ChallengeIt

IEEE 2014 Smarter Planet Challenge Proposal

Lead Proposer:

Christophe TOURET
1420 New Bellevue Avenue, Apt. #1611
Daytona Beach, FL 32114

Phone: (386) 333-1128
Email: touretc@my.erau.edu
Major: Master of Software Engineering
Institution: Embry-Riddle Aeronautical University, FL

Team Members:

Ryan GAUTHIER
Email: gauthier@my.erau.edu
Major: BS/MS of Software Engineering
Institution: Embry-Riddle Aeronautical University, FL

Siddhartha BHARANI
Email: bharanis@my.erau.edu
Major: Master of Business Administration
Institution: Embry-Riddle Aeronautical University, FL

Janani THIAGARAJAN
Email: thiagarj@my.erau.edu
Major: Master of Business Administration
Institution: Embry-Riddle Aeronautical University, FL

Advisors:

Dr. Shafagh JAFER
Assistant Professor of Software Engineering
Email: Shafagh.Jafer@erau.edu
Institution: Embry-Riddle Aeronautical University, FL

Dr. Michael BOWERS
Professor of Entrepreneurship
Email: Michael.Bowers1@erau.edu
Institution: Embry-Riddle Aeronautical University, FL

Project Description

What if the boring classroom experience can become an immersive, effective and engaging game for both the student and teacher? What if a student could be motivated to accomplish more than just the learning requirements of a class? To make these things real, we propose ChallengeIt: a mobile application that allows students to compete with one another on challenges in their classrooms in a fun and interactive manner. The classroom can now be supplemented with a targeted "game", where students can earn points by completing challenges, and having their teachers review those answers and award points. Students are free to use any medium or combination of media with which they prefer to respond to these challenges (eg. text, PDFs, photos, videos, etc.). Students will be able to always participate in the class (both at school and at home) in a way that makes them most comfortable. If the teacher so chooses, real-world problems could also be introduced into our solution, thereby allowing student efforts to be channeled into real-world solutions.

ChallengeIt represents an innovative solution because it represents a fusion of the edutainment game genre and the interactive classroom tool. It is cheap to implement, easy to use, and provides convenient access to learning activities wherever the student is at any time. ChallengeIt also represents a departure from previous attempts to implement game-based digital classroom. The Classroom Response System from Carnegie Mellon University employed a proprietary response system designed for use inside the classroom [1]and the WE Learn global initiative by Qualcomm Incorporated tried to deploy large amounts of highly customized and specialized 3G smartphones to connect students and teachers wherever they might be [2]This latter solution is relatively recent and was relatively successful, indicating that the idea of using smartphones for education has merit and potential worth exploring. We are hoping to achieve similar results with ChallengeIt by incorporating an additional fun-factor, but at a much lower cost to students, parents, and schools.

We are providing guidelines to guide the design and development of a ChallengeIt project, based on our own experiences and knowledge developing a similar solution for research inside our academic department.

How Does This Project Benefit Society?

The challenge that we're trying to tackle with this project is the apparent lack of student engagement and motivation in modern-day classrooms. Indeed, a study shows that in Wisconsin, the dropout rate of high school students is about 10 percent each year in the last decade [3]. One reason this could be happening might be the increased prevalence of technology in our day-to-day lives and how it has made us unable to focus on any particular task for long periods of time. Technology has also introduced fundamental new forms of communication: forms that are ingrained in young adults from a very young age and represent their most comfortable manner of interaction. Essentially, adapting school to address these issues would require a fundamental paradigm shift in the very way we prepare and conduct education globally.

With ChallengeIt, we look to utilize technology that most children already have and use it to create an interactive and fun environment to further studies both within and outside the classroom. There already have been a number of commercial successes in fitness, task completion, and healthy living, like this article from Smith and Jones attests: "Hospitals and physician practices are starting to use social media to incentivize patients to lead healthier lifestyles through integrated online and mobile games as a means of encouraging competition between individuals to foment personal motivation" [4]. We are hoping that our product can do the same thing for education, and it will be fast and cheap to set up. By presenting students with course-related "challenges" by their, students would compete between each other for the most number of correct answers and also be forced to learn new concepts outside the normal course requirements to be able to complete them.

