

# Design Thinking Needs Led Innovation

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## Agenda



From technology to market or from market towards technology?



Design thinking fundamentals



The Needs Led Innovation methodology



Needs finding



Needs Screening & filtering

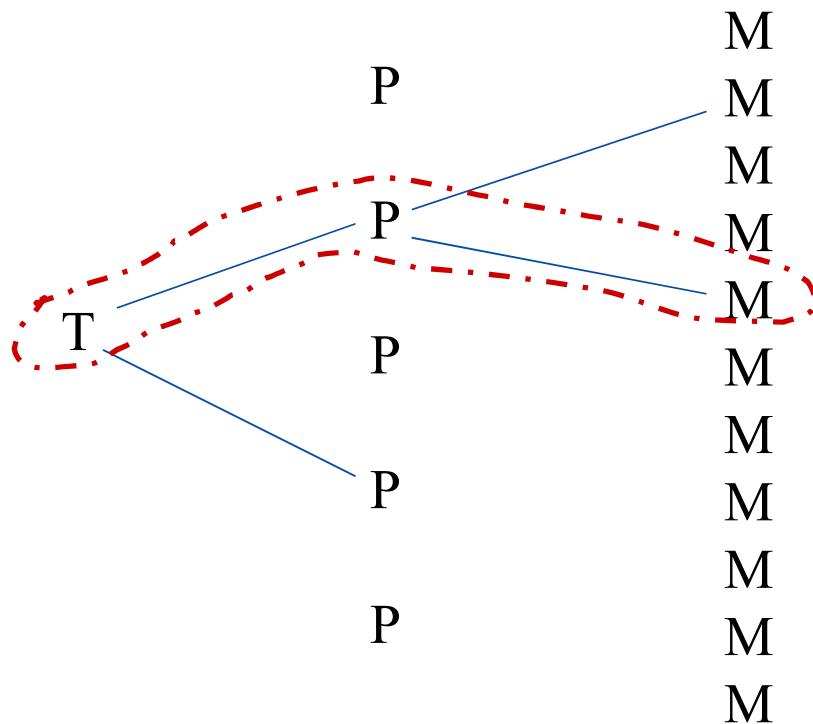


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**From technology to market or  
from market towards  
technology?**

Remember this slide from previous session?

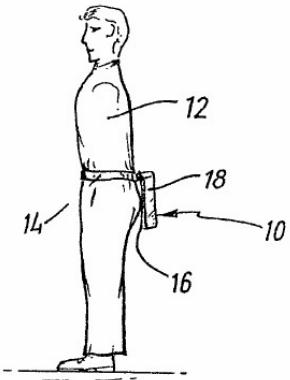
## Technology – Product – Market Matrix



## Some patented “Technologies”



1st Diesel motor

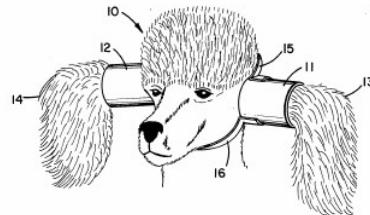


EIT

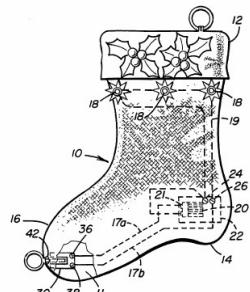
Portable Seat



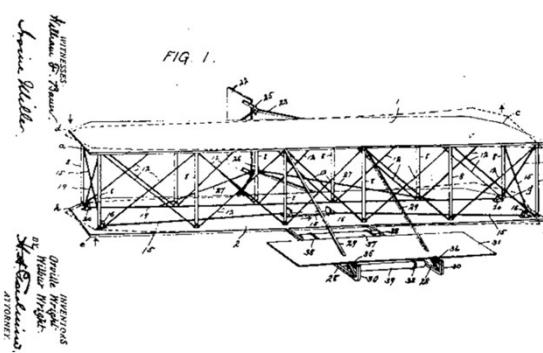
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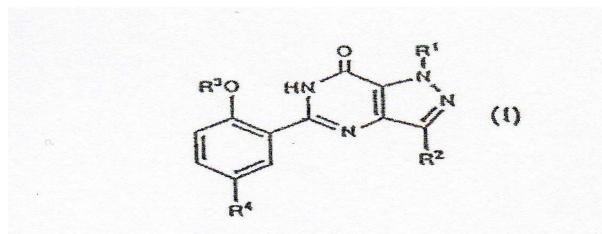
Dog ear protection



Automatic Santa Claus Detector

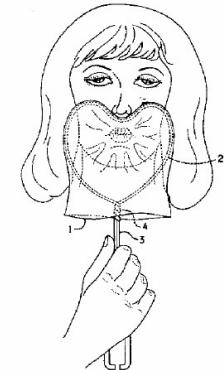
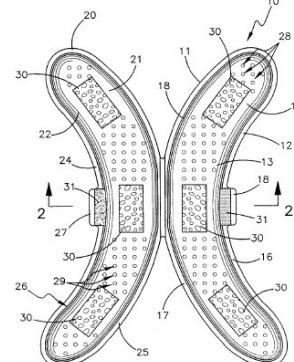


