

IoT Product Development

Customer
Orientation

Lean
Six Sigma

Agile
Processes

Project
Estimations

Transfer
Functions



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The Lean Six Sigma Way

Customer Orientation

Lean Six Sigma

Agile Processes

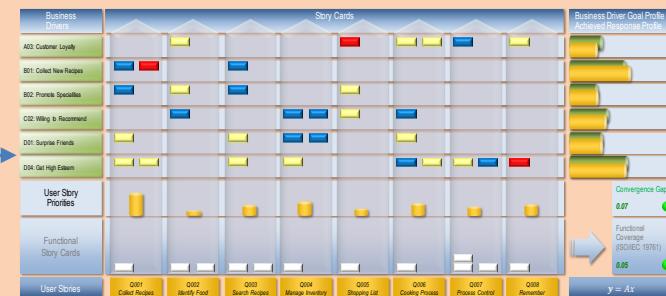
Project Estimations

Transfer Functions

Business Drivers & Customer's Needs

Funding of Implementation and of Change

Lean & Agile Development



Retrospective



Functional Sizing

The Vision

Customer Orientation

Lean Six Sigma

Agile Processes

Project Estimations

Transfer Functions



The Internet of Things (IoT)

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- By end of the decennia 50 Mia. things like fridges, kitchen appliances and other intelligent things will connect to the Internet
- They will be able to order milk when finished, turn light on or off when needed, and run washing machines during periods of low electricity rates
- What value could this create for business?

Paul Maritz



(Illustration Christoph Fischer; © NZZ November 3, 2014)

https://de.wikipedia.org/wiki/Open_Mobile_Alliance

The Vision – the Kitchen Helper

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- He knows what I intend cooking
 - ➡ By reading recipes
- Watches temperatures if I'm off
 - ➡ reading e-Mails, during phone calls...
- Prepares my shopping list
 - ➡ Knows what I need and what's missing
- 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

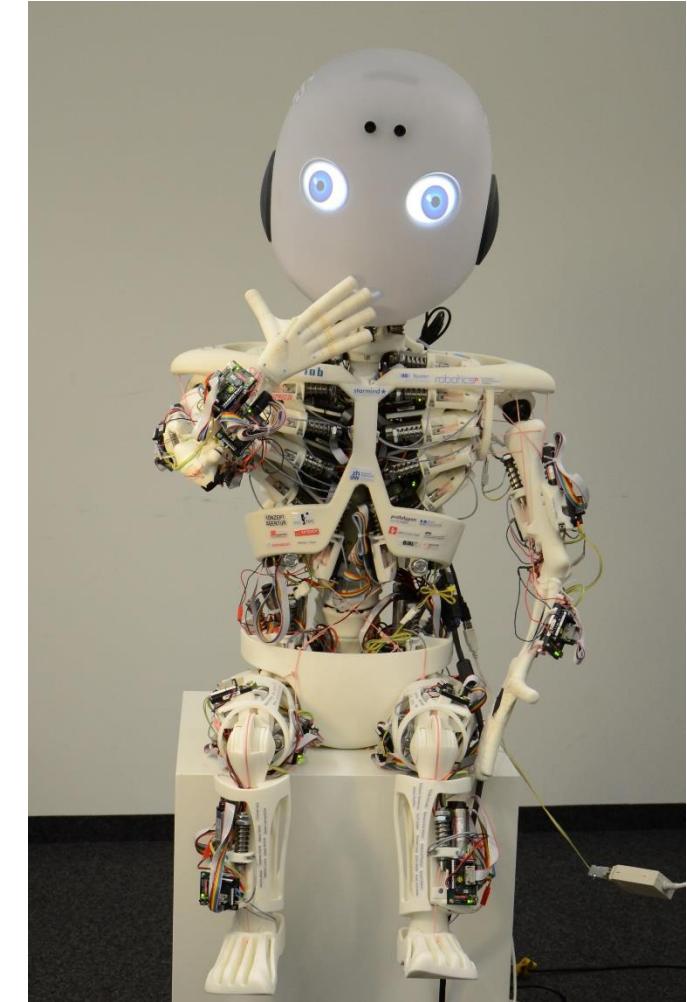


Bild Roboy © ZHAW School of Engineering, Rolf Pfeifer

The Vision – Constraints

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- Natural food features neither barcode nor RFID
- Most grocery shops give you paper receipts only
- Cooking recipes are not standardized, even online
- Your kitchen appliance's software is for remote planning & control rather than for cooking support
- It must be a collaborative approach between
 - ➡ Grocery and grocery's e-Shops
 - ➡ Cooking sites & journals
 - ➡ Kitchen appliance manufacturers



Betty Bossi

Das Online-Portal für Kochen und Geniessen

Migros, Betti Bossy and Gaggenau are trademarks without known engagement with the Kitchen Helper



