SI3 – Programmation par évènement

EIIN625B **ECUE Interfaces Homme Machine**

Université Côte d'Azur (Polytech Nice)

https://lms.univ-cotedazur.fr/2022/course/view.php?id=17340

SI3-PROG2023!

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UNIVERSITÉ CÔTE D'AZUR

POLYTECH® NICE SOPHIA

Objectifs

- Apprendre à programmer des IHMs et des fonctionnalités au sein d'une application à partir des événements.

- Mise en œuvre du concept de séparation couche de présentation / couche applicative.

- Découverte des différents types d'applications Desktop et Mobile et des spécificités de leurs IHMs

- Développement d'IHMs mobile (Android).

- Initiation et apprentissage et/ou approfondissement selon les acquis des étudiants

Organisation

- Tout support de cours sur moodle/LMS
- Le fonctionnement : TD en projet fil rouge
  - mode projet avec un assistant technique spécialisé.
- 3 groupes de TD (85 étudiants au total)
- 1 chargés de TD par groupe
- ~6 groupes de projet par TD
- 4-5 Etudiants par groupe
- 5 thématiques possibles/déclinaison sur le projet
- Evaluation individuelles et de groupe.

Evaluations

- 2 Soutenances en mode séminaire (intermédiaire 20% + final 20%)
  - 10 minutes de présentation + 5 minutes questions
  - Il faut une démo du prototype, groupe utilisateurs, scénarios
  - Evaluation en groupe avec pondération individuel (si besoin)
- Rapport (20%)
  - A rendre sur moodle/LMS en semaine 19
  - Scénarios implémenté dans les outils + argumentation sur partie Android
- Examen (40%)
  - semaine 20, QMC en ligne (sauf consigne contraire)
  - contenu tout : cours théorique + cours pratique Android + question sur le projet

Android

- **ATTENTION: installation très longue**
- IMPORTANT: à installer avant la semaine 9!

- **Android Studio Electric Eel | 2022.1.1**
- **API 29**

Séance 1

- Introduction IHM
  - Démarche UCD
  - Personnas
- Présentation du sujet du projet
- Organisation des groupes
  - 4 personnes par groupe

Bibliographie IHM

- Les Interfaces Homme-Ordinateur Joëlle Coutaz, Dunod, 1990 épuisé
- Ergonomie des interfaces - Guide pratique pour la conception des applications web, logicielles, mobiles et tactiles Broché – 26 octobre 2011. J-F. Nogier, T. Bouillot, J. Leclerc
- Designing the User Interface B. Shneiderman 1997
- The psychology of everyday things Donald Norman, BasicBooks, 1988
- User Interface Management Systems Dan Olsen, 1998
- The Psychology of HCI, Card Moan & Newell 83 Lawrence Erlbaum eds.
- IHM
  - Human Computer Interaction by Jenny Preece (Addison Wesley 1994)
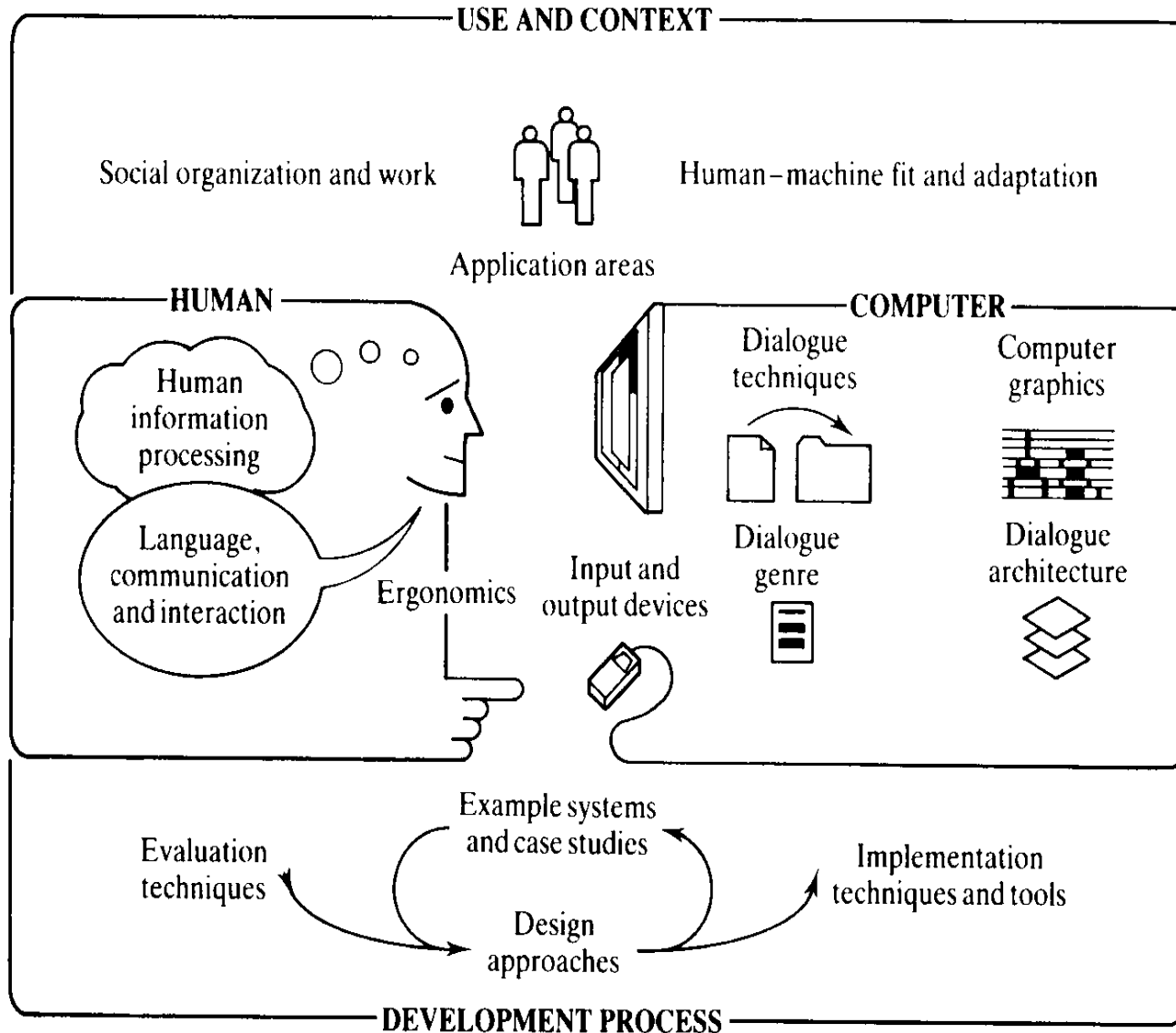 - Human Computer Interaction by Alan Dix et al. (2005)

C'est quoi **l'IHM /HCI** ?

