Bringing Knowledge Graphs to the Rural Poor

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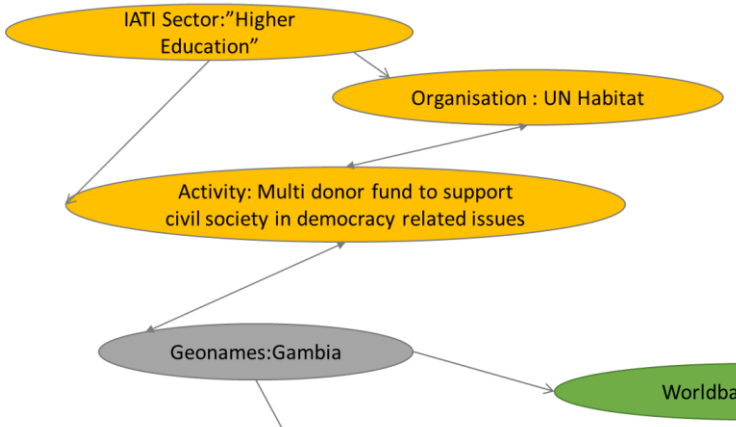
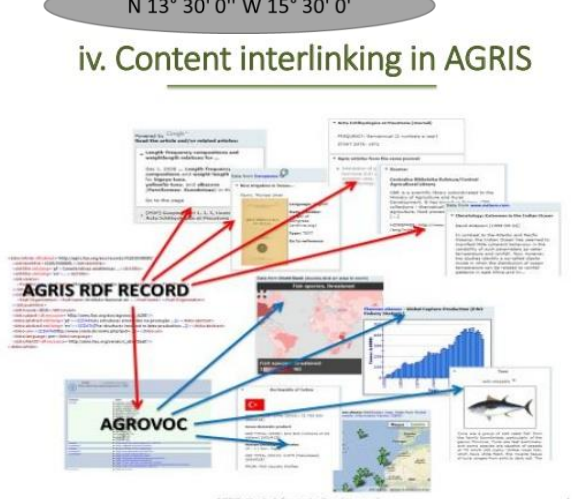
With input from: Anna Bon, Christophe Guéret, Stephane Boyera , Nana Baah Gyan, Chris van Aart, Max Froumentin, Aman Grewal, Mary Allen, Amadou Tangara, Etienne Barnard, Hans Akkermans, André Baart, Gossa Lo, Myrthe van der Wekken, Onno Valkering, Fahad Ali, Romy Blankendaal…

