

INTERNATIONAL MEETING ON HEALTHCARE SYSTEMS DESIGN RESEARCH

INITIAL REPORT OF OUTPUTS: RAW DATA



DATE HELD:

29th and 30th of November 2018

VENUE:

Seminar Room, James Dyson Building, Engineering Department, University of Cambridge, Trumpington Street,
Cambridge, United Kingdom, CB2 1PZ

ORGANISED BY:

Cambridge Engineering Design Centre, Engineering Systems Group at the Technical University of Denmark (DTU) and
THIS Institute (The Healthcare Improvement Study Institute), University of Cambridge

Compiled by

The Cambridge Engineering Design Centre and THIS Institute

EXECUTIVE SUMMARY

Aims of the meeting:

1. To identify the unique contributions that systems design research can make in achieving sustainable improvements in health and care delivery systems internationally.
2. To lay the foundations for a community of research and practice dedicated to healthcare systems design, across disciplinary boundaries.

DAY 1: Introduction, research perspectives and state-of-the-art

The objectives of the day were to:

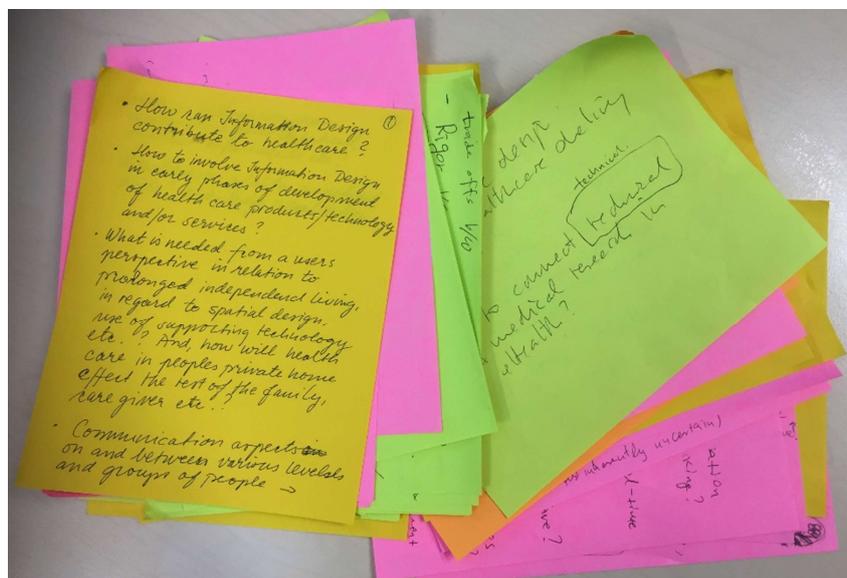
1. Get to know each other
2. Reflect on where healthcare systems design research stands today: identify the diversity and common points between all present

INTRODUCTION

The time for introduction also involved opportunities to reflect on our expectations for the meeting and to share current research questions and key themes.



Research questions



- Cultural change – Design
- Conceptual design of systems
- Engaging the “Doers” (e.g. nurses)
- Business case for Systems Engineering
- Design of medical devices in a systems context
- Patient-led change
- Interwoven design thinking (doing) and systems thinking (practice) to explore together with users
- Visual and tangible objects in use
- Exploring/communicating
- How can we make systems more accessible, legible, and transparent to different groups of users by information design and visualisation?
- How are different visual elements perceived by different users
- How do we design and visualise for the digital era?
- What kind of information can be made more accessible by visualisation
- Can/should system science and the analysis of current healthcare models change how we design medical products and services?
- How can engineering design impact healthcare while most of current hope for progress is on technologists, clinical scientists and policy-makers?
- How can we use the user’s feedback to improve/optimize the product’s user interface?
- How many users do you have to ask to understand how the product is performing/how good the product is/how you can improve the product?
- Is there a standard procedure to get insights in order to optimise a user interface?
- How to quantify the user’s perception of the interface design?
- The interface between operational research and design
- Design healthcare information systems that directly empower and enable people to care better for themselves and their families
- What are methods for doing rapid initial assessment of envisaged healthcare innovations to improve their design?
- How to design systemic approaches to achieving the UN Sustainable Development Goals on health?
- How to better access the engineering community?
- Can systems engineering science be used to analyse care systems in the hospital?
- How can we really understand and validate the people’s needs?

- How can we make sure that too much supportive technology does not cause one's own competences loss?
- How can we empower people to engage and participate in the development of healthcare support systems?
- What does "support" (healthcare support) mean?
- Value for end-users
- How technology implementation affects life and work
- Support increased control over own health
- Engagement, communities, identity – increased quality of life etc.
- The process of developing technology in a multidisciplinary context
- How to integrate the medical community in the early phases of product/services design?
- How to simulate product/service integration in complex organisational system of healthcare?
- How to design new business model for healthcare product/services?
- Healthcare improvement using NITC/ICT
- Efficiency and efficacy assessment of ICT impact on healthcare: methods and KPIs
- Patient care pathway improvement
- Patient contextual information integration while designing healthcare systems
- Healthcare provider integration in healthcare system design
- Innovation integration
- Value or requirement for healthcare system design
- Integrating ethics perspective while designing or deploying new systems
- Healthcare system improvement for whom? Patient, healthcare provider, decision-maker
- How to improve value effective healthcare through systems thinking, use of technology and an understanding of human behaviour (Human-centred)
- Value effective healthcare / technology / system thinking / human behaviour & psychology
- Can/should system science and the analysis of current healthcare models change how we design medical products and services?
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- How to design systemic approaches to achieving the UN Sustainable Development Goals on health?
- How to better access the engineering community?
- Can systems engineering science be used to analyse care systems in the hospital?
- What role might design research play in designing healthcare interventions, balancing technology, behaviour and healthcare delivery system?
- How might we design for value-effective healthcare solutions, e.g. in cognitive health?
- How might we design emerging healthcare delivery models?
- How to connect technical and medical research in e-health.
- Might design research be the connector between different disciplines to achieve sustainable development goals (SDGs)?
- Should “care” really be divided into primary and secondary?
- Should care be designed as a continuum?
- How can communication support primary care to orchestrate true holistic care?
- Money – improved patient health outcomes.
- How well does systems thinking predict acute problems in healthcare?
- Where can boundaries be most effectively drawn to represent the situation efficaciously?
- Does a systems mindset improve effective adaptability in critical care scenarios?
- What elements or behaviour are critical for effective health provider system?
- How does systems thinking compare to other analytical tools for preparing individuals to adapt with the least negative effect to other sub-systems/components?
- Who should be diagramming systems and how does this define boundaries?
- Trade-offs between:
 - rigour vs practicality of systems approach [Methodology].
 - Leading indicators for what is possibly going wrong [System]?
 - How to differentiate good adaptations and bad adaptations [Behaviour]
- Healthcare quality and patient safety improvement approaches and methodologies.
- Evaluation of clinically led improvement.
- The role of the professions in healthcare improvement.

