UNIVERSITY OF OSLO

IN4380 – Digital Transformation of Healthcare

Lecture 12: Designing and executing digital health interventions

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April 24th 2025



Agenda

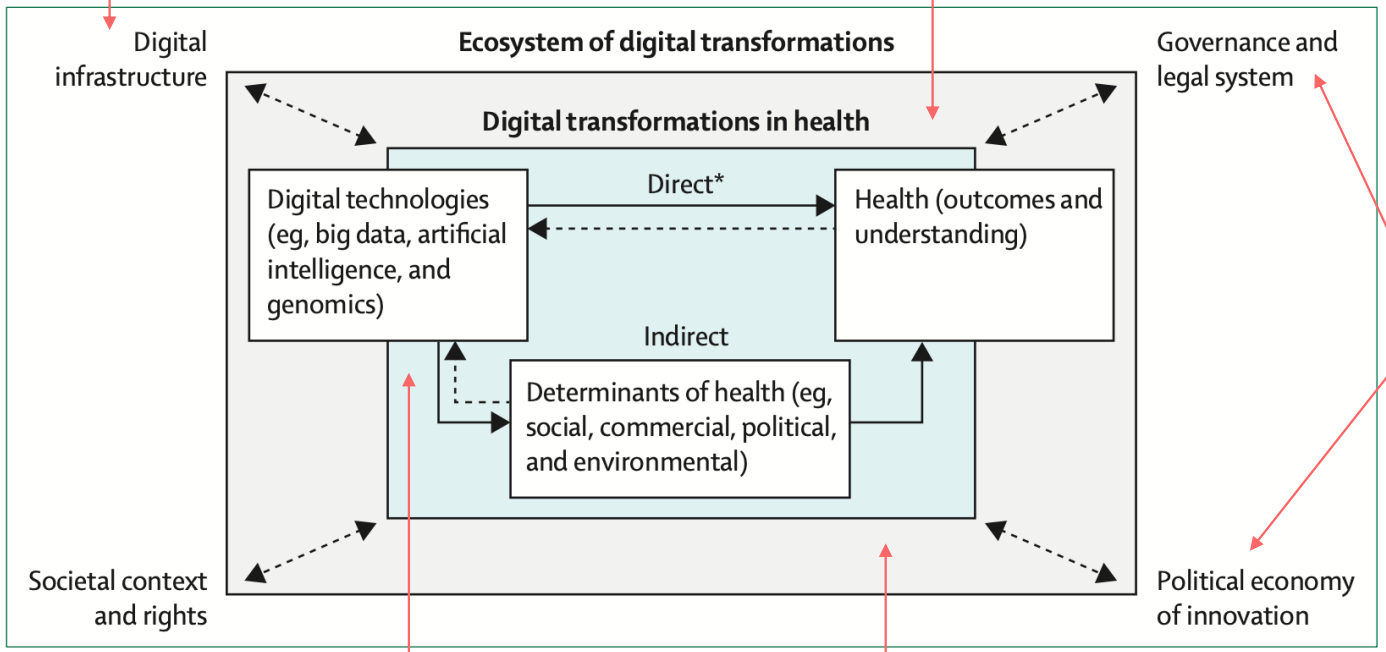
- Overview of the BioDesign framework.
- Background: The origin and principles of Participatory Design.
- Deep dives into BioDesign methods:
  - Needs identification:
    - Observations and interviews.
    - Needs selection.
  - Invention:
    - Prototyping: development and testing

Metaperspective on digital health

Lecture 3:Digital infrastructure

Lecture 11: Institutional and organizational change in digitalizing health services
Lecture 12: Designing and executing digital health services
Lecture 13: The digital change agent

Lecture 1:What is digital health?



Lecture 2: Political economy of innovation & governance and legal system

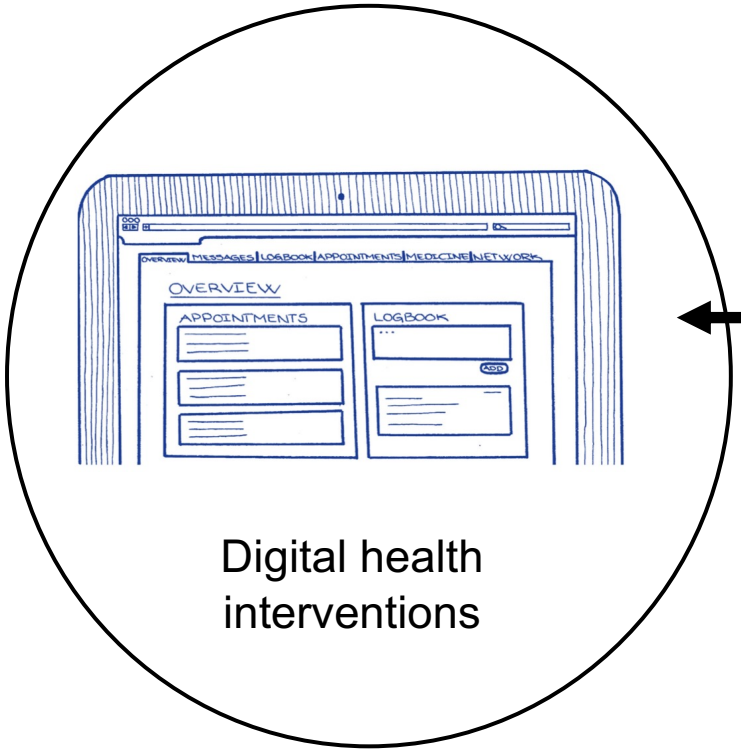
Figure 2: **Conceptualising digital transformations of health**
*Adoption of, interaction with, and governance of digital technologies for self-monitoring, in health care and in health systems.

Lecture 7: eHealth and telemedicine
Lecture 8: mHealth and wearable technologies
Lecture 9: Welfare technologies
Lecture 10: Artificial Intelligence and health data analytics

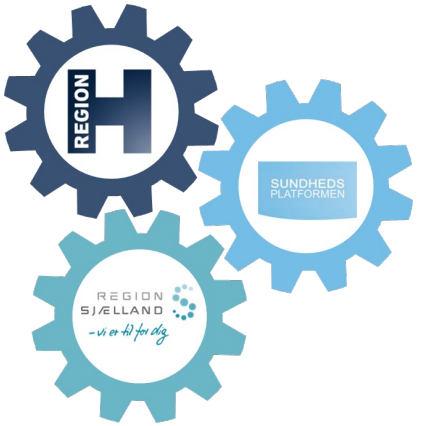
Lecture 4: Primary healthcare
Lecture 5: Secondary healthcare
Lecture 6: Cross-sectoral healthcare

