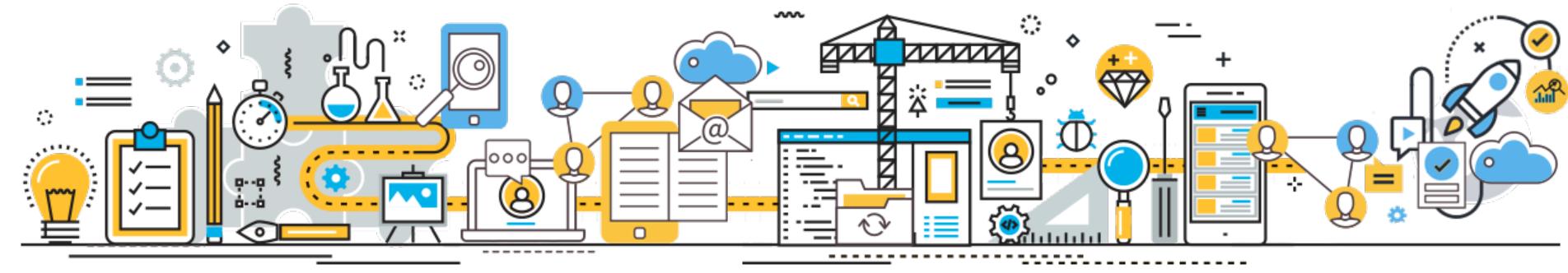


# Human–Computer Interaction

### 3. Understanding User - Part 1

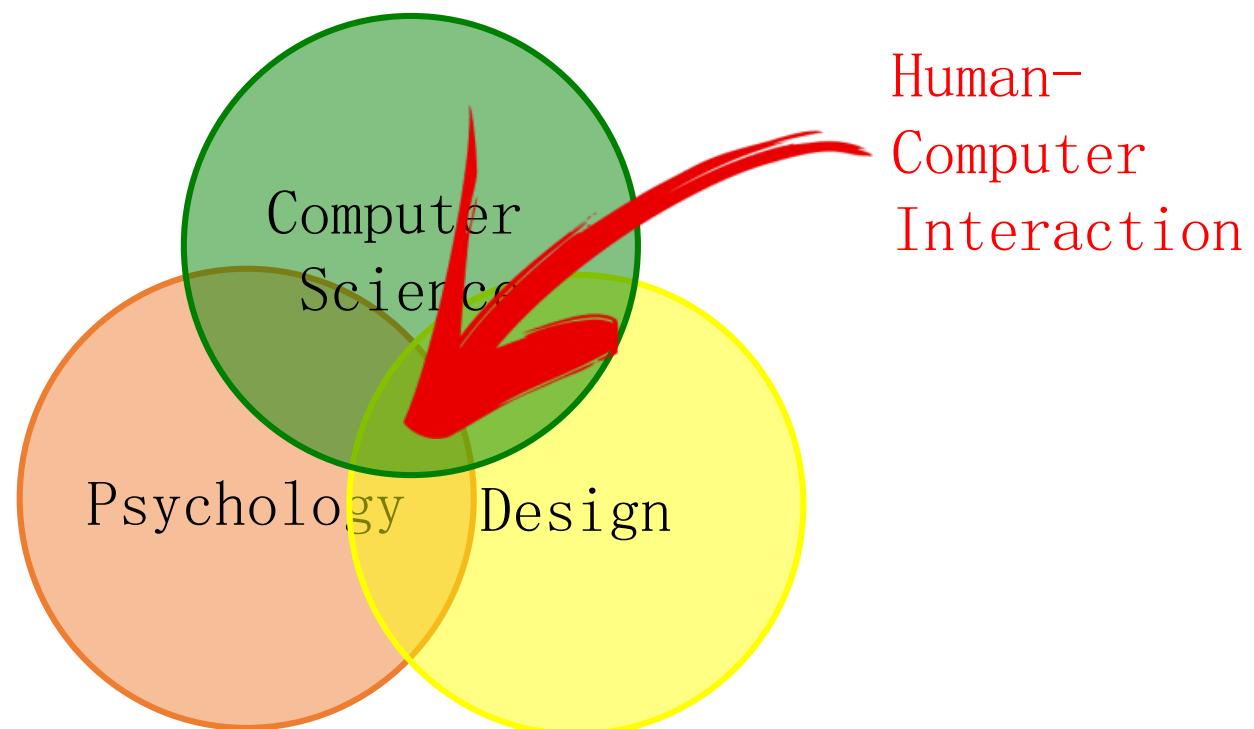


# Last week

- What is HCI and UCD?

# Recap: What is HCI?

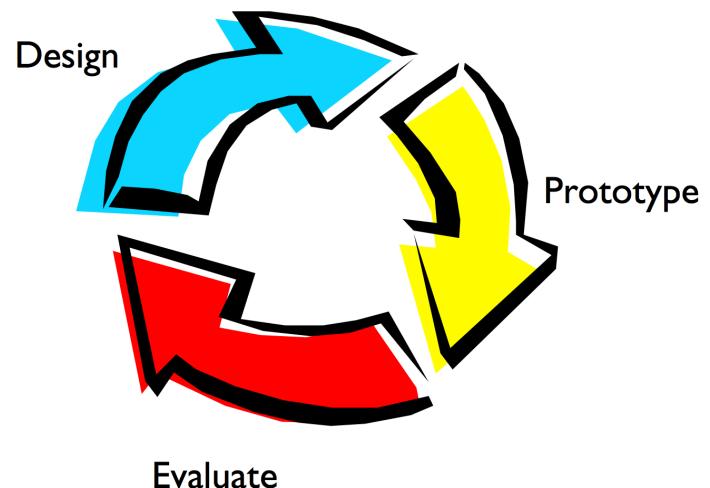
- The study of **how humans interact with computer systems**: a broad term that covers all aspects of the ways in which people interact with computing systems
- The design of **a user interface (UI)** to allow a user to interact with computer systems with minimum effort and frustration



# Recap: User-Centered Design

Six “mantras” of UCD

- Understand your users (needs, ‘wants’ , goals, tasks, context, etc.)
- Design based on the data collected from studying users and their experiences
- You, the designer, are not the user
- Prototype
- Evaluate
- **Iterate, iterate, and iterate!!!**



# Recap: User-Centered Design



Trying to satisfy the needs of all users may mean that you fail to satisfy the needs of any one user

# Recap: UI vs. UX

- UI: The space where interactions between humans and machines occur
- UX: The process of creating products that provide **meaningful** and **personally relevant** experiences
- Good HCI = Good UI + Good UX.



