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# agriXchange – a platform on data exchange in agriculture

A main goal of the EU-funded project agriXchange was the development of a platform for harmonizing data exchange in agriculture. This platform now provides the aXTool, a tool to contribute use cases and interfaces and to describe existing solutions, to discuss them and to evaluate them based on user experiences. Thus, one way to promote harmonization of data exchange for improved interoperability is to encourage agriXchange community members to disseminate results and solutions from research and development projects by contributing them to the aXTool collection.

## Keywords

data exchange, harmonizing, web-based platform, reference framework, interoperability

## Abstract

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Information sharing is the key to data exchange harmonizing. The research project agriXchange ([www.agrixchange.eu](http://www.agrixchange.eu)) was carried out from 2010 to 2012 funded by the European Union's 7<sup>th</sup> framework programme. It involved 15 partners from 11 countries. One of the main goals of this project was to create awareness of existing solutions and on-going development work, and to allow introduction of new or improved solutions. It is a complex task in the agri-food sector, because of the many aspects and dimensions that are involved. There is also a regional heterogeneity in the technical systems and information management challenges among the European countries. Therefore a reference framework for interoperability was developed and designed [1].

The main requirement for the Reference Framework was to support efficient information sharing among the agriXchange community (both project partners and other interested individuals and organisations) in a context-aware way to enhance harmonizing of data exchange in agriculture. The design includes concepts of four main user assisting functions:

- searching for existing solutions interlinked with any open (standardized) interface,
- contributing (to) existing solutions,
- discussion of solutions and
- evaluation through user experience.

The users are typically software or hardware developers, modellers describing use cases, or so called business users like advisors, researchers, companies, etc. seeking information about

already existing solutions. The developer's scope of interest focuses usually on a narrow interest area, whereas business user's scope of interest concerns wider themes capturing several solutions, e.g. use cases handling several data exchange interfaces and standards. The agriXchange Reference Framework design is constructed to support both scopes and their interactions.

## aXTool - a tool for harmonization of data exchange

For the agriXchange project, a website was set up to present the results of the project and to make its documents available. This platform also allows registered users to comment and to contribute new content based on their user privileges. The practical implementation of the Reference Framework design in the agriXchange platform is called aXTool. The aXTool serves practical communication in the agriXchange community when solving data exchange problems and sharing information. The aXTool functions as a channel to share practical information about solutions like implementations of standards in diverse practical context or introducing new solutions in an area where no standards are available. The aXTool is also a tool to collect information models and data items to further enhance the vocabulary and ontology harmonization work of the agriXchange community.

A use case modeling approach plays a key role in the design of the reference framework for systems interoperability. Three example use cases were selected to investigate the interoperability and data exchange problems in the agri-food sector. The selected use cases are:

- Updating of LPIS (Land Parcel Identification System)
- Animal registration
- Geo-farmer and fertilizing

Based on these examples, a general structure for the description of use cases was developed. For a wide scope description, a use case is described on a more general level. These descrip-

Fig. 1

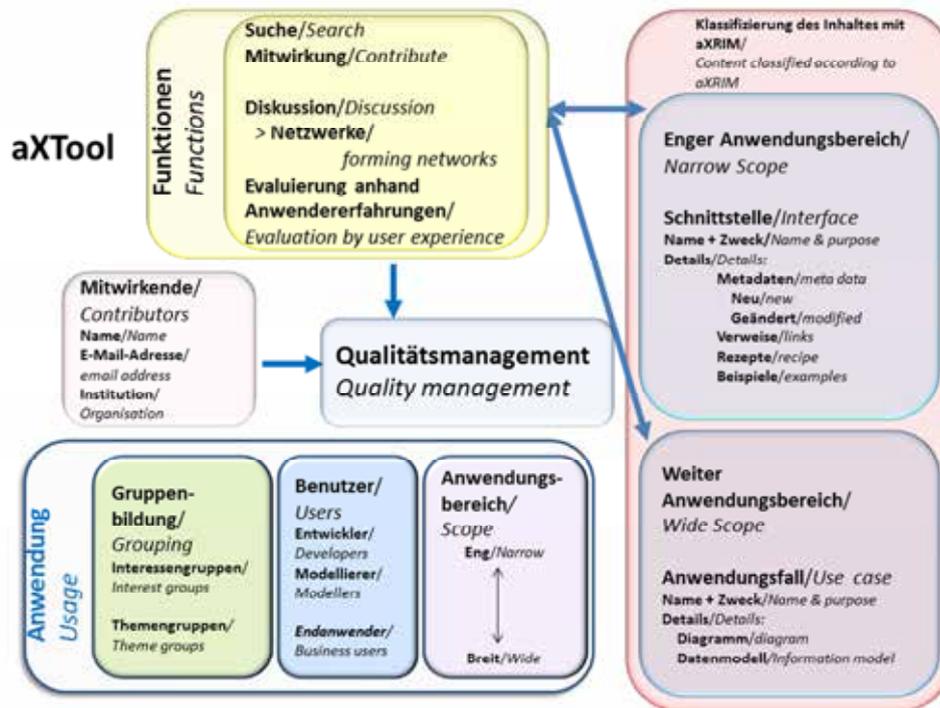


Diagram illustrating the agriXchange Reference Framework, and its implementation as aXTool

tions focus on systems consisting of several subsystems and actors. They include the following information:

- Name of the use case
- Short description
- Relevance for European agri-sector
- Relevant countries or regions
- Relevant parties, e. g. farmers, administration
- Relevant conditions (standards used in the use case, dictionaries, regulations and legislation, technologies)
- Definition of use case variants
- Description of the information exchange processes and exchanged data; data dictionaries and their interconnection
- Known issues and bottlenecks
- Proposed recommendations and solutions for harmonization

A more detailed representation of the data exchange process focusses on the data shared between several stakeholders. First, the business process of a use case is modelled using the Business Process Modelling Notation (BPMN). The resulting diagrams are displayed in the aXTool as part of the use case. A detailed description of the data (Description, BPMN reference, data attributes) can also be given here.

