

# Developing interactive systems considering User-Centred Design

2nd Sem., IHC, 2018

**deti** departamento de  
electrónica, telecomunicações  
e informática





**Technology can play an important role  
in our daily lives**

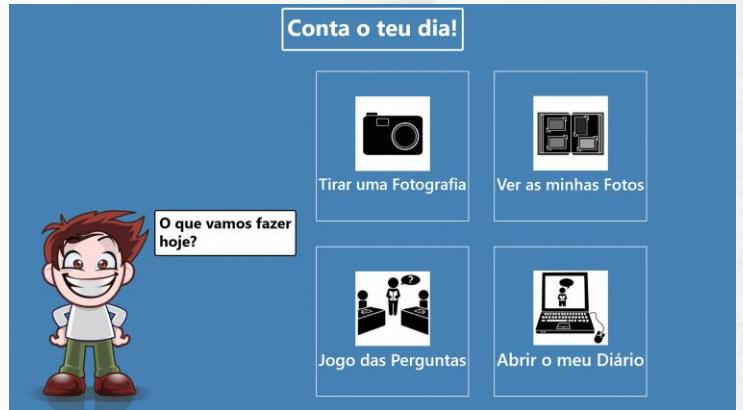
**If we manage to harness its power  
to serve our needs and  
motivations**



