

Trop longue ... restreindre peut-être à :

partie intro mais plus directe
observations
interviews
représenter les résultats
.. use cases/scenarios
.. personae

Introduction à la Conception Centrée Utilisateur

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Ce cours a été développé en partie par des membres des départements IHM de Georgia Tech et Télécom ParisTech. La liste de contributeurs inclut Gregory Abowd, Al Badre, James Eagan, Jim Foley, Elizabeth Mynatt, Jeff Pierce, Colin Potts, Chris Shaw, John Stasko, et Bruce Walker. Ces matériaux peuvent être utilisés avec attribution pour des buts non-lucratifs.



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Who am I?

James EAGAN

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Research

Human-Computer Interaction

Information Visualization

Multi-surface Interaction





Quentin Roy

Thésard en Interaction Homme-Machine

- Thésard en IHM à Télécom ParisTech
- Recherche en Interaction Gestuelle pour Surface Tactile





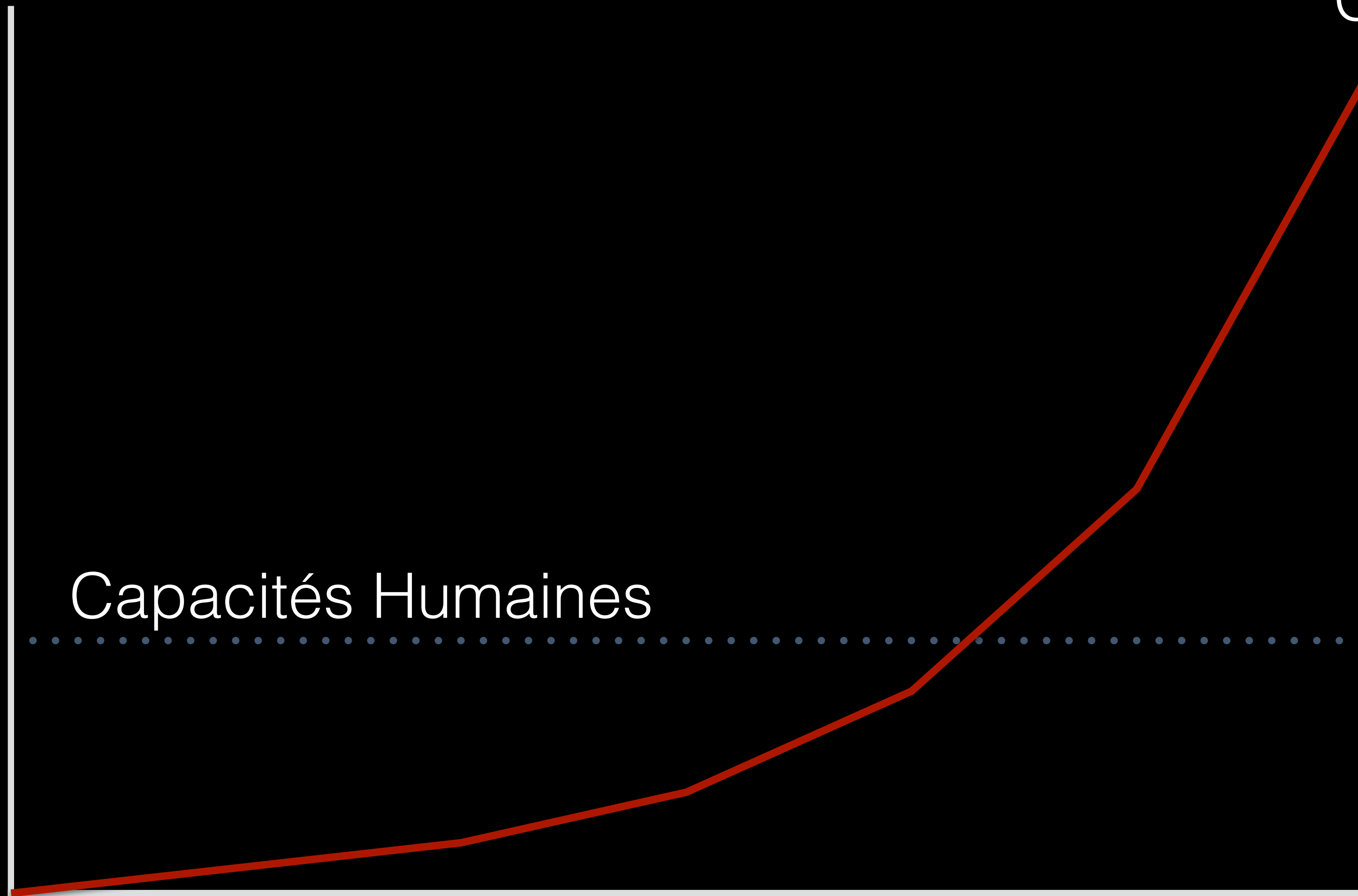
- 1999 : « La fonctionnalité la plus utilisée était ... recherche. Les personnes n'arrivaient pas à naviguer le site. »
 - « La deuxième fonctionnalité était le bouton 'help', car le moteur recherche était si inefficace. »
- Après re-conception du site centrée utilisateur :
 - Utilisation du bouton « help » a baissé 84 %
 - Ventes ont augmenté 400 %

