



SOFTWARE REQUIREMENTS DOCUMENT

Version 2.0

For John Deere

iOS Team

TABLE OF CONTENTS

- 1. Project Drivers**
 - 1.1 Purpose Of the Project
 - 1.2 The Client Customers and Other Stakeholders
 - 1.3 Users Of the Product
- 2. Project Constraints**
 - 2.1 Mandated Constraints
 - 2.1.1 iOS Version
 - 2.1.2 Android Version
 - 2.1.3 Collaboration with Existing John Deere API
 - 2.1.4 Designed to be used in the Car
 - 2.1.5 Final Deadline of the Project
 - 2.1.6 Language
 - 2.2 Naming Conventions and Definitions
 - 2.3 Relevant Facts and Assumptions
- 3. Functional Requirement**
 - 3.1 Scope of the Work
 - 3.2 Scope of the Product
 - 3.3 Functional and Data Requirement
- 4. Non-Functional Requirement**
 - 4.1 Look and Feel Requirement
 - 4.2 Usability Requirement
 - 4.3 Performance Requirement
 - 4.4 Operational Requirements
 - 4.5 Maintainability and Portability Requirements
 - 4.6 Security Requirements
 - 4.7 Cultural and Political Requirements
 - 4.8 Legal Requirements
- 5. Project Issues**
 - 5.1 Open Issues
 - 5.2 Off-the shelf Solutions
 - 5.3 New Problems
 - 5.4 Tasks
 - 5.4.1 Project Planning
 - 5.4.2 Planning of Development Phases
 - 5.5 Cutover/Migration to New product
 - 5.6 Risks
 - 5.7 Costs
 - 5.8 User Documentation and Training
 - 5.9 Waiting Room

1. Project Drivers

1.1 The Purpose of the Project

John Deere is one of the world's leading manufacturing companies that connects agriculture with technology and provides world class machinery for farming, construction, forestry and more. Their hardware products, coupled with software, allow an efficient management, monitoring and scheduling of agricultural business, conducted from home or the office.

Driving to work, or to the fields for inspection or exploration, can sometimes take up hours. To be disconnected from work for such long hours is not only a waste of time but it also keeps the user unaware of the work status, critical situations that may arise or any anomalous behavior of their work system. To help our clients utilize this time in a more efficient and productive manner, where he/she can stay connected to his work in an albeit limited manner, we aim at delivering a mobile application, for iOS which can be used from the headset of the car and enables the interaction with the application while driving.

The goal of this project is to provide users with a mobile application for monitoring and documenting observations and receiving work-related notifications and information for on-field machinery status, at any time, outside the office. Connected to the car's headset, this application will be equipped with voice interactions to minimize the need for touch-based user's intervention with the on-screen icons. Such availability of information and access to work will help users in making informed business decisions any time, from anywhere.

1.2 The Client, The Customer, and Other Stakeholders

This project is being developed for John Deere.

The main stakeholder involved in this project is farm manager. Other possible stakeholders are agronomists and dealers. The targeted customers are assumed to be familiar with the related technology and are accustomed to using tools and applications in their daily business.

Other identified stakeholders are the project managers, system architects, developers, and testers, whose involvement is crucial for deciding the flow of the project as it influences the outcomes of this project.

Users of the Product

Following are the main users targeted for this application:

- Agronomists – Experts in soil management and crop production, who can give opinions in the science of agriculture when needed. Issues beyond the scope and knowledge of farmers are taken up to agronomists for possible solutions. An agronomist is assumed to have technical know-how, who does not need extensive guidance or tutorials.
- Farm Managers - Responsible for overlooking the work going on at a farm and supervising the machine operators, farmers and other technical and non-technical staff directly involved in the farm project. All logistics and decision-making falls under this role.
- Dealers – People involved in the selling of John Deere's machinery to other customers, responsible for ensuring that the customers' experience with the machinery is satisfactory.

2. Project Constraints

2.1 Mandated Constraints

2.1.1 iOS version

Description: The mobile application built for iOS devices will operate using the version of the iOS – iOS 13.