For a narrow scope description, specific interfaces are described in more detail containing the following information:

- Link to the relevant use cases
- Purpose
- Concept
- Design
- Implementation

- Link to further information (technical details, standards, programming interfaces)

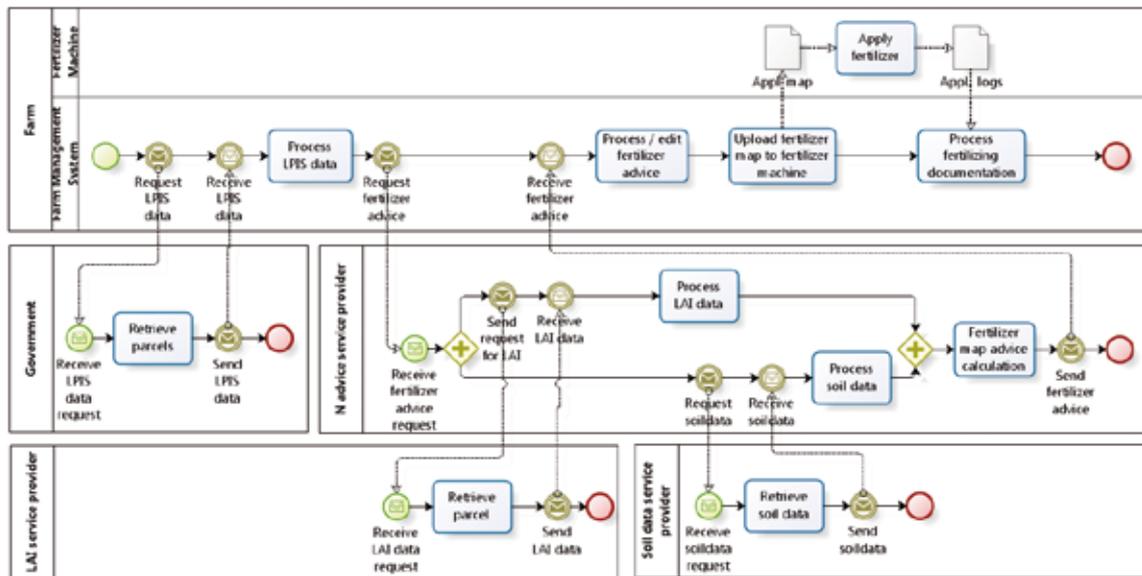
A hierarchical key word model (aXRIM, “aX Reference Information Model”) with the main classes “Process”, “Actors”, “Communication Protocol” and “Data” serves to further describe the interface descriptions and assists search functionalities.

The evaluation of the Reference Framework, which was carried out mainly by the agriXchange project members, indicated that the design fulfils the set main targets for the Reference Framework. An additional use case (“European Bovine Identification and Traceability within one EU country”) was utilized in the verification work. The evaluation results indicate that the aXTool as implementation of the design will have good potential to evolve to an efficient tool for the agriXchange community to enhance interoperability and data exchange in agri-food sector.

The aXTool shares information about possible solutions. The information gives understanding on what can be changed and in what period, and what is needed to change in order to utilize and to take benefit of existing solutions, good practices and standards, and to create interoperability.

Due to diversity of business ecosystems and their technology level and information needs in different countries, regions and production branches, the organisations involved and their role in the information systems vary. Novel technologies provide generic, often standardized, interoperable solutions for technical system structures and communication protocol designs. It seems that instead of defining typical systems for data transfer to be unified in Europe, it is important to create awareness of existing use cases showing the need and also solutions for sys-

Fig. 2



A BPMN diagram representing the GeoFertilizer use case

tems integration, and to share and (re)use open communication interfaces between the actors in the information management networks. This may, in some cases, also lead to natural formation of “de facto” standards. In this kind of networked systems, the final results of harmonizing data exchange vocabularies and ontology become important issues to harmonize and unify. Advanced semantics enable creation of intelligent integrated system networks which serve the business in the agri-food sector efficiently.

The work to harmonize vocabulary in the agri-food sector can be enhanced utilizing the material that is collected in connection to the contribution of information models to the agriXchange database. The list of collected attributes/data items could be reused when creating a new information model for a solution and/or contributing one to the aXTool. Indication of the commonness of the used word in the attribute list could guide the reuse of it. To enhance the utilization of existing standards, the standardization bodies could contribute their standards to the aXTool collection, where they can be easily found by system developers.

## Conclusions

The agriXchange community has an important role in further evaluation and development of the Reference Framework design and its implementation aXTool to mature to a usable and efficient tool for interoperability. The community shall pay attention to the constant development of the functionalities for information sharing, data exchange harmonizing process and quality management, to which the present design gives an appropriate framework. The future challenge is whether the aXTool will receive use case, interface, and implementation contributions. Thus, one way to promote the data exchange harmonizing for in-

teroperability is to encourage agriXchange community members to disseminate resulting solutions from research and development projects by contributing them to the aXTool collection. All interested parties are invited to follow this call.

## References

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