WEATHER INFORMATION MANAGEMENT OF EAST AFRICA

WIMEA-ICT

Software Requirements Specification

For

WEATHER INFORMATION DISSEMINATION SYSTEM – [WIDS]

Version 2.3 approved

Prepared by: <u>BSE 18- 27</u>

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Revision History

Name	Date	Reason For Changes	Version
BSE 18- 27	25th/09/2017	First version was created after project discussion on 25th/09/2017	1.0
BSE 18- 27	29th/09/2017	First draft version for requirements review	2.0
BSE 18- 27	3rd/10/2017	More non-functional requirements added; some minor changes overall;	2.1
BSE 18- 27	14th/11/2017	Review of applied comments and Applying changes as directed by the supervisor	2.2
BSE 18- 27	24th/11/2017	Final proof reading	2.3

1. INTRODUCTION

1.1 Purpose

This document specifies the Software Requirements Specification (SRS) for the Weather Information Dissemination System of **Release Number 1.0**. It explains the purpose, intended audience, overall description, external interface requirements and features of the system. The document is intended for both the stakeholders and the developers of the system and it shall act as a reference for the development of the APIs for the weather repository.

The system shall be used by sectors such as Agriculture, Oil and Gas, Aviation, Construction and Disaster Management and the general public at large to obtain real-time and reliable weather forecast information for informed decision making.

1.2 Document Conventions

Some of the standards or typographical conventions that were followed when writing this SRS document include;

1. Font Type: Times New Roman.
2. Size: 14 for Headings and subheadings.
3. Size: 12 for the rest of the document.
4. Case: Headings are written in Upper case.
5. Case: Subheadings and the rest of the document are written in Lower case.
6. The document follows MLA format with Bold-faced text used to emphasize section and sub-section headings.

1.3 Intended Audience and Reading Suggestions.

This document is intended for reading by the development team that require obtaining a clear picture of the system they are to develop, Project Manager that needs to monitor the progress and coordinate the system development process, Project Testers that shall test the system whether the

implementation meets the specifications and Project Stakeholders that include; UNMA and the WIMEA-ICT project team together with End Users to understand the requirements.

1. **Reader:** Project Manager.

A project Manager is expected to read all sections in this document that include;

a) 1.0: Introduction.

b) 2.0: Overall Description.

c) 3.0: External Interface Requirements.

d) 4.0: System Features.

e) 5.0: Other Nonfunctional Requirements.

f) 6.0: Other Requirements.

g) Appendix A: Glossary.

h) Appendix B: Analysis Models.

2. **Reader:** Development Team.

The development Team for the Weather Information Dissemination System shall consist of four (4) members of the group named **BSE 18- 27.**

The most pertinent sections of this document that must be read by the Development Team include;

a) 2.1: Product Perspective.

b) 2.2: Product Functions.

c) 2.3: User Classes and Characteristics.

d) 2.4: Operating Environment.

e) 2.5: Design and Implementation constraints.

f) 2.7: Assumptions and Dependencies.

g) 3.0: External Interface Requirements

h) 4.0: System Features.

i) 5.0: Non Functional Requirements.

j) 6.0: Other Requirements.

However, some of the sections of this SRS document that may be skipped by the Development Team include;

    a) 1.1: Purpose.

    b) 1.2: Document Conventions.

    c) 1.3: Intended Audience and Reading Suggestions.

    d) 1.4: Product Scope.

    e) 1.5: References.

    f) 2.6: User Documentation.

3. **Reader:** End User.

End users of the finished system shall include; Stakeholders in Agriculture sector that covers the farmers, the Farmers' Associations and extension workers, Oil and Gas sector, Aviation, Construction and Disaster Management sectors. All these End users shall obtain real time weather forecast information and advisories that are relevant to their respective sectors.

The most pertinent sections of this SRS document that must be read by the End User include;

    a) 2.2: Product Functions.

    b) 2.3: User Classes and Characteristics.

    c) 2.4: Operating Environment.

    d) 2.6: User Documentation.

    e) 3.1: User Interfaces.