Rationale: Given the time constraint of the project, there will be not enough time to develop the application to be supported on multiple version of operating systems.

Fit criterion: The built product shall be usable by all users that use iOS version 13 on their devices.

2.1.3 Collaboration with existing John Deere API

Description: The product will use the services provided by the existing John Deere API.

Rationale: By using the existing API, it speeds up the development and testing process and gives access to the data we need.

Fit criterion: The application should use the API provided by John Deere.

2.1.4 Designed to be used in a car

Description: The mobile application shall be used in a car attached to the car head display. Aim is to minimize user's on-screen interaction that may disrupt user's attention to driving.

Rationale: The client and the customers want to utilize their time while driving the car, in an effective manner.

Fit criterion: The product has to comply with the legal constraints for applications with possibility to be extended by using the CarPlay standard.

2.1.5 Final deadline of the project

Description: The final version of the project will be presented before the 20th of December 2019.

Rationale: The project is a student project with a time limit aimed to gather experience in developing a project and teamwork, and to create a working prototype for the client.

Fit criterion: The product shall be finalized before the 20th of December 2019.

2.1.6 Language

Description: The mobile application built for iOS devices will use English as a language for all the voice commands and also the user interface will be shown in English only.

Rationale: Given the time constraint of the project, there will be not enough time to develop the application to support multiple languages.

Fit criterion: The built product should use English as the language for display or for performing any actions like voice commands.

2.2 Relevant Facts and Assumptions

Corporate design/Wireframes should be taken into consideration while designing the user interface. Moreover, assuming that the users of this future application are already using the tools developed by John Deere, there shall be a consistency between existing application and the new application being developed. Also, the future users won't need any training in order to be able to use the application.

3. Functional Requirements

3.1 The Scope of the Work

During the periods of the year when planting and harvesting is done, farmers have to go and inspect the fields while monitoring the ongoing work across their organization. Driving from field to field, they don't have the access to their office or computer. With the mentioned issue, it is difficult for farm managers to manage taking notes about important observations and monitor the tasks simultaneously while driving. Given the current problems, this project aims at solving them, by providing a platform for the user to perform all relevant operations.

With this project the CarPlay features will be explored and used in a way that our client can benefit. Everything done during the project will provide an insight to the client how this car technology could be used at its best and in the most efficient way that their customers can benefit from. This project will integrate the existing John Deere functionality with creativity and innovation by transferring it to the new platform which can be used in a different setting than what the current users are used to. The application to be built will use the data provided by the John Deere API to enable the users with much needed on-the-go information. Additionally, the functionality of taking notes and voice memos, implicitly connected to the field, through the application will save the user from the trouble of forgetting important facts or linking the observations to the object of interest.

Remotely controlling the machines, as well as building the application to be used in an agricultural machine is out of scope of this project.

3.2 The Scope of the Product

The scope of the product includes a mobile application for iOS (for version refer to [section 2.1](#)). The specific functionalities of the mobile application shall be propagated to be used from a headset of the car (CarPlay for iOS and Android Auto for Android). Common functionalities may differ based on the platform they are used on.

3.3 Functional and Data Requirements

The following table elaborates the functional and data requirements. Since this is an experimental project, the functional and data requirements may change according to the progress of the product development and will be added accordingly.

Req No.	Description	Rationale	Fit Criterion	Priority
1.	Application should be able to take input commands and give output using voice.	Driver should not be distracted by the use of application.	The devices in use should be compatible with iOS voice recognition features.	High
2.	Application should show user's current location on a map	User should be able to see where he currently stands so he knows which direction he should head in	The application should support apple maps feature	High
3.	Application should update the user's location as the car moves.	User should be able to see where he is heading, and where he is at that point in time	The application should support apple maps features	High
4.	Application should show the area in the user vicinity on the map	User should be able to check which area he is in.	The application should support apple maps features	High
5.	Application should show custom field boundaries of the farms on the map	User should be able to instantly locate the fields over the basic map.	The application should support apple maps features and overlay feature libraries	High
6.	Application should allow the user to take notes verbally	User should not be distracted with typing notes while driving and hence minimize screen interaction by taking voice input	The car device in use should be compatible with iOS voice recognition features.	High
7.	Application should allow the user to save notes against a specific field	User may want to have the note for a specific farm area, so he can easily hear his notes later categorized as per field		High
8.	Application should allow the user to save general notes regardless of field.	User may want to have notes irrespective of field, like general reminders or points etc		High

