

WHELD INFO 23

8 – 12 JULY 2023 | SYDNEY, AUSTRALIA

Wearable Devices and the Digital Divide | Design Thinking to Address Social Determinants of Health

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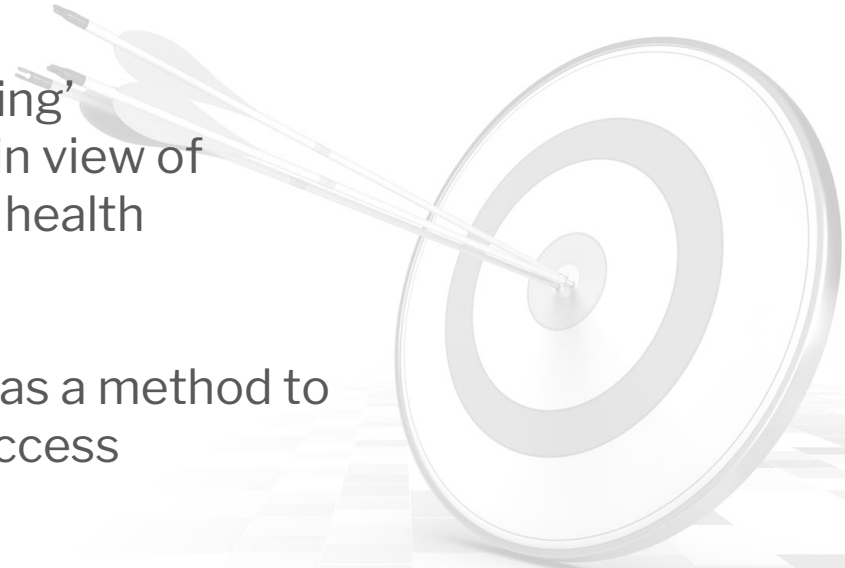
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AICH



Learning Objectives

- Think critically about new ‘promising’ technologies, such as wearables, in view of equity and social determinants of health
- Use Design Thinking techniques, as a method to address problems of equity and access



Workshop Agenda

- **Introduction** Context of wearable tech (5 min) V. Lichtner
- **Didactic** Design Thinking (10 min) H. Monkman
- **Large group activity** Brainstorming (10 min) C. Kuziemsky
- **Small group activity** Brainwriting (10 min) B. Lesselroth
- **Discussion** Reflection and evaluation (5) R. Koppel

Wearables | Definitions

“Body-attached or body implanted smart devices capable of tracking physiological signals [continuously, with minimal to no user interaction] for health-related [tracking or protecting] purposes”

– Li, Lin, & Chib 2021

1. Li et al., Mobile Media Comm, 2021

Wearables | Technology and Applications

- **Accessories**, including watches, glasses, necklaces
- **Clothing**, including sensors mounted in textiles, biomechanical shoe inserts
- **Body mounted devices**, such as skin patches, gyroscopes, cameras
- **Bio-implants**, such orthopedic prosthetics, microchips, pacemakers



1. Park et al., Info Tech People, 2016
2. Wang et al., Adv Intel Syst, 2019
3. Li et al., Mobile Media Comm, 2021



Wearables

Healthcare Applications

- Health and safety monitoring
Fall prevention, defibrillation
- Chronic disease management
Blood glucose monitoring, weight tracking
- Disease diagnosis and treatment
arrhythmia detection, depression screening
- Rehabilitation
Deep brain stimulation, orthopedic prosthetics

1. Lu et al., JMIR mHealth uHealth, 2020
2. Ledet et al., Innov Entrep Health, 2018

Wearables | Wicked Problems

- User experience, technology adoption
- Privacy, confidentiality, security
- Research ethics, individual autonomy, social determinants, access
- Big data, artificial intelligence
- Patient safety



1. Wu et al., Online J Nurse Inform, 2019
2. Rajkomar et al., New England J Med, 2019

Wearables and Access to Care

- Wearable devices have the potential to ‘revolutionize medical care’
- However, can increase inequity in access to care for patients struggling with social and structural determinants of health (e.g., poverty, health literacy, digital access)

Can we make wearables more equitable using Design Thinking (DT) techniques?