UI



UX  
UI



UX

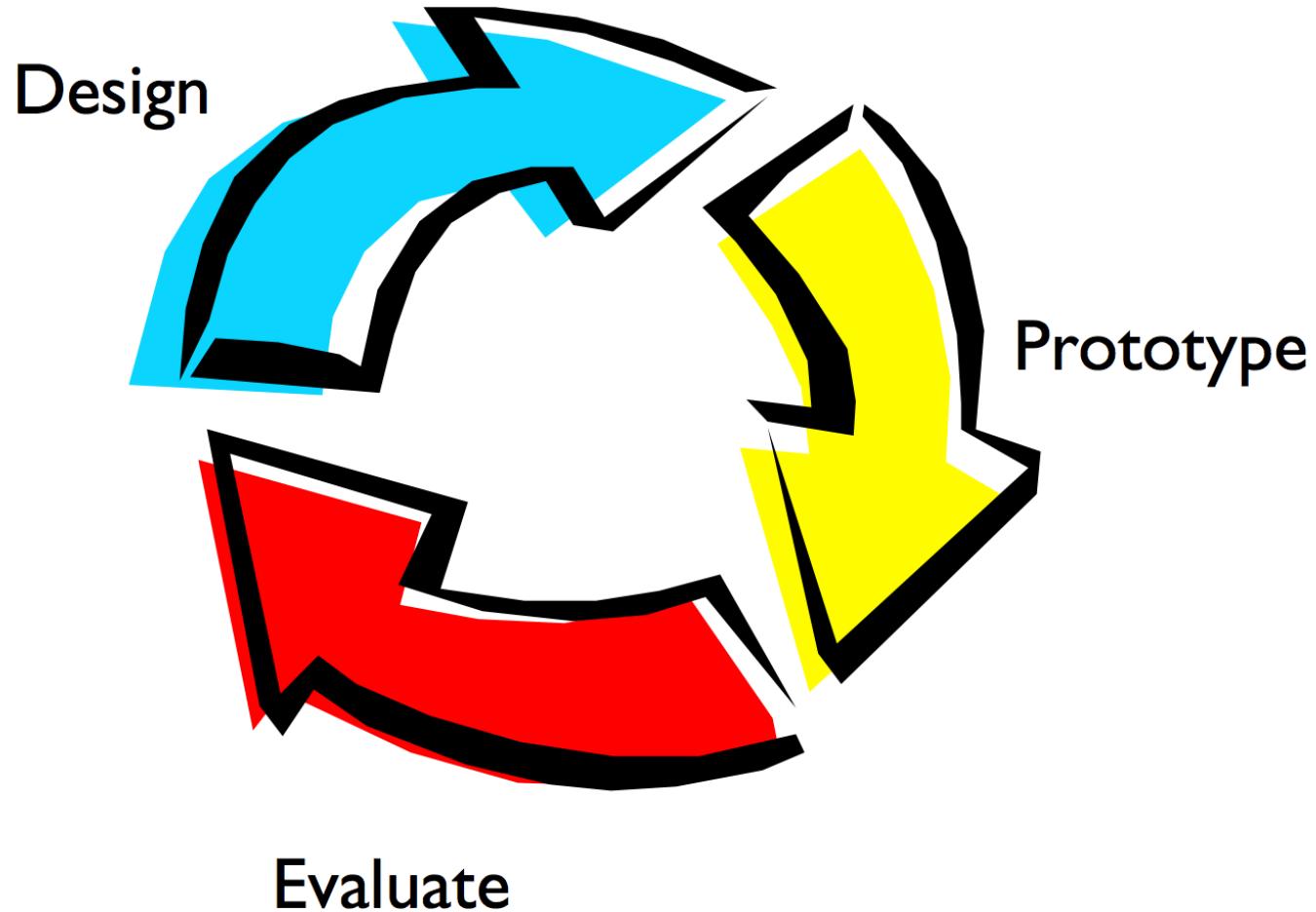


1. **The UI belongs to UX**, it is a part that makes up the structure of a product design, and it does influence the user experience, but it may or may not be the factor if the user will have a good or bad experience in its entirety; everything depends on the context of use and who is using the artifact;
2. UX makes up not only the usability and usefulness of the product, **but also what it represents in the life of the person who is consuming it**, as well as the feelings that are involved in the experience.

# Today's agenda

1. Design Thinking Process
2. Understand users
  1. Who are the users?
  2. What are their needs?

Process: Design Thinking



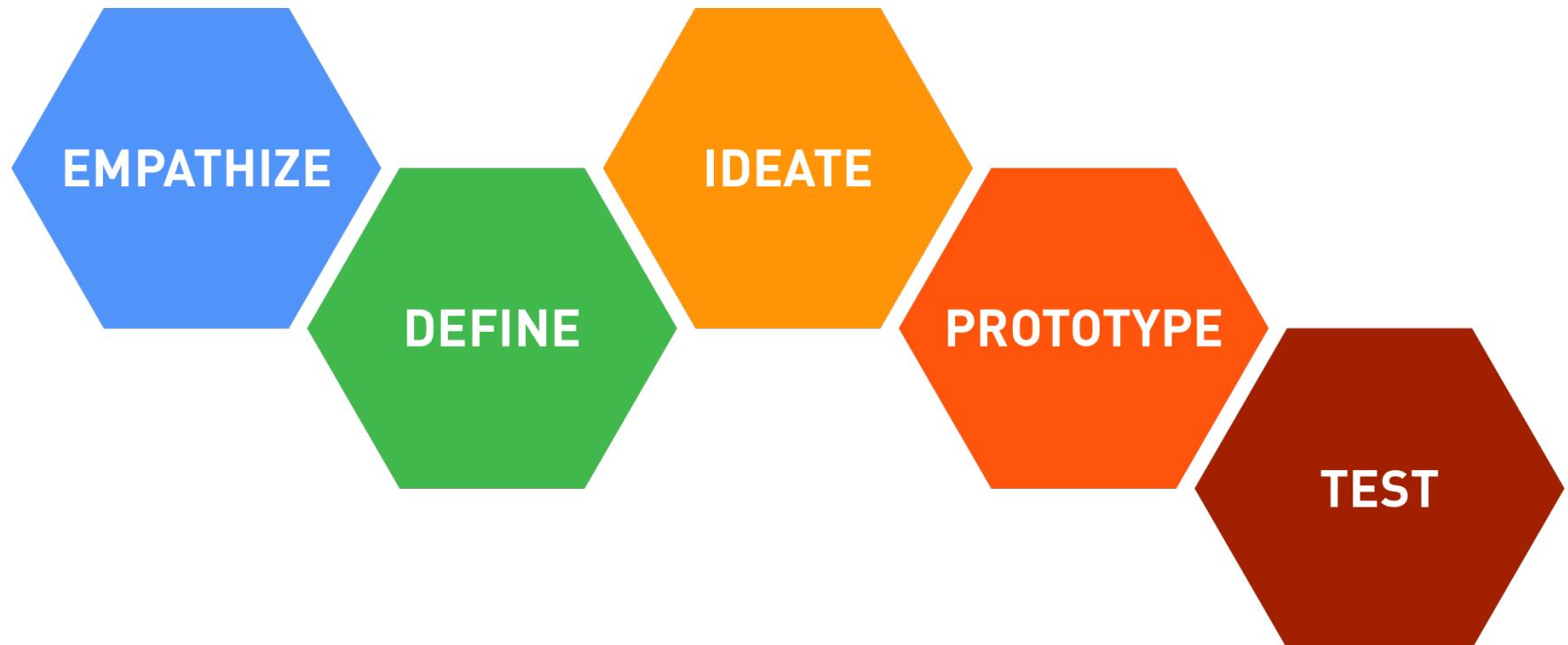
# Design Thinking



<https://www.youtube.com/watch?v=a7sEoEvT818>

# Design Thinking Process

By Stanford d. School





# 1. Empathize

“To create meaningful innovations, you need to know your users and care about their lives.”

- The work you do to understand people
- As a design thinker, the problems you are trying to solve are rarely your own — they are those of a particular group of people; in order to design for them, you must gain empathy for who they are and what is important to them
- In other words, this stage can be said as “needs finding” , “Analysis” , or “Research”



# 1. Empathize

To empathize, you:

- **Observe.** View users and their behavior in the context of their lives.
- **Engage.** Elicit stories from the people you talk to, and always ask “Why?” to uncover deeper meaning.
- **Watch and Listen.** Ask someone to show you how they complete a task. Ask them to vocalize what’s going through their mind as they perform a task or interact with an object. Use the environment to prompt deeper questions

## 2. Define (the Problem)



“bringing clarity and focus based on what you have learned to craft a meaningful and actionable problem statement.”

