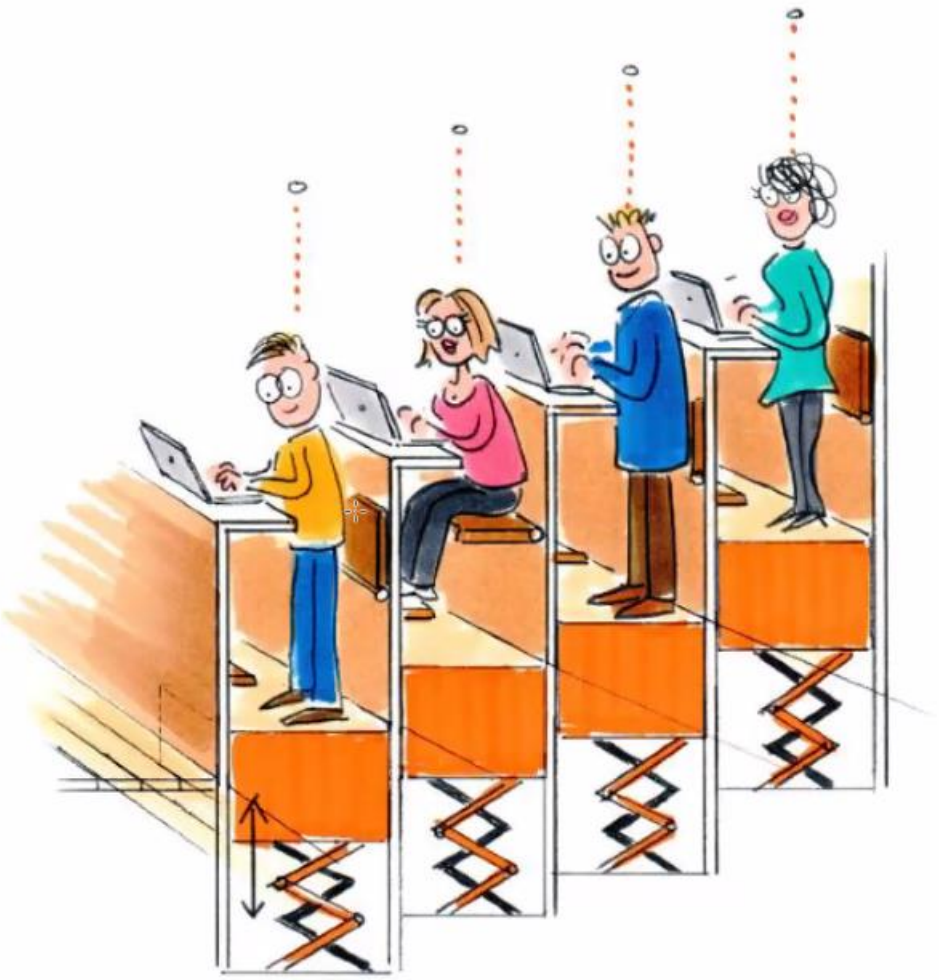
# INNOVATION AND ENTREPRENEURSHIP

## GRUPPE 37: A DYNAMIC CLASSROOM



Wanted to reinvent the school chair!

both high-level areas and their related subsections.

| | Past | Present | Future |
|---|---|---|---|
| Supersystem (user) | Couldn't stand up anymore | Sitting down<br>Working in front of a computer | Stillesiddende personer<br>Studerende<br>Børn |
| System (thing) | Chair | Bad working chair | God arbejdsstol<br>"SMART" stol |
| Subsystem (contains) | Back of the chair<br>3-4 chair legs<br>Seat | Ryglæn<br>Sæde, pude<br>Hjul<br>Hæve/sænke<br>Armlæn<br>Fjeder, vinkel etc. | Brugerinteraktion<br>"Nem stol"<br>Elektronik<br>"Selv tilpasning"<br>Automatisk |

Explaining explicit problems in the focus area health care.
Explaining that regular desk work, hence back pain, still are an unsolved problem or a problem that are still much discussed.

- *Teachers:*
  Good work environment and equipment helps to avoid back pain. Furthermore, with a changing work day, where part of the day is standing up teaching, the most of the people rejected the hypothesis of office chairs giving them back pain.
- *Students:*
  Long hours, in limited spaces for legs makes it it hard to focus in the lectures. "At navitas have i noticed that often lean more and more back during the class". The problem comes when there's no place to place baggage and jackets, because it often ends behind the back, making it uncomfortable for multiple hours of teaching.