However, some of the sections of this SRS document that may be skipped by the End user while reading through this document include;

    a) 1.0: Introduction.

    b) 2.1: Product Perspective.

    c) 2.5: Design and Implementation Constraints.

    d) 2.7: Assumptions and Dependencies.

    e) 3.2: Hardware Interfaces.

    f) 3.3: Software interfaces.

    g) 3.4: Communication Interfaces.

    h) 4.0: System Features.

    i) 5.0: Other Non-Functional Requirements.

    4. Reader: Project Testers.

Project testers can use this SRS document as a base for their testing strategy since some faults and failure instances are easier to find using a requirements document. This way, testing becomes more methodically organized.

The most pertinent sections of this SRS document that must be read by the Project Testers include;

    a) 2.5: Design and Implementation Constraints.

    b) 2.7: Assumptions and Dependencies.

    c) 4.0: System Features.

    d) 5.0: Other Non-functional Requirements.

However, some of the sections of this SRS document that may be skipped by the Project Tester while reading through this document include;

    a) 1.2: Document Conventions.

    b) 1.3: Intended Audience and Reading Suggestions.

    c) 1.5: References.

    d) 2.6: User Documentation.

    5. Reader: Project Stakeholders.

Just like project managers, project stakeholders must also read all sections of this document as they have to fully understand all its content, keeping a picture of what the product of interest shall be. These sections include;

    a) 1.0: Introduction.

    b) 2.0: Overall Description.

    c) 3.0: External Interface Requirements.

    d) 4.0: System Features.

    e) 5.0: Other Nonfunctional Requirements.

    f) 6.0: Other Requirements.

    g) Appendix A: Glossary.

    h) Appendix B: Analysis Models.

1.4   Product Scope

The Weather Information Dissemination System is a web based and mobile application system intended to automate the way weather forecast information is accessed by and or delivered to the target users.

The system is proposed for use in Uganda as a country**,** owned and managed by the Uganda National Meteorological Authority. It shall be used by stakeholders in Agriculture sector that include the farmers, Farmers' Associations and their extension workers. The other sectors to which the system can easily be extended include; Oil and Gas sector, Aviation, Construction and Disaster Management sectors.

Furthermore, the software shall need both Internet and Google map to fetch and display results. All system information shall be maintained in a database, which is located on a web-server. The system shall also have the capability of representing both summary and detailed information about the query with some of its benefits including; increased flexibility and mobility as users shall be able to access the system using their computers and mobile devices from anywhere and at any time, reduced loss of lives especially through timely and widespread warnings of extreme weather conditions through the disaster preparedness sector, reduced economic damages for example in the Oil and Gas sector and the Construction sector where most activities depend on weather patterns.

The system shall also interact with the WRF model, taking the model's output as its input.

1.5   References

[1] IEEE Software Engineering Standards Committee, "IEEE Std 830-1998, IEEE Recommended Practice for Software Requirements Specifications", October 20, 1998.

[2] Karlsson J, "A Cost-Value Approach for Prioritizing Requirements", Uni. 1997.

[3] WIMEA-ICT, https://github.com/wimeaict/dissemination/blob/master/WEATHER%20INFORMATION%20DISSEMINATION%20SYSTEM.docx?raw=true, accessed: 2017-11-20

2. OVERALL DESCRIPTION

2.1 Product Perspective

The Weather Information Dissemination System is a standalone system that shall provide accurate, reliable weather information and sector specific advisories to the relevant stakeholders.

It shall include all the subsystems needed to fulfill these software requirements. In addition, the WIDS shall have interfaces to the external systems such as the WRF model whose output shall be processed to perform some of the system functionality.

These interfaces shall be implemented according to available industry standards. Any detailed definition of an external system is out of scope of this study.

The system was purposely proposed to solve the problem of lack of access to real-time and reliable weather forecast information and advisories through the automation of the existing system so as to provide real-time and reliable weather forecast information to stakeholders in the respective sectors, helping in the short and long term informed decision making thereby promoting stability and growth in the various economic sectors of the country.