- It is your chance and responsibility as a design thinker to define the challenge you are taking on, based on what you have learned about your user and about the context
- Everything we observe in the Empathize step is formed into a very focused “problem statement: ” What is the specific problem we’re trying to solve with an innovative new product?
- Craft a meaningful and actionable problem statement

# 2. Define (the Problem)



A good problem statement is one that:

- Provides focus and frames the problem
- Inspires your team
- Informs criteria for evaluating competing ideas
- Empowers your team to make decisions independently in parallel
- Captures the hearts and minds of people you meet
- Saves you from the impossible task of developing concepts that are all things to all people (i.e. your problem statement should be discrete, not broad.)

# 3. Ideate



“It’s not about coming up with the ‘right’ idea, it’s about generating the broadest range of possibilities.”

- Define the boundaries: We have to remain grounded by the end goal.
- Keep an open mind: No ideas are bad ideas at this point; everything is on the table. Ideas will be judged on feasibility later, but now is the time to push the boundaries and consider all possibilities.

# 4. Prototype



“Build to think and test to learn.”

- The iterative generation of artifacts intended to answer questions that get you closer to your final solution
- Why prototype?
- How to prototype?

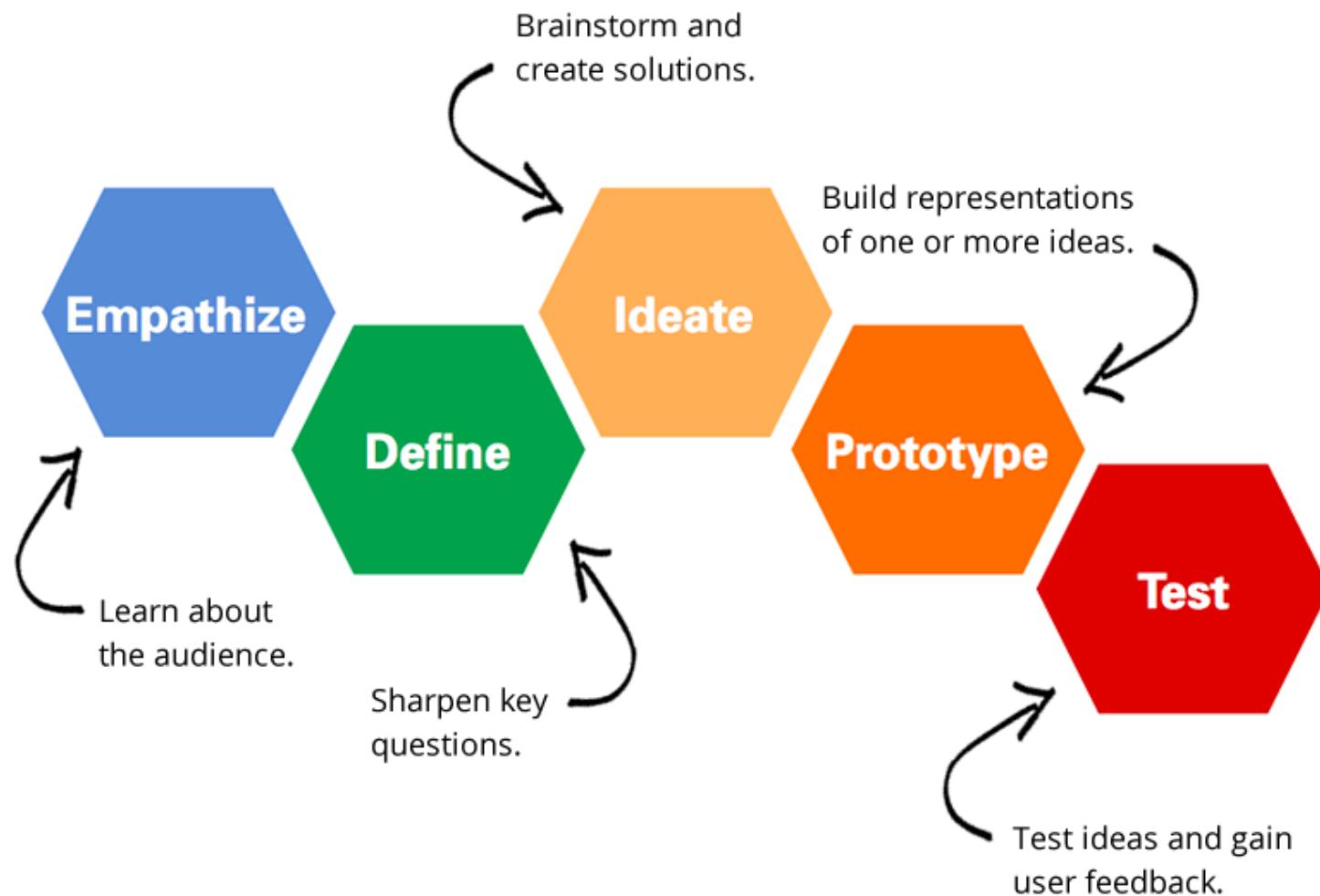
# 5. Test



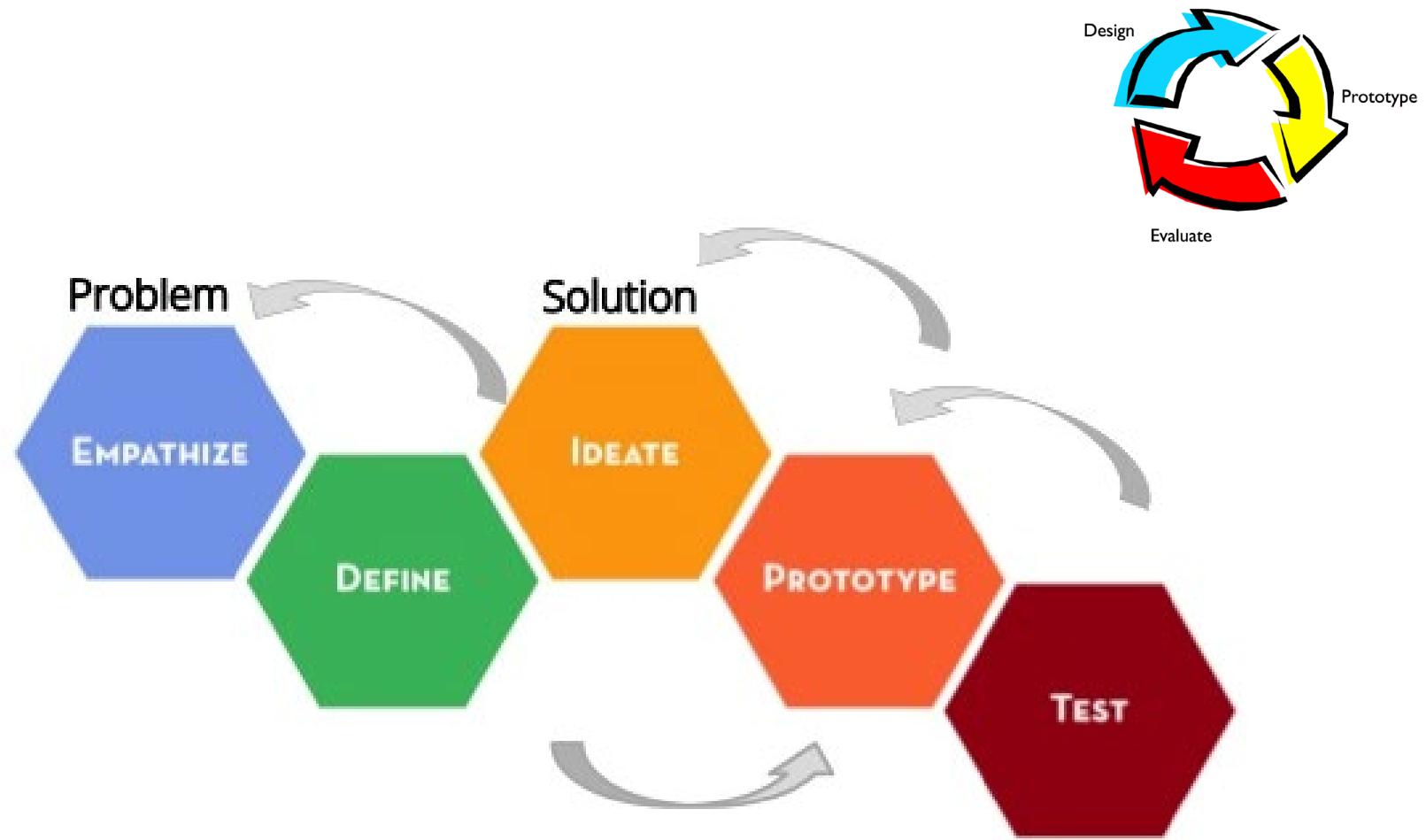
“An opportunity to learn about your solution and your user.”

