POLITECNICO
MILANO 1863

Software Engineering 2 project

Academic Year 2021-2022

DREAM - Data-dRiven PrEdictive FArMing in Telengana

Requirement Analysis and Specification Document

Version1.0 – 30/11/2021

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Content

1. INTRODUCTION

1.1 Purpose

1.1.1 Purpose

Agriculture plays a vital role in India's economy. However, with food demand increasing, climate change and COVID-19 pandemic, agriculture in Telengana India is facing severe challenges, like unstable food supply chains, vulnerabilities of marginalized communities and smallholders.

Telengana's government wants to build anticipatory governance models for food systems using digital public goods and community-centric approaches to strengthen data-driven policy making in Telengana.

This document is addressed to the developers who have to implement the requirements and could be used as an agreement among policy makers, farmers and agronomists

1.1.2 Goals

G1: Allow policy makers to identify those farmers who are performing well or badly.
G2: Allow policy makers to encourage good-performing famers.
G3: Allow policy makers to ask good-performing famers to provide useful best practices to the others.
G4: Allow policy makers to help bad-performing famers.
G5: Allow policy makers to understand whether the steering initiatives carried out produce significant results.
G6: Allow farmers to visualize data relevant to them.
G7: Allow farmers to provide information about their production and the problem they face.
G8: Allow farmers to ask for help and suggestion by agronomists and other farmers.
G9: Allow farmers to create discussion forums with the other farmers.
G10: Allow agronomists insert the areas they are responsible of.
G11: Allow agronomists receive information about requests for help and answer to these requests.
G12: Allow agronomists to visualize data concerning weather forecasts in the area and the best performing farmers in the area.
G13: Allow agronomists to visualize and update manage a daily plan to visit farms in the area.
G14: Allow agronomists to confirm the execution of the daily plan at the end of each day or specify the deviations from the plan.

1.2 Scope

DREAM is an effective application which aims to settle for various queuing problems faced by farmers, policy makers and agronomists.

Between farmers and policy makers, it allows policy makers identify farmers who are good at dealing with challenges or who need to help. Between farmers and agronomists, it allows they can learn each other's requests and solutions quickly, accurately and visually. Between policy makers and agronomists, it allows policy makers evaluate ability of agronomists.

The system also contains functions creates discussion forums with the other farmers, and allows users access information of weather, crop, water irrigation system and soil.

1.2.1 World phenomena

WP.1: Farmers know their location.
WP.2: Weather forecasts are available by Telengana.
WP.3: Farmers grow specific crops.
WP.4: Farmers face a problem.
WP.5: Farmers carry out suggestions.
WP.6: Farmers know the produced amount per product they plant.
WP.7: Water irrigation system monitors the amount of water used by each farmer.
WP.8: Sensors deployed on the territory measure humidity of soil.
WP.9: the policy makers know how to rate performance of farmers.
WP.10: the policy makers understand the initiatives from Agronomists.
WP.11 the policy makers make policies.
WP.12: Agronomists know their responsible areas.
WP.13: Agronomists research and develop solutions.
WP.14: Agronomists visit each farm at least twice per year.

1.2.2 Shared phenomena

SP.1: the policy makers visualize the information about farmers. **(machine)**
SP.2: the policy makers acquire the feedback from Farmers. **(world)**
SP.3: the policy makers collect the analysis from Agronomists. **(world)**
SP.4: Agronomists insert the area they are responsible of. **(world)**
SP.5: Agronomists receive information about farmers' requests for help. **(machine)**
SP.6: Agronomists answer to farmers' requests. **(world)**
SP.7: Agronomists check data concerning weather forecasts. **(world)**
SP.8: Agronomists check the best performing and under-performing farmers in the area. **(world)**
SP.9: Agronomists visualize and update a daily plan to visit farms in the area. **(world)**