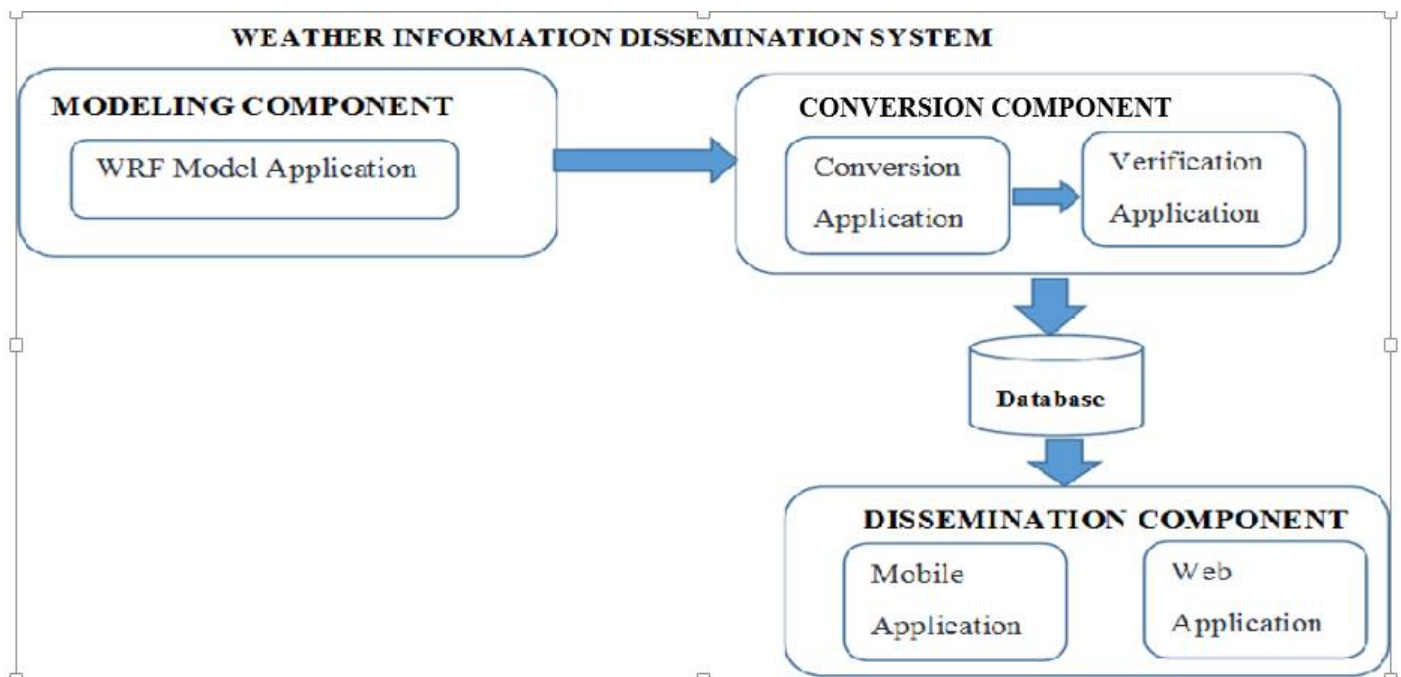Figure 1 below illustrates the components of the proposed WIDS.

Figure 1: Weather Information Dissemination System.

2.2 Product Functions

This section covers a summary of the major functions the product must perform or functions that the product must let the user perform.

2.2.1 Functions to be performed by the System

The Weather Information Dissemination System shall;

1. Provide real-time weather forecast information to;

   - Stakeholders and interested general public.

2. Provide seasonal forecasts and sector specific advisories corresponding to these forecasts.

3. Deliver alerts of extreme weather conditions to its stakeholders.

4. Provide a platform for users to provide feedback to UNMA.

5. Provide a platform for users to share weather forecast information and advisories to other platforms like social media.

6. Provide advisories and impacts to farmers, their associations and extension workers.

2.2.2 Activities to be performed by the User while interacting with the System.

The user of the finished System shall;

1. Click on regions and/or districts to get desired information.

2. Request for analysis results of weather conditions.

3. Select weather parameters to display on the interactive map when desired.

4. Be able to share relevant information from the system onto various platforms including social media platforms.

5. Request for advisories and impacts that relate to their sector.

6. Provide information to UNMA as fast as possible for example physical extreme weather conditions and their impacts.

7. Share forecasts and advisories based on indigenous knowledge.

2.3   User Classes and Characteristics

There are three classes of users that shall interact with the system and these include; System Administrators, General Public and the Forecasters.

Each of these three classes of users has different use of the system so each of them has their own characteristics.

a) System Administrators.