- To solicit feedback, about the prototypes you have created, from your users and have another opportunity to gain empathy for the people you are designing for
- Why prototype?
- How to prototype?

# Design Thinking Process

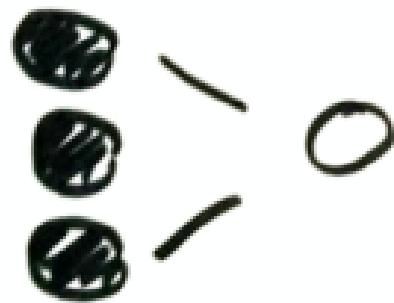


# Non-linearity & Iteration!!!!



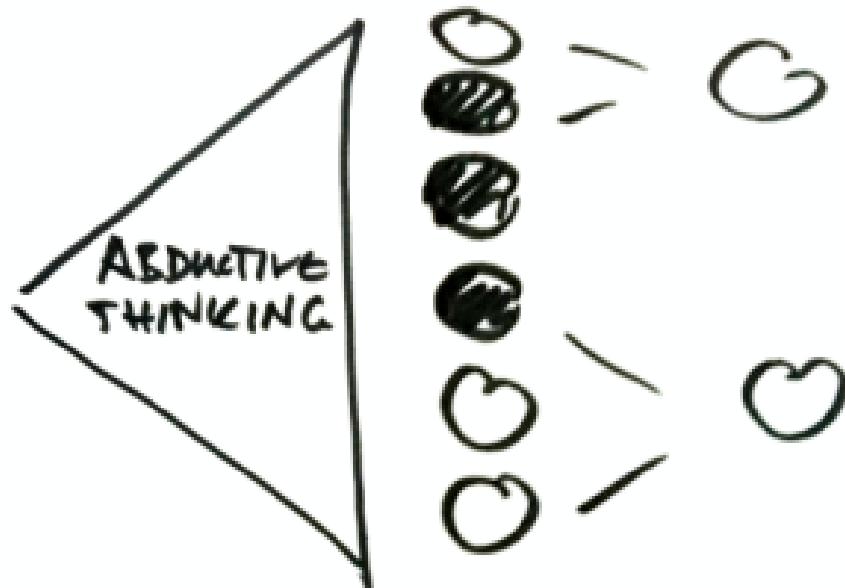
## BUSINESS THINKING

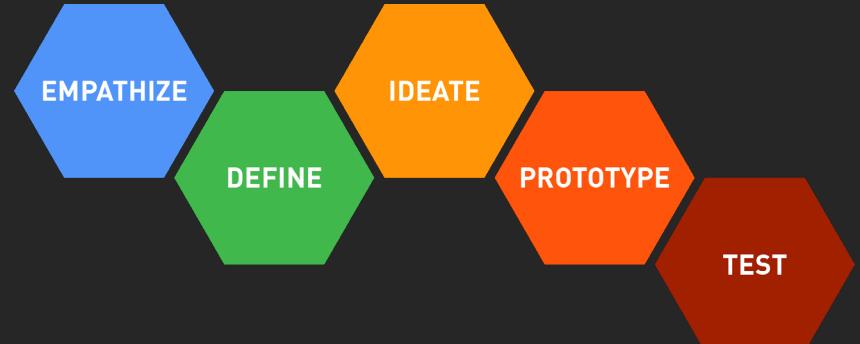
PROBLEM      SOLUTION



## DESIGN THINKING

UNDERSTAND    PROBLEM      SOLUTION





# Empathize:

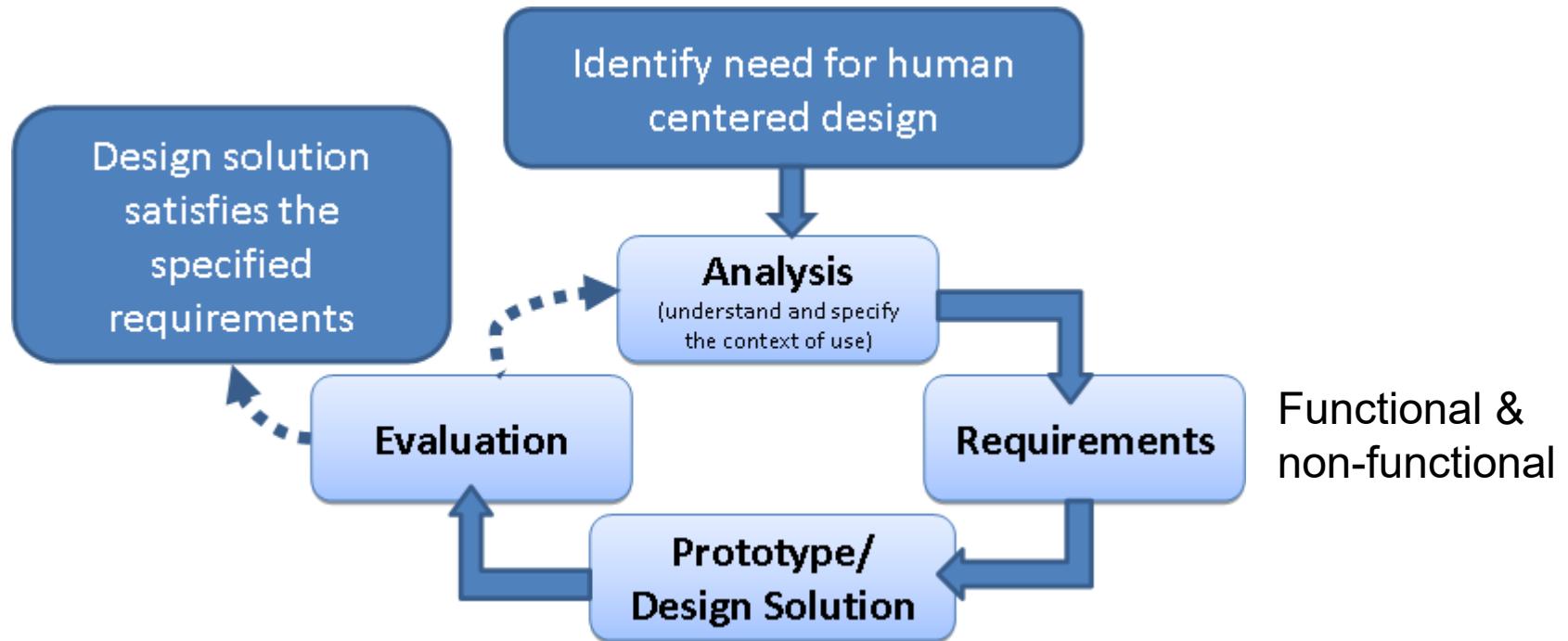
## Understanding Users



<https://www.youtube.com/watch?v=vdDwe0bM4U4>



# Human-Centered Design Process



Human centered design process (based on ISO 13407:1999).