DESIGN THINKING

Solves Wicked Problems

- **Iterative and flexible** exploration of problems and solutions
- **Tools and methods** for identifying problems and user needs
- Takes a **bi-directional approach**; based on how **users think, feel, and behave**¹
- **Used in healthcare** for service delivery, clinical outcomes, cost, and education²⁻⁴

1. Brown, Stanford Soc Innov Rev, 2010

2. McLaughlin, BMC Med Ed, 2019

3. van De Grift, Acad Med, 2016

4. Ku, NEJM Catalyst, 2016

Hasso-Plattner Institute of Design | 5 Stages



<https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>

INSPIRATION

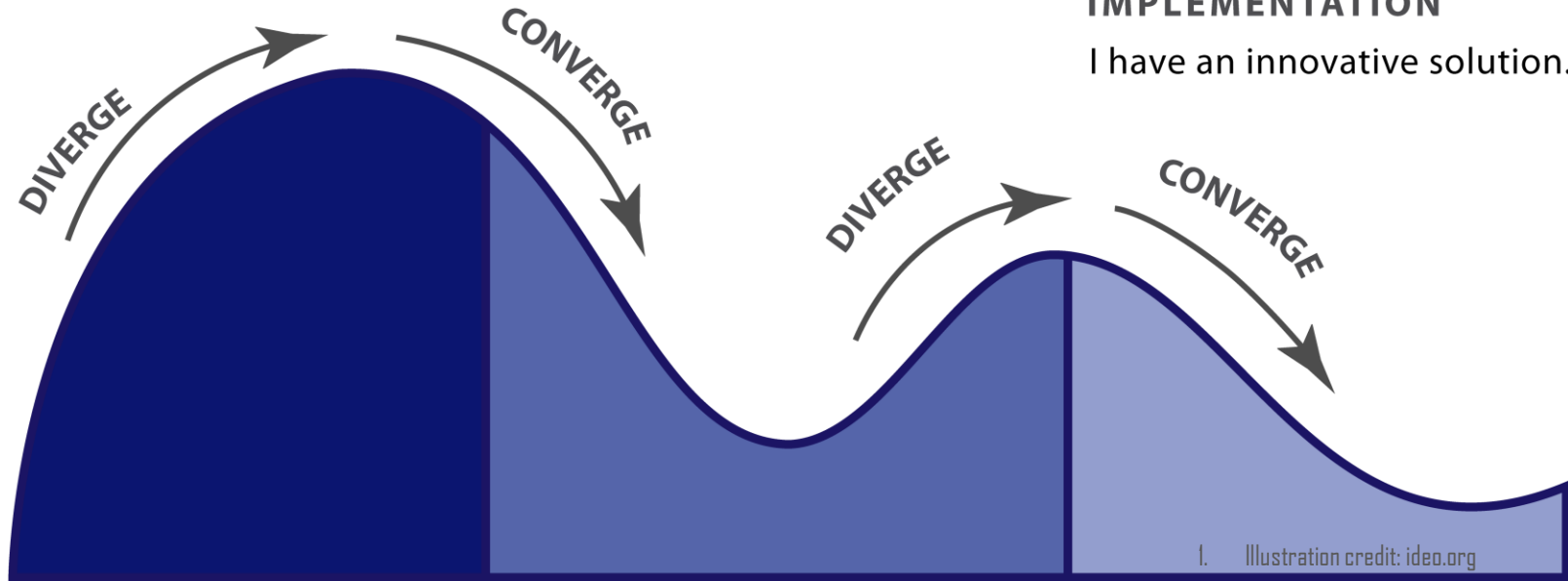
I have a design challenge.

IDEATION

I have an opportunity for design

IMPLEMENTATION

I have an innovative solution.



