LearningHub Mobile Application for Android Devices

BCIT IT Services

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March 31, 2022

BCIT Infrastructure Shortcomings

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COMM 2216 2A

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Executive Summary

British Columbia Institute of Technology (BCIT) has no dedicated mobile application of the Desire2Learn (D2L) LearningHub for Android devices. This proposal aims to launch a LearningHub mobile application, under the ownership of BCIT, for all BCIT-registered persons with Android devices.

This new mobile application, developed with Flutter, will have features including:

- offline functionality for users with no WiFi or data network connections
- a visual and technical design identical to the mobile-website version of the LearningHub for identity and user-familiarity purposes
- mobile-optimized and exclusive features:
    - automatic screen resizing
    - automatic screen rotation
    - offline sessions
        - saving user data in a local database to be synchronized with the online database during the next network connection

With the Scrum agile development framework, the mobile application will launch after five months and twenty-one days. The development process will have five distinct stages (*milestones*) each having several specific tasks exclusive to it. These milestone tasks last a week or two. Each milestone task will produce a functional piece of the mobile application for user-acceptance and development team feedback.

The project will use the “Pilot Group” methodology to test the mobile application for a select group of candidates chosen per requirements. This particular methodology is low-cost, low-risk, and is quicker to implement [1]. The isolated group is easily manageable and does not influence the data of the larger BCIT population and the whole BCIT database [1].

For the Proposal Schedule, the Requirements milestone focuses on drafting and finalizing a requirements document for the mobile application. A week of drafting and an additional week of finalizing the document is necessary. Then, in the Interview milestone, we will select pilot group members after their successful candidate interviews the following week.

The Design & Development milestone focuses on building the mobile application with the Scrum and Flutter frameworks. There are four two-week time periods for development (*Scrum sprints*). A “Scrum Master” will be appointed at the beginning of project development and is responsible for creating backlogs for team review after each sprint. An “increment”, a fully-functional piece of the mobile application, will be available for feedback in the Testing milestone after each sprint as well.

Finally, the mobile application is fully-assembled for pilot group testing in the Testing milestone. Simultaneous development of the mobile application persists throughout each sprint to fix the app per feedback. Afterwards, the Deployment milestone focuses on launching the mobile application to the whole BCIT population available only for Android users. The maintenance period will begin after the successful launch to handle any requests or support issues reported by users.

Introduction

The Learning Hub was deployed for BCIT when the focus of accessing school resources was with desktop machines. In the past decade, mobile device sales rose dramatically and the industry saw a major curve during the early 2010s [2]. Samsung and other device manufacturers such as Huawei use the Android operating system. We conducted a survey of current students in the BCIT Downtown Campus (DTC). Our findings show that 39 out of 90 students own an Android device; the sample suggests that a random student in DTC has a 43% chance of owning an Android.

The LearningHub has no mobile application equivalent in the Google Play Store. The Pulse app, a mobile application from D2L Brightspace, retains only the *access courses*, *access grades*, and *receive notifications* functionalities from the desktop website. Within the general BCIT population, users sometimes access the LearningHub outside of their desktop machines in environments without wireless network connection.

Based on our analysis of the current LearningHub website, a BCIT-owned LearningHub mobile device port for Android devices needs to solve three goals.

Mobile Application Optimization

First, it needs to be mobile optimized. This means converting the desktop-optimized website into mobile device screen and responsiveness standards. A dedicated application for the LearningHub would also have to be distributed and sold on the official Android application store, Google Play Store.

To achieve this, the application must recognize the screen dimensions of the user's device and automatically resize itself while keeping its interface proportions relative. Finally, we must respect the policies for Android application stores and follow their publishing process. For example, the application must be compliant with the Google Play policy or the Developer Distribution Agreement [3].

