Digital Language Training System

Software Requirements Specification

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Revision History

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Document Approval

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| Signature | Printed Name | Title | Date |
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| --- | --- | --- | --- |
| **Project Overview Statement** | Project Name:  Digital Language Training System | Team: Red |  |
| Problem/Opportunity: Our world is becoming ever increasingly connected across social and business landscapes as a result of internet-based technologies that can bring together individuals from disparate communities which have traditionally been localized according to geographic constraints. Today individuals and business firms are able to connect and interact within a radius of coverage that covers most of the developed world. As a result, communities have become more diverse as people coming from all cultures and locations can more easily connect, interact and transact with one another. While geographical boundaries have been broken via such technologies, there still exists language barriers amongst the many connected individuals who are unable to speak and understand the native tongues of those to whom they are connected.  The online language arts learning market is expected to be between $4-$8 billion during by 2024 [1] [2]. Indeed there is a recognizable demand for language training products worldwide who’s market majority is currently shared between two firms: Rosetta Stone Ltd. [3] and Duolingo Inc. [4] [2]. Rosetta Stone Ltd. offers a subscription based digital training platform that covers 30 languages through an online classroom styled delivery and also offers live one-on-one online tutoring via virtual web meetings [5] and has developed a social network presence within which users can interact on Facebook [6] and Twitter [7]. Duolingo Inc. covers 26 languages (including Klingon for avid Star Trek Fans) using a gamification styled delivery which is based on both an ad-free and fee based subscription models and provides an integrated social community that allows users to follow and compete with others in their Duolingo network [4].  Although the market for digital language arts training applications have been reached by several competing entities, we view opportunities to be captured within the space. Our analysis of the products offered by Rosetta Stone and Duolingo are disjoint along both the personal tutoring and gamification components. In our view there is room for significant improvement to the level of interactivity and engagement possible through a digital language arts learning platform. Namely we recognize the potential for value to be added by offering, in addition to language arts training via traditional modalities offered in existing solutions, a cognitive computing based solution that creates an intuitive virtual tutor than can be available to the user on demand via an audio-visual-text-social media based interface. Our aim is to 1.) hybridize traditional digital language arts learning modalities having demonstrated market success, 2.) expand upon current platform technologies offered using cognitive computing based solutions, and 3.) integrate said technologies into a uniquely defined product that offers market leading high quality and engaging language arts training that is cognizant of each individual user. | | | |
| Goal: Provide a multi-platform digital language arts training system that engages the user through a cognitively aware gamified interface. | | | |
| Objectives:   1. Provide a language arts training regimen via an interactive digital interface which implements the following modalities 2. Support for text and pictographic based multiple choice exercises 3. Support for text and pictographic based fill in the blank exercises 4. Support for “listen” and “respond” based exercises where user responses may be speech or written text 5. Maintain user engagement via the following modalities 6. Support for modular learning where modules are used a micro-courses focusing on one particular aspect of the language learning process 7. Support for beginner, intermediate and advanced levels of difficulty for each language learning task 8. Support for gamified based user performance based reward system that considers the level of difficulty, consistency, frequency of and performance of the user’s engagement with the learning system exercises 9. Support for in app community connectivity allowing for users to connect, socially interact and compete in user group created learning competitions 10. Support for an individualized virtual cognizant tutor and learning companion 11. Support for user to set and adjust weekly goals for performance and engagement and continuously have access to feedback metrics related to user goals | | | |
| Success Criteria:   1. Aggregate and stratified user performance according to goals set by the user (See Objectives: section D) being met and exceeded. We will consider our product to be successful if users consider themselves to be successful during their learning journey. We aim to have at least 90% of our users reach at least 90% of the goals they set. 2. Size of user base compared to current market leaders 3. User learning system usage metrics from (aggregate and stratified) based upon 4. Frequency of weekly usage on daily scale > 5 days per week 5. Number of lessons attempted vs completed across all users > 90% 6. Frequency of exercises receiving correct response within the first attempt > 80% 7. User progression metrics that track for language skills development within and among beginner, intermediate and advanced levels: We aim to see all users progress through all modules of each level of difficulty consistently according their achievement of the short- term goals they set weekly. | | | |
| Assumptions:   1. The development and QA team are well equipped to build and deliver the software that can run even on the low-end devices with relatively slow internet speed. 2. There is a bug reporting system in place where users can report issues that they run into while using the application. These bug reports need to be read, analyzed and assigned to the correct team so that the issues can be fixed in a timely manner. 3. There will exist teams of composed of senior management, product/project managers, language experts, gamification experts, and social media designers who will work within cross-functional groups including all relevant UI, machine learning and database developers throughout the adaptive agile development and launch processes. | | | |
| Risks:   1. All requirements not being identified at the beginning of the development phase leading to a requirement inflation at the later stages of the project and could threaten the budget estimates and deadlines. 2. The system might be prone to hacking and can lead to theft of user information and loss of data. 3. Server breakdown could lead to loss of data if there are no backup servers in place. | | | |
| Obstacles:   1. Designing the application in such a manner that the reading, writing and speaking skills of the user learning a new language is fully tested. 2. Designing the translation algorithm such that it presents the most appropriate translation to words and phrases depending on the context. 3. Monitoring and analyzing the usage metrics and figure out if user activity has dropped and coming up with new features to make the application more engaging for the users. 4. Designing the system in such a manner that it can be used offline. 5. Making the system platform independent so that the user experience is uniform regardless of the device the user is using to run the application. | | | |
| Prepared By:  Team Red | Date: | Approved By: | Date: |