1. Empathize

- Understand the **people** and the **problem**
 - Observe
 - Engage
 - Understand experiences and motivations
 - Immerse yourself in the environment
- Avoid assumptions about users and their needs; gain insight through user research

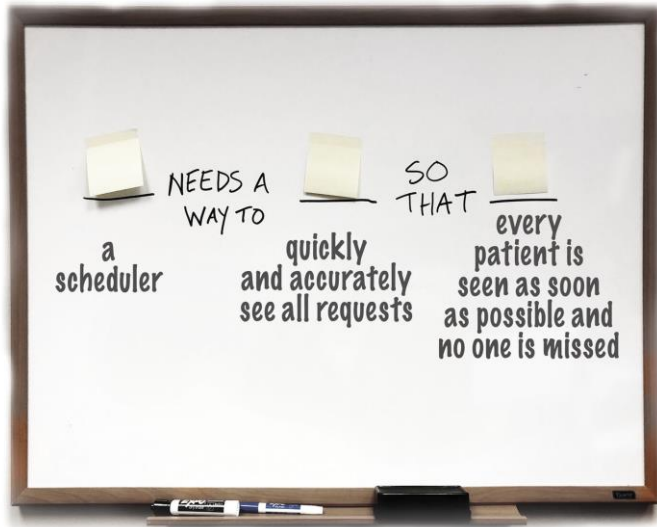


2. Define

- Analysis and synthesis of the Empathize phase
- Define the core problem(s)
- Generate a human-centered problem statement
- Designers gather ideas about features and functions to solve the problem or help users resolve the issues
 - 5 Whys
 - Why-How Laddering



Wish Lists | Summarizing the Problem



User Requirements

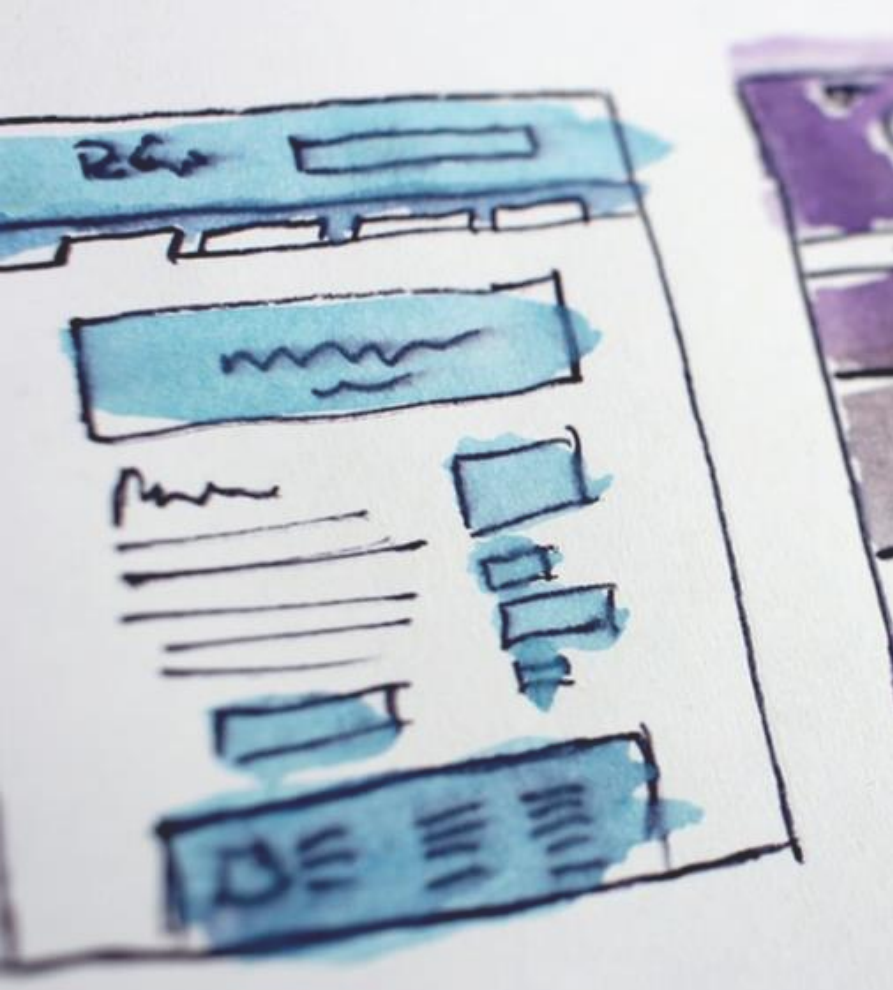
A **user** needs a way to **do something** to accomplish a **goal**.

