DT4RE: Design Thinking for RE

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Research areas

- Design Thinking and
- Design Science Research

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goo.gl/WmRyAu

Research areas

- Design Thinking and Human-centered Design for Information Systems
- Industry 4.0 / Internet of Things
- InsurTech
- Qualitative research

Daniel Méndez
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Research areas

- Empirical software engineering in Requirements Engineering with focus on:
  - Requirements Engineering
  - Software Process Models
  - Quality Management
- Interdisciplinary qualitative research

This session is based on...

- Previous tutorials given on either Design Thinking or Requirements Engineering
- Experiences made in projects

This tutorial will be about...

Scope

- Introduction into basic principles and methods for Design Thinking (DT)
- Sharing experiences and lessons learnt on using DT in context of RE
- Discuss synergies with RE and open research challenges

Out of Scope

- Out of the box solutions
- Universally applicable “blueprint”

Ground rule

Whenever you have questions / remarks,

please don’t ask 

, but

share them with the whole group.

Introduction - Who are you?

Quick round...

- Who are you?
- What are your experiences in Design Thinking
  in the context of software development projects/processes?

What do you know?

What is Design Thinking?

Same as with agile methods, there are different perspectives on Design Thinking

Way of Doing

Process

(1) Define
(2) Needfinding
(3) Synthesis
(4) Ideate
(5) Prototype
(6) Test

Toolbox

Prototype

- lofi prototyping
- wireframing
- mockups
- 3D printing
- CAD Simulations
- Software programming
- Mechanical and electrical engineering
- Service Blueprinting
- Role plays
- Stories and Comics

Needfinding Synthesis

- Interviews
- Focus Groups
- Observation
- Diary Studies
- Customer Journeys
- Re-Framing Techniques
- Engaging

Way of Thinking

Bias towards action

Radical Collaboration

Experimentation

Focus on human values

Iteration

What is Design Thinking (not)?

Design Thinking...

- … is a human-centered problem solving method that applies extensive user-research, rapid prototyping, iterative improvement cycles, and interdisciplinary team work

In contrast, Requirements Engineering

- is a holistic discipline with various principles, approaches and even more methods

Two faces of the same medal?

In Design Thinking, we often pretend that after building a high-resolution prototype, the rest is “just development”.

In RE, we often pretend that requirements are somehow present and “just need to be elicited”.

Issues in scope of current debates

When should we make use of Design Thinking?

How can we make use of Design Thinking?

How can we integrate Design Thinking and RE in a seamless manner?

Outline

1. Design Thinking in a Nutshell

2. Design Thinking for Requirements Engineering
3. Final discussion and closure

Outline

1. **Design Thinking in a Nutshell**

2. Design Thinking for Requirements Engineering
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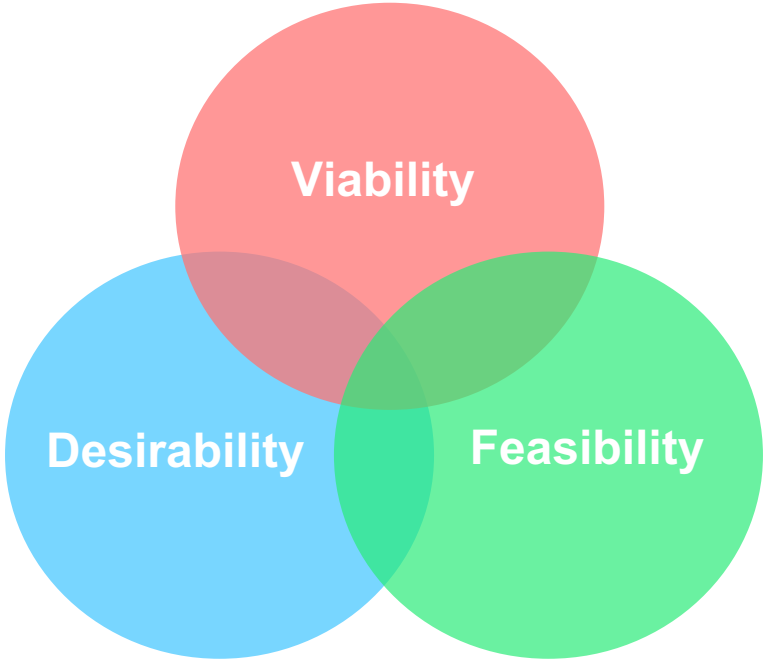
Design Thinking is a problem solving approach that starts with the human



Let’s try it...

WALLET EXERCISE

Re-design the wallet of your partner.

Your challenge for the next 30 minutes.

Find a teammate.

2 people per team

Interview. Explore. Understand.

Who? **Why?** Where? What? How? When?

3 minutes each

Point-of-View

Synthesize.

2 minute

Let‘s hear it.

Share your Point-of-View (POV).

Ideate.

Brainstorm. The more ideas the better.

2 minutes

Prototype.

Express **one idea** through a prototype.

5 minutes

Test it.

Get some **feedback** from your user.

2 minutes each

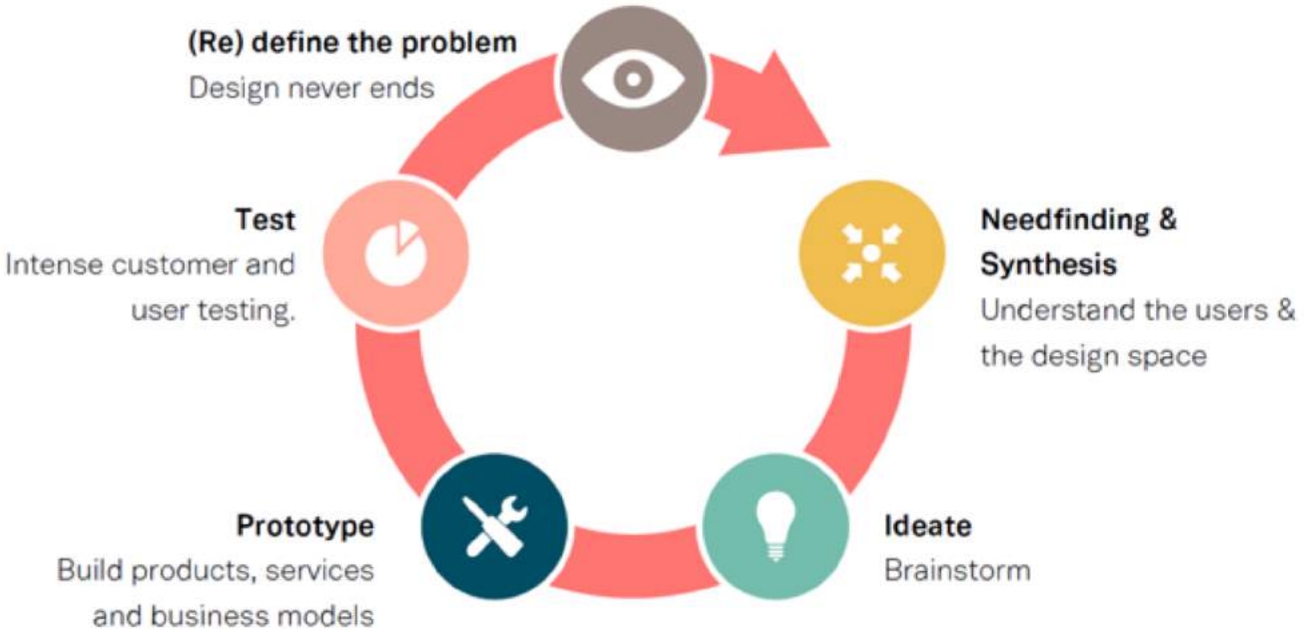
Let‘s see it.

Share your Prototype.

What was our process?

What did we just do?

Design Thinking is explorative and iterative



Define
the problem.

Needfinding
Empathize.