Student Learning Intent

If commercialized, ChallengeIt would be a service sold for use in schools of just about any education level. However, we and other students would acquire any number of new skills by building such a solution:

- Technical: As we envision it, the ChallengeIt project requires a general understanding of cloud technologies (such as Google App Engine technologies) and mobile application development (such as iOS or Android). These skills by themselves will require serious student commitment to learning and understanding how to use these technologies effectively. Students will also have to learn the any underlying programming languages (such as Java or Objective-C) needed to utilize these tools, if they do not already have that prerequisite knowledge.

- Engineering: Students would be exposed to and implement common engineering development processes, such as Scrum, which could prove useful to anyone considering a computer science related field as their future career. ChallengeIt could also be adapted in any number of ways to the particular goals of the students, including supported media types, flexibility, navigation hierarchy, or appearance. Any of these changes involve different mobile technologies and would require independent research to learn how to most effectively implement them.

  Another important engineering skill that students would learn is teamwork. They would have to schedule regular meetings to plan, design, and implement this project. Students would also have to learn how to effectively organize and disseminate information amongst themselves, and learn how to resolve any conflict or disagreement that may arise throughout the project.

- Business: Students will have to secure funding to acquire any mobile devices for testing, pay for developer licensing fees, and cover expenses for the necessary level of cloud infrastructure that drives ChallengeIt.

  Students would also learn important customer relation skills, since they would have to gather the real-world requirements of their respective professors and schools (their "clients") to determine the unique features for ChallengeIt. They would also have to regularly demo this product for these clients, and make changes based on feedback or reactions in meetings.

- Legal: Students will have to take into account issues surrounding personal and educational privacy when designing their solution, and properly inform all users about the types of data collection that might occur through use of this solution.

Target Student Audience

Groups of students with computer science and business background should have the prerequisite skills needed to replicate in some fashion what we are proposing here with ChallengeIt. Specifically, we believe that students in their second or third years of an undergraduate degree will have at least the minimum experience needed to complete this project within a standard semester. However, students as low as middle school should be able to use this product for learning advancement in the majority of their classes.

Project Details

Educators must continually develop and implement new learning content and methodologies to meet the changing needs of the field. In line with the goals of this challenge to "help make a better world," we are hoping to influence education by addressing the lack of student motivation and involvement. At the Duke University bookstore, they sell a T-shirt containing the phrase: "You can lead me to college, but you can't make me think." [5] Students are no longer pushed to think critically anymore… The focus of most teachers is simply to satisfy basic state or institutional curriculum requirements. We see our mobile application as the first of many in a series to come that will help teachers overcome these barriers to their students and "modernize" public education today.

High-Level Activities to be done:

A fully functional Android or iOS development environment should be installed prior to beginning development of the mobile application.

The team should first focus on designing, implementing, and testing the user interface of ChallengeIt (i). This will not only set the tone for how the application will look and feel, but it will quickly reveal the types of data, data structures, and data operations that will be required for proper operation of the app. This information would then inform the creation and testing of the appropriate NoSQL database to be used in conjunction with the persistence framework and Google Cloud Endpoints (ii). Once integrated together, application functionality could be thoroughly tested with a local instance of this database using the provided Google Datastore Explorer and the generated client endpoint libraries (iii).

Finally, the app and cloud back end should be deployed to the web (iv) for further integration testing and real-world testing with beta users. Once any bugs or user feedback issues are addressed, the app can be fully released for consumers, and complete system and market analysis can be completed (v-vi).

Tasks	Activity	Time	Major Skills
Mobile User Interface (i)	1. Design the application user interface (eg. view screens, navigation hierarchy amongst them) for all views described in the list below (titled "Application Views"). 2. Implement a wireframe mobile application that incorporates the overall navigation hierarchy with placeholder views. 3. Replace each of the placeholder views with final iterations of the previously agreed upon designs. 4. Test application navigation and screen rendering on a variety of device form factors (eg. phones, phablets, tablets) to ensure that everything is working or appearing as expected.	60 h	- UX Design - Mobile OS UI Best Practices - Mobile App Development
Cloud Backend(ii)	1. Design the database object schemas and determine the relevant database operations that will be required. 2. Implement the database objects using a compatible persistence framework[1] and the database operations using the Google Cloud Endpoint APIs. 3. Locally test the APIs and database objects to ensure that the implementation	100 h	- Persistence framework - SQL