A **resident** needs a way to **see all patient tasks** so she **doesn't miss a critical action** at night.



3. Ideate

- Generate as many ideas or potential solutions as possible
- View the problem from different perspectives
- To stimulate free thinking, use structured methods (e.g., *Brainstorming*, *Brainwriting*, *Worst Possible Idea*, Crazy 8s)
- Use visual thinking techniques (sketching, prototyping)
- Use other methods (e.g., [SCAMPER](#)) to refine and narrow down to the best ideas
- Think about "[How Might We...](#)(insert design problem)"



4. Prototype

- An inexpensive way to develop and test some of the ideas (e.g., specific features) to investigate the potential solutions
 - User feedback determines whether each idea is accepted, improved and re-examined, or rejected
- Experimental phase
- By the end researchers will better understand the problem, potential solutions, and how real users interact with the system

5. Test

- Rigorous testing on the complete system based on the best prototype solutions
- **Iterative process:** results are used to redesign and further clarify the **problem** and the understanding of the **users** and context



1. Leveraging data from current wearables to increase equity

- Select a current wearable (e.g. device that counts steps)
- Identify equity concerns that arise from use of data from wearable to drive care management
- Describe how data could be used to improve equity or reduce barriers to care



2. Increase accessibility to wearables for those who cannot afford them

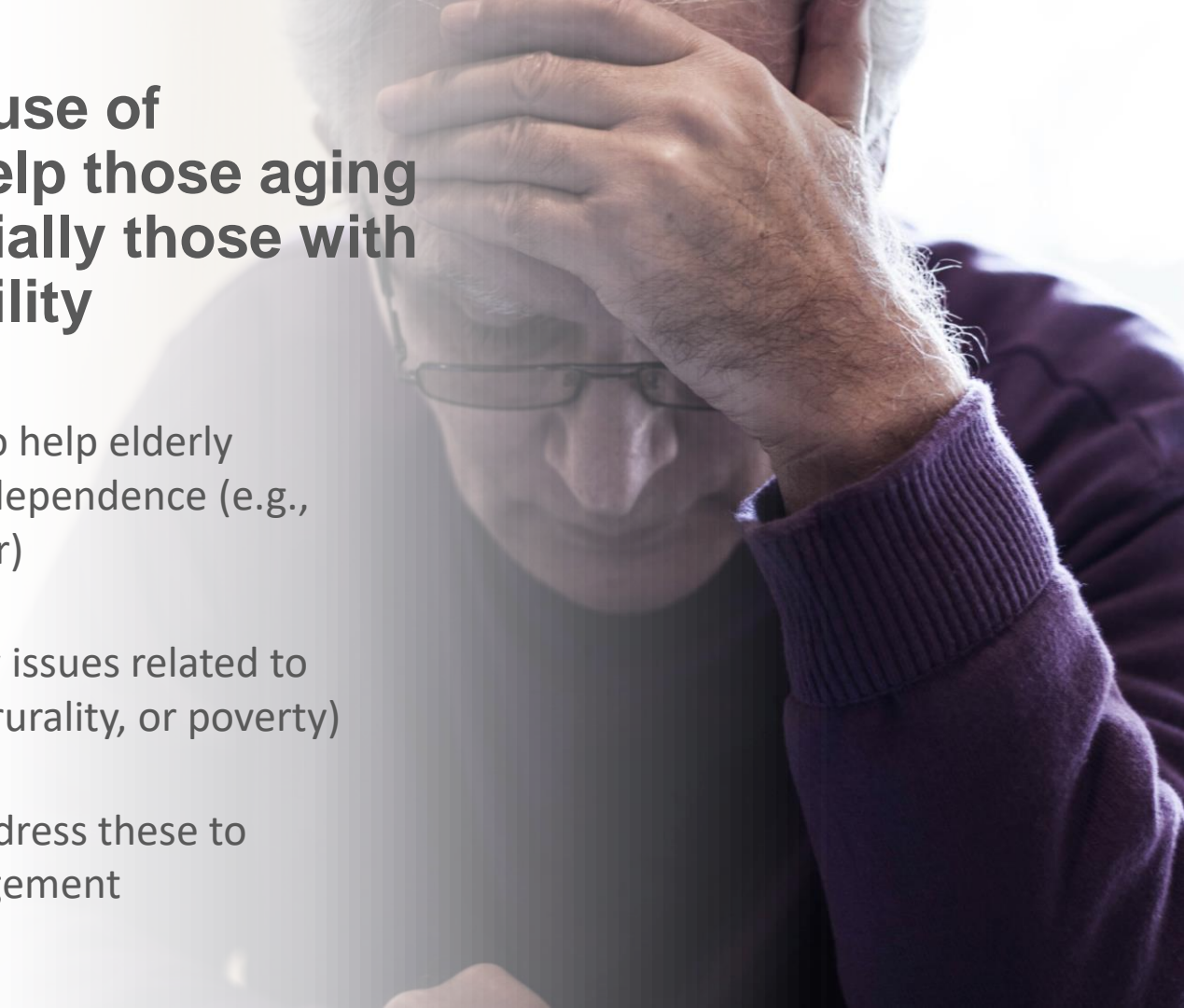
- Select a wearable used in post-acute care rehabilitation (e.g., step counter)