Wright Brothers Plane



Viagra molecule

Banana Box



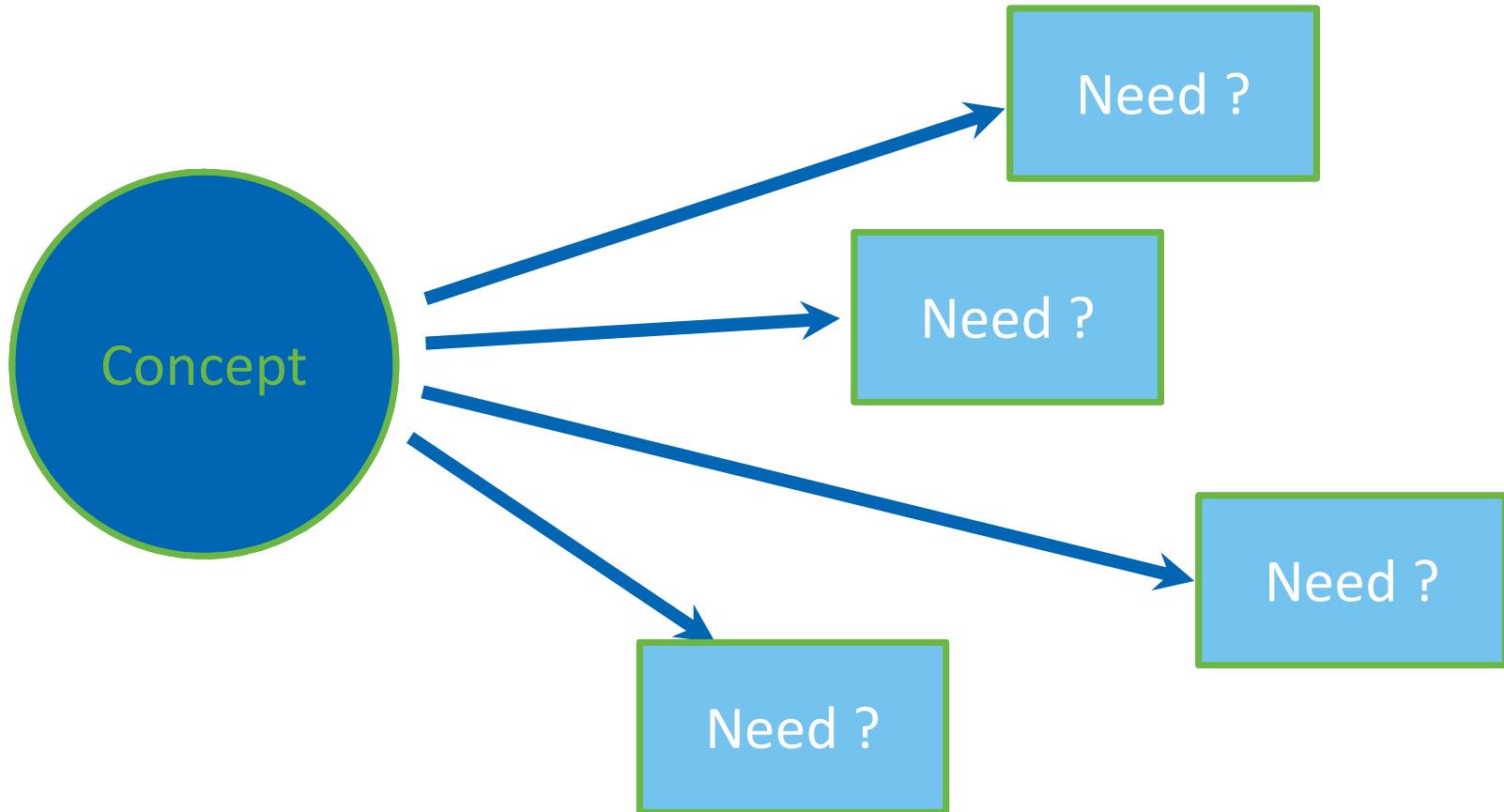
Kiss shield Protection



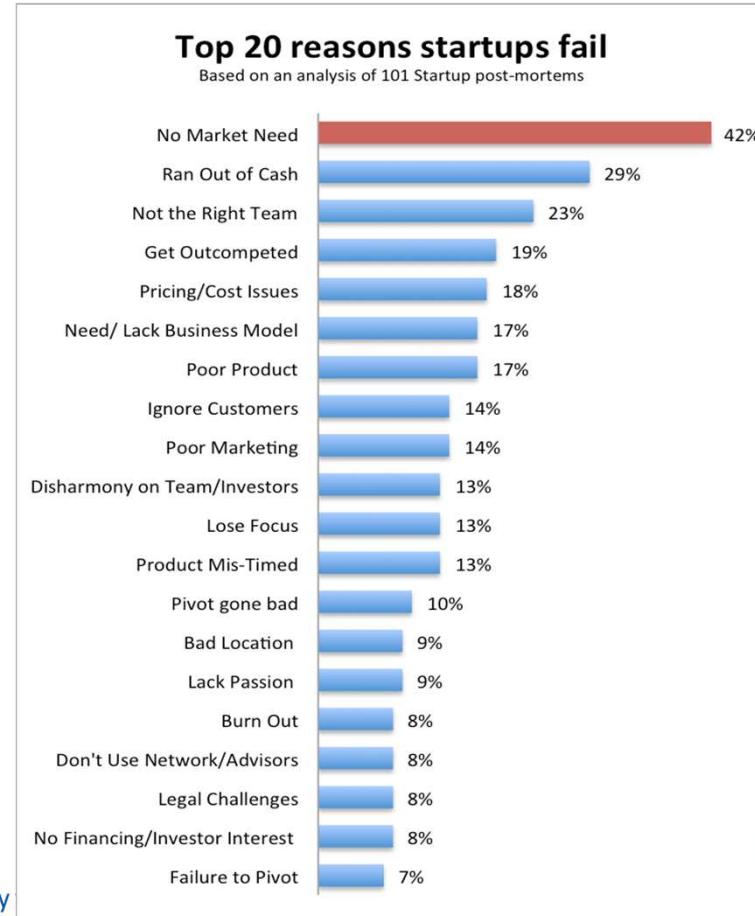
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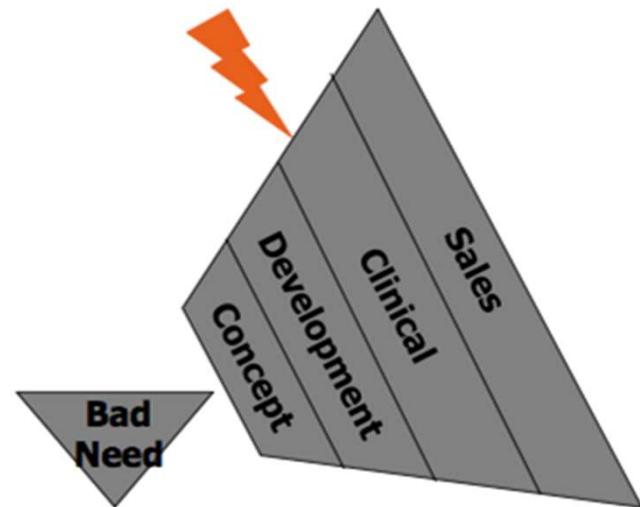


## Self-reported reason why startups fail

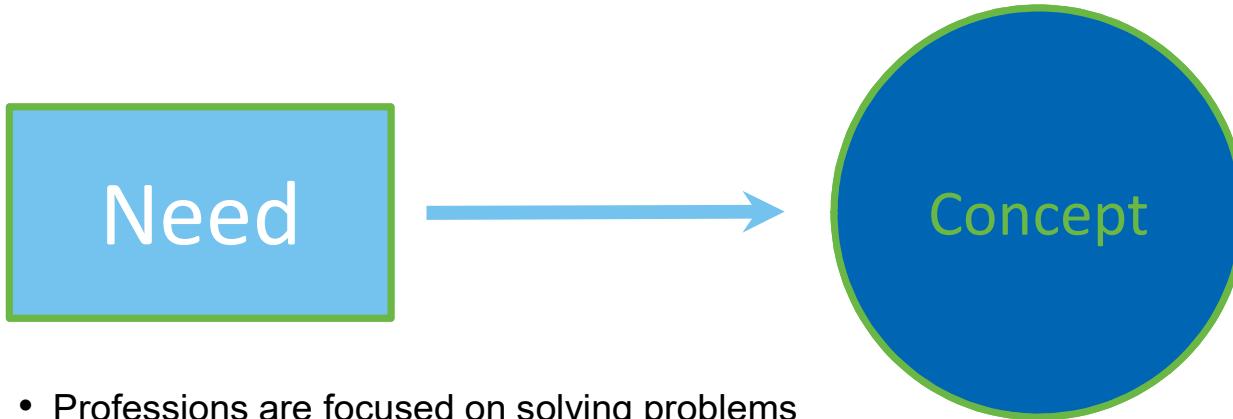


## High cost of failure

- Between \$10M (traditional) and \$100M (MedTech)
- The time of 20–120 people
- Between 3 and 20 years
- Between 3% and 25% of a lifetime



## The Importance of focusing on the need



- Professions are focused on solving problems
- Little attention to solving the right problem / need
- The road from idea to product is long and expensive:
  - Technical development costs are only a small part
  - Intellectual property
  - Marketing
  - Funders
  - Quality management



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## Design thinking fundamentals

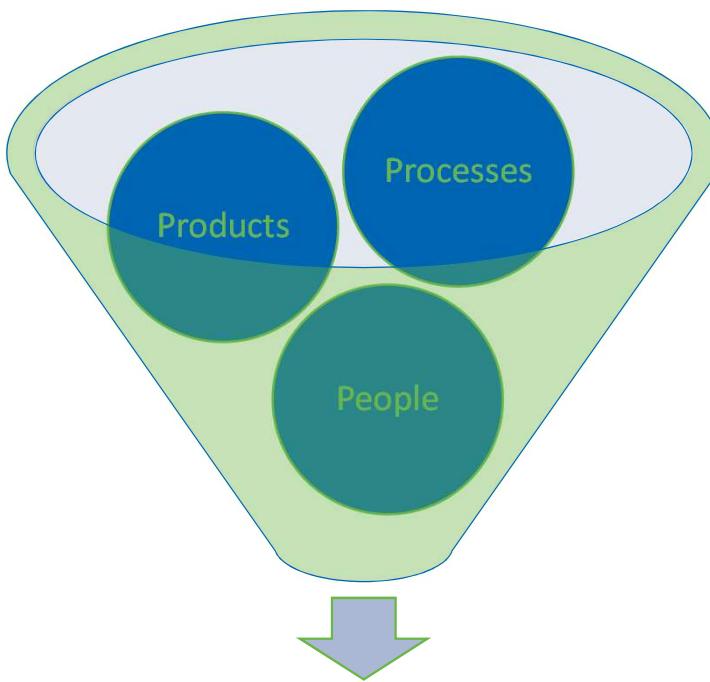
# A definition of Design Thinking

*“Design Thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success.”*

— Tim Brown, CEO of IDEO.