A Direct Port of the BCIT LearningHub Website

Second, it needs to be a direct port of the BCIT LearningHub website. This means the application has to preserve all the tools and resources provided by the website. Additionally, the application has to remain identical by visual and technical design. Opportunities for improved performance gains while maintaining these requirements will be considered.

To achieve this, the application must resemble the source code specifically developed for the desktop website but converted for Android architecture. Since the source code for online websites made for desktop machines are different to Android devices, the code can be remade with Flutter's supported coding language(s) exclusive to Android development.

Regarding network connections, although website connection disruptions are infrequent, they still negatively impact the user-experience. Combined with a restricted medium to access the website, the user can become frustrated and unwilling to use the website service on mobile

again. It is important to improve upon the source code only, rather than creating new and custom features that may cause more user-experience issues.

Mobile Application Offline Functionality

Third, it needs to be usable during offline sessions. This means using the mobile application with no WiFi or data network connection. Information received and displayed by the application from the last known login through a wireless network connection should be preserved for offline viewing. The offline session should be synced with the server once the application receives a wireless network connection again; refreshing the content to its most updated state. To achieve this, the application will use the Flutter framework's "Offline First" workflow.

Proposal Benefits

Successfully building an institution-exclusive mobile application of a globally rated and marketed learning management system (LMS) provider positively impacts BCIT's name and culture. BCITs advocacy for finding and providing solutions for world challenges is solidified with the project. Additionally, the publicity of the application will attract more prospective students. For enrolled students, the publicity reaffirms their choice for studying at a school championing its values and populace. The project itself is directed by BCITs own IT Services (ITS) team; skillful individuals considered by BCIT through our back-end programming, databasing, and network resolving skills. The application will be developed by our team and represent a first-of-its-kind product amongst those available from other competitive post-secondary schools.

Project Details

In this section, crucial technical and real-world details will be further discussed in order to demonstrate our full understanding and commitment to our proposal to create a mobile application of the LearningHub for Android devices.

Pilot Implementation Methodology

Our first plan of action will be selecting and beginning the pilot implementation methodology process. The methodology consists of a small group of people using a new product—the mobile application—before the rest of a targeted population (i.e., all Android users of the LearningHub). This group is known as the pilot group. Any issues encountered during the implementation process is contained within this group, therefore leaving the larger population's data unaffected. This methodology is low-risk with high management, low-cost, and its implementation deployment is much quicker compared to other methodologies.

Low Risk and High Management Capabilities

Since the implementation would involve only a small group of people using the mobile application, any encountered problems could be easily contained and resolved. The small-scale implementation allows us to iteratively and incrementally resolve problems.

Since any risks are contained, huge data loss during network communications from the mobile application to the D2L database would be highly unlikely. If data loss does occur,

the environment is controlled and can be traced within the small sample size of the pilot group, therefore eliminating a large amount of trouble of identifying network activities of several thousand users. Note this example can be applied towards any error found within the pilot group.

Low Cost

As it is a small-scale implementation, the cost of developing and maintaining the mobile application for the pilot group while maintaining the desktop website would be inexpensive. The Learning Hub would still have to function for all mobile device platforms and desktop platforms (as a website) alongside the new Android-exclusive application. Therefore, having the cost cheaper for both mediums to be operational during development is a clear benefit.

Quicker Implementation

The methodology would only involve enabling access to the mobile application for a small group of people with Android devices, which can be done much faster than deploying the application for every Android user in BCIT. The data conversion process is only concerned for the small group's user account and information. This is easier and much quicker to do as opposed to data conversion for an entire targeted population.

Pilot Group Candidates

In order to form a successful pilot group, we must consider the select few using the mobile application. Note that although professors at BCIT have several years of extensive industry-experience valuable for feedback, they are the users who use the LearningHub to a high degree. There are hundreds of professors at BCIT and each professor provides course resources and must manage their students individually daily. Since they form the necessary bridge between education for students, it would be wise to consider our IT staff instead. Furthermore, it would also be a good opportunity to consider Level 4 or Co-op students from the Computer Information Technology (CIT) program *and* a few students from non-technology programs.