1. Overview

The purpose of Part I of this document is to present the pre-planning related project components that composes the software requirements (functional and non-functional), use cases, system architecture and hardware requirements of the language learning system. Part II of this document will compose a detailed description of the planning phase of the language learning arts system development process and includes details of how cross-functional teams will be organized and which deliverables each will be responsible for. Part III of this document analyzes and quantifies the factors/events that may exist at any point during the planning and launch processes.

1. Definitions

3. Functional Requirements

3.0 Application launch and entry point

3.0.1 Splash screen will appear upon application launch (Diagram 1)

A picture containing object

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Diagram 1: Splash Screen

3.0.2 Upon successful application launch by a new user, the new user will be presented with the New User Account Setup Interface

3.0.3 Upon successful application launch by an existing user, the user will be presented with the training program interface (Diagram 2)(See 3.4)

A screenshot of a cell phone

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Diagram 2

3.0.3.1 Lower button bar of main interface will provide access buttons to

3.0.3.1.1 User training program interface

3.0.3.1.2 User social media tools interface

3.0.3.1.3 Weekly League Standings interface

3.0.3.1.4 App Store interface

3.0.3.1.5 The identity of the interface in which the user currently resides will be

indicated by the coloring of the appropriate lower button bar access button. All other lower button bar access buttons will be colored grey while User remains in the current interface:

Case 1) User is in Training Program Interface (Purple)

Case 2) User is in Social Media Interface (Orange)

Case 3) User is in Weekly League Standings Interface (Yellow)

Case 4) User is in App Store Interface (Black)

3.0.3.2 Upper button bar of main interface will provide

3.0.3.1.1 Language selector access button

3.0.3.1.2 Button to access Health and Practice interface

3.0.3.1.3 Button to access Trophy Collection interface

3.0.1.1.3 Graphical icon displaying number of Rewards Points earned

3.0.3.3 The area between the Upper and Lower Button Bars will be referred to as the Main Window (Diagram 3)

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Diagram 3

3.0.3.4 Upon first entry to the Language Training Application, User will be allowed to navigate among Interfaces as shown in (Diagram global\_interface\_navigation\_paths)

A close up of a map

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Diagam global\_interface\_navigation\_paths

3.1 Language(s) Selection Interface:

3.1.1 This interface will present the collection of all available language Training Programs

available within a scrollable action window

3.1.2 Each language Training Program will be represented by a Training Program selector button

that contains a picture of the corresponding country’s flag.