Lecture 14: Course summary

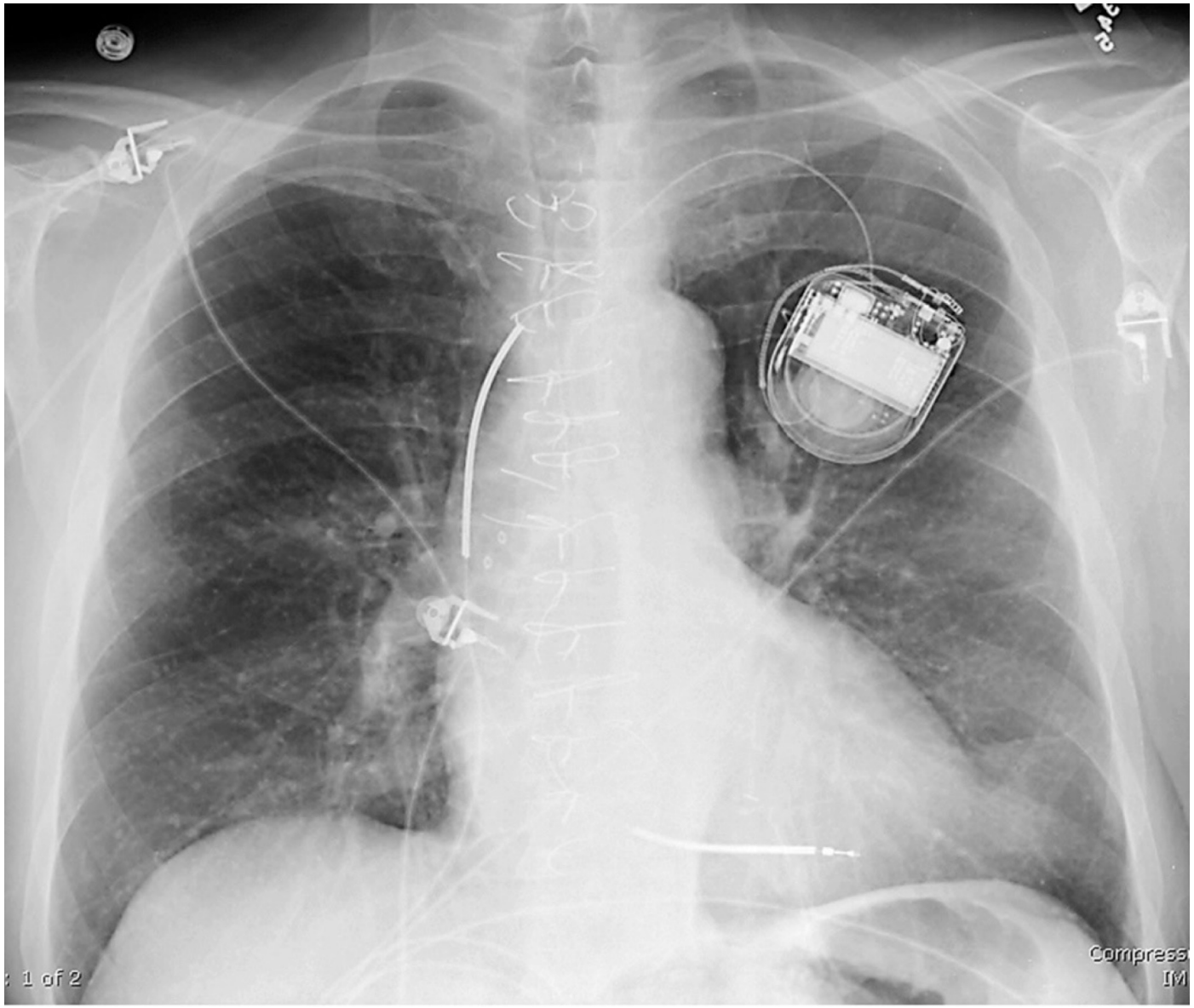
Relevance on the spectrum of Health Information Systems



Digital health interventions



Platforms and information infrastructures


1 of 2

Case: Implantable Cardioverter Defibrillator (ICD)

- A type of pacemaker that monitors for cardiac fibrillation and restores sinus rhythm by giving a powerful shock.

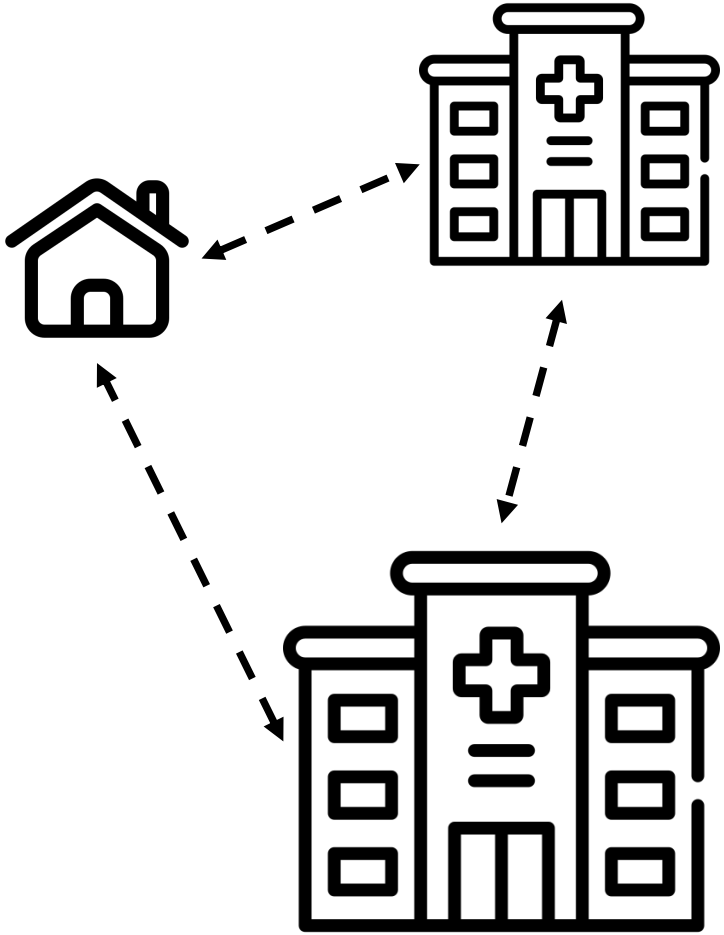
- The device is able to transmit data to relevant health professionals to enable remote monitoring of the device and the patients condition.



Distributed care of ICD patients in Denmark

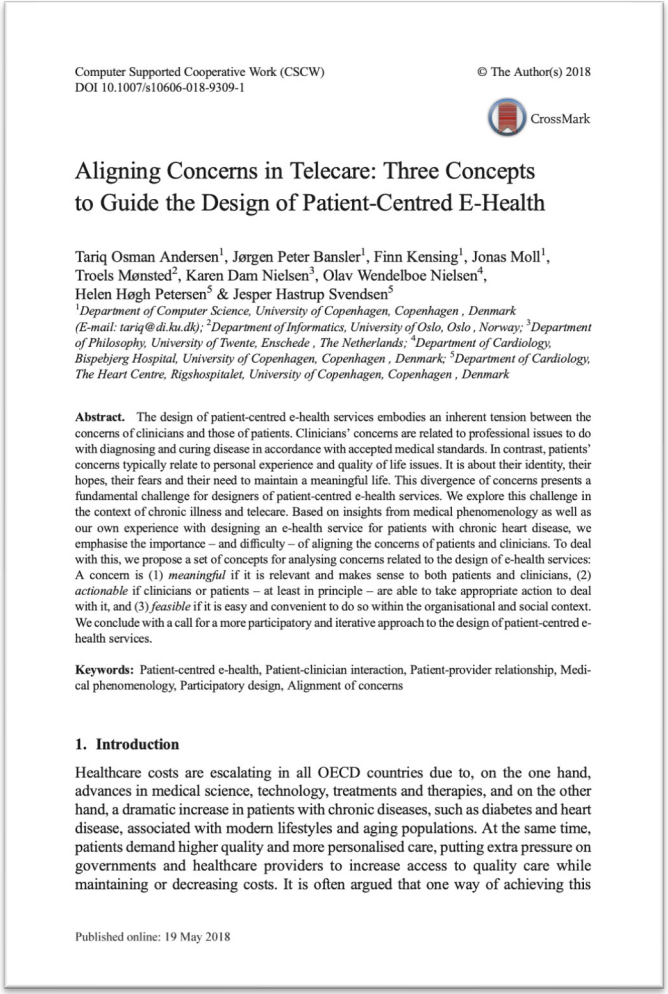
ICD care in DK is distributed across (at least) three settings:

- The hospital ICD center: Responsible for implantation and monitoring of the device.
- The local hospital: Responsible for monitoring the general condition of the patient and prescription of medicine.
- The patient's home: Responsible for transmitting data and reporting symtoms.



The starting point: Known needs in ICD care

- Need for improved communication and coordination between the involved hospitals.
- Need for improved communication between patient and ICD center and support for interpreting own symptoms.
- Purpose of paper: To present design guidelines for telecare based on experiences from the ICD project.



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Aligning Concerns in Telecare: Three Concepts to Guide the Design of Patient-Centred E-Health

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Abstract. The design of patient-centred e-health services embodies an inherent tension between the concerns of clinicians and those of patients. Clinicians' concerns are related to professional issues to do with diagnosing and curing disease in accordance with accepted medical standards. In contrast, patients' concerns typically relate to personal experience and quality of life issues. It is about their identity, their hopes, their fears and their need to maintain a meaningful life. This divergence of concerns presents a fundamental challenge for designers of patient-centred e-health services. We explore this challenge in the context of chronic illness and telecare. Based on insights from medical phenomenology as well as our own experience with designing an e-health service for patients with chronic heart disease, we emphasise the importance – and difficulty – of aligning the concerns of patients and clinicians. To deal with this, we propose a set of concepts for analysing concerns related to the design of e-health services: A concern is (1) *meaningful* if it is relevant and makes sense to both patients and clinicians, (2) *actionable* if clinicians or patients – at least in principle – are able to take appropriate action to deal with it, and (3) *feasible* if it is easy and convenient to do so within the organisational and social context. We conclude with a call for a more participatory and iterative approach to the design of patient-centred e-health services.