# Requirements analysis

- **User analysis**
- **Context analysis**
- **Tasks analysis**
- Analysis of competitors / competing tools
- Requirements: What should the system do for each user under which conditions?
- Needs prioritization!
- Typical methods used in user/context/task analysis:
  - Interviews of different users
  - User observations (e.g. at work)
  - Surveys and questionnaires
  - Designing and evaluating prototypes



© Inner West Photo Society

# Who are your users?



**1**

How the customer explained it



**2**

How the project leader understood it



**3**

How the analyst designed it



**4**

How the programmer wrote it



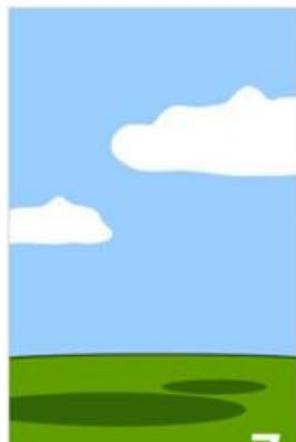
**5**

What the beta testers received



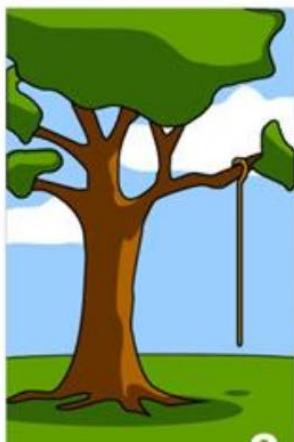
**6**

How the business consultant described it



**7**

How the project was documented



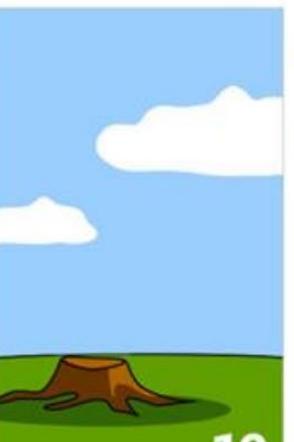
**8**

What operations installed



**9**

How the customer was billed



**10**

How it was supported



**11**

iSwing  
What marketing advertised



**12**

What the customer really needed

# User analysis

# User Analysis in Human-Centered Design:

- Success of the system is closely tied to the **expectations** and **needs** of the user
- **Problem:** Necessary definitions and a clear understanding of target users is often missing
- **Solution:** Create and share a common understanding of target users
- Crucial for driving design decisions:
  - Who are my users?
  - What tasks do/will they conduct?
  - What other criteria will influence the system?
  - What similar systems are out there?
  - ...



# Who are the users?



# Who are the users?

Those who interact directly with the product

Those who manage direct users

Those who receive output from the product

Those who make the purchasing decision

Those who use competitors' product

Stakeholders

- **Primary users:** people who use the product directly
- **Secondary users:** people who are affected by the product, or who influence its development



# Who are the users?

- Physical
  - Age
  - Sex
  - Culture
  - Physical ability & disabilities
- Educational background
- Computer/IT experience
- Psychological
  - Motivation
  - Attitude



# Who are the users?

Consider physical limitations of the users

- 15% ~ 35% of the population in the developed countries have impairment or disability that interferes with everyday activities
- No need to know what condition might cause difficulty in interacting with a computer; but need to know how many might have such a difficulty
- Visually impaired & color blinded

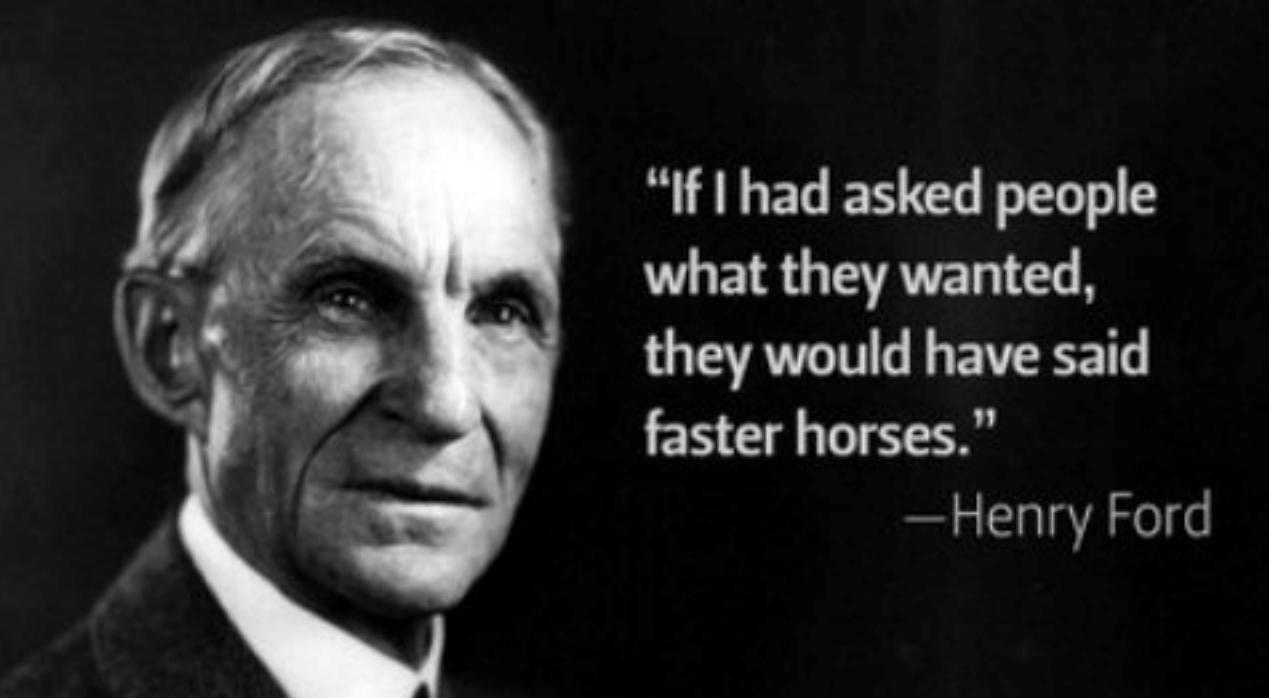
# What are their needs?

“Needs finding”

- Expressed needs – what users say they want
- Felt needs – users unsure what the system can do
- Normative needs – professional view about the nature of the problem and what may be needed

Problems:

- Users often don’t know what’s possible
- Users often can’t articulate clearly what they need to achieve their goals