- Use of routine/audit data to inform improvement incorporating multi-disciplinary approaches for better improvement (e.g. design, OR, psychology, HFE, informatics, sociology, et)
 - How to do it well?
 - How to evaluate it?
 - How to learn from and spread it?
- Theory-based evaluation approach and how to incorporate methodological perspectives.
- How to incorporate diverse perspectives in designing/coproducing effective and acceptable improvements?
- How do we understand complex healthcare systems?
- How can we use this to build shared mental models between partners from different backgrounds?
- How do we use this shared understanding to plan/implement efforts? Safe, useful.
- How can we co-create a more user-centred health and care system?
- Meet different disciplines perceptions and views on the topic.
- See where the field is moving to – roles, shape area together. Tech perspective.
- How can (industrial) design bridge (smart) technologies and the healthcare domain?
- What is an effective integrated (collaborative) healthcare design approach where medical research and design are developed in parallel?
- How can data-enabled design methods improve healthcare design?
- How can we design for behavioural change in the healthcare domain?
- How can information design contribute to healthcare?
- How to involve information design in early phases of development of healthcare products/technology and/or services?
- What is needed from a user's perspective in relation to prolonged independent living, in regard to spatial design, use of supporting technology etc? And, how will healthcare in people's private home effect the rest of the family, care giver etc?
- Communication aspects on and between various levels and groups of people such as information from doctor/care giver to patient, different departments etc?
- Visualisation of data on different levels? Knowledge visualisation.
- How can I use systems thinking to engage and understand systems?
- What is the role of facilitation (workshops) in supporting the design and evaluation of systems?
- Quality improvement methods in healthcare
- Tools to bridge research and practice (which tools exist?)
- Qualities of these tools (user requirements)
- Technologies to increase well-being (personal health tech.)

- Design for well-being (possibility-driven)
- Design for maternal health (any specific interest)
- User's experiences in health systems with personal healthcare technologies
- Shifting roles in health care systems (empowering patients)
- Methodologies to investigate design's role on people's well-being (especially related to special needs – users with specific conditions/needs)
- Does the whole "Healthcare Systems Design" community define a "Healthcare System" the same way?
- Does "Healthc. Sys. Des." Currently use knowledge and principles from Human Factors and Ergonomics to improve Healthcare Systems?
- In "Healthc. Sys. Des." do we only look at the patient-caregiver relationship, OR is it possible to expand the system view to include non-sick people as agents in staying healthy throughout life?
- What does "Healthcare" mean, and who is responsible for it?
- How can we demonstrate the usefulness and effectiveness of systems design methods/approaches in healthcare? How to evaluate these methods?
- What is the essence of systems design's contribution to improving healthcare delivery? What do we do that is unique?
- How information visualisation can support engineering decision-making?
- How to perform/achieve real-time data-driven design?
- Value assessment for health care?
- How to infuse new technologies into the design process (systems)?
- What are the metrics of improvement of the design process?
- How to quantify "better"?
- What is the state-of-the-art in computational modelling of healthcare (HC) systems and processes in order to identify numerical optimisation opportunities?
- Since HC is a dynamic (and thus inherently uncertain) product-Service system of systems, I would assume that computational models are extremely complex and costly. I would then expect that problem decomposition and coordination approaches would have to be developed to improve it, aided by data science advances.
- How do we measure success?
- How do we map health and care systems?
- How do we assess risk in health and care?
- What does a good improvement process look like?
- What does a good process facilitator do?
- What is the role of training in improving systems?

- What does an inclusive service look like?
- How do we introduce/embed a systems approach in practice?
- What form/role would a toolkit play in encouraging better care?
- How do we encourage creativity in healthcare improvement?
- What forms of evidence are useful/necessary?
- What do clinicians/healthcare professionals need to know about a systems approach?
- How do healthcare delivery services work as a system?
- How do we describe healthcare delivery systems using diagrams in order to facilitate shared understanding?
- How does our understanding of the healthcare delivery service as a system impact how we approach improvement?
- Can we develop a diagramming approach specific to healthcare?
- Technology integrated into healthcare systems design (methods, processes, impacts)
- Healthcare systems design (value-based approaches, simulations) – Products, services, healthcare pathway. PPTONE model
- How can hospital buildings be made flexible and efficient?
- What can we learn from hospitals for engineering?
- How do we integrate legacy systems in a creative way in new healthcare systems?

Keywords describing research themes

1. Information visualisation
2. Big data visualisation
3. Information design
4. Systems visualisation
5. Process visualisation
6. Risk
7. Efficacy
8. Adaptability
9. Boundaries
10. Business case
11. Cost trade-offs
12. Health systems
13. Soft systems methodology

14. Soft OR
15. Problem structuring methods
16. Operational research
17. Facilitation.
18. Improvement research
19. Operational research
20. Systems modelling

RESEARCH PERSPECTIVES ON HEALTHCARE SYSTEMS DESIGN

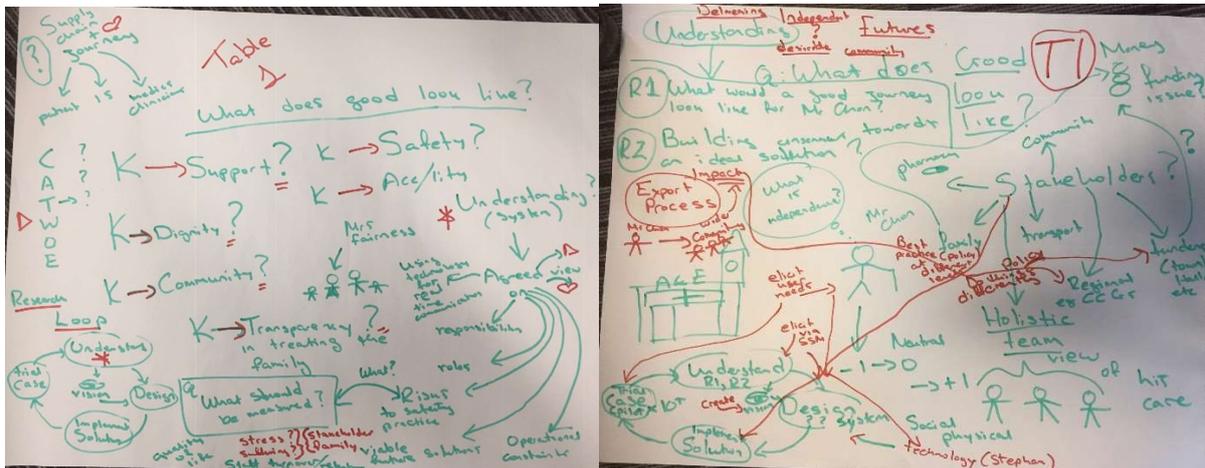


TABLE 2 - Old age

Proposal name: COALA: Coordinating Old Age independent Living Approaches

RQs:

How do we prioritize needs and requirements for all stakeholders? systems engineering and organizational design, and user-centered design. value assessment

what are the system's goals and are they possibly conflicting? Causal loop diagrams, cybernetics, feedback loops, DSM/CPM

how do we develop a robust HC system? Uncertainty modeling and quantification, simulation-based risk management

visualize status of the system: efficiency, delays, emergencies, etc. Modeling and information visualization

assess/quantify value (metrics): sell it to taxpayers Tradespace exploration studies, focus groups

what are the appropriate technologies and how are they best integrated systems engineering and integration

how to we validate the whole thing from a medical point of view V&V&C

Impact: characterize and quantify tradeoffs and reconcile conflicting needs in order to streamline the system

TABLE 2- Cancer care

RQs:

What are the information gaps that hinder a learning organization from capturing all facets of the problem

How do we ensure traceability and transparency of information: trust is of utmost importance to patients and doctors

Model this as a multi-agent system (game theory?) this seems like a non-zero sum game with incomplete information

How do we set up the right system of acquiring, processing, analyzing information and making recommendations

How do we address turnover issue (knowledge management, processes, etc.)