Interviewing and self-immersion in Kenya (Photographer: Falk Uebernickel)

In Needfinding we apply three methods

Observe

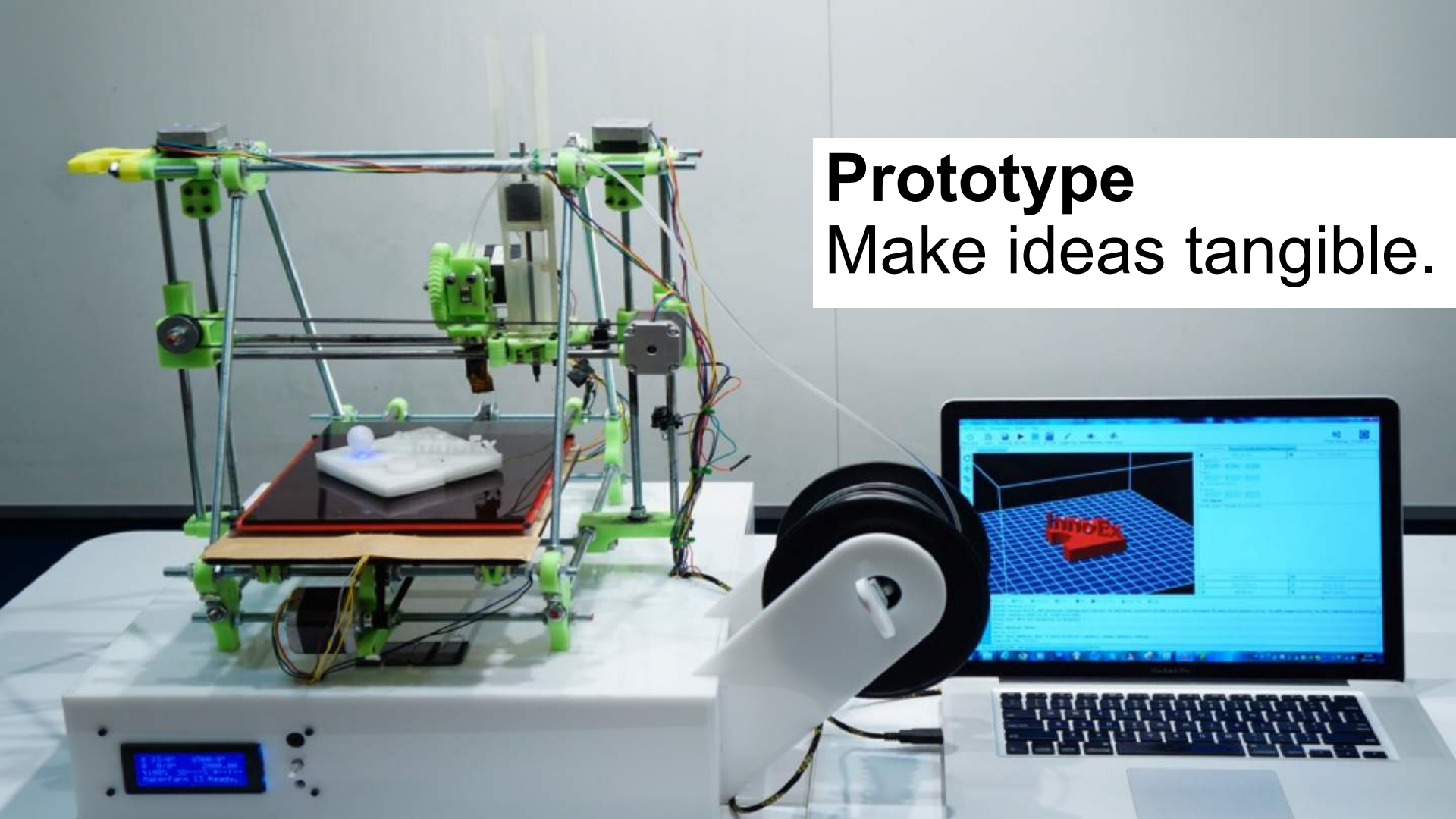
Immerse

Ask


Synthesis
Make sense.

Pictures: project for an insurance company (2017)

Ideate
Generate ideas.


Prototype
Make ideas tangible.


barcelona


Worksum
PRIO BOX
CLAIM TO PRIO BOX
Good Morning!
YOUR DAY
Details
Record Activity
CHALLENGE
STARTING
CHECKING
CHECKING
FINISHED
External link


Abbi
bot
Rise and shine!
This exercise helps with practically everything, including your core, legs, balance, and strength:
- Sit on the edge of a firm surface like a chair or a bed, with your feet on the ground
- Activate your core and stand up using as little support as you can
- Sit down and repeat 4 times
09:43
Message


Vittel

The outcome of a Design Thinking project is one or more tested prototypes

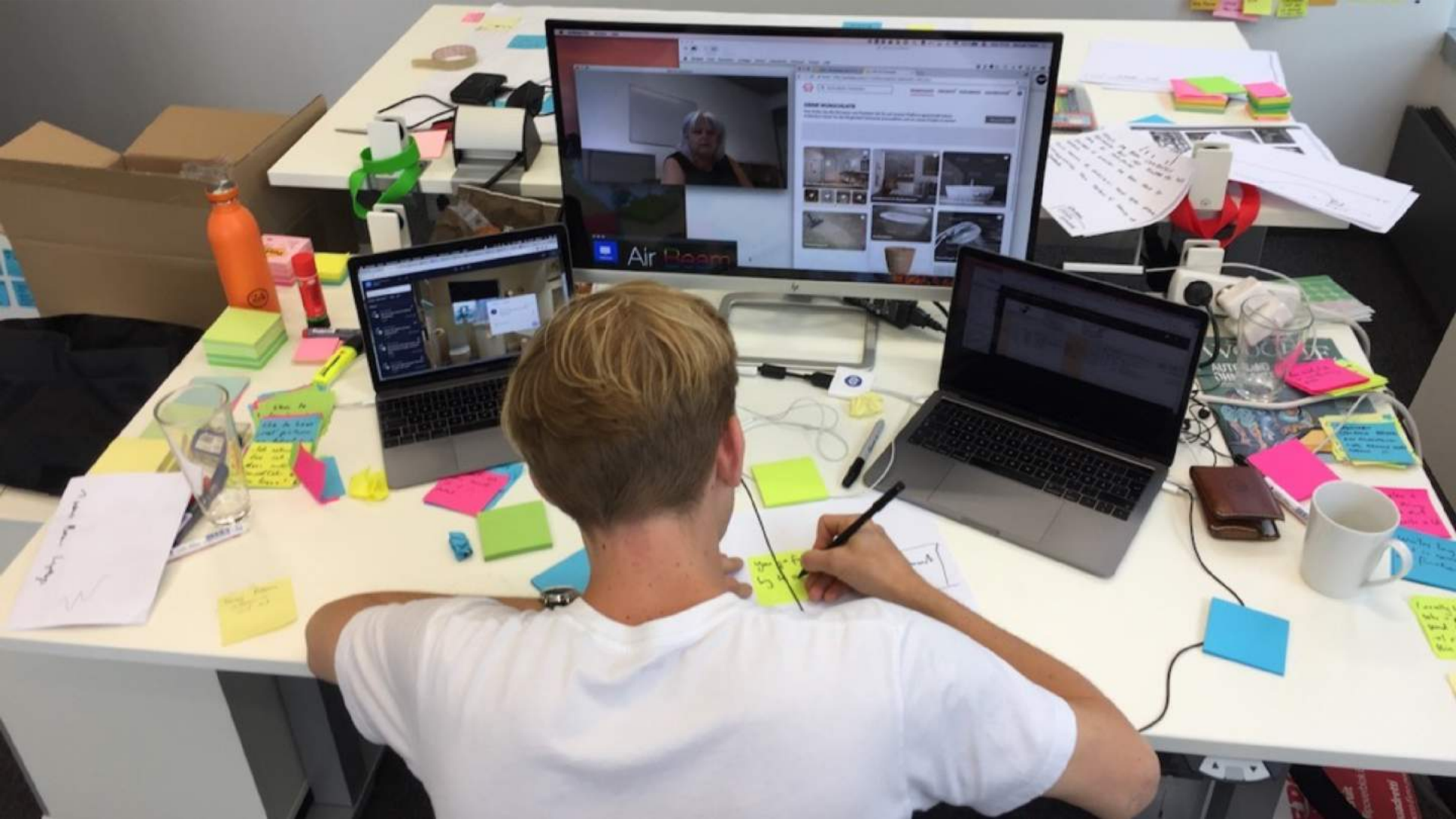
LOW RESOLUTION PROTOTYPE

HIGH RESOLUTION PROTOTYPE

Simple and easy to handle prototypes
Quickly created
Focus is on few features / critical functions
Costs: low

Complex simulations and prototypes of the future product, service or process and business model
All important functions are implemented
Costs: higher

Test
Collect feedback.