**Designing and developing  
for different audiences  
is challenging**

**We must understand  
users and their needs**

# Application “Tell Your Day”

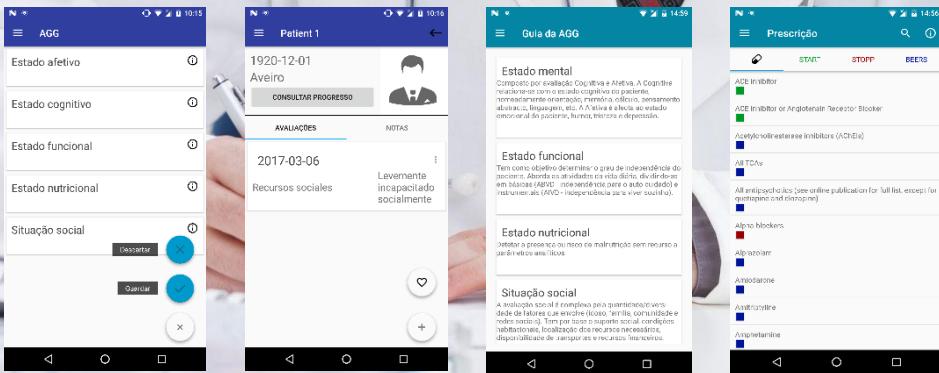


<https://danskebank.com>

Multimodal App targeting ASD scenario



# Application “Geriatric Helper”



**Agile application of Comprehensive Geriatric Assessment**

# Application “Medication Assistant”



Beyond just a medication reminder

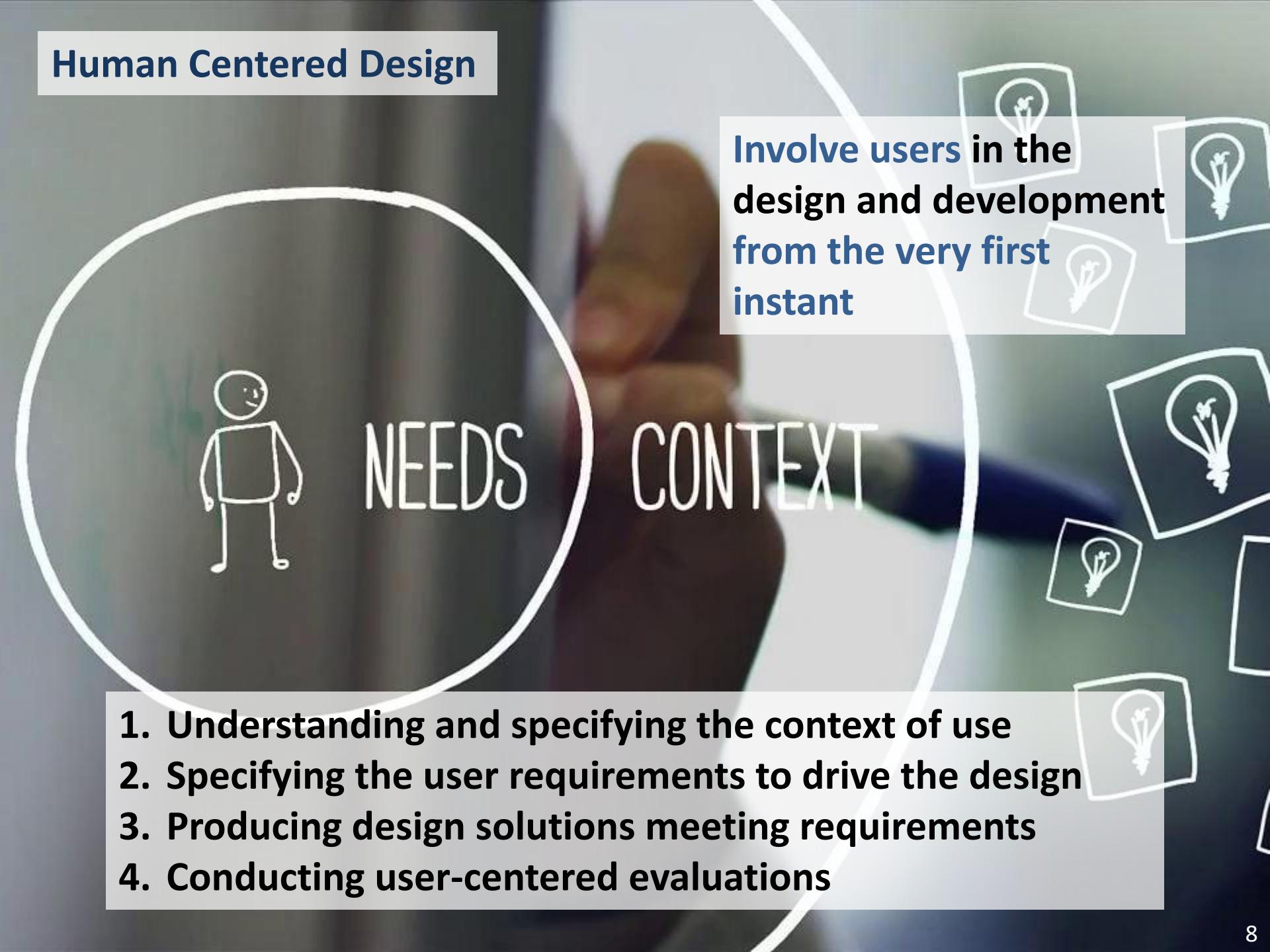


# Personal Life Assistant “AALFred”



Multimodal Interactive Assistant to  
Enhance the Social Life of the Elderly

# Human Centered Design



Involve users in the design and development from the very first instant

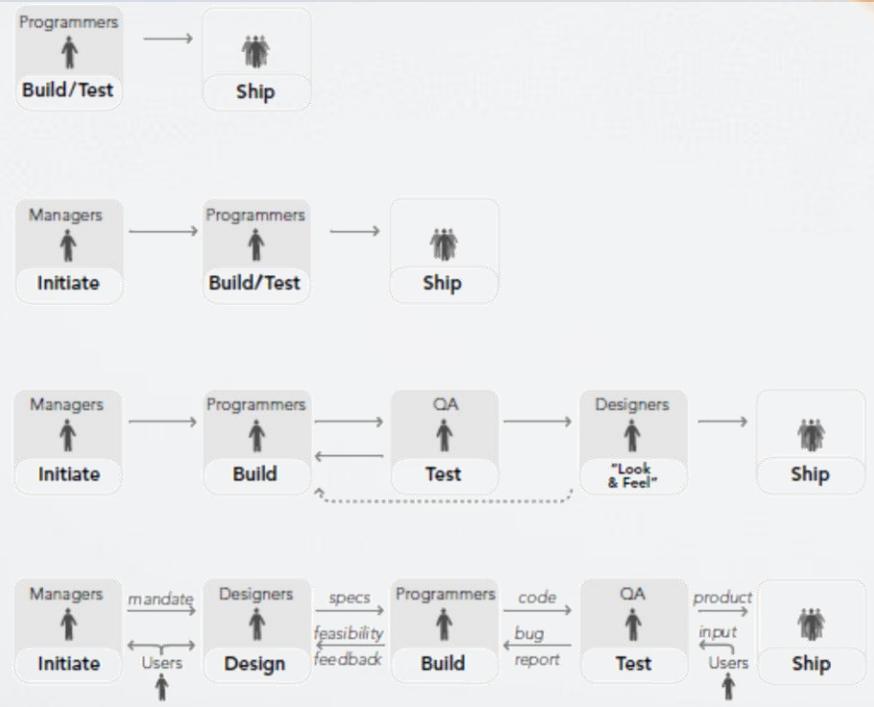


NEEDS

CONTEXT

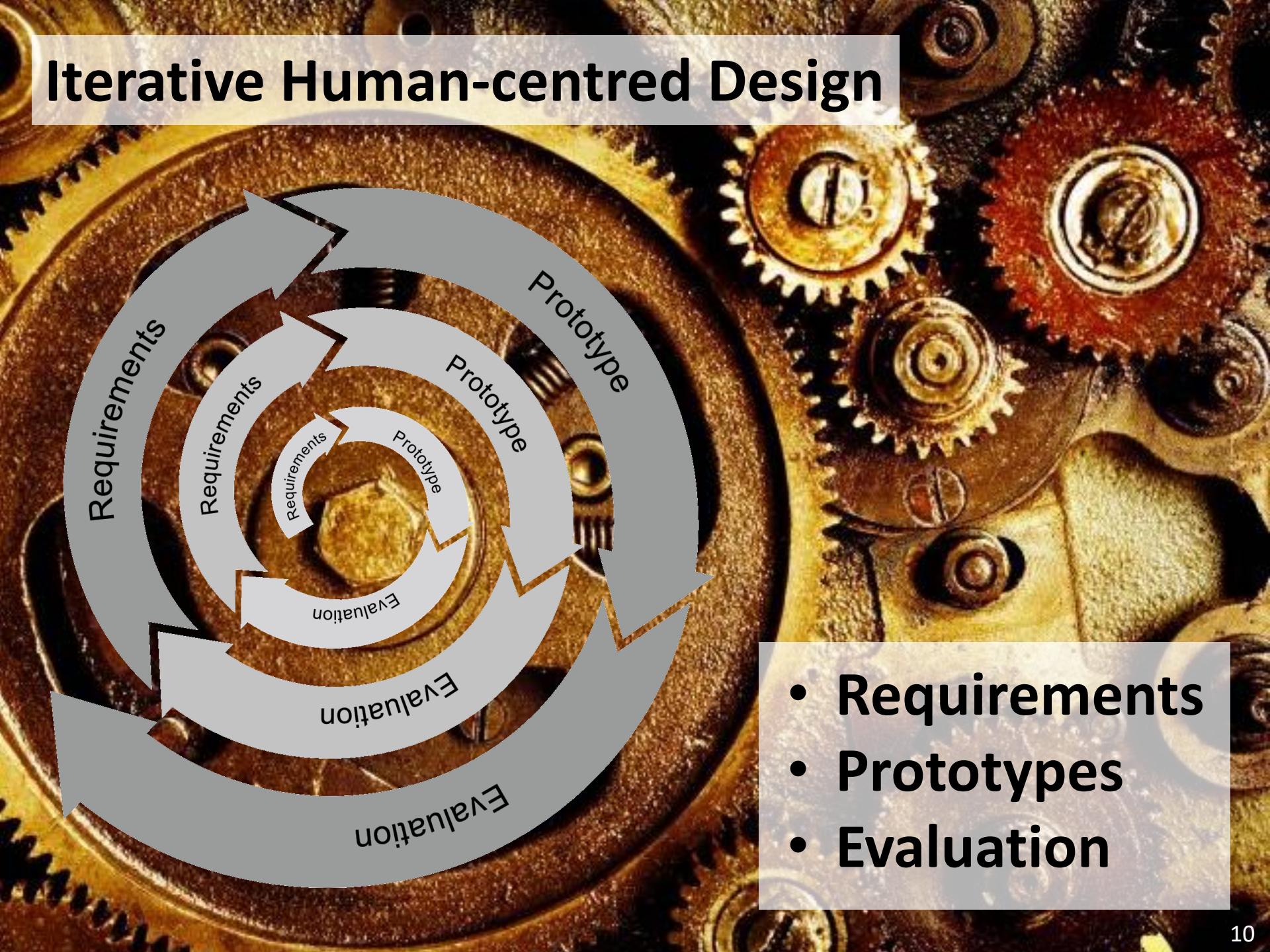
1. Understanding and specifying the context of use
2. Specifying the user requirements to drive the design
3. Producing design solutions meeting requirements
4. Conducting user-centered evaluations

