

# Bringing the Web of Data to Developing Countries: Linked Market Data in the Sahel

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## 1 Linked Market Data and the RadioMarché system

Although the Web is a great success, around 4.5 billion people -mainly in developing countries- are still unable to access its information. Currently, a number of efforts are being undertaken to bridge this so-called 'digital divide' in the Web of Documents. At the same time, as engineers of the Web of Data, we have the opportunity to not let the "Digital Linked Data Divide" grow too large. Like it does in the developed world, sharing and re-use of locally produced and consumed data can also increase its value in developing regions. We here describe our ongoing efforts to implement Linked Data-backed solutions for the rural Sahel regions.

These efforts center around, RadioMarché, a web-based market information system aimed at stimulating agricultural trade in the Sahel region. Its market data is accessible for local farmers through voice-based interface in local languages using first generation mobile phones. The data from regionally distributed instances of RadioMarché, can be aggregated and exposed using Linked Data approaches, so that new opportunities for product and service innovation in agriculture and other domains can be unleashed.

An instance of RadioMarché has one data store with market information such as product offerings (including product type, quality, quantity, location and logistical issues) and contact details from sellers and buyers. To maximize the reusability across different domains and regions and allow for automatic machine processing, we adopt Linked Data standards to represent the data. Linked Data fits our purposes well since it provides a particularly light-weight way to share, re-use and integrate various data sets and does not require the definition of a specific database schema for a dataset. Our implementation methodology assumes that we start from a legacy Market Information System and Linked Data provides us with a way of integrating the data across multiple regional instances of RadioMarché or reuse the data for completely new services, both within a region and across regions. Additionally, Linked Data is well-suited to deal with multiple languages as its core concepts are resources rather than textual terms.

Other than Linked Data-access to the data (through RDF request or SPARQL), Radiomarché provides multiple user interfaces to the data. Through the traditional Web

channels or via e-mail, users can get weekly digests of the latest offerings or add their own information. The innovative *voice-based* interface allows non-intrusive market information access for all users having a first-generation mobile phone. It allows local farmers to navigate a voice-based menu and enter product offerings using a call-in service at a local telephone number. The voice service is available in the local languages relevant to the specific region. For the voice-based interface, we use prerecorded phrases in local languages and dialects for a slot-and-filler text-to-speech system.

## 2 Current status

An instance of Radiomarché has been deployed in the Tominian area in Mali, Africa. Here, it augments a legacy MIS focused on non-timber forest products (NTFP's) such as honey and nuts set up by the project partner NGO, Sahel Eco. The system has been running since November 2011 and many product offerings have been added to the data store. A voice-interface is defined for the local French dialect as well as the Bambara language spoken in the region. Currently, the voice- and web-interfaces are designed for use by local radio station operators, who serve as middle men in delivering the market data to people in the region. We are currently elaborating the interface to allow access for the individual farmers themselves.

The data is exposed as Linked Data using an instance of the Cliopatria semantic server <sup>5</sup>, accessible at <http://eculture.cs.vu.nl:1979> <sup>6</sup>. Links to external sources such as DBPedia and GeoNames are established. We are investigating opportunities to host this data on low-powered hardware in the region itself.

## 3 Linked Data Use Cases

We are defining use cases and building applications that benefit from the sharing and re-use of the Linked Market Data. One additional service being developed now is a meeting scheduling system which provides local NGOs with a more effective way to transfer agricultural knowledge about NTFP's to their farmer communities. By integrating this information with the market information, personal profiles can be enriched with information about the type of products that specific farmers have been producing.

A second use case that is currently under development is a voice-based journalism platform (named Foroba Blo), which allows both professional and citizen journalists to send voice-recorded news items to local community radios. The target region for this use case consists of agricultural communities providing opportunities for re-use of both technical infrastructure as well as data.

We are currently developing services that benefit from aggregated market information across regions. By linking the market information to DBPedia, agricultural vocabularies and geographical thesauri, local and national governments as well as NGOs can exploit the aggregated market information for analytic purposes, monitoring the trade in NTFPs within and across regions.

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<sup>5</sup> <http://cliopatria.swi-prolog.org>

<sup>6</sup> An example URI for a single offering is [http://purl.org/collections/w4ra/radiomarche/offering\\_54](http://purl.org/collections/w4ra/radiomarche/offering_54)