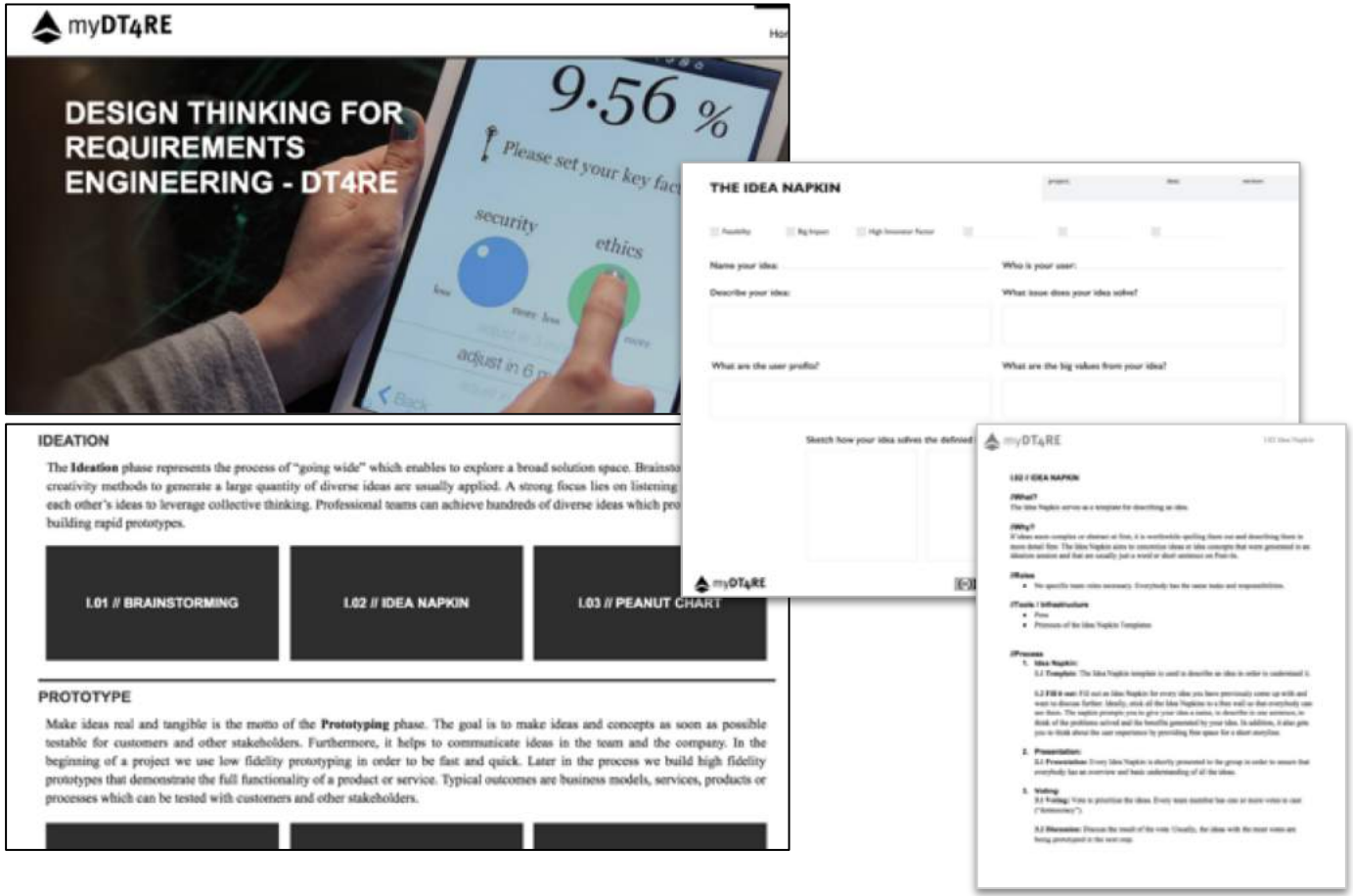

Air Beam


(Re-)define
Iterate.

Toolbox

DT

https://www.dt4re.org/



People and Making are the heart of Design Thinking

Principles

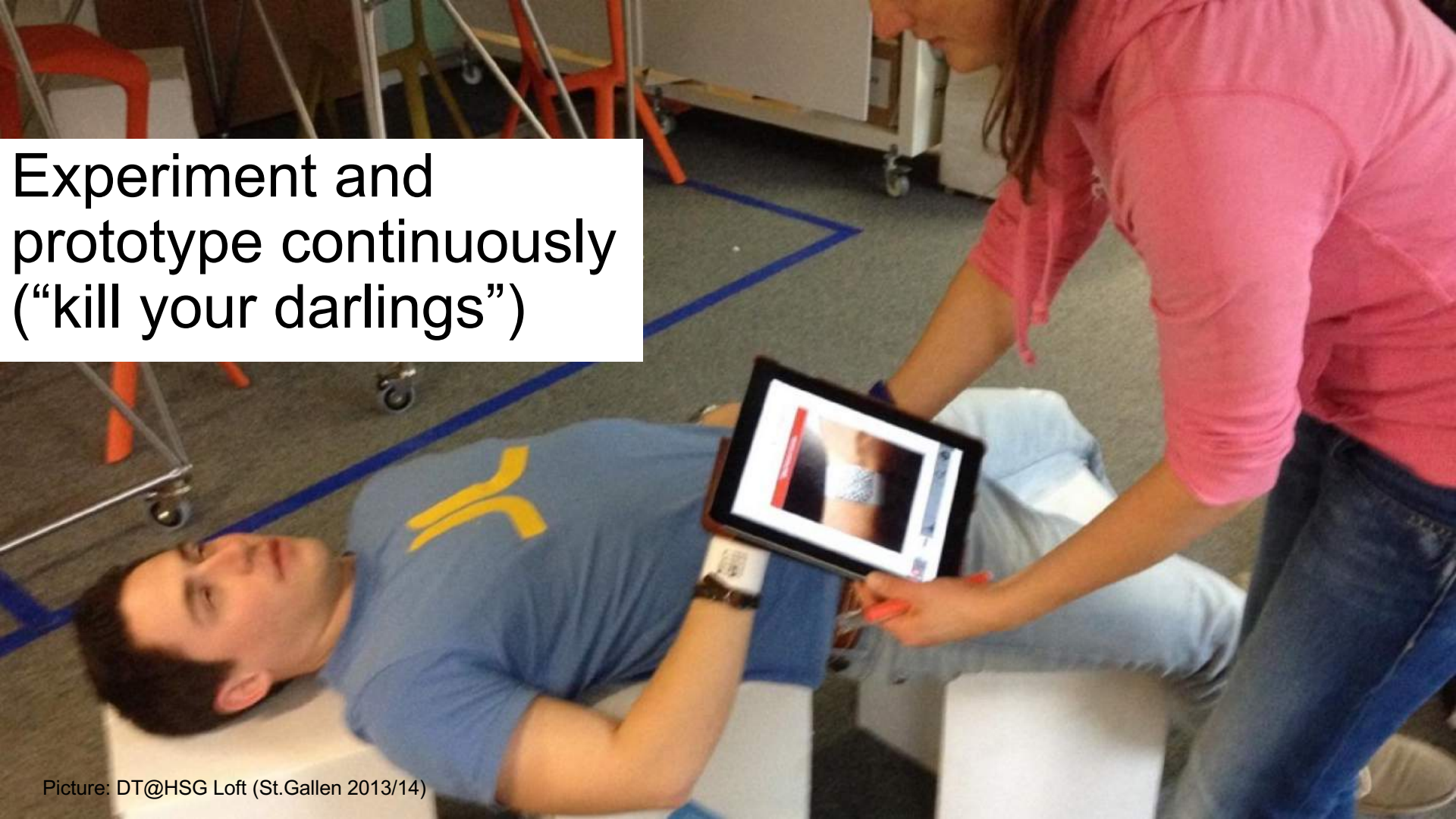
Picture: FIFA Project (DT@HSG 2012/13)

Do not stop at your corporate doors

Picture: DT@HSG (2016)

Making instead of over-thinking

Picture: Stanford ME310 Loft



Picture: DT@HSG Loft (St.Gallen 2013/14)

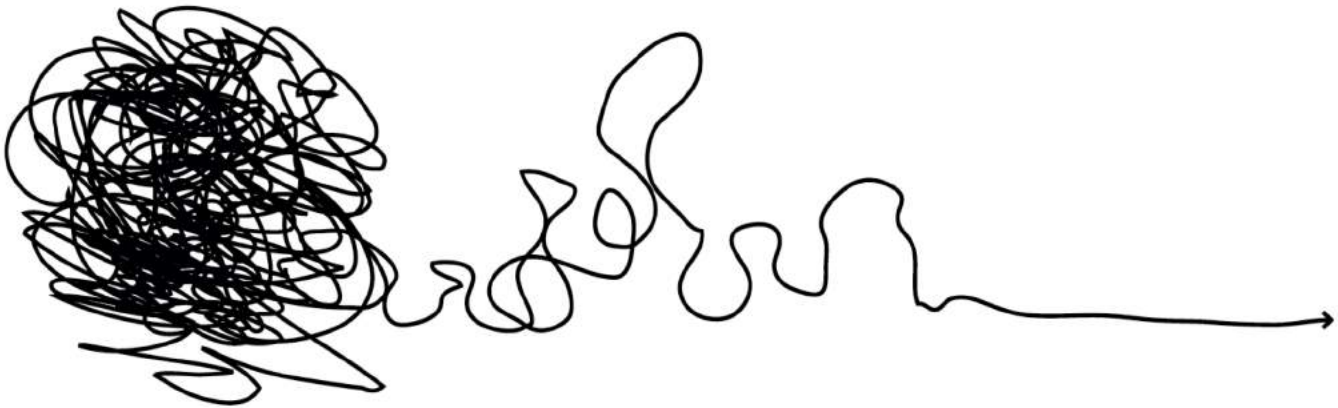
Field testing even in early project phases (”fail forward”)