3.1.3 Selection of a language Training Program via tapping on a given Training Program selector button within the Language Selection interface will bring User to the Training Program interface for the selected language

3.2 Training Program Interface

3.2.1 Training Program Conceptual Organization

3.2.1.1 A Training program will consist of levels

3.2.1.2 Each consecutive level will represent a higher degree of learning difficulty.

3.2.1.3 Training program levels will consist of modules.

3.2.1.4 Each module will contain a set of lecture notes related to the module topic.

3.2.1.4 Each Module will consist of a collection of Parts

3.2.1.5 Each Part will consist of a collection of Lessons

3.2.1.6 Each Lesson will consist of a collection of interactive Exercises related to the Module topic.

3.2.2 Training program progression concepts

3.2.2.1 Progression from one training level to the next more difficult level will be allowed once all modules at the lower level(s) of difficulty have been completed satisfactorily.

3.2.2.2 Satisfactory completion of any module is defined as satisfactory completion of all lessons within the module.

3.2.2.3 Satisfactory completion of a lesson is defined as user having provided correct responses to all exercises within a single lesson attempt.

3.2.3 Graphical Representation of a Training Program (Diagram 4)

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Diagram 4

3.2.3.1 A Training Program will be represented as a collection of mutually exclusive directed acyclic graphs where each graph will represent a recommended learning path for each Level of difficulty.

3.2.3.2 Each module will be represented as a node in a graph having an in degree of one and an out degree of one.

3.2.3.3 Recommended learning path will be represented as edges connecting each consecutively recommended module (node) within a graph for a given level.

3.2.4 Training Program Interface Functions and Behaviors: The Training Program Interface will

present all Levels of a Training Program within a scrollable view of the Main Window.

3.2.4.1 Completed module nodes will be marked as completed graphically via a “check mark” graphic place in the upper right hand corner of each completed module.

3.2.2.2 Edges between a pair of two completed modules will be graphically distinct from edges between all other possible module pairs.

3.2.4.3 User may select any training module within their current Training Program Level by tapping on a node within the accessible graph. After tapping a module (node) a pop up window will provide the following (Diagram selected module pop\_up\_window)

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Diagram selected\_module\_pop\_up\_window

3.2.4.3.1 Textual information informing the user of the Lesson Part and Lesson Number which is about to begin

3.2.4.3.2 An access button to the Introductory Notes Interface applicable for the current lesson.

3.2.4.3.3 An access button that will trigger the Current Lesson Attempt Interface to begin.

3.2.4.3.4 See Section 3.4.5 for detailed Lesson Functional Requirements.

3.2.5 Training Program Lesson:

3.2.5.1 Lesson Introductory Notes Interface

3.2.5.2 Lesson Attempt Interface: Upon triggering a Current Lesson Attempt to begin, User will be presented with a set of Lesson Attempt Global Components and a sequence of interactive Exercises.

3.2.5.2.1 Lesson Attempt Interface Global Components: During any point of a Lesson, the User will be presented with the following elements (Diagram lesson\_attempt\_global\_elements).

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Diagram lesson\_attempt\_global\_elements

3.2.5.2.1.1 Lesson Exit Button

3.2.5.2.1.2 Lesson Progress Bar

3.2.5.2.1.3 Life Status Meter

3.2.5.2.1.4 Interactive Exercise

3.2.5.2.2 Interactive Exercises: Each Exercise Interface will be structured according to one of the following Exercise Types

3.2.5.2.2.1 Textual Challenge/Textual Response: User will be asked to read a Challenge Sentence and provide the correct translation via the keyboard. The Challenge Sentence may be written in either the Training Program Language or the user’s native language

3.2.5.2.2.1.1 User will be notified as to whether their response is correct or incorrect as shown in (Diagram exercise\_textual\_challenge\_textual\_response\_results).

A close up of a device

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Diagram exercise\_textual\_challenge\_textual\_response\_results

3.2.5.2.2.2 Textual Challenge/Multiple Choice Response: User will be asked to read a Challenge Sentence and several potentially correct textual translations, each embedded within a button. User will select their guess as to the correct translation by tapping the button containing the text representing the correct translation. The Challenge Sentence may be written in either the Training Program Language or the user’s native language.