# Goal-Directed design



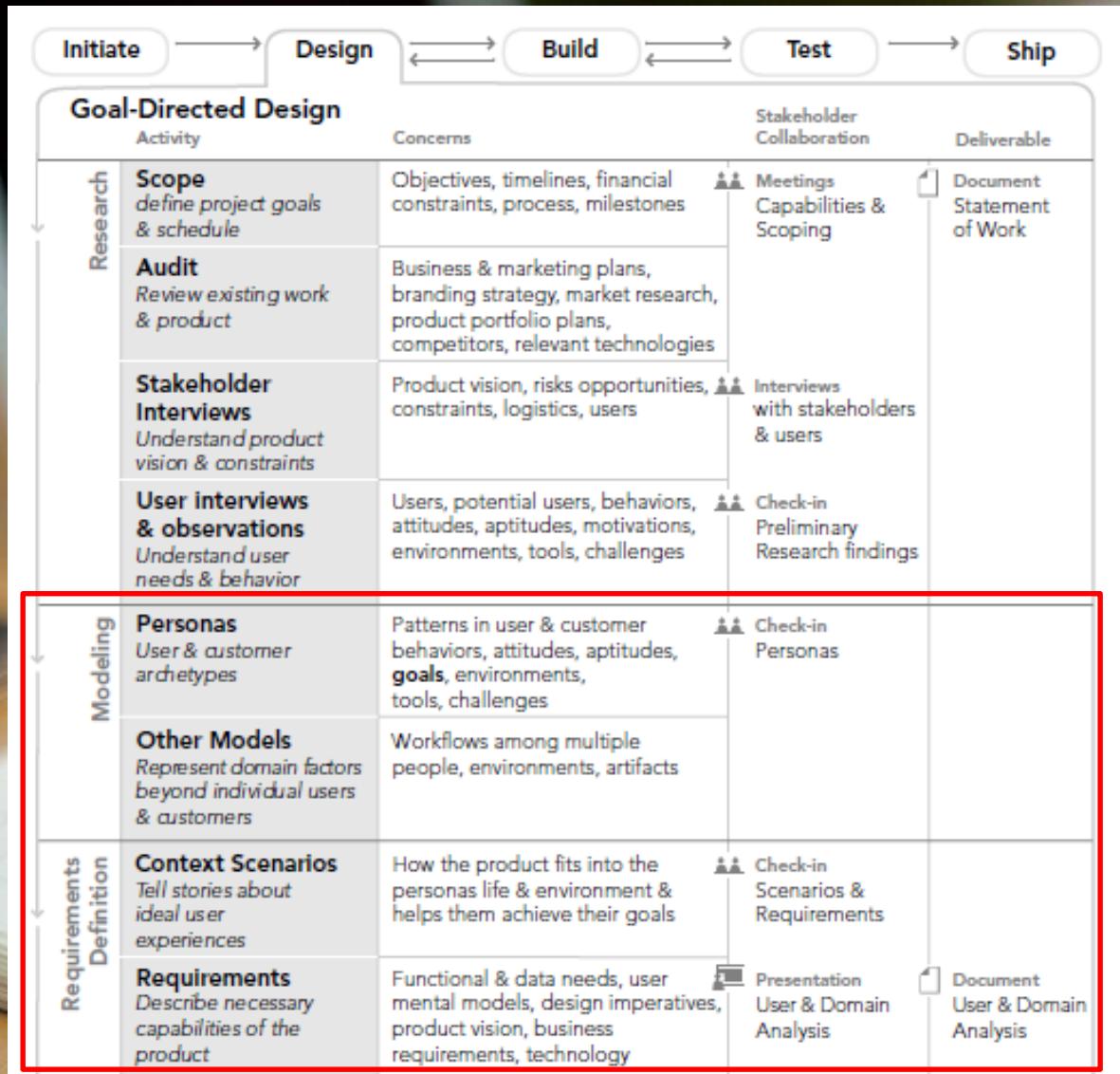
Design to meet  
goals in context

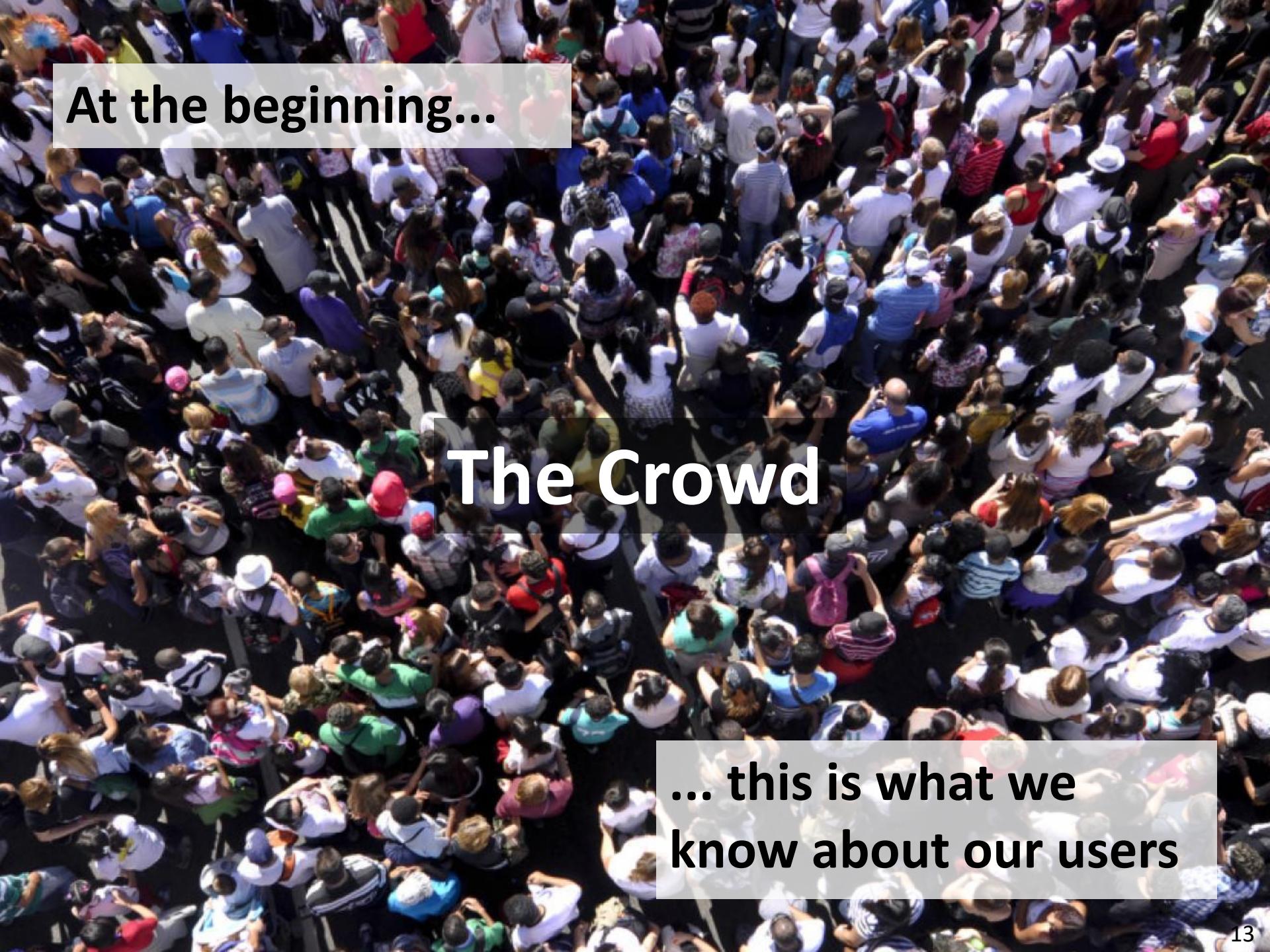
# Iterative Human-centred Design



- Requirements
- Prototypes
- Evaluation

# REQUIREMENTS





**At the beginning...**

## The Crowd

**... this is what we  
know about our users**

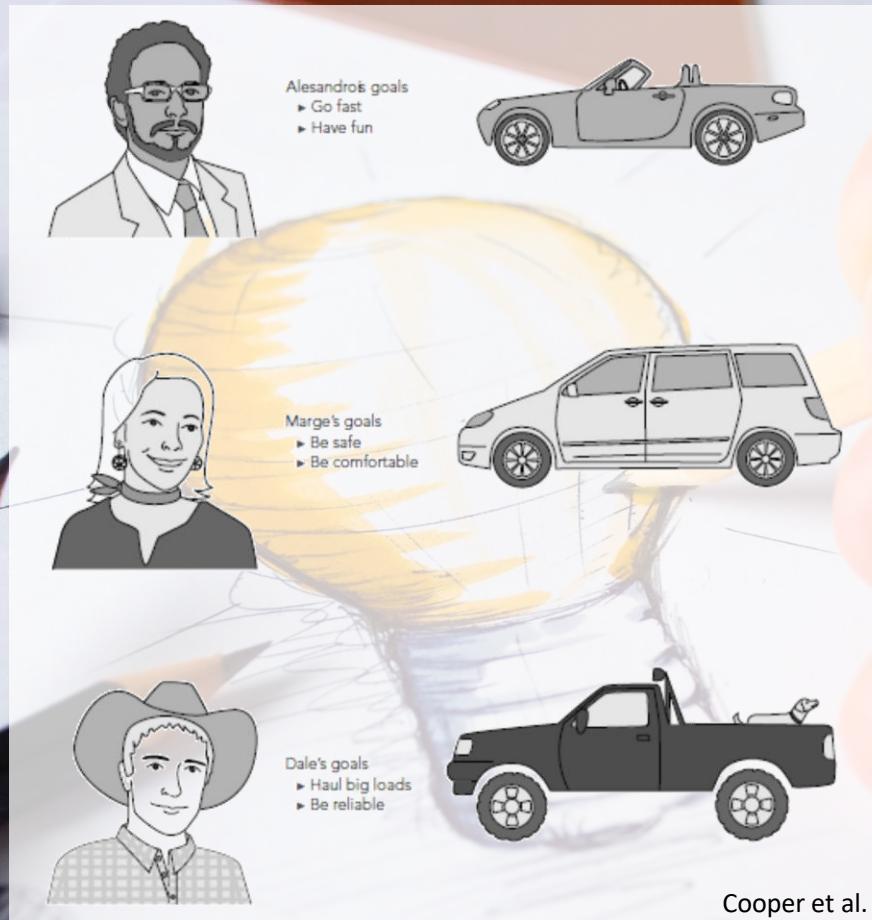
# Designing to please every possible user...



Cooper et al.

