TEXTBOOKU: A MOBILE APP THAT HELPS STUDENTS TRADE TEXTBOOKS AND SAVE MONEY

Emily Hoch, Ryan Harrington, Tom Kratz, Joo Tan
Kutztown University of Pennsylvania
dhoch984@live.kutztown.edu, rharr936@live.kutztown.edu, tkrat567@live.kutztown.edu, tan@kutztown.edu

ABSTRACT
At Kutztown University, students must complete a capstone course which serves as the culminating experience for computer science seniors before they graduate with a major in the discipline. The current capstone requirement comprises of a two-course sequence in Software Engineering. As the capstone project, a project team consisting of 3 students decided to develop a mobile application that will allow students to buy and sell used textbooks directly to other students at the university. This application will be extremely useful in helping students save money on textbooks for their courses. The initial goal will be to test the application within the university.

KEY WORDS
Textbooks, software engineering, capstone project, agile development, mobile apps, Android OS.

1. Introduction

This paper outlines a student project in a two-course capstone sequence (CSC 354-355) to develop a mobile application that addresses the price of college textbooks. During Software Engineering I (CSC 354) in the Fall semester of 2015, the authors' team (named as TeamD) planned the project, gathered requirements for the application (hereafter referred to as TextbooKU) from the client, documented, and designed TextbooKU in preparation for implementation and testing in the next phase of the software development lifecycle. During Software Engineering II (CSC 355) in Spring 2016, the plans will be implemented during two-week sprints that is based on Agile software development methods [1]. There are two scheduled milestone deliveries for TextbooKU.

The cost of college attendance has been steadily rising since the mid-1980s, with public and private tuition outpacing even general inflation in the United States [2]. One of the contributing factors most directly felt by college students is the price of textbooks. Because students represent a captive population in a market which is heavily manipulated by the publishing and reselling industry, every effort to squeeze profits out of students has been made. This led James Koch to coin the term "broken market", and is illustrative of the problematic nature of textbook pricing [3].

TextbooKU aims to disrupt this system by allowing students to recoup more of the money spent on textbooks. The goal of the project is to have a working app that can be deployed to university students at the end of the Spring semester.

2. Project Description

This project is intended to last for two semesters. The project takes the students through the entire software development lifecycle, starting from planning through implementation, testing, and deployment, along with the experience of working with a real client.

There are two major milestones built into the project. One is the Intermediate Delivery, due on March 04, 2016, at which time a subset of the major functionalities is expected to be completed. Some of the items identified for this delivery include the ability to create, log into the app, and delete an account; view account activity; search for an ISBN manually; list a book for sale or offer to purchase a listed book. The second milestone is the Final Delivery on April 25, 2016. For this delivery, all functionalities should be implemented and the app ready to be deployed. In addition, the more complicated process of retrieving book data from the web will be finalized and user tutorials as well as help features made available.

3. Description of the Mobile Application

TeamD envisioned TextbooKU to be a textbook trading application for the Android operating system to be used on mobile devices such as tablets and smartphones. It is a tool that college students will be able to use to buy and sell textbooks on their campus through face-to-face transactions. Students will be able to scan the barcode of a textbook using the device's camera, or manually enter the ISBN. The app will use the ISBN to retrieve information about the book from the web, including its current price on major marketplaces such as Amazon and Chegg. The student will then be able to set their own price and list the

book for sale within TextbooKU. Other students will be able to browse by course prefixes or directly by ISBNs for the books they need. If no book is available, the student may add it to a Wish List, so that they will be notified via text message when a copy of that book is listed for sale. Once an available book is located, the app will prompt the potential buyer and seller to set up a time to meet. The app will not handle any payment information. It will refer users to PayPal, or ask them to confirm payment by cash or personal check. Finally, to ensure that the system is not abused, all users must register for a TextbooKU account using their .edu e-mail address, which will be verified. In addition, users will have an option to flag inappropriate behavior by other users.

3.1 Purpose and Benefit to Students

As mentioned earlier, the purpose of TextbooKU is to give students some advantage in re-selling textbooks. Currently, most students only have the option to resell books to campus stores, which have limiting buyback quotas, or to sell their books online to book vendors. In both cases, the buyback prices are low when compared to the prices they are sold at, regardless of whether the book was purchased new, used, or of the condition it is sold in. In the experience of the authors, buyback prices range from a mere 6% to approximately 50% of the purchase price. Because of the expenses, many students report downloading books illegally, or skipping the book entirely [4,5].