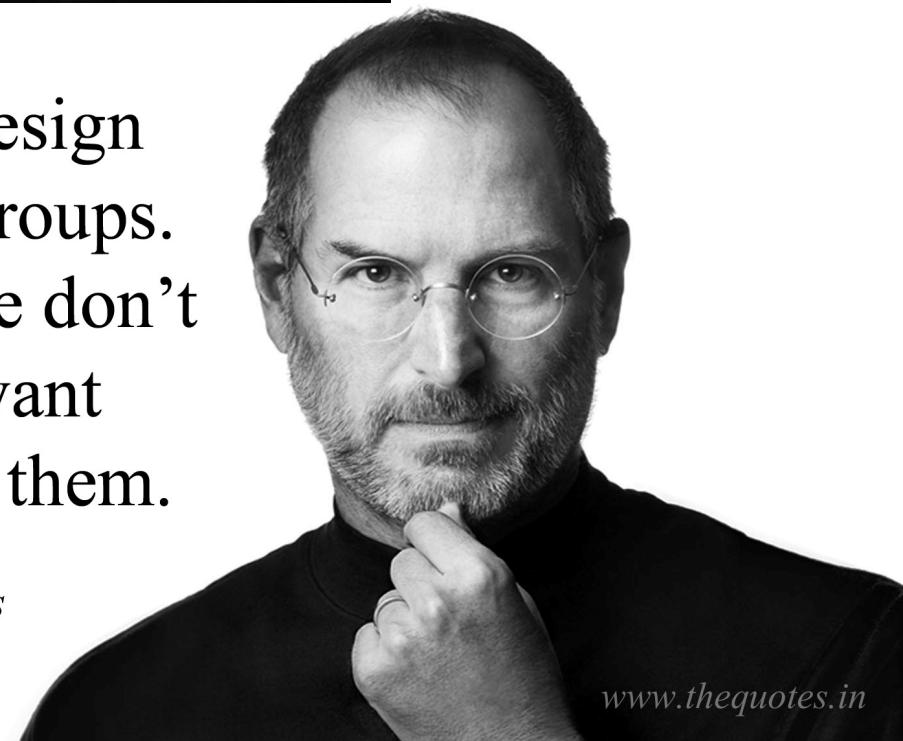


**“If I had asked people what they wanted, they would have said faster horses.”**

—Henry Ford

It's really hard to design products by focus groups. A lot of times, people don't know what they want until you show it to them.

*Steve Jobs*



# What are their needs?

What do we (designers) need to do?

1. Look at existing tasks by investigate situation, study users, and examine tasks
  - Context
  - Required information
  - Possible collaborations
  - Reasons and motivations
2. Propose envisioned tasks
  - Rooted in existing behavior
  - Described as future scenarios

How can we understand the users  
and their needs?



We (designers) are not the users!

# User analysis

- Define background information of target users:
  - Goals and motivation
  - Education, cultural background, specific training/know-how
  - Age, gender
  - Physical capabilities
  - Experience
    - E.g. uses similar systems?

# Personas

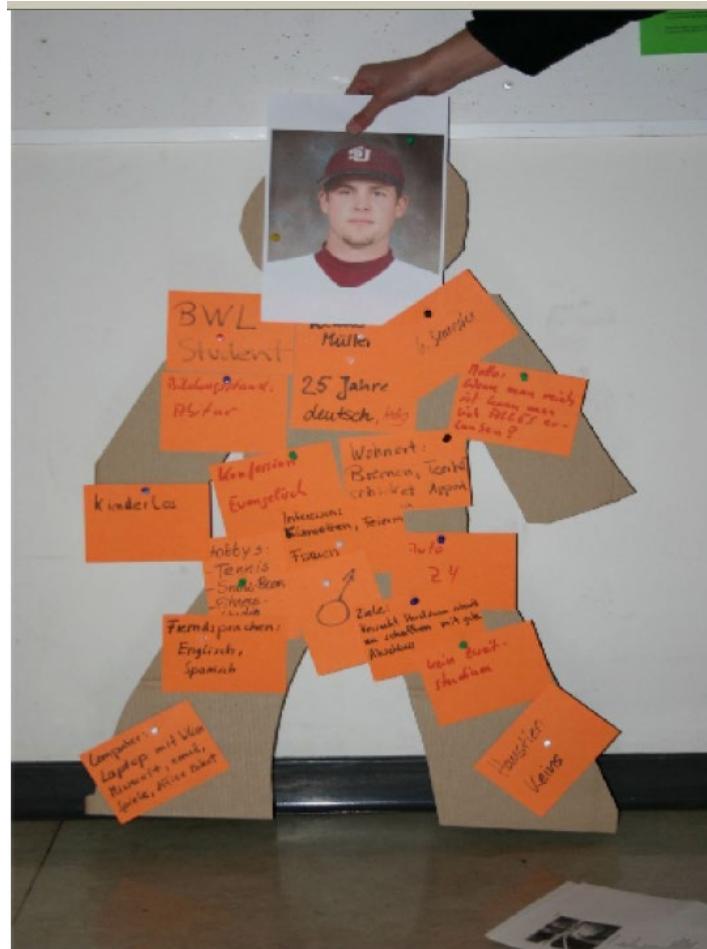
- Who are our users?



# Personas

- Introduced by Alan Cooper 1999
- A fictive person that represents a larger number of users with similar **characteristics, expectations, and motivations**
- Personas surrogate real users in the design process
- Persona descriptions need to be clear, concise and short

# Personas Examples



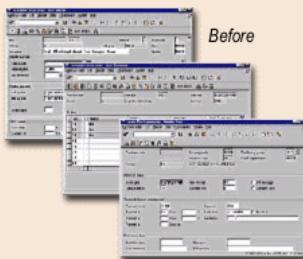
# Personas Examples

- SAP

## Case Study: SAP Materials Management



Bobby Watson  
Purchasing Assistant  
Gizmo Toys



### Bobby's Goals:

- Get his job done by 5:00.
- Feel competent.
- Make the process run smoothly.

Cooper Design

Cooper's Materials Management (MM) design took functionality that was spread across several screens and brought it into a one-screen interface. Bobby Watson, the primary persona for the MM tool, can do his job without ever losing his context: all his important information is visible and easily accessible.

## Case Study: SAP Business-to-Business



Paolo Ramiro  
Buyer  
Omni Distribution

### Paolo's Goals:

- Clear his desk by the end of the day.
- Make the day run smoothly.
- Don't reinvent the wheel.

The Business to Business design gives Paolo access to the forms and information necessary to do his job. A powerful attribute-based retrieval system lets him quickly find the right form, vendor, customer, item, or any other object in his business database.

# Personas Examples

- Microsoft

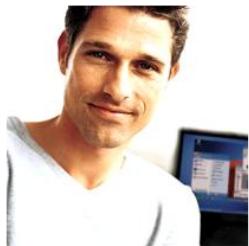
Carl - The New Guy

**General Characteristics and Responsibilities:**

Carl finished his degree in computer science last year, and has been working as a Software Design Engineer in Test (SDET) at Microsoft for just over six months. Carl has learned a lot in his half year with the company; he is getting more comfortable with his job and more confident in his abilities every day. He likes writing code and spends a good chunk of his time writing automated tests and tools to help with his work and to help the rest of his team. Carl also loves analyzing problems and coming up with solutions. He is currently working on integrating a popular Microsoft internal fault injection tool into his tests. With that, he can exercise more of the error handling code in the application he is testing. Carl uses customer data to influence the design of his test cases. He has relatives who are often frustrated when using the computer; he is proud that he can have so much influence on the design of the software and hopes he can ease his relatives' frustration.

**Goals and motivations:**

Carl has been programming since high school and was initially a bit apprehensive over taking a testing job at Microsoft. Now, however, he finds the work both challenging and exciting. Carl is a great coder, but he has found that his passion for problem solving and analysis make him a great tester. He loves the variety of the job and appreciates the growth paths for testers at Microsoft.



Alecha - Product Line Customer Advocate

**General Characteristics and Responsibilities:**

Alecha is skilled at knowing the needs and attributes of her customers. She has a knack for seeing things from the customer point of view, but also works closely with program management and marketing to verify her assumptions and clear up ambiguity. She analyzes data from various tools that track customer data and makes sure that the testing effort focuses primarily on customer scenarios and customer pain points. She is also one of the key drivers in determining how these tools are used for her product. Alecha writes some automation, but is most effective when working with the rest of the test team to make sure that their automated tests focus on customer scenarios. She is an excellent exploratory tester, and typically spends an hour or so each day testing end to end scenarios in various areas of the product. While most of her teammates focus on specific technologies within the product, Alecha is valued for always having the big-picture view of the product and for her understanding of how all of the pieces fit together.