- Identify social determinants impacting use (e.g., cost, health literacy, tech literacy)
- Describe ways healthcare systems can address these to provide equitable use

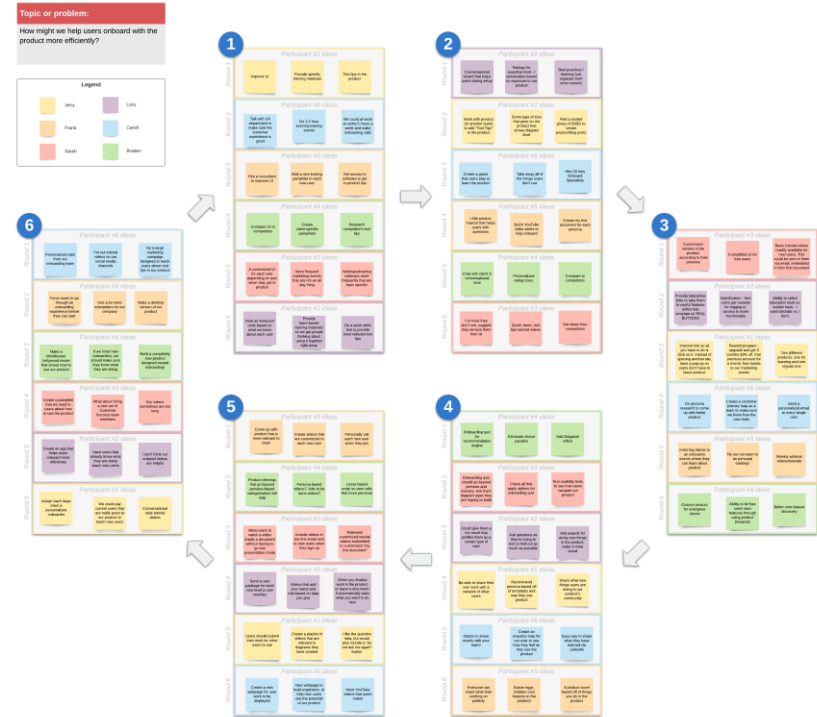
3. Increasing the use of wearables to help those aging in place, especially those with housing instability

