IoT Orchestrierung

Marcel Bernet wird über IoT Orchestrierung und Physical Mashup im Web of Things referieren - also die Erstellung neuer Produkte durch Rekombination bestehender Geräte und Dienste.

Als ein Beispiel gezeigt wird das «Kitchen Helper Project», ein IoT Orchester, welches das Überkochen von Herdplatten verhindert. Das Beispiel wird an die Teilnehmer vollständig abgegeben mitsamt allen notwendigen Schnittstellen und Software-Metriken.

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Kategorien

SwiSMA

Ort

TECHNOPARK Zürich
Schulungsraum "Newton" 1012

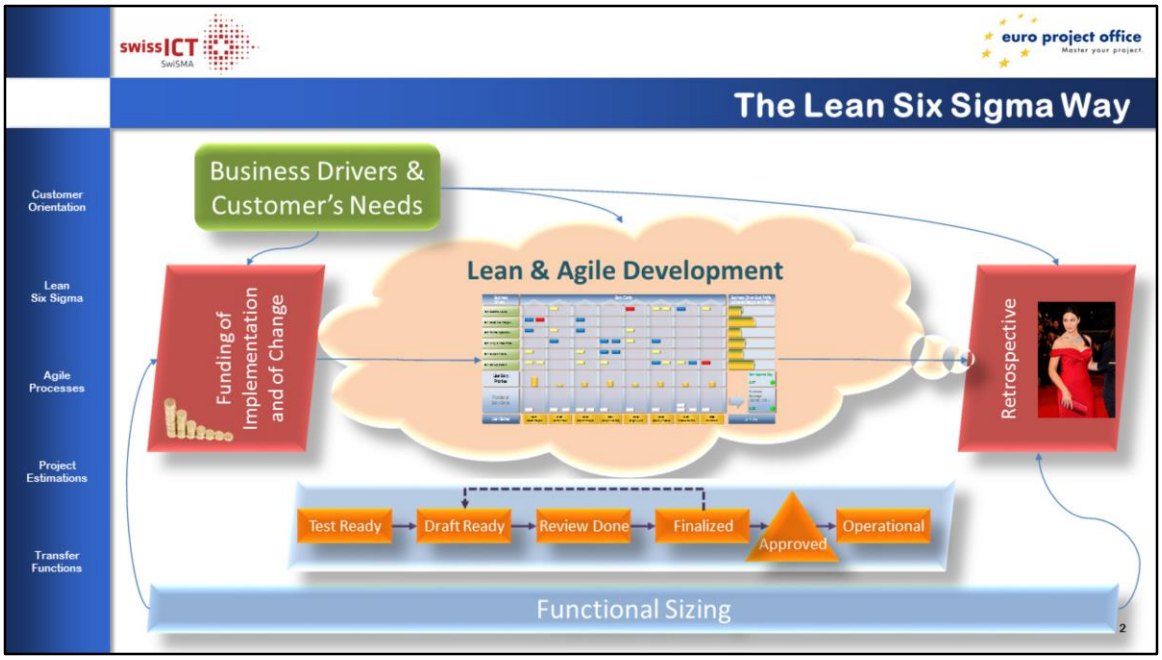
Technoparkstrasse 1
8005 Zürich

weitere Informationen

Organisation
Fachgruppe SwiSMA

Direktlink zur Veranstaltung

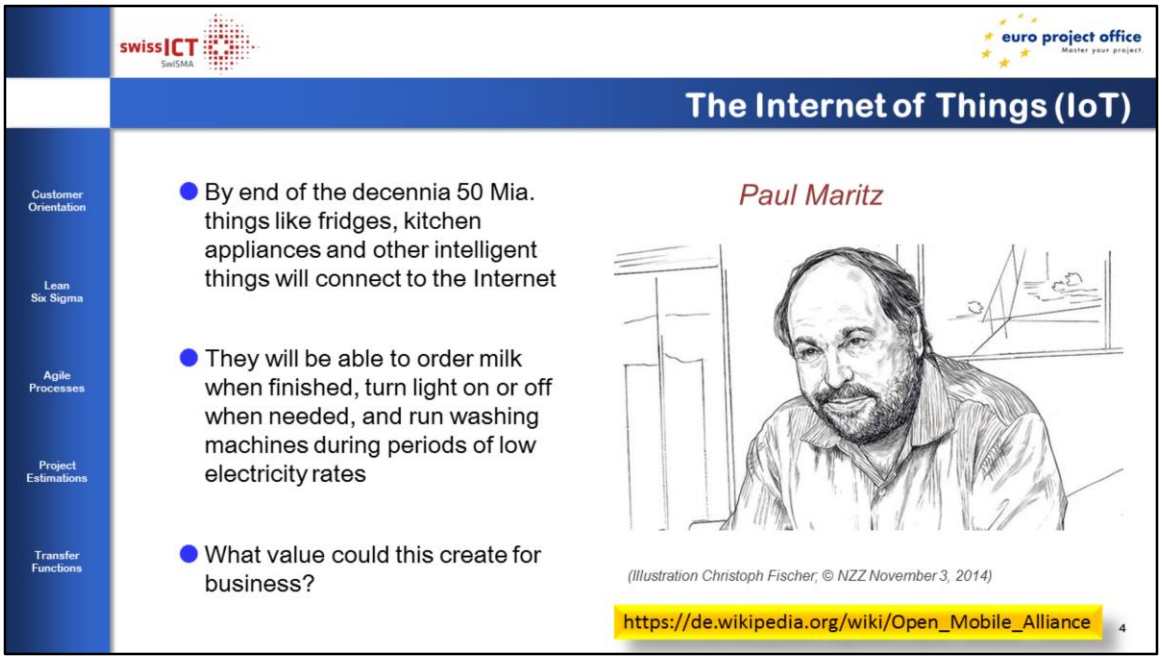
http://www.swissict.ch/expertenwissen/fachanlaesse/?VER_ID=176



A Lean Six Sigma software project uses many of the concepts known from Agile, including the Definition of Done (*Six Steps to Completion*) and the Retrospective.

Other elements are freely selectable: not even sprints are needed to ensure reducing variation, although waterfall approaches suffer from the well-known fact that complete and unambiguous specifications are very, very hard to get. Maybe in some strictly regulated high-risk environment, such things exist.

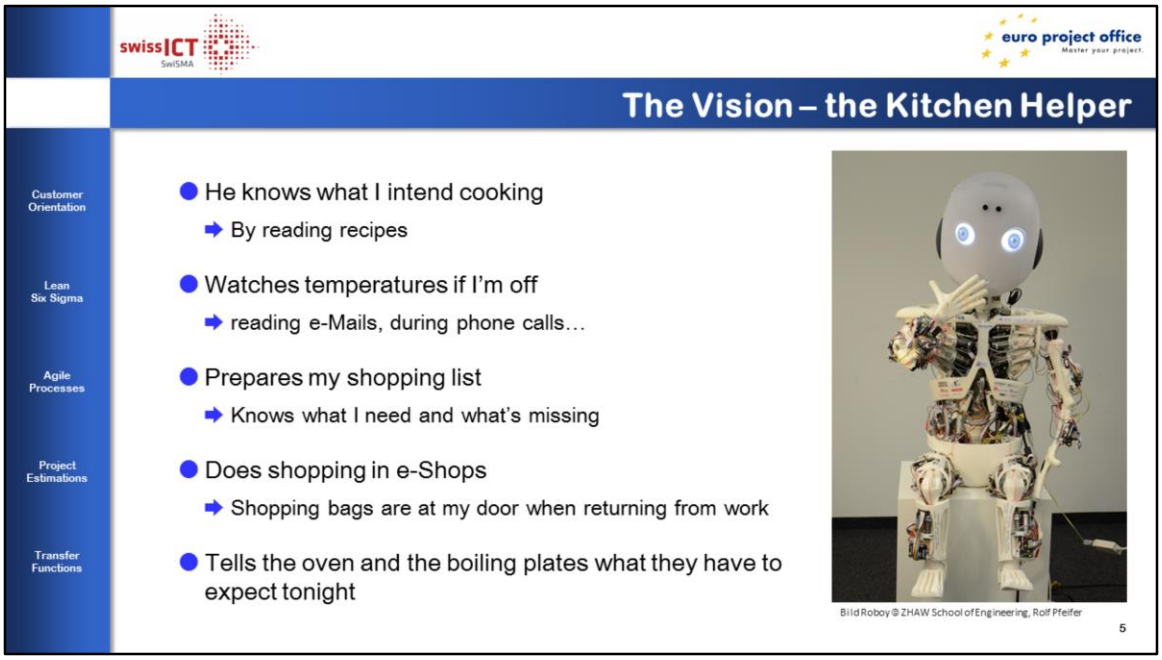
Seen that before?