Picture: DT@HSG (2013/14)

Shape your view with interdisciplinary teams

Source: DT@HSG (2013)

Design Thinking transforms wicked into ill- and well-defined problems



Outline

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1. Design Thinking in a Nutshell

2. **Design Thinking for Requirements Engineering**
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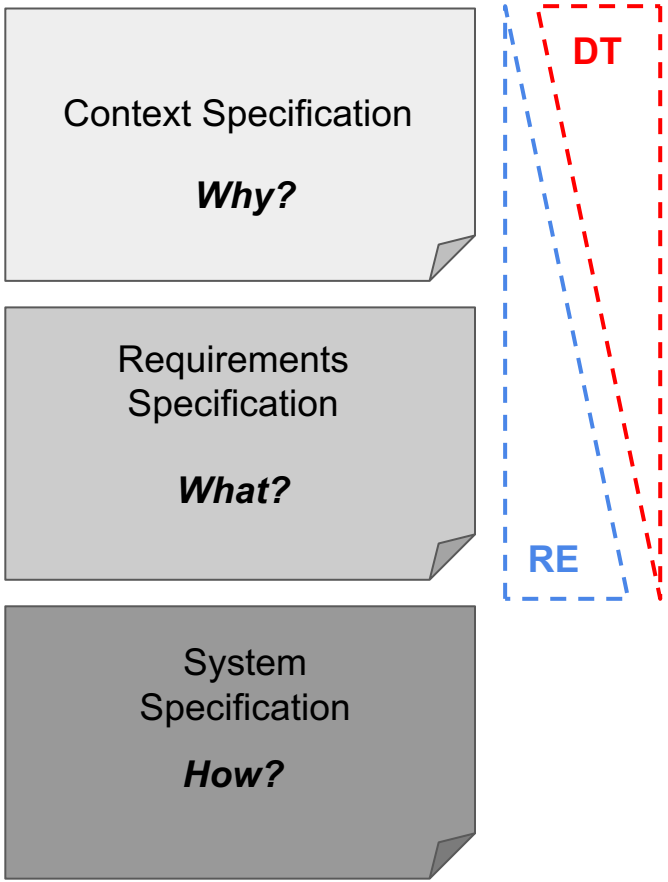
Cross Comparison

DT largely concentrates on **identifying/empathising with the stakeholders and end-users**, and understanding the domain and problem space to enable distilling needs and requirements.

RE typically concentrates on **subsequent requirements elicitation, analysis, and documentation**



Source: Artefact-based Requirements Engineering: The AMDiRE Approach - https://arxiv.org/abs/1611.10024

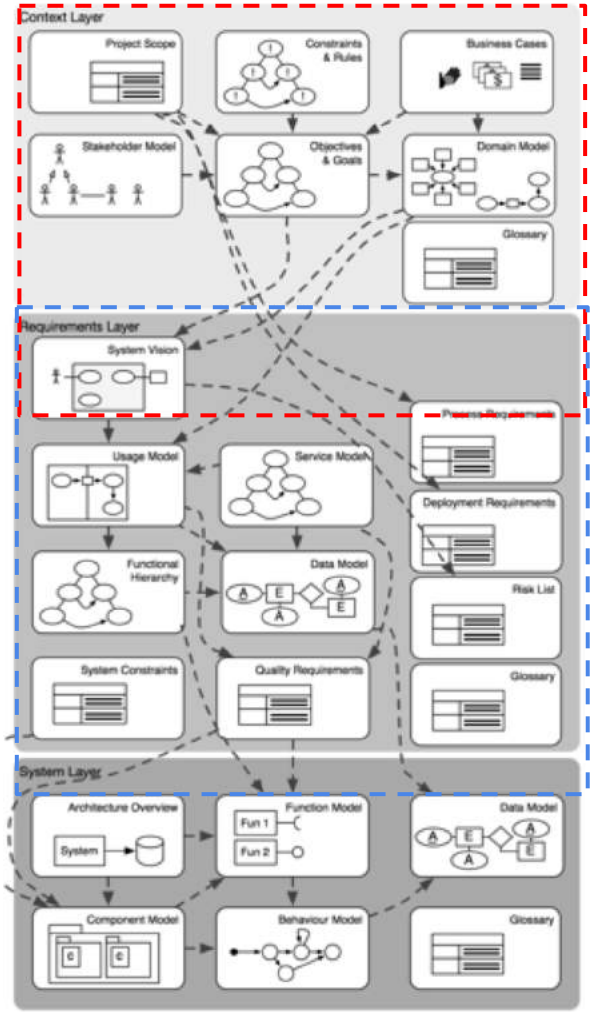
Cross Comparison

DT largely concentrates on...

- … better understanding the problem space by identifying and empathising with stakeholders
- … providing a system vision by defining key (functional) features
- … the rationale for (“formal”) requirements

RE largely concentrates on…

- … identifying, analysing/refining, and specifying/modelling requirements going beyond functional ones



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Design Challenge

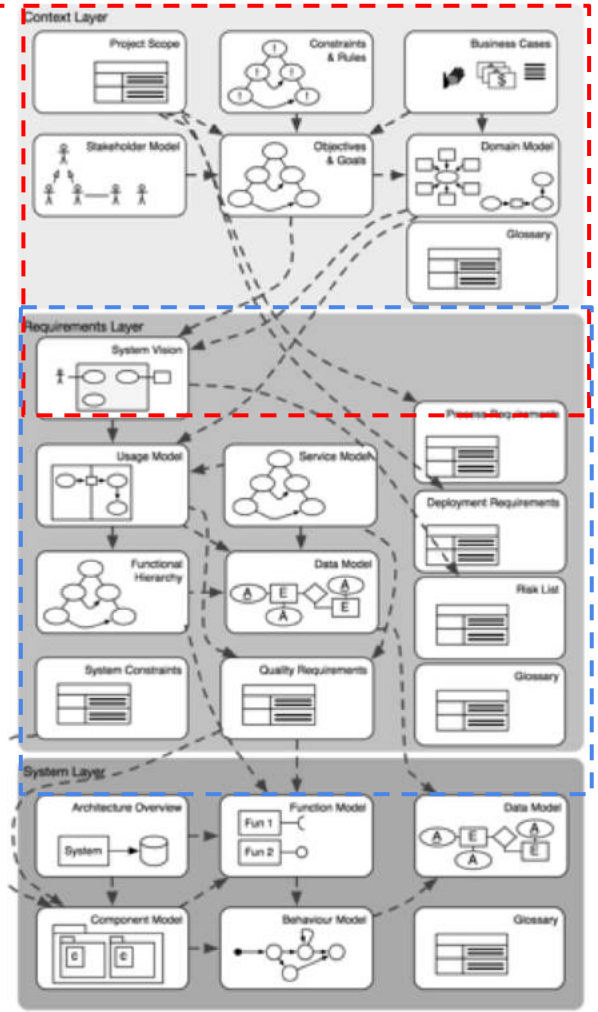
Business model | Stakeholder Map | Persona