System Administrators only interact with the web portal. They manage the overall system so that there is no incorrect information within it. The administrator can manage the information for each region as well as the options for both the external users and the system owners.

Administrators should have characteristics that include;

1. Should be able to track system logs on real time.
2. Should have skills in handling urgent issues that may arise in the system so as to avoid system shut down.

b) General Public.

This class of users is composed of stakeholders in Agriculture sector that include the farmers and Farmers' Associations together with extension workers, Oil and Gas sector, Health and Water sector, Construction and Disaster Management sector together with the Aviation sector.

These users can only access and use the system to obtain the weather predictions and also submit query or seek for advisory information. This implies that this class of users should have characteristics that include;

1. Being Computer literate. All users need to have the minimal technical expertise that is to say; need to know how to use the mouse and keyboard.
2. Having motivation for the availability of accurate advisories and impact tailored to specific regions.
3. Knowledge about how to navigate through web based system interfaces in order to get a relevant result. This is because they have to specify an appropriate search criterion that will yield desired value.
4.   (Optional) Having indigenous knowledge of weather prediction and willingness to compare it scientific model forecasts.

    c) Forecasters.

This class of users comprises the employed personnel to forecast the weather information.

Forecaster should have characteristics that include;

    1. Should be computer literate.

2.4 Operating Environment

The web version of the proposed system will be supported by browsers such as Mozilla Firefox, Google chrome and many more.

The Mobile version shall be tested on: Microsoft Windows, GNU/Linux distribution and Android mobile platform.

2.5 Design and Implementation Constraints

Some of the design and implementation constraints for the Weather Information Dissemination System include;

    1. The system shall be built using a standard web page development tool that conforms to either IBM's CUA standards or Microsoft's GUI standards.

    2. The computer must be equipped with web browsers such as internet Explorer, Mozilla and Google Chrome.

    3. The product shall be accessed and used only in the presence of an internet connection. This is because the system shall require fetching data from the database over the Internet and therefore it is crucial that there is an Internet connection for the system to function properly.

    4. Maintenance of the finished and deployed system shall be done by only the development team involved in its development.

    5. The system use shall be limited to only English language understanding users.

2.6 User Documentation

The user manual for the WIDS shall be available to administrative users through the provided link [2].

An Online help shall be created and availed to the users of the system.

2.7   Assumptions and Dependencies

Some of the Assumptions and Dependencies for the Weather Information Dissemination System include;

1. System Access: The finished product is assumed to be web based that is to say; accessed and used over internet and supported by all browsers such as Mozilla, Google Chrome, and Internet Explorer.

2. Performance: Another assumption about the product is that it will always be used on devices that have enough performance. If a device does not have enough hardware resources available for the product, for example users might have allocated resources with other applications thereby creating a scenario where the product does not work as intended or even at all.

3. System Up-Time: The finished product is assumed to be available 24/7 that is to say; 24 hours a day for each 7 days.

4. User capability: It is assumed that users of the finished product shall be well acquainted with the English language for the initial implementation. However, after commissioning of the first prototype the WIDS shall be translated into a few common local languages.

5. System Monitoring: A finished and deployed system shall require a Systems Administrator that shall continuously monitor its performance to ensure that it is up and operating in real time.

6. Another assumption is that the Google map component in all devices works in the same way. If the some devices have different interfaces to the Google map, then system shall need to be specifically adjusted to each interface and that would mean the integration with the Google map would have different requirements than what is stated in this specification.

3. EXTERNAL INTERFACE REQUIREMENTS

3.1 User Interfaces

1. The user interface of the system must be user friendly, intuitive and easy to use, implementing the ergonomic standards.

2. In the map view, each region shall be represented by a pin with each pin having an information link which provides a more detailed description of the selected region as shown in Figure 2 below.
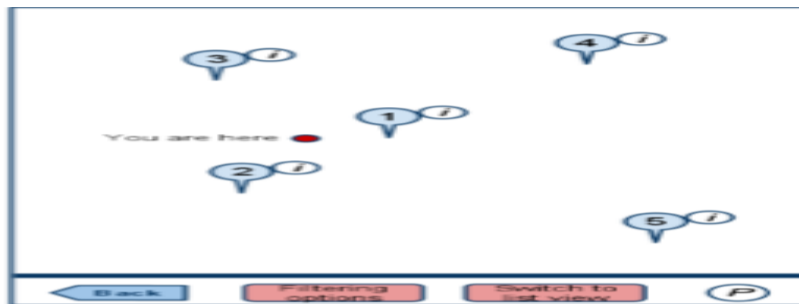
Figure 2: Regions Represented by pins.