*What did they (maybe) mean? (Implicit (latent, tacit) needs)*

- *For students:*
  Limited space can **implicit** be because of height

*D: Challenge: Alternatives, Because, Cut (Challenge assumptions)*
*Alternative for the school chair:*
Car, spaceship, standing up (e.g. as to a concert), hammock
saddle on horse, cinema, bench, rocking chair, dentist chair, bus, train, concert,

*Because (challenge the concept of the school chair):*
School chairs are "small", because not much space.
School chairs are simple, because then they don't break easily
School chairs are "90 degrees", because it is practical with computer and schoolbooks.
Height of table is the same when you have chairs

*Cut (can something be removed?):*
School chairs don't have many features, so there's not much to remove. (legs? Back? Wheels? Chair? seat?)

*4: Valleys to explore: (Create insight)*
*A: Needs to challenge / potential lead users*
Challenge: Why don't we have more comfortable chairs in classrooms/auditorium in high school/university?
E.g. gaming chair, special chair for handicap

*B: Knowledge to explore (researchers, technologies, breakthroughs etc.)*

| | |
|---|---|
|  |  |
| Picture 3: Future chair [3] | Picture 4: Future chair [4] |

Different studies have been made regarding the ergonomic of the office chair. [5]

*C: Potential other inspiration areas:*

- Car chair, Massage chair
- Wall-E, Science fiction movies, Transformers

*5: Personalize (with name) the most rewarding persons/valleys: WHY? (Clarify direction)*
Optimal: Stephen Hawkings, Leonardo Da Vinci, Hans J. Wegner, ancient Egyptians (who invented the first chair) Thomas Jefferson (inventor of the office chair).
Good: Chair designer, physiotherapist, Occupational Therapist.
Possible: students (user), chair designer, chair seller, physiotherapist, Occupational Therapist.

*6: Define innovation task(s) (Innovations task)*
*We want to ..... because .....!*

We want to rethink the "chair situation" in a classroom/auditorium to remove the uncomfortability, due to the chair, during a four hour lecture, because this will improve the student ability to focus on the lecture content.

They did their own process

concept using vertical innovation. However, it was possible to postpone decisions until the idea for the pitch session was selected. The Rosetta software was used to keep track of the process.

The process is descripted in the following figure.


*Figure 1. The innovation process undergone in the innovation project.*

## Methods for ideation

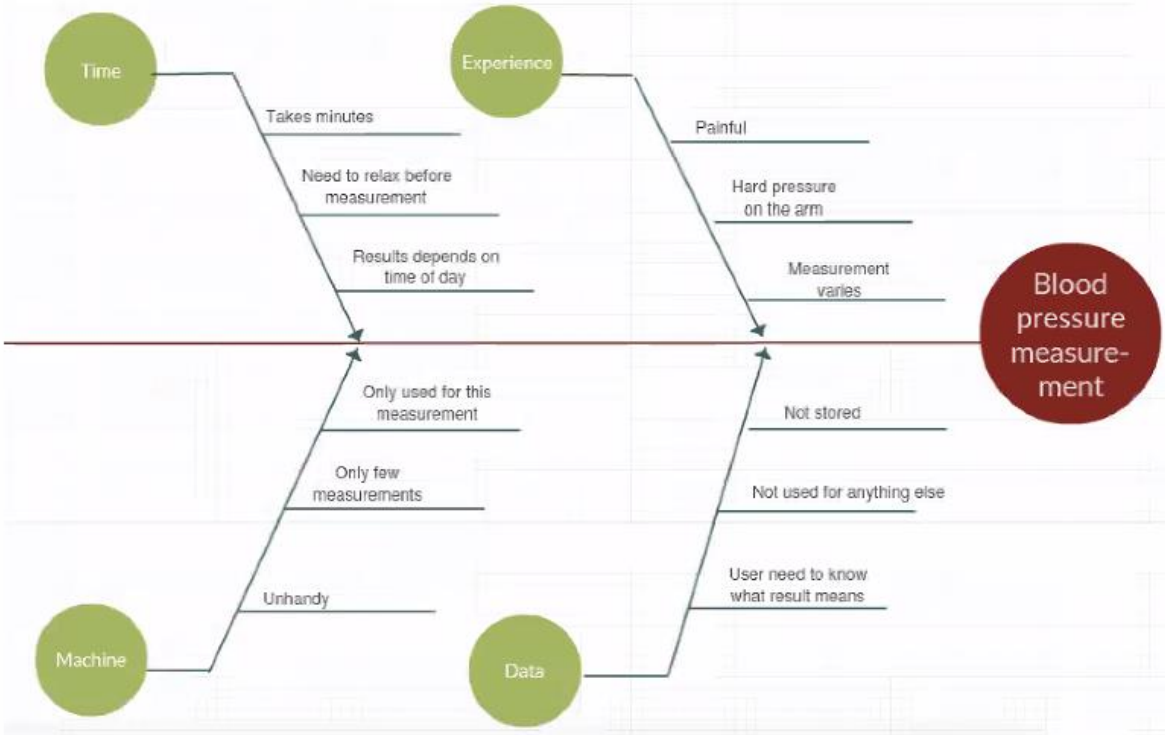
For the ideation five methods were selected. The reason for selecting these five methods was to gradually increase the degree of originality of the inputs generated. By using brainstorm the group got the ideas based on everyday creativity out of mind and made it possible to go beyond creativity to generate paradigm breaking innovations.