The Information is Here

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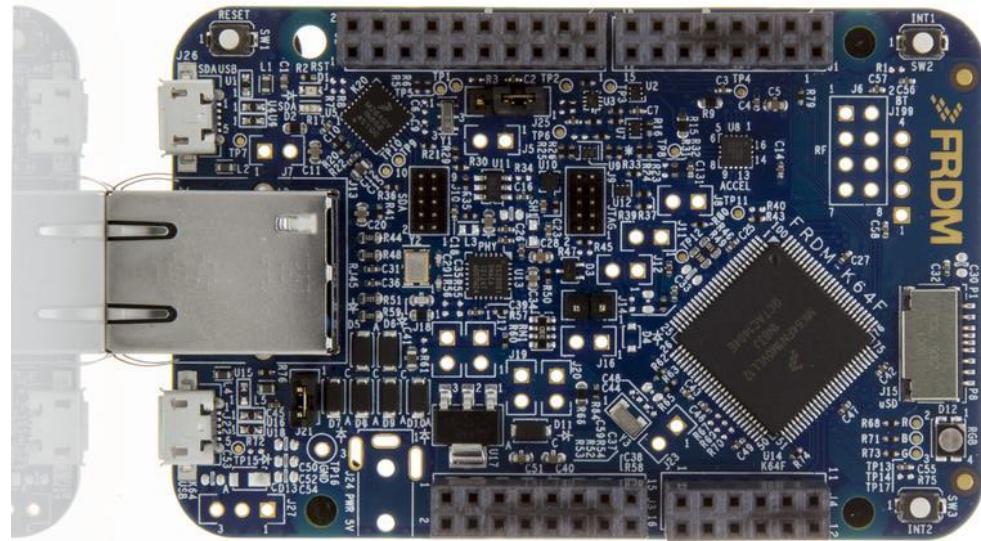
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Transfer Functions

- Big Data is available

- ▶ Just grasp it!
- ▶ Using your Smartphone



- ARM mbed connect physical and virtual world
 - ▶ With Sensors for collecting information
 - ▶ With Actuators for impacting physical world
- Cloud Services provide an IoT hub

Transfer Function for Developing IoT Concertation

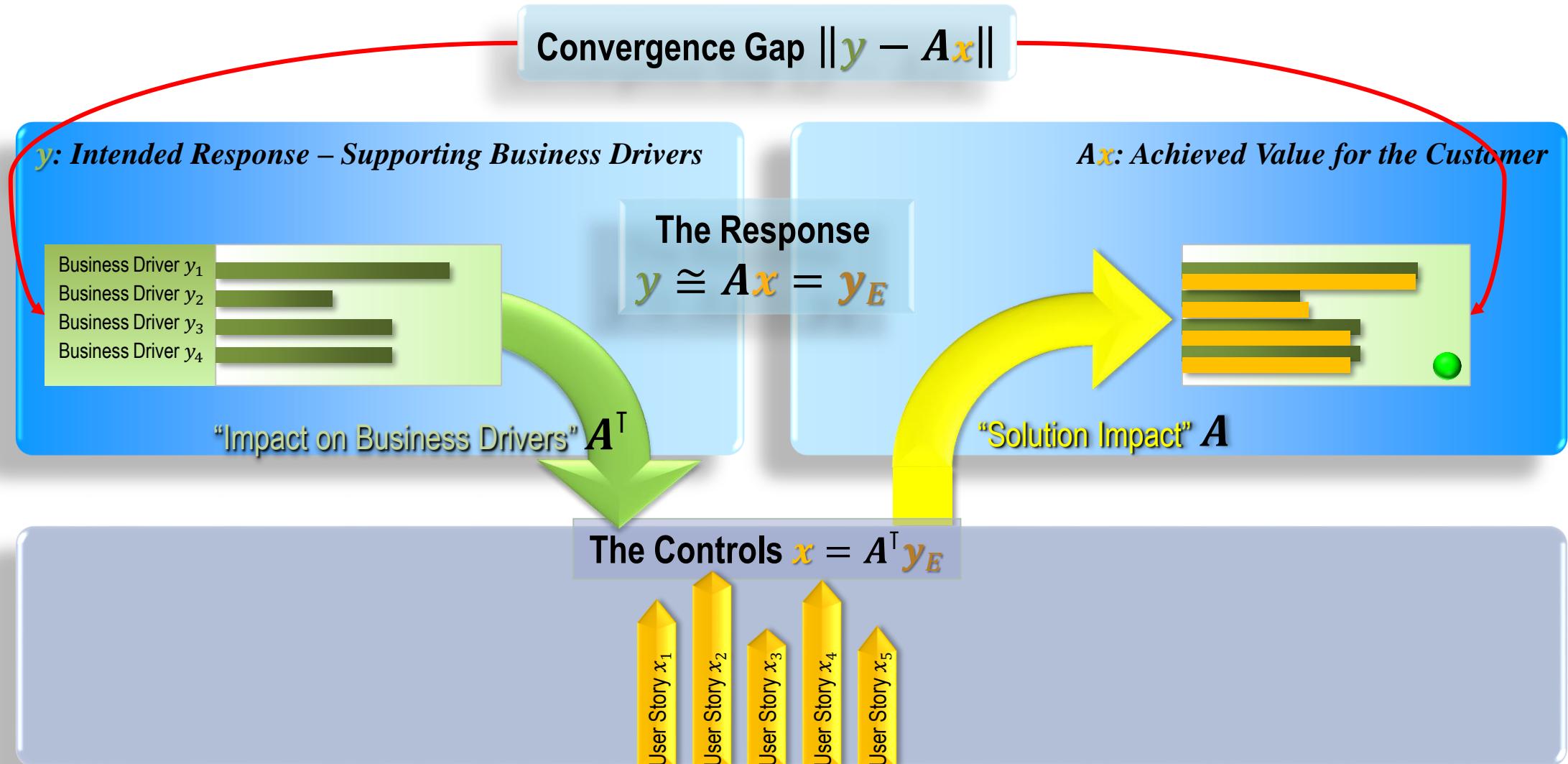
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Transfer Functions and IoT Product Development