How do we eliminate waste by effective management of resources

How to we identify the right stakeholders (e.g., parking, elevator, etc.)

how do we address the interface between the actual treatment and other supporting elements

how do we utilize an innovation-driven approach to tackle the overall problem?

THE PHARMACY PERSPECTIVE
T3

Questions

- Can we transform the waiting experience e.g. with process updates/feedback?
- Can we improve/automate planning and priority-setting?
- Can we automate parts of the process?
 - ↳ more efficient?
 - ↳ safer?
- Can we individualize the process?

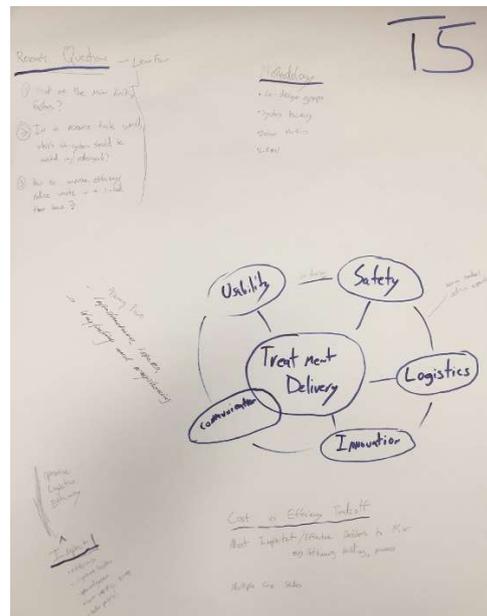
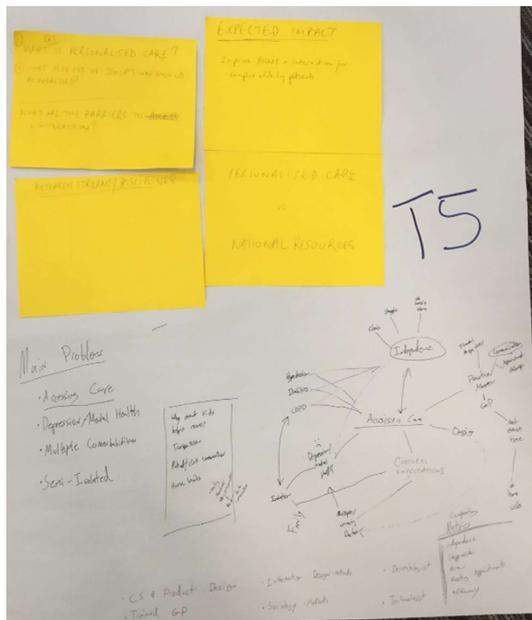
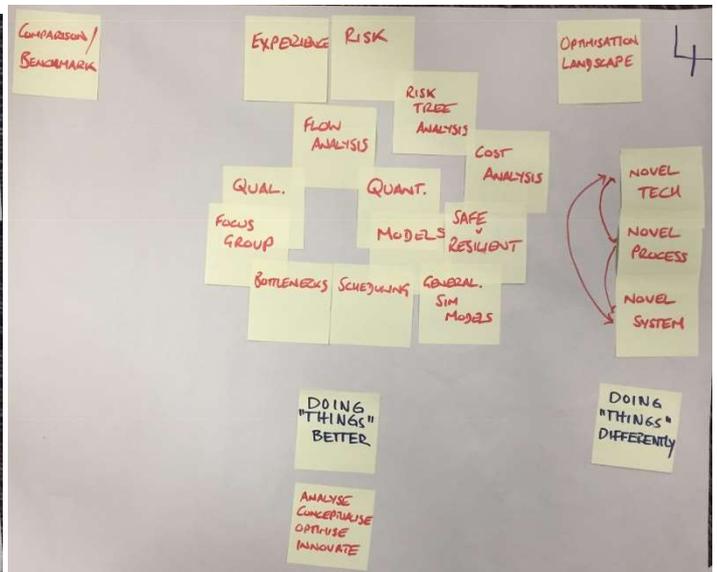
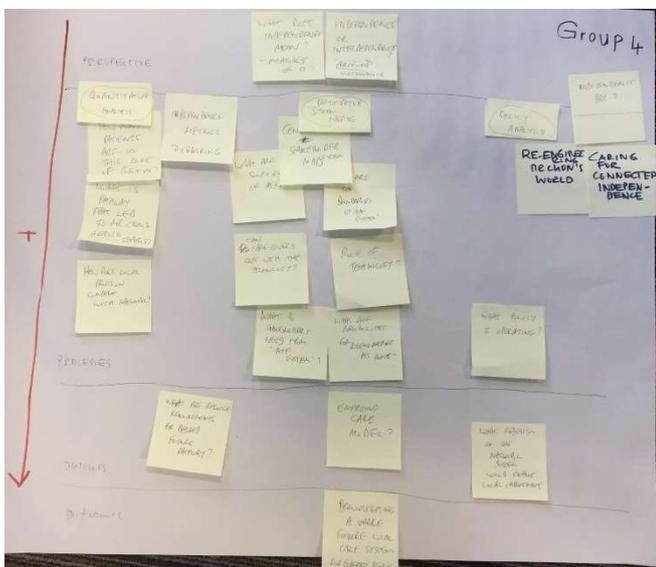
Methods

- Cost-analysis
- Process mapping
- Dynamic planning for production

FOCUS: F. CHON

PROJECT NAME:
COORDINATING MEDICAL & NONMEDICAL SYSTEMS

- IDENTIFY ALL THE STAKEHOLDERS IN FRANCIS WELLBEING? (EG FAMILY, GP....)
- HOW CAN THE INTERACTION BE MEDIATED?



* Assumption: We design for a 30-year younger Mr. Francis Chan.

Research questions:

- How do you get more resilience in people's life styles?
- How do we investigate earlier life-style on later life behaviour & health status.

Our Customers:

- * Health insurers.
- * GPs?

Health continuum

MAIN

How to incorporate new disciplines (beyond psychology) into the field of behaviour change? to encourage a healthy life-style.