3.2.5.2.2.2.1 User will tap the translation button which they believe is correct which will be highlighted.

3.2.5.2.2.2.2 User will click NEXT button and will then be notified as to whether their response is correct or incorrect as shown in (Diagram exercise\_textual\_challenge\_mult\_choice \_results). Correct answer will be highlighted.

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Diagram exercise\_textual\_challenge\_mult\_choice \_results

3.2.5.2.2.3 Audio Challenge/Textual Response: User will be asked to listen to an audio clip of a phrase spoken in the Training Program Language. User will then enter their translation via the keyboard.

3.2.5.2.2.3.1 Audio recording may be played by User via tapping an Audio Challenge Button which activates the audio clip based Challenge Sentence.

3.2.5.2.2.3.2 Audio clip may be played repeatedly via tapping the Audio Challenge Button until User inputs their response and submits their answer.

3.2.5.2.2.4 Textual Challenge/Audio Response: User will be asked to read a textual Challenge Sentence and provide the correct translation via the microphone (Diagram textual\_challenge\_voice\_response).

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Diagram exercise\_textual\_challenge\_mult\_choice \_results

3.2.5.2.2.4.1 User will tap the Microphone Button when prepared to record their translation. User will speak their translation into the microphone and tap the Microphone Button again to finish recording. If recording is verified to contain machine translatable speech, a SUBMIT button will be activated and User may proceed to receive results. If recording is not verified to contain machine translatable speech, USER will be brought back to initial Exercise state so that User may repeat the recording process.

3.2.5.2.2.5 Audio Challenge/Audio Response: User will be asked to listen to an audio clip of a phrase spoken in the Training Program Language. User will then enter their translation by speaking their translation into the microphone. Requirements 3.2.5.2.2.3.1, 3.2.5.2.2.3.2 and 3.2.5.2.2.4.1 apply.

3.2.5.3.2 Exercise Tools: Once User has submitted their response and received the results for a particular exercise, two Exercise Tools Buttons allowing User to access the Cognizant Language Tutor and or flag the exercise to the application maintainers for potential problems (Diagram Exercise Tools).

3.2.5.3.2.1 Cognizant Language Tutor

A screenshot of a cell phone

Description automatically generated3.2.5.3.2.2 Flag for Problematic Exercises Button will bring up a popup window having a text container within which User may provide textual details related to the Exercise and a Post Flag button which will submit the Flag to the system database.

Diagram exercise\_tools

3.3 Trophy Collection Interface This interface will provide a collection of Trophy icons that the user may earn while using the app.

3.3.1 Description of Trophies which can be earned

3.3.1.1 Accuracy Master: An Accuracy Master trophy will be awarded when User

completes a given number of Lessons without getting any Exercises wrong.

3.3.1.1.1 Level I: Complete one lesson without getting any Exercises wrong

3.3.1.1.2 Level II: Complete five Lessons consecutively without getting

any Exercises wrong.

3.3.1.1.3 Level III: Complete twenty Lessons consecutively without getting

any Exercises wrong.

3.3.1.2 Consistency Master: A Consistency Master trophy will be awarded when User

satisfactorily completes at least one Lesson each day over the course of a number of

consecutive days.

3.3.1.2.1: Level I: Seven consecutive days

3.3.1.2.2: Level II: Fourteen consecutive days

3.3.1.2.3: Level III: Thirty consecutive days

3.3.1.3 Weekend Warrior: A Weekend Warrior Trophy will be awarded when User

completes at least one lesson each day over the course of a consecutive Friday,

Saturday and Sunday weekend.

3.3.1.4 Night Hawk: A Night Hawk trophy will be awarded when User satisfactorily completes a Lesson between the hours of 10:00 p.m. and 12:00 a.m.

3.3.1.5 Morning Glory: A Morning Glory trophy will be awarded when User satisfactorily

completes a Lesson between the hours of 5:00 a.m. and 9:00 a.m.