... often results in low user satisfaction, overall

# We need to understand which types of users matter...



... and target their specific goals

# How do we understand and characterize our target users?

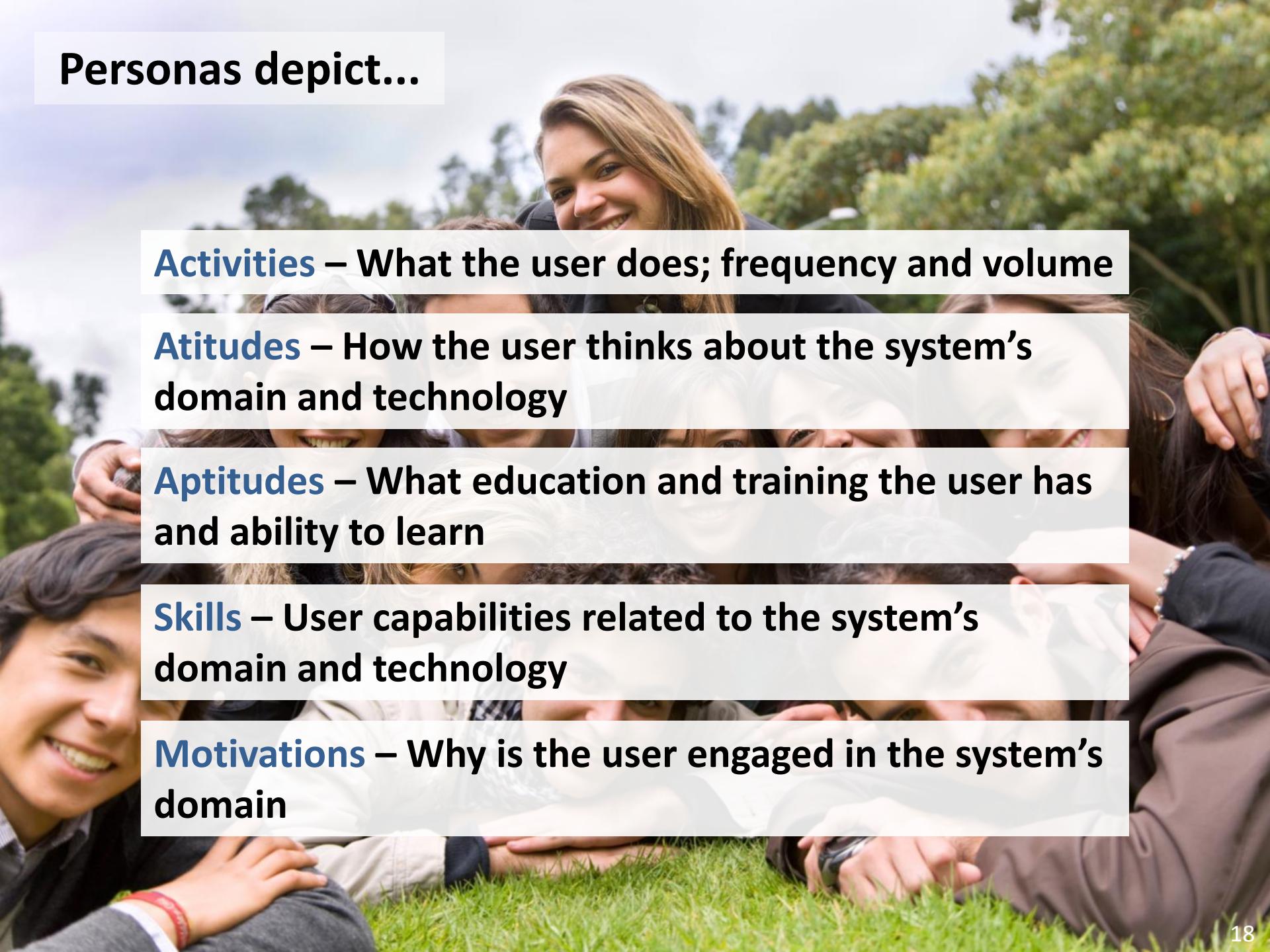


Beginners	Intermediates	Experts
<p>What does the program do? How do I print? What is the program's scope? Where do I start?</p>	<p>I forgot how to import. How do I find facility X? Remind me what this does. What was the command for X? Opps! Can I undo? What is this control for? What new features are in this upgrade?</p>	<p>How do I automate this? What are the shortcuts for this command? Can this be changed? How can I customize this? What is dangerous? Is there a keyboard equivalent?</p>

# Personas

- Based on research
- Represented as individual people
- But, represent groups of users
- Explore ranges of behaviour
- Must have motivations

# Personas depict...



**Activities** – What the user does; frequency and volume

**Attitudes** – How the user thinks about the system's domain and technology

**Aptitudes** – What education and training the user has and ability to learn

**Skills** – User capabilities related to the system's domain and technology

**Motivations** – Why is the user engaged in the system's domain

Personas articulate this information and...



- Include biographical data
- Are presented in narrative form
- Have a photo

# Personas as tools to understand and empathize with users

*Persona for Nuno Rocha, a kid diagnosed with ASD.*



**Nuno Rocha**, born on February 20th, 2005, in Aveiro, Portugal, lives with his parents and a 13 year old sister. At the age of two he went to a Child Development appointment, at the district hospital, because his parents suspected that something was wrong, after which he was sent to an autism exam at the Paediatric Hospital of Coimbra. At the age of three, he was diagnosed with an Autism Spectrum Disorder (level 2 in the scale of severity), with associated cognitive deficits.

He is attending the 4th grade at Anadia's Primary School, benefiting from a Structured Teaching Unit (STU) delivering him a structured learning model (TEACCH) and the application of interdisciplinary intervention methodologies. He also benefits from Speech Therapy sessions.

Nuno follows an individual curriculum (consisting of changes to the normal curriculum, by introducing, replacing or eliminating goals and contents). On a daily basis, for 2 hours, he attends the regular class to work sociability, whereas functional classes (like functional Portuguese, world knowledge, functional math and every day activities) are learned at the STU.

At home, he prefers to watch TV and play computer games. When asked about professional preferences, he mentions he would like to stay at home with his mother and watch TV or play computer games.

He appears to dominate the basic functions of a computer; however, he only uses his ability to play computer games. He is not able to research information on any search engine, nor does he use social networks for communication.

He appears to understand simple oral material, specifically words or sentences related with his social and familiar day-to-day. On the other hand, difficulties are observed on the comprehension of longer sentences that lack visual support or that are out of the context.

General characterization of the child

School and curricula

Technology adherence and proficiency

Receptive-expressive language

**They are not about technical aspects,  
but about behaviours and abilities**

# Personas are for the whole team to understand



Francisco is a 30 years old Internal Medicine Physician who obtained his degree one and a half years ago. Besides his studies, he enjoys jogging, at least twice a week, and going to the movies with his girlfriend.

During his studies he never had specific training about geriatric patients and how to diagnose them considering CGA. The first contact he had with CGA happened about one year ago, when he started his work in Aveiro's Hospital.

His patients usually present several pathologies, tend to display multiple geriatric syndromes, and have autonomy problems in daily life activities, such as cleaning up their homes, doing

laundry, using electronic equipment, and so forth. He starts to follow them, at the hospital, when patients begin to lose their abilities or present symptoms of acute diseases.

Francisco is willing to replace the current standard procedure of assessing the geriatrics patients, using paper and pen, which is slow, by an alternative, supported on technology, that could be more versatile and easier to use. A system sending the test results to the medical information system and acting as a tool to access up-to-date information on geriatric practice for physicians would speed up his work.

During his first year of professional activity, he would struggle, daily, to prescribe the correct drug to a patient, since there are additional criteria establishing the drugs or active components that should or should not be prescribed for patients in certain situations.

**MOTIVATION:** Francisco would like to improve the way he performs CGA during his practice and be more certain that his prescriptions consider all the applicable criteria.

<sup>a</sup> Image adapted from [pxhere](#).