*“Where do we look for this [design] knowledge?”*



# Design Thinking requires certain competencies, behaviours and values

## Competencies

- Empathy
- Integrative thinking
- Synthesis
- Creativity

## Behaviours

- Observation
- Visualisation
- Experimentation
- Collaboration
- Dialectics

## Values

- Validity
- Holism
- Solutions
- Future growth

**Design Thinking requires problem solving skills, a human-centred focus, interdisciplinary teams, collaboration, iteration**

# Practices and mindsets of Design Thinking

PRACTICES	THINKING STYLES	MENTALITY
<ul style="list-style-type: none"><li><b>HUMAN-CENTERED APPROACH</b> E.g. People-based, user-centered, empathizing , ethnography, observation (e.g. Brown 2008; Holloway 2009; Ward et al. 2009)</li><li><b>THINKING BY DOING</b> E.g. Early and fast prototyping, fast learning, rapid iterative development cycles (e.g. Boland &amp; Collopy 2004; Lockwood 2010; Rylander 2009)</li><li><b>VISUALIZING</b> E.g. Visual approach, visualizing intangibles, visual thinking (e.g. Carr et al. 2010; Drews 2009; Ward et al. 2009)</li><li><b>COMBINATION OF DIVERGENT AND CONVERGENT APPROACHES</b> E.g. Ideation, pattern finding, creating multiple alternatives, (e.g. Boland &amp; Collopy 2004; Drews 2009; Sato et al. 2010)</li><li><b>COLLABORATIVE WORK STYLE</b> E.g. Multidisciplinary collaboration, involving many stakeholders, interdisciplinary teams (e.g. Dunne &amp; Martin 2006; Gloppen 2009; Sato et al. 2010)</li></ul>	<ul style="list-style-type: none"><li><b>ABDUCTIVE REASONING</b> E.g. The logic of "what could be", finding new opportunities, urge to create something new, challenge the norm (e.g. Fraser 2009; Lockwood 2009; Martin 2009)</li><li><b>REFLECTIVE REFRAMING</b> E.g. Rephrasing the problem, going beyond what is obvious to see what lies behind the problem, challenge the given problem (e.g. Boland &amp; Collopy 2004; Drews 2009; Zaccai in Lockwood 2010)</li><li><b>HOLISTIC VIEW</b> E.g. Systems thinking, 360 degree view on the issue (e.g. Dunne &amp; Martin 2006; Fraser 2009; Sato 2009)</li><li><b>INTEGRATIVE THINKING</b> E.g. Harmonious balance, creative resolution of tension, finding balance between validity and reliability (e.g. Brown 2008; Fraser 2009; Martin 2010)</li></ul>	<ul style="list-style-type: none"><li><b>EXPERIMENTAL &amp; EXPLORATIVE</b> E.g. The license to explore possibilities, risking failure, failing fast (e.g. Brown 2008; Fraser 2007; Holloway 2009)</li><li><b>AMBIGUITY TOLERANT</b> E.g. Allowing for ambiguity , tolerance for ambiguity, comfortable with ambiguity, liquid and open process (e.g. Boland &amp; Collopy 2004; Cooper et al. 2009; Dew 2007)</li><li><b>OPTIMISTIC</b> E.g. Viewing constraints as positive, optimism attitude, enjoying problem solving (e.g. Brown 2008; Fraser 2007; Gloppen 2009)</li><li><b>FUTURE-ORIENTED</b> E.g. Orientation towards the future, vision vs. status quo, intuition as a driving force (e.g. Drews 2009; Junginger 2007; Martin 2009)</li></ul>

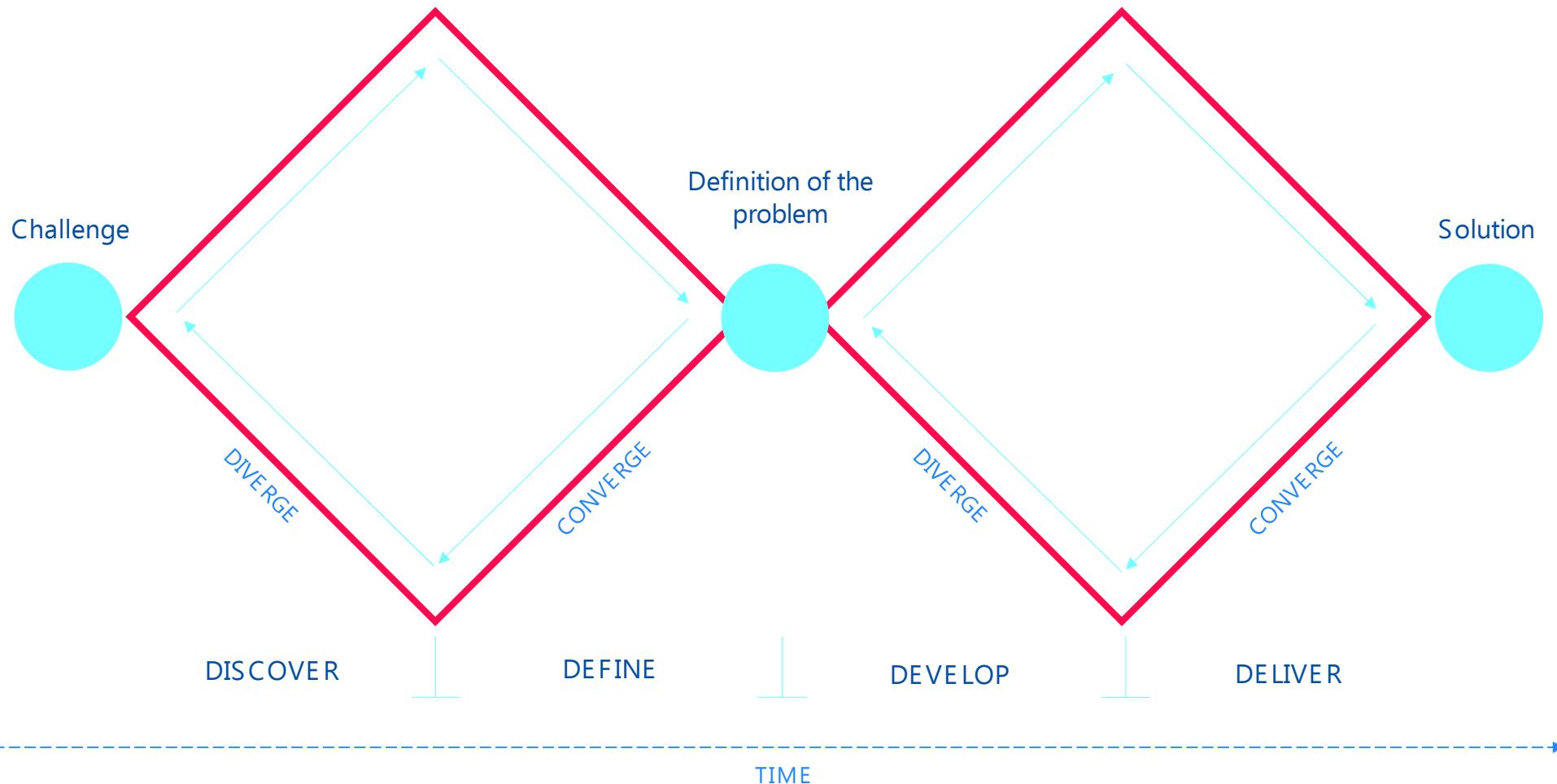
## Take home message

... design thinking requires a certain mindset to ensure successful application:

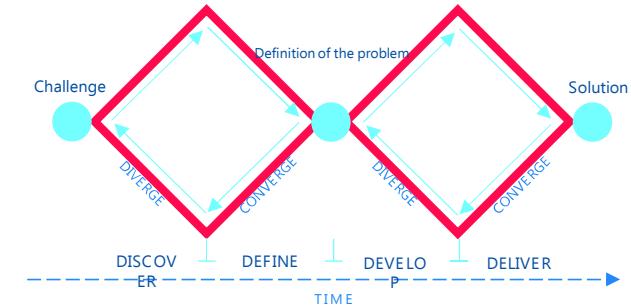
- The answer will not be clear from the start and even though this is uncomfortable it allows for unexpected solutions
- It is okay to fail and in fact it is desirable that you fail because failure is an incredibly powerful tool when it comes to learning
- Design thinking relies on the power of tangibility so stop talking and start making
- Human focus is crucial and should be allied to empathy, observation, and evidence-based insights; the people you are designing for are ultimately your path to innovative solutions

## The Double Diamond Design Process

The Double Diamond approach to problem solving is built around **two pairs of divergent and convergent thinking**