The reason for choosing the specific method and the outcome are described below:

- ***Brainstorm*** was chosen to get a lot of ideas out of the mind and get started with the ideation. Many inputs were generated, but the level of originality tended to be low. The inputs were mostly directly related to the innovation challenge.
- ***Random*** was chosen in order to get inspiration from other sources and use the underlying principles to solve our innovation challenge. Surprisingly, the random method also generated some paradigm breaking inputs and it was discovered that the

## C – Fishbone

Fishbone diagram showing the negatives about blood pressure measurements.




## D – Triz nine windows

Triz nine windows for investigation the past, present and future.

| | **Past** | **Present** | **Future** |
|---|---|---|---|
| **Supersystem** | Family<br>Witch-doctors | Doctors<br>Home use | Internet of things<br>Insurance companies<br>Public health sector<br>Doctors |
| **System** | Judgements of symptoms | Sphygmomanometer<br>Watches(New) | Chips / shared knowledge |
| **Subsystem** | Symptoms | Blood pressure measurement<br>Mercury<br>Digital system<br>Band on upper arm | Cyborg technology.<br>AI suggestions for optimal planning<br>Meal suggestions.<br>Thought processing. |

things that could be challenged and get an idea of how to target the problem.

### External knowledge

Throughout the process external knowledge was used. While breaking down the challenge some potential sources of knowledge were listed.

- **Blood pressure patients:** These will be the daily users of our innovation.
- **Medical doctors and researchers:** These can provide domain specific knowledge that the group members do not possesses.
- **Experts in other fields not directly related to the topic:**
  - Biologists
  - Expert in pressure measurements

[1] See Appendix A
[2] See Appendix B
[3] See Appendix C
[4] See Appendix D

After defining the sources of external knowledge needed these were personalized. Specific persons were appointed to be a potential knowledge source. An example is the professor from Aarhus University Christian Aalkjær who has done research on giraffes and their blood circulation.

Due to time constraints it was decided only to do an interview with a doctor and a person suffering from high blood pressure.

### User needs

From the interviews user-needs were found. The persons were asked about the existing methods, how they feel about measuring blood pressure etc. They were also asked if they see any trouble in how the blood pressure is measured today and what they would like it to look like in the future.

The needs can be divided into explicit and latent needs. One example of each type is illustrated:

- **Explicit:** *A method that does not causes pain for any patients.* Both the patient and the doctor said that pain was an issue.
- **Latent:** *The data is collected and presented in a more convenient way.* The patient felt frustrated about not understanding the measurements. The doctor said that the he does not

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- **Explicit:** *A method that does not causes pain for any patients.* Both the patient and the doctor said that pain was an issue.
- **Latent:** *The data is collected and presented in a more convenient way.* The patient felt frustrated about not understanding the measurements. The doctor said that the he does not get the full picture of the patients, because the measurements are not consistent.

## Things to challenge

There is a need to challenge the way to blood pressure is measured today and the equipment used at the doctor's place, but also the equipment used at home. There is also a potential to challenge how the measured data is used. Today, it is only used to see if the blood pressure is normal or if it is too high. The data could for example be used by insurance companies or dietitians to help planning a diet.

## Innovation task

With the knowledge gained throughout the focusing the innovation task was defined:

"We want to improve the everyday life for people suffering of high blood pressure by reducing the impact it has on their daily life. This would reduce health problems for the individual, improve happiness for relatives and reduce the strain it puts on the global economy every year."