Keywords: Patient-centred e-health, Patient-clinician interaction, Patient-provider relationship, Medical phenomenology, Participatory design, Alignment of concerns

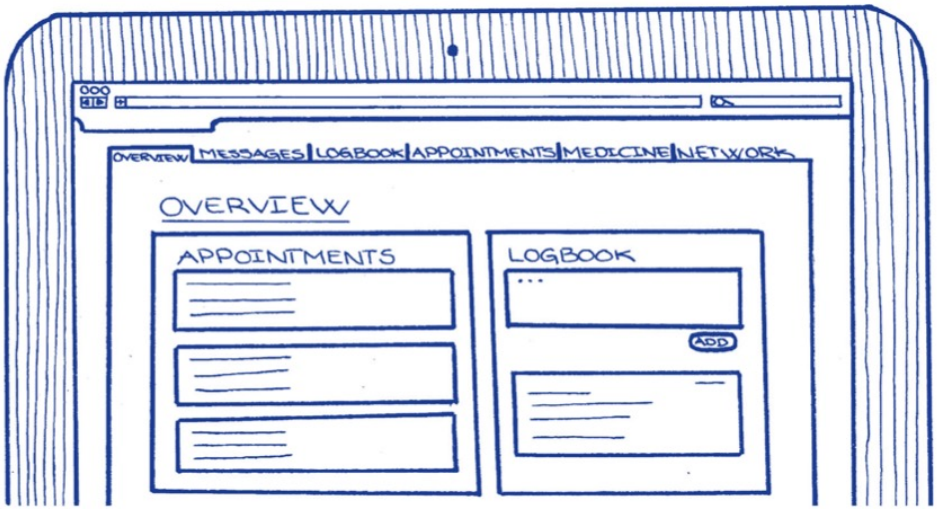
1. Introduction

Healthcare costs are escalating in all OECD countries due to, on the one hand, advances in medical science, technology, treatments and therapies, and on the other hand, a dramatic increase in patients with chronic diseases, such as diabetes and heart disease, associated with modern lifestyles and aging populations. At the same time, patients demand higher quality and more personalised care, putting extra pressure on governments and healthcare providers to increase access to quality care while maintaining or decreasing costs. It is often argued that one way of achieving this

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The core concept: MyRecord

- Patient record aimed at enabling patients to engage with clinicians. Designed as add-on to existing remote monitoring system.
- Main features:
  - Overview
  - Messages
  - Logbook
  - Appointments
  - Medication list
  - Patient network



The core challenge: Diverging meanings of illness and disease

Patients and physicians are often concerned with very different aspects of the same condition:

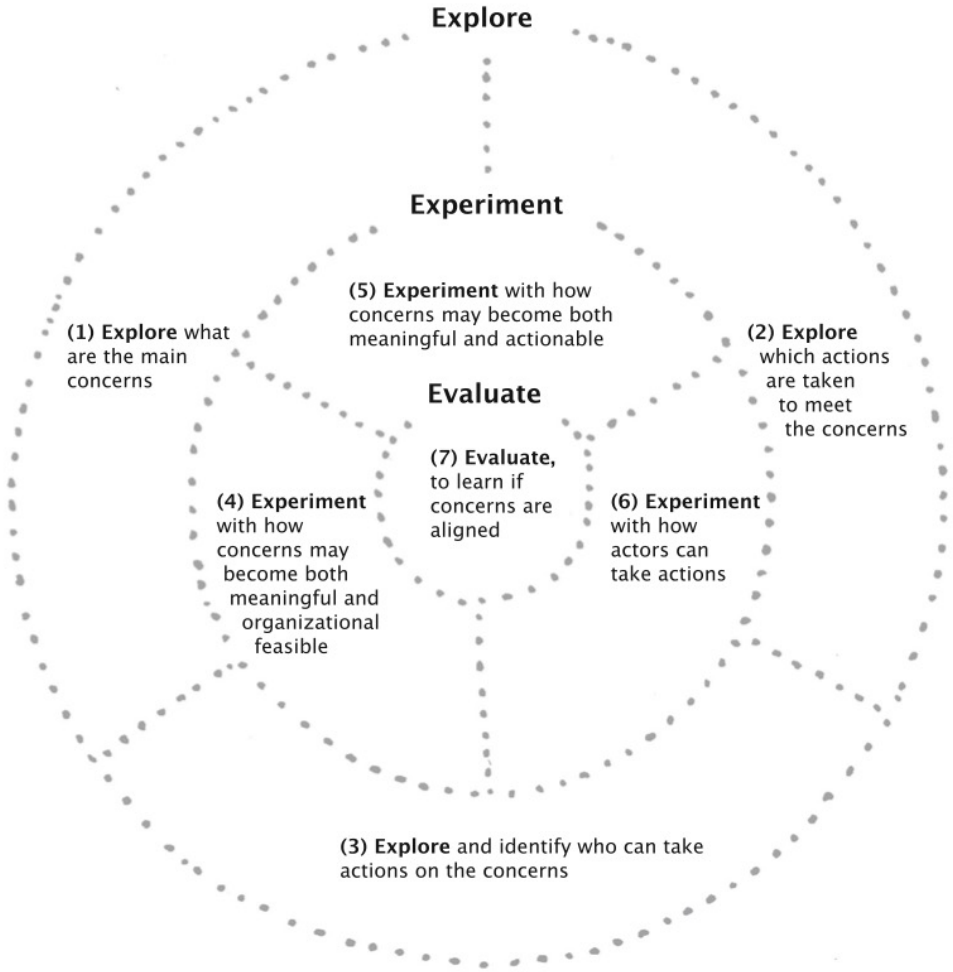
- Physicians typically focus on isolated conditions using biomedical terms such as symptoms, diagnoses, pathology, treatment, and prognosis.
- Patients typically experience illness as a unique, personal event that transforms their bodily awareness and disrupts their everyday lives, including their roles and relationships with others.

Consequence: In design of telecare, it is essential to develop the design in a way that bring these concerns into functional allignment.

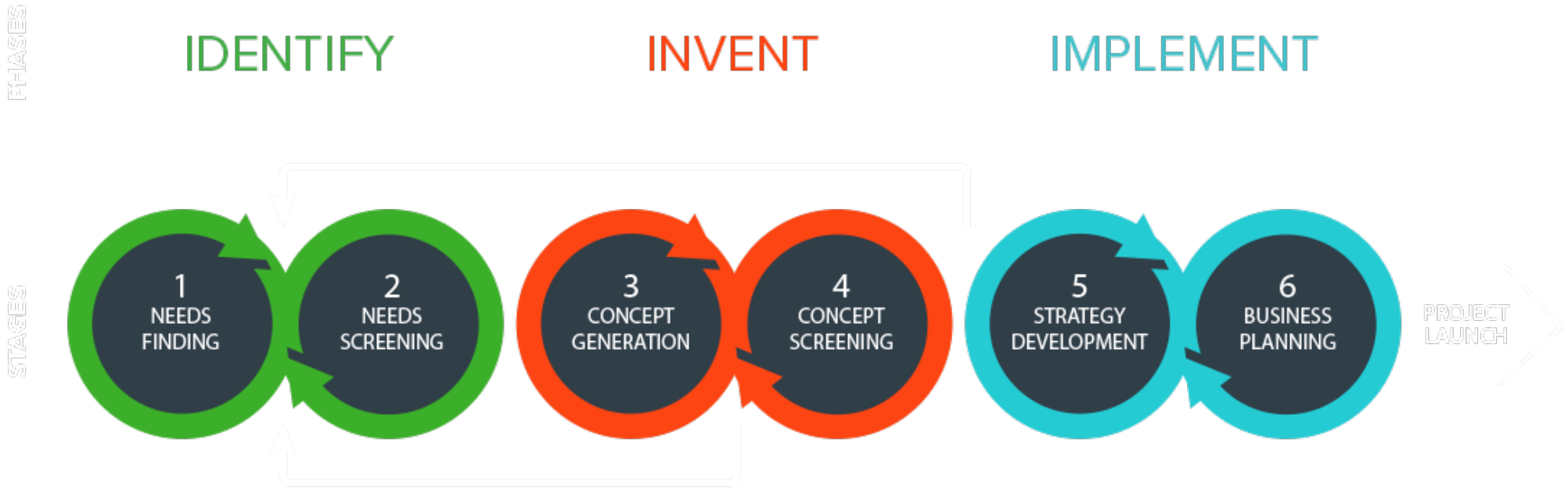




The methodical framework in Andersen et al (2018)



The Biodesign process



Some background: The origins of Participatory Design



April 1977: 141 dage uden Berlinske Tidende. Politiet i færd med at fjerne aktivister, der foretager blokade af Berlinske. Den ny edb-teknologi gjorde det muligt for andre end typografer at udføre bestemte arbejdsfunktioner.