She designs end to end customer scenarios for entire team, and also is extremely knowledgeable in customer scenarios. She consolidates customer data and works with the test team to design test cases that reflect customer scenarios, and with program management and development teams to ensure that designs and implementations match customer usage patterns. The influence of her work spans all disciplines in her division.

Alecha contributes to product design reviews where she provides valuable input on how the customer will see and interact with the proposed feature set. She is well versed in customer focused design techniques and works with the appropriate cross discipline owners to apply these techniques across the product. She is concerned with all aspects of the customer experience including usability, reliability, security, performance and general product effectiveness. Alecha spends a lot of time working with other team members to ensure everyone maintains that customer connection that enables her team to create a quality product that the customer wants and needs.

**Primary responsibilities include:**

- Analyzes customer data from a variety of sources
- Represents the customer in design and usability reviews
- Mentors and educates the test team in customer based testing approaches and the needs of the customer
- Is Active in customer discussions such as newsgroups, conferences, or special interest groups
- Provides immediate and accurate feedback on customer impact of bugs
- Designs end to end testing scenarios based on customer usage data.

**Goals and motivations:**

Alecha enjoys coming to work every day knowing that she directly shapes the product in a way that ensures the customer's needs will be met. She enjoys being a product expert and feels valued and respected by her team members as someone that is completely knowledgeable about their product and industry. She loves her product and the difference she directly makes in customer's lives by the work she does for them.

# Personas Examples

- Kivio

**Kivio Users**

	The researcher	The Sysadmin	The OSS developer	The CS student
				
Name	Alexander Weiß	Donald M. Berry	Kristian Larsson	Eric Neville
Age	30	30	26	24
Location	Germany	US	Sweden	France
Social Life	Alexander lives with his girl-friend in a flat in Hamburg.	Donald lives with his wife and 1-year old daughter in a house in Portland.	Kristian shares an apartment with two friends in Stockholm. His girl-friend lives in Uppsala. They see each other every weekend.	Eric lives with his parents in a small city close to Lyon. He visits the university there. Often, he stays at his friend's apartment for playing PC games and programming.
Work Life	He works at centre for environmental systems research and designs plans for replaceable energies in a EU-funded project.	He is a lead system administrator in a huge network solutions company in Portland.	A software developer with a dayjob in a medium-sized software company. Works on KDE in his spare time.	He is a student of computer science. Besides university, he performs small programming jobs for people in his neighbourhood.

Quelle: <http://msdn2.microsoft.com/en-us/testing/bb414765.aspx>

# Personas Examples



**Timothy Powell**  
P.Eng, Civil Engineer  
GeoLine Engineering  
Age: 52

*"Speed trumps security when it comes to exchanging documents. It's not worth jumping through hoops to protect a document that nobody's interested in but me and the client."*

Sends 12 documents/week at nearly 100 MB each <b>via FTP</b>	<b>Goal:</b> Get everything done before heading home.
Sends 8 documents/week under 5 MB each <b>via email</b>	Timothy has a lot of work to stay on top of and firm deadlines that cannot be missed. Speed is a competitive advantage for GeoLine, so it's essential that delays do not occur. Timothy hates working at night, too, so he makes the most of his hours at the office.
Receives 15 documents/week under 5 MB each <b>via email</b>	<b>Goal:</b> Cover his back and avoid blame.
Receives 15 hand-edited CAD drawings/week <b>via fax</b>	In Timothy's industry, projects usually go far over budget and are completed late, at which point all the subcontractors involved begin pointing fingers at each other. Timothy needs detailed records that prove he completed exactly what was expected of him and his company.
Exchanges primarily PDF and Microsoft Word files	
Employs couriers only for shipping physical goods	
Internet use is mostly limited to a website that hosts discussion groups for civil engineers. Purchases flights, hotels, and conference registrations twice per year.	Timothy Powell is famous among his coworkers for once visiting a construction site and remarking to the client, "Look, you may build bridges, but I design them. And that's the most critical part!" He may not have made a friend that day, but Timothy was unconcerned. He doesn't suffer fools, just as he won't put up with anything that stands in the way of getting his job done. Timothy's work is extremely deadline-driven. His clients demand aggressive schedules and expect him to stick to them, as timing is crucial when coordinating subcontractors and suppliers on a large construction project.
	"On a great day, I'm able to get everything out the door and into our client's hands. Never, ever let anything come between you and that door!" Timothy struggles with this all the time. With at least three major projects underway, it takes an enormous effort to produce his CAD drawings on schedule. As a result, he ships most of his documents at the end of the day, just before leaving the office around 5:30 pm.

**CLICKDOX**

# Personas

- Allow to **share** target user understanding across entire design team
- Number of personas needs to be **manageable**
  - Only specify personas that are actually needed
- Personas should **not** be too **complex**, so they can be internalized by designers
- Usually 1 page is enough
- Persons should describe **typical** usage scenarios
- Personas must **not** be an **average** user!

# Personas

- Benefits
  - Helps defining a system
    - What does the system need to support/do?
    - How should it “act”?
  - Helps evaluating designs
  - Avoids developing for “own” goals
  - Avoids developing for the „elastic user“
  - Gives a “face” to the user (powerful!)
  - Costs are comparably low

# Personas

- **Potential problems?**

# Personas

- Potential problems:
  - How to find/select the right personas?
  - Plausibility and trustworthiness?
  - Need to be communicated well, otherwise not useful
  - Tendency towards “re-using” personas for multiple projects

# Personas: structure

- Description of “Body”:
  - Photo
  - Age
  - Gender
  - ...
- Description of “Background”:
  - Education
  - Experiences
  - ...



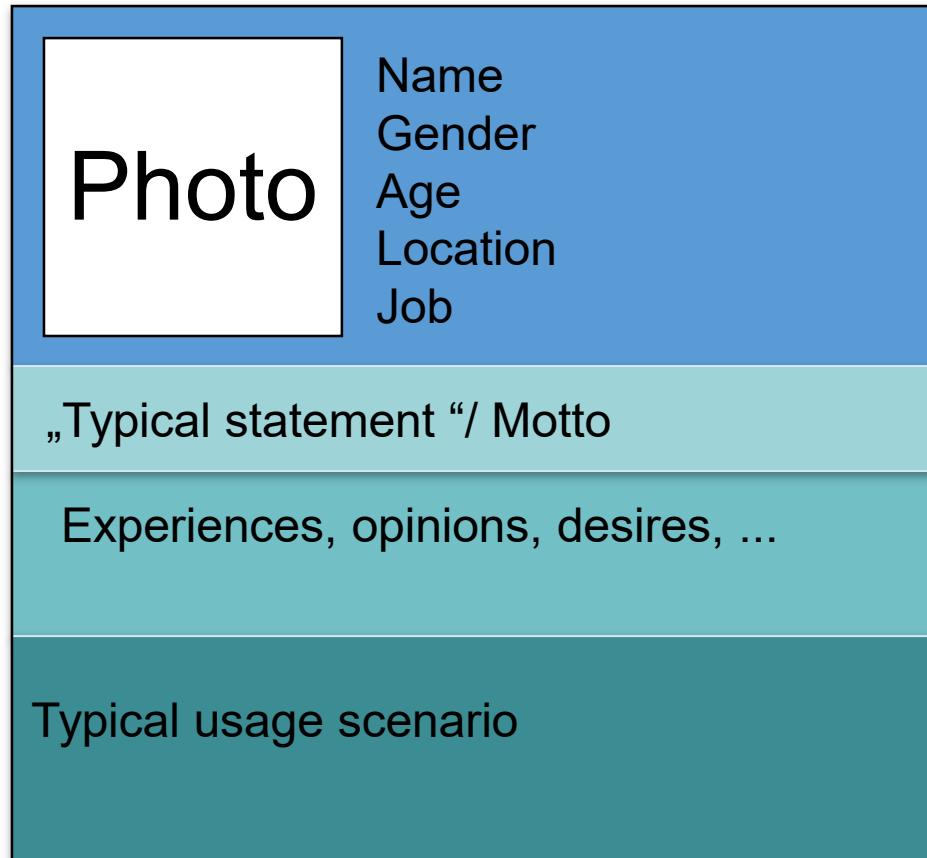
# Personas: structure

- Description of opinions and desires
  - Typical statement / motto
  - Typical scenario
  - ...
- 
- Structure not set in stone, can vary between different projects and systems