Towards a system that prevents diseases.

Open data, / personalised data, accessible.

T6

DESIGNING A 'CHEMOTHERAPY CAFE'

- INTEGRATING CANCER CARE IN A ONE-STORY FACILITY
- PROVIDING A SPACE FOR PATIENTS AND FAMILY TO TALK, SUPPORT, SHARE EXPERIENCES
- PROVIDING A WAY OF WORKING THAT IS BOTH MORE PATIENT-CENTRED AND MORE EFFICIENT

RESEARCH QUESTIONS

- WHAT HAS MADE THE CURRENT SYSTEM SO DYSFUNCTIONAL?
- CAN WE APPLY DESIGN PRINCIPLES TO RECONCILE COMPETING PRIORITIES AND REACH A 'PARETO OPTIMAL' MODEL?
- CAN WE INCORPORATE MULTIPLE PERSPECTIVES TO CODESIGN A NEW MODEL?

*name for! Needs marketing input

RESEARCH STRAINS

1 BUILT ENVIRONMENT (WHERE? NOT NECESSARILY THE HOSPITALS - e.g. How NEUTRAL ENVIRONMENT etc.)

- TO INVESTIGATE OPTIONS AND APPRAISE ADVANTAGES AND DISADVANTAGES

2 PROCESS MAPPING / ENGINEERING

- TO EXAMINE CURRENT PROBLEMS, BOTTLENECKS etc. AND MODEL A MORE EFFICIENT SYSTEM

3 DESIGNING A NEW MODEL

- TO BRING TOGETHER STAKEHOLDERS TO BUILD A NEW MODEL, USING INSIGHTS FROM # WORKSTATIONS 1 AND 2 - PERHAPS BASED ON THE IDEA OF A ONE-STORY CAFE OFFERING CLINICAL, PSYCHOLOGICAL AND SOCIAL (PEER) SUPPORT

PROB AND EVALUATE

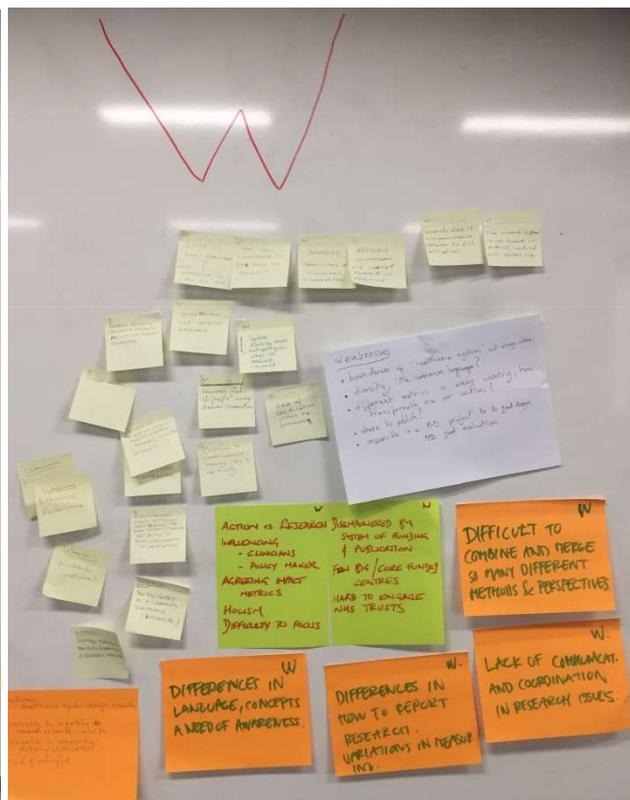
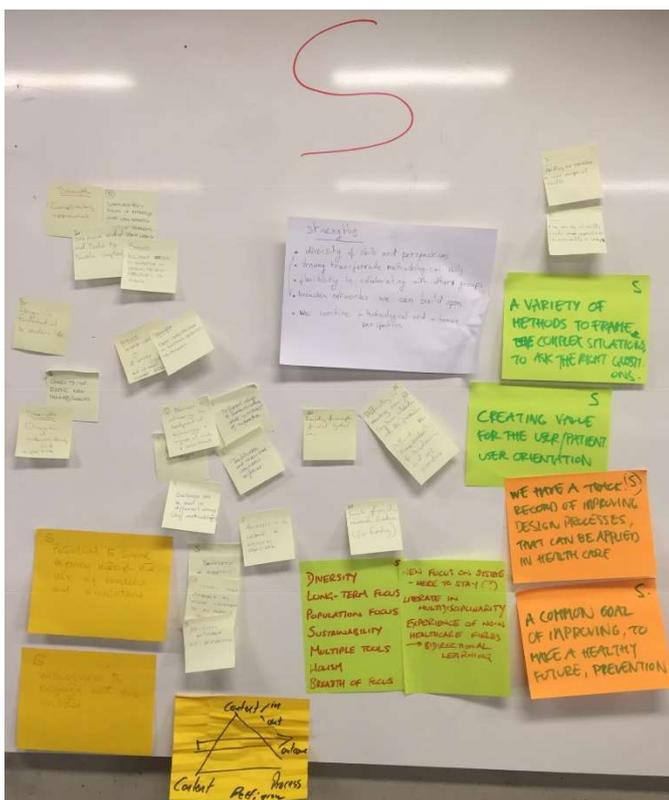
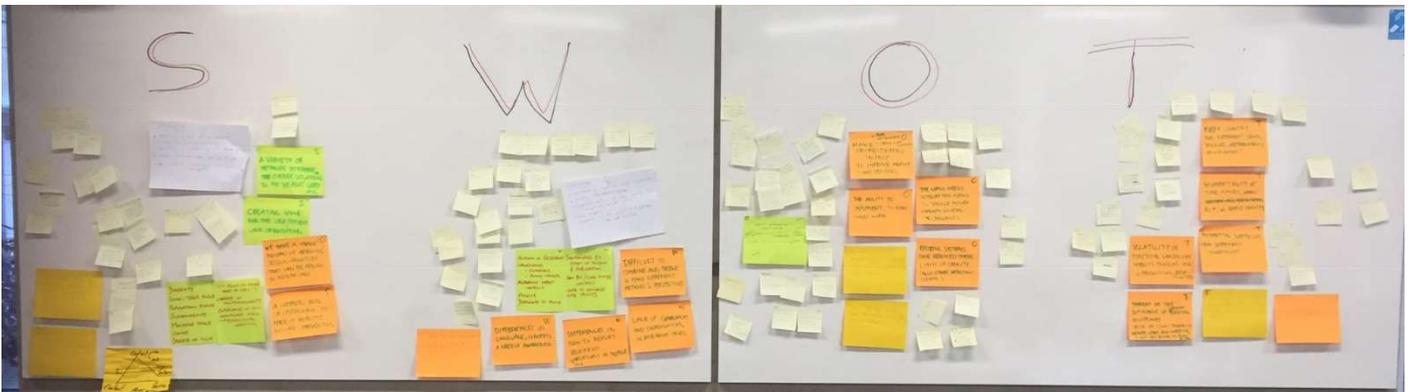
STATE OF THE ART