Knowledge graphs for Good

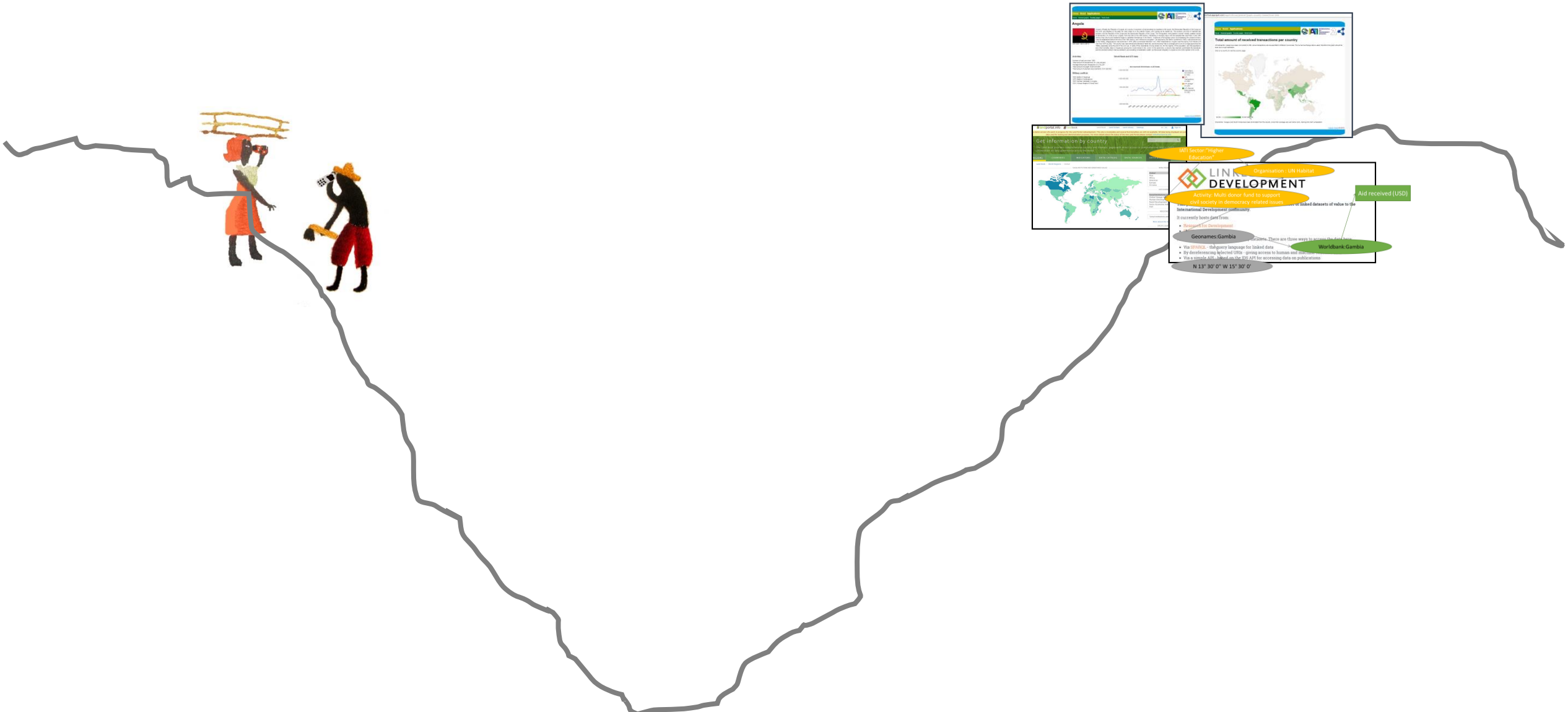


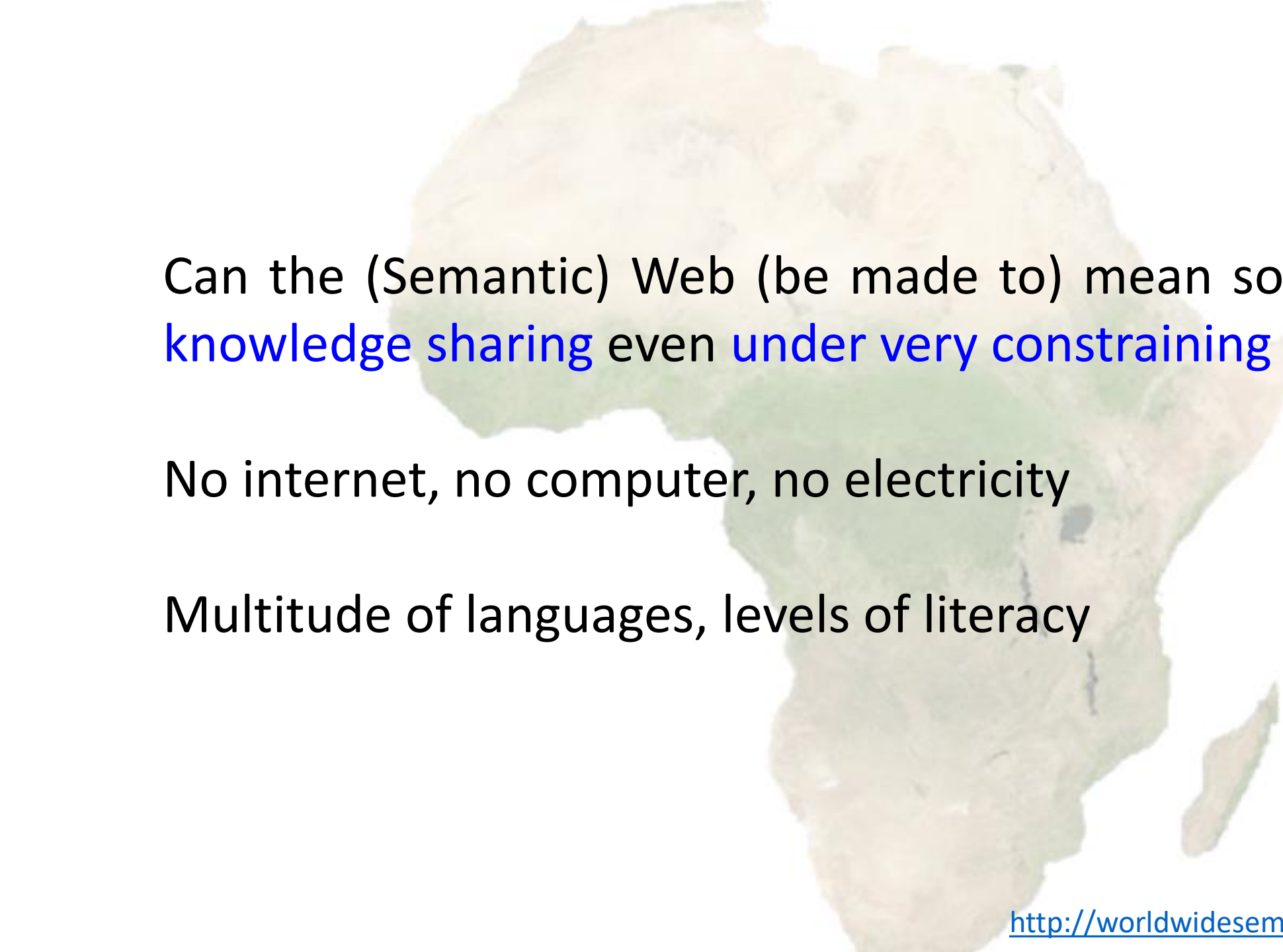


"Unless the investment and energy going into opening up data and building systems to manage data across the web is at least matched by investment and activity in **intermediary and local level support for effective data use**, open data is likely to widen, rather than narrow, economic and social divides."