# Personas: structure

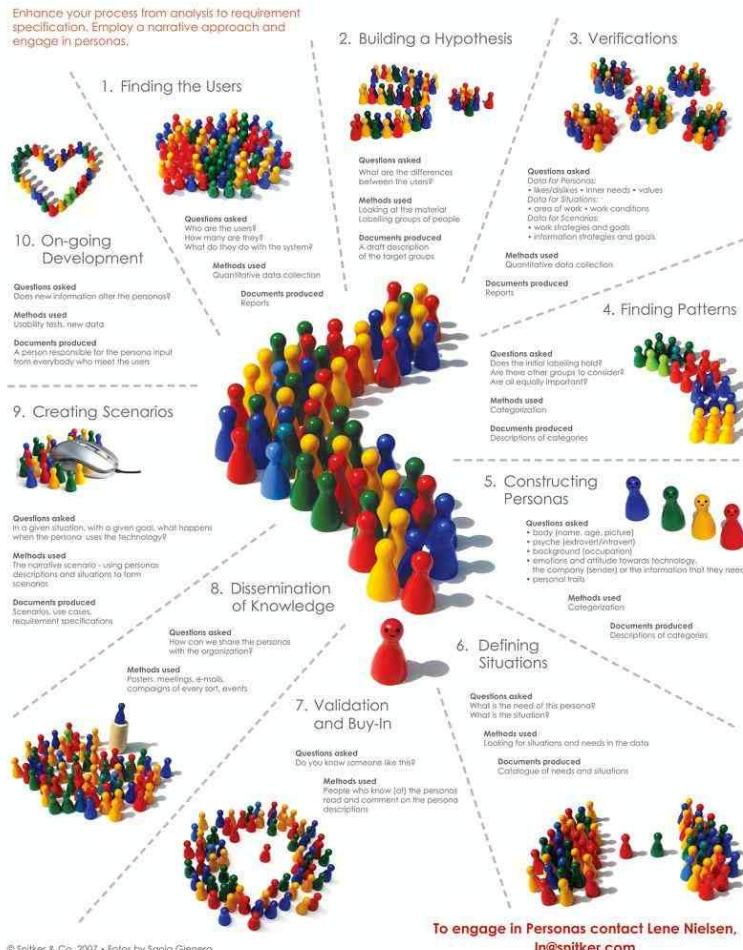
- Example



# Where do Personas come from?

## 10 steps to Personas

Based on the method "Engaging Personas and Narrative Scenarios" (2004) by Ph.D. Lene Nielsen



- Imagination of Designers (?)
- Epistemic distance?
- User interviews
- ...
- Field studies
- Full-blown ethnographic study

<https://www.interaction-design.org/encyclopedia/personas.html>

Context analysis (short)

# Context analysis

- Analyze the context a system will get used in:
  - Environment: weather, light conditions, noise
  - Usage of the system
    - While seated, standing ...
    - At work, at home, on the go, ...
    - Frequently / rarely
    - Hectic / calm
- Typically studied in the field



Group project

# Themes

“Smartphone application for **health, wellness, and environmental sustainability**”

1. Think about ways to promote an environmentally sustainable daily life, such as traffic congestion, energy shortages, and air & water pollution
2. Think about ways to support personal healthcare
3. Think about problems that marginalized populations encounter and ways to support their needs for the quality of life using a smartphone application
4. Think about solutions to facilitate collective efforts in solving important societal problems: Citizen Science

# Theme: Citizen Science

- Harnessing the power of citizens in solving real-world problems
- Engage members of a community in understanding and coping with the community's impending problems
- Examples
  - Ecological: <https://www.pca.state.mn.us/ecoexperience/citizen-science>
  - Municipal: <https://www.cityofboston.gov/311/>



# Themes

- Consider adding a smart-watch app coupled with a mobile app
- No meetup, buddy-finding apps
- No activity/calorie tracking apps
- Consider **accessibility** to potential users!

# Schedules and Grades

Stage	Details	Weight	Due (by midnight)
0	Submit team contact memo	Check	9/20
1	Problem statement	5%	9/20
2	Review of existing systems	5%	9/30
3	Data collection design	10%	10/9
4	Data collection & analysis	10%	10/15
5	Solution proposal	5%	10/25
-	Mid peer evaluation	5%	11/4
6	Wireframe	10%	11/25
7	Critique Feedback	5%	12/3
8	Hi-fi prototype	10%	12/10
9	Evaluation: Heuristic evaluation	5%	12/15
10	Final project presentation	10%	12/23, 25 (in class)
11	Final project report & video submission	10%	1/4
-	Final peer evaluation	10%	1/4

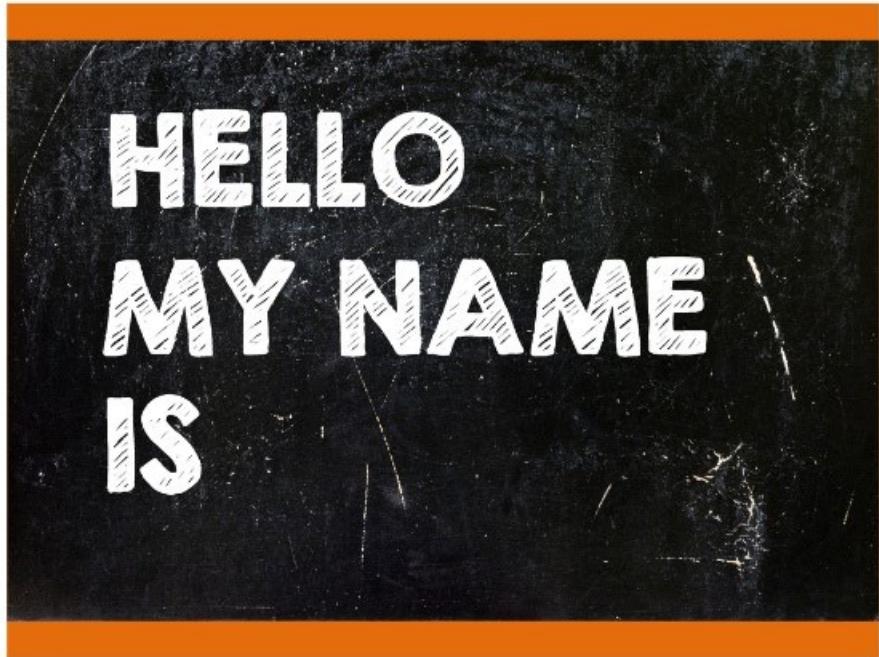
\* Schedules and topics are subject to change.

# Team formation

- Form a team of 3–4 students to work for a project throughout the semester
- When forming a group, you want to make sure that your group members have **different skillsets** (e.g., drawing, writing, programming, etc.)
- Recommended to have gender diversity

# Team Building





- Name
- Year
- Recent interests/hobbies
- What you are good at  
(Skills & expertise)
- What you can contribute to  
working on a group project

# By next class

- One of the team members submit a team memo by 9/20 11:55PM.

Team member should include:

- Team Name: Give your team a name
- Members: Names of team members and preferred contact info
- Skills Inventory: List of who is good at what
- Communication Plan: How will you communicate as a team?
- Rules: Things you all agree to do