Domain Engineering for Weather Information Services

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January 2019

WIMEA-ICT

Content

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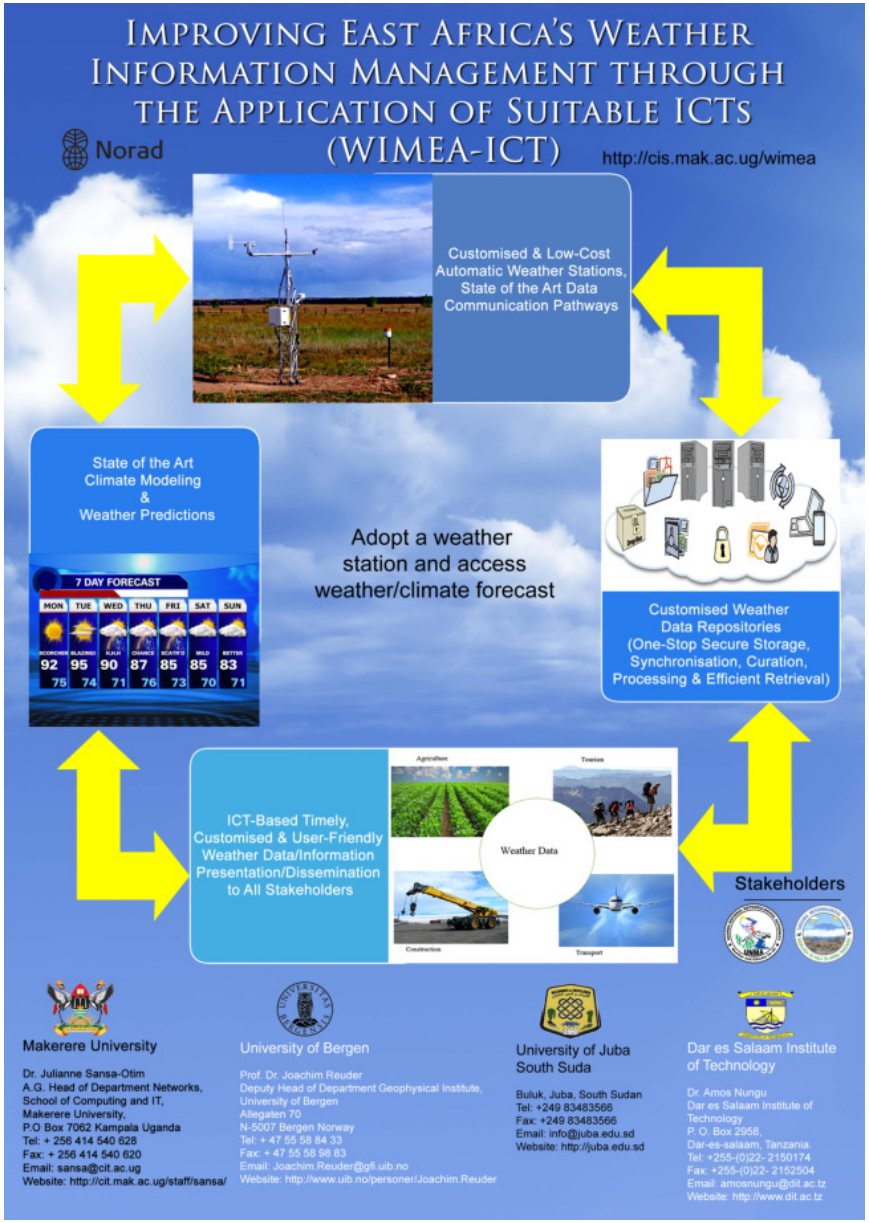
Context

- Weather affects the livelihood of people everywhere
  - For increased productivity (in the agricultural, energy, water resources and construction sectors)
  - For safety (in the aviation, disaster management, fishing, health, mining, and defense sectors)
- Weather services can lead to improved living conditions for communities.
- Accessibility to reliable weather information vital for informed decision making


IMPROVING EAST AFRICA'S WEATHER INFORMATION MANAGEMENT THROUGH THE APPLICATION OF SUITABLE ICTs (WIMEA-ICT)
Norad
http://cis.mak.ac.ug/wimea
Customised & Low-Cost Automatic Weather Stations, State of the Art Data Communication Pathways
State of the Art Climate Modeling & Weather Predictions
7 DAY FORECAST
MON TUE WED THU FRI SAT SUN
92 95 90 87 85 85 83
75 74 71 76 73 70 71
Adopt a weather station and access weather/climate forecast
Customised Weather Data Repositories (One-Stop Secure Storage, Synchronisation, Curation, Processing & Efficient Retrieval)
ICT-Based Timely, Customised & User-Friendly Weather Data/Information Presentation/Dissemination to All Stakeholders
Weather Data
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Challenge