Emerging implications of Open and Linked Data for Knowledge Sharing in Development. Davies & Edwards, 2012

Hm..


Get information by country
IATI Sector:"Higher Education".
Organisation : UN Habitat
LINK DEVELOPMENT
Activity: Multi donor fund to support civil society in democracy related issues
Aid received (USD)
Geonames:Gambia
Worldbank:Gambia
N 13° 30' 0" W 15° 30' 0"



Can the (Semantic) Web (be made to) mean something for knowledge sharing even under very constraining conditions?

No internet, no computer, no electricity

Multitude of languages, levels of literacy

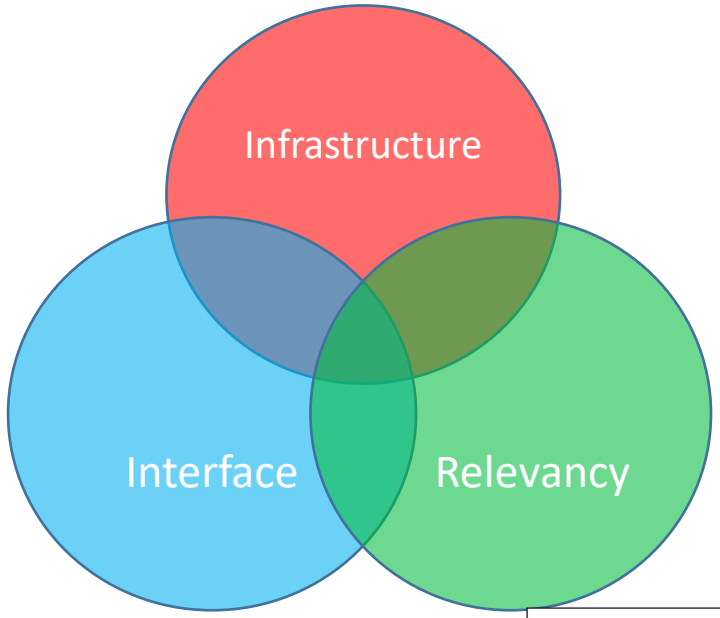
http://worldwidesemanticweb.org

Three challenges for Bringing Knowledge Graphs to the Rural Poor

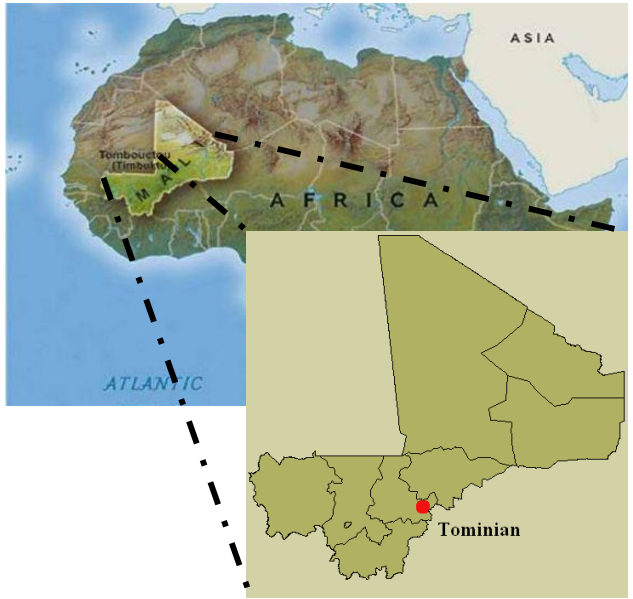
Make KGs usable in **low-resource, low-connectivity** contexts

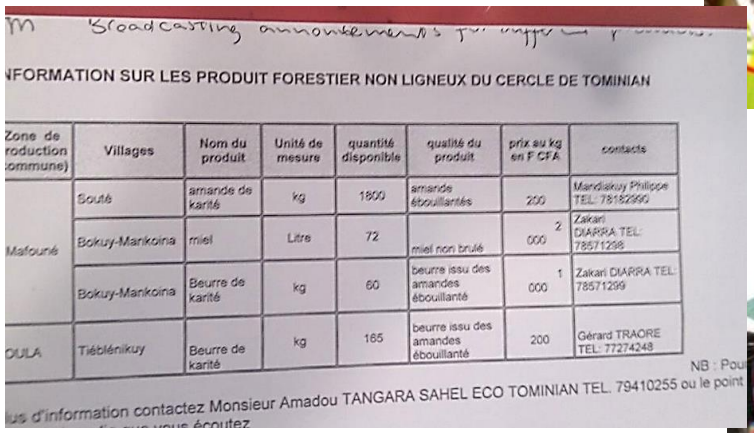
Make KGs **accessible for users** with various (cultural) backgrounds
and levels of literacy;