« L'IHM est une discipline consacrée à la **conception**, la **mise en œuvre** et à l'**évaluation** de **systèmes informatiques interactifs** destinés à des utilisateurs humains ainsi qu'à l'étude des principaux phénomènes qui les entourent. »
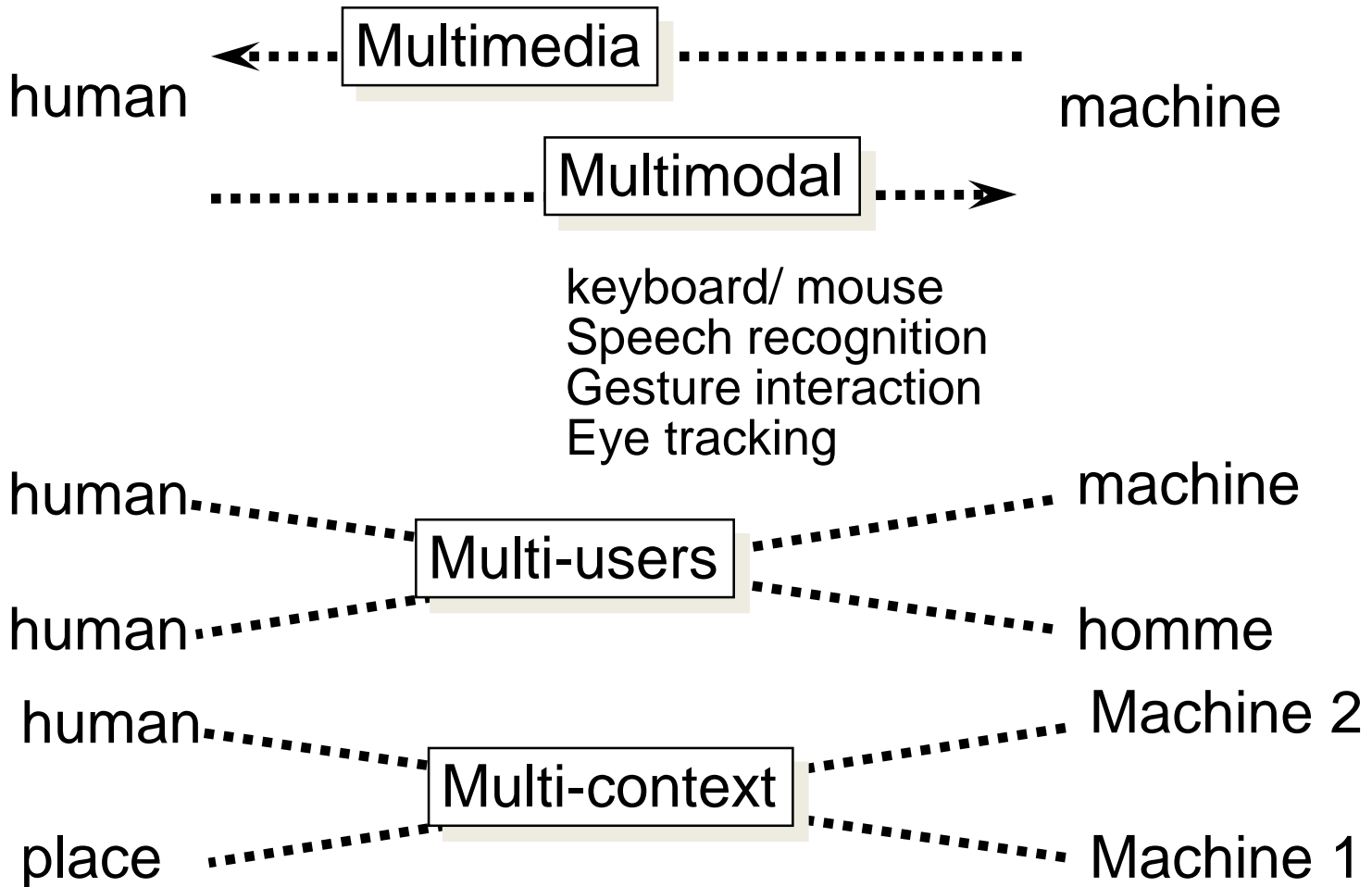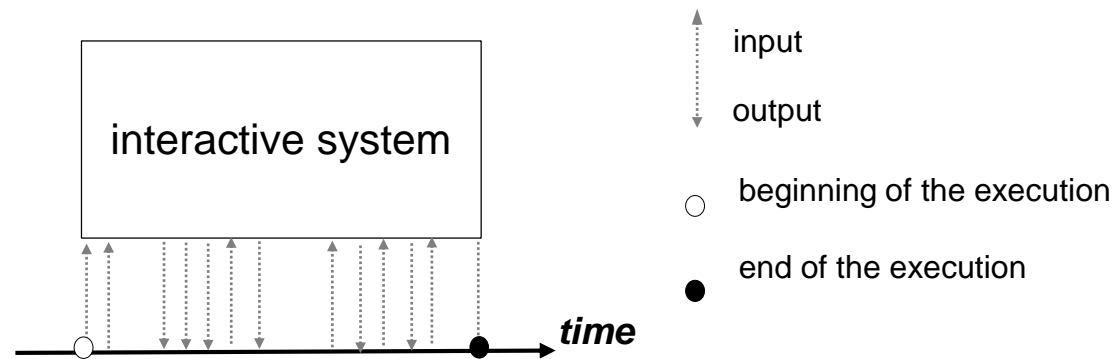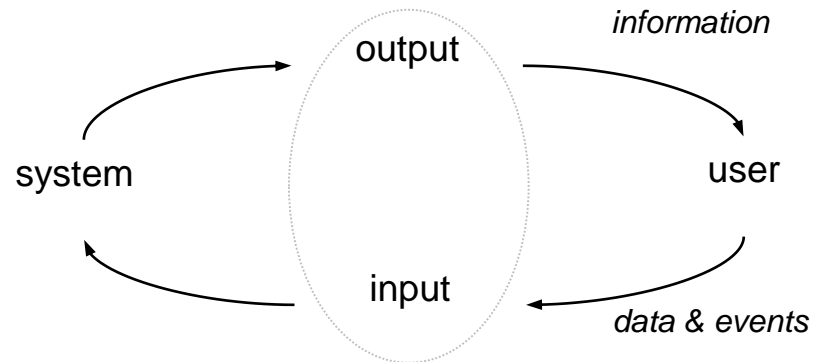
[afihm]

Human-Computer Interaction

https://sigchi.org/

Missing dimensions

Graphics, video, audio, voice (recognition and synthesis)