3.3.1.6 Social Butterfly: A Social Butterfly trophy will be awarded when User connects

with a given number of other users via the in-app Social Network Interface

3.3.1.6.1 Level I: User connects with three new friends

3.3.1.6.2 Level II: User connects with five new friends

3.3.1.6.3 Level III: User connects with ten new friends

3.3.1.7 High Scoring Star: A High Scoring Star trophy will be awarded when….

3.4 League Standing Interface

3.5 Health and Practice Interface

4. Non-functional requirements

4.1 Performance: The UX should be intuitive and easy to use. The application should be fast and not put

too much pressure on the hardware.

4.1.1 Battery: The app should be able to run on background consuming the least amount of

power that is possible. User should be able to run the application from the background and

should be able to seamlessly resume using the application.

4.1.2 Network Connectivity: The app should work on poor network connectivity. If the network is

extremely poor and the app fails to run then the user should be notified with a meaningful

notification message. The app should resume seamlessly when the network improves.

4.1.3 Speed: The app should run fast and smoothly. The lectures should not take more than

700ms to 1s. The app should navigate from one page without lagging and the transition

Animation should not appear jumpy.

4.1.4 Load balancing: The server(s) should be able to handle large volume of requests and should

be able to balance the load in case of heavy traffic.

4.2 Scalability

4.2.1 The architecture of the system needs to be designed in such a way that it is scalable. It

should be easy for course creators to add new courses.

4.2.2 The frontend needs to be designed in such a manner that new added courses are displayed

without any UI distortion. Courses can be of different structure, so, the frontend should be able

to handle different types of courses with little customization.

4.2.3 The backend also needs to be designed in such a way that it allows customization.

4.3 Reliability

4.3.1 The app should be available for use 24 hours, every day. In case of technical faults, there

should be backups so there is no down time.

4.3.2 Our application offers offline support, so, there should be no difference between the online

experience and the offline experience. There shouldn’t be any continuity issue.

4.4 Usability

4.4.1 There should be a brief tutorial for new users to learn the important aspects of the

application and get acclimatized using it.

4.4.2 Users should be allowed to use Facebook and Google accounts to register for the

application.

4.4.3 The courses must get more challenging as the user’s performance gets better.

4.5 Portability

4.5.1 The application should be platform independent i.e. should run on android, iOS and web

browsers.

4.5.2 There should not be any difference in the user experience while using the application on

any of the fields. The only acceptable difference is that the UI needs to adhere with the frontend

standards that applications need to follow for these individual platforms.

4.6 Security

4.6.1 The users can create account using email and password or can create account using

Facebook or Google accounts.

4.6.2 Users allowed to use Facebook and Google accounts to login along with the email and

password combination.

4.6.3 The password should adhere to the following rules:

4.6.3.1 Should be alphanumeric

4.6.3.2 Must have at least one Upper case letter and one lower case letter

4.6.3.3 Must have a special character

4.6.4 Users should be prompted to change the password every 3 months

4.6.5 Sensitive information like name, date of birth, payment info, phone number and address

should be encrypted before being saved in the database.

4.6.6 Email should be verified using verification link and phone number needs to be verified by

send in security code to the phone number.

4.6.7 All requests need to be encrypted using an SSL certificate and the requests needs to be

HTTPS requests.

4.6.8 The system should logout a user every time the password is changed to avoid unauthorized

access.

4.6.9 The user should be able to easily recover or reset password in case the password is

forgotten.

4.6.10 The security protocol needs to implement uniformly throughout the system for all

servers and backup servers.

4.7 Privacy

4.7.1 Under no circumstances is the user information shared with anyone.

4.7.2 Password field in the frontend is masked with an option to “Show password”. Password is

encrypted first and then saved in the backend.

4.7.3 Payment info is partially masked while displaying on the frontend and encrypted before

being saved in the backend.

4.7.4 Password can only be reset by the user. The user can request a system administrator to

reset the password.

4.8 Reusability

4.8.1 Content creators can use existing course template to create new contents or can create a

new template. The system should allow that level of customization.

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