9.	Application should allow the user to discard the note	User may have created a note he doesn't need or given wrong information that he does not want saved		Medium
10.	Application should read out the notes to the user when asked for	User should not be distracted with reading the text off the screen while driving		High
11.	Application should confirm if the note taken should be saved or not	User may want to discard a note in case its not correct, important or relevant		High
12.	Application should ask the user if the note should be saved as a reminder.	User may want to save a note as a reminder.		Medium
13.	The user shall be able to specify the date for the reminder.	The note with set date can be heard only on the exact date or after the date specified.		Medium
14.	Application should ask the user for which field he wants to hear the notes	There could be multiple fields in the vicinity and user may want to hear his notes for specific field		High
15.	Notes for a specific field should be saved with the field's geo tag.	When user saves a notes for a particular field, the location tag is required to fetch field info		high
16.	Application should read back the note to the user when taken	User should be allowed to ensure whether its correct or not		Medium
17.	Application should immediately save the notes locally on the device	Data loss should be avoided and notes should be readily available for later use	The devices in use has storage capacity.	High
18.	Application should be able to detect if there are any fields within the user's vicinity	User should be equipped with maximum relevant information regarding his surroundings, so he may schedule and plan things accordingly	The application should use John Deere's API for the custom field maps and fetch data to see if there are any matching coordinates in the current vicinity	

19.	Application should be able to give information ongoing operations on the fields in the user's vicinity	User does not need to go outside the car and inspect the field.	The John Deere's API's have all relevant data and is accessible by the application.	Medium
20.	Information about the field and the machinery should be date specific	User should know how old the information is and has the situation changed over time or not		Medium
21.	Application should provide the information about the field with the timestamp later than the last user visit.	User would be more interest in knowing the latest updates rather older one		Medium
22.	Application should be able to provide information about the machinery being used in the fields in the user's vicinity	<ol style="list-style-type: none"> 1. User does not need to go outside the car and inspect the machines. 2. User may want to schedule some tasks or take some notes as per the information he receives regarding the machines 	The machine/Equipment information provided by the API in use is accurate.	Medium
23.	Application should allow the user to ask if there is any important information regarding the field or the machinery	User should be allowed to check if there is any information rather than rely on guesses or assumptions		High
24.	Application should provide the information field and/or the machinery only when asked for	User should not be flooded with information all the time, uninformed but should only have to know the information when desired		High
25.	Application should colour the areas within custom field boundary to match the colour of the field operation.	User should be able to quickly pick the visual cues about which field needs more attention and hence prioritize the order of listening to information about the fields/machinery		High

26.	Application should provide information about the nearby field/machinery through voice.	To be able to know about important information while driving the car without interacting with the mobile.	The application should be able to give information on the car device and read them out to the user	High
27.	Application should show a flag icon in a field boundary if there are flags set for the specific field.	User should be able to gather as much information from the map in the shortest time period possible.		Medium
28.	Users of the application can see flags pinned by other users.	User should be able to see if other users have found some information worthy of notifying		??
29.	Application should show a tractor icon in the custom field boundary every time someone reports an issue with the machinery in that field.	User should easily be able to identify that the nature of the problem pertains to machinery and may want to contact the operators in that field		??