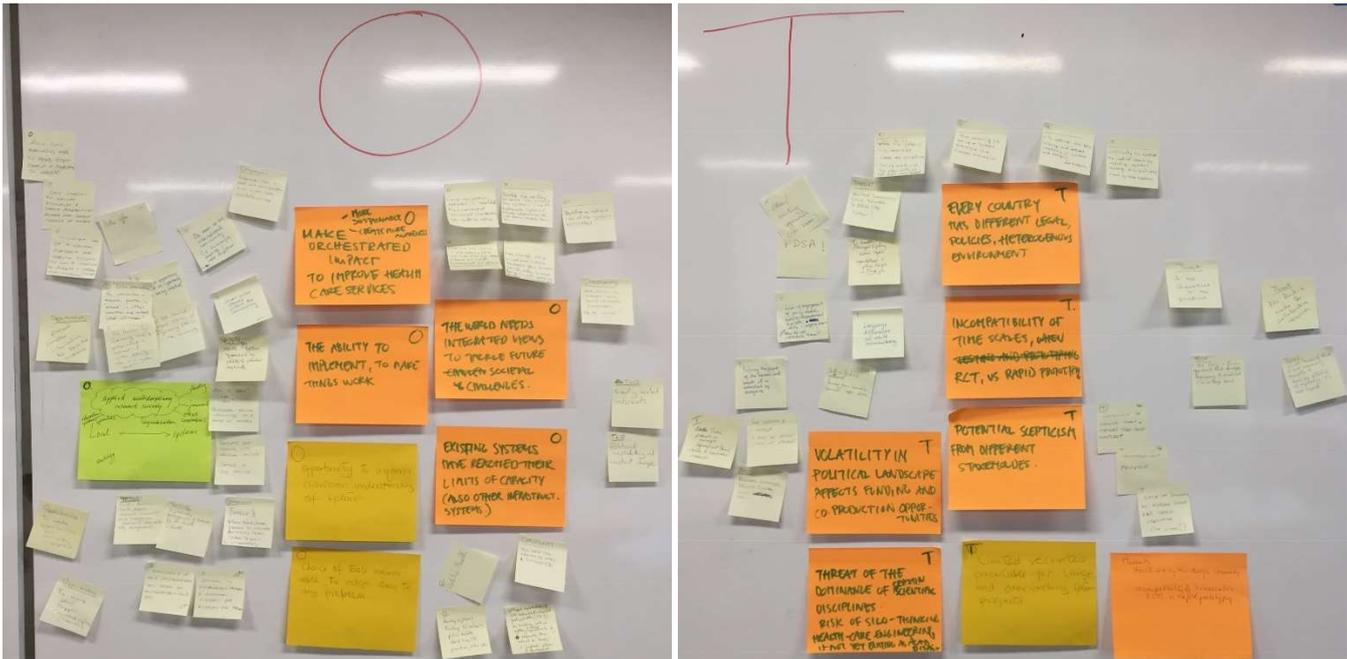
Day 2: Potential for impact and next steps

Objectives:

1. Identify strengths and opportunities (of group) for healthcare systems design research
2. Identify weaknesses and threats for reflections
3. Plan next activities

POTENTIAL FOR IMPACT





STRENGTHS

- Passion and will to engage
- Passionate subject (everyone is concerned)
- Desire to do this
- Emerging domain
- Increasing need from society's point of view to improve healthcare system
- Timely research
- Design is fundamental to modern life
- Complementary approaches
- We have methods and tools to tackle complexity
- All/most bring in expertise in systems design approaches to health
- Complementary fields of expertise who can address "complex" problems by different views
- Diversity that foster new thoughts/insights
- Diversity of understanding and expertise
- Deep understanding un systems-oriented techniques
- Health care is a complex system and we have relevant approaches
- Different ways of communicating create a richness of information
- Practitioners and researchers (engineers) together
- Possibility to create a holistic framework
- Challenges can be seen in different ways (different methodologies)
- Nearness to influencing the development of technology: a language of needs and requirements
- Real-world challenges
- Holistic approach is appealing
- Systems should embrace all other techniques in an informed way
- Diversity of academics
- The variety of skills, tools and capabilities is actually a strength
- Potential to save money through the use of models and simulations
- Willingness to engage with one another

- Diversity
- Long-term focus
- Population focus
- Sustainability
- Multiple tools
- Holism
- Breadth of focus
- New focus on systems is here to stay (?)
- Literate in multidisciplinary
- Experience of non-healthcare fields -> bidirectional learning
- Diversity of skills and perspectives
- Strong transferrable methodological skills
- Flexibility in collaborating with other groups
- Broader networks we can build upon
- We combine a technological and a human perspective
- Ability to consider a wide range of skills
- A variety of methods to frame the complex situations, to ask the right questions
- We have a track record of improving design processes, that can be applied in healthcare
- Creating value for the user/patient
- User orientation
- A common goal of improving, to make a healthy future, prevention
- Common needs of “people” across diverse communities

WEAKNESSES

- Lack of existing research evidence (for funding)
- Difficulty in making meaningful long-term collaborations with healthcare practitioners
- different timescales of academics and healthcare providers
- diversity of conception of what “systems” is
- limited (?) knowledge of each other’s skillsets amongst us
- (no) shared vision? (no) shared frame?
- Currently there is miscommunication between the different disciplines
- Diversity caveat: lack of clinicians and stakeholders
- The current “system” is not aware or directly involved with systems engineering
- Resource limitations for change processes in practice
- What is the challenge? How/where/who to sell it to?
- Too many techniques to be easy to handle?
- Evidencing the holistic approach
- Systems thinking lacks common methodologies, ways to measure impact
- Lack of coordination within the community
- Research protocols (process of research) are not uniformly considered
- Funding problems
- Community is not necessarily easy to identify (journals, scientific community...)
- Different types of systems per country introducing different ways of doing research (types and contributions)
- Challenge to create coherent message, due to our diversity
- Measuring performance
- Practitioners involvement
- Multidisciplinary domain: different ways of tackling the same subject (sometimes not obvious in terms of evaluation of contribution)

- Not recognized as a community scientifically (publications, etc.)
- Initially different practices and ambitions and research approaches
- Variation in approaching research results
- Variation in measuring/defining indicators
- Lack of oversight
- Action versus research
- Influencing clinicians and policy-makers
- Agreeing on impact metrics
- Holism is difficult to focus
- Disempowered by system of funding and publication
- Few bog/core funding centres
- Hard to engage with NHS trusts
- Differences in language, concepts. A need of awareness.
- Differences in how to report research.
- Variations in measuring.
- Lack of communication and coordination in research issues.
- Difficult to combine and merge so many different methods and perspectives.
- Boundaries of “healthcare” not always clear
- Diversity, little common language?
- Different metrics in every country, how transferrable are our “solutions”?
- Where to publish?
- Impossible in a PhD project to do good design and good evaluation