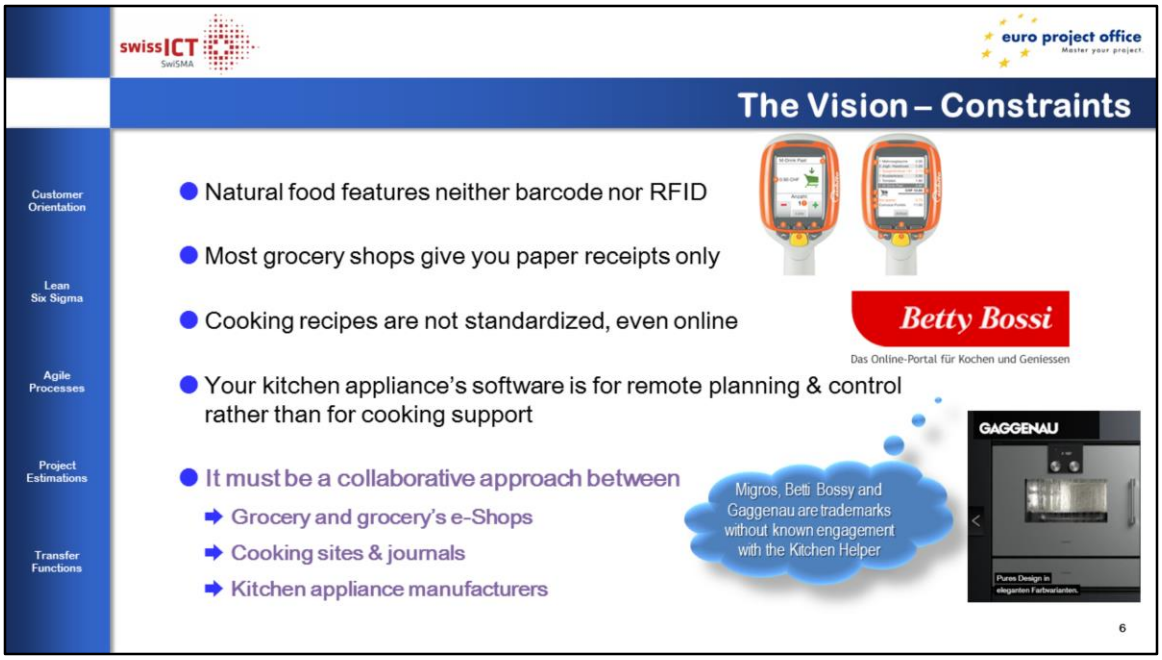
Some know this man. Until 2001 he was number three with Microsoft, now he works for Pivotal, a joint venture of EMC and VMWare. IBM, SAP and Hewlett Packard, also Telecoms such as AT&T, Verizon and Swisscom (CF Summit: Swisscom Discusses Using Cloud Foundry and OpenStack/Piston To Build Future Cloud Platform) – Open Source, Agile and Collaborative; Cloud Foundry and OpenStack.

The goal is to build a standard that allows interchanging data and information between different platform things.

This talk is assuming such a standard already exists. It's visionary, not an experience report.

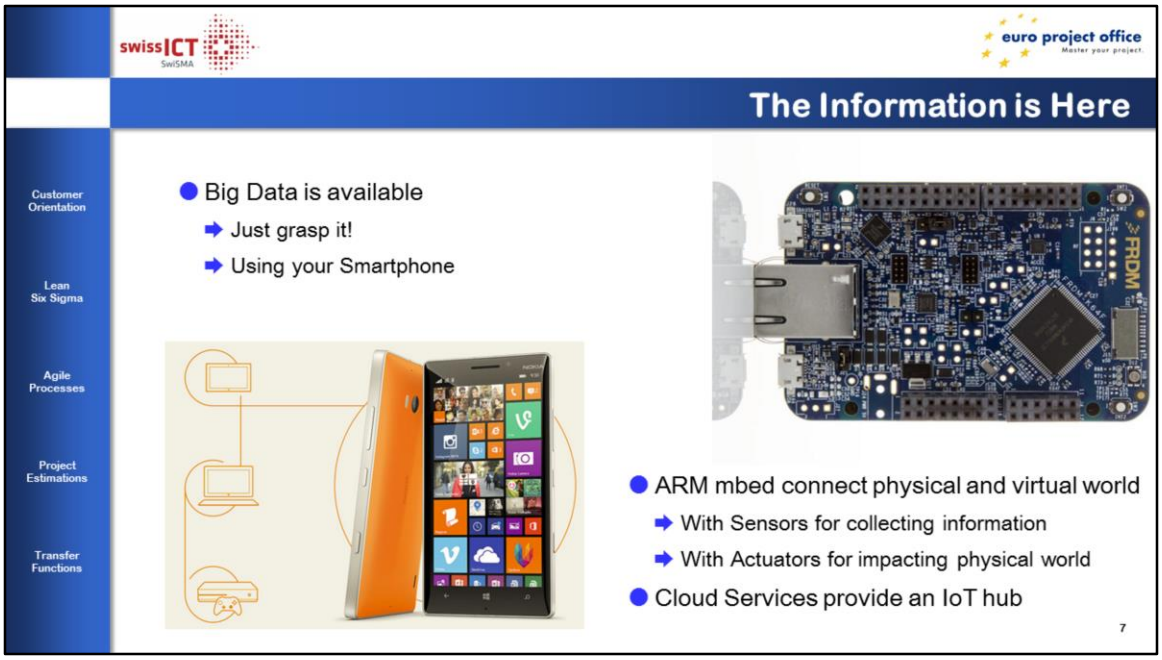


- He knows what I intend cooking
  - He reads recipes
- Watches temperatures if I'm off
  - reading e-Mails, during phone calls…
- Prepares my shopping list
  - Knows what I need
- Does shopping in e-Shops
  - Shopping bags are at my door when returning from work
- Tells the oven and the boiling plates what they have to expect tonight
  - Download cooking plans is what you might expect – never more!



- Natural nutrition contains no RFID
  - ➡ Your kitchen appliances cannot know what it is when cooking
- Most grocery shops give you paper receipts only
  - ➡ Some friendly shops may send you a PDF delivery list that you can OCR
- Most cooking recipes are online
  - ➡ Few provide you with an API or XML export
  - ➡ And REST conform JSON export is yet to come
- Your kitchen appliance's Internet is for remote planning & control rather than support cooking
  - ➡ You seldom find sensors that allow for feedback control loops
- It must be a collaborative approach between
  - ➡ Nutrition shops
  - ➡ Cooking sites (Betty Bossi in CH; Chefkoch in D; …)
  - ➡ Kitchen appliance software providers