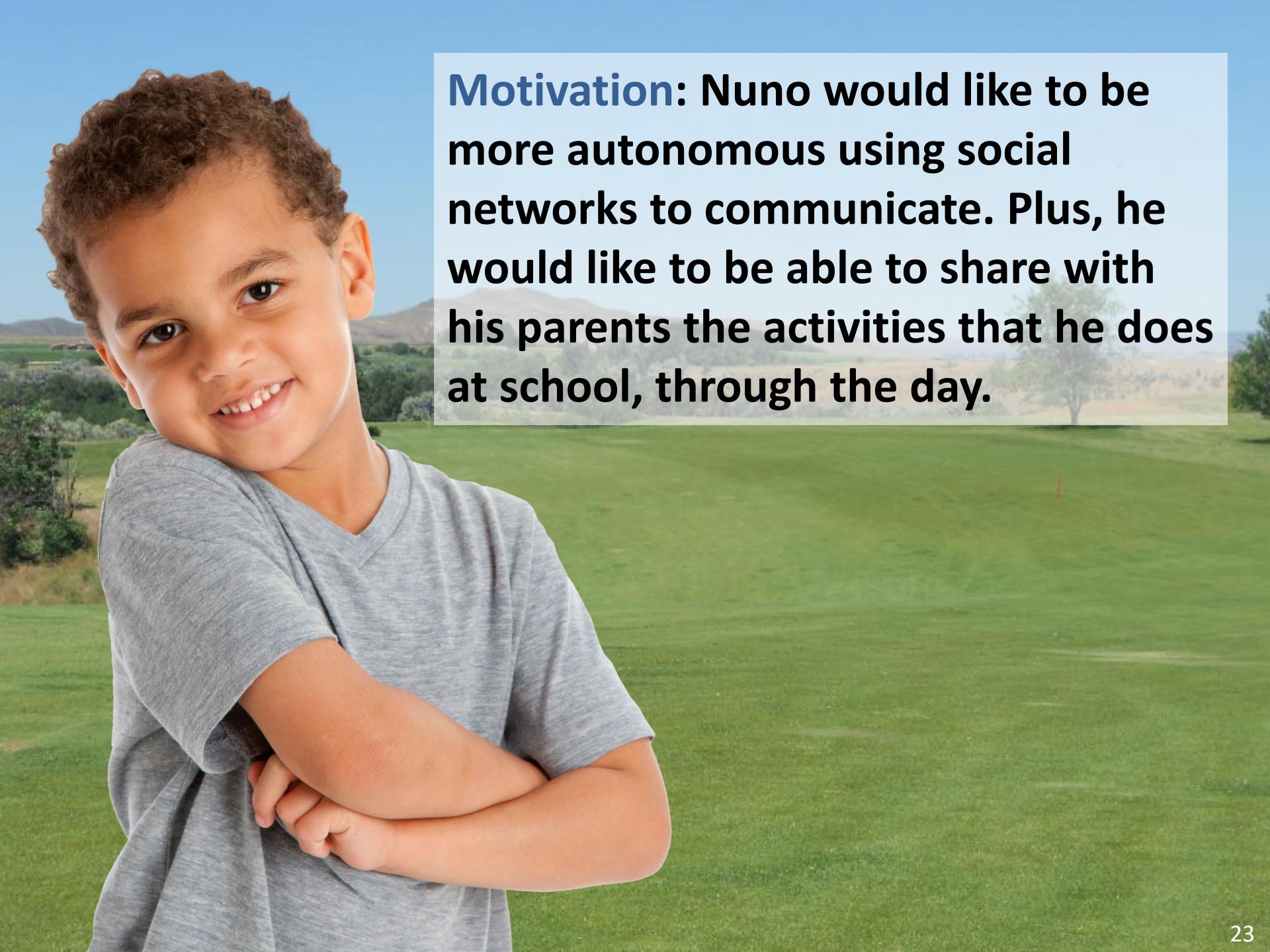
## And need to be credible

**Francisco** is a 50 years old Internal Medicine Physician who obtained his degree one and a half years ago. During the courses he took he never had specific education about geriatric patients and how to diagnose them regarding the CGA. The first contact he had with it happened about one year ago, when he started his work in Aveiro's Hospital. Besides his studies, he enjoys jogging at least twice a week and going to the movies [...]

**Motivation: Francisco would like to improve the way he applies CGA during his daily practice to enable its more extensive use.**



**Motivations, motivations, motivations...**



**Motivation:** Nuno would like to be more autonomous using social networks to communicate. Plus, he would like to be able to share with his parents the activities that he does at school, through the day.

# **Isabel Oliveira is a Special Education Teacher**

Isabel Oliveira was born in France, on the 20th of April, 1972, and currently lives in Aveiro. She is married with Luís Oliveira and has two daughters and a son.

She has a BSc in Language, Literature and Cultures, with a major in Portuguese and French, a post graduation in Special Education focusing on Cognitive and Motor development. Currently she is attending an MSc in Special Education. She has 19 years of teaching experience, 7 of those in Special Education at the Structured Teaching Unit for students with ASD of Anadia's primary school.

She has a very good level of knowledge regarding her field of work and she constantly works to be up to date with recent knowledge and practices. To provide the best to her students she always tries to improve her knowledge regarding every specific conditions and adopt new pedagogic theories and didactic practices.

From her point of view, information and communication technologies can be an asset during the learning process of kids with special educational needs and, during her work with them, she often uses computers and tablets with educational software.

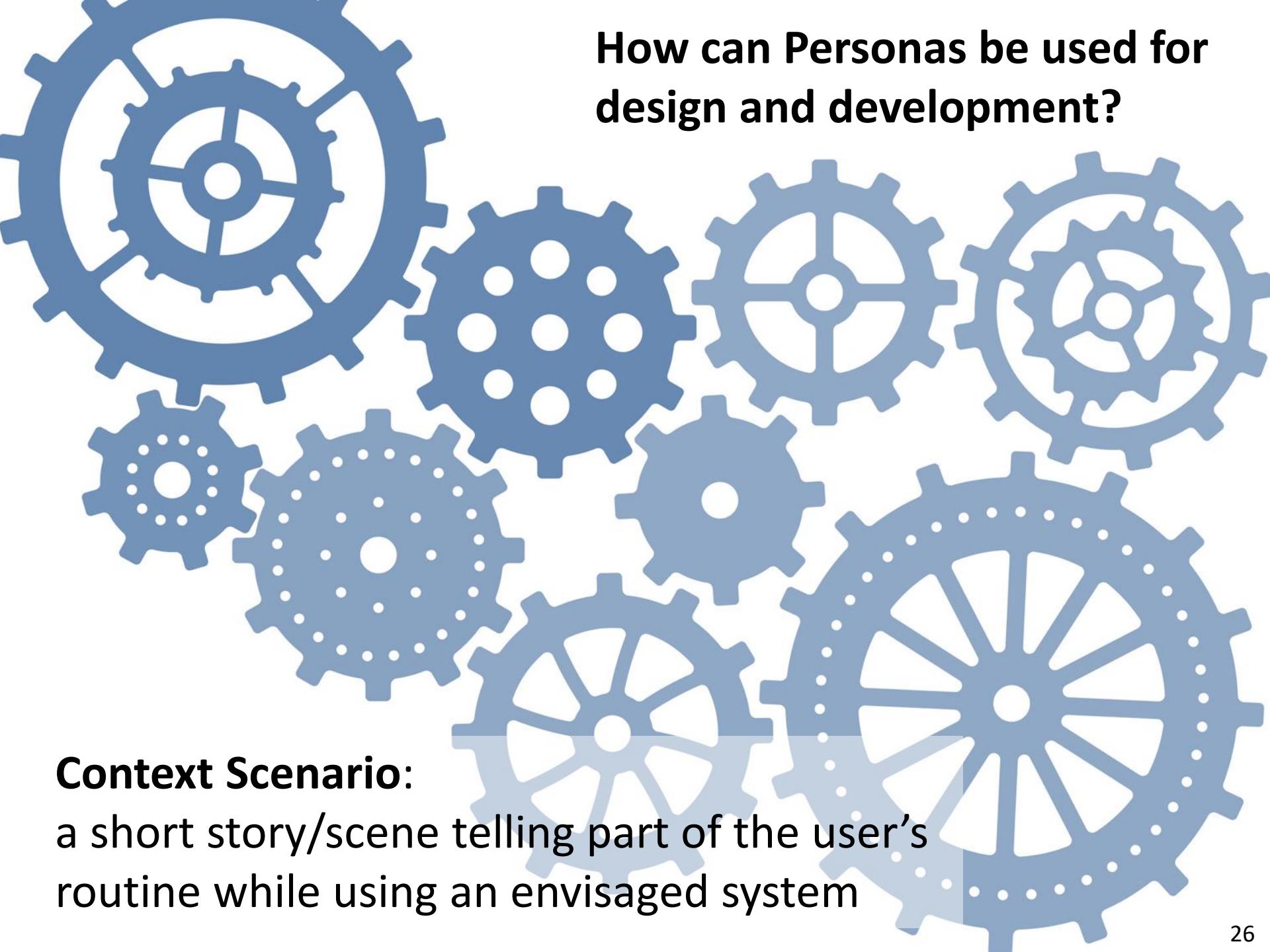
Her main interests are literature, cinema, cooking, and writing, but, during her free time, her family is the main priority.



**Motivation: Isabel would like to promote the autonomy and enhance the learning process of Nuno, improving his motivation and participation in the school tasks.**



**LAB: Persona(s) hands on**



# How can Personas be used for design and development?

## **Context Scenario:**

a short story/scene telling part of the user's routine while using an envisaged system

# Scenarios

- Short scenes illustrating, for example:
  - Where will the system be used?
  - For how much time?
  - What activities does the Persona need to perform?
  - Expected end results of using the system
  - How much complexity is permitted based on the Persona skills and frequency of use?

