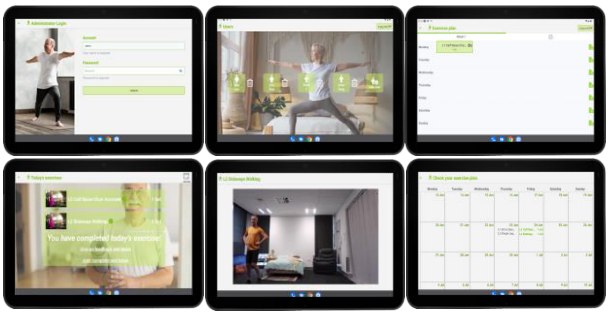

Figure 4 Screenshots of the app

5. CONCLUSION

The lead author gained experience by applying technical skills in real-world projects, dealing with stakeholders, and adopting an Agile approach to manage the project. The project deliverable fulfilled the functionality requirements. The Android app will benefit the users by improving their fitness, restoring confidence, and preventing future falls.

6. REFERENCES

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