## Double Diamond



### Divergent thinking

'go wide' and explore different ideas, possibilities, and possible causes

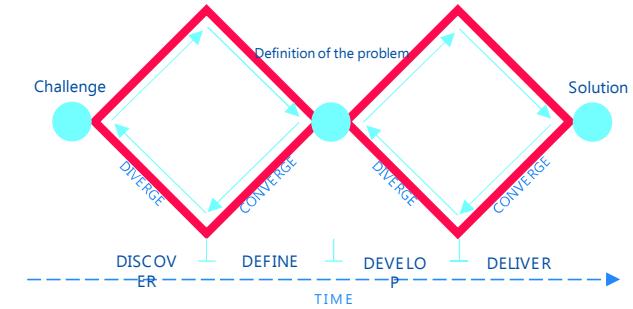
Requires creative thinking and curiosity-driven exploration

### Convergent thinking

'go narrow' and refine these possibilities down to a single cause, problem, or idea

Relies on critical thinking

## Double Diamond



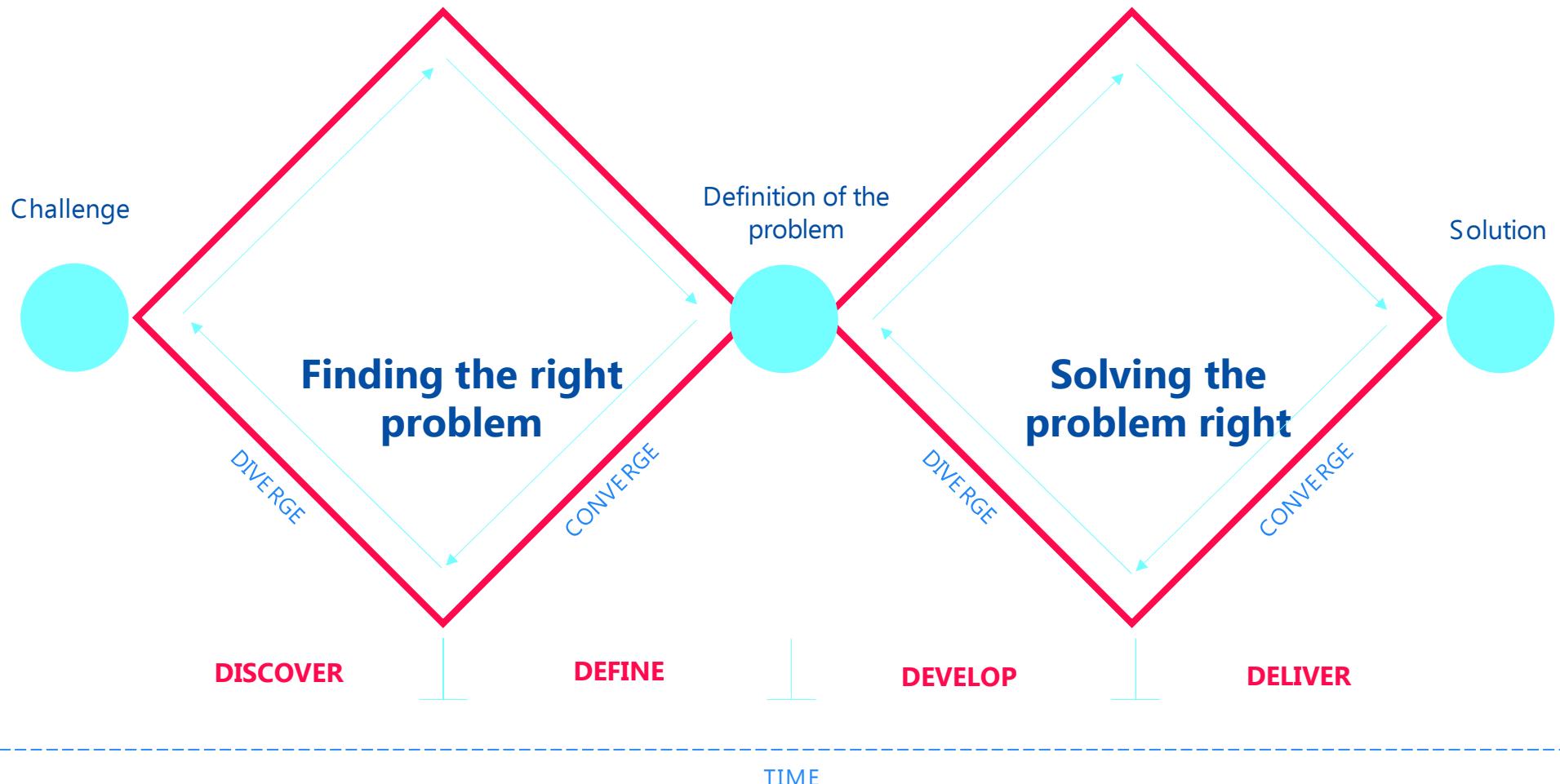
### First diamond

Relates to the understanding and defining of the problem

### Second diamond

Relates to the development of an idea or strategy to solve the problem

Design is about **solving problems** as much as it is about **identifying problems to be solved**.



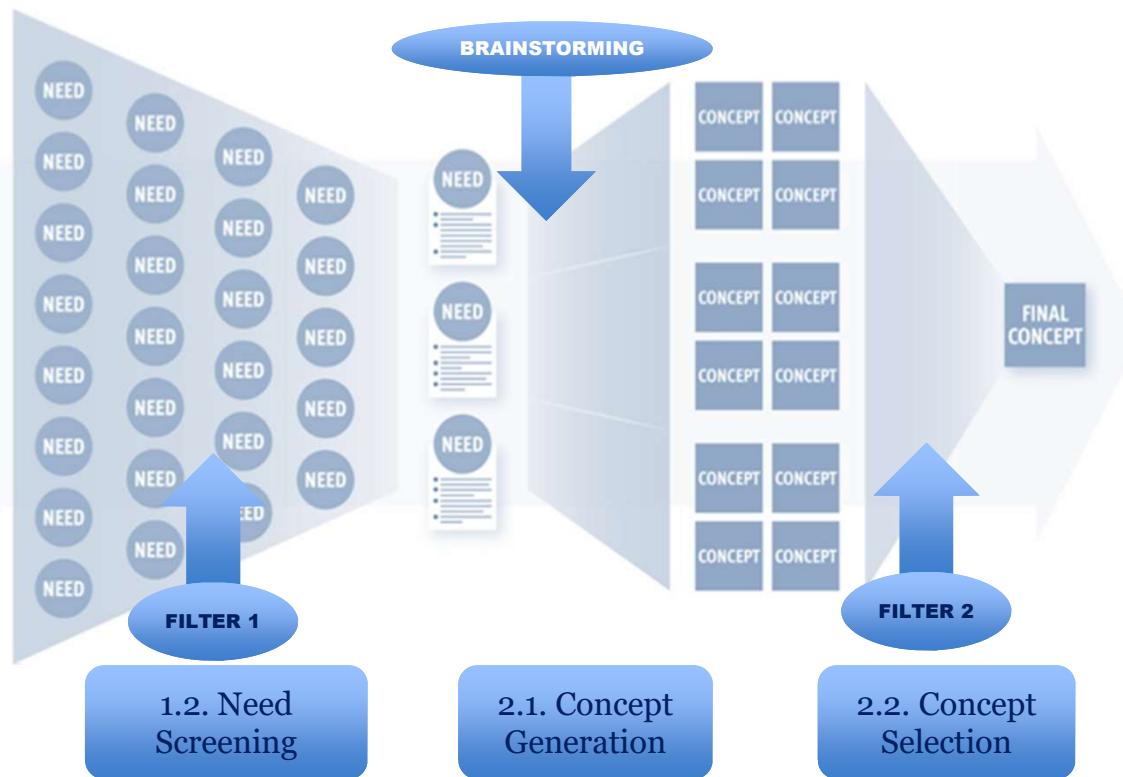


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# The Needs Led Innovation methodology

We will adapt Design Thinking on our program and will follow a Needs Led Innovation Approach

Challenge influences where  
observations take place



Source: JJ Fernandez-García



Need finding starts with observing



The process  
The stakeholders  
The environment



Observe and talk to people,  
Their opinion  
Their experience





João Ribas  
EIT Health Starship Alumn

(preparing for na MRI Scan to understand patient concerns)



## Where to register your observations?

needs led innovation observation and need list (template w one example) - Excel

Ficheiro Base Inserir Esquema de Página Fórmulas Dados Rever Ver Power Pivot Diga o que pretende fazer...