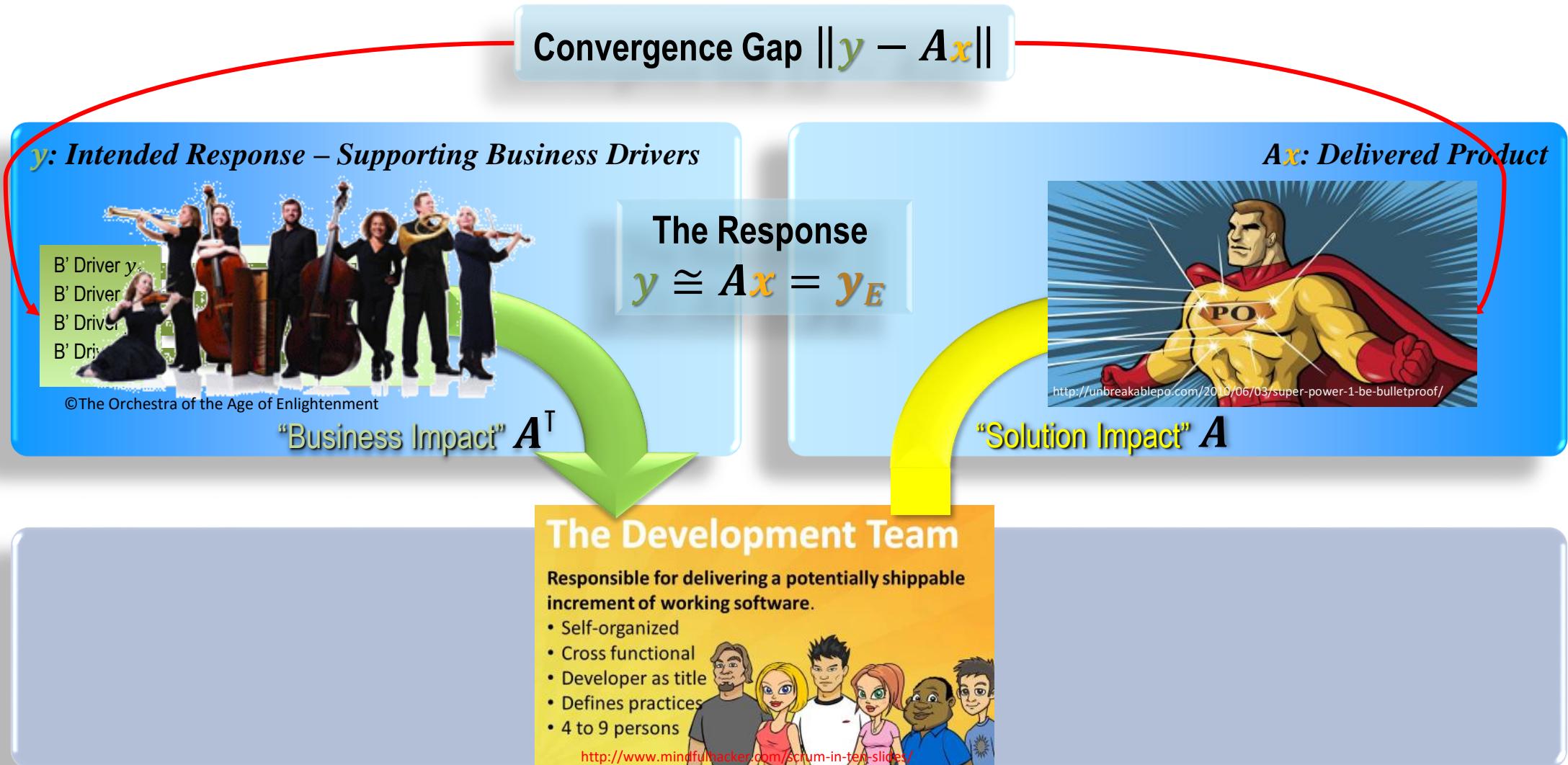
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What else are Transfer Functions Good for?