human ← ········· | Multimedia | ···················· machine

········· | Multimodal | ·····→

keyboard/ mouse
Speech recognition
Gesture interaction
Eye tracking

human ··········· | Multi-users | ··········· machine

human ··········· ··········· homme

human ··········· | Multi-context | ··········· Machine 2

place ··········· ··········· Machine 1

Interactive Systems

information

output

system

user

input

data & events

interactive system

input

output

○ beginning of the execution

● end of the execution

time

Interactive Systems

interface | noyau fonctionnel
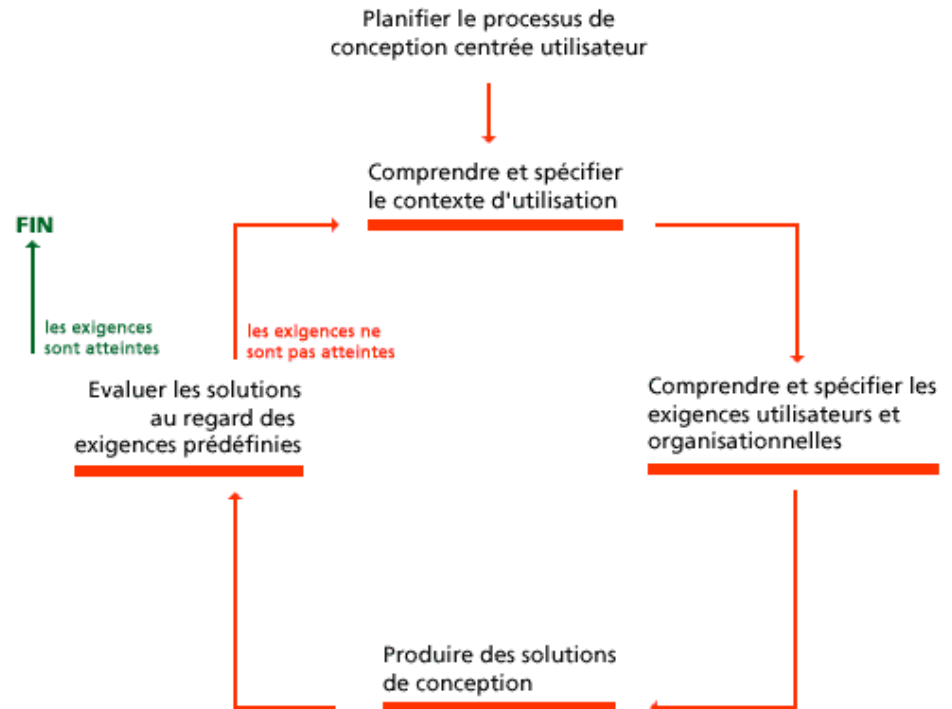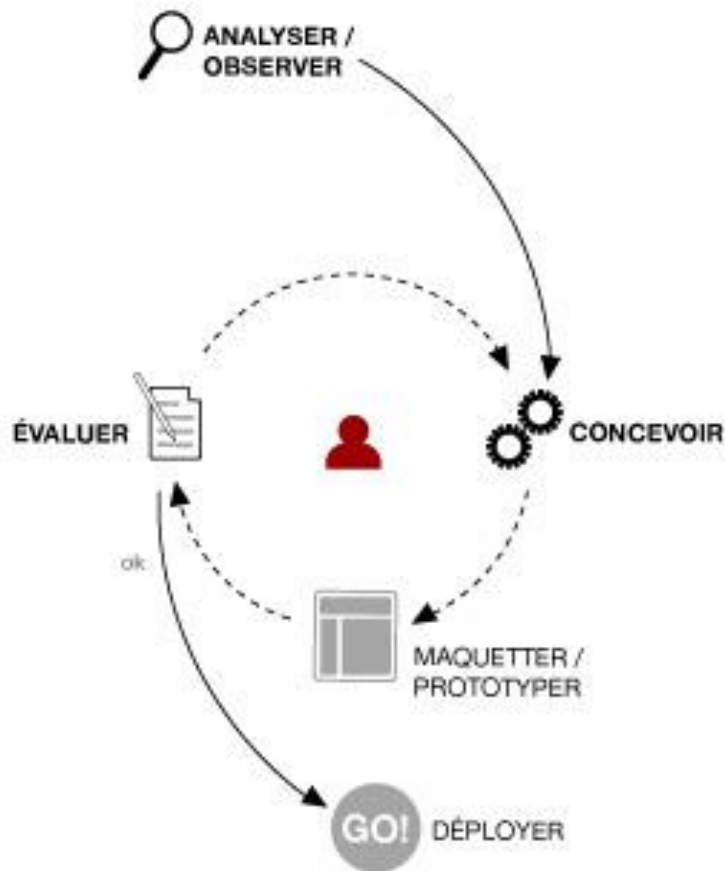
application interactive
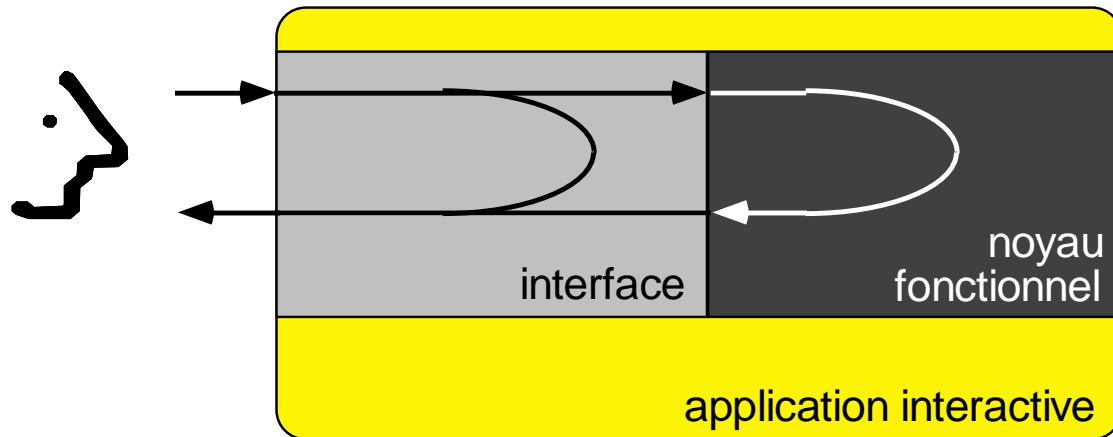
User interface => Communication channel, language, visual

Human => Task, human factors, human Error

Machine => Functional core, process, software Aspects

User-Centered Design

HCI and ISO standards

- ISO 13407 User Centered Design
- ISO 9241-210:2019 - Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems.
  - Usability:
    - Effectiveness
    - Efficiency
    - Satisfaction
  - User Experience/UX:
    - Dimensions describing users' perception and feelings
- ISO/IEC 40500:2012 - Information technology — W3C Web Content Accessibility Guidelines (WCAG) 2.0

Usability

- [Nielsen, 1992]
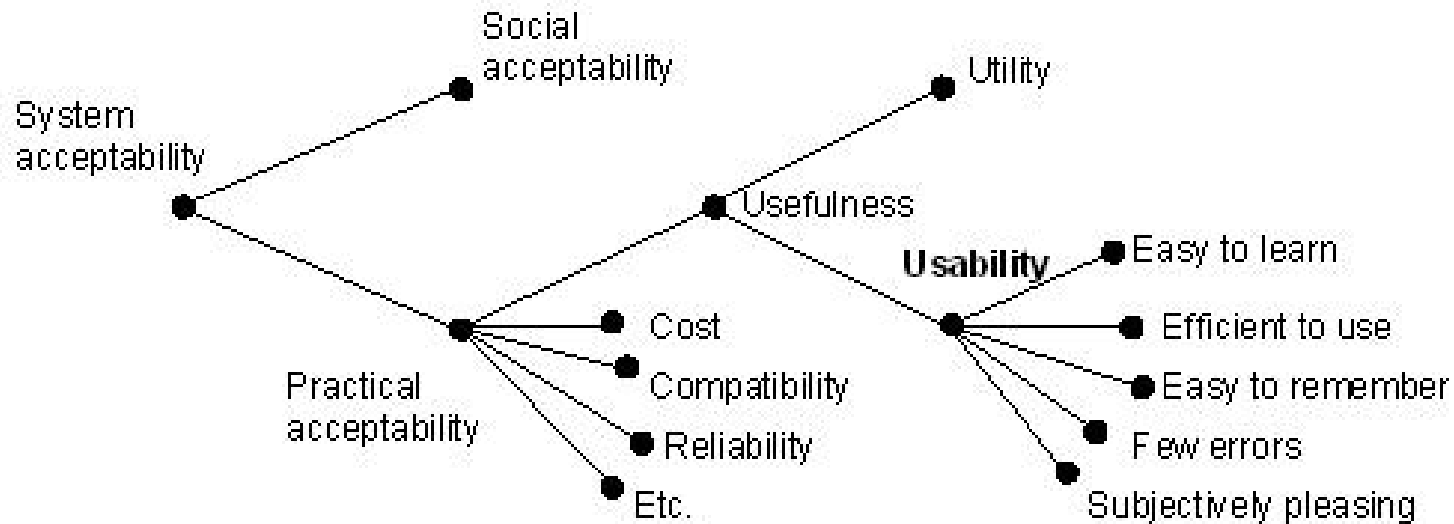
Usability is …

- Is the system easy to learn?
  - What happens if I press the button?
  - What can kind of actions can be currently performed?
  - Why am I here?
  - Ah … yes I know that, it should work like that …
  - Save is in the first menu … it is always there …
  - Left is cancel, right is ok (or is it the other way arround?)