Cortar Colar Pincel de Formatação Área de Transferência

Fonte: Arial Tamanho: 10

Formato: N I S

Alinhamento: Unir e Centralizar

Número: % 000,00,00

Formatos: Personalizado

Formato: Formatar como Estilos de Condicional

Formato: Formatar como Estilos de Tabela

Formato: Formatar como Estilos de Célula

Inserir: Células

Formato: Estilos

Formato: Eliminar Formatar

Soma Automática:  $\Sigma$

Preenchimento: A Z

Ordenar e Localizar: Limpas

Editor: Filtrar Selecionar

B3

A	B	C	D	E	F	G	H	I	J
1	No.	Date/time	Place	Observer	Description of observation	Need no.	Hospital contact	Comments and / or keywords	
2	1	2017-03-01	Stockholm	Sjoerd	Hypertension patient came in with the sole purpose of checking blood	1	Anna (Nurse)	hypertension, pregnancy	
3	2								
4	3								
5	4								
6	5								
7	6								
8	7								
9	8								
10	9								
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24	23								

Observations Needs Data Ideas (for later reference) +

# Dos and don'ts

- Do
  - Be concise
  - Make sure you are pinpointing the core of the observation
- Don't
  - Include any assumptions
  - Write observation statements longer than 1 sentence

## Exercise

- Watch the video “ER Observation”;
- Write at least 10 observations from what you observe in the clip



## From observation to need statement

### Observation

- Singular witnessed event

### Problem

- Recurring situation of doubt, uncertainty or difficulty

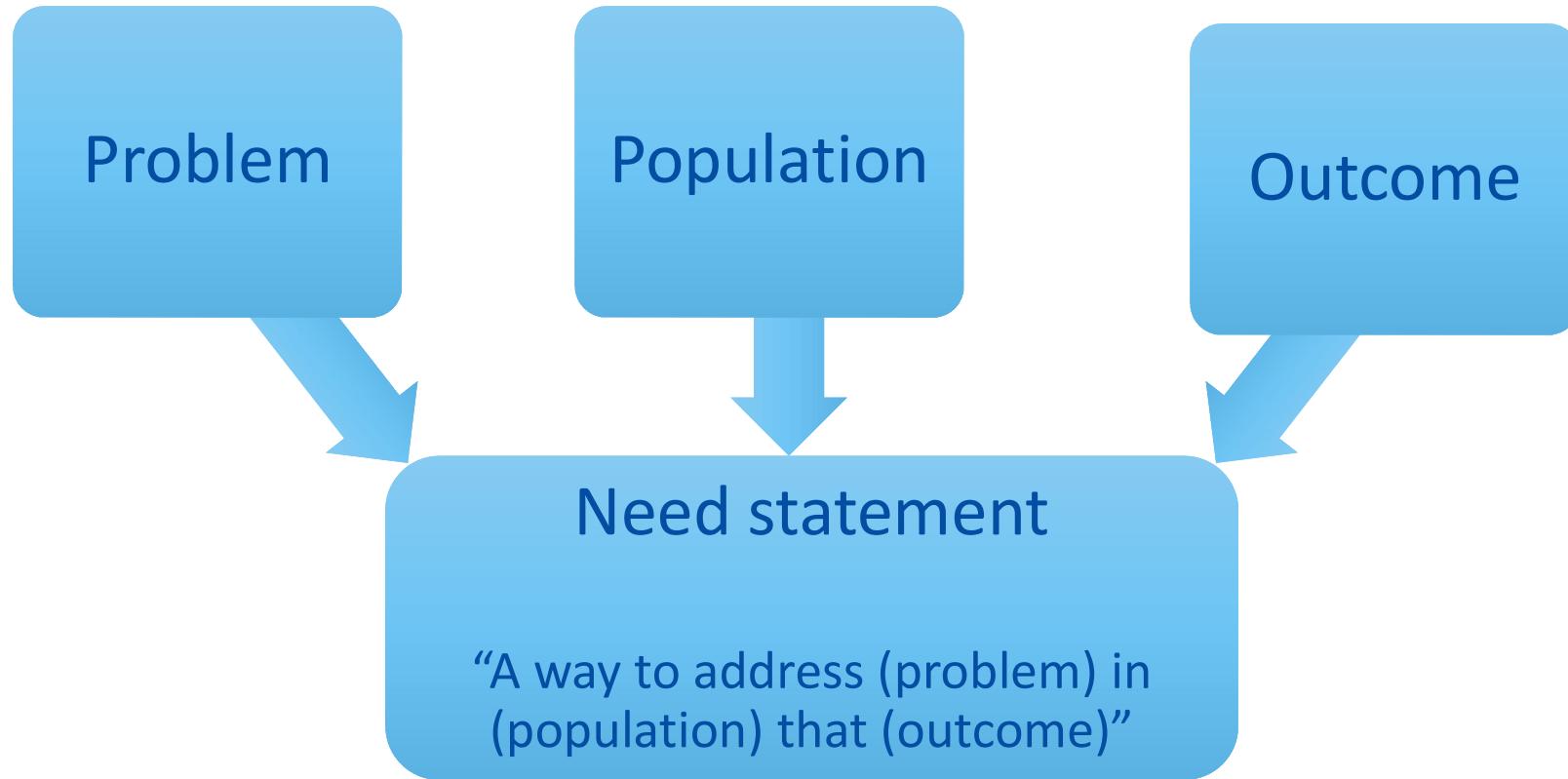
### Need

- Identified change in outcome to address problem



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## Need statement components



## Need statement example

• “*A way to support mothers with breastfeeding after they've left the hospital.*”

- Is the need clear?
  - > Eliminate ambiguity (random-person-on-the-street test)
- Why is this need important?
  - > Determine what the pain point is
- What is the desired change in outcome?
  - > Investigate the underlying triggers

## Need statement example

*“A way to support mothers with breastfeeding after they’ve left the hospital.”*



*“A way to relieve mothers’ worries related to breastfeeding after they’ve left the hospital.”*