Some contributing factors to the rise in textbook prices are that publishers release new editions every three to four years; the publishers and distributors constitute an oligopoly, limiting competition; the practice of "bundling", or including one-shot access codes to online material, which reduces the value of the book once purchased; and price discrimination, or the practice of setting different prices in different regions [6]. None of these factors are easily changed by students directly.

There have been some efforts to address the issue of college costs and textbooks in particular. One is the StudentPIRG (Public Interest Research Groups)'s Make Textbooks Affordable campaign, which advocates for open textbooks [6]. However, it is up to faculty to adopt open textbooks, and again, students themselves have little control over this. This is where an app like TextbooKU can help make a meaningful difference to students trapped in a market they can't otherwise change.

Some larger universities have book trading sites for students, or informal Facebook groups, such as UC Berkeley Textbooks. The purpose of TextbooKU is to introduce a similar system within the Pennsylvania State System of Higher Education (PASSHE). By creating an app for textbook trading, it is hoped that students will be able to respond quickly to each other and trade safely and with ease.

The way TextbooKU is envisioned, students buying used textbooks would be paying approximately the same prices as if they shopped for used books at major online vendors. However, they will have the chance to resell books at prices comparable to what book vendors get for a given book.

Another feature that has been discussed is asking students to rate their transactions with other users, most likely on a simple scale like one to five stars. This would provide more transparency for users and help to create trust among them, as well as helping administrators identify bad actors who may need to be removed from the system.

3.2 Major Functions

Some of the major functionalities that will be implemented in TextbooKU are described next.

- Create an account: Anyone who wishes to use this app must have an active student email address at the campus they plan to buy or sell books. They can register for a TextbooKU account using this e-mail address. The system will validate the e-mail as being an .edu account from Kutztown University. This is intended to limit the user base to current college students. Figures 1 & 2 show the screens for creating an account and login for the application.

Figure 1: Create an account screen

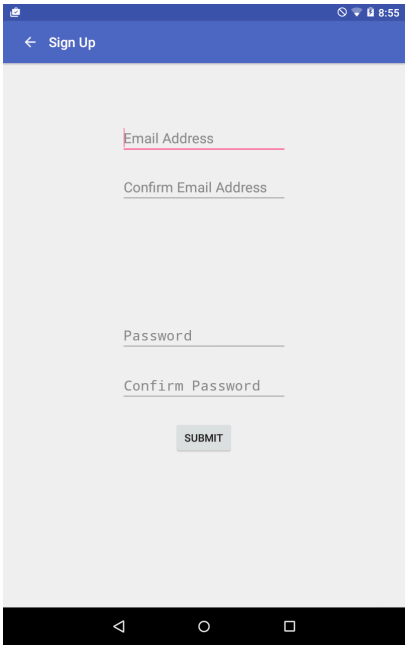
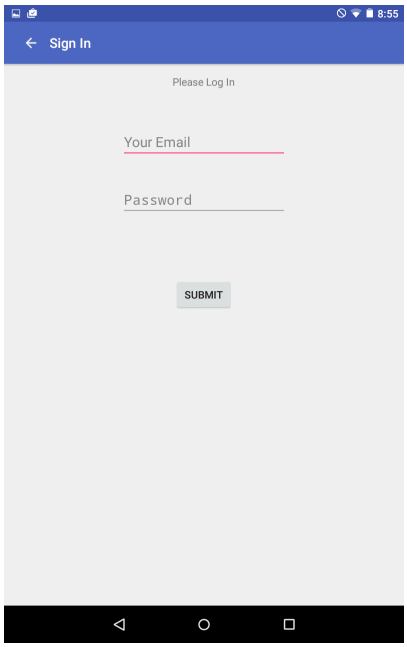
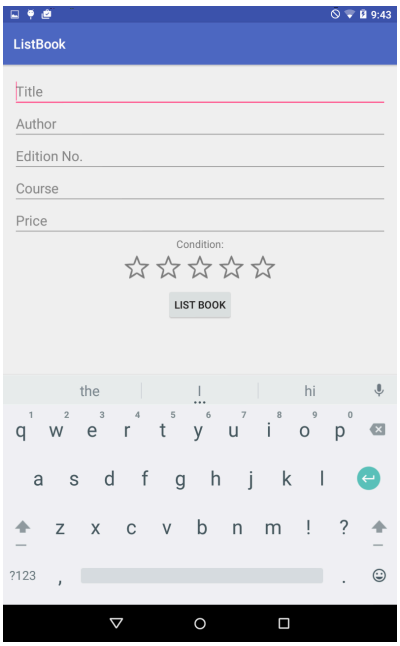


Figure 2: Log in screen



- Post a book to sell: Students will be able to scan the barcode of their books using the camera in their mobile devices or type in the book's ISBN. The app will look up the book from Amazon.com and show the seller the current price of a used version of their book. It will them prompt them to enter a sale price for their book. They may also enter additional notes on the condition of the book. The book will then be listed in TextbooKU for all other users to see. Figure 3 shows a sample screen that has been designed for this action.