4. Non-Functional Requirements

4.1 Look and Feel Requirements:

- 4.1.1 The product shall comply with the corporate branding standards which will be given by John Deere.
- 4.1.2 The look of the product used in cars shall not be distractive to the driver and follow the Apple CarPlay product design guidelines.
- 4.1.3 The application should provide visual clues that stand out, through icons and color scheming, to identify important information without having to interact much
- 4.1.4 The application layout should be compatible for car devices

4.2 Usability Requirements:

- 4.1.5 The product shall be readily available on car devices.
- 4.1.6 Possibly, the product should be simple enough in language context so that people with limited understanding of English face no difficulty.
- 4.1.7 The product shall use symbols and words that are naturally understandable by the farming community.
- 4.1.8 The product shall hide the details of its construction from the user.
- 4.1.9 The product is not concerned with the users with disabilities as of now.
- 4.1.10 The system should be able to recognize voice commands even to open the application without touching screen or pressing button when the hands-off functionality on the device is switched on.
- 4.1.11 The system should be able to respond to voice commands even when the app is currently not running. (By implementing a service running in the background)
- 4.1.12 Voice responses by the application should be precise enough to avoid long dialogues and task delays.

4.2 Performance Requirements

- 4.3.1 The product shall consider the working conditions with low network bandwidth.
- 4.3.2 There shall be provisions for storing data with poor data connectivity and upload data automatically while back online.

4.4 Operational Requirements

- 4.4.1 The application shall be used by a user in all weather conditions in which a smartphone can be used.
- 4.4.2 The product shall be used hands free in major share of time (I/O by voice).

4.5 Maintainability and Portability Requirements

- 4.5.1 The product shall be able to be maintained by John Deere developers other than original developers.
- 4.5.2 The product shall be given support by the John Deere support team if implemented in the user environment.
- 4.5.3 The product is expected to run on iOS (refer to [section 2.1.1](#)).
- 4.5.4 The product is intended to run on Mobile devices and automobile head up units.
- 4.5.5 We are not concerned about the subsequent releases now, but the product shall be compatible with future updates.

4.6 Security Requirements

- 4.6.1 The product security shall be compatible with the security features of “MyJohnDeere” application.
- 4.6.2 A John Deere user account is needed for using the application.
- 4.6.3 The user account is protected by John Deere’s privacy policy.
- 4.6.4 The user authentication shall be done based on the data available from John Deere’s database(s).
- 4.6.5 The data shared through the application shall be protected according to EU regulations and will be stored in John Deere databases.
- 4.6.6 The product shall make its users aware of its information practices before collecting data from them.
- 4.6.7 The product shall notify customers of changes to its information policy.
- 4.6.8 The product shall reveal private information only in compliance with the organization’s information policy.

4.7 Cultural and Political Requirements

- 4.7.1 The product shall not use offensive or abusive content in any formats.
- 4.7.2 The product shall be able to be used in all countries where John Deere products are supported.
- 4.7.3 The use of the product shall not be limited to any specific device manufactures, but the product shall be liable to Android or iOS regulations.

4.8 Legal Requirements

- 4.8.1 Personal information shall be implemented so as to comply with the Data Protection Act.
- 4.8.2 The product shall be developed according to iOS development guidelines and shall not include any copyright infringements.
- 4.8.3 The product shall comply with the European Union and United States laws and regulations.

5. Project Issues

5.1 Open Issues

- The limited knowledge and experience of the development team along with time constraints may affect the quality of the product developed.
- Since it is a student project which involves students from different backgrounds and limited knowledge of agriculture industry, the naming conventions used may not be suitable for the end users.
- Performance of the application may be limited by the device being used and the performance of the existing John Deere API's that are used in the development of the project.

5.2 Off-the-Shelf Solutions

To be determined later.