## Personas as actors in movie scenes



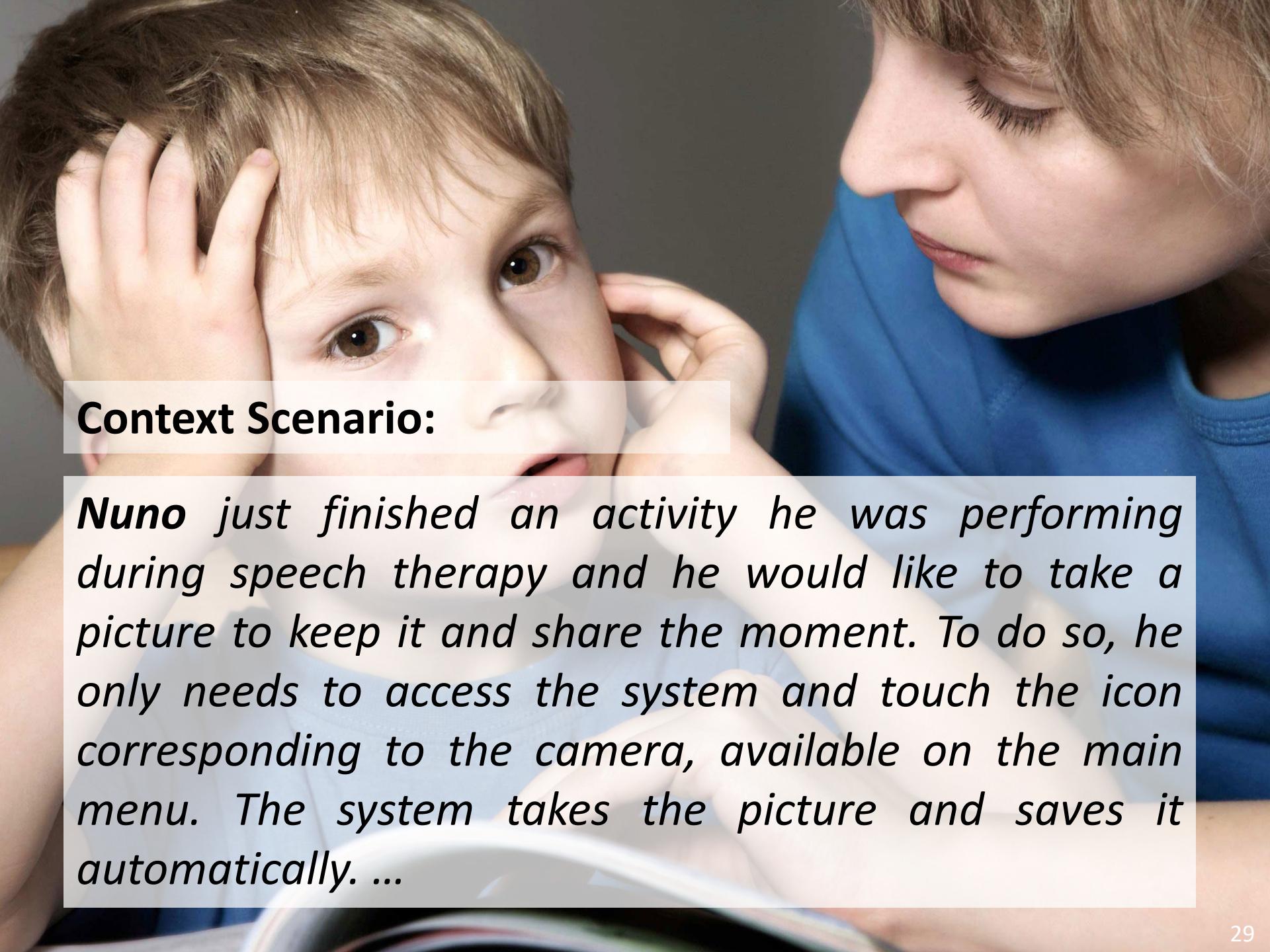
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*Francisco performs a CGA assessment— Francisco opens the application and sees a welcome message which informs him about the key features of the application. He is informed that only the standard features are activated, and additional functionalities are available for activation from the menu. He explores the information regarding the application of CGA and reviews some of the scales that he usually applies, during his practice. He experiments with filling a few and checks the computed results.*



## Context Scenario:

**Nuno** just finished an activity he was performing during speech therapy and he would like to take a picture to keep it and share the moment. To do so, he only needs to access the system and touch the icon corresponding to the camera, available on the main menu. The system takes the picture and saves it automatically. ...



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General characterization of the child

## Be open-minded and creative

### Context Scenario:

#### Scene 2: Comment picture taken

Next, the application displays the edit menu so that Nuno can choose an option: attach an emotion to the photo; add a comment to the photo; or share it in his diary so that Nuno's family and friends can be aware of what he is doing at school. Choosing the first option, six different emotions are presented and Nuno picks the one associated with laughing. Going back, he wants to add a small text explaining what he was doing and, after that, he chooses to share it in his diary.



Scenarios express **WHAT** the system will do **NOT HOW** it is done

Remember, not all people in a design and development team have technical skills

A photograph of a film crew at night. In the foreground, a man in a black jacket and blue jeans stands next to a camera mounted on a dolly. He is looking down at the equipment. Another man in a grey cap and denim shirt is leaning over the camera, adjusting it. A third man in a dark jacket and cap stands behind them, observing. In the background, several other crew members are visible, some sitting and some standing. The scene is lit by artificial lights, creating strong shadows and highlights.

**LAB: Scenarios hands on**



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e.g., HTA

# Scenarios depict the tasks and features that need to be addressed



The image displays a composite view of the GeriatricHelper mobile application. At the top right is a welcome screen with a doctor icon and text in Portuguese: "Bem-vindo ao GeriatricHelper" and "Esta aplicação permite-lhe aplicar a Avaliação Geriátrica Global (AGG)". Below this are four smaller screenshots of the app's interface:

- AGG screen:** Shows a list of categories: Estado afetivo, Estado cognitivo, Estado funcional, Estado nutricional, and Situação social. Each category has a circular button labeled "desativar" (deactivate) or "ativar" (activate).
- Patient 1 screen:** Displays patient information: 1920-12-01, Aveiro, and a "CONSULTAR PROGRESSO" button. Below this are sections for "AVALIAÇÕES" (Assessments) and "NOTAS" (Notes), with a note from 2017-03-06 stating "Levemente incapacitado socialmente".
- Guia da AGG screen:** A detailed guide for the AGG assessment, titled "Estado mental" (Mental State). It includes text about cognitive impairment and depression, and a table of "Tabelas de referência" (Reference tables) for specific conditions like Alzheimer's and depression.
- Prescrição screen:** A prescription screen showing a list of medications under "Medicamentos" (Medicines). It includes columns for "Nome" (Name), "Dose" (Dose), and "Efeitos colaterais" (Side effects). Some medications are marked with a red square, indicating they should be avoided.

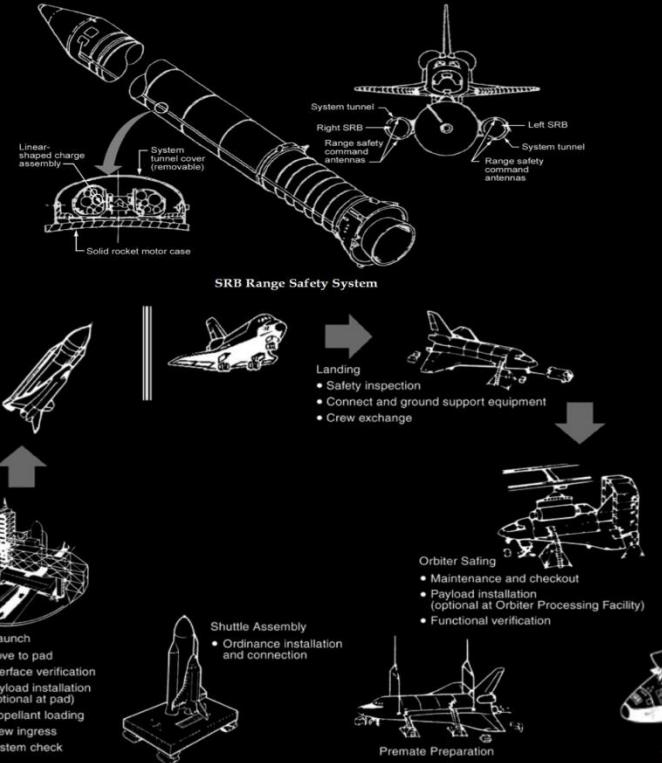
A large blue arrow points upwards from the bottom right towards the "Prescrição" screen, highlighting the medication management feature.