Develop knowledge sharing **cases and applications** relevant for the rural poor



Case: Market information in the Sahel





INFORMATION SUR LES PRODUIT FORESTIER NON LIGNEUX DU CERCLE DE TOMINIAN

Zone de production (commune)	Villages	Nom du produit	Unité de mesure	quantité disponible	qualité du produit	prix au kg en F CFA	contacts
	Soutè	amande de karité	kg	1800	amande ébouillantés	200	Mandiakuy Philippe TEL: 78152990
Mafouné	Bokuy-Mankoina	miel	Litre	72	miel non brulé	2 000	Zakari DIARRA TEL: 78571298
	Bokuy-Mankoina	Beurre de karité	kg	60	beurre issu des amandes ébouillanté	1 000	Zakari DIARRA TEL: 78571299
OULA	Tiéblénikuy	Beurre de karité	kg	165	beurre issu des amandes ébouillanté	200	Gérard TRAORE TEL: 77274248

NB : Pou

ius d'information contactez Monsieur Amadou TANGARA SAHEL ECO TOMINIAN TEL. 79410255 ou le point

VOIce-based Community-cEntric mobile Services for social development

Market Data store

RDF

Information / Communique Services

Web Interface

Text-To-Speech / ASR

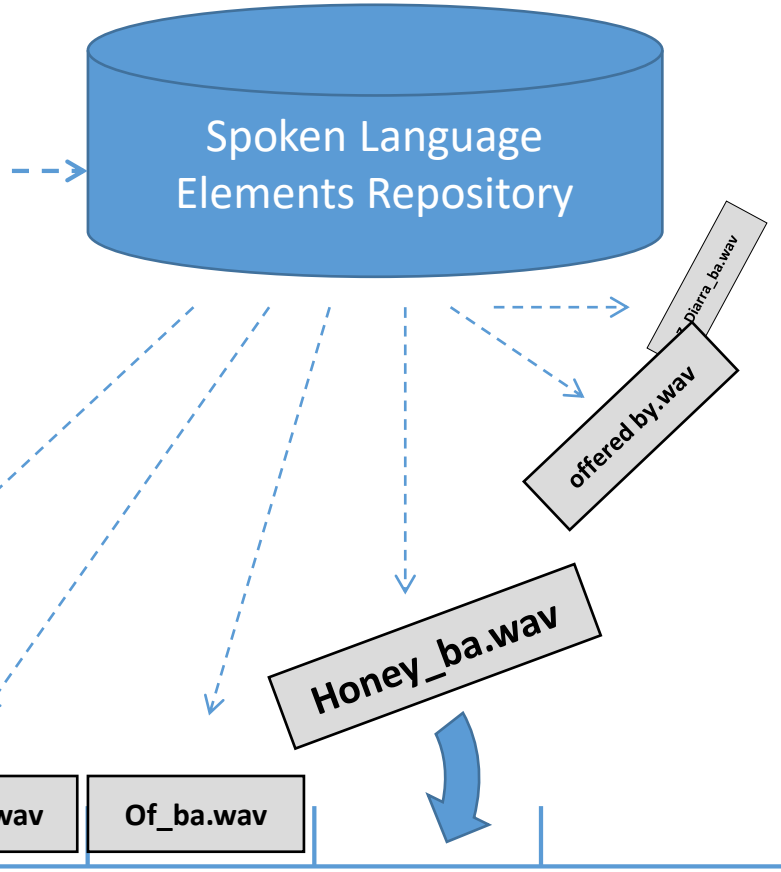
GSM/Voice interface

Field operative

Users

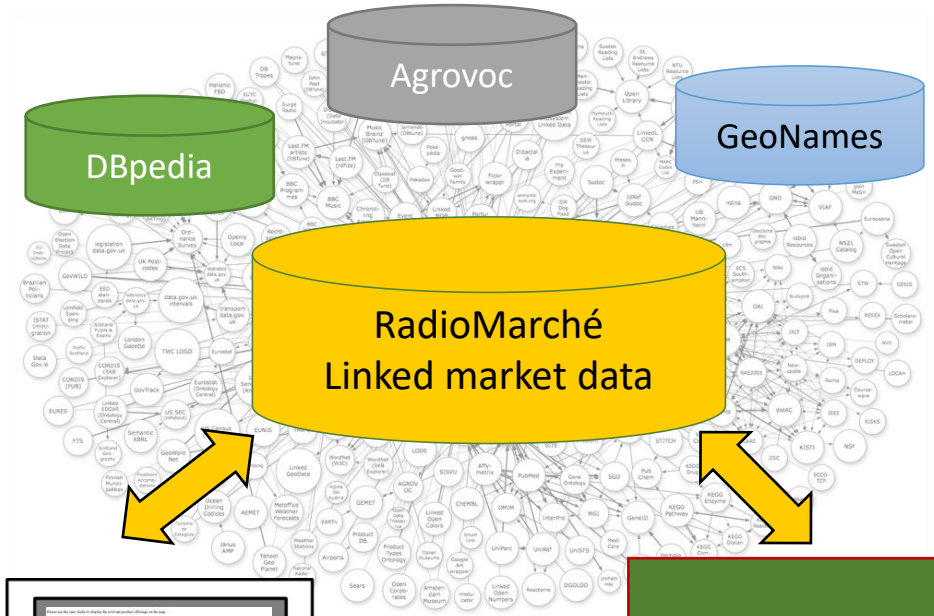
Radio users

“Slot and Filler” Text-to-Speech



Bambara:	15_ba.wav	L_ba.wav	Of_ba.wav			
English:	15	liters	of	honey	offered by	Zakari Diarra