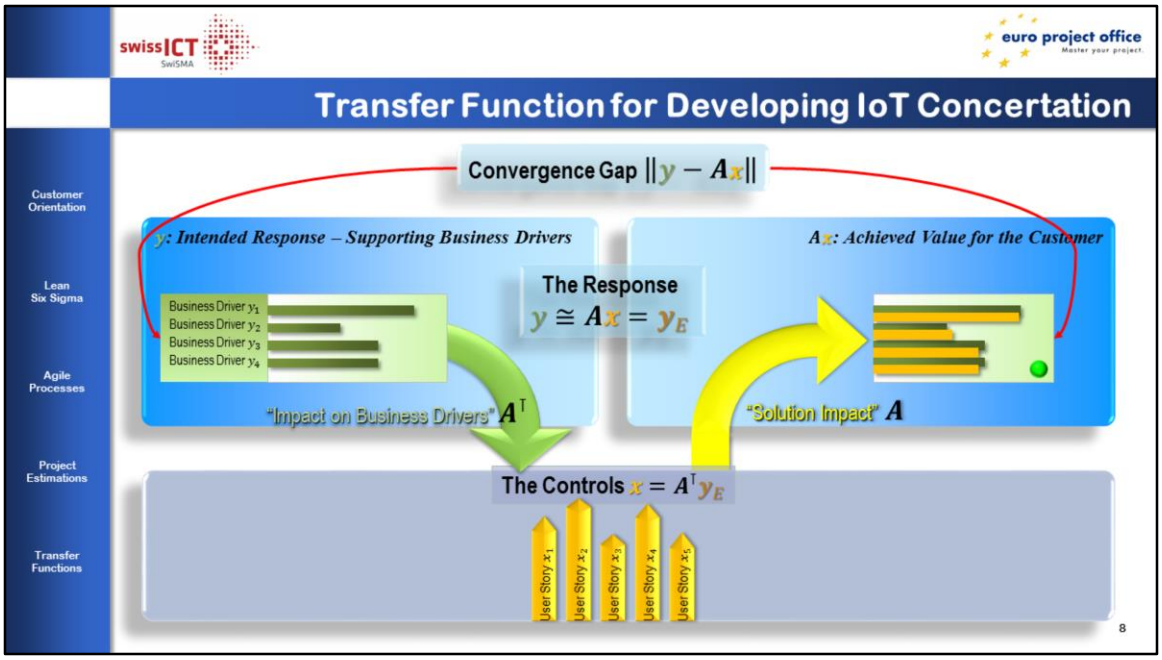
Disclaimer: the brands listed or mentioned here have nothing to do with the (fake) project shown in this talk. They are just used to stir your imagination.



You have your Smartphone always available to capture the data you need – cooking recipes, shopping lists, etc.

Arduino-compatible processor boards are cheap and easily programmable devices that connect to the Internet and link it to physical events, using sensors and actuators.

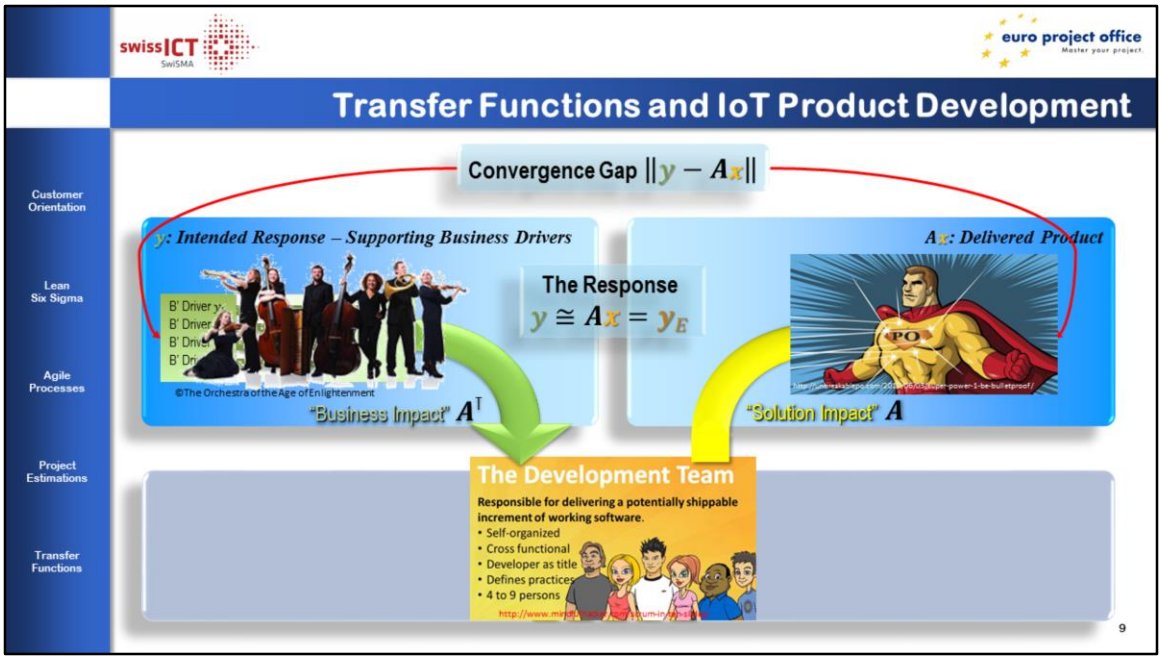
Often, an IoT hub – can be a Raspberry PI, a Mobile Phone or a Cloud Service – collects data and distributes updates in order to be able using low-power connectivity on the sensors.



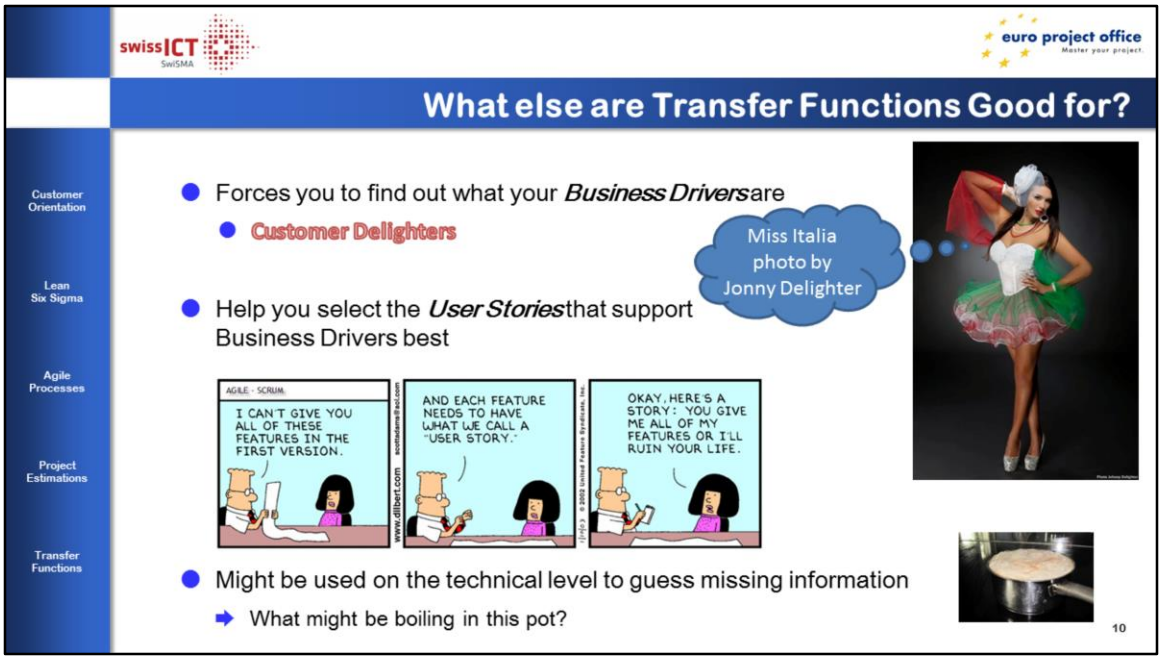
Now, applying this for new product development is straightforward. The intended response become e.g. Business Drivers, following Denney, that define the goals of a product: the "What". The controls are whatever makes the product work as intended by defining the "How".

In Agile, the term *User Story* is used for both the "What" and the "How"; in UML the term *Use Case* always denotes the "How".

For clarity, we consequently use "User Story" to refer to how customers want to use the software, and we use the term *Functional User Requirement* (FUR) to denote the "What", in functional terms, and *Business Driver* to denote the "What" that refers to quality aspect driving business with customers. Some authors, especially in software, use the term *Non-functional Requirements* (NFR) instead of Business Drivers.