*Prescribing medication to Lurdes — The physician needs to be careful since Lourdes already takes medication for other health issues and the drug he is going to prescribe must not interfere, causing new health complications. Since he needs to consult medication-related criteria, which is not visible by default, he heads to the settings menu. He browses a list of the modules that can be activated and deactivated and proceeds to activate the Clinical Criteria module. Francisco consults the app and searches for the name of the medicine he has in mind. The app tells him that medicine should be avoided for a health issue Lourdes already has. Francisco then proceeds by using the Start criteria that inform which drugs are best for certain conditions.*

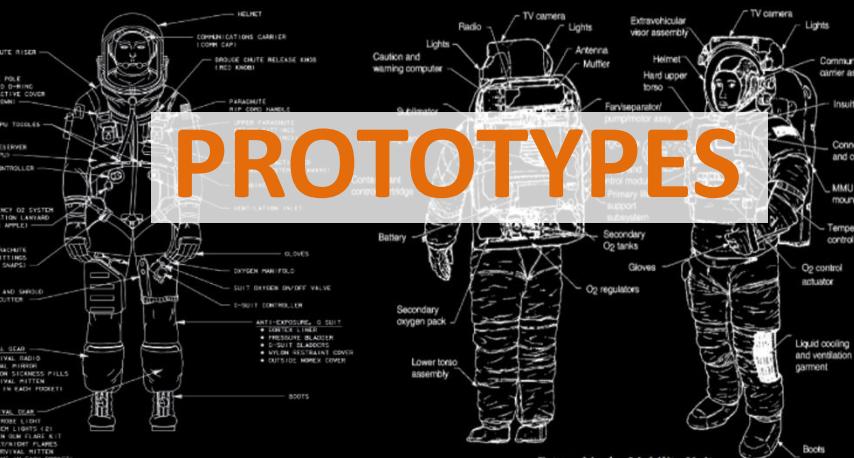
# Requirements

- Extracted from actions and features depicted in the scenarios
- Can also be complemented with Use Cases
- Can be the first stage for other systematic methods such as Hierarchical Task Analysis

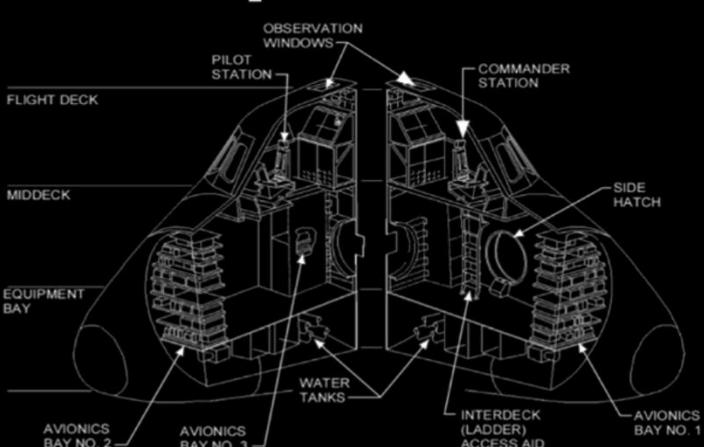
# The space shuttle



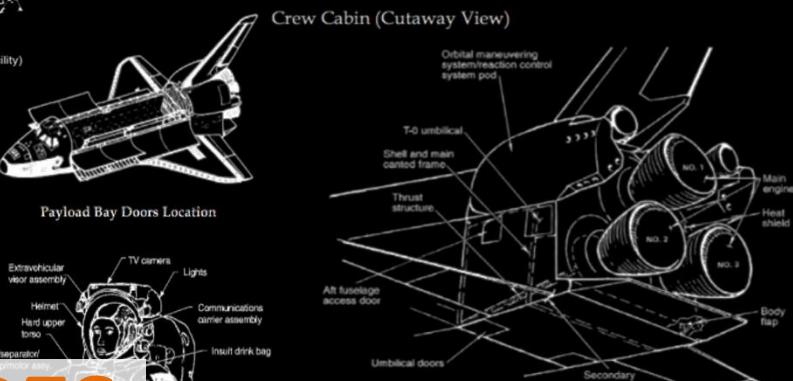
## Kennedy Space Center Ground Turnaround Sequence



Extravehicular Mobility Unit



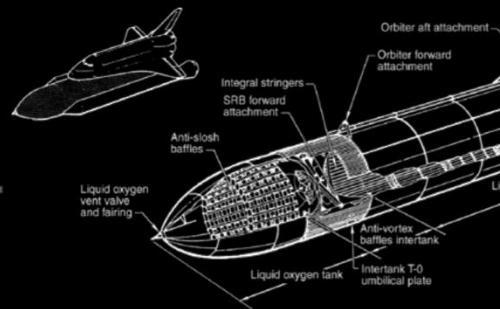
#### Crew Cabin (Cutaway View)



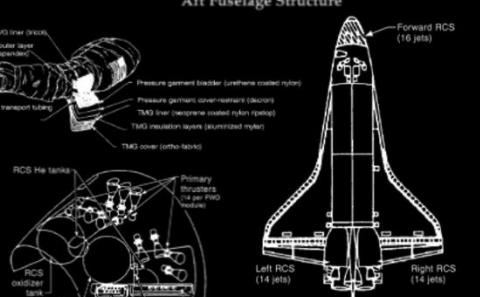
The diagram illustrates the external configuration of the Orbiter, highlighting several key structural and functional elements:

- Vertical stabilizer**: Located at the rear of the fuselage.
- Orbital maneuvering system/Reaction control systems pods**: Located on the upper side of the fuselage.
- Payload bay**: A large rectangular opening on the upper side of the fuselage.
- Xo582**: A label near the overhead windows.
- Overhead windows**: Located on the upper side of the fuselage.
- Crew compartment**: The front section of the fuselage where the crew sits.
- Forward reaction control system module**: Located on the side of the forward fuselage.
- Nose cone**: The pointed front end of the Orbiter.
- Nose gear**: The landing gear located at the front of the aircraft.
- Side hatch**: A hatch located on the side of the forward fuselage.
- Midfuselage**: The middle section of the fuselage between the forward and aft sections.
- Main gear**: The landing gear located at the rear of the aircraft.
- Wing glove fairing on forward fuselage**: A fairing covering the junction of the wing and the forward fuselage.
- Forward fuselage**: The front-most section of the fuselage.