Talking to Knowledge Graphs

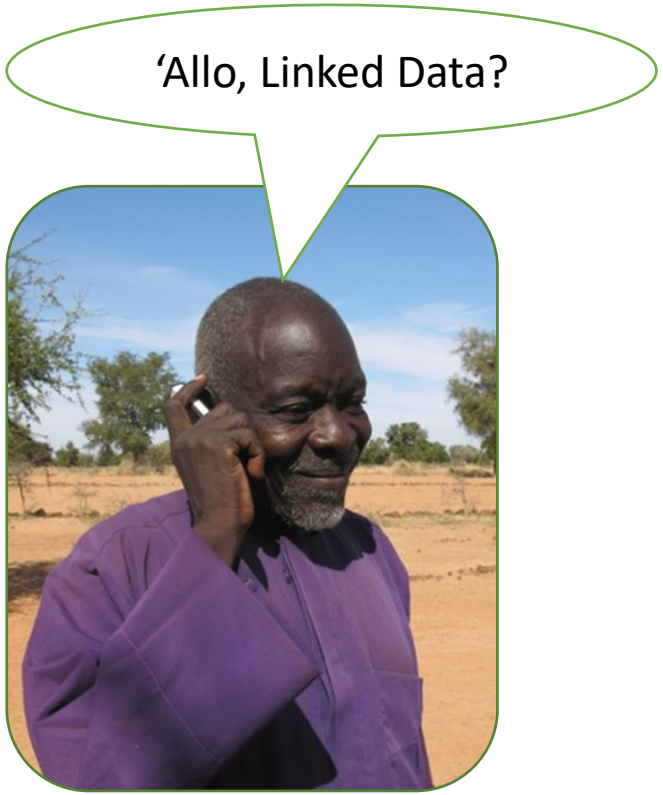


Web applications

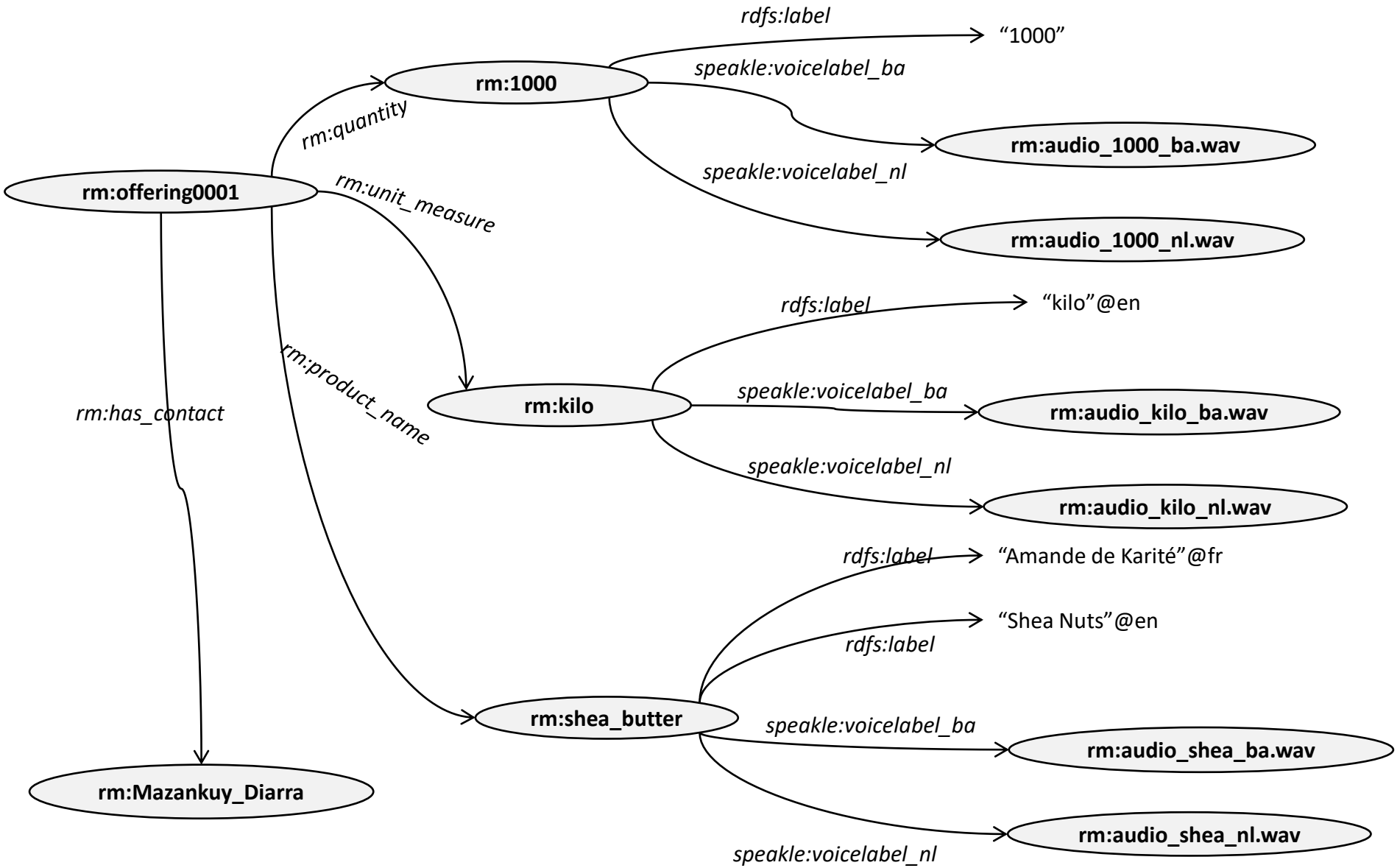
<VoiceXML> to SPARQL

voxeo
evolution.voxeo.com

Voice browser



Speakle voice labels



Low-resource Knowledge sharing

DOWNSCALING

HTTP

Orange Emerginov Platform

SIP over Ethernet

Officeroute running Asterisk

Cheap, small hardware