Possible  
solution  
areas



*Medicate the mother*



*Advise against  
breastfeeding*



## Need statement example

*“A way to support mothers with breastfeeding after they’ve left the hospital.”*



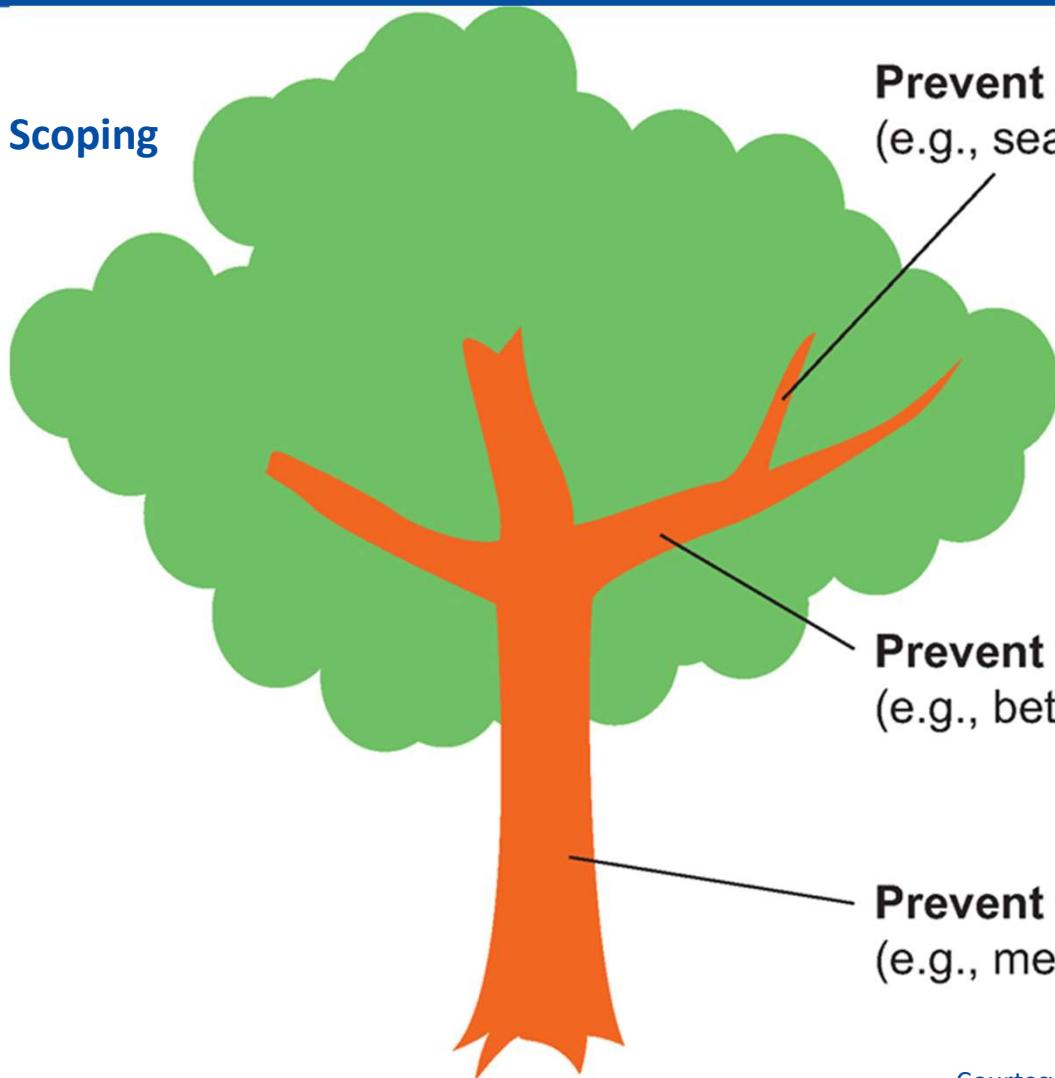
## Need statement example

*“A way to support mothers with breastfeeding after they’ve left the hospital.”*



*“A way to shorten time at breastfeeding centers spent on mothers wrongly thinking they have engorgement, in order to reduce personnel stress.”*

Need Scoping



**Prevent clot from leaving heart**  
(e.g., seal off atrial appendage)

**Prevent clot from forming**  
(e.g., better anticoagulation)

**Prevent atrial fibrillation**  
(e.g., medications, surgery, ablation)

## Common Need Statements Pitfalls

Pitfall	Problematic Example	Improved Example
NEED IS TOO GENERAL	<p><i>A way to improve outcome of spine surgery</i></p> <ul style="list-style-type: none"> <li>● Not clear which surgery, initial diagnosis, or how to improve</li> </ul>	<p><i>A way to reduce risk of re-herniation after lumbar discectomy for sciatica to reduce re-operation</i></p> <ul style="list-style-type: none"> <li>● Clear about procedure, diagnosis, and complication</li> </ul>
NEED IS TOO SPECIFIC	<p><i>A way to treat bifurcation lesions in the left main coronary artery to reduce recurrence rates</i></p> <ul style="list-style-type: none"> <li>● No reason to limit to this population—many patients have bifurcation lesions in other main coronary vessels</li> </ul>	<p><i>A way to treat coronary bifurcation lesions to reduce recurrence rates</i></p> <ul style="list-style-type: none"> <li>● Increases the patient population at least several-fold</li> <li>● Likely that same solution will work across all types/patients</li> </ul>
NEED IS STUCK IN CURRENT PRACTICE	<p><i>A way to close sternotomy without risk of sternal-wire breaking</i></p> <ul style="list-style-type: none"> <li>● Focuses on sternal-wire; closes out other approaches</li> <li>● Focuses on part of procedure that doesn't deliver result</li> </ul>	<p><i>A way to close a sternotomy following CABG quickly and securely that reduces wound dehiscence</i></p> <ul style="list-style-type: none"> <li>● No reference to current solution, targets procedure goal</li> </ul>
NEED HAS AN EMBEDDED SOLUTION	<p><i>A way to ultrasonically weld suture in surgery</i></p> <ul style="list-style-type: none"> <li>● Completely limits to one approach</li> </ul>	<p><i>A way to secure an aortic valve prosthesis with minimal or no on-pump time to reduce cognitive dysfunction after surgery</i></p> <ul style="list-style-type: none"> <li>● Identifies specific procedure and problem while leaving solution open</li> </ul>
NEED IS BUILT ON A NEGATIVE	<p><i>A way to not have infections related to dialysis catheters</i></p> <ul style="list-style-type: none"> <li>● Focuses negatively on one specific issue of one solution</li> </ul>	<p><i>A way to provide long-term, high-flow vascular access for hemodialysis with reduced risk of infection</i></p> <ul style="list-style-type: none"> <li>● Not so negative; focuses on the goal of dialysis catheters rather than the specific solution and is therefore less limited</li> </ul>