Highly Experienced IT Services Staff

BCIT's ITS work to ensure the school's LMS is operational. They are also responsible for all the back-end services and processes (i.e., networking, data-center operations, and database management). Only the most experienced and highly-qualified individuals from the IT department should be considered as candidates. These individuals are the most apt to recognize any back-end concerns regarding the application development. With their expertise, their feedback would be especially valuable.

DTC Students

It would be an exciting and interesting opportunity for students to participate as a pilot group member. The opportunity could be advertised across campus via posters, social media, and by section representatives.

Students from the CIT program

CIT students would be able to experience a hands-on technical and business position. If the student was enrolled in a former co-op position, they would be able to further exercise their new-found industry skills.

Level 4 students continue to learn necessary skills for careers in the I.T. industry. These students have endured and passed the 3 previous semesters; semesters structured to challenge non-actively committed peers. In their final semester, they have a strong commitment to demonstrate their current skills to secure a position in a pursued career they are well-taught for.

With respect to small-scale, the three top performing Level 4 CIT students should be joined with two well-received-and-performing CIT co-op students to be candidates for the pilot group. Should any of the candidates reject the offer, the next candidate academically or professionally ranked must be selected, and so on.

DTC Students from outside the CIT program

Students who are not enrolled in the CIT program are users of the LearningHub who may only have entry-level knowledge of technology, or less. Therefore, these students can offer constructive feedback as a “regular” user.

> With respect to small-scale, any three students willing to participate for the pilot group can be considered as a candidate. An acceptable level of professionalism and commitment must be considered from these candidates.

Mobile Application Development

The project will use Flutter to develop the mobile application.

> Flutter is an open-source framework by Google for building beautiful, natively compiled, multi-platform applications from a single codebase [4].

With Flutter, our chosen text-editor will be Visual Studio Code. It is endorsed by Flutter for their "app execution and debug support" [5]. The Dart programming language, a necessary tool for Flutter, will be installed in our team's text-editors.

> Dart is a platform-independent, open-source, and object-oriented programming language that comprises a range of useful features for a software developer [6].

Building the Application

> The focus for the mobile application is to keep *all* the existing functionality of the website and preserving its mobile view. We will have to first communicate with Brightspace to legally access the code and programming languages used to create the website view for Android devices. BCITs database is managed by Brightspace, the LMS provider, so we have to extend our request with access to their database, so the application can communicate user and app data to it. Note that such legal proceedings

may affect the project completion date. Once legal negotiations are completed, our team can begin replicating the design and technical features of the LearningHub.

Offline Functionality

The application will work without wireless connection by using the Offline First workflow of Flutter. In this workflow, an event is initiated (*method call*) to check the connectivity status of the user.

If the user is connected to WiFi or cellular data, a method call to retrieve the data from the LearningHub's database begins. The new data is then synchronized with the user's device (*local database*) and the user is then allowed to use the application [7].

If the user is not connected to WiFi or cellular data, a method call begins to check the user's data since their last wireless network connection. This event then reloads their local database and displays the saved information, and the user is then allowed to use the application [7].

Scrum Framework

To keep the schedule, budget, and scope of the project minimized, we will be developing the project with the Scrum framework. The Scrum framework encourages developers to *"fail fast"* in order to learn [8]. The Scrum framework will allow the project owner and stakeholders to

make requests during the development process and see fully-functional increments after every sprint.

After every sprint, our team will communicate with each other and provide feedback regarding the progress of the project. In this phase, the team acquires valuable information to prevent any shortcomings from their parts of the project to persist in the future.

During a sprint, a backlog is created by the Scrum master to monitor and manage all the actions done by the development team. We believe BCIT IT Services' (ITS) lead software administrator, Tristan Lingat, is a great fit for a Scrum master. Our choice is supported by his excellent leadership, effective team-communication, and highly dependable work experience.