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- Forces you to find out what your *Business Drivers* are
 - Customer Delighters*
- Help you select the *User Stories* that support Business Drivers best



Miss Italia
photo by
Jonny Delighter



Photo Johnny Delighter

- Might be used on the technical level to guess missing information
 - What might be boiling in this pot?



Hierarchy of Business Drivers

- The four stakeholders have different business drivers for investing into the Kitchen Helper
 - Grocery Shopping cares for customer loyalty
 - Cooking Community searches always new recipes
 - Kitchen Manufacturer needs referrals and promoters
 - Kitchen User, the cook, wants high esteem and social rewards

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Business Drivers	AHP Summary		Local		Weight		Global	
	Profile	Ranking	Local	Global	Profile	Ranking	Profile	Ranking
A Grocery Shop	0.31	4	16%					
A01 Increase Turnover	0.38	2	24%	3.9%	0.13	11		
A02 Promote High-end priced Food	0.33	3	21%	3.4%	0.11	12		
A03 Customer Loyalty	0.86	1	55%	9.0%	0.28	5		
B Cooking Community	0.44	2	23%					
B01 Collect New Recipes	0.89	1	67%	15.5%	0.49	2		
B02 Promote Specialities	0.45	2	33%	7.8%	0.25	6		
C Kitchen Manufacturer	0.37	3	20%					
C01 Extra Appliance Value	0.47	2	30%	5.9%	0.19	7		
C02 Willing to Recommend	0.85	1	54%	10.6%	0.34	3		
C03 Low Maintenance Cost	0.26	3	16%	3.2%	0.10	13		
D Kitchen User	0.76	1	41%					
D01 Surprise Friends	0.44	2	23%	9.2%	0.29	4		
D02 Cook without Stress	0.28	3	14%	5.8%	0.18	8		
D03 Everything in Stock	0.26	4	13%	5.3%	0.17	9		
D04 Get High Esteem	0.79	1	40%	16.2%	0.51	1		
D05 Stay in Control	0.20	5	10%	4.2%	0.13	10		

Uncover Your Top Business Drivers

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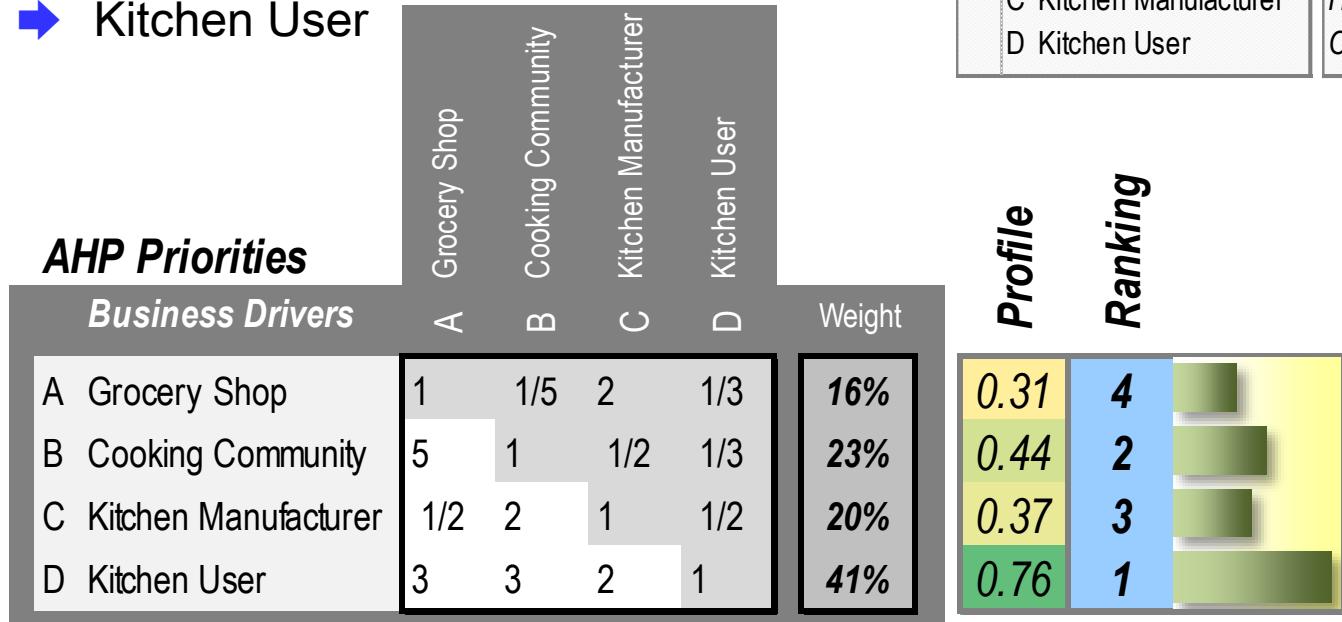
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- The Analytic Hierarchy Process (AHP) allows determining Business Drivers' priorities among various Stakeholders
 - Grocery Shops
 - Cooking Community
 - Kitchen Manufacturer
 - Kitchen User