SP.10: Agronomists confirm the execution of the daily plan at the end of each day or specify the deviations from the plan. **(world)**
SP.11: The farmers check local weather forecasts. **(world)**
SP.12: The farmers search for personalized suggestions concerning specific crops to plant or specific fertilizers to use based on the type of product. **(world)**
SP.13: The farmers insert the data about the production (types of products, produced amount per product) into the system. **(world)**
SP.14: The farmers insert the problems they face into the system. **(world)**
SP.15: The system shows the answer to the farmer's request. **(machine)**
SP.16: The farmers create a discussion forum in the system. **(world)**
SP.17: The system shows the discussion forum to all farmers. **(machine)**

1.3 Definitions, Acronyms, Abbreviations

1.3.1 Definition

Marginalized communities: Socially excluded groups of people for different reasons, such as age, physical or mental disabilities, economic status, access to education, or live in isolated places or depressed areas.
Smallholders: Smallholders are usually farms supporting a single family with a mixture of cash crops and subsistence farming.
Challenge: It may cause exceptionable influence from human or natural factors
Telengana: Telengana is the 11th largest state in India with a geographical area of 112,077 km2 and 35,193,978 residents (data from 2011)

1.3.2 Abbreviations

1.4 Revision history

Vision	Date	Content
1.0	30/11/21	Finish Section1

1.5 Reference Documents

- Project assignment specification document.
- ISO/IEC/IEEE 29148 - Systems and software engineering.
- Course slides on WeBeeP

1.6 Document Structure

This document is presented as it follows:

1. **Introduction:** contains a b brief description of problems to be solved, purpose of system, and goals which the application must reach. Meanwhile, it describes scope, which gives more details about goals and shows world or shared phenomena.
2. **Overall Description:** gives a general description of the system, focusing on its functions and constraints. Moreover, it provides the domain assumptions of the analyzed world.
3. **Specific Requirements:** explains in detail the functional and non-functional requirements. It lists the possible interactions with the system in the form of scenarios, use cases and sequence diagrams.
4. **Formal Analysis Using Alloy:** contains the Alloy model of some critical aspects of the system and an example of the generated world.
5. **Effort Spent:** keeps track of the time spent to complete this document.
6. **References:** lists the references used in this document.

2. OVERALL DESCRIPTION

2.1 Product perspective:

2.2 Product functions:

2.3 User characteristics:

2.4 Assumptions, dependencies and constraints:

3. SPECIFIC REQUIREMENTS: Here we include more details on all aspects in Section 2 if they can be useful for the development team.

3.1 External Interface Requirements

3.1.1 User Interfaces

3.1.2 Hardware Interfaces

3.1.3 Software Interfaces

3.1.4 Communication Interfaces

3.2 Functional Requirements: Definition of use case diagrams, use cases and associated sequence/activity diagrams, and mapping on requirements

3.3 Performance Requirements

3.4 Design Constraints

3.4.1 Standards compliance

3.4.2 Hardware limitations

3.4.3 Any other constraint

3.5 Software System Attributes

3.5.1 Reliability

3.5.2 Availability

3.5.3 Security

3.5.4 Maintainability

3.5.5 Portability

4. FORMAL ANALYSIS USING ALLOY:

This section should include a brief presentation of the main objectives driving the formal modeling activity, as well as a description of the model itself, what can be proved with it, and why what is proved is important given the problem at hand. To show the soundness and correctness of the model, this section can show some worlds obtained by running it, and/or the results of the checks performed on meaningful assertions.

5. EFFORT SPENT:

Timeline	Content	Xu	Zhang	Hu
15/11→19/11	Section1	1.5h	4.5h	2.5h
20/11→22/11	Review section1	0.5	0.5h	0.5h
23/11	Offline discussion section1 part1	1h	1h	1h
24/11→29/11	Section2			
30/11	Offline discussion section1 part2	3h	3h	3h
TBD				
1/12→2/12	Review Section2			
3/12	Offline discussion section2 in Patio			
4/12→6/12	Section3			
7/12→9/12	Review section3			
10/12	Offline discussion section3 in Patio			
11/12→16/12	Section4			
18/12→19/12	Review section4			
20/12→22/12	S5&S6, Final discussion in Patio			
23/12	DDL			

6. REFERENCES