Each Scrum sprint will last a maximum of two weeks, excluding the maintenance task. Specified technical requirements of the application, and additional requests, will be completed during these sprints *sequentially* according to project priority and will be presented for feedback.

Schedule Sheet

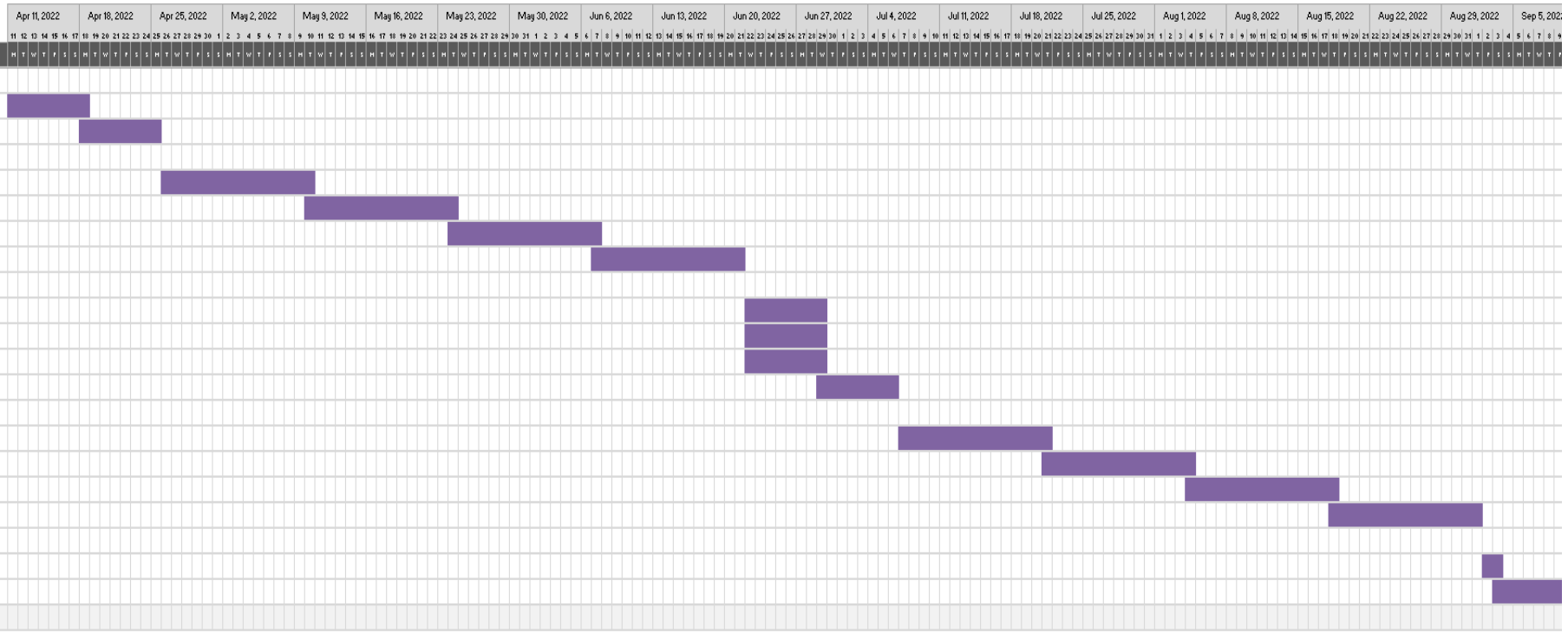
Proposal Schedule

SIMPLE GANTT CHART by Vertex42.com

https://www.vertex42.com/ExcelTemplates/simple-gantt-chart.html

Tristan Lingat | Mon, 4/11/2022 | 1

TASK	START	END
Requirements		
Draft	4/11/22	4/18/22
Final	4/18/22	4/25/22
Design & Development		
Application Port	4/26/22	5/10/22
Application Port	5/10/22	5/24/22
Application Port	5/24/22	6/7/22
Application Port	6/7/22	6/21/22
Interview		
I.T. Staff	6/22/22	6/29/22
CIT Students	6/22/22	6/29/22
Non-CIT Student	6/22/22	6/29/22
Pilot Group	6/29/22	7/6/22
Testing		
Pilot Testing 1	7/7/22	7/21/22
Pilot Testing 2	7/21/22	8/4/22
Pilot Testing 3	8/4/22	8/18/22
Pilot Testing 4	8/18/22	9/1/22
Deployment		
Launch	9/2/22	9/3/22
Maintenance	9/3/22	10/1/22



**The Maintenance task of the Deployment milestone spans a month for image sizing purposes. The expected end date is indefinite.*

Schedule

Requirements

This phase will focus on the drafting and finalization of the project's requirements. We will discuss with project stakeholders and begin drafting the requirements document. Afterwards, we will finalize the requirements document, ensuring that all the requests and standards of the stakeholders for the mobile application are confirmed. Note that during the development process, stakeholders can request for more changes which may affect development schedule.

Interview

This phase will focus on selecting the candidates for the pilot group. Each candidate group will have their interview conducted at the same time in the same week in the DTC. Interviews will be held inside the private rooms in the Tech Hub, which is located in the fifth floor. After the interview period, the pilot group will be constructed within one week and all the selected candidates will be contacted and granted access to install the mobile application from the Google Play Store.

Design & Development

This phase will focus on the design and development of the mobile application. The application will be built with Flutter and Dart for Android devices. There will be four two-week sprints in this phase. Between each phase, feedback regarding development and interpersonal relations will be discussed. The goal from these sprints is to utilize our backlogs and the direction of our

Scrum Master to learn from our shortcomings and produce fully-functional increments of the application after every sprint.

Testing