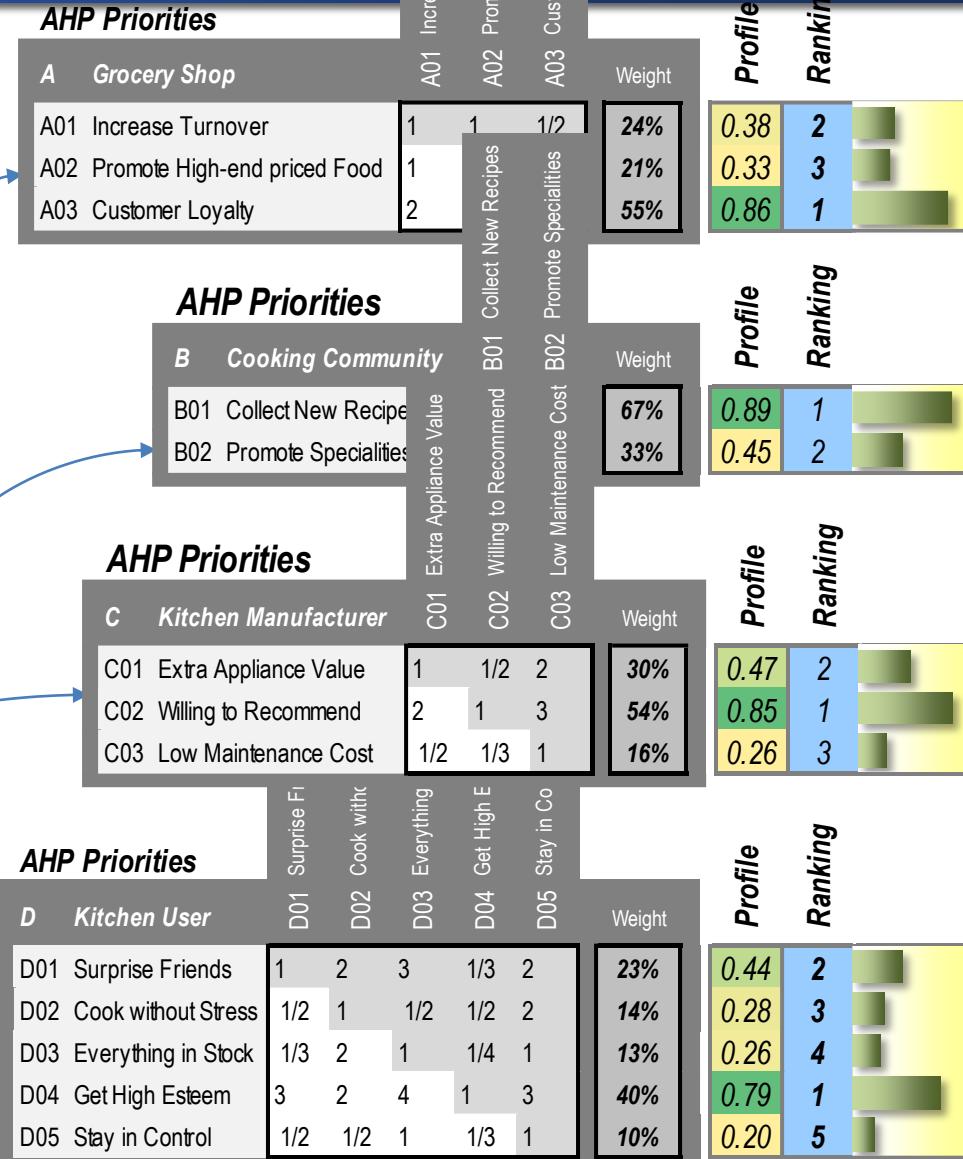
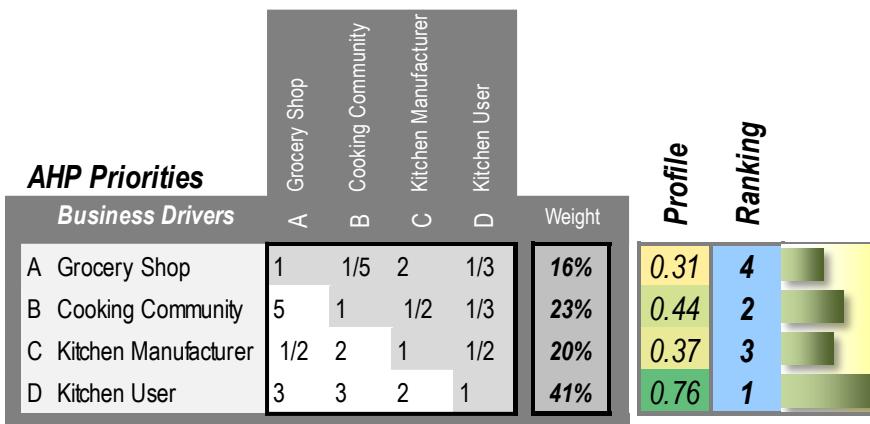
*Business Drivers
Top Level*