3. The System owners and Administrators shall interact with the system through a web-portal where the System owner shall have to register on the web-portal in order to log in and manage the system's information and an also an administrator shall be able to log in to the web-portal where he shall administer the system by for instance editing system or user information.
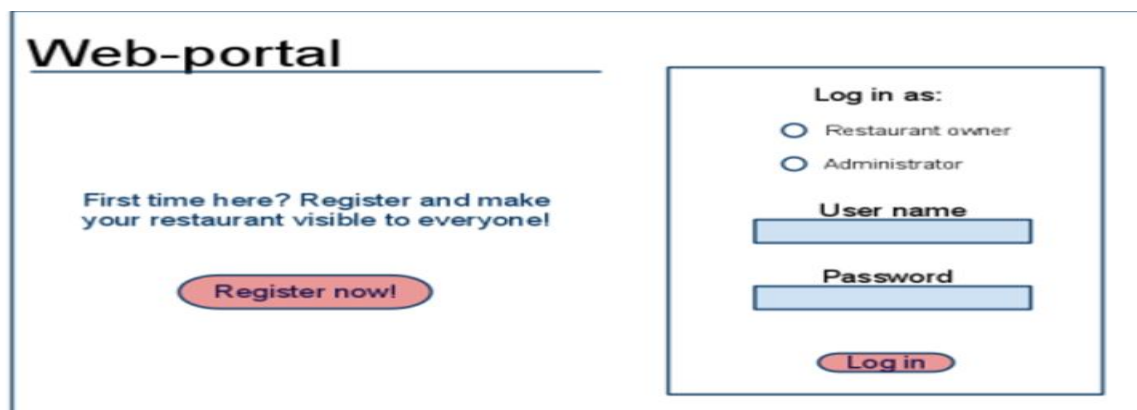
Figure 3: Web Portal for the System.

4. The user interface for the system shall be compatible to browsers such as Internet Explorer, Mozilla or Netscape Navigator by which user can access and use the system.

5. The user interface shall be implemented using any tool or software package like Applet, MS Front Page, EJB etc.

3.2 Hardware Interfaces

1. All hardware shall require internet connection with hardware interface for the system such as Modem, WAN – LAN, Ethernet Cross-Cable since the system must run over the internet.

2. The server part of the Weather Information Dissemination System shall be able to run and fulfill the performance requirements on: Dual Pentium 2.8 GHz, 2 GB RAM, 5 GB disk space with a LAN bandwidth: 1Gbps.

3. The client part of the Weather Information Dissemination System shall be able to run and fulfill the performance requirements on: Single Pentium 1.8 GHz, 1 GB RAM, 1 GB disk space, LAN bandwidth: 1 Gbps, WAN bandwidth: 2 Mbps and a Minimum screen resolution: 1024x768.

4. The hardware requirements for data storage system are out of scope of this study/ project. However, it is assumed, that the data storage system shall provide sufficient performance to fulfill the performance requirements of the Weather Information Dissemination System.

3.3 Software Interfaces

1. The system shall run on MS Windows 2000, Windows XP, Windows Vista, Linux System with kernel version 2.4 or higher, and Mac OS 9 or higher, iOS and Android.

2. The system shall communicate with the WRF prediction model by using its prediction output to make sector specific advisories for different regions in the country.

3.4 Communications Interfaces

1. The system shall use a communication protocol:

   - Between host part and client part on common PC: HTTP protocol.

   - Between host part and client part on mobile device: WAP protocol.

   - Between host subsystems the transport level protocol must be TCP/IP.

2. The system shall provide Web service interface for accessing its main functionality from an external system.

4. SYSTEM FEATURES.

This section organizes the functional requirements for the Weather Information Dissemination System by use of system features.

4.1 Advisory Feature

4.1.1. Description and Priority.

The Advisory Feature shall be used to acquire sector specific advisories for the selected region by the user.

Priority: High.