Insights | Human model | Ideas | Needs | Opportunity Areas | User journey

Platform Model | Prototype

Service Model | User Test protocols

Exemplary DT Artefacts



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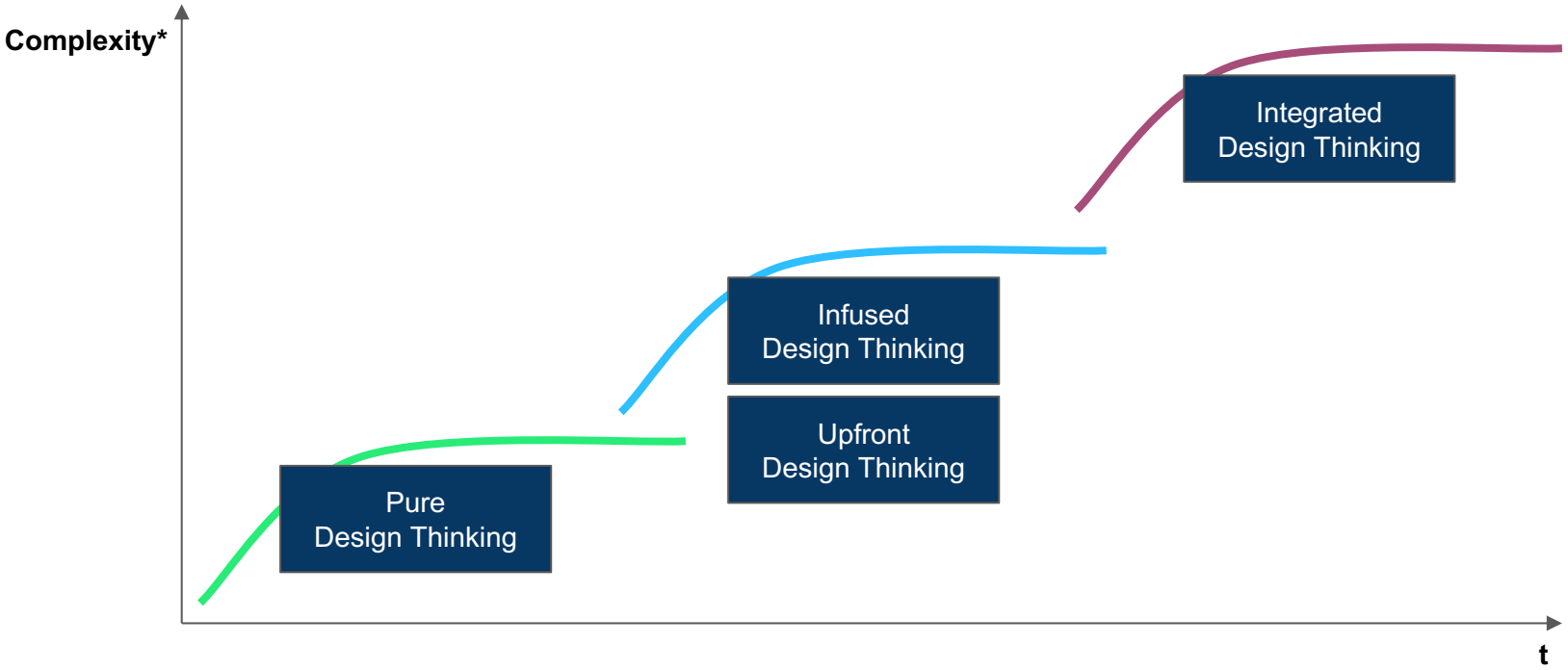
Disclaimer

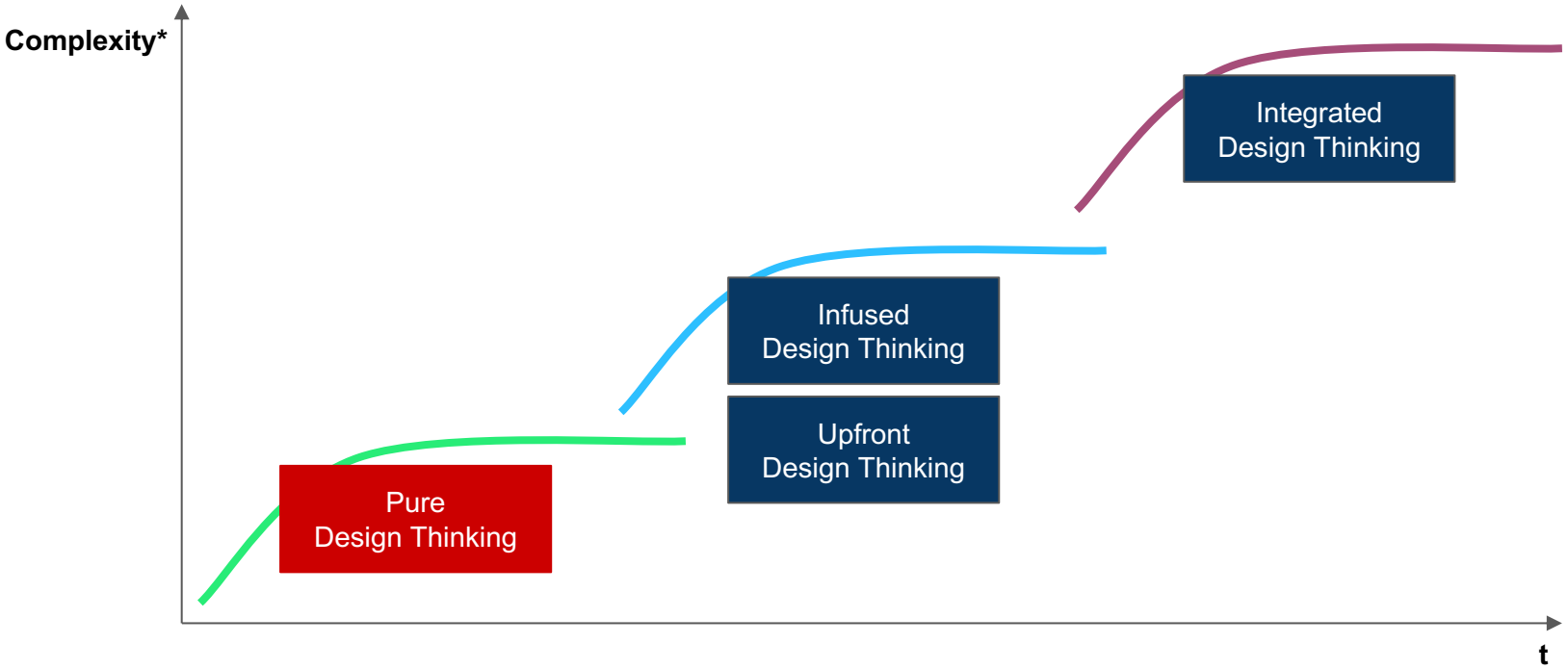
… but many lessons learnt

Evolution of Design Thinking and RE



* Note: one is not per-se “better” than the other; everything has its place

Evolution of Design Thinking and RE



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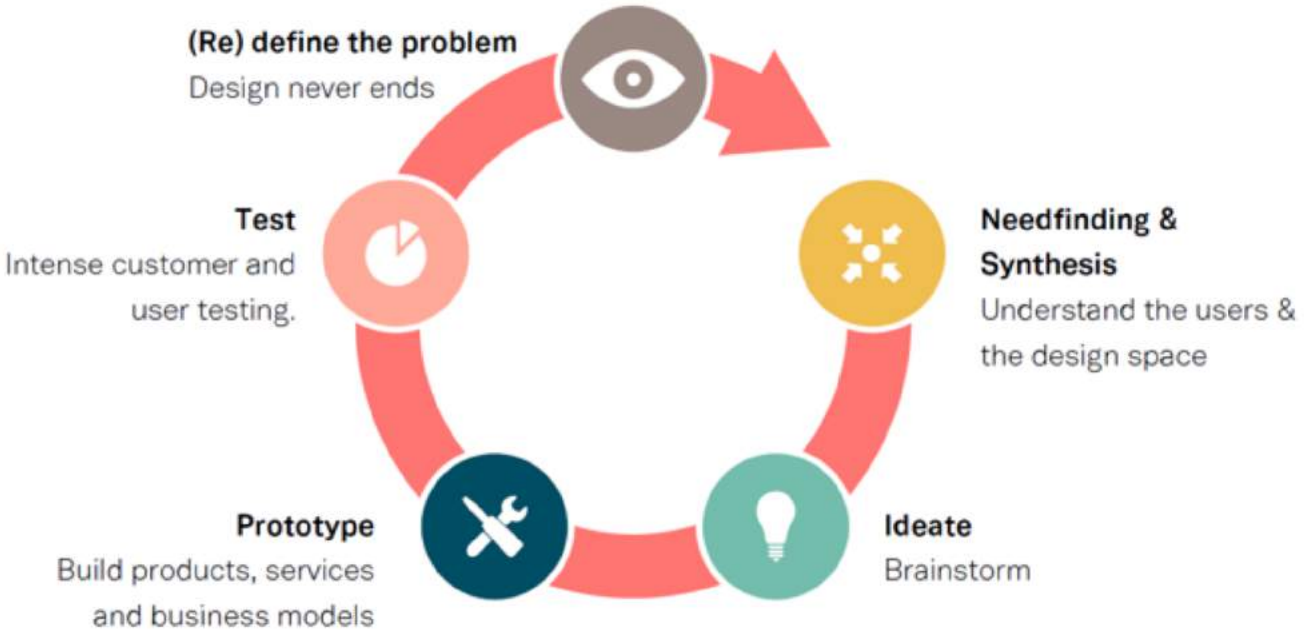
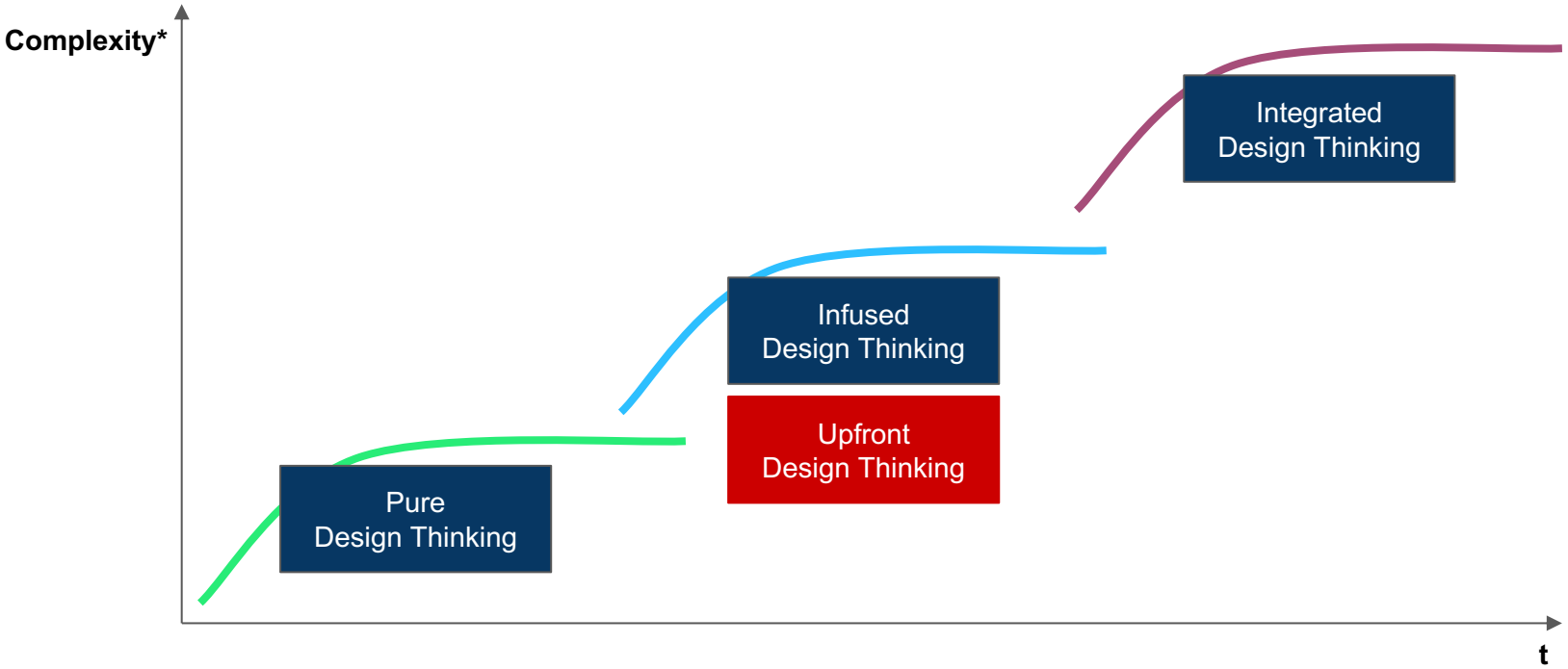
Pure Design Thinking