Business Drivers		Attributes			AHP Profile
A	Grocery Shop	Chain	Quality Offer	Rating	0.31
B	Cooking Community	Journal	Recipes	Online	0.44
C	Kitchen Manufacturer	High End	Lifestyle		0.37
D	Kitchen User	Consumer	Short of time	Amateur	0.76



How to Uncover Your Top Business Drivers

- The kitchen user is most important as she or he finally decides whether they are ready to cook recipes together with the kitchen helper service



The Kitchen Helper Application – Top Business Drivers

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- The six highest priority Business Drivers for a successful Kitchen Helper
 - ➔ Seen from the perspective of kitchen users
 - ➔ They decide whether the project will be successful
 - ➔ ... and they change their minds fast!
- Ordered by priority:

Top Business Drivers

Business Drivers

<i>Top Business Drivers</i>	<i>Attributes</i>	<i>Profile</i>
D04 Get High Esteem	<i>Earn praise</i>	0.51
B01 Collect New Recipes	<i>Be special</i>	0.49
C02 Willing to Recommend	<i>A special kitchen</i>	0.34
D01 Surprise Friends	<i>Feel cool</i>	0.29
A03 Customer Loyalty	<i>Customer come back</i>	0.28
B02 Promote Specialities	<i>Recipes promote high-yield food</i>	0.25
	<i>Make friends envious</i>	0.56
	<i>Make it essential</i>	0.54
	<i>Kitchen helper helps!</i>	0.37
	<i>Find special food</i>	0.32
		0.31
		0.27

The Kitchen Helper Application – Top Business Drivers

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- The six highest priority Business Drivers for a successful Kitchen Helper
 - ➔ Seen from the perspective of kitchen users
 - ➔ They decide whether the project will be successful
 - ➔ ... and they change their minds fast!
- Ordered by topics:

Top Business Drivers

Business Drivers

	<i>Top Business Drivers</i>	<i>Attributes</i>	<i>Profile</i>
A Grocery Shop	A03 Customer Loyalty	<i>Customer come back</i>	0.28 0.31
B Cooking Community	B01 Collect New Recipes	<i>Be special</i>	0.49 0.54
	B02 Promote Specialities	<i>Recipes promote high-yield food</i>	0.25 0.27
C Kitchen Manufacturer	C02 Willing to Recommend	<i>A special kitchen</i>	0.34 0.37
D Kitchen User	D01 Surprise Friends	<i>Feel cool</i>	0.29 0.32
	D04 Get High Esteem	<i>Earn praise</i>	0.51 0.56

User Stories – High-level Scope

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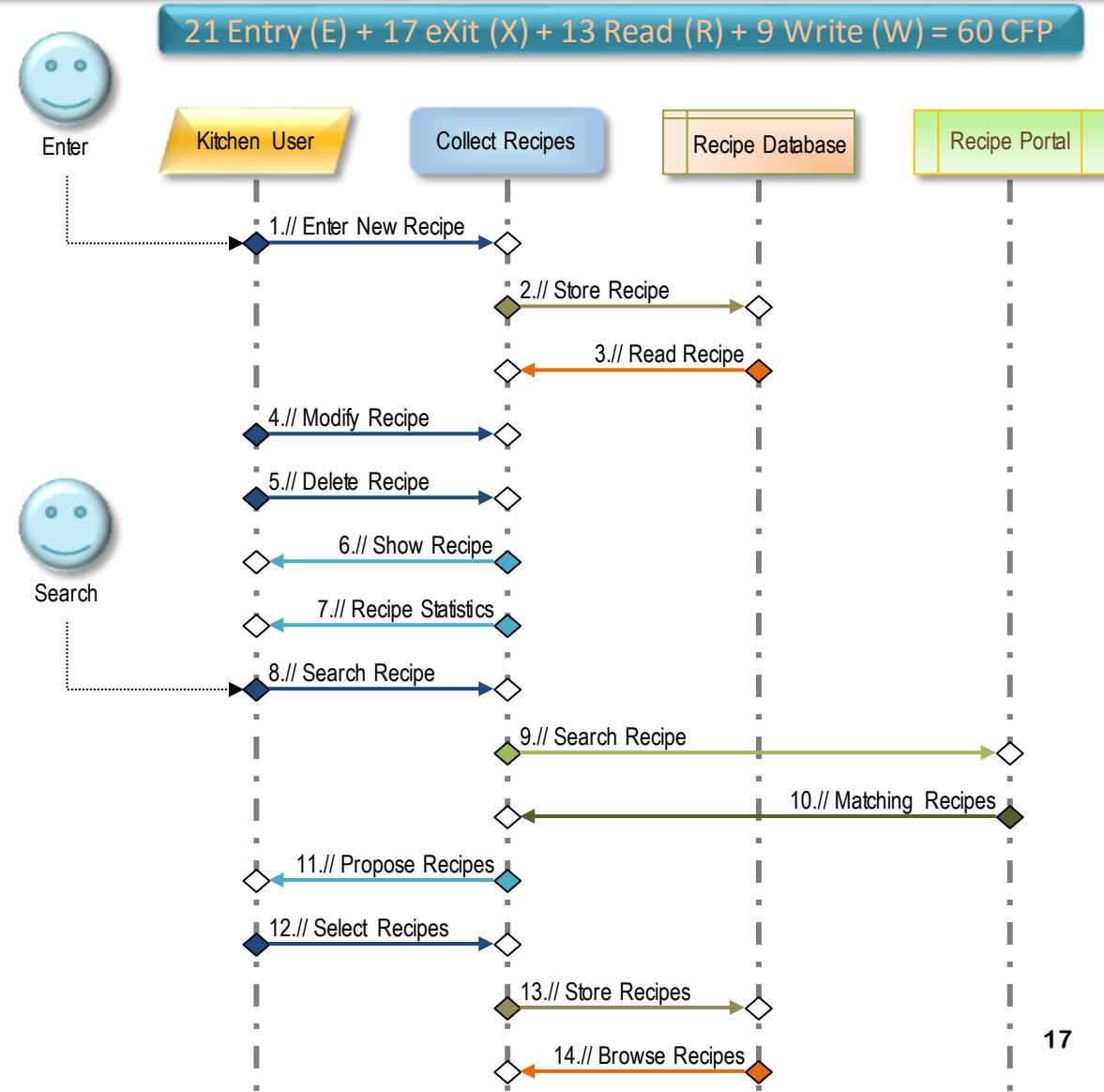
Transfer Functions