Benefit: 9

4.1.2. Stimulus/Response.

Stimulus: User wants to acquire specific sector advisories.

Sequence of Actions:

- A user accesses the system.
- The user clicks on a region/district on the live map.
- The user selects the sector he/she wishes to investigate.
- The user selects the category of advisory in the sector.

Response:

- The System shall provide an interface with downloadable sector specific advisories as requested for by the user.
- The system shall send a notification message to the user in case the requested advisory is unavailable.

Stimulus: Administrator wants to upload Advisory to the system.

Sequence of Actions:

- The Administrator logs onto the system using correct credentials.
- The Administrator creates Advisory.
- The Administrator uploads the Advisory.

Response: The system shall provide a confirmation message to the Administrator.

4.1.3. Functional Requirements.

Advisory**:** The system shall provide audio advisories and impacts to a user.

Advisory download**:** The system shall allow the download of specific advisories.

Advisory display**:** The system shall provide graphical/pictorial functionality in the advisory section.

Advisory upload**:** The system shall provide a facility to upload audios and images/graphs.

4.2 Forecast Feature

4.2.1. Description and Priority.

This feature shall allow a user to receive reliable weather forecasts which may be real-time, daily, monthly and seasonal.

Priority: High.

Benefit: 7

4.2.2. Stimulus/Response.

Stimulus: The user wants to know the Forecast information.

Sequence of Actions:

- A user accesses the system.
- A user clicks on a region/district on the live map.
- A user selects the type of forecast he/she wishes to receive such as hourly, daily, monthly, and seasonal forecasts.

Response:

- The system shall provide the requested weather forecast information.
- The system shall send a notification message to the user in case the requested advisory is unavailable.

4.2.3. Functional Requirements.

Forecast**:** The system shall provide real time weather forecast information to the user.

Forecast period**:** The system shall allow a user to select a period of time for which he/she wants a forecast.

4.3 Weather Alerts Feature

4.3.1. Description and Priority.

The Weather Alerts Feature shall send alerts to mainly the mobile users about extreme weather conditions and advisories on how they should proceed to prevent the damages caused by these weather conditions.

Priority: Medium.

Benefit: 8

4.3.2. Stimulus/Response.

Stimulus: The Administrator wants to send an alert to the system users of certain category/ geographical region.

Sequence of Actions:

- The administrator selects the user category or region for which he/she wishes to send this alert.
- The administrator then sends out an alert update.

Response:

- The system shall send a confirmation message to the Administrator.
- The system shall post an update to users' phones and the web portal

4.3.3. Functional Requirements.

Alert: The system shall send an alert to system users in case of any extreme forecast conditions.

User group contact: The system shall provide a list of user groups and contact information for sector stakeholders in different regions of the country.

Warning: The system shall provide a facility for an administrator to enter a revised warning if required.

4.4   Feedback Feature

The Feedback Feature is divided into 2 specific features that include the Indigenous knowledge and the general feedback feature.

4.4.1.   Description and Priority.

The Indigenous Knowledge feedback shall allow interested users to offer their indigenous forecast advice to the meteorological dissemination team as a measure of inclusion into the online system. This indigenous feedback is required by the dissemination team for comparisons with actual data collected in order to further verify their predictions.

The General Feedback feature shall provide a platform to send back feedback about the services of the UNMA in relation to dissemination and also easily report current weather issues in their specific region that they believe require the immediate attention of the Meteorological Authority.

Priority: Low.

Benefit: 5

4.4.2.   Stimulus/Response.

Stimulus: Stakeholders and users want to give prediction based on indigenous forecasts or feedback on service delivery and or notify the organization of a current weather situation in a certain place that requires immediate attention

Sequence of Action:

- The user clicks on the feedback option.
- The user selects either indigenous feedback or general feedback option
- The user selects an option he/she intends to use such as text, image.
- The user uploads the feedback.

Response: The system shall provide a confirmation message on successful delivery of this feedback

4.4.3.   Functional Requirements

Feedback upload: The system shall provide a facility for the user to upload feedback to UNMA.

Feedback status. The system shall prompt the user to confirm status of the file before uploading.