Loi de Moore

Capacité de calcul

- Transistors
- Vitesse
- Taille⁻¹
- Coût⁻¹
- Batterie

Capacités Humaines



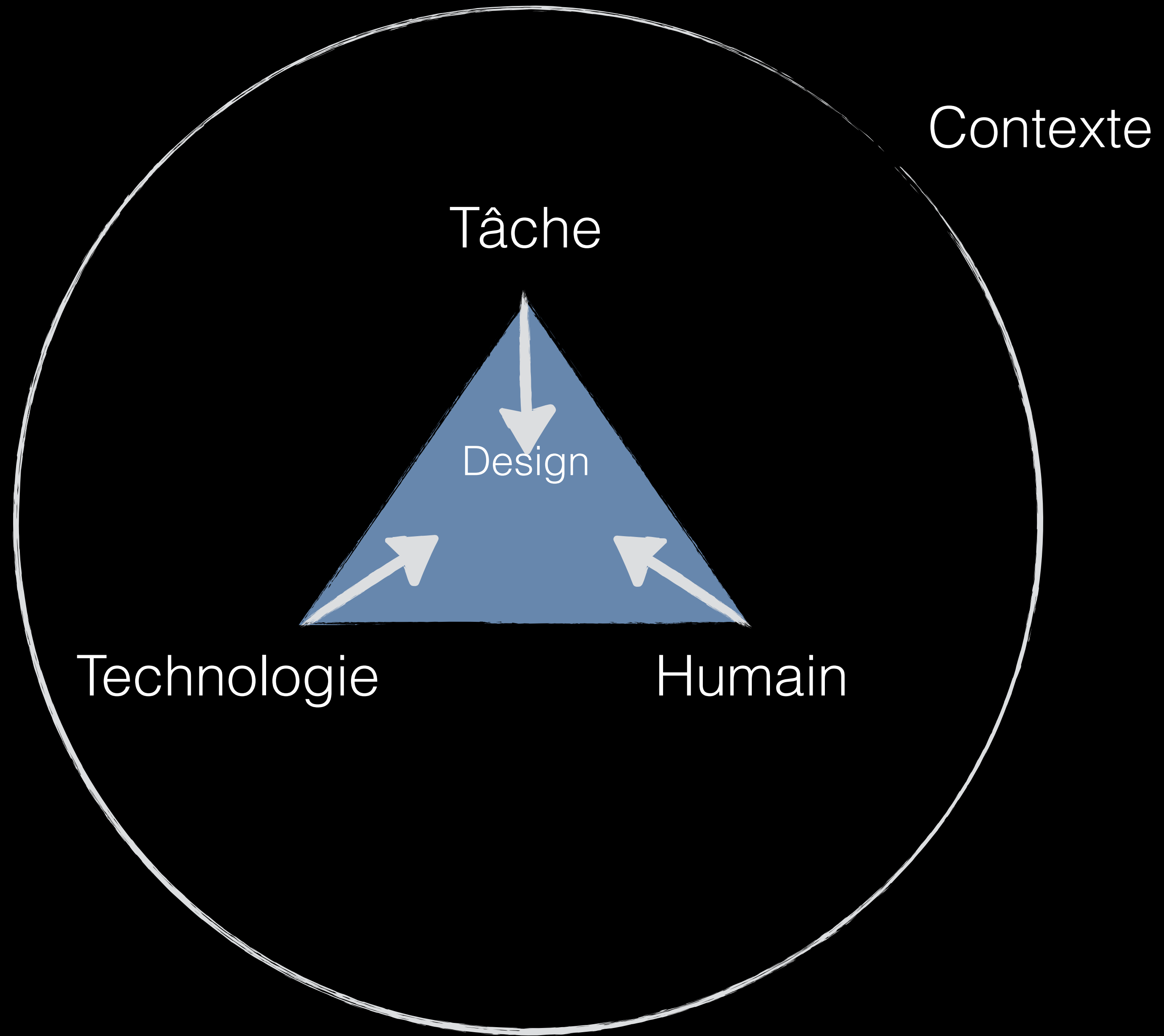
Interaction Homme-Machine

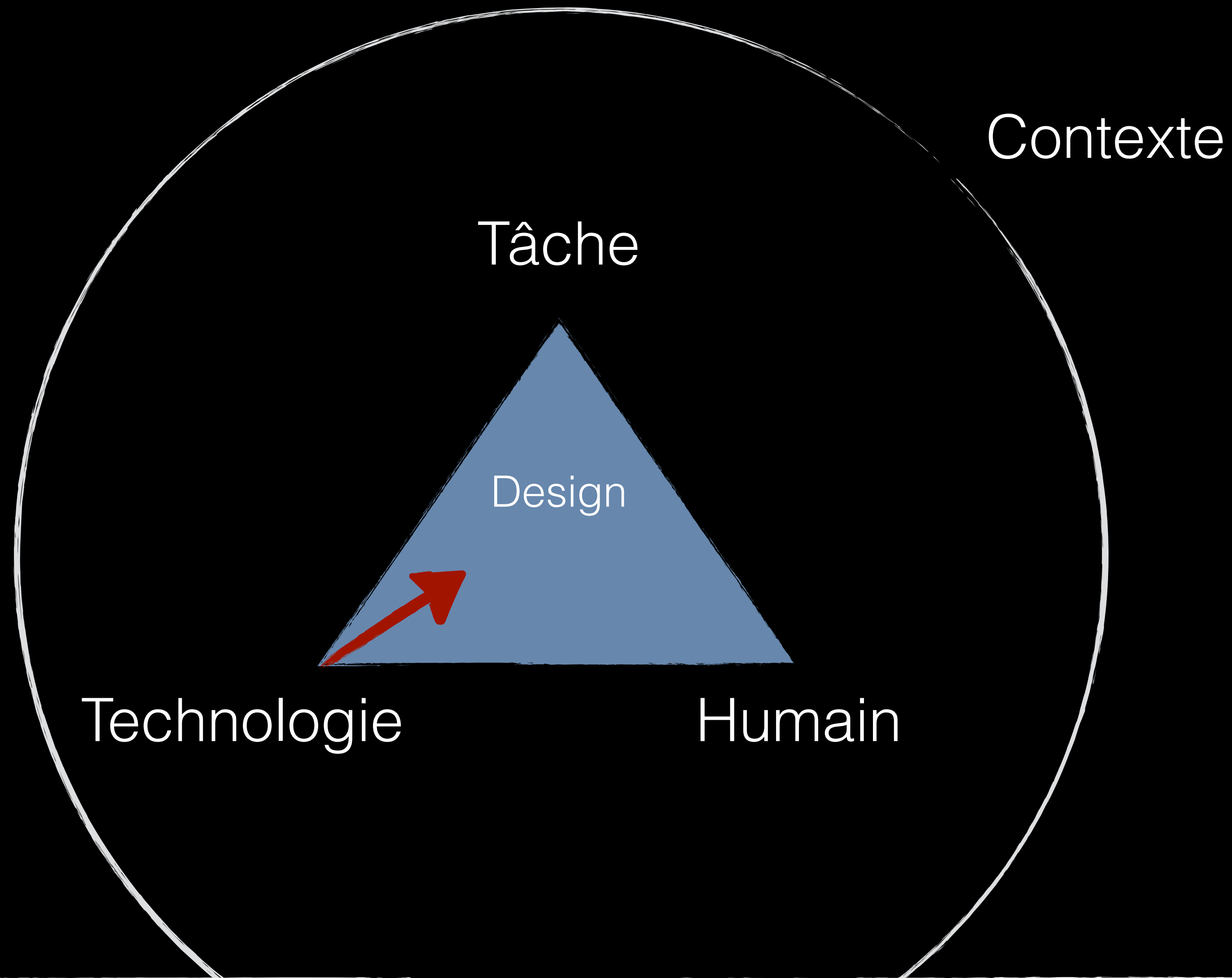
Human-Computer Interaction

Human-Computer Interaction

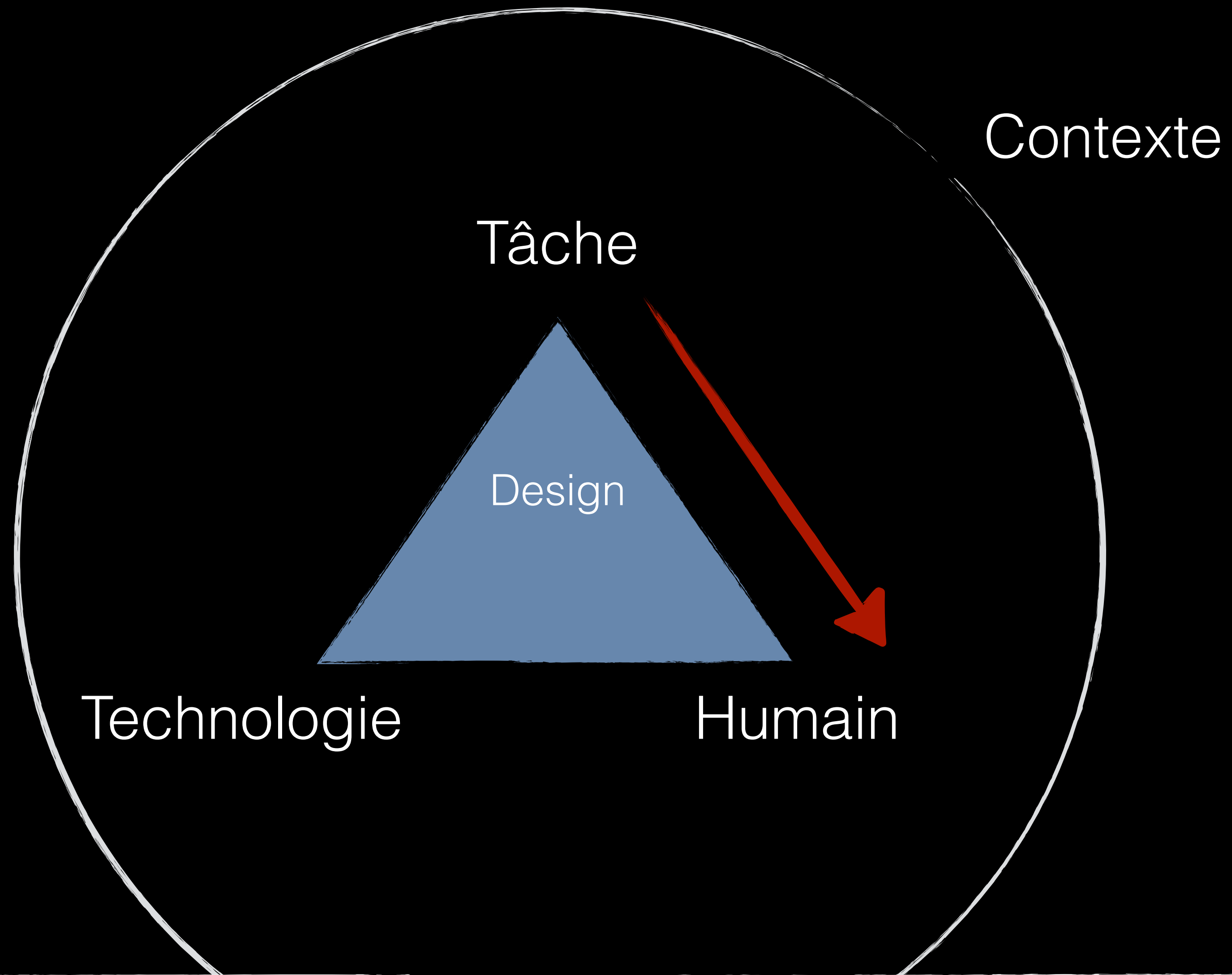
- Human
 - L'utilisateur final du système
 - Autres personnes dans l'organisme
- Computer
 - La machine qui tourne le logiciel