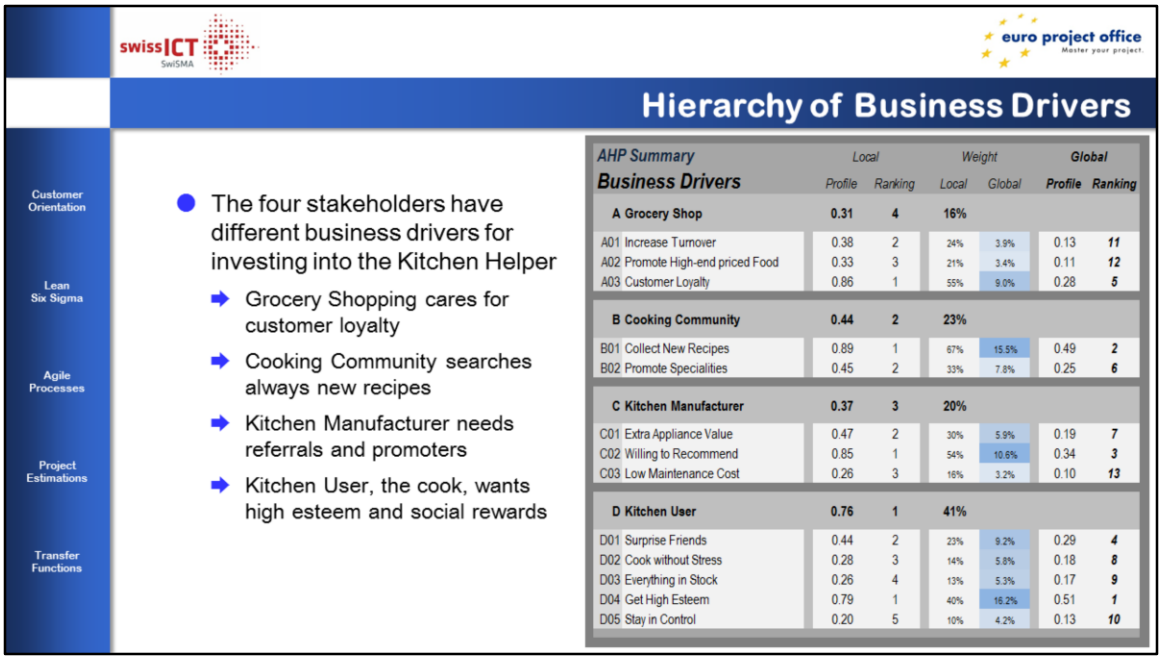


- The ***Sponsor*** is responsible to explain the Intended Response
- The ***Product Owner*** is responsible for the Achieved Response
- The ***Scrum Master*** is responsible for Lean & Agile Development



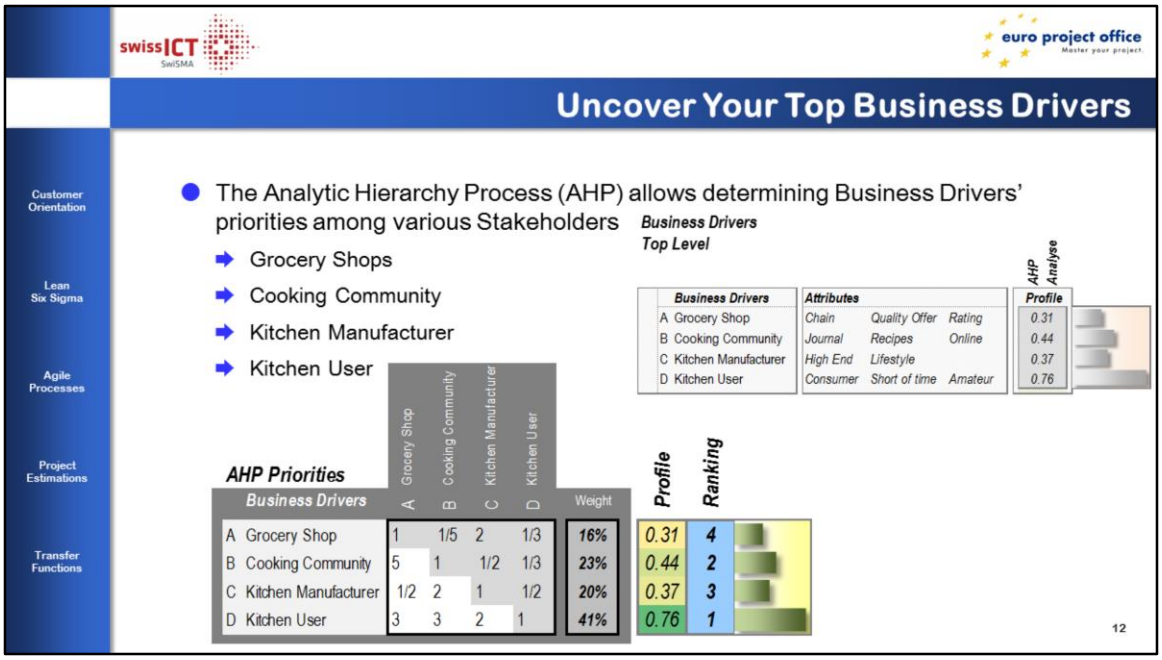
Transfer Functions come into play on two different levels

- Find the User Stories that match Business Drivers;
- Can be used to guess missing information, e.g., what boils on which plate?



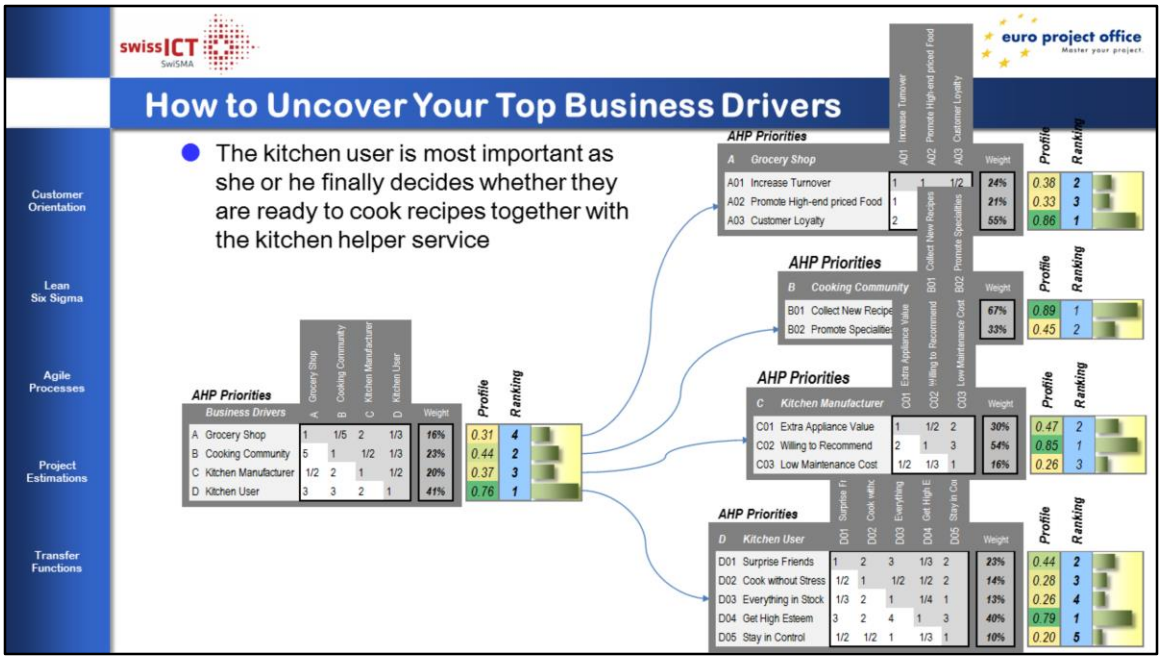
There are four different stakeholders involved:

- Grocery Stores
- The Cooking Community
- Kitchen Manufacturers, and
- Kitchen Users