OPPORTUNITIES

- Multiplier for the audience by combining the different disciplines
- Early enough to influence
- Demonstrating effects of SE (systems engineering)
- Rich field available, need to find right people and problems to address
- Better coffee
- Present complex information to broader audience
- Universities can be a neutral platform for health systems to come together e.g. pharma + hospital (public). Open environment.
- Case sharing to gather resources and share perspectives, perhaps even develop metrics of impact.
- We should share stories of design/engineering ethics in the community
- Diverse experiences create an opportunity for being creative
- “echo intervention”: an intervention or research question is “echoed” in other countries and contexts. What will happen?
- The healthcare systems community needs to gather around a statement of system quality: when is a system “good”?
- Information technologies to deal with multidisciplinary, large, complex data – available, visible.
- Be seen as an international community (i.e. exchanges, sharing) -> work together
- Share success stories within the community
- How to train? Who? How?
- Professional training opportunities for a range of actors
- Technology assists systems approaches e.g. ability to visualise complexity
- Translate deep thinking with practical action
- Examples of good practice
- Timely! Many social, demographic reasons to welcome initiatives from system design research communities

- empathy to improvement fatigue is a potential platform for a systems engineering approach
- knowledge of one improvement tool opens an improvement mind set
- to make this happen (multidisciplinary research)
- to create opportunities for community engagement
- create a dynamic multi-domain research community as a transversal community (internationally recognised)
- Digitalisation: development of technology (m-health, e-health...)
- once the systems approach is established then extended societal characteristics can also be added
- Develop the ability to take into account the systemic view of healthcare systems. Whole infrastructure, medical devices, supply chains, etc.
- Realise how actions in the teams affect not only the teams, but other teams as well. Appreciate the indirect connections as CPM.
- Even though the immediate impact targets each patient individually, in the long run will impact the broader community, society
- Develop a holistic view of the systems by systems
- Availability to interact with health and life science communities – we’re invited!!
- Systems design of information flows – people need to make good decisions on health care
- Support implementation of UN sustainable development goals on health (SDG 3) by enacting work on systems and design approaches to it, especially the relevant to “messy” and “wicked” problems of development.
- The ability to implement, to make things work
- The world needs integrated views to tackle future societal challenges
- Existing systems have reached their limits of capacity (also other infrastructure systems)
- We have the ability to make a difference
- Public health
- Develop systems thinking and enhance public debate about health provider, risks, etc.
- Choice of tools means able to align tools to any problem
- Opportunity to inform clinician understanding of systems
- Make orchestrated impact to improve health care services. More sustainable. Create more awareness.
- Bringing more clinicians into the community through training etc. attract “mixed profiles” clinicians + systems design.
- Connecting with medical institutions e.g. EBC with Royal College of Physicians.
- Help people who have problems!
- Learn from each other
- Diffusing ideas through projects involving practitioners is a type of impact.
- Influence healthcare to look at “impact” in different ways.
- Once a tipping point is reached, it can go quickly.
- Strong need – frustration in the NHS and frontline healthcare staff everywhere!

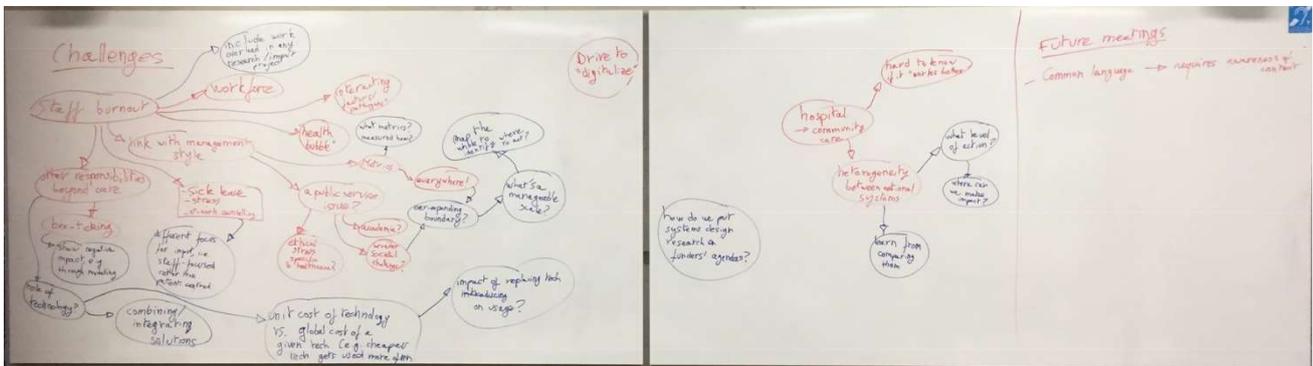
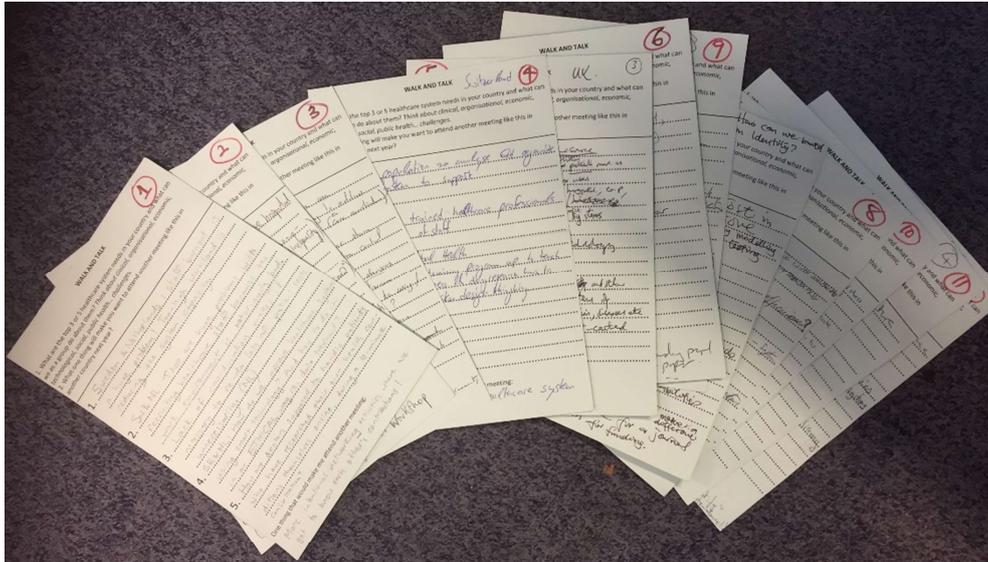
THREATS

- Existing vested interests
- Political instability and constant change
- Not being heard because partners do not have time
- Time consuming to set up a systems practice in a current situation
- To overuse the term “thinking” and prevent creativity and evolution in systems and design
- Every country has different legal, policy, heterogeneous environment
- Incompatibility of time scales. When RCT vs rapid prototyping!
- Potential scepticism from different stakeholders
- Too big and “fuzzy” a group to show impact?