 - Y en a souvent plusieurs
- Interaction
 - L'utilisateur exprime ce qu'il veut
 - L'ordinateur communique les résultats







Dans un smartphone avec écran tactile, on peut supposer une interaction multi-touch



Les connaissances d'une personne changent lorsqu'elle agit... elle apprend.

Interaction Homme-Machine

Un métier qui s'intéresse :

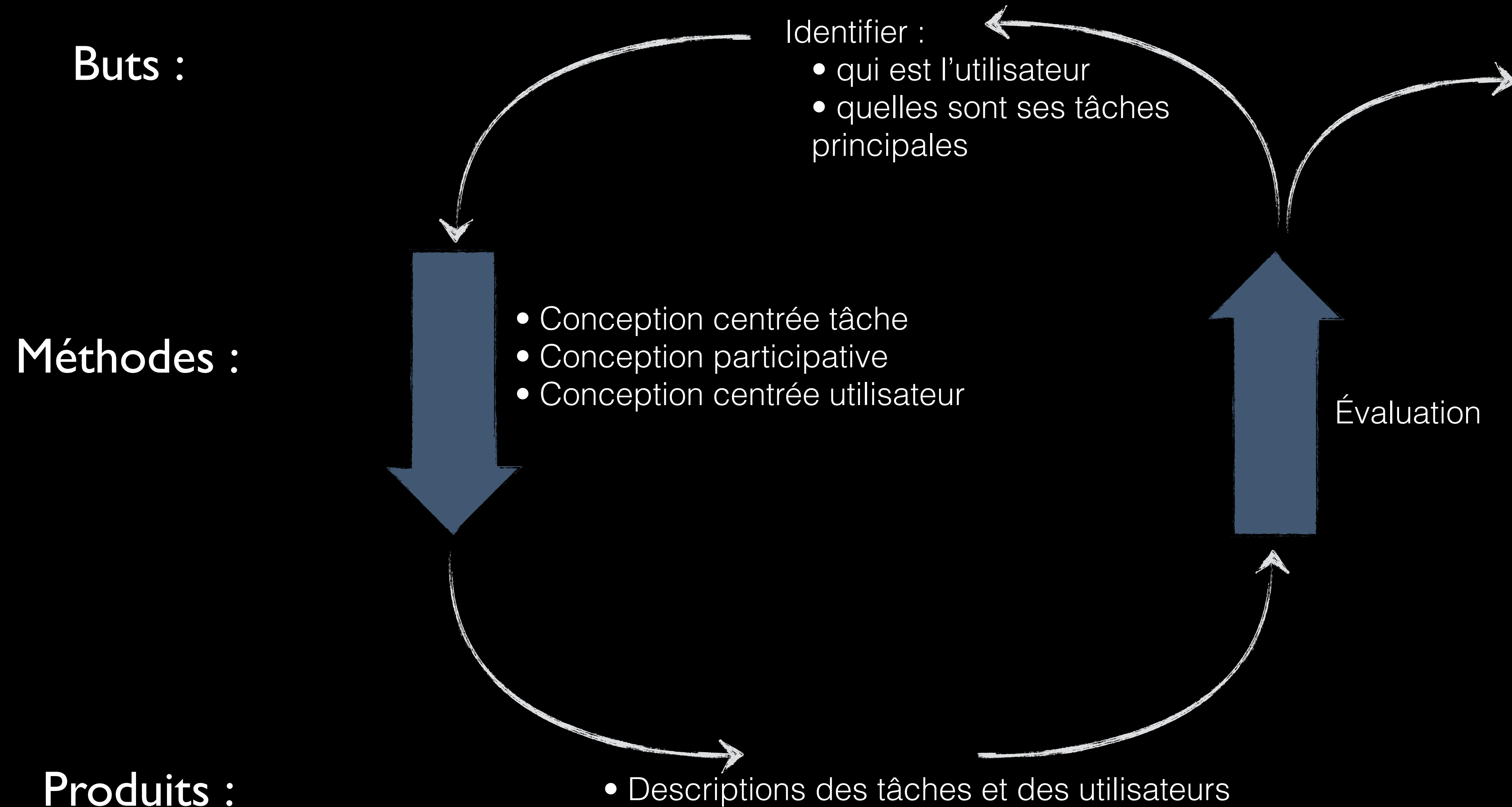
au design,
à l'implémentation, et
à l'évaluation