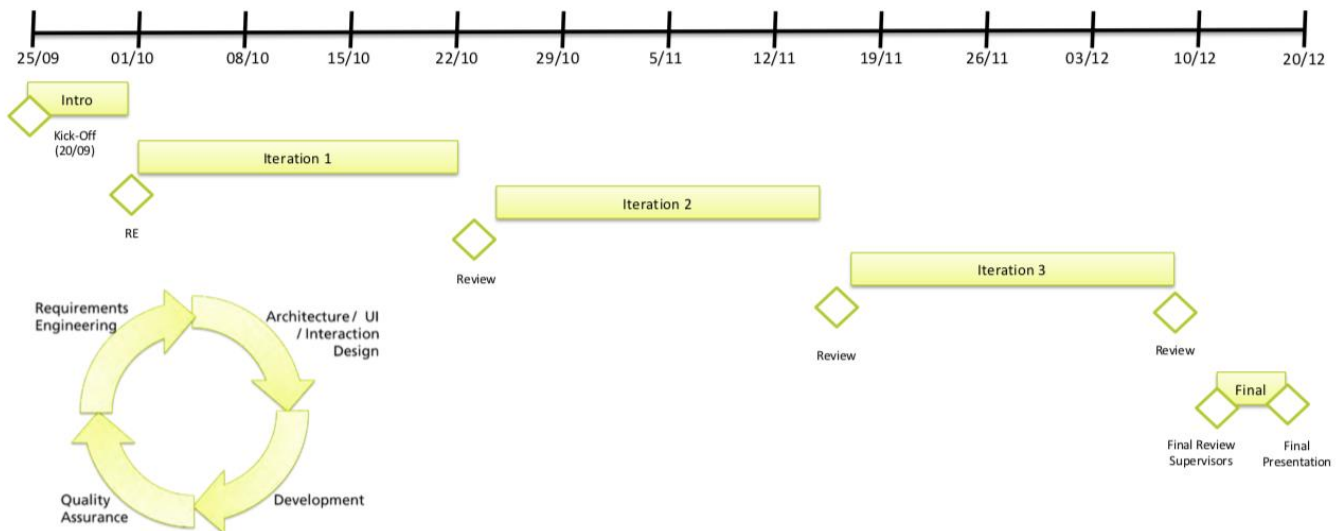
5.3 New Problems

The end users are already using different applications from John Deere so the use of multiple applications for the same purpose in different devices might cause confusion to the existing users. Moreover, since the application is required to run in multiple devices at the same time, it may affect the performance of the product.

5.4 Tasks

5.4.1 Project Planning

For the development of the project, we will be following three weeks sprints starting from October 1, 2019. Following is the initial sprint plan of our project.



Img Src: Meetings_KickOff2019_-_Project_Software_Engineering_WS2019 slides

5.4.2 Planning of the Development Phases

The initial project development plan is as follows. The team members will try to strictly follow the project plan and to deliver the prototypes as mentioned in the plan in due time. Changes in requirements from the customer's part will be also documented as the time progresses.

Phase Name	Date	Agenda / Functionalities implemented
Introduction	25/09	Kick off meeting, Project elicitation
Interview	27/09	Customer meeting, Gathering of project information.
Info Gathering	01/10	Collecting and sorting of requirement data among team and familiarizing with the development environment.
RE Documentation	7/10	Requirements engineering document review by the project coordinators.
Final SRS	15/10	The final RE document is submitted to the customer for validation.
Supervision Review	10/12	The product is submitted for supervision review and recommended changes are being made.

Final Presentation	19/12	The product is presented before the client and its functionalities and uses are explained.
--------------------	-------	--

Please Note: Additions and changes to the above mentioned plan is possible as the progress of the project which will be reviewed by Fraunhofer's support team.

5.5 Cutover / Migration to new product

We are not concerned about the future updates of the application as of now.

5.6 Risks

The risks involved with the project include:

- Lack of product functionalities as envisioned by the end user
- Lack of experience of the development team with the environment in which the product is to be used. Moreover, the time constraint of a student project may cause low productivity and quality than expected.

5.7 Costs

As this is a student project, costs are not applicable to it.

5.8 User Documentation and Training

No manuals or user documentations are maintained.

5.9 Waiting Room

The application holds a huge potential for integrating other functionalities to the existing product. Some of them according to their priority are:

- Using the product in John Deere Machine's display units
- Controlling John Deere Machines through the application
- Capturing field data while inside the car
- Application made friendly for colour blindness users