4.5 Specific Weather Parameters Feature

4.5.1. Description and Priority.

The Specific Weather Parameter feature shall enable a user or stakeholder to request for a specific weather parameter and view its distribution across the country or region accordingly. Some weather parameters can include temperature, humidity, rainfall distribution and others.

Priority: Medium.

Benefit: 7

4.5.2. Stimulus/Response

Stimulus: The user/stakeholder wants to know the parameter distribution.

Sequence of Actions: The user selects the weather parameter he/she wants to view.

Response: The live map changes accordingly to display the distribution of the requested weather parameter.

- The system automatically displays the distribution of the weather parameter.
- The system shall provide a message to the user incase the weather parameter is not readily available.

4.5.3. Functional Requirements.

Weather Parameter: The system shall provide a list of all available viewable weather parameters.

Weather Parameter Key: The system shall provide a key to explain the appearance of the live map.

5. OTHER NONFUNCTIONAL REQUIREMENTS

5.1 Performance Requirements

The performance requirements for the Weather Information Dissemination System under various

1. The system shall support concurrent work where multiple users can access it at the same time.
2. The system shall have the following average response time:

   - 80% of executions of any function shall be within 3 seconds,
   - 95% of executions shall be within 5 seconds
   - 100% of executions shall have no requirement.

3. The maximal response time must not exceed the average response time by more than 50%.
4. The client part of the system shall consume not more than 1 GB of disk space.
5. The host part of the system shall consume not more than 5 GB of disk space.
6. The average memory consumption must be not higher than 500 Mbytes on the client part and 500 Mbytes on the host part.

5.2 Safety Requirements

Some of the Safety Requirements for the Weather Information Dissemination System include;

1. The system must ensure that it leaves untouched the input data. No modification of System information is allowed by End user except by the Administrator.
2. The system should function even in cases of wrong data insertion or wrong settings.
3. The system should provide users with appropriate help messages in case of any error(s).

5.3 Security Requirements

The Security Requirements for the Weather Information Dissemination System include;

1. All audit entries must at least contain the following: Time stamp when the user performed an action, Action description of activities that are audited, Global events such as logon and logoff, password changes performed specifically by the System's administrator, creation/

editing/deletion of user query or advisories and assigning and reassigning permissions to user.

2. The system shall ensure secure and tamper proofed data exchange between its parts and the user.

5.4   Software Quality Attributes

5.4.1 Portability.

The system should be portable thus run on different platforms such as widows, iOS and Android.

5.4.2 Maintainability.

The system shall be designed in such a way that it is easy to extend and the code should be written in a way that it favors implementation of new functions.

5.4.3 Testability.

Test environments should be built for the system to allow testing of the system's different functions.

5.5   Business Rules

Some of the Business rules to be observed as to the Weather Information Dissemination System include;

1. The user shall not request for information for more than one region at a time.
2. The administrator must login using correct credentials that shall include the; username and password.
3. The user should be alerted after three consecutive, unsuccessful login attempts.

6. OTHER REQUIREMENTS

A database for Weather Information Dissemination System calls for a server side implementation that holds information for the Administrator. The database will be using MySQL.

An example of information that may be stored in the database includes the Administrator (Admin)**: Username** and **Password**.

The server will be configured on a Linux platform.

Appendix A: Glossary.

TERM	DEFINITION
User	Someone who interacts with the system.
Admin/ Administrator	One with specific permission for managing and controlling the system.
Client System	The part of the system that runs on the user PC and other mobile devices such as phones. Provide GUI and required system functionality and maintains physical connection to the host system.
Host System	The main part of the system that resides on the server and where the business logic runs. Maintains physical connections to all external systems.
Stakeholder	Any person who has interaction with the system who is not a developer
Subtask	A task that has a parent task what it belongs to.
Task	Any activity that needs to be accomplished within a defined period of time. Tasks can be linked together to create dependencies and can have subtasks.
Web-Portal	A web application which present special facilities for system owners.
TERM	**EXPLANATION**
DEP	Dependency.
DESC	Description.
GUI	Graphical User Interface.
IBM	International Business Machine.
ICT	Information and Communications Technology
ID	Identifier A unique, persistent identifier contained in a Language statement
RAT	Rational.
SRS	Software Requirements Specification.
UNMA	Uganda National Meteorological Authority.
WIDS	Weather Information Dissemination System.
WIMEA	Weather Information Management in East Africa.
WRF	Weather Research and Forecast.