Usability is …

- Whatever I do … the system will not crash
  - What happens currently with the system?
  - Am I able to recover from an error?
  - Why is nothing happening? Did the system crash?
  - Why can't I do it this way, I really thought the system would support that.

Dimensions of User Experience

Visual/aesthetic experience refers to the pleasure that people gain from sensory perceptions, how beautiful something is perceived

Emotion, the emotional experience is one of the three main factors contributing to product experience, including feelings and emotions elicited

Stimulation as a hedonic attribute of a product, which can lead to new impressions, opportunities and insights

Identification dimension addresses the human need to express one's self through objects

Meaning and Value is referring to "Ideo pleasure" indicating values the product can satisfy.

Relatedness (***social relatedness/co-experience***), products that facilitate communication as well as those that serve as conversation pieces contribute to socio pleasure.

Example of UX in context

- "*I am passing by at this park every Sunday and this bench has not been repaired for weeks* **[Identification]**. *It is time now to report that, so it will get fixed. It is not really a problem or unsafe, but the bench is simply not usable in the current state* **[Meaning and Value]**. *It seems important now to make sure that the appropriate person is informed about that bench* **[Social relatedness]**, *I think I should use the application to report the incident, because I want to be a good citizen* **[Identification]**.

- "If the photo is good **[Aesthetic experience]**, they [the local administration] will see the problem…"

- "If I make a picture you are afraid **[Emotion]** that there will be a kind of retaliation?"

- "Besides going to report your idea, the application could ask **[Stimulation]** if there are other ideas close to your home."

User eXperience over time
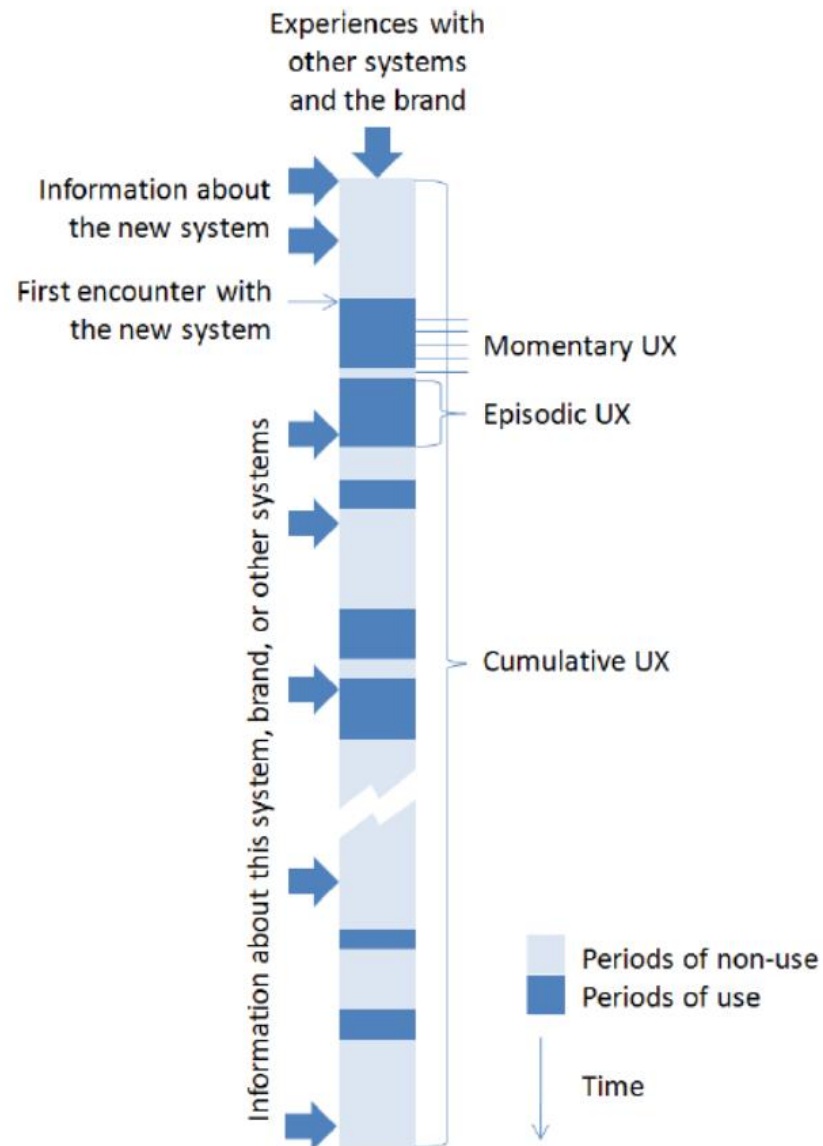
Accessibility

Why **Accessibility** ?

- "**Accessibility** is ease of use of a product, a service, an environment or a facility, **regardless of individuals' capabilities**." (Standard ISO 9241, 2008).
- Multiples implications for:
  - Understanding individuals capabilities
  - Design of assistive technology
  - Regulations and laws for making social impact

♿ Users with Special needs (Accessibility)

- Accessibility: make an interface accessible even for impaired people or users with special needs including physical or cognitive handicap, special work conditions or technology constraints
- Ex.:
  - Users with visual impaired (8% male population in USA can't distinguish red from green)

Accessibility : Vision
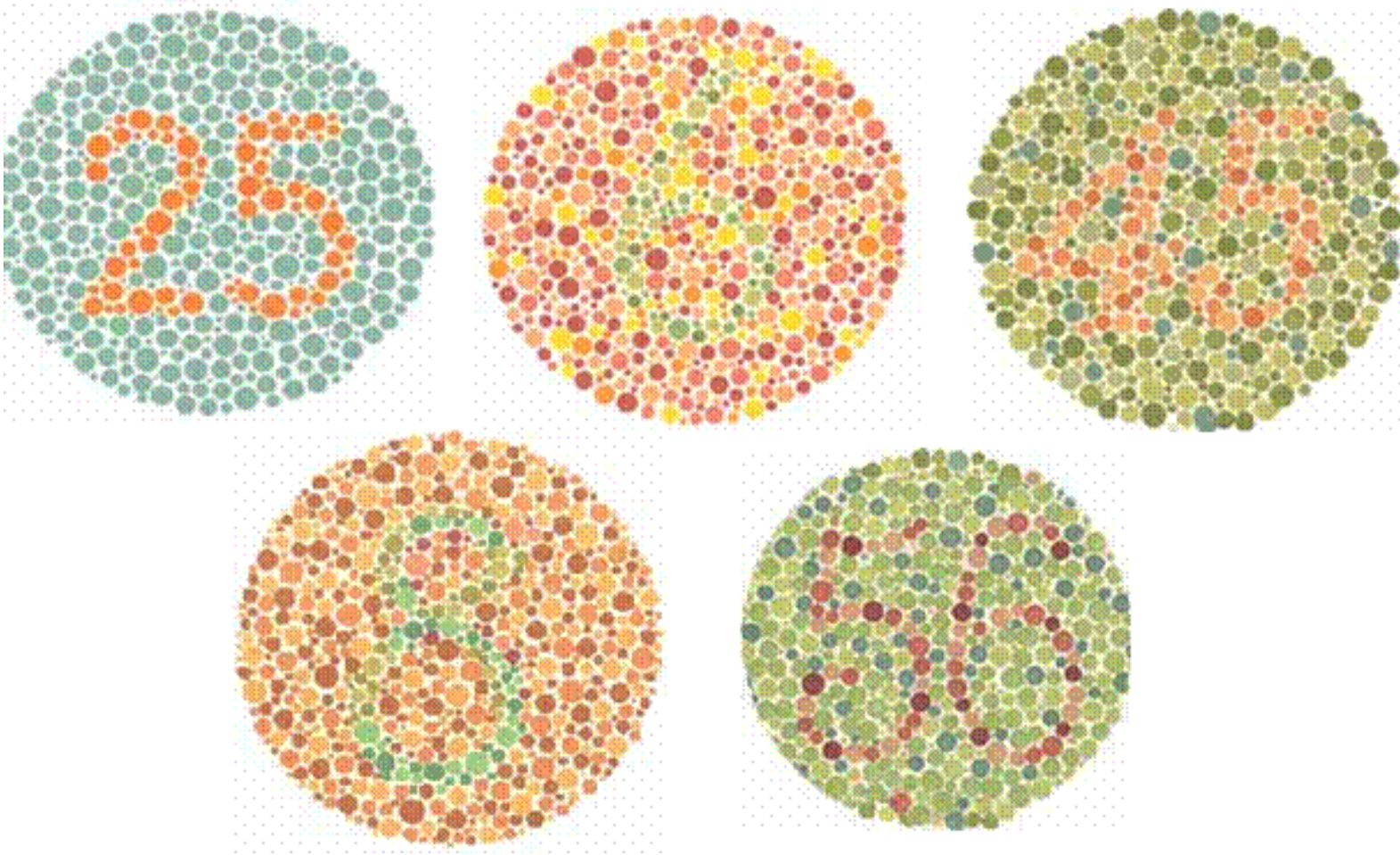
Accessibility : Hearing