- Select a wearable to help elderly people maintain independence (e.g., fall detection sensor)
- List potential equity issues related to housing instability, rurality, or poverty)
- Describe how to address these to improve self-management



Brainwriting

- **What:** ideation activity; participants write down ideas, pass ideas to the next person, and build on the ideas of others¹
- **When:** early in ideation sessions; initial braindump²
- **Pros:** Speeds up ideation; removes common brainstorming obstacles
- **Risks:** don't spend too long on one round; participants don't push past initial ideas³



1. Sherwin, Nielsen Norman Group, 2017
2. Interaction Design Foundation at Interaction-Design.org, 2022
3. Banfield, Design Sprint, 2016

Image source: Lucidchart, How to use brainwriting to generate ideas

Step	Instructions
1	Print one brainwriting worksheet for each member of the group.
2	Decide on the number and duration of rounds.
3	Appoint someone as the moderator. One focus per session only.
4	Each participant writes down three ideas they think worth exploring in the three spaces provided.
5	When time is up, the moderator collects the sheet and hands them out again at random. No one should get the same sheet as before.
6	During each additional round, everyone writes down three further ideas. Preferably, they should build on the ideas before.
7	After the final round, the moderator presents all the ideas on the worksheets.
8	The group discusses which ideas to take forward.

Brainwriting

	IDEA 1	IDEA 2	IDEA 3
PERSON A	Person A writes an idea here...	... and another here and one more here.
PERSON B	Person B writes an idea here;	perhaps a new one or building	on one or more prior ideas.
PERSON C	Person C writes an idea here;	which could build on anything prior	...or something completely different.

Discussion

- ❑ What settings would you use Design Thinking in your own institution (e.g., education, clinical care, research)?
- ❑ What stages of the process interested you the most, and what techniques would you try?
- ❑ How could you apply Design Thinking to other informatics implementations affected by social determinants?



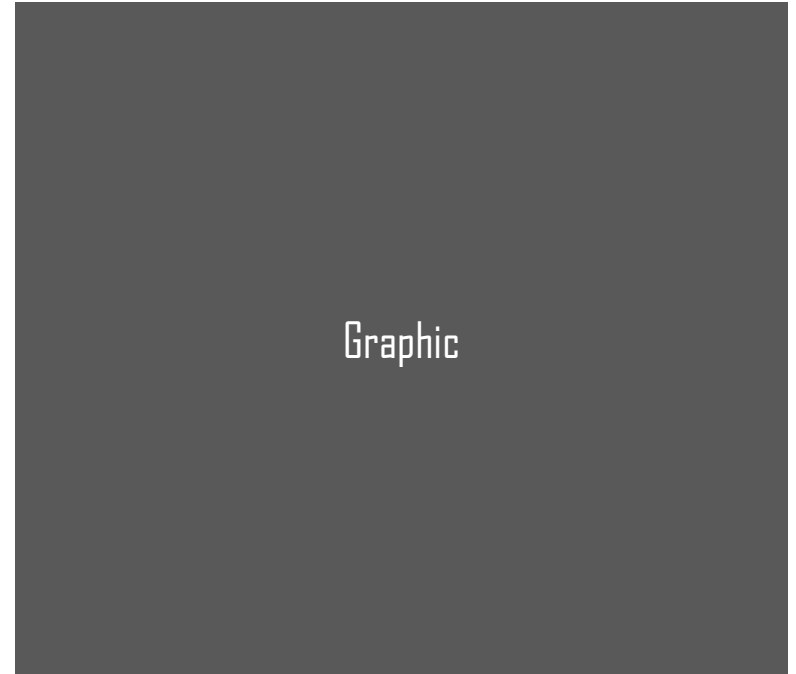
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- Bullet number three



1. Reference
2. Reference