Survey to establish the status of the weather information dissemination system in Uganda

- Limited access to, no control over weather information (one-way communication)
- Untimely weather information - received when there is no value for it
- Content: relevancy
- Complex, technical, mainly published in English
- Bias regarding accuracy (credibility), leads to disregard, lack of acceptance

Weather services are critical but ineffective modes of communication

The Need for An Integrated Effective Weather Dissemination System for Uganda

Issues:

- Interactivity
- Advisories
- Timeliness and access
- Packaging localized content (language specific) for indigenous users
- Personalizing/ packaging $\rightarrow$ relevance

Domain Engineering

Domain Engineering: Collecting, organizing, and storing past experience in building systems or parts of systems for reuse when building new systems

- Systematic approach that optimizes the different dimensions and concerns
  - Diversity in stakeholders, ways to disseminate weather information, purposes, weather parameters of interest, levels of detail
- Incorporate stakeholder needs right from the requirements phase, through the design stage to the final system
- Design domain specific components that embed key concerns, constraints and knowledge

Domain Engineering Approach

Goal

To improve user experience in accessing and receiving of personalized, timely weather information to enhance decision making

- Domain analysis to identify specific information needs for stakeholders
- Domain design - define a Domain Specific Language (DSL) to support development of weather information dissemination products (messages and channels)
- Develop a prototype for an integrated weather information dissemination system, based on DSL - domain implementation
- Validate prototype with targeted stakeholders

Application Area - Farming

Scope

- Dissemination of weather information in Uganda
- Chosen stakeholders - **farmers**
  - Representative sample - Four out of five people in Uganda depend on agriculture for income and food security
  - Weather information demands vary from seasonal, to within-season forecasts
  - Explore capabilities (learn from) of pilot projects already undertaken e.g., SMS to farmers, fishermen

Domain Analysis

- Focus group sessions with farmers from Rakai, Mbale
- Questionnaires with extension workers
- Individual interviews with UNMA personnel

Themes

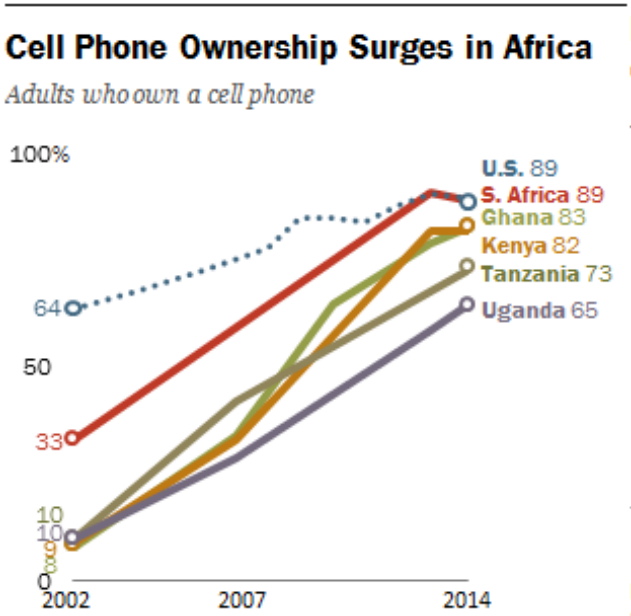
- Agricultural Activities - crops grown, animals kept, inputs, irrigation
- Agro-Meteorological Information - weather parameters, advisories, frequency, usage
- IT & Dissemination Channels - dissemination channels, formats, language, and
- Indigenous Knowledge Forecasts