- Deafness
- Hard of hearing
- Noisy environments
- Silent environments (library)

Accessibility : Physical disabilities

- Motor disabilities
- No mouse
- Adapted keyboard
- Speech disabilities

Accessibility : Cognitive and neurological disabilities

- Dyslexia, dyscalculia

- Attention deficit disorder

- Memory impairments

- Photo-sensitivity

Accessibility Technology

- Too old browser
- Too new browser
- Other operating system
- No such plug-in
- Low bandwidth

When was the last time you…

Use curb cut ?

Went through an automatic door ?

Read closed-captioning?

Situations affect our abilities
to interact with technologies,
our surroundings, and other people.

Situationally induced impairments and disabilities (SIID)

"Both the environment in which individuals are working and their current [activities] ... can contribute to the existence of impairments, disabilities, and handicaps."

Andrew Sears &
Mark Young (2003)

Disabling situations

"[A soldier on a battlefield] can be blinded by smoke, deafened by gunfire, mobility impaired by being up to the waist in mud, have poor tactile sensitivity and dexterity because of wearing a chemical warfare suit, and be cognitively impaired because of being scared stiff of being killed—and this is before the solider is wounded! If one were to measure the effective abilities of a person in such an environment, they would be poor enough over a number of dimensions for him or her to be classified as severely disabled in a more normal environment."

Alan F. Newell (1995)

Don't need to be a soldier to experience a disabling situations

Environments affect our ability to interact. We adapt ourselves to compensate.

Assistive technology

Our computing devices remain oblivious to the many ways we adapt ourselves to suit them.

Accessible computing? Or adaptable humans?
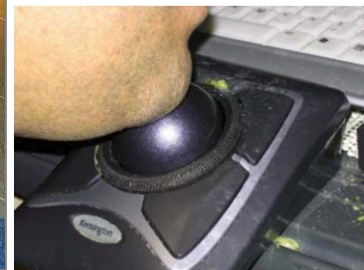
Assistive technology, a few examples

Since environments affect all of us, we *all* might benefit from more situationally aware devices.

UCD and Universal Design

- Focus on users groups
- We should explicitly inform designer about the needs of users' special needs
- Take advantage of demographics to focus on users and needs

What does it mean user group ?

- The first requirement of practical HCI design is to identify who the users will be!

- Users groups describe the characteristics of target users of an interactive system

- Process for identifying and selecting users
  - define the characteristics of the user population, i.e. user groups
  - work with a representative sample of the user group

User Groups (or WHO?)

- Characteristics of the User
- Focusing on the User means: ask questions, try to get answers
- Things we want to ask:
  - Questions related to the person (demographic information),
  - Attitude (e.g. towards work: motivation, interests, readiness to asume a risk),
  - Frequency the product is used,
  - Knowledge in the (working) area,
  - Experiences in other areas (education, technical background)
  - (software) products used
  - Language used (e.g. technical terms, entertainment, …)

User Groups (or WHO?)

- ## Who are the users?
  - Primary and secundary users
  - Buyers or substitute (or representativeà users)

- ## Description of the Users:
  - Jobs, Tasks, Tools, mental models
  - Individuell Differences
  - Usage of products

User groups (or WHO?)

- How to learn about the users?
  - Who is having contact with the users (e.g. hotline)?
  - What kind of users and potential users can we think of?
  - User/Task Matrix (who is doing what, and how often)?
  - Typical characteristics of the user-community
  - EVALUTE your ASSUMPTIONS!!

User/Task Matrix

Users	Getting comfortable with software	Basic software use	Advanced software use	Training the patients	Customizing the software
Patients	X	X			
Patient families	x	X	X		
Novice clinicians		X	X	X	
Expert clinicians		X	x	X	X

Describing and assessing user groups

- Methods for describing user groups
  - User roles, personas, user profiling
- Methods for assessing user groups
  - Interviews, questionnaires, focus groups …

- Important Problems
  - Every user is an unique individual (variation in the population)
  - In some cases, users tasks and responsibilities might be more important that individuals preferences but not always…
  - Stereotyped views of users is a dangerous and yet necessary tradeoff

User characteristics to consider

- Job or task related factors:
  - job characteristic, knowledge of application and job familiarity, rate of use of the computer (in work)
- Traits and intelligence:
  - cognitive styles, affective traits, skill sets or capability
- User characteristics and demographic data:
  - Age, gender, education, occupation, cultural background, special needs, computer training and knowledge, experience with similar systems/products
- Disabilities and special needs

Ascertain user's tasks

- Define tasks
  - Tasks
  - Subtasks
- Frequency
  - Frequent
  - Occasional
  - Exceptional
  - Repair

- Ex. difference between a space satellite, car engine, and fighter jet
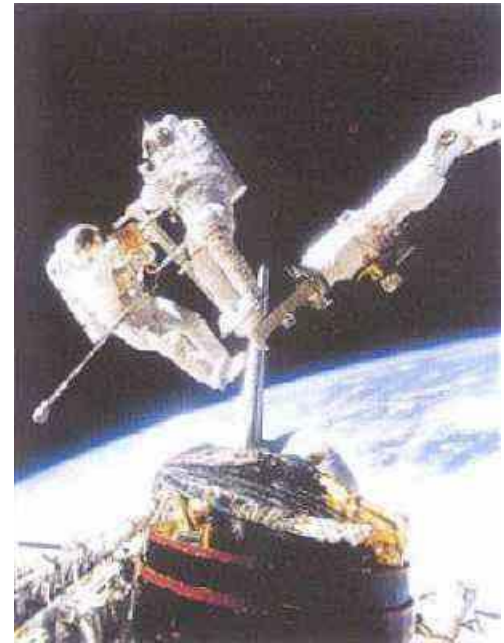
User characteristics
(based on learning skills and usage)

- A simplest classification:
  - Users are: NOVICE or EXPERT
  - Usage is: FREQUENT or INFREQUENT
- Defining user ability
  - Levels of ability e.g. novice, advanced beginner, competent user, proficient user, expert (Dreyfus, 1980)
  - Revised frequency of usage (constant, regular, occasional)
  - Task familiarity (slanted towards technical ability)
  - Degree of usage of similar technology (dissimilar hardware/software).
  - Demographic data (user age and status profile)
  - Value perception (particularly relevant to the introduction of new technology)

Dreyfus, S. E.; Dreyfus, H. L. (February 1980). A Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition. Washington, DC: Storming Media.