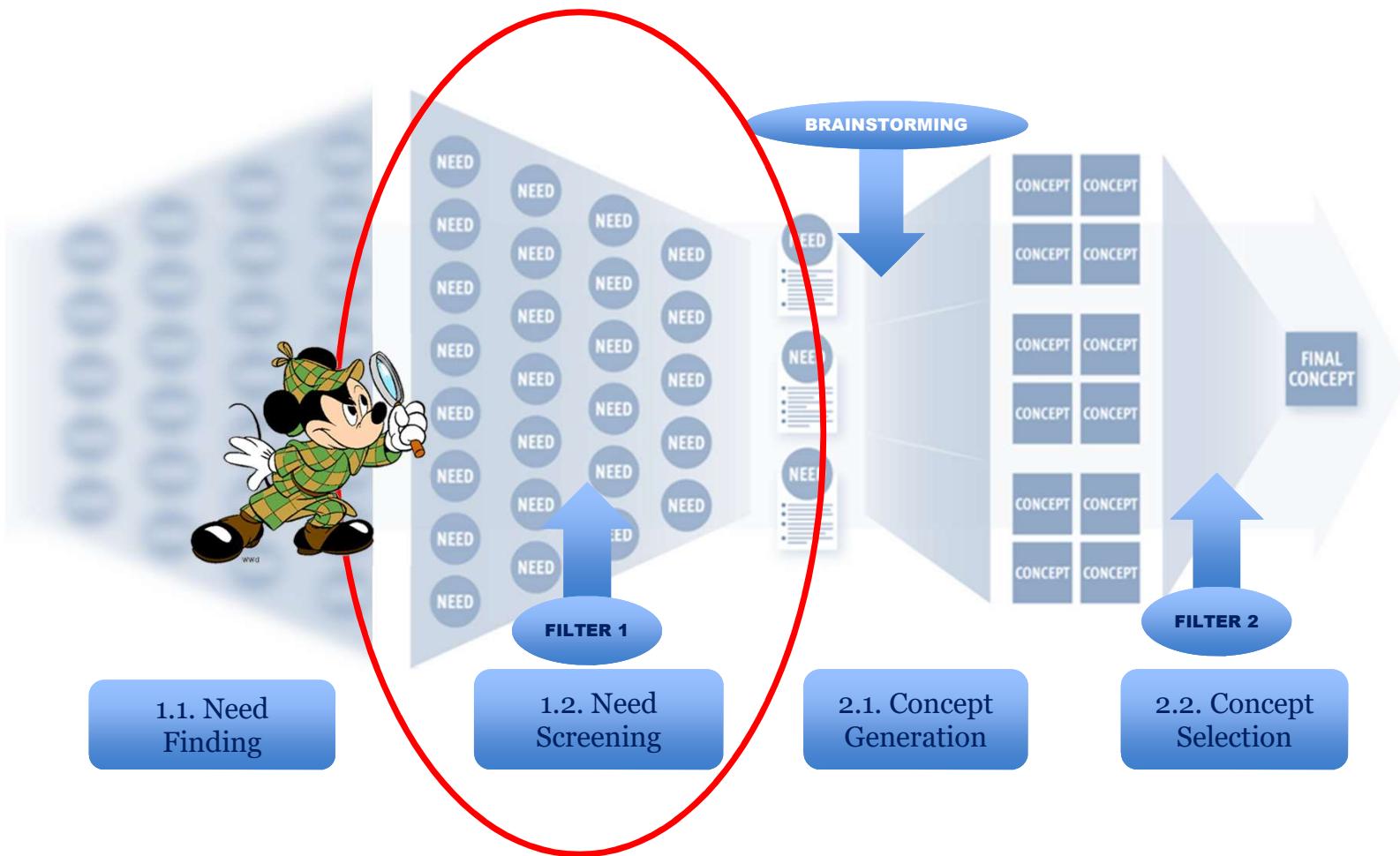


## Where to register your needs?

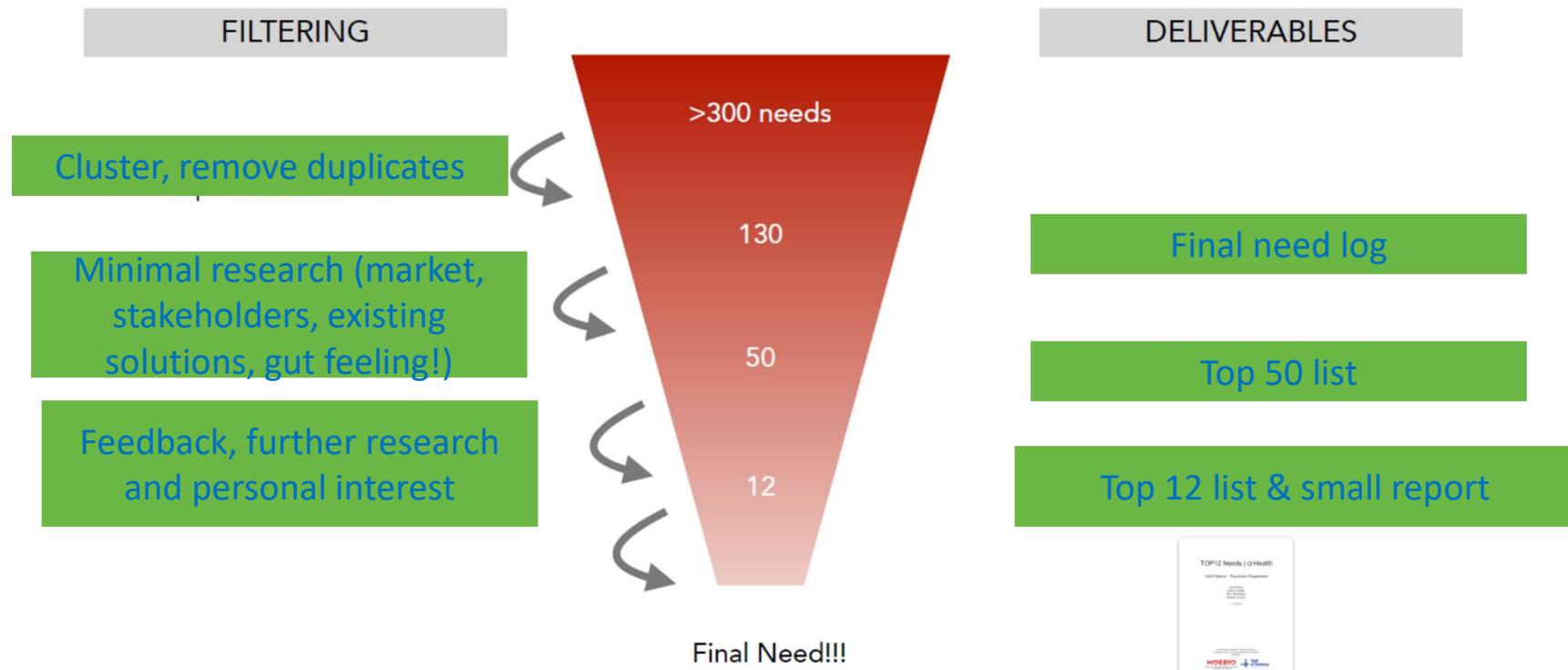
needs led innovation observation and need list (template w one example) - Excel

No.	Observer(s)	Need formulation Problem - population - outcome: A way to address ... in ... to ... .	Observation no.	Contact Name of person to contact for follow-up	Need owner Whose responsibility is it to address the need?	Solution stakeholder Who benefits from solving the stated need? (except the patient and society)	Payer Who pays for the solution to the need?	Alignment Is need owner = solution stakeholder = payer? (all 3 equal: good; only 2: OK; none: bad)	Market Rough estimate of the market size of the need, e.g. in your home country.	Trend
1	1 SJ	A way to address the location where selected care moments of pregnant women are performed, in order to reduce cost and increase accessibility of care	1	Anna (Nurse)	Obstetric department at hospital	Obstetric department at hospital	Obstetric department at hospital	Good	Subset: cost of visits by pregnant mother with high blood pressure: roughly ~0	
2										
3	2									
4	3									
5	4									
6	5									
7	6									
8	7									
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Observations    Needs    Data    Ideas (for later reference)    +



## IDENTIFY: Needs Filtering



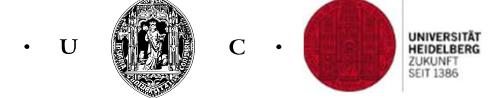
**And now a small break to introduce you....**

### **Stakeholder Definition**

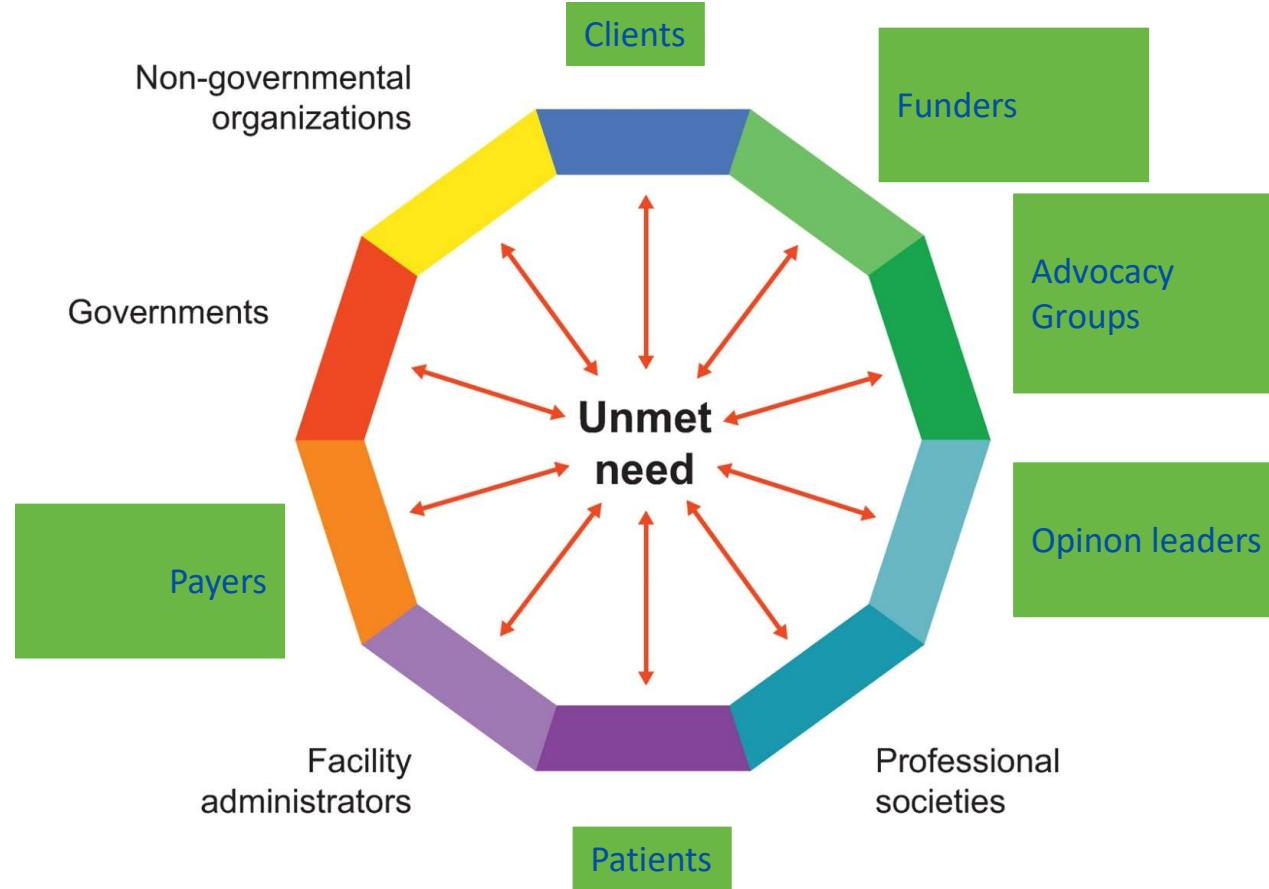
All parties with some interest in the delivery and financing of solutions for a specific need.