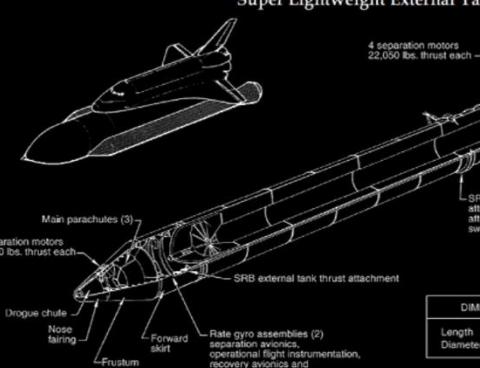
Orbiter



### Super Lightweight External Ta



## Forward, Left, and Right RCS Modules

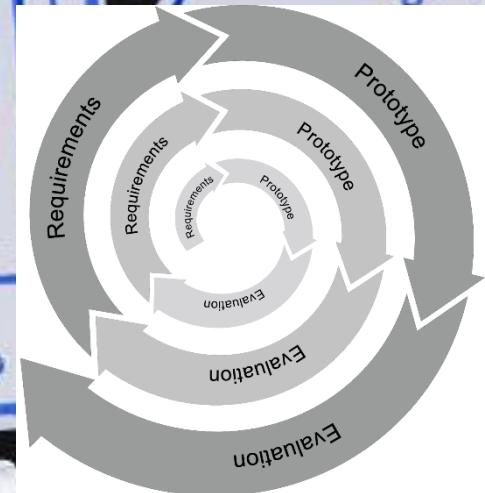


Solid Rocket Booster

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# The role of prototyping

Rapid development cycles for a subset of requirements

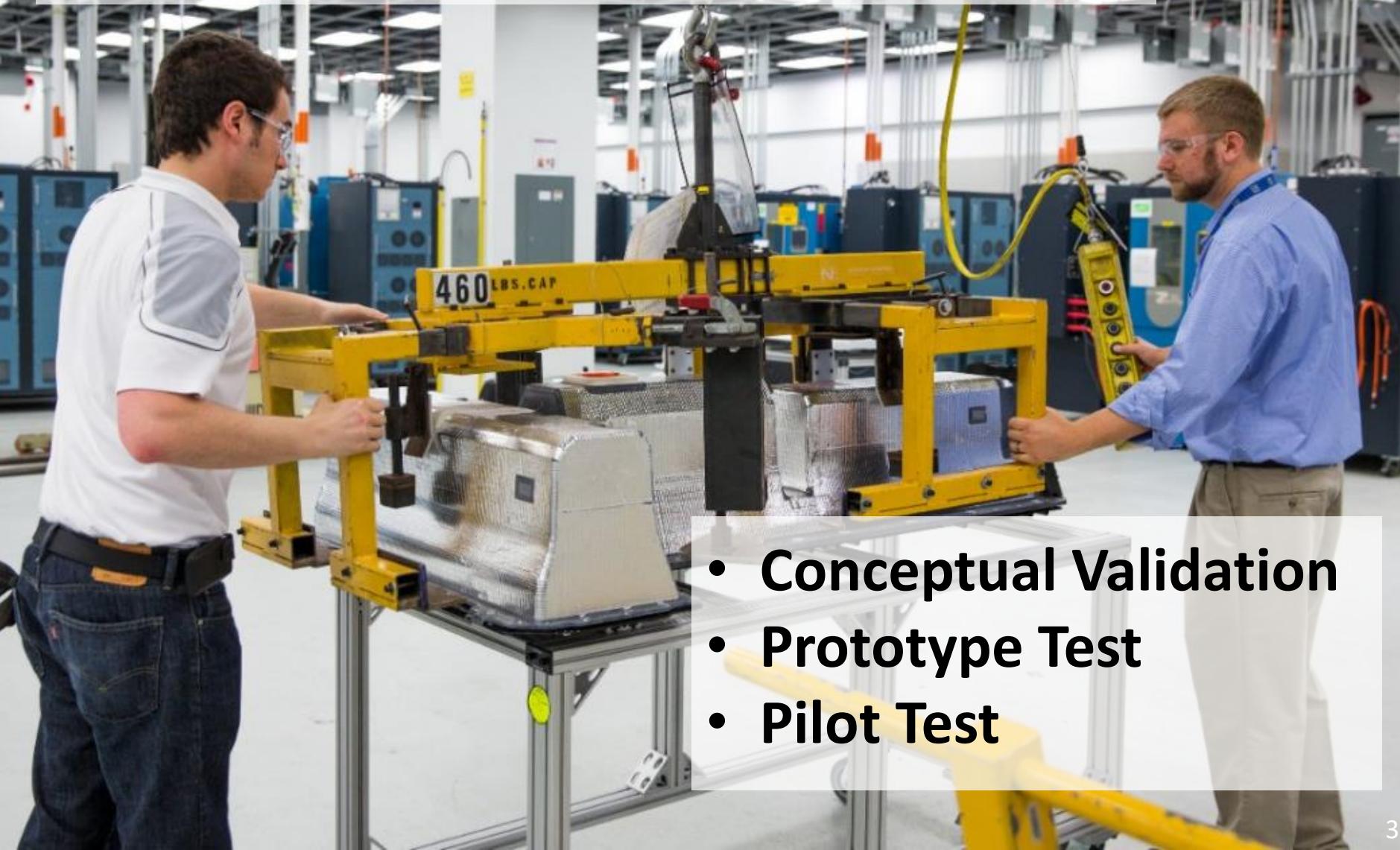


- Discover issues at an earlier stage
- Refine/expand requirements
- Support dialogue with stakeholders

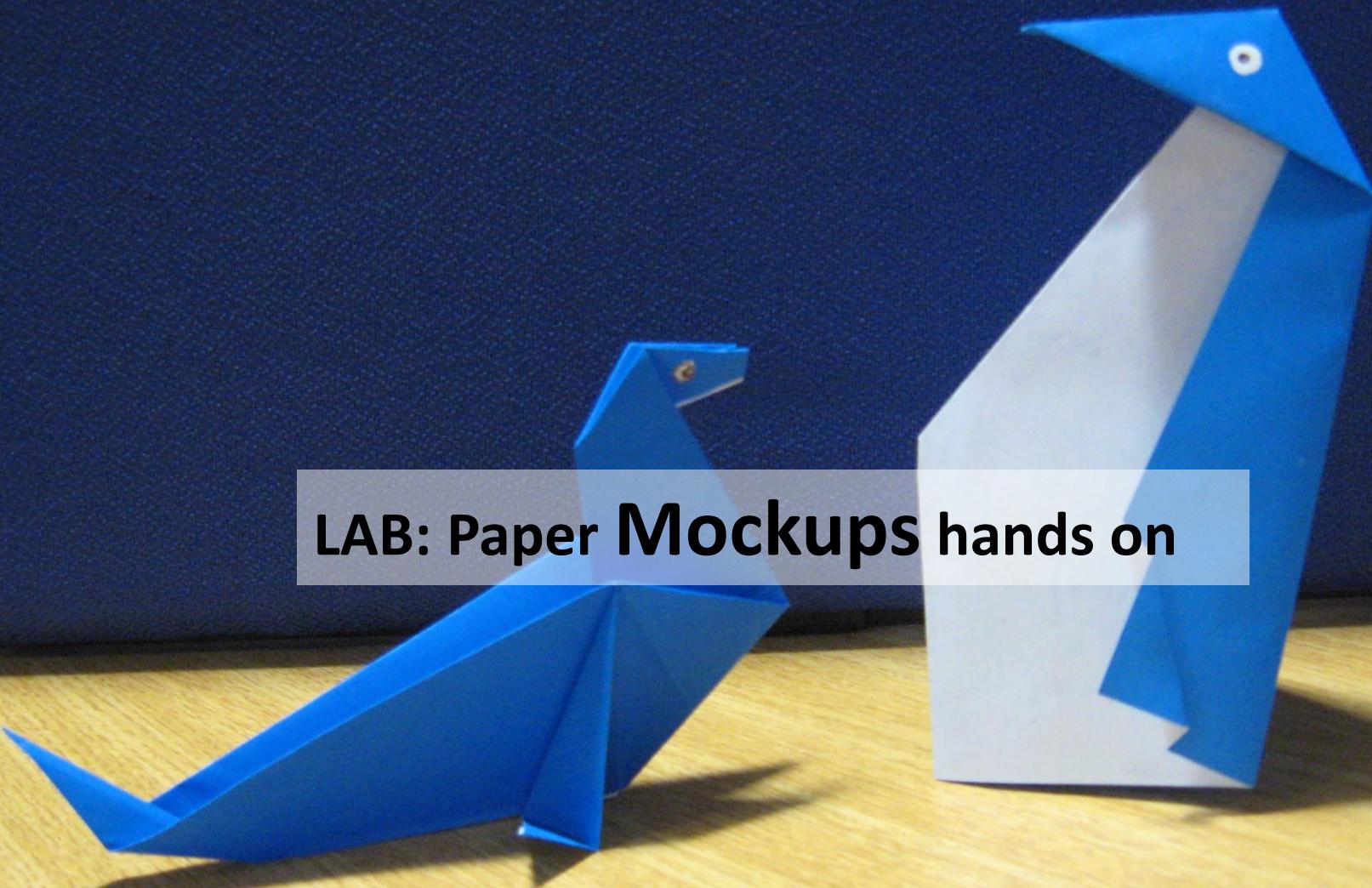
A photograph showing two hands from different people, both giving a thumbs-up gesture. The hands are positioned side-by-side against a light blue background.

**EVALUATION**

# Prototyping and evaluation methods adapted to the project's stage



- Conceptual Validation
- Prototype Test
- Pilot Test

The image shows two hand-made paper birds on a light-colored wooden surface. One bird is a simple blue model on the left, and the other is a more complex model with white and blue stripes and a small eye on the right. A dark blue background is visible behind the birds.

## LAB: Paper Mockups hands on

# Recommended bibliography

Cooper, A., Reimann, R., & Cronin, D. (2007). About face 3: the essentials of interaction design. John Wiley & Sons. (chapters 1, 3, 5 and 6)

Teixeira et al. (2017). Medication Assistant: , Universal Access in the Information Society, vol. 16, no. 3, pp 545-560 (example of iterative UCD)

Pruitt, J., & Grudin, J. (2003). Personas: practice and theory. In Proceedings of the 2003 conference on Designing for user experiences (pp. 1-15). ACM.

Leal, A., Teixeira, A., & Silva, S. (2016). On the creation of a Persona to support the development of technologies for children with autism spectrum disorder. In Proceedings of HCI International (pp. 213-223). Springer.