Kilde: PET's arkiv

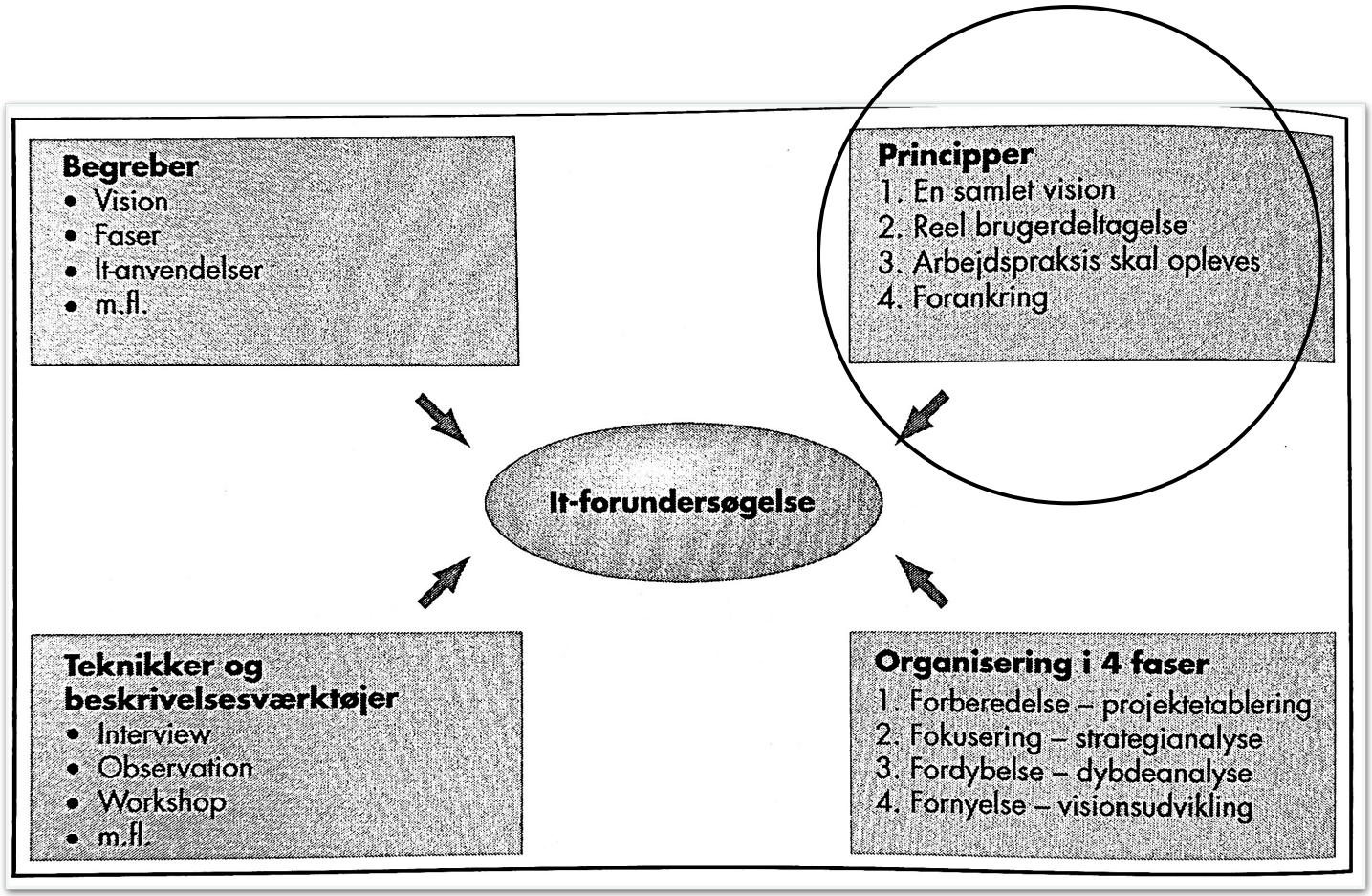
Professionalizing Participatory Design: The MUST method





Bødker, K., F. Kensing og J. Simonsen (2008): Professionel it-forundersøgelse: - grundlag for brugerdrevet innovation (2 udg.). Samfundslitteratur.

Key resources in the MUST method

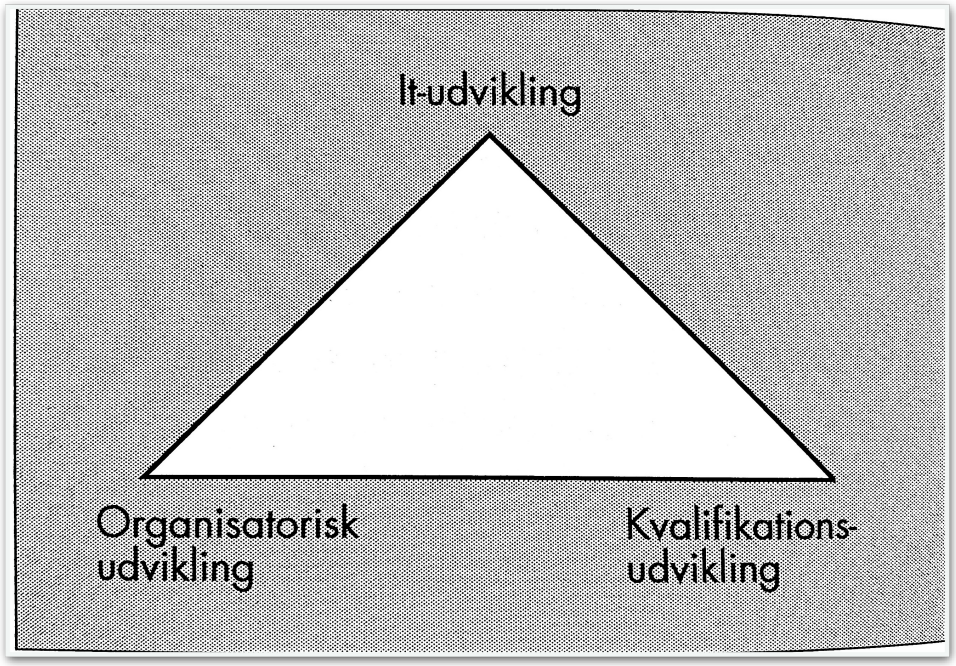


The principle of a unified vision

A good vision for change strikes a balance between:

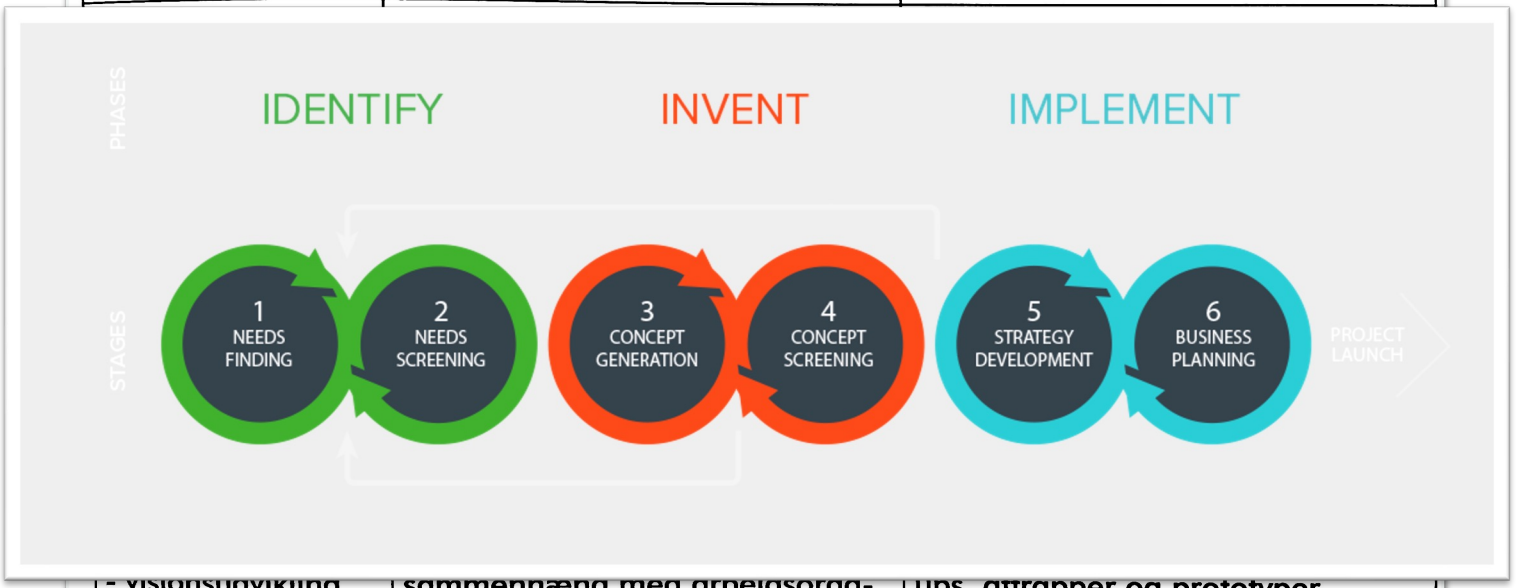
- The required IT development.
- The required organizational development.
- The development of new competences for the users of the system.