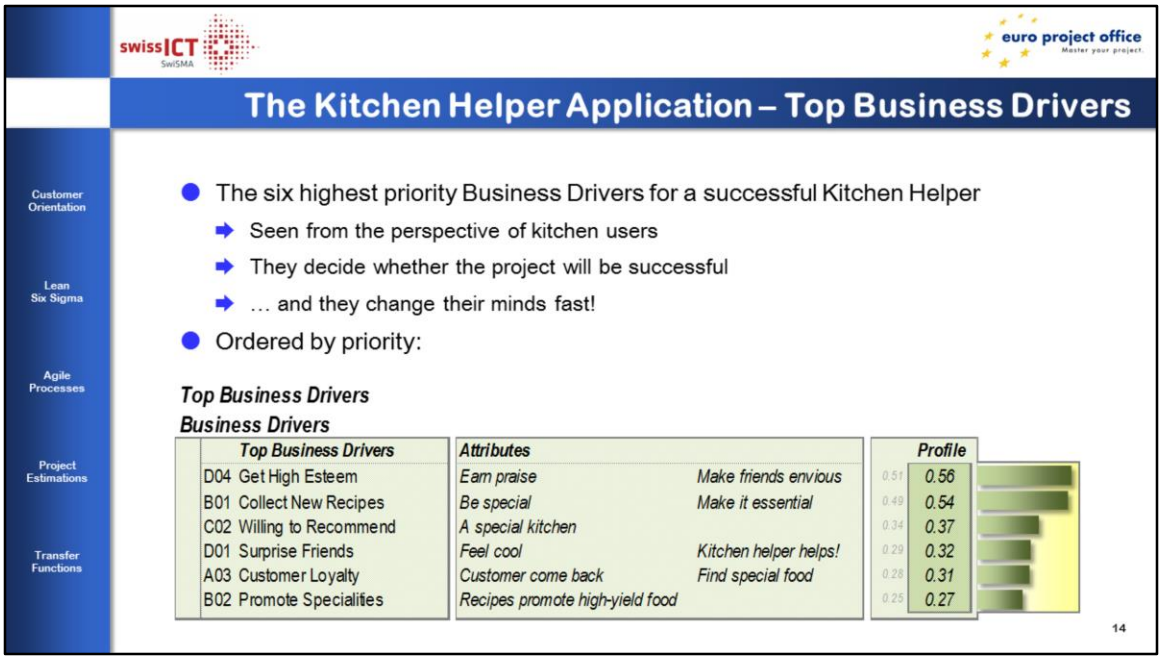
We have four stakeholders in the project; three among them as sponsors and the fourth, the kitchen user, decides whether the product will be a success.

They might have to pay for it; most probably not in full as the three other stakeholders see the kitchen user as their most valuable consumer, and want to sell either food or new kitchen appliances.



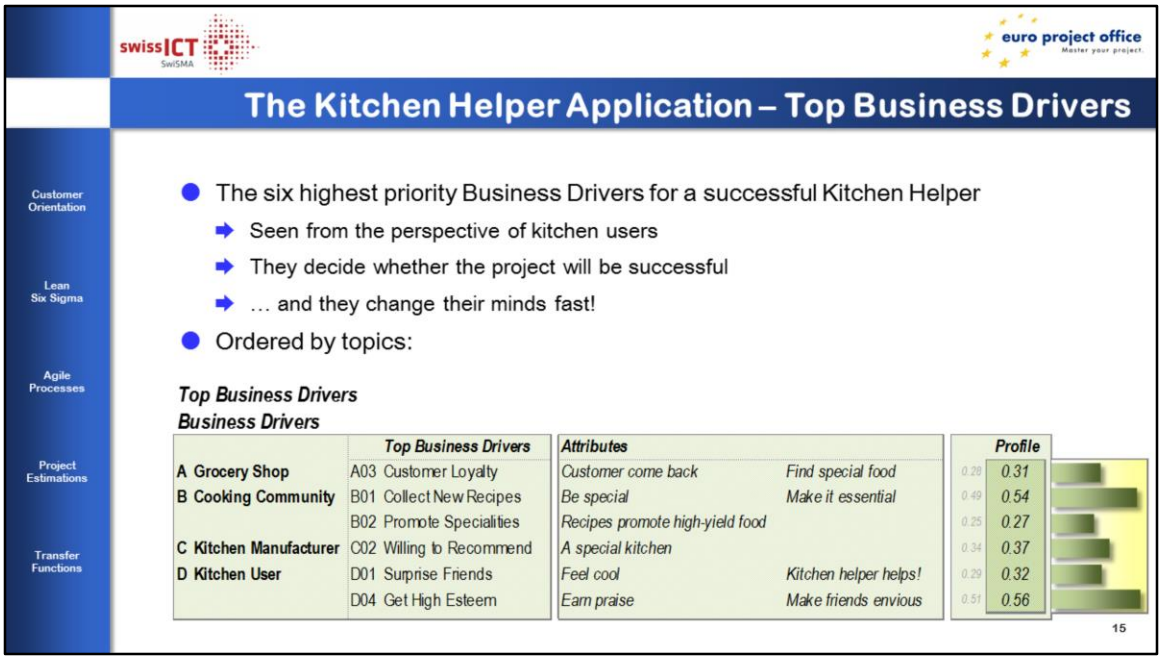
The AHP process splits the prioritization into two steps:

- Determine the importance of which stakeholder to the success of the project
- Find the most important Business Driver for each of the four stakeholders

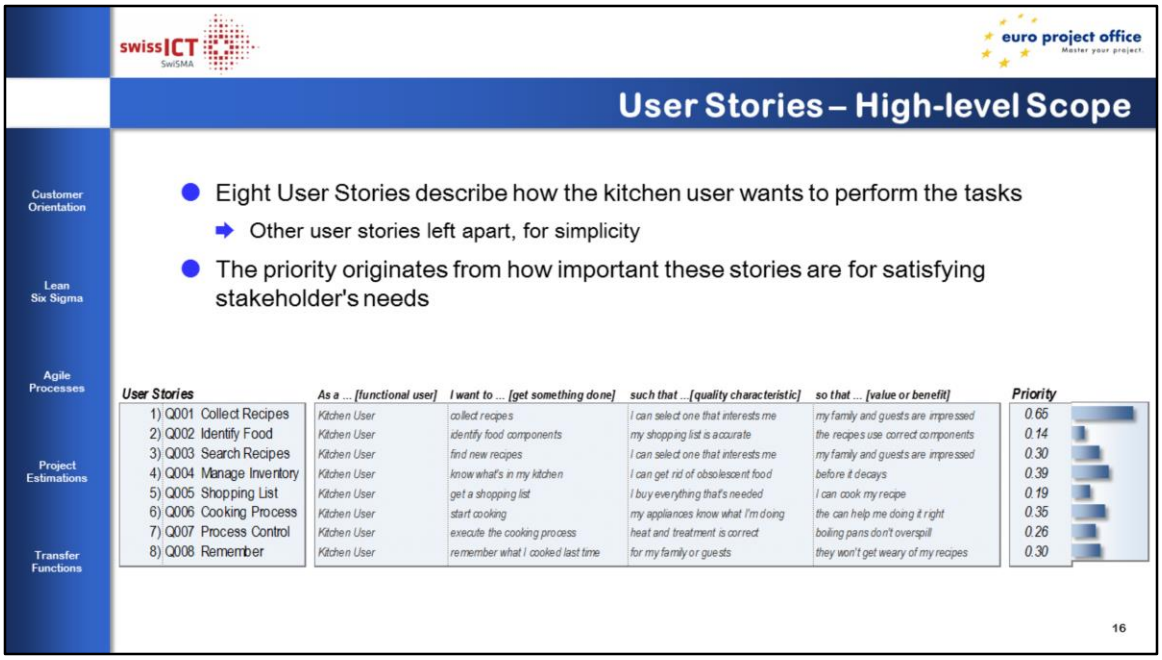


Not too surprisingly, the needs of the kitchen user to get high esteem and always have access to new recipes is dominant.

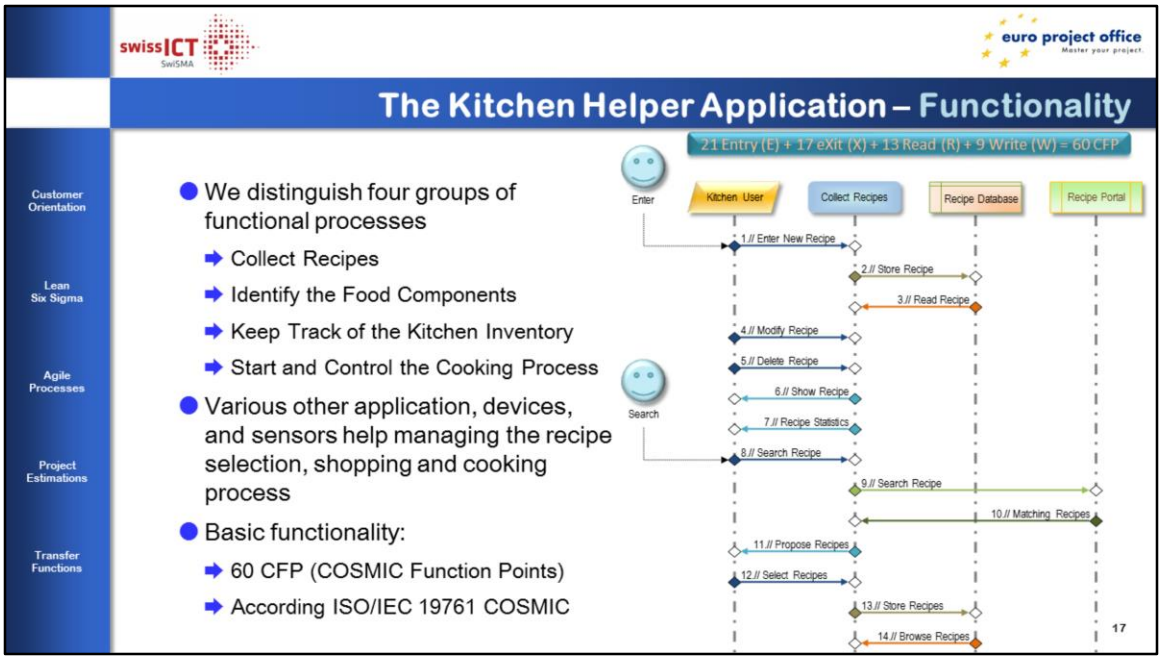
This insight allows to select the IoT that pertain to this needs, and avoid spending time and money on others, less important. For instance, having the kitchen helper do the food supply autonomously is no business driver, absolutely!