Physical Variation

- Ability
  - Disabled (elderly, handicapped, vision, ambidexterity, ability to see in stereo [SUTHERLAND])
  - Speed
  - Color deficiency
- Workspace
  - Science of *ergonomics*
  - Size
  - Design
- Lots of prior research

Physical Variation

- Field of **anthropometry**
  - Measures of what is 5-95% for weight, height, etc. (static and dynamic)
  - Large variance reminds us there is great 'variety'
  - Name some devices that this would affect.
    - note most keyboards are the same
    - screen brightness varies considerably
    - chair height, back height, display angle

- Multi-modal interfaces
  - Audio
  - Touch screens

Cognitive and Perceptual Variation

- Bloom's Taxonomy
  - knowledge, comprehension, analysis, application, synthesis, evaluation
- Memory
  - short-term and working
  - long-term and semantic
- Problem solving and reasoning
- Decision making
- Language and communication

Cognitive and Perceptual Variation

- Language and communication
- Search, imagery, sensory memory
- Learning, skill development, knowledge acquisition
- Confounding factors:
  - Fatigue
  - Cognitive load
  - Background
  - Boredom
  - Fear
  - Drugs/alcohol
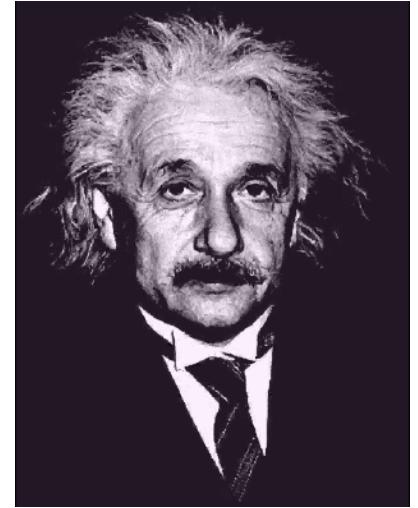
Personality

- Computer anxiety
- Gender
  - Which games do women like?
  - Pac-man, Donkey Kong, Tetris
  - Why? (Hypotheses: less violent, quieter soundtracks, fully visible playing fields, softer colors, personality, closure/completeness)
  - Can we measure this?
- What current games are for women?
- Style, pace, top-down/bottom-up, visual/audio learners, dense vs. sparse data

Personality

- No simple taxonomy of user personality types. Ex. Myers-Briggs Type Indicator
  - Extrovert vs. introvert
  - Sensing vs. intuition
  - Perceptive vs. judging
  - Feeling vs. thinking
- Weak link between personality types and interfaces
- Think about your application, and see if user personality is important!
  - Fighter jets vs. search engines

Cultural and International Diversity

- Language
- Date / Time conventions
- Weights and Measures
- Left-to-right
- Directions (!)
- Telephone #s and addresses
- Names, titles, salutations
- SSN, ID, passport
- Sorting
- Icons, buttons, colors
- Etiquette
- Evaluation:
  - Local experts/usability studies

Users with Disabilities

- Federal law to ensure access to IT, including computers and web sites. (1998 Amendment to Rehabilitation Act)
- Disabilities
  - Vision
    - Blind (bill-reader)
    - low-vision
    - color-blind
  - Hearing
    - Deaf
    - Limited hearing
  - Mobility
  - Learning
    - Dyslexia
    - Attention deficient, hemisphere specific, etc.
- Keyboard and mouse alternatives
- Color coding
- Font-size

Users with Disabilities

- Contrast
- Text descriptors for web images
- Screen magnification
- Text to Speech (TTS) – JAWS (web pages)
  - Check email on the road, in bright sunshine, riding a bike
- Speech Recognition
- Head mounted optical mice

Users with Disabilities

- Eye Gaze control
- Learning what helps those with disabilities affects everyone
  - Present procedures, directions, and instructions accessible to even poor readers
  - Design feedback sequences that explain the reason for error and help put users on the right track
  - Reinforcement techniques with other devices
- Good target area for a final project!

Elderly

- Reduced
  - Motor skills
  - Perception
  - Vision, hearing, touch, mobility
  - Speed
  - Memory
- Other needs
  - Technology experience is varied (How many grandmothers use email? mothers?)
  - Uninformed on how technology could help them
  - Practice skills (hand-eye, problem solving, etc.)
- Touch screens, larger fonts, louder sounds

User groups modeling techniques

- Using stereotypes to infer many things at a time
  - User profiles
  - User roles
  - Persona
- Inferring individuals facts, patterns of user behaviors, condition-action rules
  - Task models
  - Scenarios

User profile

- Fictitious summary including motivation, goals and personalities

- Includes information about, age, gender, skills, education level, experience, cultural level

Describing the main user characteristics

- Personal characteristics:
  - Age, sex, education, job type, socio-economic status, role in organization.
  - Lifestyle, personality, emotions and attitudes (e.g. toward using a technology).
  - Skills.
  - Physical abilities and constraints, e.g. poor eyesight, color blindness, etc.
- Task related characteristics:
  - Goals and motivation.
  - Tasks.
  - Usage (heavy vs. light, frequency, indirect or remote).
  - Training and experience (from novice to expert).
- Geographic and social characteristics:
  - Location: regions, countries, continents, market areas.
  - Cultures and other circumstances.
  - Social connections and societies.

Example

1. **# of users** that occupy this user type
2. **General responsibilities or activities**
3. **Computer skills**
4. **Domain expertise**
5. **Goals:** how does the tool help this user reach their goals?
6. **Pain Points:** what nagging problems can the tool help to solve?
7. **Usage Contexts:** where will the tool be used?
8. **Tool Ecosystem:** what other tools does this user type rely on?
9. **Collaborators:** who does this user work with to help reach their goals?
10. **Frequency of Use:** how often is this type of user likely to use the tool?

To help understanding the characteristics of users/customers that might have bearing on the design, construct a profile containing information about the type of user relevant to the tool being created.