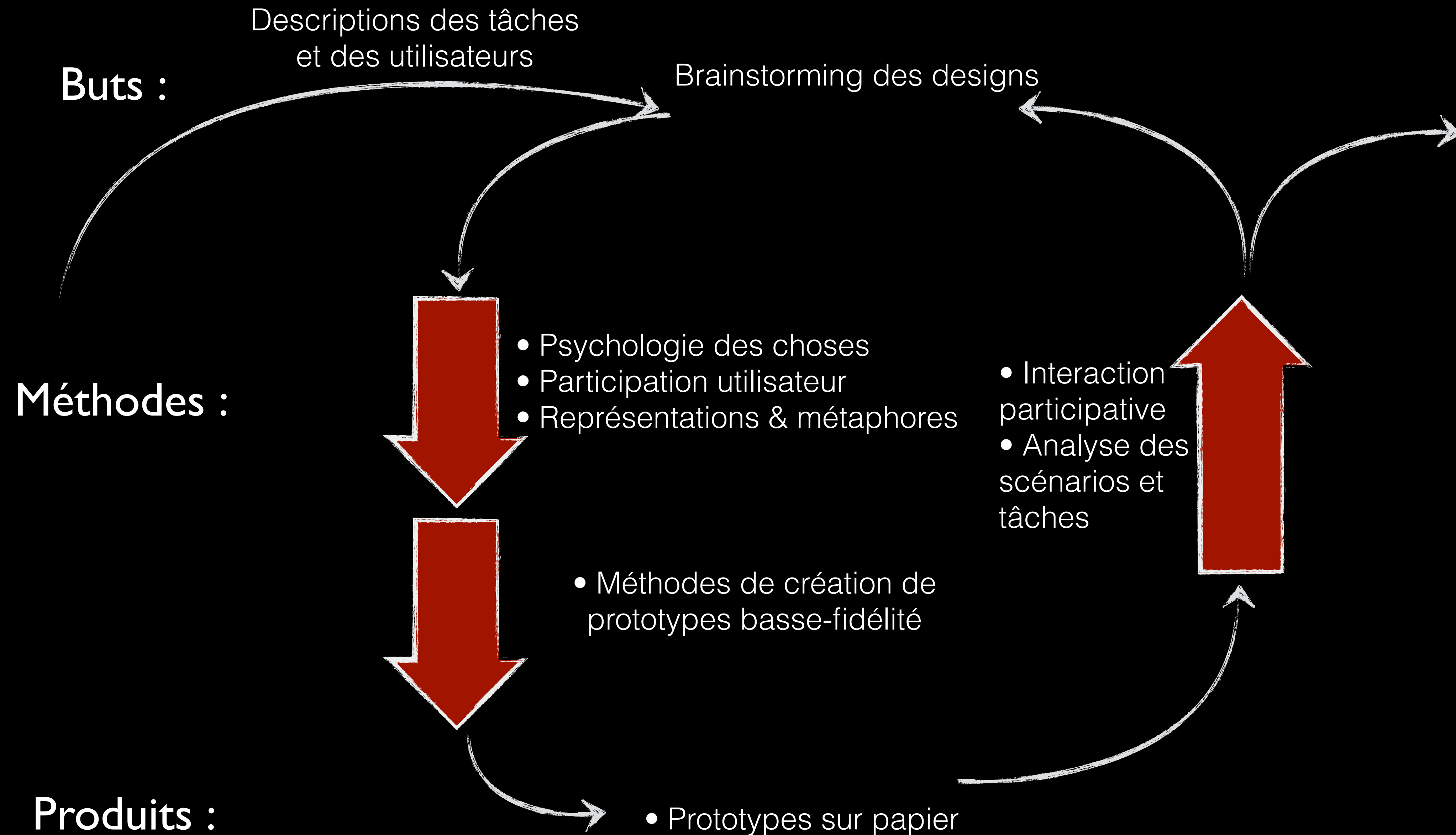
de systèmes informatiques à usage par un être-humain



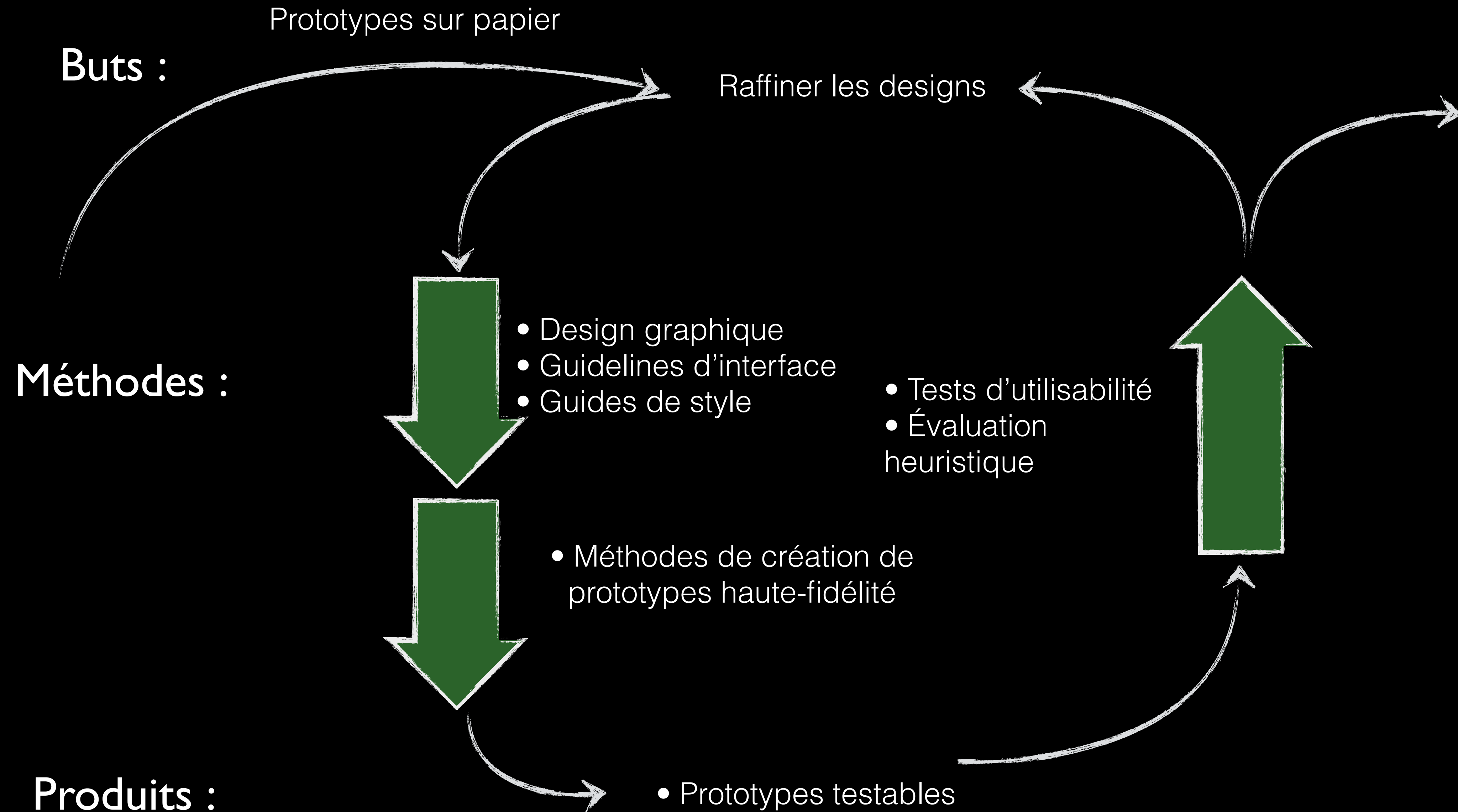
Conception de Design & Ingénierie de l'Utilisabilité