Figure 3: Post a book screen

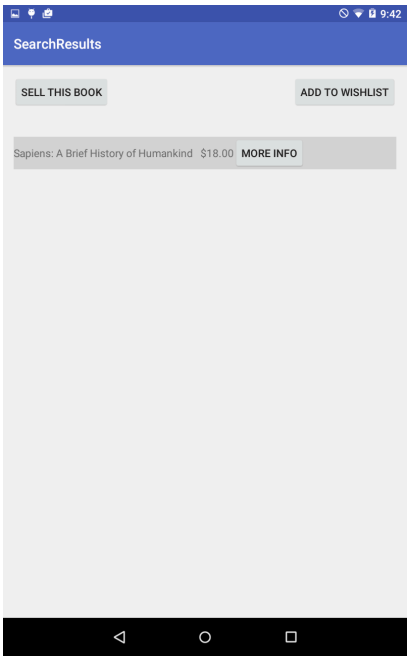


- View account activity: The View My Activity screen will contain all relevant information about the account, such as the purchase history, sale history, current Wish List items, links to the tutorial and "Contact Us" sections, and the controls for deleting the account. Figure 4 shows a sample screen.

Figure 4: View account activity screen

- Find a book: Potential buyers can type in the ISBN of a book they need to buy, or choose from a menu of course prefixes to find books listed by department and course number. If the book searched for is not currently listed for sale within TextbooKU, the user can add that book to a Wish List. The user will receive a notification when a copy of that book becomes available in TextbooKU. In the case that a book is available, the app will display a listing showing the current price on Amazon along with the price the local seller is asking. This is intended to prevent price-gouging. The book listing will also display notes entered by the seller regarding condition of the book and any optional information. Buyers can make an offer to purchase the book, which will trigger the transaction function. Figure 5 illustrates this screen.

Figure 5: Find a book screen



- Transaction: When an offer has been made on a book, the listing is changed from "Available" to "Sale Pending" for four hours. A notification is sent to the seller that there is an interested buyer. The seller then responds to the buyer with a time and location to meet in person. The buyer can either accept this meeting arrangement or send a counter offer with alternate times and places. Buyer and seller can also negotiate a payment method during the Transaction period, utilizing existing PayPal accounts, cash, or personal check. After the four-hour pending period, a notification is sent to the seller asking if the sale was completed. If so, the listing is removed. If not, the listing returns to "Available" status. A sample screen for transaction is shown in figure 6.

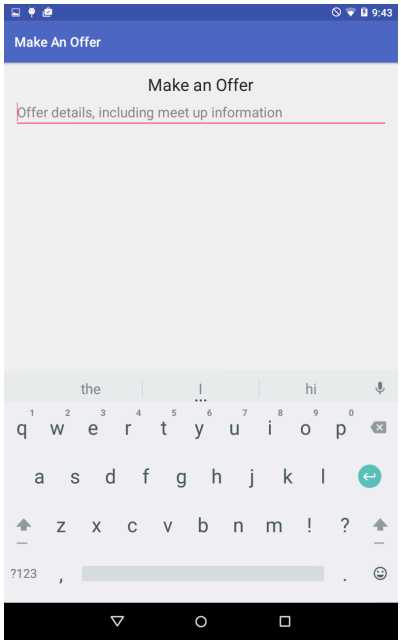
3.3 Who are the Users?

There are two types of users built into the application: Administrators and Application Users.

An Administrator has the ability to edit or remove book listings added by the Application Users, and the ability to edit or remove user accounts. Administrators will be the primary moderators of the application, keeping it clear from spam.

The Application Users have the ability to create an account and sign in, list books for sale, view other listings, and schedule a purchase. They will also be able to view all account activity. Application Users will be the standard students at the university. Since users will be required to use a school e-mail, it will be harder for mass book sellers or spam sources to access TextbooKU.