This phase will focus on receiving feedback and additional critical requests to fix errors and failures found in the mobile application. The pilot group will provide their feedback over the course of four two-week sprints. During this phase, our team will update the mobile application to ensure the requirements are met and there are no errors or failures. With the feedback from pilot testers, we will also utilize our backlogs and Scrum Master's direction to deliver the updated mobile application per sprint.

Deployment

This phase will focus on launching the mobile application to all BCIT LearningHub Android users after final adjustments. The mobile application must be legally distributed through Google Play Store. After launch, our team will provide maintenance support for the mobile application. Any requests made within this period are evaluated and developed should they promise technical or design value (determined by the application's users). The maintenance period lasts indefinitely because it is ultimately determined by our employment status in the BCIT ITS team.

Conclusion

The LearningHub mobile application will take five months and twenty-one days to develop and launch for all BCIT Android users. The project will have five distinct milestones, each having separate tasks to be completed and delivered after Scrum sprints. With the Scrum agile framework, proactive and clear communication between the development team and project partners is guaranteed. Additional requests and ongoing support will be delivered as per established dates.

The new mobile application will retain the design of the website with improved features including:

- offline connection functionality for users with no wireless or data connection
- identical visual design to its website counterpart for familiarity and identity
- performance and responsiveness improvements optimized specifically for mobile devices
    - e.g., automatic screen resizing and automatic screen rotation

There are several benefits from this project including:

- an exclusive and original institution-owned mobile application
- project promotion piques interest at and solidifies BCITs advocacy for hands-on learning and solving complex real-world problems
    - opportunities for current students to learn hands-on and be a part of a development and business process in the technical field
    - positive conceptions from prospective students, current students, and staff
- providing users with all desktop-website functionalities and increased user-friendly experience as a dedicated mobile application

Recommendations

We recommend that BCIT promote the project ahead of the start date to attract attention and receive initial feedback and responses. All three candidate groups of the pilot stage can then be informed of the project in advance to prepare themselves and any questions for signup should they choose to do so.

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