This requires learning about both the new system, the associated practices, and the surrounding organization (including its business model and governance structure).

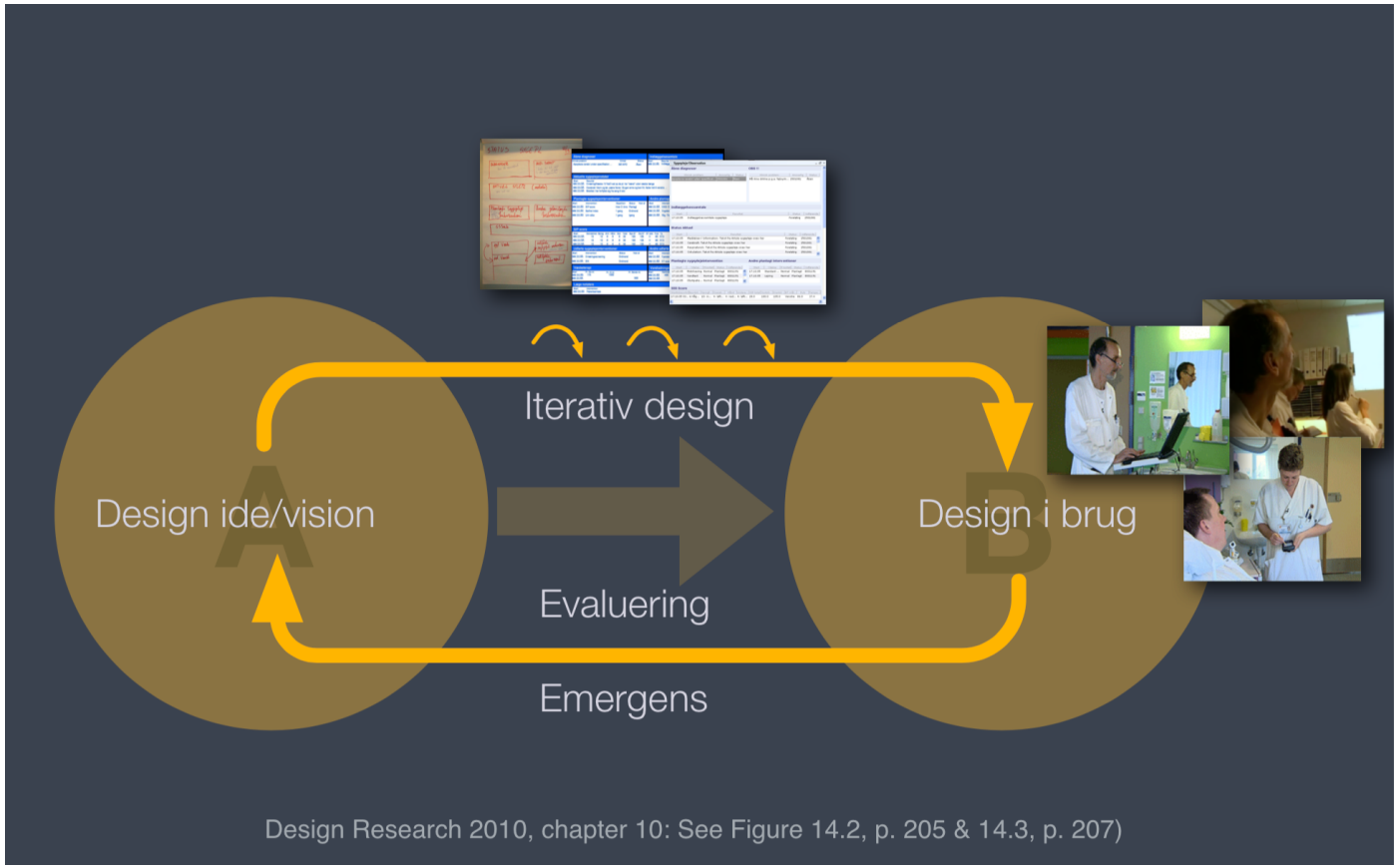


The four phases of a MUST method

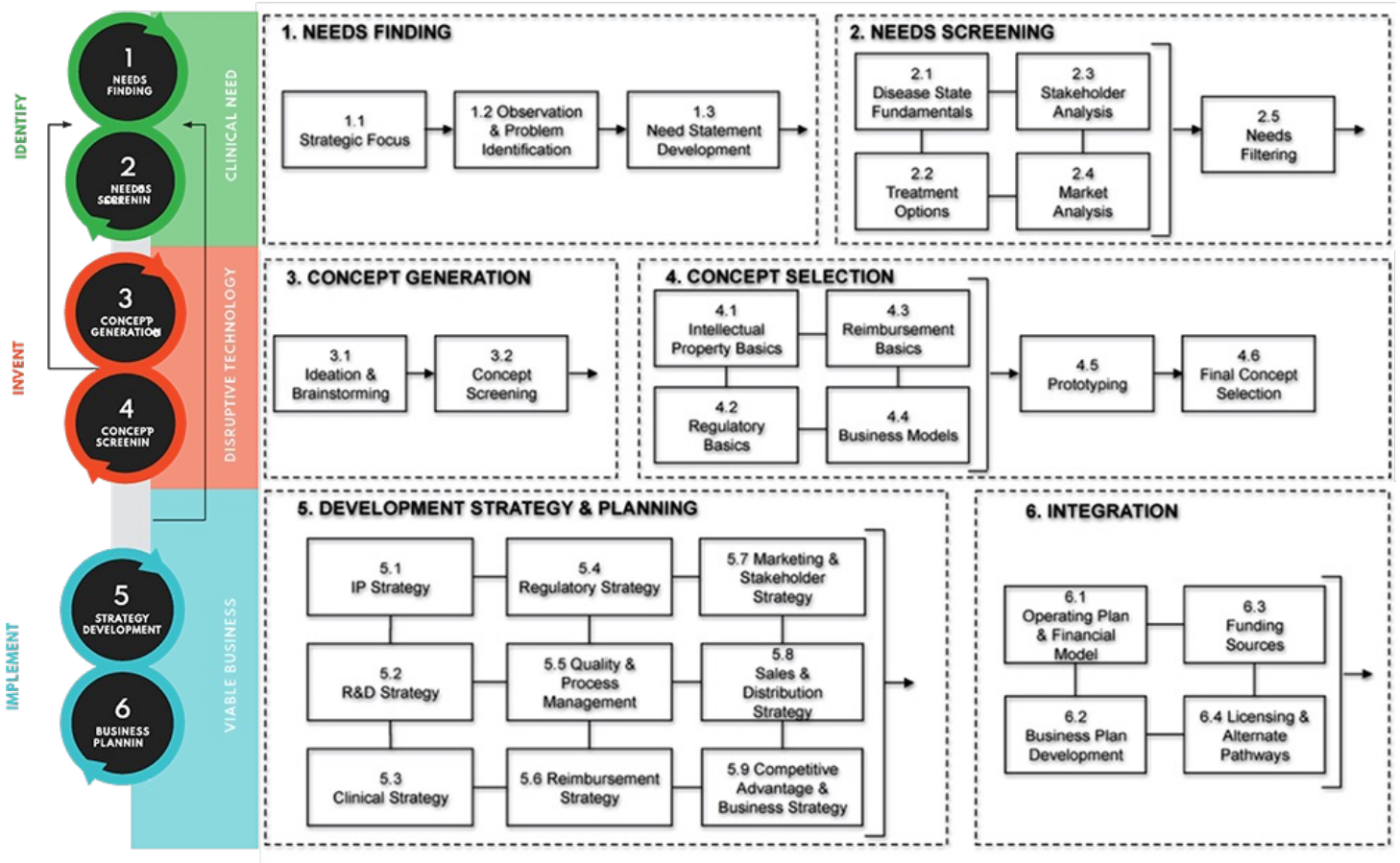
Faser	Fokus	Resultat – beslutninger
- visionsudvikling	sammenhæng med arbejdsorganisering og kvalifikationer Implementeringsprojektet	ups, affrapper og prototyper – hvilke visioner skal implementeres, og hvordan skal dette foregå