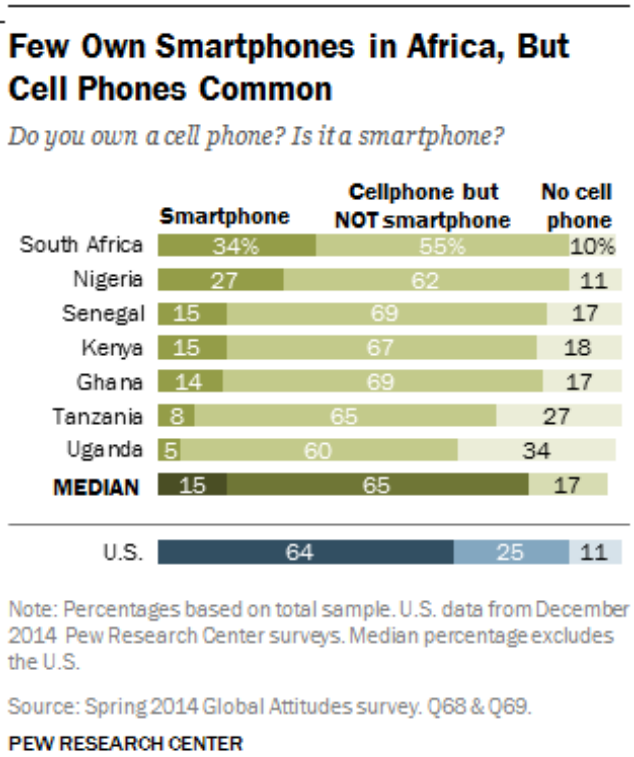
Thematic analysis

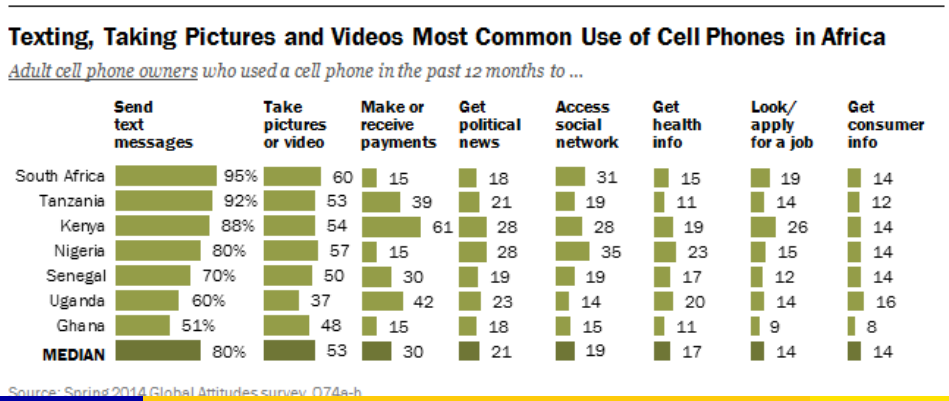
Findings

- Majority owned a mobile phone or have access to one, coined as 'farmer phone'
- Were conversant with phone functionality/usage, including short codes;
- Were willing to pay up to 200Ugx ($\approx$ 6kes) for SMS with weather information requested for,
- Wanted to receive audio messages customized by language
- Integration of indigenous Knowledge into scientific weather forecasts
- Knowledge on seasonal information, what crops to grow, when to undertake related farming activities (weed, harvest, spray, apply fertilizers)