Appendix B: Sample Interview Guide.

The weather information dissemination system is meant to provide reliable and real-time weather information advisories and impacts to various sectors of Uganda.

The data to be collected pertains to the need to incorporate the WRF model into the dissemination system in order to provide real-time weather information dissemination.

Sample questions;

1. What are the technical skills needed to use the WRF model's output?
2. How are the maps generated by the WRF models used?
3. Has there been any request to use the WRF model's output for other purposes in addition to the current usage?
4. Are forecasts produced from the WRF model incorporated into weather information disseminated to stakeholders?
5. If not, is that of interest to UNMA?
6. Is there any connection between the weather modeling and weather information dissemination or do these teams interact?
7. In your view, can the WRF model together with its output improve weather information dissemination?
8. In your view, how can this happen?
9. Who are all the users of the weather information that is disseminated?
10. Are there any groups of users that require information presented on maps from UNMA?
11. If so, what weather information do they request for on these maps?
12. How often do they request this information on maps?
13. Does UNMA currently provide all this information?
14. What are the challenges in providing this information?
15. Is a clickable map with information a welcome addition for UNMA or any users?
16. If so, what are your suggestions to roll this out?
17. Is UNMA willing to accommodate this change in terms of work schedules/activities?
18. Does this solution in your view provide value to UNMA and its stakeholders?

Appendix C: Analysis to Data Collection.

An Interview was held with personnel from both the WRF model and the Dissemination Component at UNMA.

Below are the general answers that were given for some of the applicable questions during the interview conducted at The Uganda National Meteorological Authority.

Sample questions and the provided response;

QN. What are the technical skills needed to use the WRF model's output?

Ans. No special skills are needed to use this model. But you have to give yourself a few days (around 2-3) to perfect its use.

QN. How are the maps generated by the WRF models used?

Ans. So far right now, they are used to support forecasting when used in collaboration with and verified against raw data on the ground.

QN. Has there been any request to use the WRF model's output for other purposes in addition to the current usage?

Ans. Not really. Not yet, but they are here to be used in collaboration with the actual on ground data in order to make better predictions

QN. Are forecasts produced from the WRF model incorporated into weather information disseminated to stakeholders?

Ans. NO. They are not because they haven't been in use for long and so far used for long time prediction generation

QN. If not, is that of interest to UNMA?

Ans. Yes. It would be great to use this output to support other components because it can support a lot of work in the forecasting parts if used well.

QN. Is there any connection between the weather modeling and weather information dissemination or do these teams interact?

Ans. Currently not yet, but that is a view not yet thought about by the authority but seem to see being operational and very useful.

QN. In your view, can the WRF model together with its output improve weather information dissemination?

Ans. They agree it can help very much because of the very many calls and communication they get from day-to-day users asking for weather prediction information in order to plan their activities

QN. In your view, how can this happen?

Ans. They suggest that if the model output generated can be verified with raw data, then this can help in solving the issues of calls to UNMA for information incase it's used to disseminate this information.

QN. Who are all the users of the weather information that is disseminated?

Ans. Day-to-day users, Health sector, Construction sector, Disaster management sector, basically everyone needs this information in however way they need it.

QN. Are there any groups of users that require information presented on maps from UNMA?

Ans. On live maps, they conceded that so far no one has requested for this information but considering what they ask for and how the map idea was explained, they agreed it was an excellent idea.

QN. If so, what weather information do they request for on these maps?

QN. How often do they request this information on maps?

QN. Does UNMA currently provide all this information?

QN. What are the challenges in providing this information?

QN. Is a clickable map with information a welcome addition for UNMA or any users?

Ans. They agreed that with a little bit of sensitization, this idea is a very good and welcome addition. And especially because it incorporates the youth group that they are so hardly trying to get involved in these activities.

QN. If so, what are your suggestions to roll this out?

QN. Is UNMA willing to accommodate this change in terms of work schedules/activities?

Ans. They are willing to accommodate this change for the better performance of the dissemination product and inclusion of the youth.

QN. Does this solution in your view provide value to UNMA and its stakeholders?

Ans. Generally, all interviewees agree that this solution is of use and importance and adds value to UNMA as an organization and supports agricultural activities.