- Eight User Stories describe how the kitchen user wants to perform the tasks
 - ➡ Other user stories left apart, for simplicity
- The priority originates from how important these stories are for satisfying stakeholder's needs

User Stories	As a ... [functional user]	I want to ... [get something done]	such that ...[quality characteristic]	so that ... [value or benefit]	Priority
1) Q001 Collect Recipes	Kitchen User	collect recipes	I can select one that interests me	my family and guests are impressed	0.65
2) Q002 Identify Food	Kitchen User	identify food components	my shopping list is accurate	the recipes use correct components	0.14
3) Q003 Search Recipes	Kitchen User	find new recipes	I can select one that interests me	my family and guests are impressed	0.30
4) Q004 Manage Inventory	Kitchen User	know what's in my kitchen	I can get rid of obsolescent food	before it decays	0.39
5) Q005 Shopping List	Kitchen User	get a shopping list	I buy everything that's needed	I can cook my recipe	0.19
6) Q006 Cooking Process	Kitchen User	start cooking	my appliances know what I'm doing	they can help me doing it right	0.35
7) Q007 Process Control	Kitchen User	execute the cooking process	heat and treatment is correct	boiling pans don't overspill	0.26
8) Q008 Remember	Kitchen User	remember what I cooked last time	for my family or guests	they won't get weary of my recipes	0.30

The Kitchen Helper Application – Functionality

- We distinguish four groups of functional processes
 - ▶ Collect Recipes
 - ▶ Identify the Food Components
 - ▶ Keep Track of the Kitchen Inventory
 - ▶ Start and Control the Cooking Process
- Various other application, devices, and sensors help managing the recipe selection, shopping and cooking process
- Basic functionality:
 - ▶ 60 CFP (COSMIC Function Points)
 - ▶ According ISO/IEC 19761 COSMIC



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The Kitchen Helper Application – Objects of Interest

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	Description	Type
Kitchen User	Wants to cook some recipe	Device User
Collect Recipes	A process that collects cooking recipes of interest	Functional Process
Recipe Database	List of recipes collected from various sources	Persistent Data
Boiling Plates	IoT Hub collecting and distributing info to “things”	Cloud Service or IoT Hub
Identify Food	Another process that is able to identify various food	Functional Process

- About 16 objects of interests connected by more than 60 data movements describe the full functionality needed for the eight user stories
 - ➡ Limited to the kitchen users' area of interest
- Sequence diagrams describe functionality on a level granular enough for defining integration test cases
 - ➡ Next level above unit tests; ideal for crowd testing

Buglione-Trudel Matrix – Initial



Buglione-Trudel Matrix – Final



The Goal Profile for Developing – The Sundeck of the Matrix

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- Numbers in the cells show the total impact as seen in the final Buglione-Trudel matrix