GSM dongle

Kasadaka: Low-resource knowledge sharing platform

Low-power, ubiquitous, cheap hardware
FLOSS components

User Interfaces
- Voice services
- SMS-based
- Visual

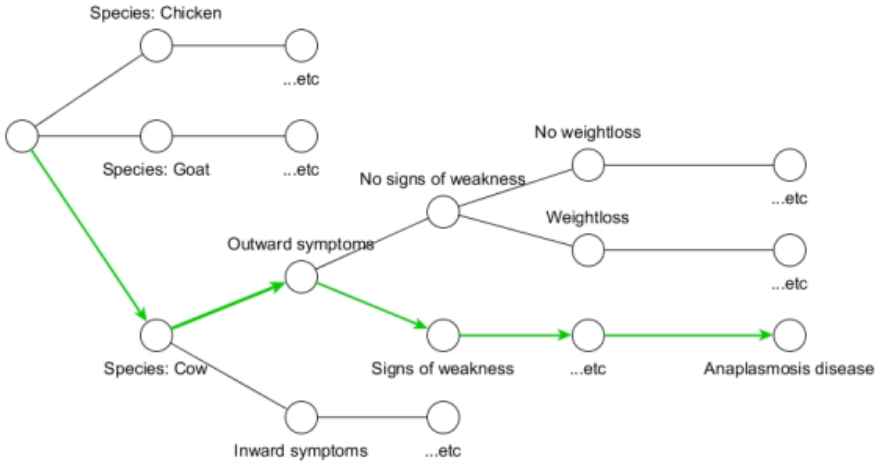
Wifi, 3g or GSM network

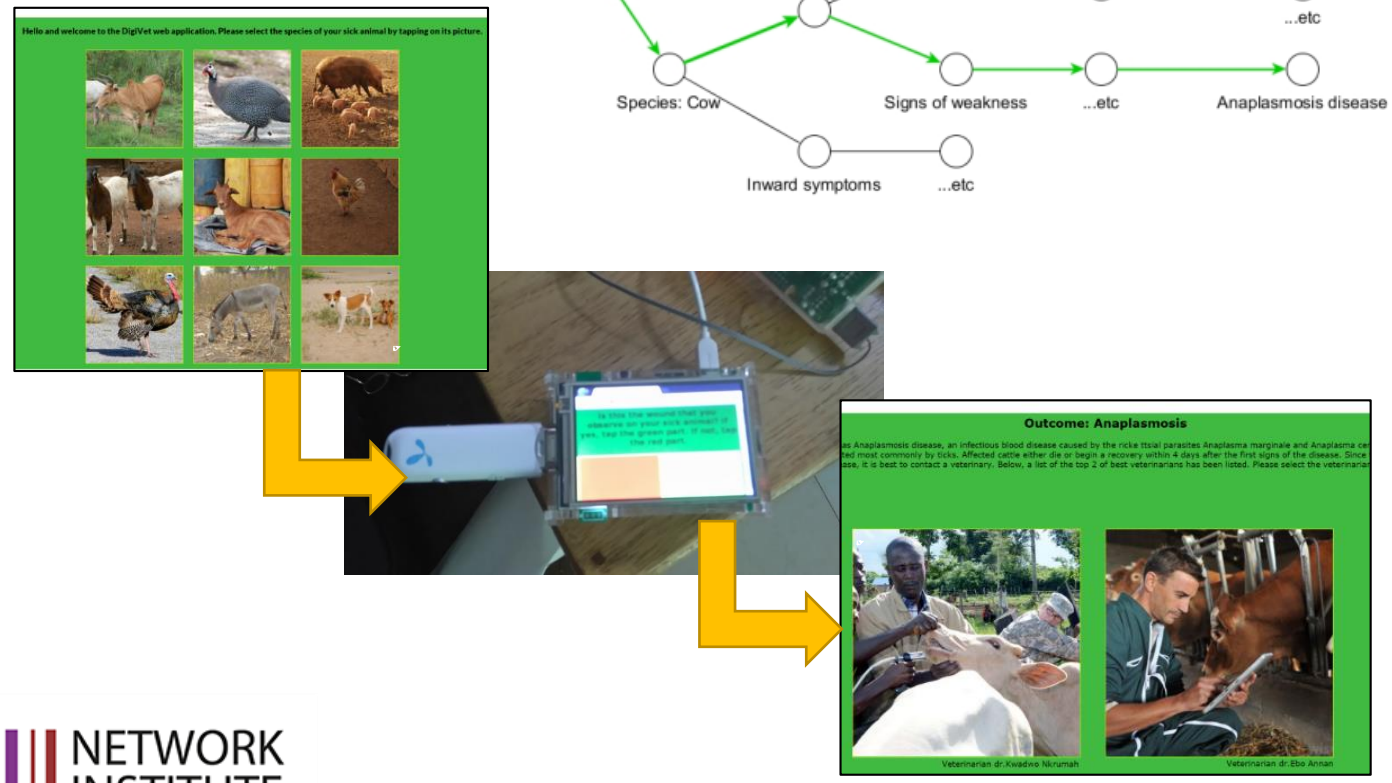
(Linked) Data allows for flexible data integration across applications, deployments