Mobile Phone Statistics

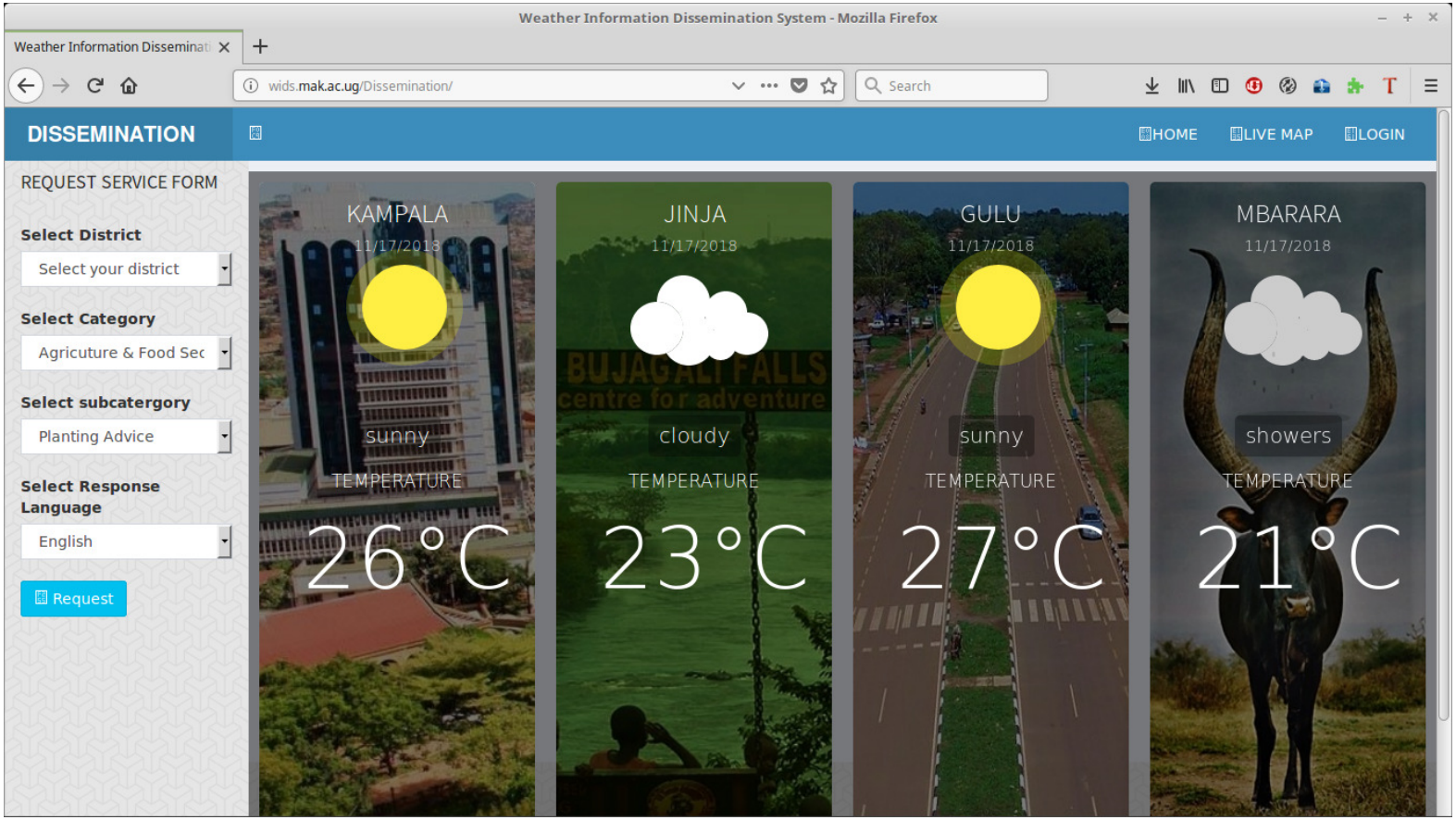




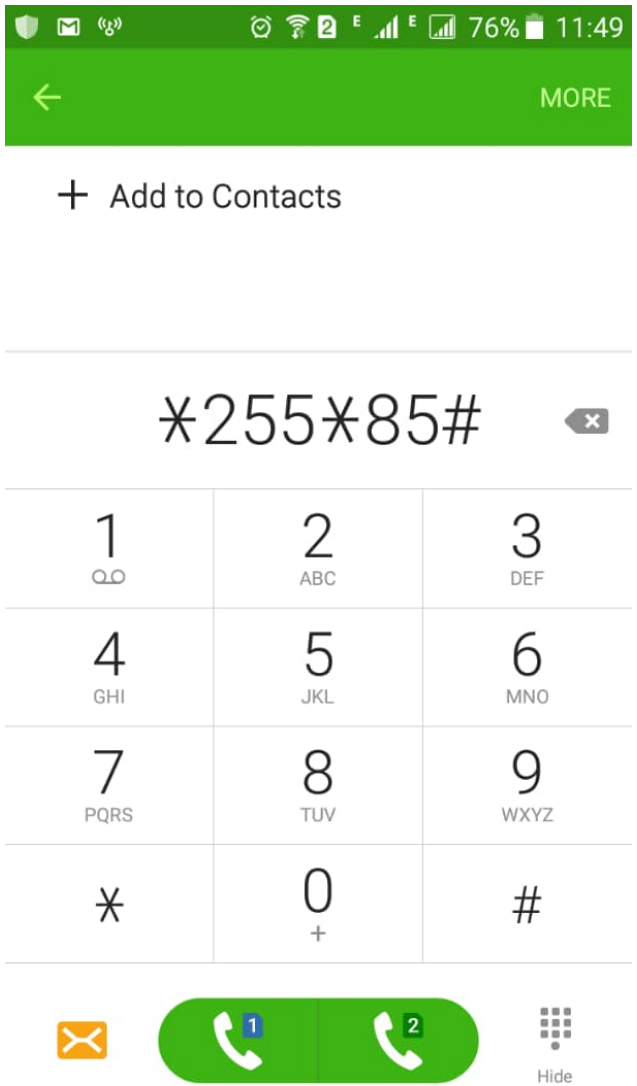


Web and Mobile Application Screenshots

http://wids.mak.ac.ug/Dissemination



USSD App


76% 11:49
MORE
Add to Contacts
*255*85#
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
*
0 +
#
Hide

Farmer Training




- Live Map added (embedded WRF model)
  - Receive forecast and advisory for specific locations
- Updating web application
- Indigenous Knowledge incorporation
- Audio translations from ACCRA and UNMA

Next Steps

- Analyse feedback from farmers using the system - Validation
- Dedicated personnel to keep data updated
- Explore ways of plugging into existing dissemination channels, e.g., radio, TV
- Customize for other stakeholder groups from other sectors (e.g., disaster management)

Thank You!
Asante!