- The development focus conforms to customer's Business Driver profile

- The transfer function finds a small convergence gap

- The **User Story Impact** profile is the **Goal Profile for Development**

Top Business Drivers
Deployment Combinator

Top Business Drivers

Solution Profile for User Stories

Total Business Impact: 73

0.10 Convergence Range

0.20 Convergence Limit

User Stories



Functional Coverage – The Cellar of the Matrix

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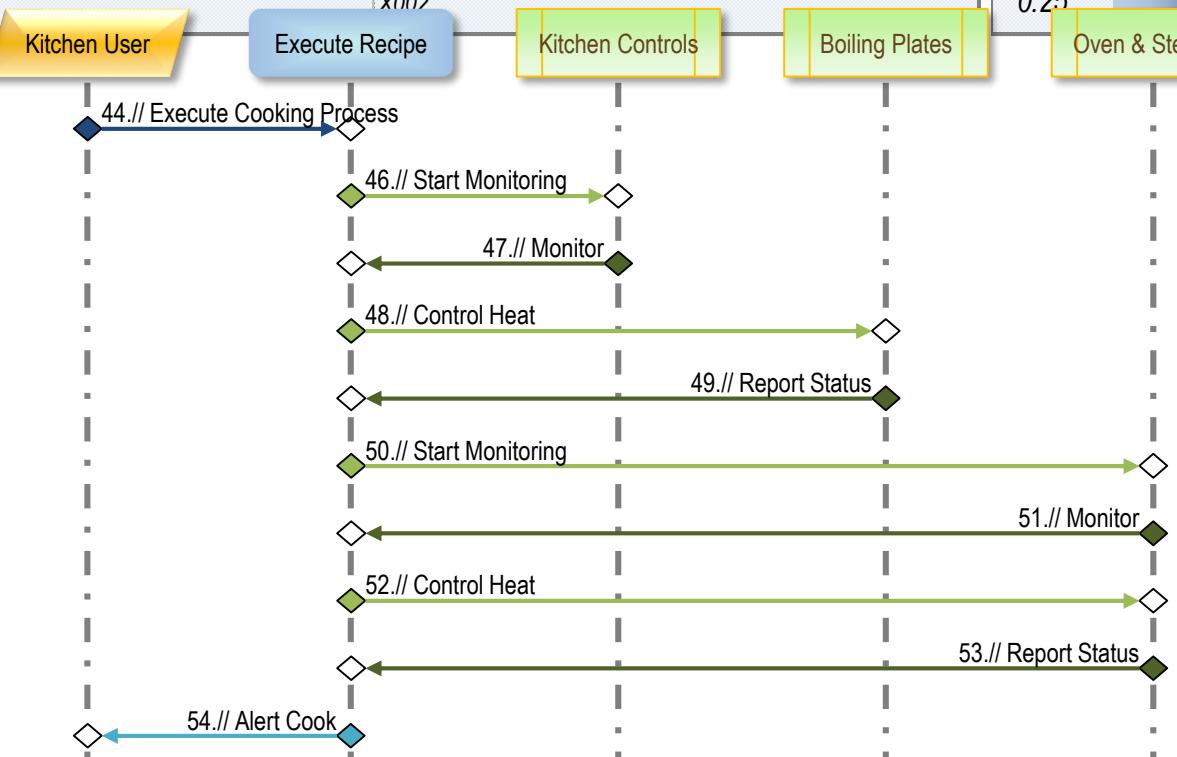
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Transfer Functions

Top Business Drivers				Priority
Topics	A03: Customer Loyalty	D01: Surprise Friends	D04: Get High Esteem	
Q001 Collect Recipes Q002 Identify Food Q003 Search Recipes Q004 Manage Inventory Q005 Shopping List Q006 Cooking Process Q007 Process Control Q008 Remember	X007,R004,W005,E009,X006,X001,R001,W001,E001 X017,R001,W001 R006,R005,E010,X007 X009,R007,W006,E011,X008	X016,R011,E022,W009 X016,R011,E022 X007,R006,R005,E010 R013,X017,W009 X017,X016,X015,E019,X014,E016,X011,E015	W001,E001 X016,E014,X009,R007,W006,E012 X004,E005,X003,E004 X007,R004,W005,E009,X006 E010,X007 X016 F010 X007 F006 X004 F004 X015,E019,X014,E018,X013,E017,X012,E016,X011,E015 X002	0.40 0.41 0.45 0.29 0.24 0.32 0.40 0.25

- Which data movements are necessary to execute an user story?
- What user requirement do they cover?
 - ➡ Click, and select
 - ➡ Count is automated



Functional Coverage – The Cellar of the Matrix

- The total count of data movements indicates functional coverage
- A small convergence gap indicates functionality is fully covered but still lean
 - No excess functionality
 - No waste (Muda, 無駄)
- It is not always possible to make convergence gaps small
 - However, by adding must-do requirements to the Business Driver, it might go well
- The **User Story** functional profile is the **Goal Profile** for Testing



Findings from this Case Study

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- **Lean** means managing the scope of the project to meet stakeholder's expectations
 - ➡ And never more than that!
 - ➡ Not producing any 無駄 – muda, waste!
- **Agile Scope Management** is bottom-up
 - ➡ In Agile, **User Stories** define the project scope
 - ➡ In Lean, focus on Business Drivers limit scope creep
 - ➡ Lean & Agile works from the start as well as for all changes
- **Lean & Agile** product development orientates itself towards the end customer
 - ➡ Stakeholder's needs are important as well
 - ➡ It all depends whether you can profile the product development targets

Questions?

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