Kasadaka (“talking box”)

Andre Baart

Case: DigiVet





Veterinary service in North-Ghana

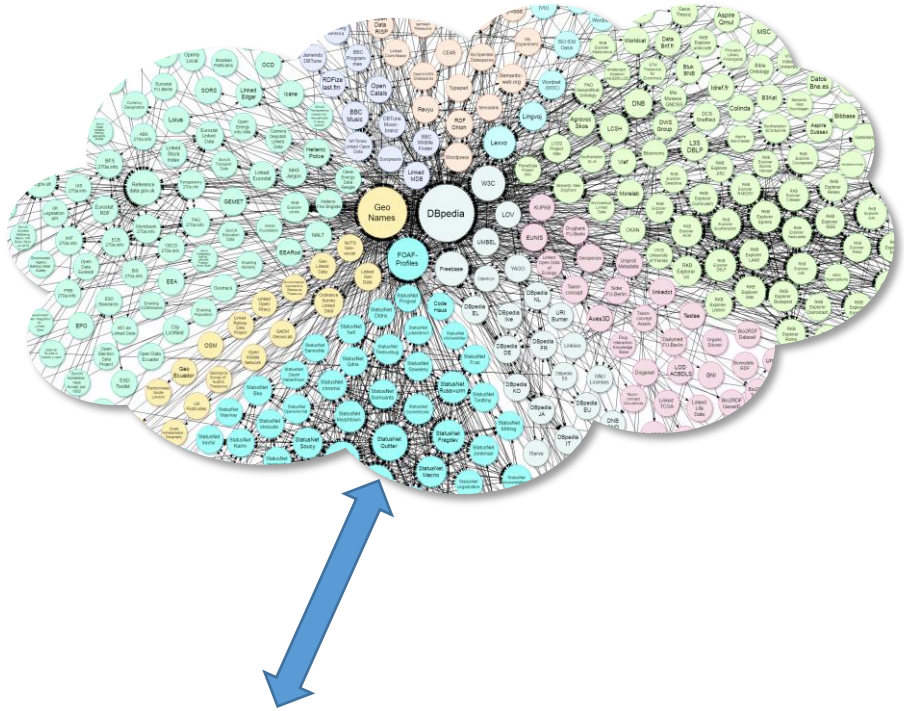
Animal health ontology developed by eliciting information from domain experts using CommonKADS method