Figure 6: Transaction screen



3.4 Technical Details

During the Spring 2016 semester, TextbooKU will be implemented and tested with a final delivery date of April 25, 2016. The app can be divided into a front end, consisting of the mobile app itself as seen by users, and the back end, consisting of the database and web service.

The mobile application is developed in Android Studio as a native Android application [7] and sends HTTP requests to the web service. The RESTful web service is implemented in Python using a web development microframework called Flask [8]. The web service then uses SQLite commands to interact with the database and post information back to the Android App. The current design of the database uses three tables: Users, Listings, and Wishlists. The Listings table includes the most attributes, and can be used to generate the information users will see in the My Activity screens.

Usability testing will be conducted with volunteer testers to assess TextbooKU's design, responsiveness, and ease of use. Test users will be asked to rate various features on a Likert-type scale questionnaire as well as to give freeform feedback. If any patterns emerge in the ratings and feedback, changes based on the feedback may be incorporated into future versions.

3.5 Experiences with This Project

One of the biggest benefits from the Software Engineering course is the chance to design and plan software from scratch. The project has been structured with a hybrid of traditional and modern methods. In the first semester, the focus was on producing documentation to become familiar with the stages of planning, and the gathering and specification of requirements for both the project and the software itself. Rather than being locked into ideas generated in the first weeks of the Fall semester, the team has had the flexibility to adapt to new inputs from the project client, and to the team's own capabilities.

One of the largest challenges faced by TeamD is learning to develop a mobile application, since this is the first encounter with the topic while studying in the computer science undergraduate program. None of the project members had any experience with developing mobile applications. This was a huge challenge for the team. Having some experience with mobile app development is a highly marketable skill set, so researching and learning available IDEs, SDKs, and platforms is valuable.

The decision to develop TextbooKU for Android OS was based on two factors. First, each member of the team has some previous experience with Java, the language used by Android. Second, the app could be listed and distributed through Google Play for free, thus avoiding the yearly $99 license fee required to put an app in the Apple AppStore. It was also determined that testing would be simpler on Android devices, because team members already had Android-based smartphones. Furthermore, tablets can be borrowed from the Computer Science department for testing purposes.

3.6 Future Considerations

If the app is adopted by students at the university, porting to iOS would be a sensible next step, thereby expanding the user base. TeamD has discussed forming a Limited Liability Company (LLC) in order to maintain the app and derive any income from it. If the app is deployed for use in one or more universities, possible sources of income could be from in-app advertising, a percentage of sales collected by the app, or sale of the app itself, most likely for $0.99 or less.

It is also assumed that the app could be modified for other college campuses, beginning with the PASSHE schools and possibly even moving on from there.

4. Conclusion

The primary advantage and purpose of TextbooKU is to help students recoup the costs of textbooks. If successful, this app could be adapted for many university campuses.

This capstone project has provided TeamD members valuable experience with planning, designing and implementing a mobile application. This experience offers potential for continued learning beyond the classroom after college graduation.

The limitations this project faces are developer experience levels and user adoption. This the first time any member of the team has attempted to deploy a "real world" application. Research and prototyping will be significant parts of making the system work. In addition to creating a working system, potential users must be made aware of the app. Word-of-mouth will be a way to start, but if the project gets going, a Kickstarter campaign would be a useful way to raise some funds to publicize the app, reach out to users, and continue developing it further.

References:

[1] Frank Tsui, Orlando Karam, Barbara Bernal, *Essentials of Software Engineering* (Jones and Bartlett, 2014).

[2] Sandy Baum, Trends in College Pricing, *The College Board*, 2008.

[3] James V. Koch, An Economic Analysis of Textbook Pricing and Textbook Markets, ACSFA College Textbook Cost Study Plan Proposal, *Advisory Committee on Student Financial Assistance*, Washington, DC, 2006.

[4] David Schick, Mary Beth Marklein, College Students Say No To Costly Textbooks, *USA Today*, August 20, 2013, last retrieved 2/3/2016

[5] Tyler Kingkade, College Textbook Prices Increasing Faster Than Tuition and Inflation, *The Huffington Post*, January 23, 2014, last retrieved 2/3/2016

[6] Ethan Senack, Affordable Textbooks, A Policy Guide, *The U.S. PIRG Education Fund and Student PIRGs*, 2014, last retrieved 2/3/2016

[7] The Android Studio, IDE for Android Development, http://developer.android.com/sdk/index.html, last retrieved 2/1/2016

[8] Flask, Web Development Microframework using Python, http://flask.pocoo.org/, last retrieved 3/2/2016