Remember: digitalization involves emergent change

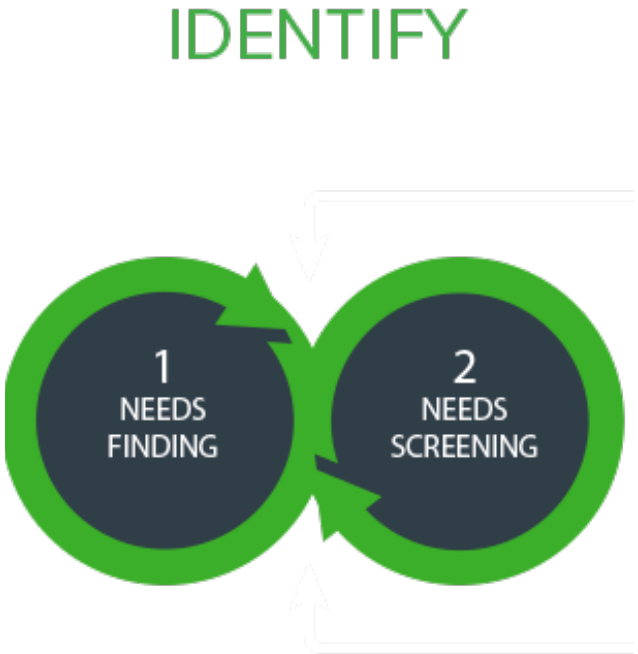


The Biodesign framework



Phase 1: Identify needs

The purpose of this phase is to identify a compelling, unmet health-related need and to become an expert in that need through primary and secondary research.



Most important tasks and technique:

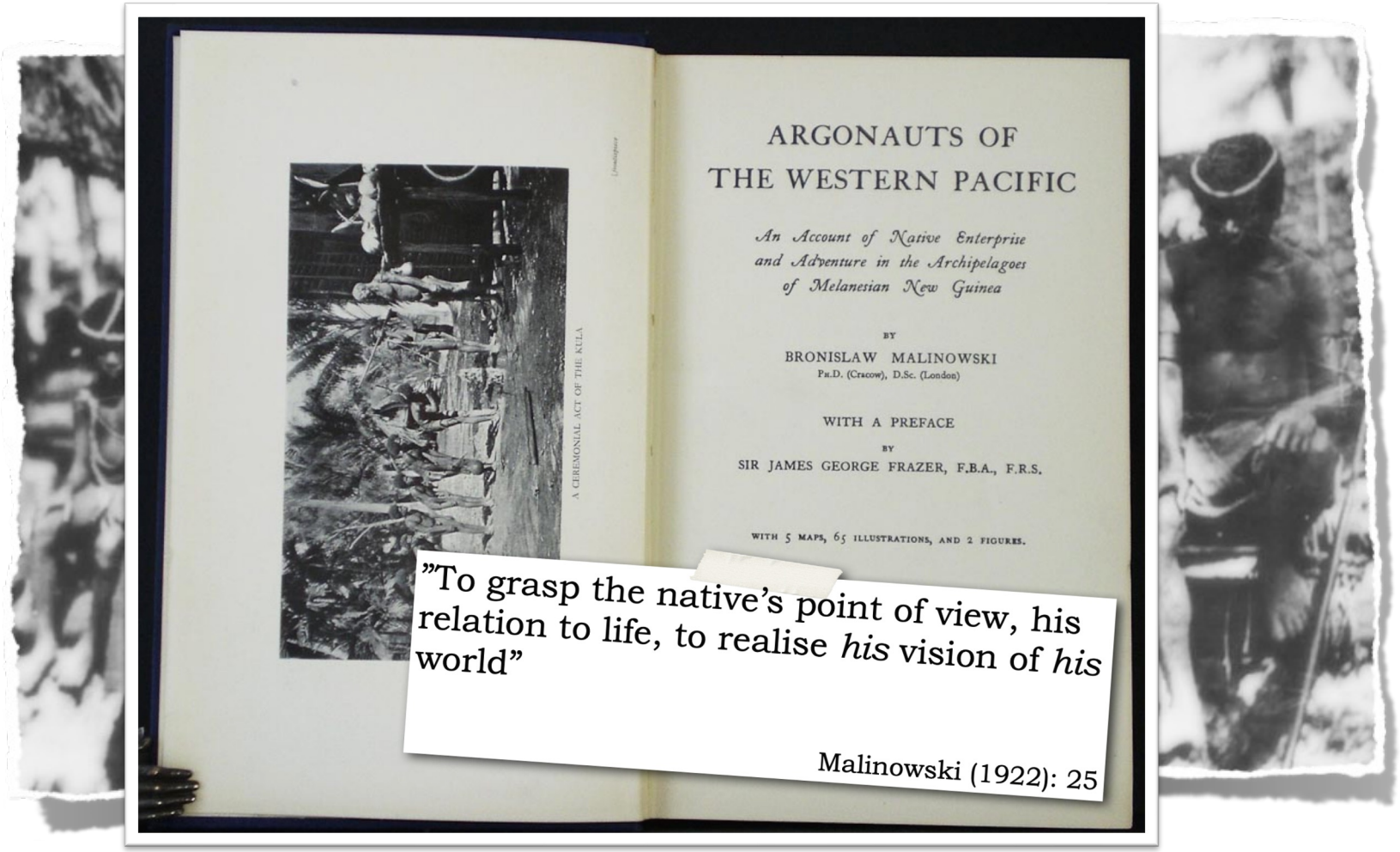
- Identify need area
- Need finding and validation through, surveys, research, **observations,** and **interviews.**
- Screening and selection of needs.

Observations in clinical settings

- Purpose: To ‘get behind the scenes’, develop your own understanding of the needs, and get surprised!
- How: Shadowing/participant observation – follow the actors.
- Where: Ideally, in the actual healthcare settings. Alternatively, in analogue settings or using secondary material (e.g. videos).
- What to look for: Activities, environment, interactions, objects, users – and pain points.
- Remember: Research ethics!



A few words of wisdom from social anthropology



Some personal experiences

- Ensure legitimate presense:
    - Make clear agreements: Where and who are you allowed to observe, how do you handle informed consent, how is sensitive data handled etc. Get ethical/managerial approvals if needed.
- Go where the action is: Important contextual factors are often overlooked in artificial settings.
- Apply a holistic scope: Be sure to take notice of contextual factors, overlapping procedures and activities that influence on what you are primarily conserned with.
- Following the artifact/actor/process as a data collection strategy.
- Don’t be shy – informal conversations can be valuable data.



Interviews in a healthcare context

- Purpose: To validate your experience of the needs and to learn from people with first-hand knowledge about the need.
- Who to interview: A broad variety of expert-users/patients. Be sure to include multiple perspectives.
- How: Do your research and prepare a (semi-structured) interview guide. Keep an open mind and ask questions beyond the core need.
- Personal experience: Interviewing takes a lot of practice!



Screening and selection of needs

- Purpose: investigate, prioritize and select the most important and potential needs identified.
- How:
  - Analyze your data well and formulate a gross list of all identified problems and needs.
  - Choose relevant selection criteria, e.g. disease state mechanism, patient impact, provider impact, market opportunity etc. and rate each identified need accordingly.
  - Engage relevant stakeholders in discussing and validating the needs selection.

Inspiration from the MUST method: Diagnostic cards

Problem/Needs	Causes	Consequences	Suggestions for solution
0-yield rate is too high (especially for VAT)	Random selection No revenue estimates when selecting Third party information not used Inaccuracy (and non-availability) of data Filtering is not effective	Wasted resources (wrong tax-payer) Risk of tax payer harassment	Make prioritization of cases based on estimated revue possible and easy Improve receiving and filtering of returns CIF fully operational or DB-access improved

Outcome of the identification phase in the ICD project: Need criteria

Table 1. Conceptual guidelines for aligning concerns in e-health

	Definition	Example
Meaningful	A concern is meaningful when it – at the same time – fits the biomedical model of medicine and the lived experience of patients	A patient approaches the cardiologist with a wide range of concerns that in number, character and style contrasts with what the cardiologist finds meaningful. The (lack of) response in turn makes the encounter meaningless to the patient.
Actionable	A concern is actionable when clinicians and/or patients – in principle – are able to take appropriate action	A patient is concerned that she has irregular heartbeat (arrhythmia). The lab technician at the heart centre takes appropriate action by making a short reply where she comforts the patient and assures her that she does not have arrhythmia.
Feasible	A concern is feasible when it is not only actionable in principle, but also in practice easy and convenient for clinicians or patients to take appropriate action.	A patient is concerned with his blood pressure and asks the clinicians at the heart centre to have it monitored. The request is, however, outside the scope of their responsibilities – and thus not feasible.