Take-Aways

- Much like RE, DT shouldn’t suddenly stop
- DT is human-centric, but also team-driven
  - Team members (skills, motivation, participation) are crucial
  - Make explicit implicit assumptions (e.g. to avoid gold plating)
  - Beware dependencies to implicit knowledge
- Potentially working towards the void
  - No immediate counterpart and no institutionalised “hand-shake”
    → Software process model? Needs and team culture?
  - No continuity and potentially no champion
- No guaranteed operationalisation (and feasibility) of prototype

Evolution of Design Thinking and RE



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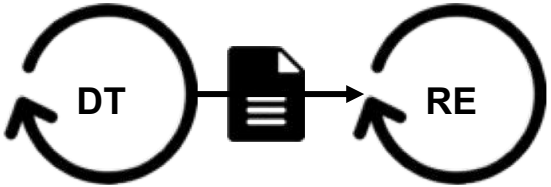
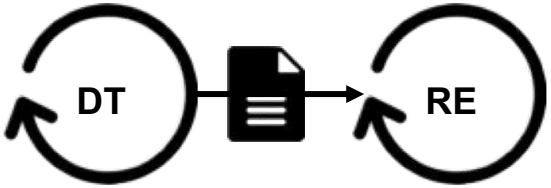
Upfront Design Thinking



- German Software Company (SME)
- Problem Statement: Development of an offering for a new target group (private landlords) in real estate management
- Team: Requirements Engineer, Product Manager, IT-Architect, Designer, Hotline Support, Project Lead, Design Thinking Coach
- Design Thinking Project: 4 months

Upfront Design Thinking



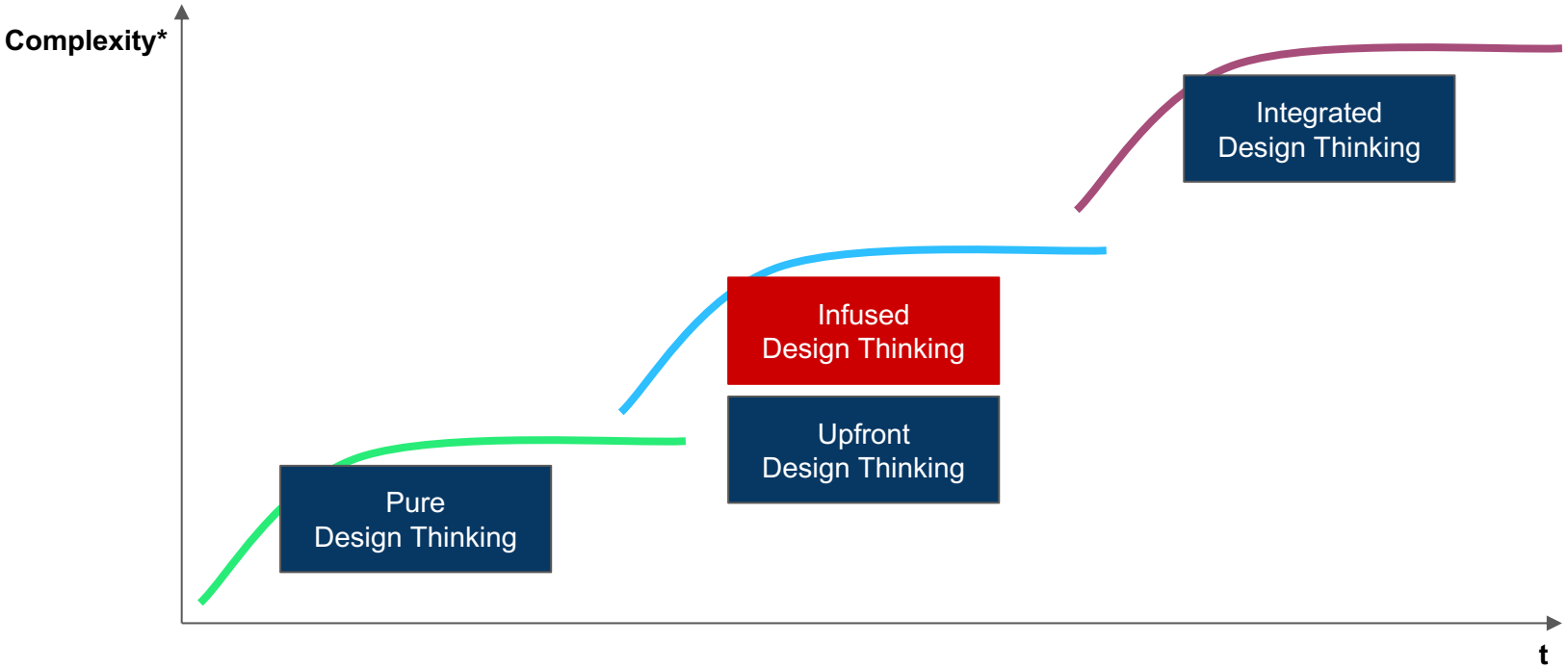
- 12 qualitative interviews
- 1 quantitative questionnaire
- 2 Personas
- 4 prototypes

- User story definition via project team
- User stories and high resolution prototypes are handed over to implementation

Take-Aways

- What works:
  - Fostering a collaborative working environment
  - Fostering a failure tolerant culture through rapid prototyping and continuous experimentation
  - Broadly validated key features / user stories
- Open challenges:
  - Final deliverable via user stories and HighRes prototype
  - No further feedback cycles
  - Potential starvation of results with no implementation (or control over it)