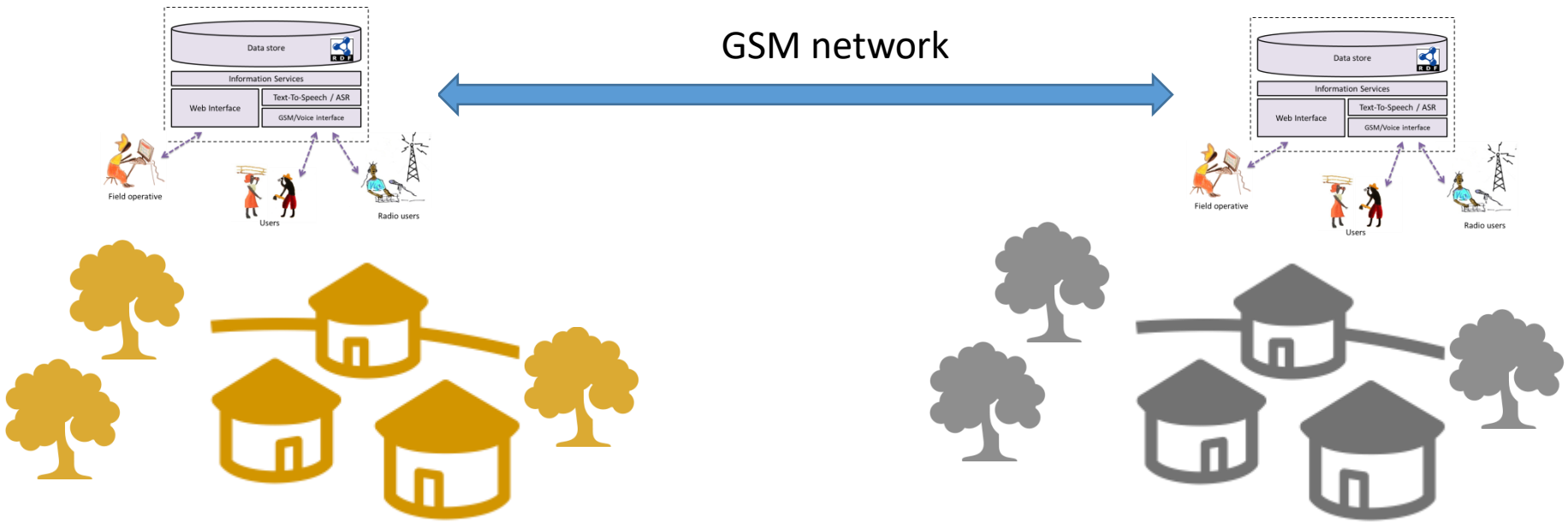
Users can interact with system through voice, simple visual interaction

Gossa Lo, Myrthe van der Wekken, Romy Blankendaal

NETWORK INSTITUTE

Challenge: Knowledge exchange in low-connectivity setting





Semantic Web in an SMS

Enable (Semantic) Web data exchange over GSM networks.

Converters to translate SPARQL HTTP request to SMS message (140 or 160 chars) and vice versa

Onno Valkering

Evaluation: 4 scenarios in 2 cases

Digivet and RadioMarche applications

Four scenarios / SPARQL queries in total

Listing 1.2. DigiVet SPARQL query for 2nd scenario

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX dv: <https://w3id.org/w4ra/digivet/>

INSERT DATA {
    dv:black_leg a dv:Disease .
    dv:black_leg rdfs:label "Black_leg"@en .
    dv:Cow dv:canCarryDisease dv:black_leg .
    dv:Sheep dv:canCarryDisease dv:black_leg .
    dv:unwillingnessToMove dv:symptom_for_disease dv:black_leg .
    dv:rapidBreathing dv:symptom_for_disease dv:black_leg .
    dv:lameness dv:symptom_for_disease dv:black_leg .
    dv:appetiteLoss dv:symptom_for_disease dv:black_leg .
    dv:fever dv:symptom_for_disease dv:black_leg .
    dv:swellingThigh dv:symptom_for_disease dv:black_leg .}
```

Results

Scenario	Location	Query type	Request Size in nr. of SMS	Request est. cost (USD)	Response Size in nr. of SMS	Response est. cost (USD)
Digivet Sc.1	Ghana	CONSTRUCT	3	0.042	3	0.042
Digivet Sc.2	Ghana	INSERT	3	0.042	n.a.	
RadioMarché Sc.1	Mali	CONSTRUCT	3	0.105	8	0.280
RadioMarché Sc.2	Mali	INSERT	3	0.105	n.a.	

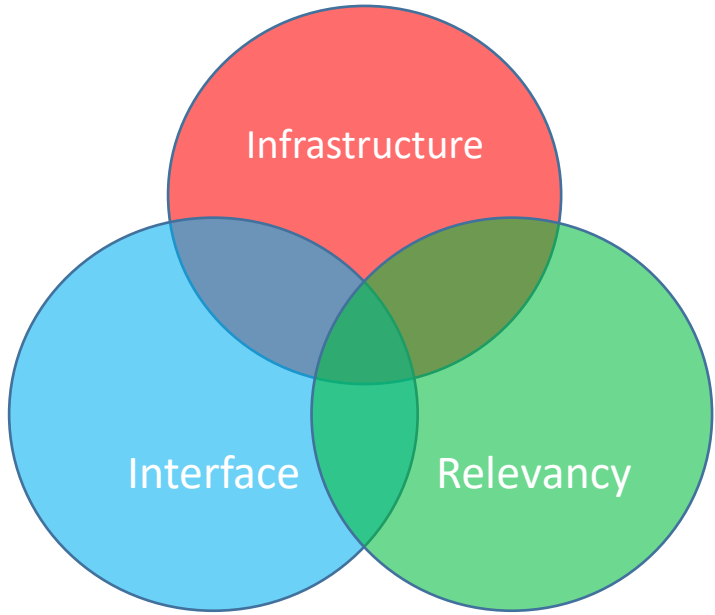
Linked Data and Knowledge Graphs allow for knowledge sharing in ICT4D cases

But we need to develop solutions that mean something on the ground

User-centric cases

Technological innovations

- Voice-access to knowledge
- Semantic Web without the Web
- Low-resource computing



Thank you

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http://w4ra.org