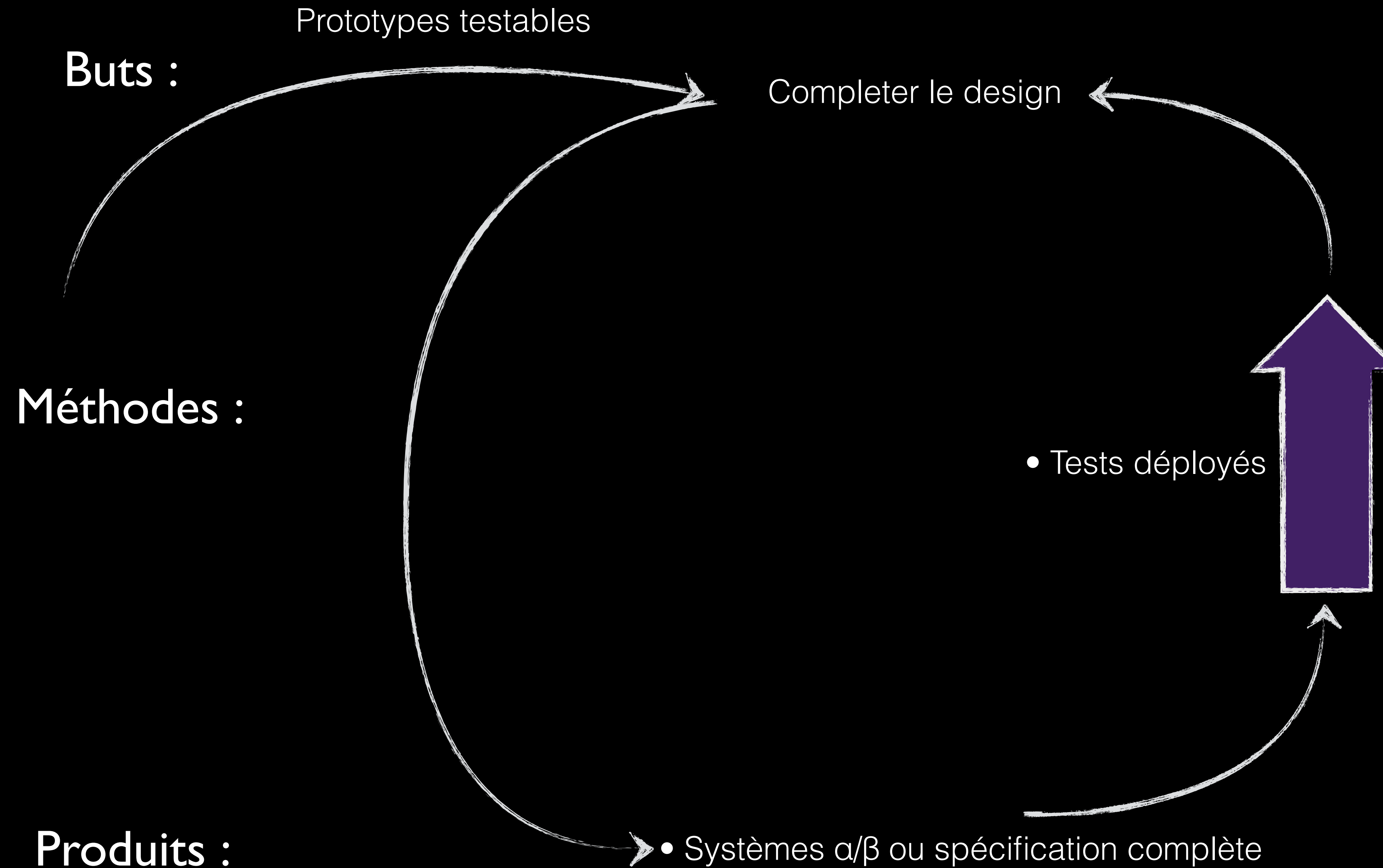
Conception de Design & Ingénierie de l'Utilisabilité