Table B.1: TRIZ: Nine Windows for Methane

| | **Past** | **Present** | **Future** |
|---|---|---|---|
| **Super-System** | Building Materials<br>Fire Fuel<br>Fertilizes | Fuel<br>Fertilizes<br>Building Materials | Fuel<br>Climate<br>Consumers<br>Countries (Global image) |
| **System** | >Poop<br>>Burps | **METHANE**<br>**(Cow feces and farts)**<br>**(Bi-products)** | Re-cycle<br>Reduce<br>Collect |
| **Sub-System** | Cows<br>Grass/Food<br>Burps and Farts | Cows<br>Grass/Food<br>Burps and Farts | Cows (Different breed)<br>Food (Modification)<br>Supplements<br>Other stimuli |

# PABS - Patient Anti Bacterial Sleeve

An Innovation Project


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To get a professional point of view an interview was conducted with the department nurse, Jeannette Thierry Andersen, at the Joint and Tissue Diseases department in Aarhus University Hospital. She gave an inside knowledge of the problem self-infection. She said that the biggest problems with hospital infections are when the patients have a weakened immune system because it makes it easier for an infection to survive. The cleaning procedure at the hospital is generally very high. The hospital room is cleaned daily and the nurses use alcohol-based hand sanitizer many times every day. When asked about procedures around personal electronic devices, especially patient devices, Jeanette responded the following: *"I do not think so, but it is a good point, because it is filled with bacteria... Incidentally, it is quite interesting because I also go with my own phone, and so do all the nurses and doctors... We have new habits that have come in the last few years, and we need to pay extra attention to this... As I know, we do not have any hygiene document on the cleaning of your own mobile phones."*

This was surprising to hear, and the group decided to change the focus to infections caused using personal electronic devices and more precisely, patients' mobile phones.
A recent study by R.R.Brady (2011), concluded the following: *"Eighty-six out of 102 (84.3%) patients' mobile phone swabs were positive for microbial contamination. Twelve (11.8%) phones grew bacteria known to cause nosocomial infection. Seven (6.9%) phones and 32 (31.4%) nasal swabs demonstrated Staphylococcus aureus contamination. MSSA/MRSA contamination of phones was associated with concomitant nasal colonization."* The amount of phone users has only increased since 2011, and now even elderly patients use phones on a regular basis. This increases the problem even further.
The chosen specific task can be formulated as the following: How can bacteria on phones, located in hospitals, be prevented from infecting the patients and the hospital personnel. This is the task that will be solved through the ideation process.

# 4 Ideation

With the defined focus/task followed the ideation, and as the team was already composed with optimal numbers and great diversity, it was decided that all 5 team members participated in the creation of ideas. The problem-solving method was used as a starting point, as all team members, as future engineers, have become accustomed to developing on the basis of a problem, thus this would facilitate the startup process. Later in the ideation process, attempts were also made to pursue a disruptive process in order to think further out of the box.

## 4.1 Ideation on demand

The first inputs were made with the question of how to avoid contact infection through electronic devices, and the methods that were used were based on Søren Hansen's presentation about Ideation on Demand and making innovation through creative thinking. By using the six steps of ideation with fluency, flexibility, originality, alternatives, new categories and development of an idea, the process eventually ended up with a result.

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## Group creation

To become a team we talked about our different engineering backgrounds and which topics we found interesting in our field of study. Secondly, we talked more broadly about our personal backgrounds in order to get a better knowledge of each other and what our expectations to the course was. From this session a team agreement was formed consisting of 5 statements that all group members could agree upon: *Vision, Qualification, Incentives, Resources and plan*[1].

By defining our team agreement and discussing both engineering and personal interests we were able to get a focus and start working with defining our innovation task.

## Focusing

The goal of the focusing was to define an innovation task to be solved. Firstly, a broad approach was taken to define as many potential areas to work with within the main topic "Healthcare". From this we gained an overview of the topic. Different potential areas were then investigated and one area was selected to be investigated further in order to define an innovation task.

### Mind mapping and selection of innovation task area

In order to investigate the general topic "Healthcare" a mind map was created. The mind map was filled with all thoughts, problems, ideas, technologies and challenges that came to mind when elaborating on the topic. The mind map can be found in appendix[2]. The topics and ideas were very broad and therefore it was decided to focus on the branch called self-monitoring. Further development of this branch showed that one focus could be blood pressure measurements. This topic was selected because it was found appealing and a potential area for creating change with the qualifications of the group members in mind.

### Break down challenge

To break down the topic "blood pressure measurement" all the pros and cons was found. In order to find an interesting challenge to work with all the cons was conducted into a fishbone diagram[3]. For the same topic the Triz model/ 9 windows was used to find out what is known today, how it was previously and what the future will look like[4]. All these methods were used to create an overview of things that could be challenged and get an idea of how to target the problem.