Phase 2: Invention

The purpose of this phase is to to generate and screen a wide range of solutions to select the one with the greatest likelihood of making it into patient care.

Most important tasks and technique:

- Develop and select ideas
- Build and evaluate a prototype of the solution



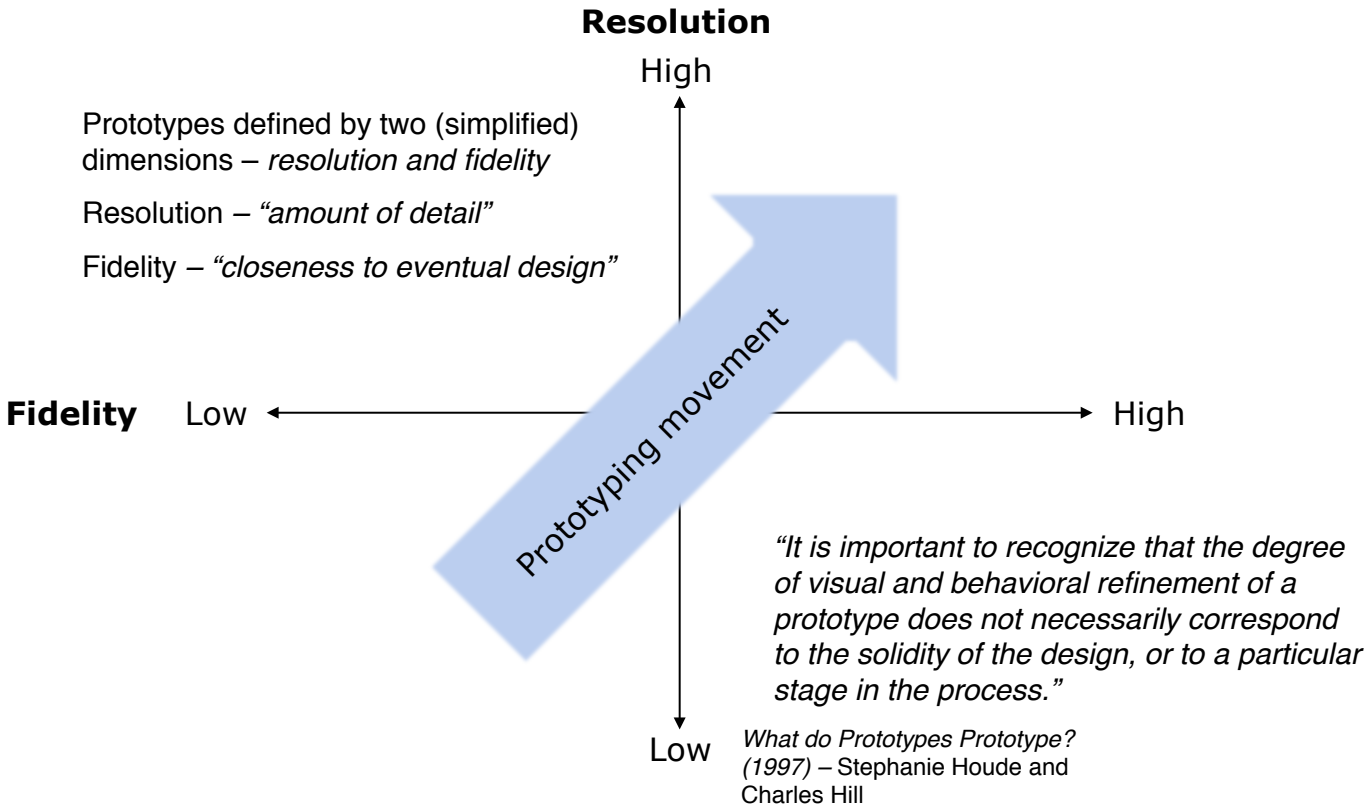
Prototyping as a central technique

Prototypes are early types of the system that can be used to both conceptualize the design, evaluate different concepts, and present the properties of the finished system.

Questions prototypes can help us find answers to according to BioDesign:

- It the concept technically feasible and functional?
- Is it a novel and unobvious innovation?
- How do the target users and leaders respond to the solution?
- Can it be manufactured?
- When can it be made available?

What is a prototype?

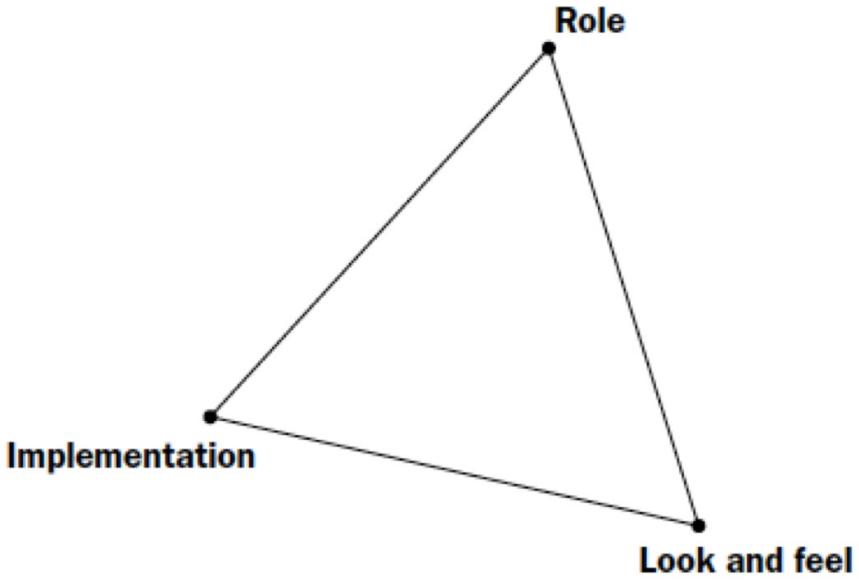


Prototypes can prototype different things!

"Current ways of talking about the prototype tend to **focus on attributes of the prototype itself**, such as which tool was used to create it (as in "C", "Director", and "paper" prototypes); and on **how finished-looking prototypes or -behaving a prototype is** (as in "high-fidelity" and "low fidelity" prototypes). Such characterizations can be misleading because the capabilities and possible uses of tools are often misunderstood and the significance of the level of finish is often unclear, particularly to non-designers."

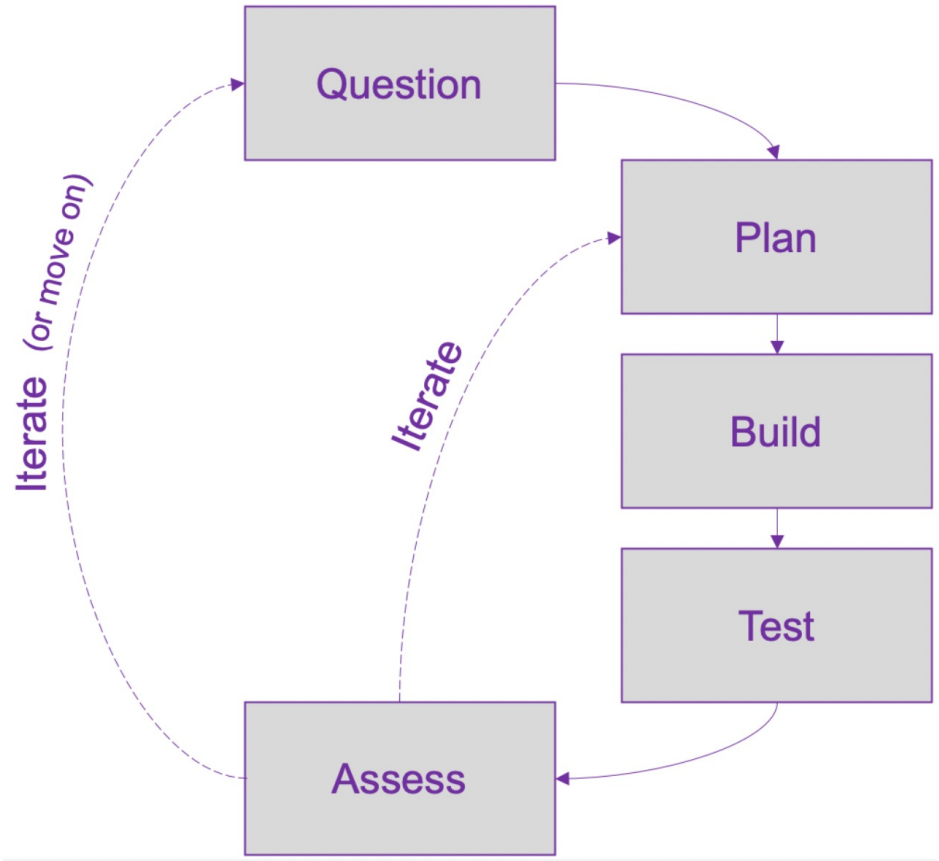
Houde and Hill (1997):2

So what should your prototype prototype?