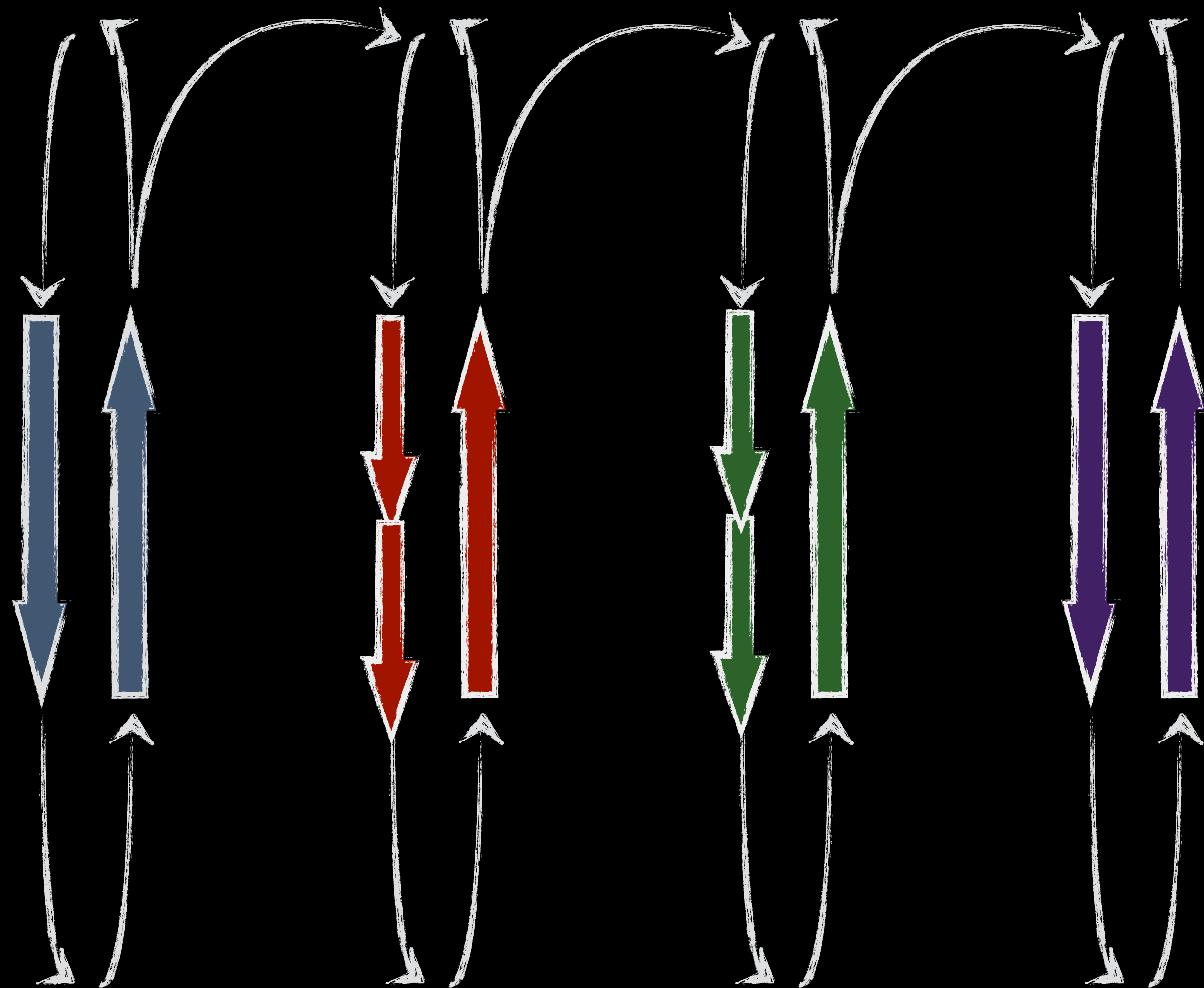
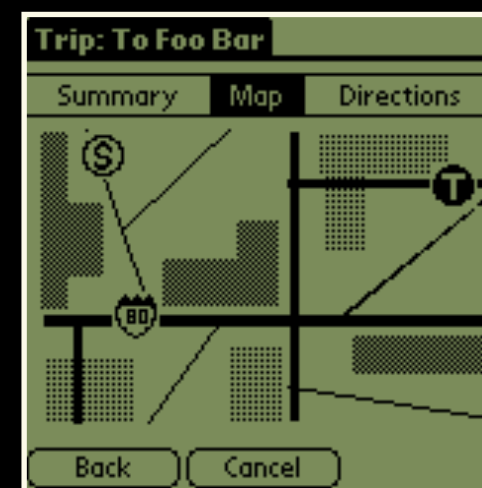
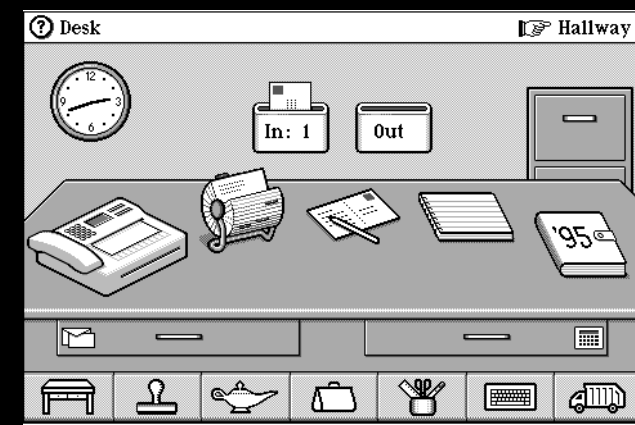
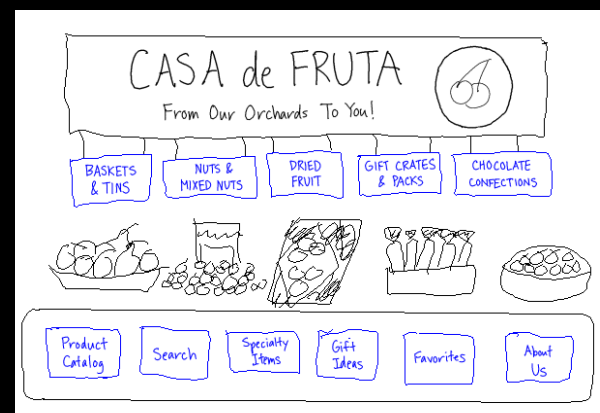
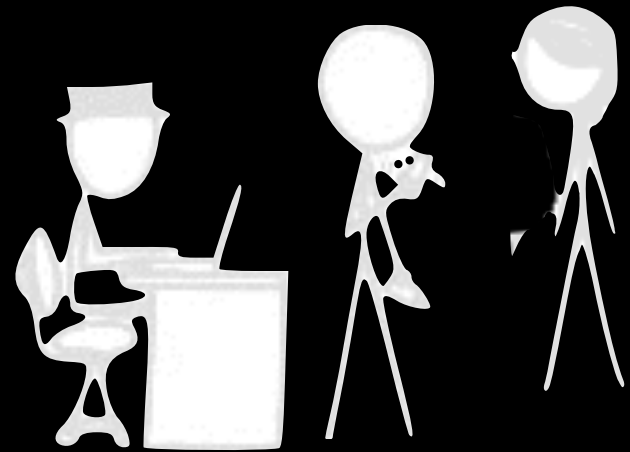


Conception de Design & Ingénierie de l'Utilisabilité



Conception de Design & Ingénierie de l'Utilisabilité





Pourquoi Suivre une Méthode de Design ?

- 63% de gros projets explosent leur budget
 - 4 raisons principales :
 - Clients ont demandé des améliorations au design
 - Tâches/besoins loupées
 - Utilisateurs ne comprenaient pas leurs propres besoins
 - Communication entre développeur et utilisateur insuffisant

L'Utilisabilité = Genie Logiciel !

- ~Deux fois plus chère après déploiement
- Trop facile à commencer un design détaillé qui ... :
 - ... est basé sur des fausses suppositions des besoins
 - ... n'est pas suffisamment flexible
 - ... n'est pas facile à utiliser
 - ... n'a jamais été testé

Principes de Bases pour la Conception d'Interfaces

Overview

- Introduction au cours et à l'IHM

Comprendre l'utilisateur et ses besoins

- Conception centrée tâche
- Développer des tâches indicatives
- Personae et scénarios utilisateurs

Design avec l'utilisateur

- Conception centrée utilisateur
- Conception participative
- Evaluer l'interface avec l'utilisateur