- “impact” is heterogeneous and can be difficult to define
- Avoid competing between groups inside projects
- Clinicians can be resistant to change (change/project fatigue)
- Boundaries of community not always clear
- Need a case for change. Why should people (staff, patients, policy-makers) work with us?
- Keep the momentum in interdisciplinary projects can be hard. No framework for this.
- Difficulty to extend the medical teams by including systems-thinking disciplinary views by other experts
- No funding mode for collaborative research
- Being too theoretical or too practical
- Commitment to single tools and methods can cause conflict
- Create research that is not commonly accepted and loses the potential of explaining its real impact
- Not having a funding opportunity that bridges engineering and medical (in a large sense)
- PDSA!
- Improvement fatigue
- Lack of diversity in funding bodies and their criteria (UK, others?)
- Language differences can create misunderstanding
- Difficulty to update the syllabus in universities
- Create new disciplines
- Training people with the right skills at tall levels within societal systems
- Other existing approaches (IHI, Lean)
- Health managers and policy-makers regard organisational and policy design as their job
- Lack of engagement of policy-makers, quality improvement directors, CEOs, supply chain. When/how do we introduce them?
- Shift in funding patterns away from innovation towards safer options.
- Defining the purpose of the system and ensure it is understood by everyone
- Time consuming and complex. Risk that people will not engage
- Time pressure on managers squeeze out their ability to commission research
- Realising initiatives require funding, until then –
- Volatility in political landscape affects funding and co-production opportunities
- Threat of the dominance of certain scientific disciplines.
- Risk of silo-thinking
- Healthcare engineering is not yet existing as academic discipline
- Limited resources available for large and over-arching systems projects
- Incompatibility of timescales, e.g. RCTs vs rapid prototyping
- Going from principles and methods “on paper” to practice = operationalising systems can be hard!
- Healthcare practitioners have become accustomed to dealing with messy, frustrating situations.

TOWARDS A COMMUNITY OF RESEARCH AND PRACTICE

Walk and Talk



CARD NUMBER 1

	ISSUES	COUNTRY	WHAT CAN WE DO?
1	Staff burnout is a huge problem! Too-high workload is reducing the system capacity.	Sweden and Netherlands	
2	There are huge problems with recruiting healthcare staff because the work environment is notoriously bad.	Sweden and Netherlands	
3	Lack of coordination makes it necessary to re-do lots of patient tests unnecessarily.	Netherlands	
4	How do we improve healthcare systems using smart technology? And how to do it in an ethical way re: data treatment?	Sweden and Netherlands	

5	How are doctors supposed to handle patients who have researched their own health conditions themselves online during a 10 – minute consultation?	?	
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One thing that would make me attend another meeting:

More intentional networking activities where we get to know each other’s contributions!

CARD NUMBER 2

	ISUES	COUNTRY	WHAT CAN WE DO?
1	The move away from expensive hospital-centric care UK priority – 5 year forward view, Access inequality (Germany)	Sweden, UK Germany	
2	How to impact – Design influence from multi-disciplinary team. (“is the healthcare system designed?”)	UK, Sweden, Germany	
3	Predicting how healthcare may evolve, so we can design for the future + sustainable improvements – systems thinking to guide to what we need to predict.	UK, Sweden, Germany	
4	“Survival” – achieving the same outcomes with less resources. Systems thinking to explore issues (identify waste points) Cross domain analysis of this – Engineering Design, Healthcare improvement, Clinicians and Social Sciences Team as a “broker” in use of the right skills for the right problem.	UK, Sweden, Germany	
5			

One thing that would make me attend another meeting:

Concrete collaborative project or workshop

CARD NUMBER 3

	ISUES	COUNTRY	WHAT CAN WE DO?
1	Ageing people, chronic diseases - How can we use systems thinking to address these challenges e.g. care coordination?		
2	Implanted devices - How can we share with US people that use another control system (FDA)?		
3	Nano technology and concealed devices - How can we communicate between disciplines (from linking correct data to using/analysing them and giving feedback)		
4	Funding – how can we build common projects across disciplines and countries?		
5	Training – How to disseminate the change propagation using systems approach?		

One thing that would make me attend another meeting:

Mapping the ecosystem of the healthcare systems approach research community

CARD NUMBER 4

	ISUES	COUNTRY	WHAT CAN WE DO?
1	Ageing population – to analyse and organise the system to support.	Switzerland	
2	Not enough trained healthcare professionals – overload of staff	Switzerland	
3	Organising global health – setting training program up to teach local partners and doing research how to push systems design thinking.	Switzerland	
4			
5			
One thing that would make me attend another meeting:			
Representatives of the healthcare system.			

CARD NUMBER 5

	ISUES	COUNTRY	WHAT CAN WE DO?
1	Systemic features of resource challenges e.g. how to position patients more as resources and less as service users.	UK	
2	Fragmentation between hospital, GP, public health, social care and benefits of systems.	UK	
3	System implications of new technology	UK	
4	??? by NHS ??? ...health systems of global trends – climate, migration, diseases etc. Developing truly patient-centred healthcare	UK	
5			
One thing that would make me attend another meeting:			
A clear and useful group task.			

CARD NUMBER 6

	ISUES	COUNTRY	WHAT CAN WE DO?
1	Need to integrate HC, PH, Social care etc.	UK	
2	Adapt HC to new thinking and technology	UK	
3	Make better use of people for selfcare etc.	UK	
4	Big Data + AI	UK	
5			
One thing that would make me attend another meeting:			
Specific objective – e.g. funding proposal; joint paper			

CARD NUMBER 7

	ISSUES	COUNTRY	WHAT CAN WE DO?
1	The need to save cost in healthcare and improve efficiency.	UK	We can apply modelling and scenario testing
2	Mental health	UK	
3	E-health	UK	
4	Integrated care – complex health needs and ageing population	UK	We can map out how our capabilities align to these challenges and present a business case for how HSD can make a difference.
5			
One thing that would make me attend another meeting:			
Having a special issue for a journal paper or a collaboration for funding. We also need to think about how we can build our identity.			

CARD NUMBER 8

	ISSUES	COUNTRY	WHAT CAN WE DO?
1	Ageing population	UK	
2	Overloaded staff: systems efficiencies?	UK	
3	Medical devices: FDA solutions? Systems	UK	
4	Funding for research and for public health systems - evidence	UK	
5			
One thing that would make me attend another meeting:			
Framework, presentation of case studies + feedback – tangible goals – research output.			