We can rearrange the business drivers according the four stakeholders that we used for the AHP.

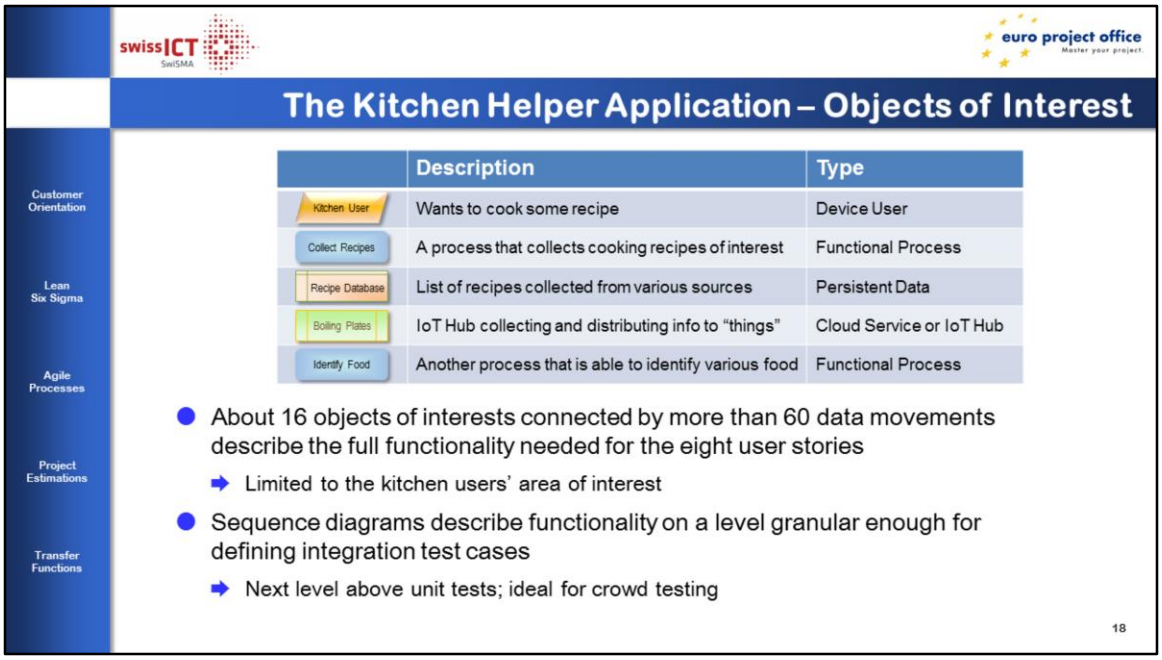


This is a somewhat simplified version of our Kitchen Helper project. For instance, there are no security or privacy aspects recorded in these eight user stories. It might be possible to use Smartphone SIM-Application security for all of it; however, this is not within the scope of this talk.



The first thing we do is designing the intended solution using an UML Sequence Diagram. This has the advantage that such diagrams easily split into functional tasks by focusing on a few data movements only, and thus is more suitable than UML or any other modeling technique to define the product scope. As an additional benefit, we get the functional size of the project, expressed in COSMIC function points (ISO/IEC 19761).

Project Scope means then the split of the product scope into small bundles of data movements. We call them *Story Cards*.

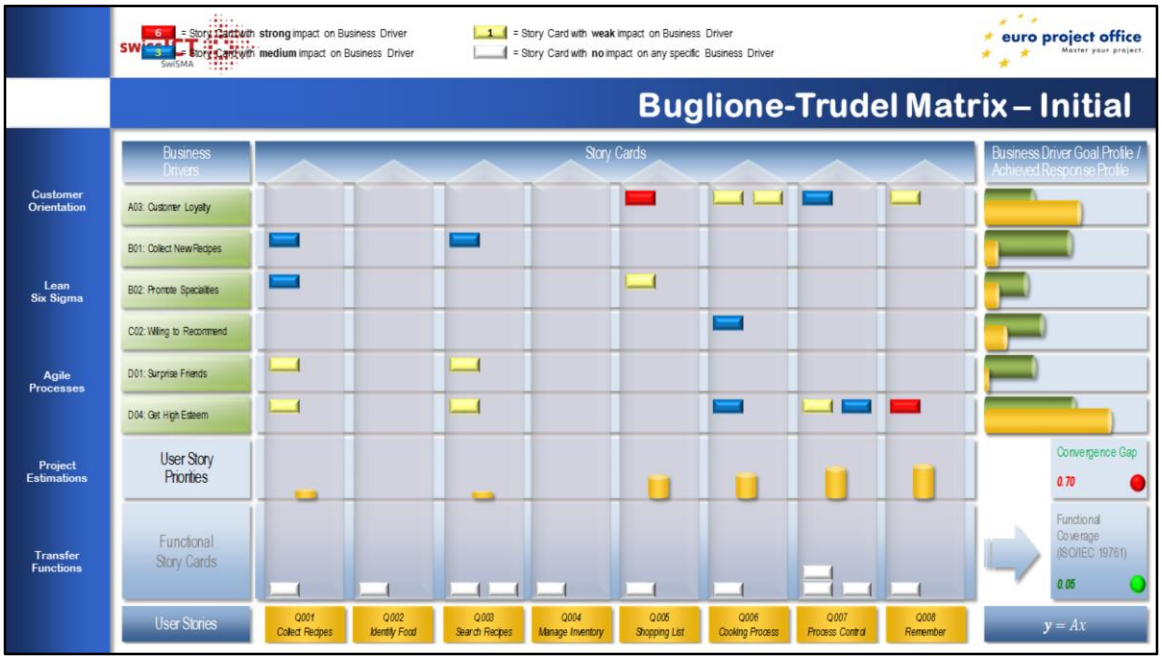


The "Objects of Interest" represent the

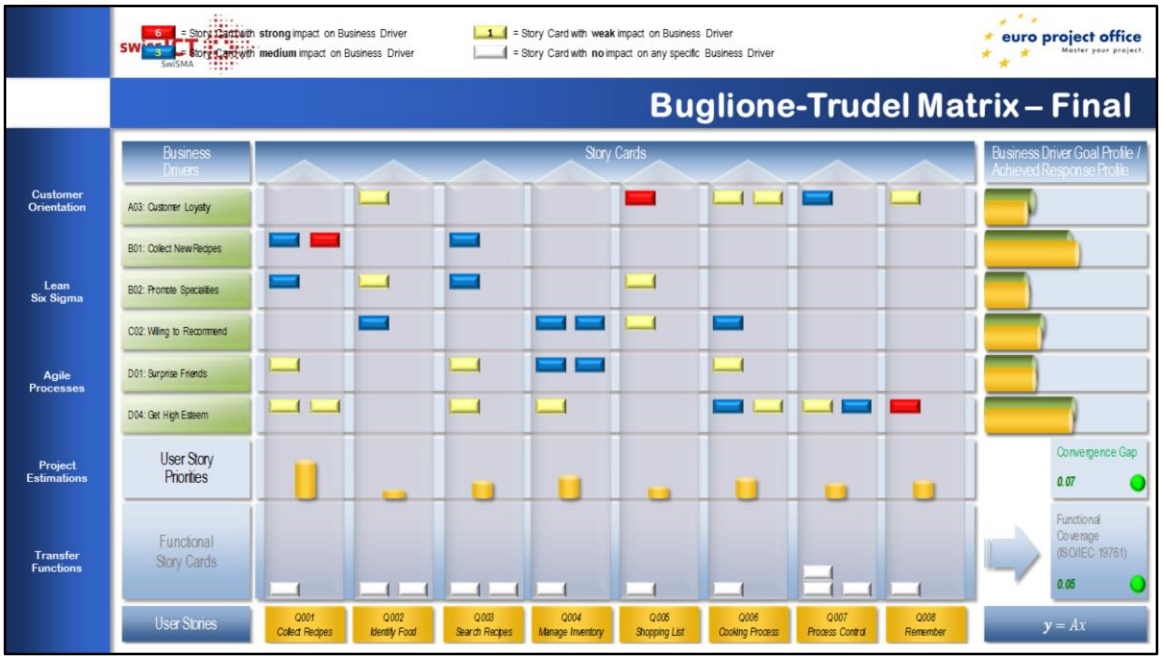
- Functional Processes needed to execute the App; here two of them.
- Device Users using the App; here the interactive device, the holder of the smartphone, and its GPS device.
- Persistent Data resides on the smartphone.
- Other Applications behave as any other device users; however, they might reside on some other system or service.