Evolution of Design Thinking and RE



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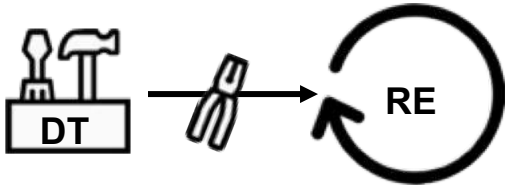
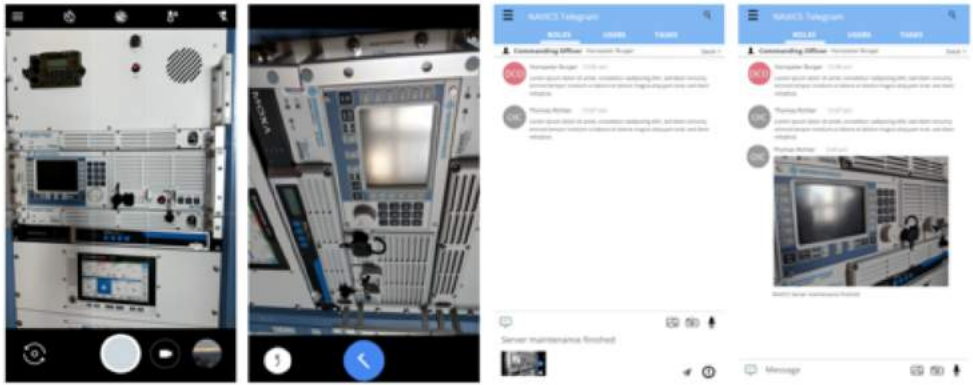
Infused Design Thinking



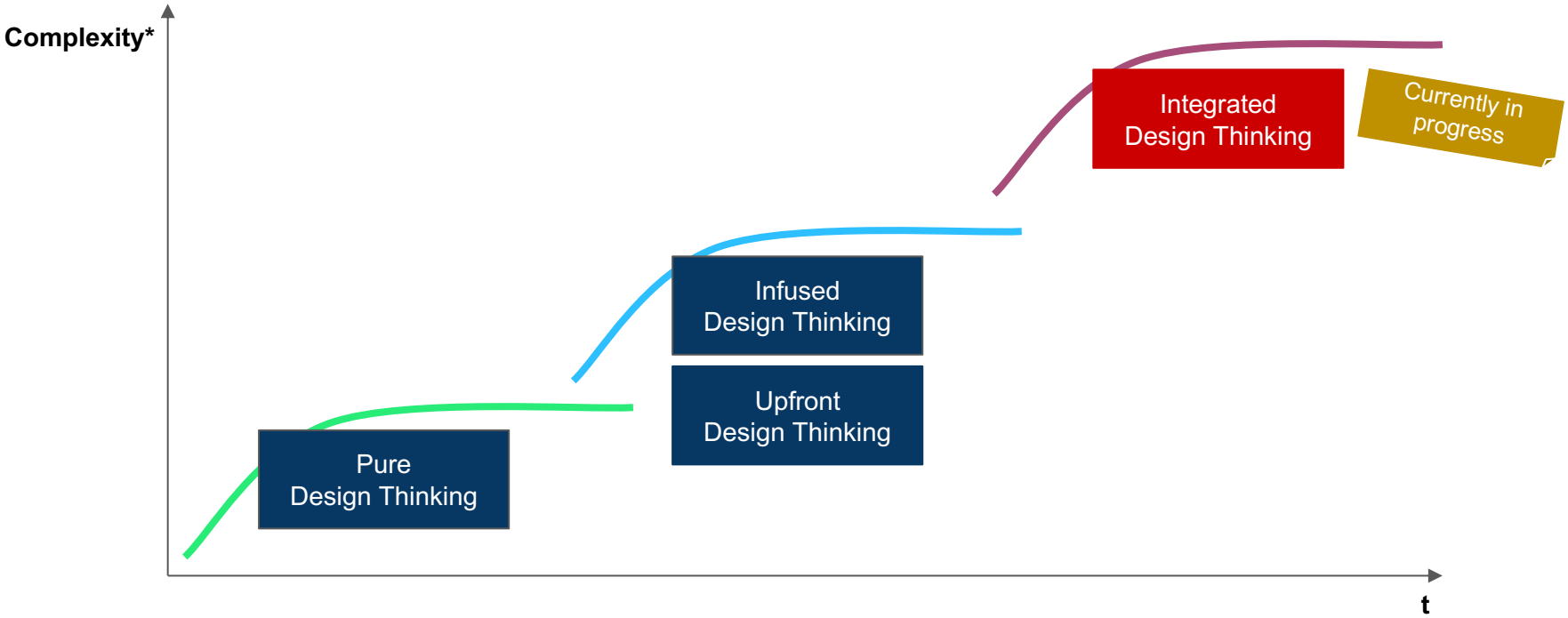
- International Electronics group
- Headquarter in Germany, 10.500 employees
- Needfinding and Prototyping Infusion



Take-Aways

- What works:
  - Fostering a broader collaborative working environment
  - Integrating creative idea generation in context of a software development life cycle
- Open challenges:
  - No further development-critical artefacts, e.g. NFRs, technical constraints, or data models
  - Still no seamless and sustainable integration of DT methods into software development activities
  - Limited learning curve for reuse in further projects

Evolution of Design Thinking and RE



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Integrated Design Thinking approach

- German Utility Company
- Problem statement: Development of an offering to boost photovoltaik sales
- Team: multidisciplinary
- Design Thinking process: 3 months
- Integrated approach: 12+ months

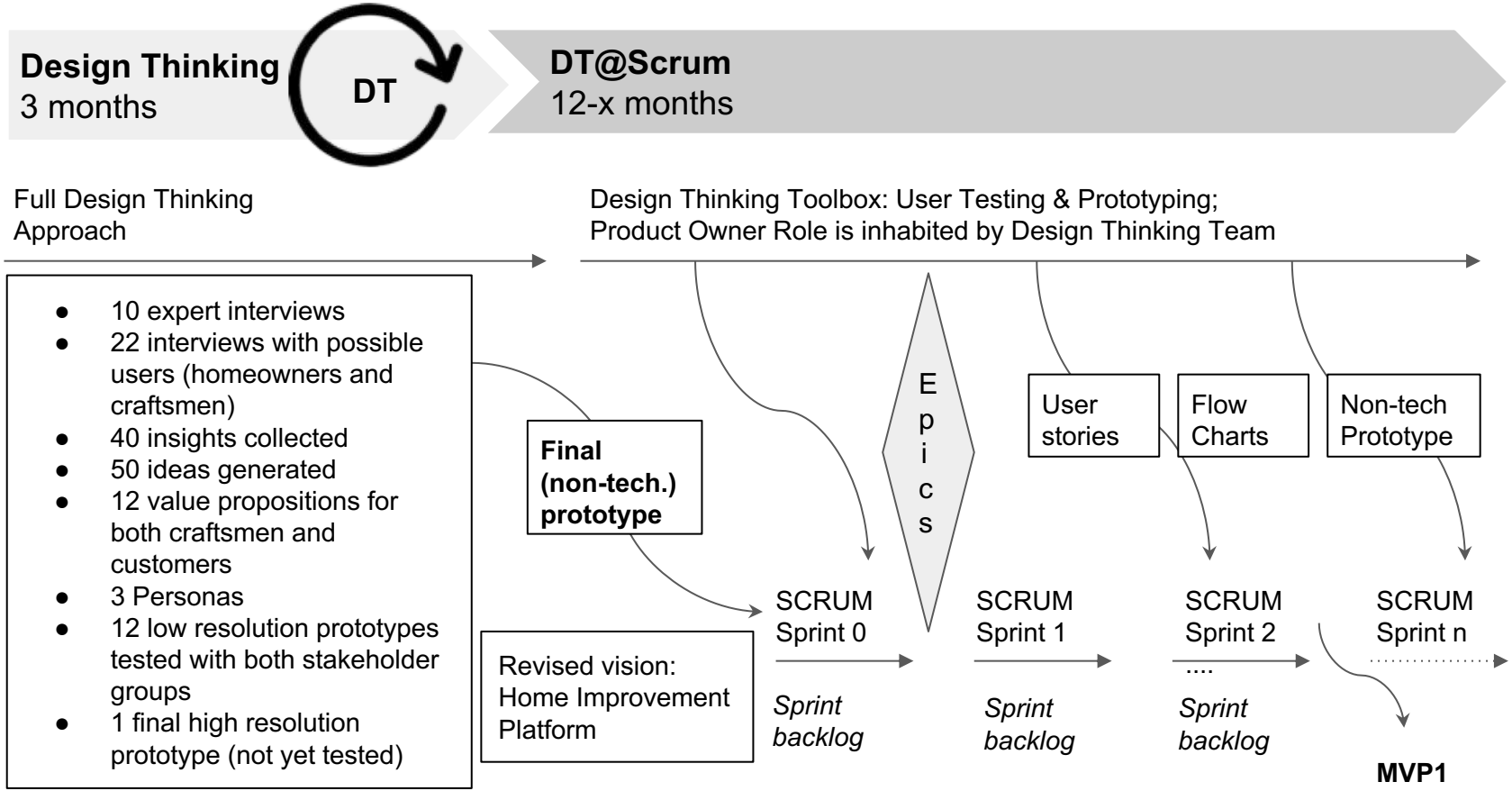
Design Thinking
3 months

Full Design Thinking Approach

- 10 expert interviews
- 22 interviews with possible users (homeowners and craftsmen)
- 40 insights collected
- 50 ideas generated
- 12 value propositions for both craftsmen and customers
- 3 Personas
- 12 low resolution prototypes tested with both stakeholder groups
- 1 final high resolution prototype (not yet tested)