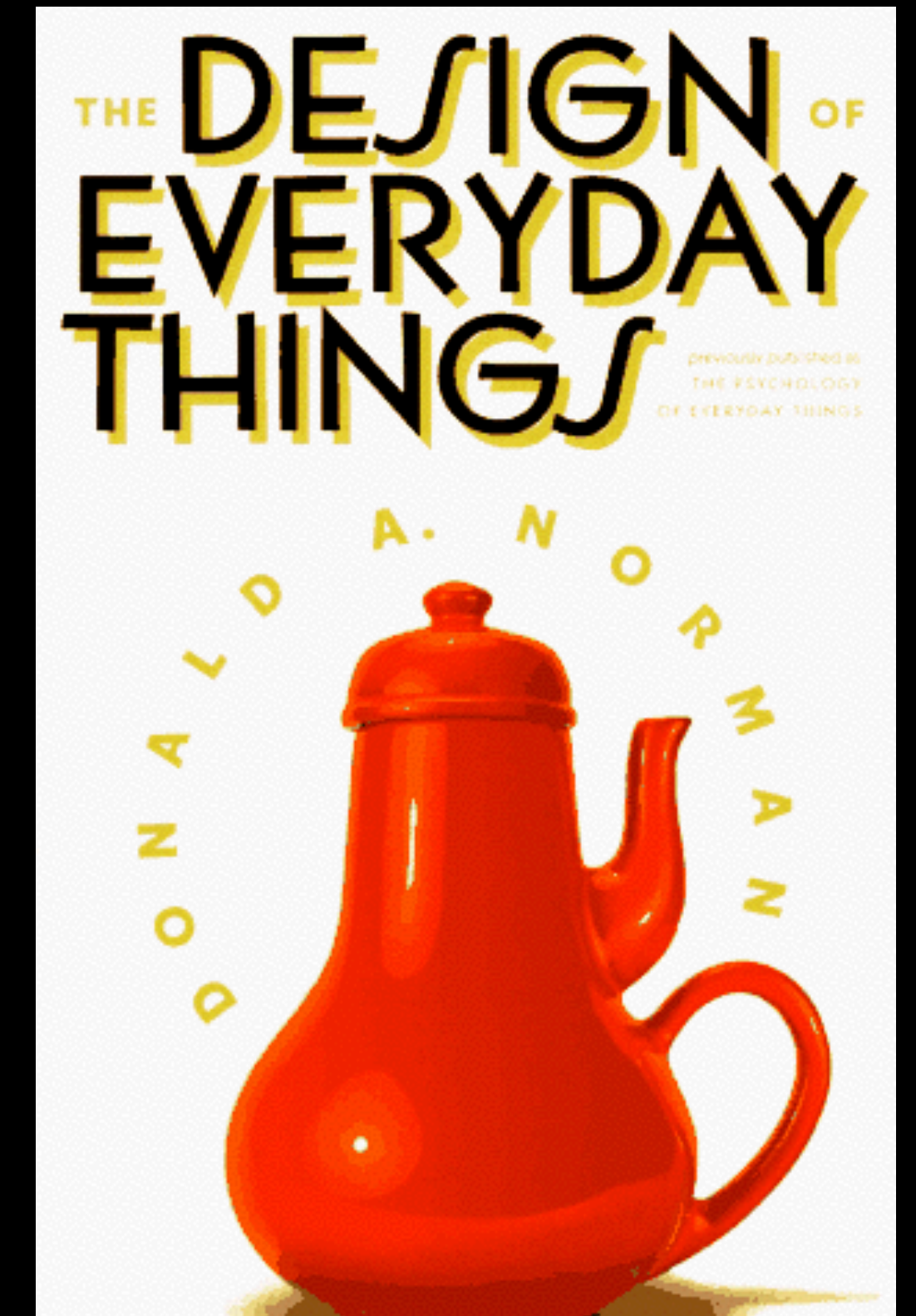
Principes de Bases pour la Conception d'Interfaces

Design d'interfaces visuelles

- Psychologie des choses de la vie quotidienne
- Au-delà du design sur l'écran
 - Représentations et métaphores
- Design graphique
 - Comment mettre en place les éléments graphiques sur l'écran

Principes de design

- Guidelines, heuristiques, etc.
- Comment découvrir des problèmes d'utilisabilité avant développement



Objectifs du Cours

Buts de ce module :

- Savoir comment récolter des besoins utilisateur et faire une analyse de tâches
- Avoir de l'expérience avec la conception centrée utilisateur
- Connaître plusieurs méthodes d'évaluation
 - ... quand les utiliser
 - ... pour quels buts

Déroulement du module

Travaux dirigés :

- 1 TH de cours suivie par 1 TH de TD

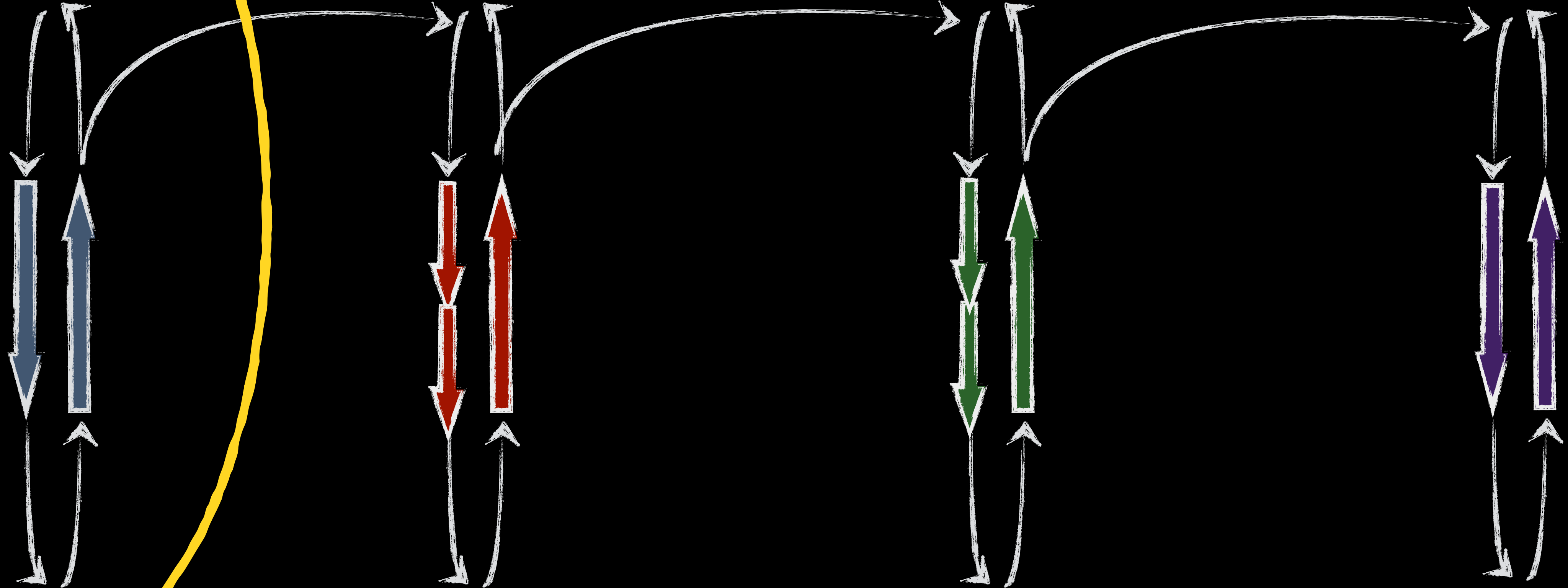
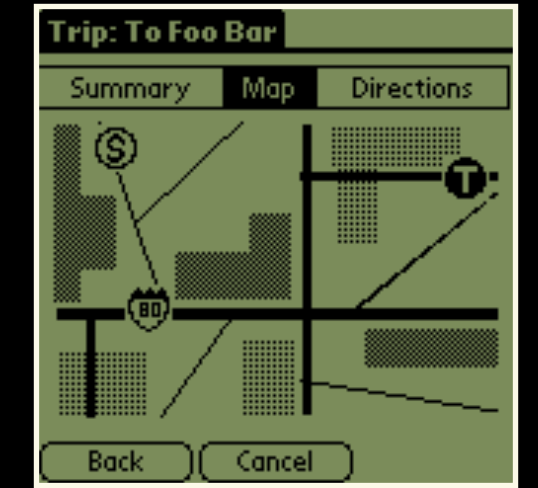
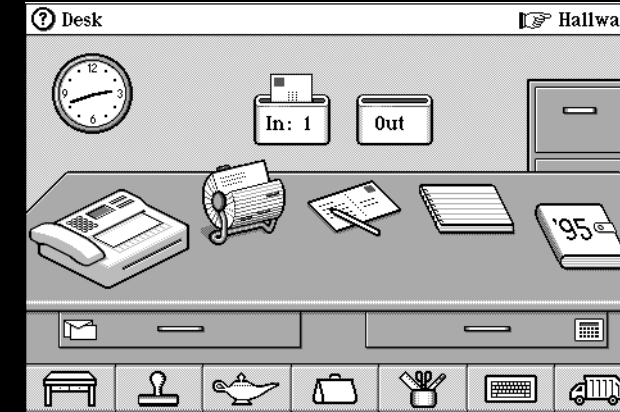
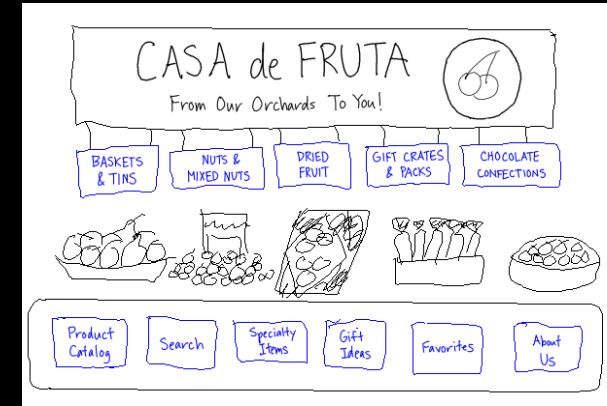
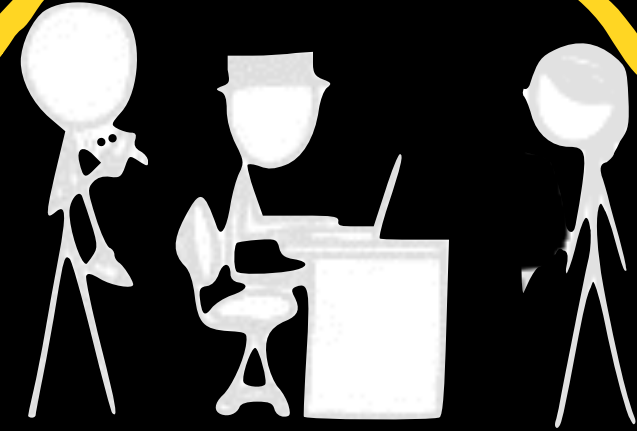
Devoirs à maison :