Note that Androids and iOS phones need an external GIS Application, Google Maps, to interpret GPS coordinates delivered by the phone. The Ticket Shop application is always external. The phone's system clock synchronizes with local train times and thus is also considered an (external) application.

All other applications are assumed to be operational and already tested; not part of the game.

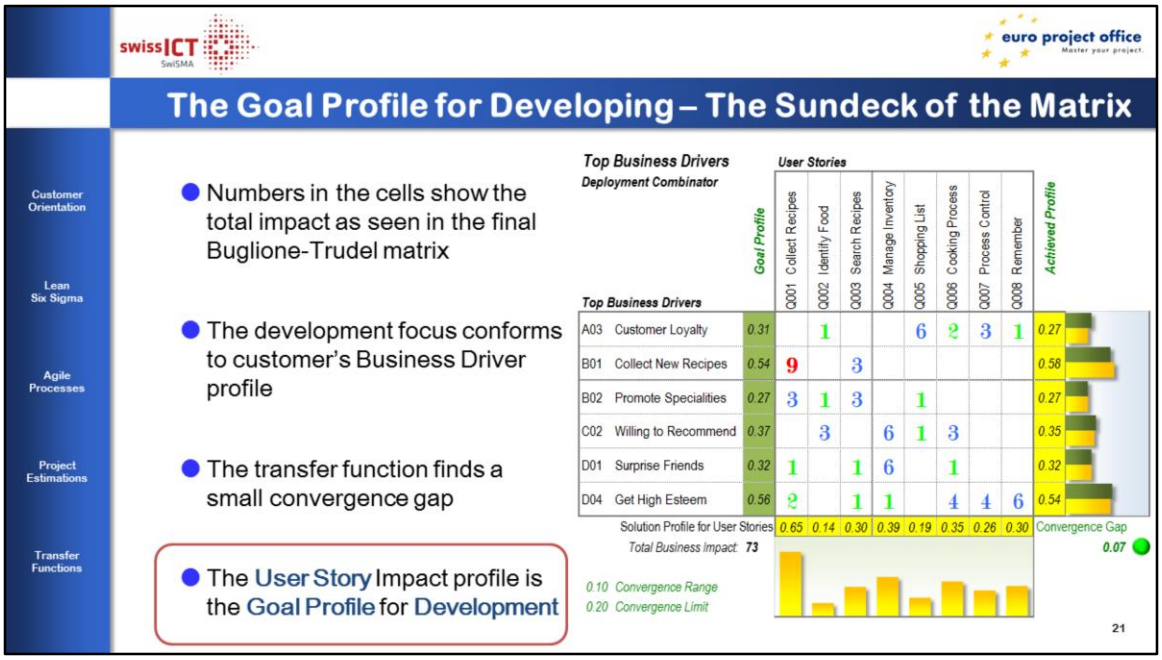


Not quite. The *Buglione-Trudel* matrix shows each story card with regard of its impact on the Business Drivers; calculating the transfer function shows a mismatch between the goal profile and the achieved response profile.



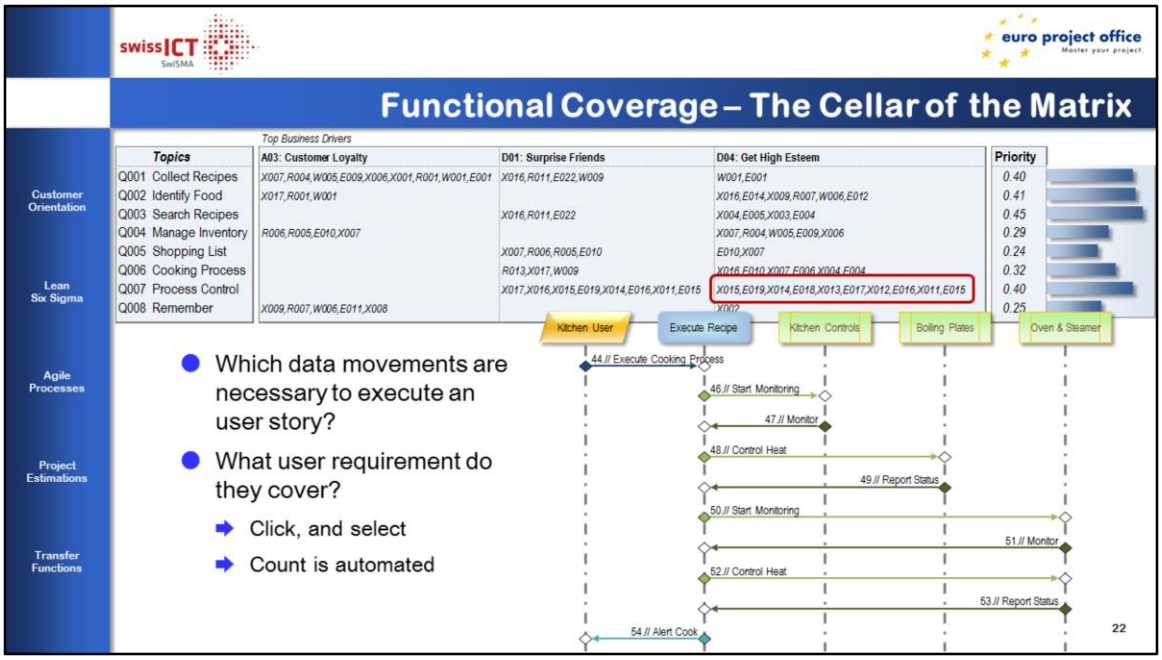
Yes, two of them already do the job:

- Add promotions to the product to drive the creation and distributions of new recipes over suitable channels
- Support the ability to perform of kitchen users. This might induce additional functionality later (e.g., rating ability by adding a kitchen game); however, it's already within project scope, and thus cost.



The Excel graphics shows the calculation of the transfer function mapping user stories to business impact.