CARD NUMBER 9

	ISSUES	COUNTRY	WHAT CAN WE DO?
1	Prevention in work-life – digitisation, how to use such that there is not more workload.	?	
2	New Public Management vs Personal interactive patient caretaker & caretaker communication amongst each other.	?	
3	Interconnectedness ... ?? systems from childcare to eldercare – lifecycle perspective	?	
4	To start a documentation of the many different approaches – may be a book, define chapters	?	
5			
One thing that would make me attend another meeting:			
EU-level project. Special issue. Networking			

CARD NUMBER 10

	ISUES	COUNTRY	WHAT CAN WE DO?
1	Health bubble (increase in ill-health) in society. Inactivity, mental stress for both patients, society citizens and health personnel.	?	We as community: being in knowledge/mind-sets together with health professionals – understand and ideate
2	Specialist focus – good, but need holistic views, to meet individual needs (patient-centric)	?	We can focus on applying technology rather than developing (only) new technologies to improve holistic “chains” of care.
3	From centralised to decentralised (home) care. Highly individual preferences in combination with health risk concerns.	?	We as community can support individualized solutions.
4			
5			
One thing that would make me attend another meeting:			
Concrete progression of community! E.g. collaborative special issue, joint studies.			

CARD NUMBER 11

	ISUES	COUNTRY	WHAT CAN WE DO?
1	Roadmap for future research	?	
2	Boom of field	?	
3	Funding	?	
4			
5			
One thing that would make me attend another meeting:			

CARD NUMBER 12

	ISUES	COUNTRY	WHAT CAN WE DO?
1	Integration between types of evidence and research contributions.	UK	Systems approach can help.
2	Transferring systems skills to low- and middle-income Countries with much more fragmented healthcare systems.	UK	
3	Funding modes for healthcare delivery	UK	
4	Funding models for interdisciplinary research.	UK	
5			
One thing that would make me attend another meeting:			
A tangible output e.g. book (would incentivise people and help justify attendance)			

Wrapup

WHAT WE DID:

- ⊕ Research questions
 - improving what's here
 - designing new models
- ⊕ Research proposals
 - ↳ which entry point to complex issues?
- ⊕ "State-of-the-art"
 - ↳ existing stream
 - ↳ future?
- ⊕ SWOT
 - ↳ clear strengths
 - ↳ passion for healthcare systems design
 - ↳ passion for interdisciplinarity
 - ↳ ≠ languages
 - ↳ act as a bridge
 - ↳ ability to frame complex issues
 - ↳ what is our goal?
 - ↳ are we trying to be too much at once?
 - ↳ who are our spokespeople?

NEXT = WHAT?

- our own projects: talk/share them!
 - Cases
 - framework for sharing
 - commonalities?
- funding for this network?
- different perspectives on the same case?
- mapping capabilities in a framework
- shared/collaborative review paper
- sth concrete to work on
- conceptual papers together
- special issues
- may funding opportunities

combine? → prepare the framework before meeting

ISSUES!

- short experience feedback on our projects
- book project - edited
- Table of contents?
- DTU or Cambridge event

start with special issue?

Future meetings = HOW?

- Common language → requires awareness of context
- ICED 2019
- Shared folder → raw material report slides
- everyone to share 1 paragraph on their research
- between "formal" meetings?

GENERAL NOTES

INTRODUCTION

Anja:

- DTU is growing on healthcare technology
- Local, national and global opportunities for new healthcare delivery models facilitated by technology
- Value-effective healthcare: link technology + behaviour + system, can enter from any of these three dimensions
- Broad view of design, H Simon: "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones."

John:

- EDC: improving design process
- Only two basic questions for engineers: how can we do it better? What can possibly go wrong?
- Mistakes happen because of poorly designed systems (L Leape)
- We need a process of improvement + a programme of change + a case for change
- Debates before the Engineering Better Care report show that improving healthcare requires research (from all communities) + training + practice

Individual presentations – a few elements that were mentioned:

- Similar challenges in bridging between knowledge areas
- What is systems thinking? We need to define this to start
- Someone met another person working on the same topic, information visualisation, whom he had not heard of.

Research question – a few elements that were mentioned:

- Is healthcare only about sick people and caregivers?
- What is the business case for systems engineering in healthcare?
- How to improve the value of care through a human-centred approach?
- What's design's role when most expectations for improvement are on policy-makers, clinicians and technologists?
- How can we co-create a more human-centred healthcare system?
- How to manage the trade-off between methodological rigour and practical application of our methods?
- How can industrial design build a bridge between healthcare and technology?
- What is the role of facilitation and workshops in supporting the design of healthcare systems?
- What are the methods for rapid evidence assessment for designing and evaluating healthcare technology?
- How to include information design in healthcare systems design?
- How do we define efficacy when evaluating systems and technology? E.g. different views between clinical and technological notions of efficacy
- What are the forms of evidence needed for us to make a case?
- How do we reconcile co-production and co-creation vs. throughput and efficacy?

PERSONAS – PERSONA 1 – AGEING

- What are the metrics for the project?
- What language are we using when discussing these problems? Sometimes the same words do not "sound" the same in different communities. For instance, "modelling" can sound very "quantitative" for some when they actually do what others call modelling, e.g. using process mapping.

- How do we prioritise the needs and requirements between all stakeholders?
- Define outcomes, boundaries, trade-offs
- Trade-offs is what engineering is good at!
- What does “independence” mean? Is it not better to be “interdependent”?
- Stakeholder mapping would be needed
- Concept of boundary, defining it and questioning it, is a strength of systems approaches, even if the boundary is not always clear to us we know it is an important concept

PERSONAS – PERSONA 2 – OUTPATIENT CHEMOTHERAPY

- Simpler situation (needs fewer different expertise areas to solve)
- Is it research or consulting?
- Does it need to be one or the other? Can't it be both, e.g. action research?
- This issue can also be extended outside the hospital, e.g. looking at the situation of the patient's family => not so simple
- What are information gaps between people? How can we identify them?

STATE OF THE ART

Comments mostly related to the EDC systematic review and meta-analysis on the effectiveness of systems approaches in improving healthcare delivery

- “Systems engineering” is different from “systems approaches”! The NASA definition of “systems engineering” is too restrictive here. How can we define a systems approach?
- “Patient care” can be different from “healthcare” and “health services”
- Systems approaches can be evaluated through looking at learning
- E.g. information that was implicit in the group becomes explicit
- Systems approaches can be evaluated by looking at what “appears” when you use them, what is new after using them
- Measuring impact of systems approaches: is there traction for change after using the method?
- Learning should ultimately translate into patient outcomes, so impact should be visible at this level too
- Are we applying a reductionist approach to holistic thinking?
- Not measure only one outcome, but a plurality of outcomes: be systemic in defining outcomes
- Some outcomes can be important but very removed from patient outcomes
- Who are we doing this for? Who do we need to convince?
- We have very different audiences in different countries and communities. Some of these do not need evidence-based medicine type of evidence.
- How ambitious should we be? We could construct a justification step-by-step
- Different audiences have different needs for measurement
- Is evidence a UK-only question? No!
- Mixed methods can be a good approach
- The debate is not only on what outcomes to measure, but also how the study is framed, e.g. emergence of adaptive RCTs and mixed-methods trials

JOHN'S INTRO TO DAY 2

Looking at wordcloud of research themes

- Huge common passion for improving healthcare
- But also, huge diversity
- Different languages

- We need to work together and spend time on it to progress and be able to translate our concepts among ourselves
- Objective: build a community!