Final (non-tech.) prototype

Revised vision: Home Improvement Platform


Design Thinking
3 months
DT
DT@Scrum
12-x months
Full Design Thinking Approach
Design Thinking Toolbox: User Testing & Prototyping;
Product Owner Role is inhabited by Design Thinking Team
10 expert interviews
22 interviews with possible users (homeowners and craftsmen)
40 insights collected
50 ideas generated
12 value propositions for both craftsmen and customers
3 Personas
12 low resolution prototypes tested with both stakeholder groups
1 final high resolution prototype (not yet tested)
Final (non-tech.) prototype
Revised vision: Home Improvement Platform
Epics
User stories
Flow Charts
Non-tech Prototype
SCRUM Sprint 0
SCRUM Sprint 1
SCRUM Sprint 2
....
SCRUM Sprint n
Sprint backlog
Sprint backlog
Sprint backlog
MVP1

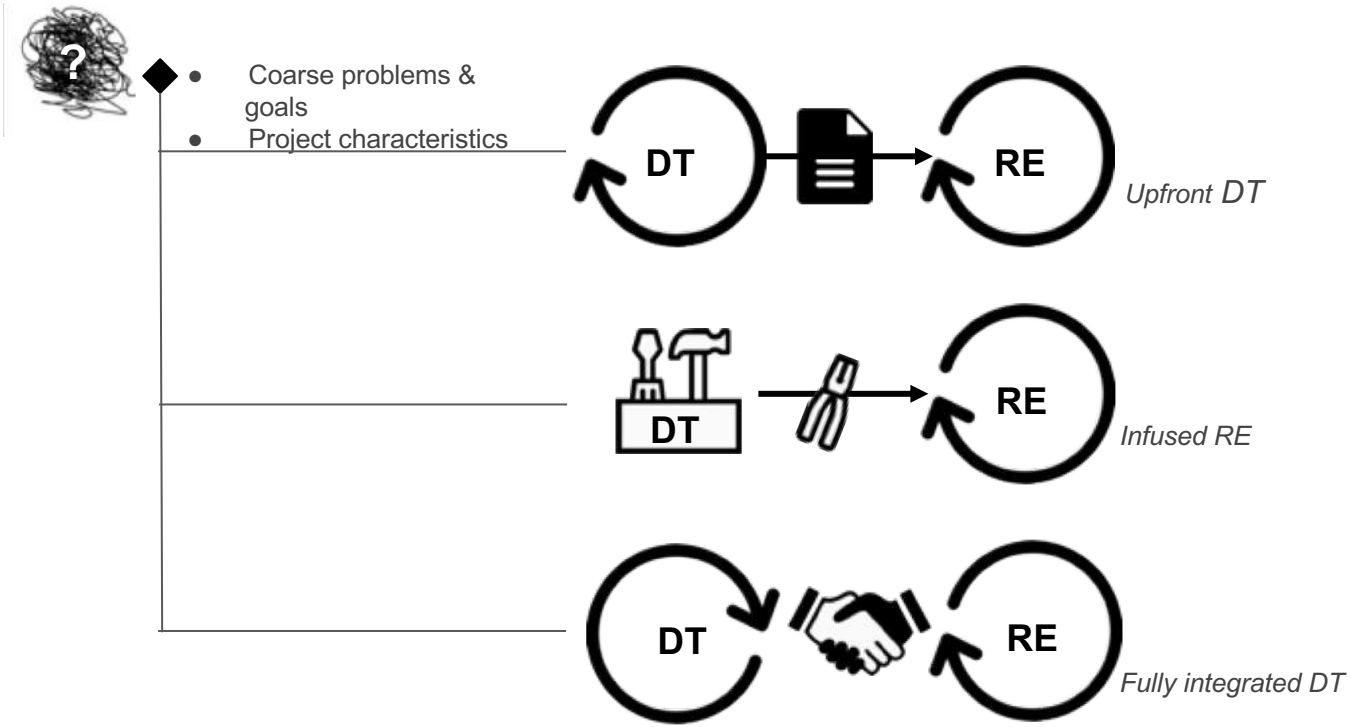
Take-Aways

- What works:
  - DT as a structured, domain-agnostic approach to requirements elicitation
  - Extended arm into wicked problems and re-define actual problems and SW system context
  - Sufficiently correct and complete key features / user stories via continuous experimentation and testing of non-technical and technical prototypes
  - Clear roles and responsibilities
- Currently open challenges:
  - Difficulty in integrating further RE-specific artefacts, e.g. NFRs, technical constraints, or data models

How can we efficiently integrate DT and RE?

Reminder

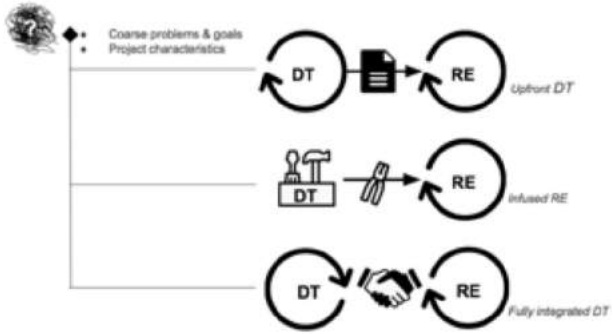
Towards a pragmatic approach to human-centric RE



Open research challenges

General Challenges

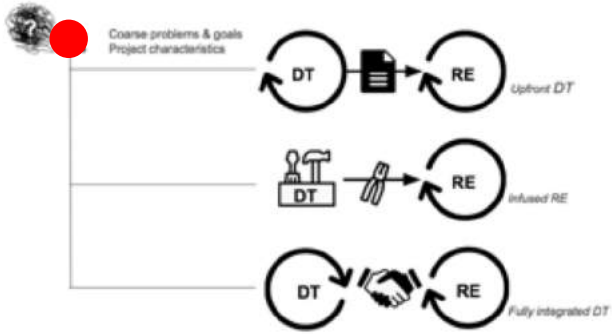
- Principles: Which principles and approaches in DT can be found in more holistic human-centred software development approaches and how do they differ?
- Boundary objects: How can artefacts with similar purposes, but different forms, be integrated?



Open research challenges

Project Influences

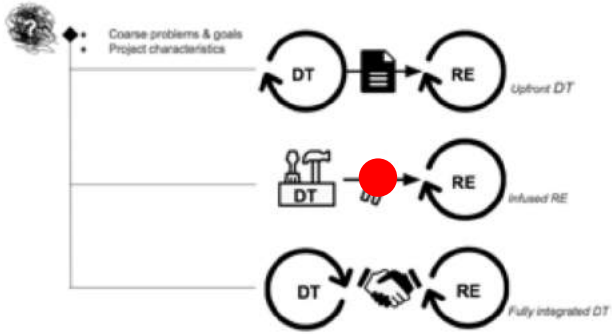
- How can problems be efficiently classified?
- What are typical project situations which influence the choice of a strategy?
- How do these situations and the class of systems influence the choice of a strategy and single methods?
- How can these situations be characterised and assessed in early stages of a project (with which confidence)?



Open research challenges

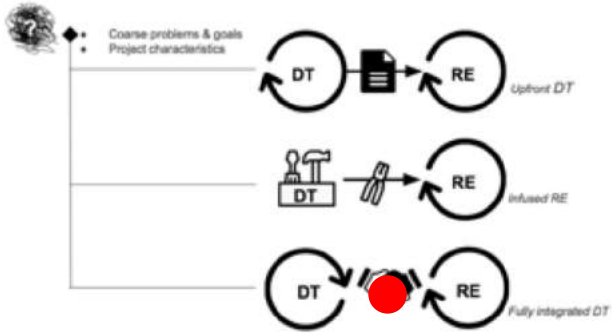
Method adoption

- Which methods in DT can be found in / reused for other software engineering disciplines (e.g. HCI, TDD)?
- How do these methods differ? How can they be integrated?



Open research challenges

Interface and Operationalisation



Interfaces

- How can artefacts, roles, and methods be seamlessly integrated?
- Which artefacts do overlap? Are shifts in roles and responsibilities necessary?
- How can milestones be efficiently defined?

Operationalisation

- How can resulting processes be integrated (into the overall life cycle) - for instance SCRUM?
- How can resulting processes be tailored?

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