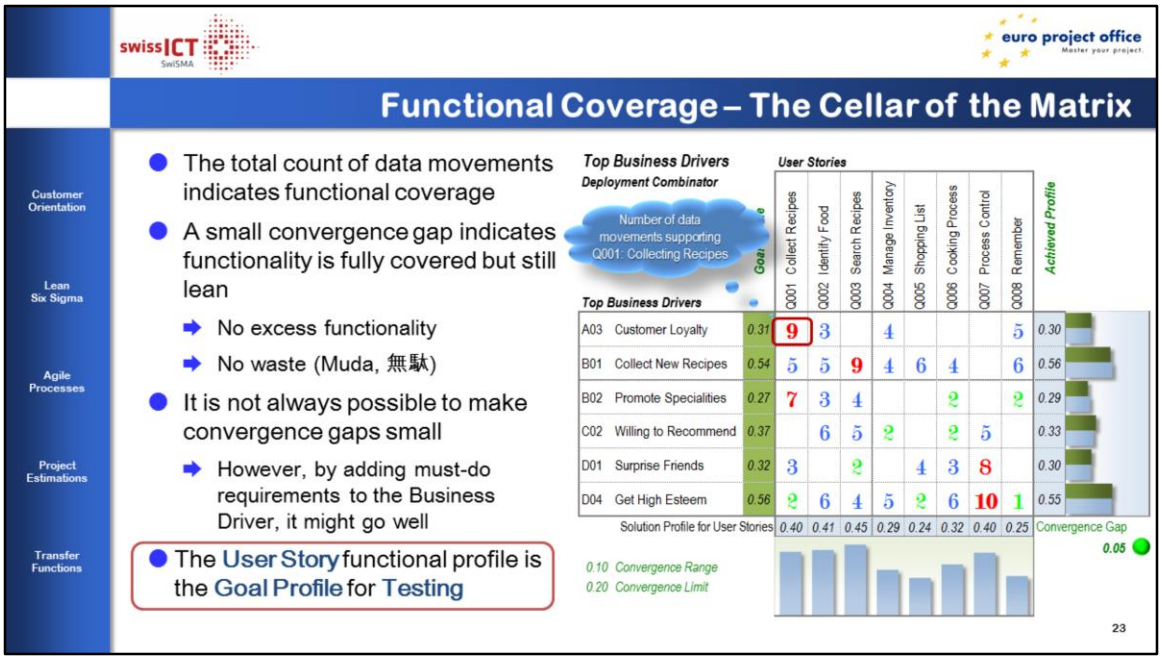
The impact is represents the non-functional requirements of the users and stakeholders.



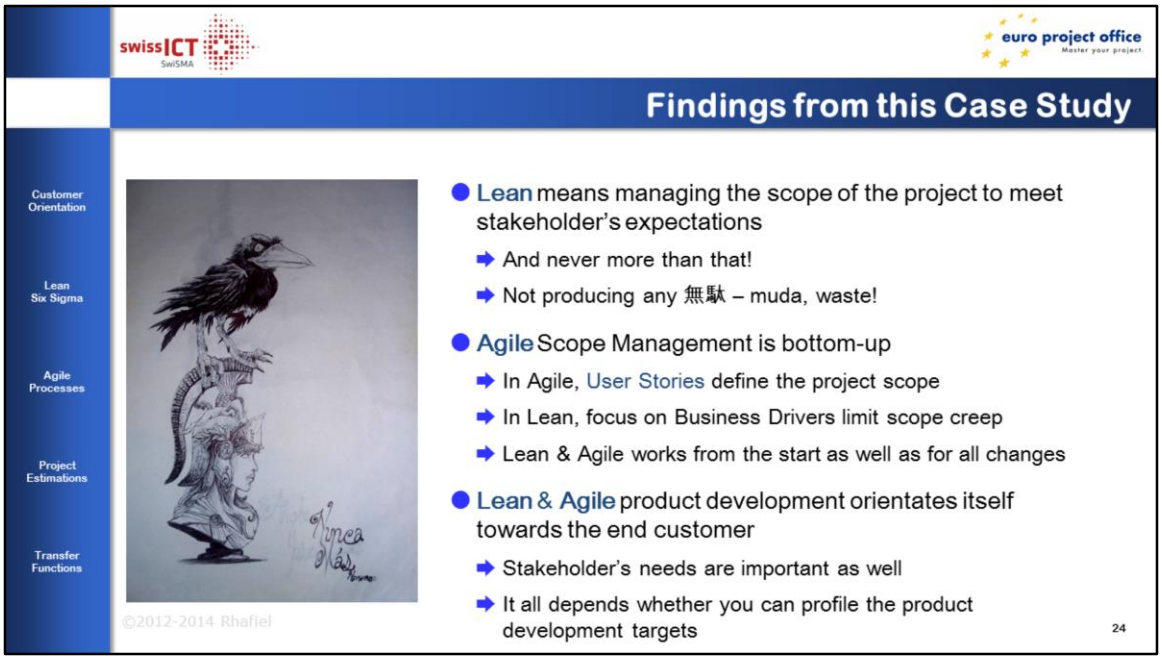
Functional coverage is countable thanks to taking data movements as basic units for functionality. No code is needed.

As any measurement, it's measuring exactly one aspect, in this case data movements. It is clear that there are many other aspects of software that deserve being measured if possible. It's like you say: "the road to Bern is 122 km long" but you don't specify neither anything about road capacity, traffic jams, or else.

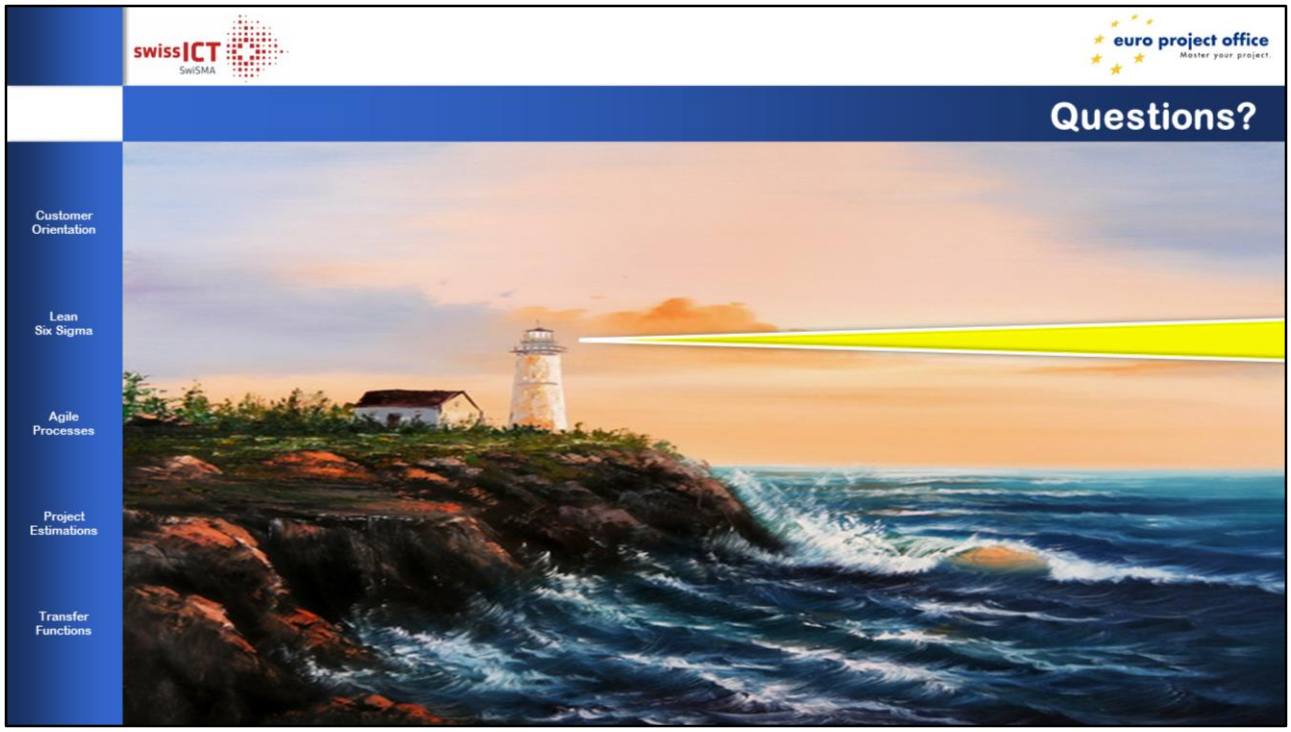
Another question might be whether functionality must meet Business Drivers. You might decide to meet other needs as well, such as what developers deem essential and desirable; however, when doing an App for customers of public transportation service, it might be worth asking for functional coverage of their needs, and not add functionality that they don't value. This concept stands at the origin of agile software development and is largely accountable for its big success.



The transfer function mapping data movements to business drivers assess the functional completeness of the implementation. Functionality might be needed for other reasons than business impact, and usually the functional profile is different from the impact profile.



The small example we've shown here is for demo purposes only – it's not complete or proven to be feasible and only comprises some 60 FP (ISO/IEC 19761) – possibly not a realistic figure for an IoT application.



The author has published quite a bit on the subject together with Eberhard Kranich in Duisburg – e.g., in QFD symposia, at SW metrics conferences like MetriKon or IWSM / Mensura; also at Lean Six Sigma Conference Glasgow, Strathclyde and in Zurich.

Currently, there is a book in the works: "Managing Complexity"