	is correct and make any changes as necessary.		
App Integration (iii)	1. Generate the Cloud Endpoint client libraries for the mobile app OS that will be used. 2. Import the client libraries into your project and add the needed backend logic to use App Engine to implement all of the ChallengeIt functionality. 3. Test application functionality and integration with App Engine using the Google Datastore Explorer locally.	60 h	- Mobile App Development - SQL
Deployment on the App Store and Cloud Backend (iv)	1. Deploy the cloud backend on Google App Engine. 2. Deploy the app on the appropriate app store for beta testing. 3. Correct and test any bugs or user complaints for your beta version. 4. Re-deploy app for general release on appropriate app store.	50 h	- Cloud Deployment - Customer Relations - Code Testing
System Analysis (v)	1. Estimate the percentage of consumers who are inactive during classes through publicly released reports and statistics. 2. Determine the change in inactive consumers during class through analytics of app usage after integration of ChallengeIt into the classroom. 3. Estimate the costs involved for every individual to use the application including updating and formatting the same.	30 h	- Economics - Quantitative Reasoning
Market Analysis (vi)	1. Recognize target market (for example the number of people using smartphones during high school). 2. Reach out to the target by creating awareness of the application through public media such as radio, newspaper, advertisements and outreach programs.	30 h	- Marketing - Communication Skills

The project needs an estimated 330 hours of work to complete from start to finish for an individual with working knowledge of any required programming languages, but no practical experience with mobile or cloud technologies. Any additional knowledge of technologies used in this project could easily reduce development time.

Application Views:

The following is a list of suggested views that we believe should be present in any implementation of ChallengeIt. For clarification, a master is the role of a user who moderates all challenges in a game, adds additional challenges as they become available, and controls access to their game (eg. a teacher). A player is any user that participates in a game. Students are free to add or remove any views they deem relevant to the particular version they are working on:

- View to display a list of all games that the user is either a player in or master of
- View that shows all of the challenges for a particular game and the rank of all participating players
- View that displays the details of an individual challenge
- View that allows the user to respond to a challenge with a message and media content (such as text, images, or file attachments)
- View that allows the game master to review challenge responses and award points
- View that allows the user to access any app settings and profile information
- View that allows users to search for other users, as well as view and edit a list of friends

Milestones:

With an estimated 330 hours of work to complete ChallengeIt, we suggest that a team of 4 students each commit to work about 8 hours/week for an estimated 11 weeks. Here is a list of suggested milestones:

Tasks	Milestone
Mobile User Interface	Week 2
Cloud Backend	Week 5
App Integration	Week 7
Deployment on the App Store and Cloud Backend	Week 8
System analysis	Week 11
Market Analysis	Week 11

Required Technical Skills:

The student developers should have general knowledge in:

- Java (Android) or Objective-C (iOS)
- Android or iOS SDK
- NoSQL (App Engine Database)
- JPO, JPA, or Objectify (persistence library for use with App Engine objects)

Required Materials and Goods:

Students will require access to computers with the prerequisite software installed for an Android (Android Studio) or iOS (Xcode) development environment, as well as the Google App Engine SDK. Preferably, students would also be utilizing some sort of version control system, such as Git or Subversion.

Steps required for the teacher to use the project:

Ideally, this project would be incorporated into a mobile development or project-based software engineering course. It could possibly be used as a project for a business or marketing class.

We suggest that the teacher employ the use of Scrum methodology with the class to plan and organize the development process for the application:

- Introduce students to the fundamentals of any programming languages and technologies to be used for the mobile application and Google Cloud Endpoint service.
- Find students, professors, or school staff that are willing to serve as the client for the purposes of this project and ensure that they are integrated into the development process for requirements sourcing and product demos.
- Ask students to develop detailed project designs and plans, based on the guidelines that are provided in the project description and on client requirements.
- Divide students into groups of 3-4 individuals with clearly defined roles, and put them into contact with business majors for assisting in system and marketing analysis of the application at the end of the project phase.
- Ensure that teams are on-track with their project plans for the app.
- Require that teams submit all deliverables (code, documents, plans, application analysis) at the end of the project phase.
- Require that teams deliver oral presentations and live demos of their product.
- Factor client satisfaction and comments into the grading of all submitted deliverables.

References

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