Characteristics suitable for this user type (design imperatives)

- **ease of learning**
- **retention** of learning
- **efficiency** of interaction
- **reliability** of interaction
- user **satisfaction**
- user **convenience**
- necessity for **proficiency**
- importance of **accuracy**

User roles

- A collection of attributes that characterize certain user population and their intentional interaction with the system

- Task and responsibility based

- Individual preferences does not matte here

User roles: a simple example

User group	Task	Number of users
Admission clerks	Collect patient data	25
Nurses	View medical data	490
Administrators	Install and maintain software	12

user/task matrix

Tasks	Admissions clerk	Ward clerk	Physician's officer
Collect patient demographic data	Frequent	Never	Frequent
Collect patient insurance data	Frequent	Never	Frequent
Collect patient medical data	Sometimes	Frequent	Frequent
Assign patient to room and bed	Never	Frequent	Never
Make patient ID bracelet	Frequent	Sometimes	Never
Give directions to floor and room	Frequent	Sometimes	never

Role Modeling Steps

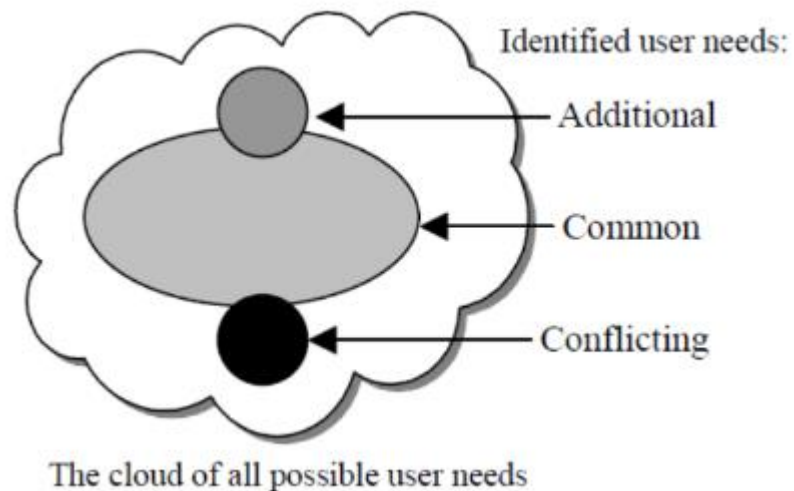| Role	Who
Job Seeker	Scott
First Timer	Laura
Layoff Victim	Kindra
Geographic Searcher	Allan
Monitor	Ashish
Job Poster	Mario, Savannah
Resume Reader	Delaney, Savannah

- brainstorm an initial set of user roles
  - A user role is one user
  - System roles are also useful
- organize the initial set of cards
  - Tasks and responsabilities
- consolidate roles
- refine the roles
  - The frequency with which the user will use the software.
  - The user's level of expertise with the domain.
  - The user's general level of proficiency with computers and software.
  - The user's level of proficiency with the software being developed.
  - The user's general goal for using the software. Some users are after convenience,
  - others favor a rich experience, and so on.

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Priorities and conflicts between user groups

User groups in hospital		
Admission clerks - Collect patient data - Want effectiveness and ease of use	**Nurses** - View medical data - Want to nurse and heal patients - Need easy access and accurate data	**Administrators** - Install and maintain sofware - Love technology - Want security

Identified user needs:
- Additional
- Common
- Conflicting

The cloud of all possible user needs
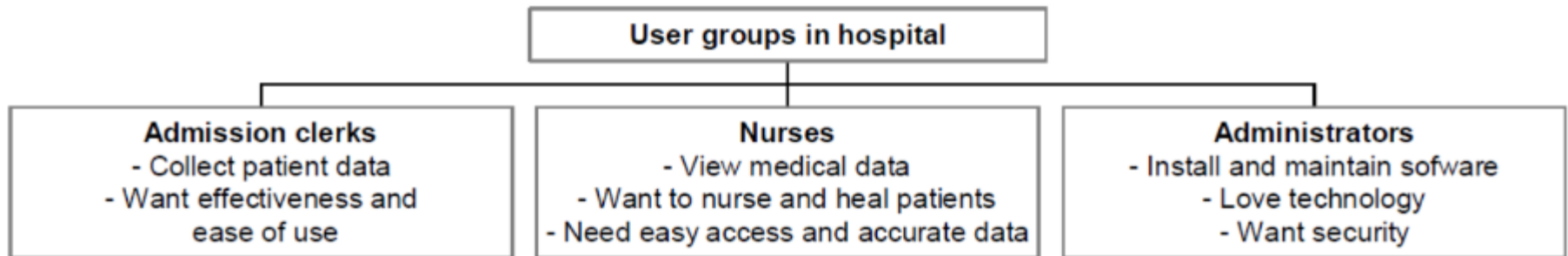
Personas

- Technique based on data gathered through user research, mapping user archetypes (profiles), that represent a few important classes of users' goals and needs
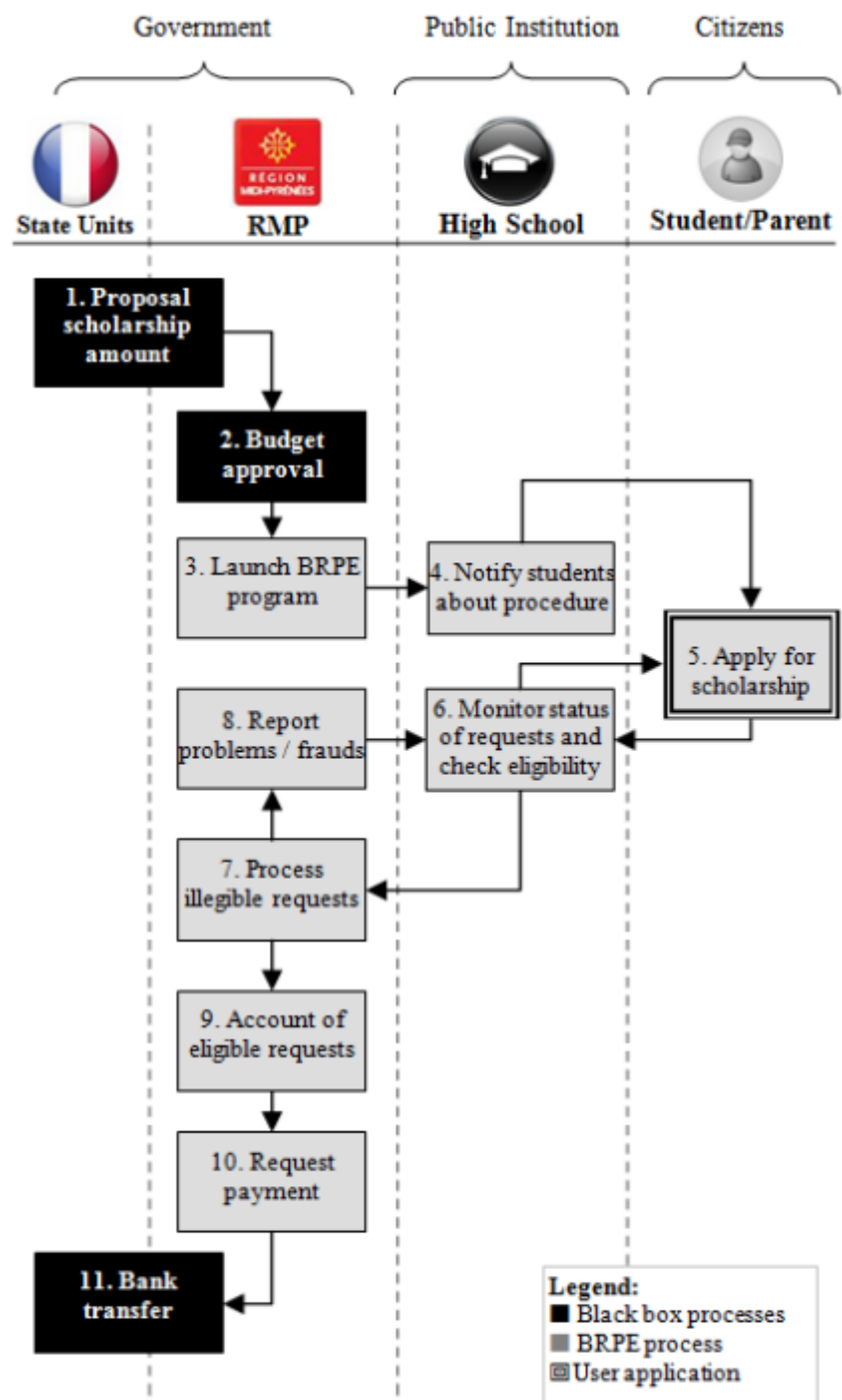
Build a simple persona

- Include:
  - Name
  - A role or job title
  - Quotes in the personas language
  - Relevant demographics
  - Descriptions that reveals goals, motivations, pain points
  - Descriptions that describe primary activities this user type will engage in.