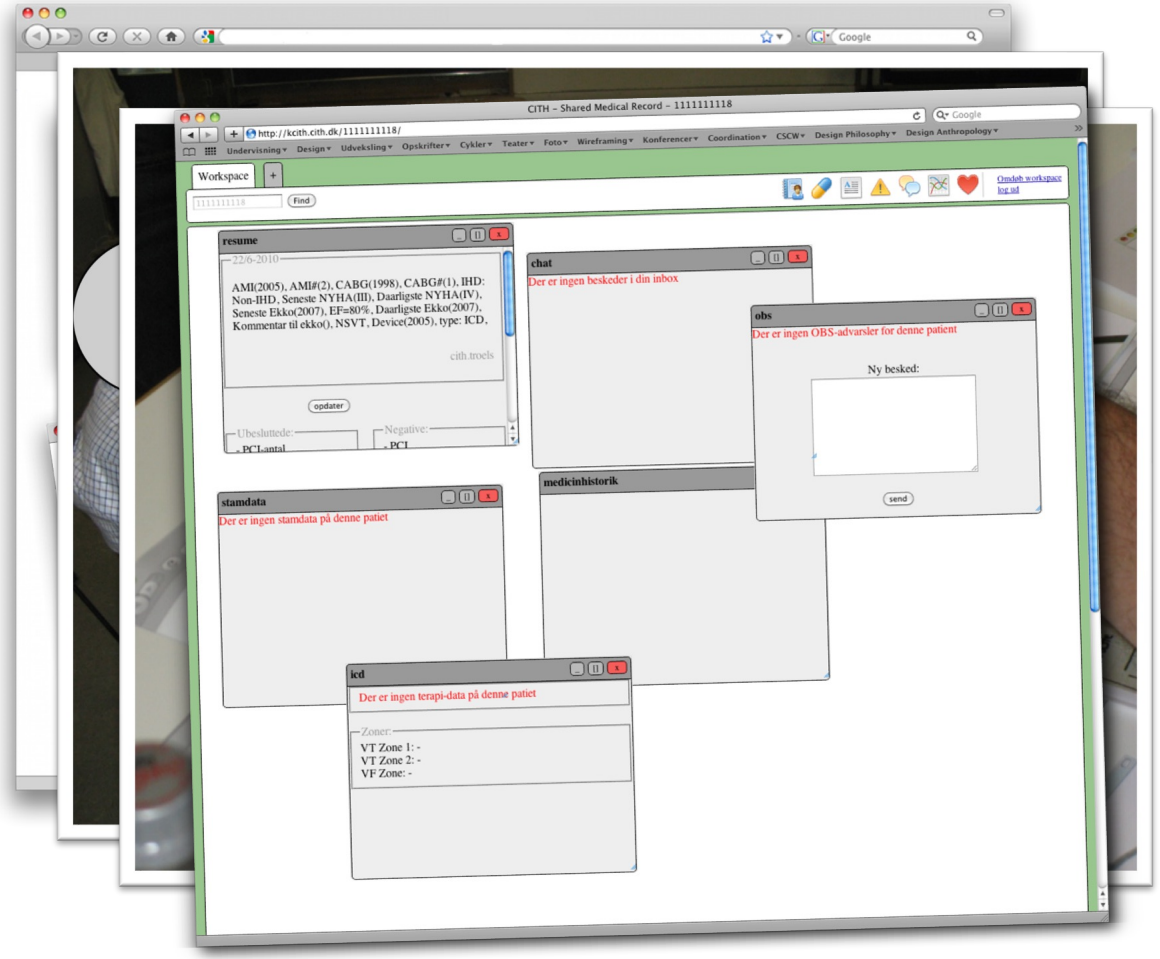


Houde and Hill (1997):3

The basic prototyping process according to BioDesign



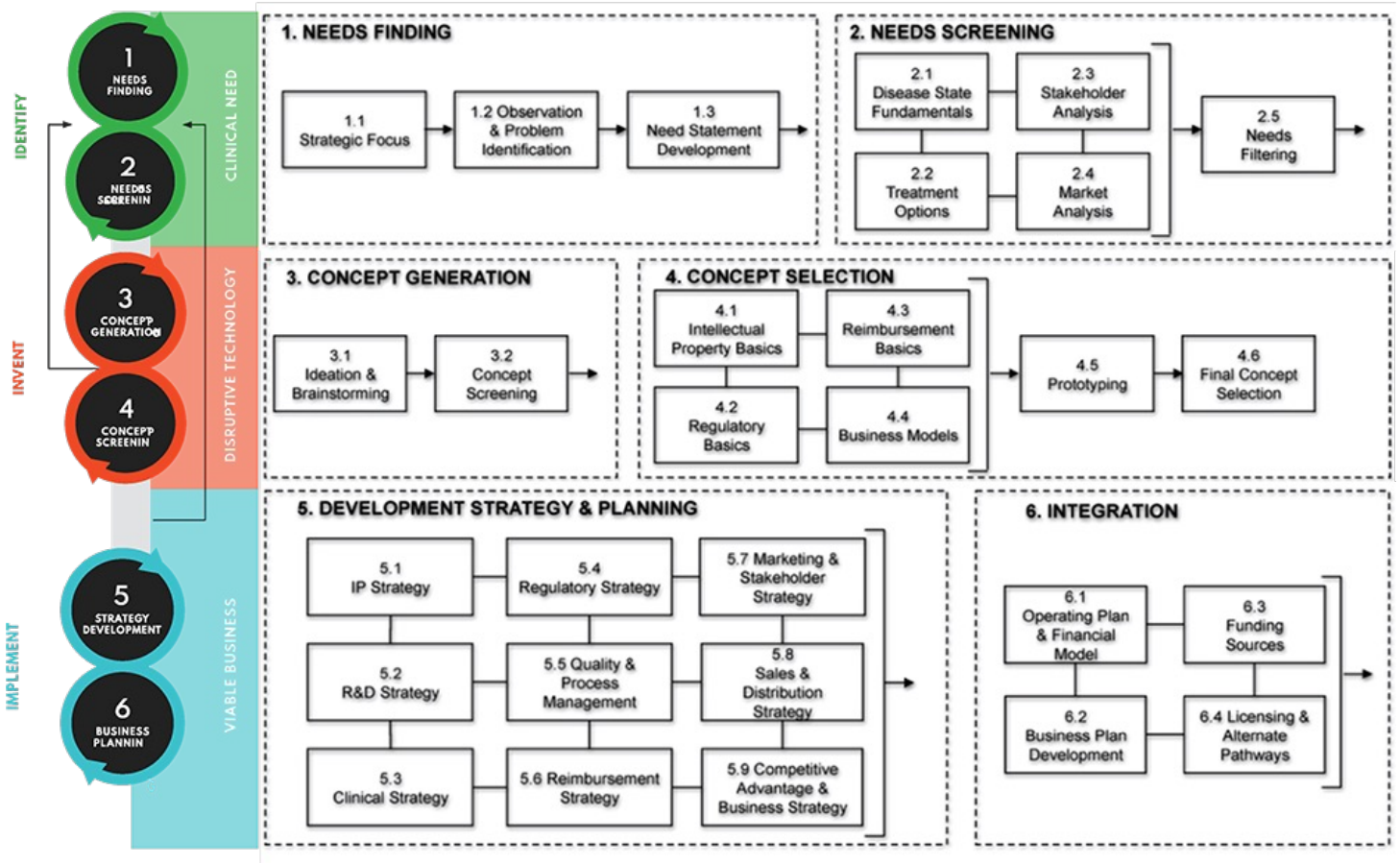
Example of early stage prototyping: Validation of core concept with users



Example of late stage prototyping: Real-life testing of functional prototype



The Biodesign framework



Questions

