Identifying the ICT challenges of the Agri-Food sector to define the Architectural Requirements for a Future Internet Core Platform

Christopher Brewster
Aston University
United Kingdom

Sjaak Wolfert
LEI, part of Wageningen UR,
The Netherlands

Harald Sundmaeker,
ATB, Bremen,
Germany
The Challenge of ICT in Agri-food

- Food and agriculture is 5.9% of GDP worldwide, 35% of employment worldwide.
  - In the EU, one of largest manufacturing sectors, e.g. 13% of UK workforce
- ICT uptake in agri-food mixed
  - Intense in some areas e.g. retailing, loyalty cards/data warehouses
  - Very limited in farming sector
- Very poor information flow in agri-food
  - Both within sectors, and along the supply chain
  - Very conservative “need to know” attitude
- Lack of information flow major challenge
  - Need for transparency due to consumer pressure
  - Need for tracking and tracing for food emergencies e.g. E. Coli
Research Objectives

- SmartAgrifood Project: Focusses on application of Future Internet technologies
- FI PPP - 21 partners across food supply chain: Three sub-areas:
  - Smart Farming
  - Smart Agri-logistics
  - Smart Food Awareness
- **Focus of this talk:**
  - describe user and business requirements
  - identify the relevant technological possibilities
  - describe the over-arching vision for end-to-end data integration - the super-scenario
Methodology

- A 7 step user centred approach was specified early on in the project:

1) Inventory of Short-term and Long-term needs of food-chain users

2) Inventory of future capabilities to meet those needs
Methodology (2)

• For 1) Food chain user needs:
  – Questionnaires completed in six EU countries (Germany, Hungary, Finland, Greece, UK, Spain) n=135
  – Focus groups were held in the same countries (except Spain) n=69

• For 2) Inventory of Future Capabilities: Combination of
  – Expertise from partner institutions
  – Results from the development of Generic Enablers in the FI-WARE project

• For the “end to end” super-scenario
  – A series of collaborative vision and road mapping session
  – Technology led
  – but with feedback from food chain actors
Results: Agri-food needs

• Farming:
  – information for daily decision making
  – sharing information/knowledge with neighbours
  – integration of sensor data
  – many existing systems but have poor interoperability and high cost
Results: Agri-Food needs

• Agri-logistics:
  – better co-ordination and decision making
  – real-time exchange of big data
  – proactive control of processes
  – shared online monitoring of trucks and cargo
  – integrated freight and fleet management
Results: Agri-Food needs

• **Food awareness:**
  – provision of more information: origin, production, treatment
  – information needed from all stages of the food chain
  – communication of product related information of growing importance

• **All areas:**
  – compatibility between systems and standardisation major issue
  – need for flexible data exchange - both within and across sectors
Scenario Specifications

- Detailed use cases were developed
  - for validation of FI-WARE Generic Enablers
  - for demonstration system features and functional requirements

- **Smart Farming**
  - precision farming, smart decision making, disease management
  - objective: increase yields, reduce resources, improve traceability and production methods
Scenario Specifications (2)

• **Smart Agri-logistics**
  – based on GS1 technologies/standards
  – real time virtualisation of planning, control and orchestration
  – intelligent event management and early warning and forecasting
  – objective: increase efficiency, reduce costs, reduce waste losses

• **Smart Food Awareness**
  – tracking and tracing for health and safety
  – tailoring the consumer experience with integrated data
  – objective: build trust, enhance transparency, increase retailer market share

• Details of the pilots and specifications in the paper
Super Scenario

• Analysis showed need for “end-to-end” scenario
• Drivers:
  – regulatory pressures
  – consumer pressure for transparency
  – need for tracking and tracing in food emergencies
• Clear need for standards:
  – to make data easily accessible
  – to allow system integration
  – to provide advances services = easy service composition
• This would make possible:
  – farmer selecting meteo service + policy service + advisory service
  – integration of multiple data sources for smartphone app for targeted consumer
  – adaptability to constant changing information needs
Super Scenario (2)
Conclusion and outlook

• SmartAgriFood has identified:
  – a set of user needs in agri-food community
  – a set of potential technologies to fulfil those needs

• Implication:
  – FI technologies in agri-food will increase industrial agriculture but reduce environmental impact
  – More efficient logistics and forecasting can reduce food waste
  – Increased food awareness can enable (not ensure) more environmentally conscious consumer purchasing
  – Most radically: increase fluidity, responsiveness of food chain and reduce entry barriers
  – Important for urban food management, increasing efficiency with the “food shed” of major cities, enabling more urban agriculture
Thank you

Questions?