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## Stakeholders



## Stakeholder Analysis process



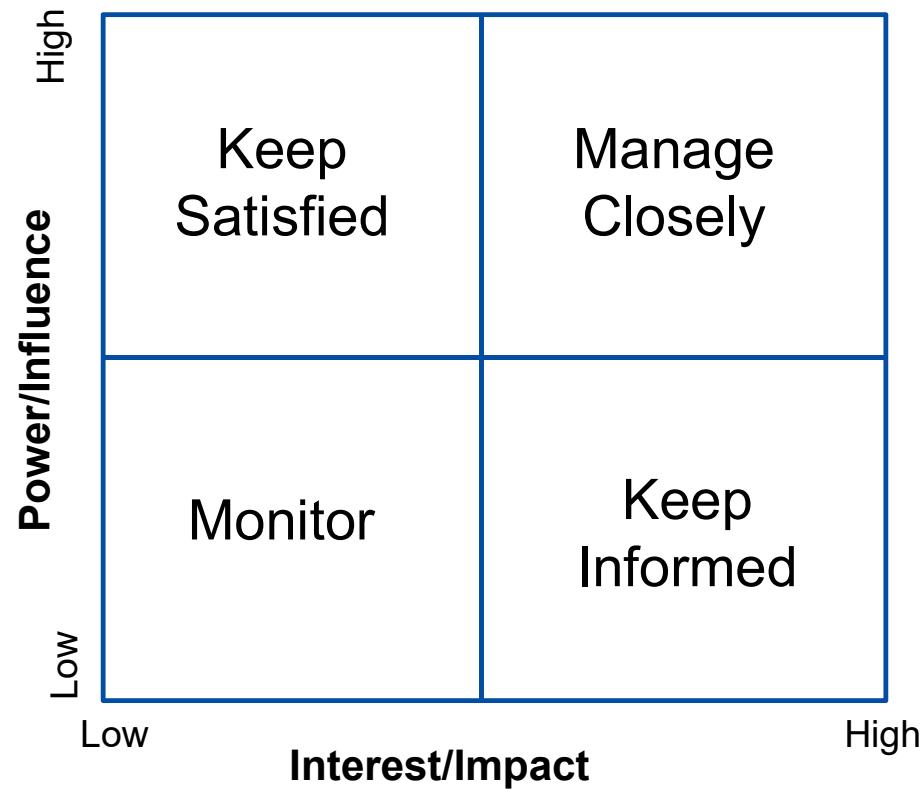
1. Identify stakeholder
2. Outline benefits and costs for each stakeholder group
3. Summarize net impact and key issues for each stakeholder group
4. Classify stakeholders and assess trade-offs

## Stakeholder Analysis

# An helpful Matrix

Stakeholder	Persona/ person /entity	Impact How much does the project impact them? (Low, Medium,High)	Influence How much influence do they have over the project? (Low, Medium, High)	What is important to the stakeholder?	How can the stakeholder contribute to the project?	How can the stakeholder block the project?	Strategy for engaging the stakeholder

## Strategy for engaging the Stakeholder



## MONITOR MOM

A way to engage children in sharing their diabetes management activities with their parents in order to improve adherence behaviour.

Stakeholder	Personal entity	Impact How much the project impact them	Influence How much influence do they have over the project	What is important to the stakeholders	How the stakeholders can contribute to the project	How the stakeholder can block the project	Strategies to engage the stakeholder
Beneficiary	DM 1 DM 2	High	Low	Accuracy Personalized	Feedback Wellbeing	Non-participation	Medical staff engagement Educational videos Family engagement
User	Caregivers of the DM patients	High	High	Access to medical information about DM management	New features Interoperability with EHR	Lack of knowledge/H R Non-participating	Secondary prevention materials
Payer	Insurance companies Caregivers	High	Medium	Reduce DM complications	Funding Promoting	Lack of investments No DM education management	Promotions

Coming back to needs filtering...

Define some criteria to do a fast filtering.  
Some examples (don't have to use them all):

- Stakeholder alignment
- Market size
- Market trend
- Teams personal gut feeling and passion

# Market Assessment

Market Size: Define some scoring thresholds that makes sense for your evaluation, for exemple:

Market size criteria	Score
Small (~ 2M€)	1 Points
Medium (~20M€)	2 Points
Large (~100M€)	3 Points
Huge (>100M€)	5 Points

Market Trend: Define some scoring thresholds that makes sense for your evaluation, for exemple:

Market size criteria	Score
Negative trend	-3 points
Stable next 10 years	0 Points
Doubles in 10 years time	3 Points
X10 in tem years time	5 Points

## **At the end of the day you'll have a quick & dirty scoring table**

Need statements	Stakeholder Alignment	Market Size	Market Trend	Team passion/Gut feeling	Total
Need 1	3	5	3	3	13
Need 2	5	5	3	3	16
Need 3	1	3	1	4	9
Need 4	5	1	-3	2	5
(...)	(...)	(...)	(...)	(...)	(...)

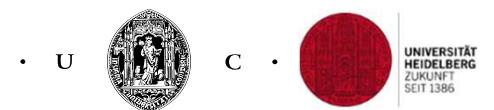
## Example

No.	Need formulation Problem - population - outcome: A way to address ... in ... to ...	Avg personal scores (/3)	Market Size (/5)	Need Impact (/5)	Competition (/5)	Technical Feasibility (/5)	Final Ranking Score
71	A way to provide the right tools to radiologists so they always keep a good visual acuity in order to reduce reporting errors due to perceptual errors	2,75	3	4	4	5	<b>18,8</b>
17	A way to help restore the circadian rhythm of nurses who jump from day to night shifts to reduce long-term fatigue .	2,75	4	4	3	3	<b>16,8</b>
30	A way to help the surgical team with eye accommodation from very bright to soft light	2	3	4	5	3	<b>17,0</b>
60	A way to reduce the impact of X-ray radiation on eyesight during surgical procedures requiring imaging techniques in order to prevent vision	2,5	3	3	1,5	4	<b>14,0</b>
29	A way to help paramedics to manage sudden intense light changes in their work environment in order to avoid migraine	2	2,5	4	3	3	<b>14,5</b>
28	A way to reduce visual fatigue in GPs and family doctors due to too much screen work in order to avoid dry and itchy eyes	2,25	3	2	2	5	<b>14,3</b>
10	A way to ensure the precision of the imaging exams done by radiology technicians in order to facilitate the diagnostic process of radiologists	2	5	3	4	3	<b>17,0</b>
66	A way to improve visual adjustment to different light settings in order to improve the work environment for medical professionals who are exposed to	2,25	5	3	1	2	<b>13,3</b>
72	A way to reduce the need to force visual acuity of radiologists to prevent eye strain	2	3	4	3	2	<b>14,0</b>
4	A way to avoid surgeons to adopt bad postures when operating in order to prevent long-term injuries and chronic pain.	2,25	3	3	3	1	<b>12,3</b>
67	A way to reduce the impact of long periods of work in low light condition for radiologists in order to reduce their fatigue.	2	3	3	3	4	<b>15,0</b>
50	A way to prevent muscles strain and fatigue of surgical staff without compromising the surgery workflow	1,25	3	3	3	3	<b>13,3</b>
46	A way to provide appropriate lighting towards the surgical area of interest in order to improve the surgeon's accuracy during medical procedures	2,75	3	3	1	3	<b>12,8</b>
52	A way to reduce time exposure to environmental hazards in the OR (especially for long surgeries (>4h)) in order to prevent headaches in	1,75	2	2,5	2	2	<b>10,3</b>
68	A way to introduce different light sources within medical professionals	1,25	4	2	3	4	<b>14,3</b>

Any questions?



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## Team work

1. Select which will be the challenge your team will address 18<sup>th</sup> June
2. Make a plan within your team to collect observations related with your challenge.
  - Make sure you do direct observations at Health care units and speak with different stakeholders related with the challenge.
  - Populate your observation list with at least 30 observations29th June
3. Convert your observations into needs statement. Make sure you get at least 5 needs statement 6th July
4. Select the top 3 needs using filtering criteria predefined by the team and pick one to work during the summer school 13th July



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# Thank you!

Cheng-Wen Jaw  
Jorge Figueira