Case study BRPE

Users	Criteria
RMP stakeholders	Costs
	Prevent frauds
	Time for checking eligible applications
	Traceability of applications
High school's principals	Visibility on students applying for the scholarship in his/her institution
	Time for checking eligible applications (e.g. no required information is missing)
	Time for assisting students to filling in the forms
	Pedagogical value of procedures in daily life
Citizens	Ensure eligibility of application
	Time for filling in the forms
	Time for obtaining the scholarship
	Full transparency

Government — State Units, RMP
Public Institution — High School
Citizens — Student/Parent

1. Proposal scholarship amount
2. Budget approval
3. Launch BRPE program
4. Notify students about procedure
5. Apply for scholarship
6. Monitor status of requests and check eligibility
7. Process illegible requests
8. Report problems / frauds
9. Account of eligible requests
10. Request payment
11. Bank transfer

Legend:
- Black box processes
- BRPE process
- User application

Personas for BRPE

First name	Rémi, the nature boy
Age	16 years old
Nationality	French
Family status	Single, living with his parents in a farmer.
Education	Repeating first year at the vocational high school Saint Paul on Veterinary Scholar Program after failing a first year in a traditional high school.
Information Technology skills	He prefers to surf the Web at school because of the low Internet bandwidth in the rural area where he lives. He gave up with cell phones because of the poor mobile network in the farmer.
Motivation for using new information technologies	He does not have any specific motivation but he knows how to use computer to check his assignments at the electronic kiosk available at the school.
Professional projects	To finish high school and go back to the farm to work with his father.

First name	Iban, the artist
Age	18 years old
Nationality	French
Family status	Single. Part time job in a restaurant after classes and during weekends. Living with friend in an apartment rented by his parents who live in another city.
Education	First year of vocational program in arts at the high school Matisse after two years attending Plumbing program at the same high school.
Information Technology skills	In the top 5 students in informatics. He is very skilled with drawing programs.
Motivation for using new information technologies	He likes innovative IT solutions and he very keen to try new devices. He was a first adopter of iPhone. Since then, he is using it to show his paintings everywhere he goes.
Professional projects	Work in the game industry.

Prototyping scenarios
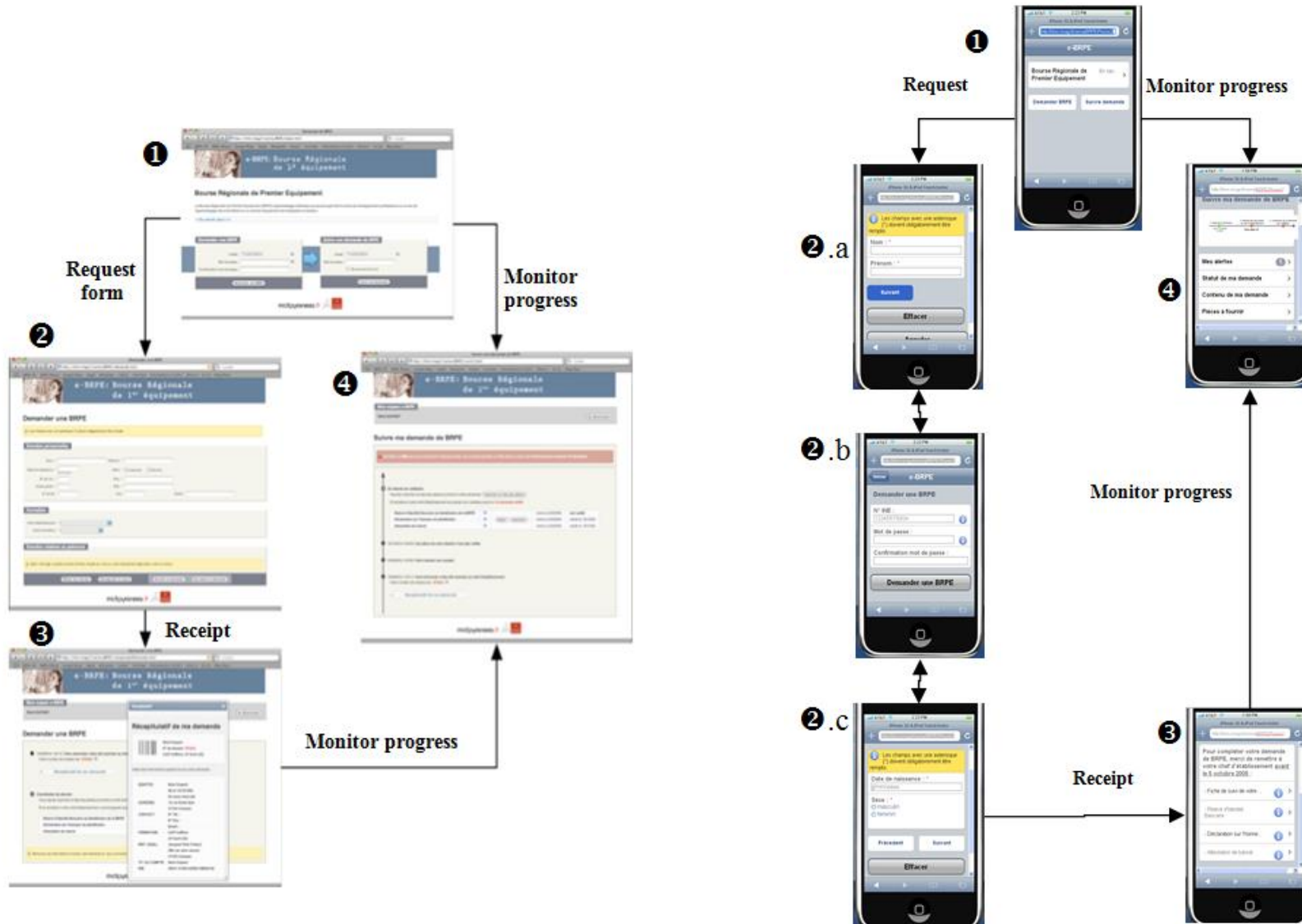
Creating scenarios and user stories

- White down representatives users tasks with the Web application
- Identify users tasks for each kind of user in all contexts of use
- Define:
    - Context of use (street, work, home, etc …)
    - How the system help to perform the task
    - What is required to perform the task
    - How important the task is for the user?

Présentation du sujet du projet

- Créer une application pour le suivie de consommation alimentaire. Plusieurs options possibles:
  - **Accidents;** ex. signalement d'accidents sur la route, incendies, etc;
  - **Aliments;** ex. collecter de bonnes adresses de fourniers;
  - **Bateaux;** ex. données méteo pour les balades en bateaux;
  - **Déchets;** ex. planification de collecte des encombrants;
  - **Oiseaux;** ex. suivi d'oiseaux migratoires;
- Personnes ciblées
  - Déterminé selon les cas d'usage choisi
- L'application doit supporter les tâches suivantes:
  - Signaler les informations d'intérêt;
  - Garder l'historique des activités d'un utilisateurs;
  - Partager des informations avec d'autres utilisateurs;
  - Avoir un mode tableau de bord permettant de monitorer l'activités des tous les utilisateurs;