- À faire seule, à rendre avant la séance suivante

Projet :

- À faire par groupes de 5
- Une partie conception, une partie réalisation
- 50 % de la note finale
- Détails à suivre...

Aujourd'hui



La Théorie de Grande Unification

- Qui est {l'utilisateur, le client, le sujet, ...} ?
 - Astuce : Il y en a probablement plusieurs
- Qu'est-ce qu'il ou elle essaye de faire ?
- Comment peut-on l'aider à le faire ? (Et gagner quelques €/\$/¥ en le faisant.)
- L'interface, réussit-elle ces buts ?

Know Thy User

- You are not your user
- Who are your stakeholders?
 - Travel system: employee, manager, auditor
- What is the user's goal?
 - How is success defined?
 - What are the constraints? Real-world, technical, political?
- User characteristics

Real-World Constraints

- Time to market
- Cost/effort to design & implement
- Size/footprint/weight/price/power
- Computer power/memory
- Consistency with product line/brand image
- Backward compatibility
- Differentiation from competitive products

How to Understand the User

- Gather data
 - Interviews, observation, surveys & questionnaires, documentation, immersion
- Organize data
 - Notes, cards, affinity diagrams, computer tools
- Represent data
 - Lists, outlines, matrices
 - Narratives, Scenarios, Use cases
 - Hierarchies, Networks, Flow Charts

How to Understand the User

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Data Gathering

Objectives

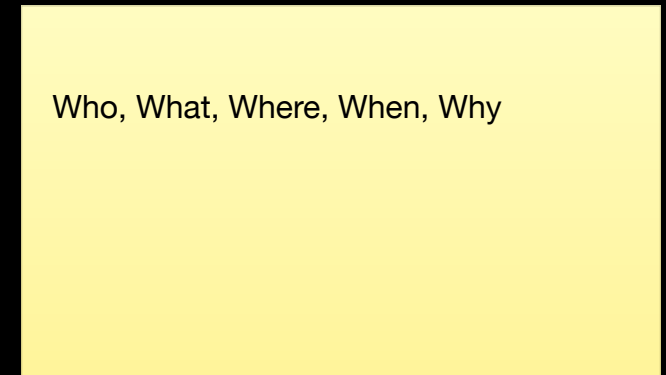
- Understand the user
 - What are his or her goals & values?
 - Individual's or group's interactions within a culture
 - Make tacit domain knowledge explicit
 - Be unbiased
 - For UI designers: improve system by finding existing problems

Focus on Observable Behaviors

- What are the practices, methods, steps, objects, ..., used?
- Learn what users do, why they do it, how, they do it, when they do it, with what tools or people they do it
 - Your new system may change some of this, especially how
 - Understanding the how and the why is what leads to deeper knowledge and insights

What to Gather

- Three key components in how people work
 - Activities
 - Artifacts
 - Relations
- Not just computer system oriented!
- The context matters!
 - Office: papers, whiteboards, ...
 - Phone calls: address book, note pad, dialer, ...



Who, What, Where, When, Why

Some Data Gathering Methods

- Observation & Think-aloud
- Cooperative Evaluation
- Interviews
- Questionnaires & Surveys
- Focus Groups
- Study Documentation
- Competitive Product Analysis
- Ethnography

Data Gathering

- Tasks & Subtasks
 - Physical
 - Cognitive
 - Communication
- Conditions under which these are done
- Results/outcomes of tasks

Techniques

- In-person observation
- Audio/video recording
- Log analysis
- Interviews

- “Wallow in the data”

Techniques

- In-person observation
- Audio/video recording
- Log analysis
- Interviews

- “Wallow in the data”

Observation is Key

- Carefully observe everything about the users and their environment
- Think of describing it to someone who has never seen this activity before
- What users say is important, but also non-verbal details

Observations

- Things of interest to the evaluator
 - Structure & language used in work (domain vocabulary)
 - Individual & group actions
 - Work culture
 - Explicit & implicit aspects of work
- Example: Office environment
 - Business practices, rooms, artifacts, work standards, relationships between workers, managers, ...

Interviews

Interviews

- Participants
- Recruitment
- Questions

Interviews

- Have a question plan, but keep interview open
- Be specific
- Create interpretations together with users
 - Be sure to use their terminology
- At the end, ask if there's anything else you should have asked
- Record interviews

Steps

- 1. Preparation
 - Understand the organizational context
 - Familiarize yourself with system and its history
 - Set initial goals and prepare questions
 - Gain access and permission to observe & interview

During Interviews

- Establish rapport with users
- Observe/interview users in workplace and collect all different forms of data
- Follow any leads that emerge from visits
- Record the visits

Interviews

- Structured — “Just the facts”
 - Efficient
 - Training: interview process
- Unstructured — A conversation
 - Inefficient
 - Training: process + domain knowledge

Semi-Structured Interviews

- Start with focused questions, move to open-ended discussion
 - Good balance, often appropriate
 - Training: process + domain knowledge

Semi-structured Interview Questions

- Pre-determine data of interest — know why you are asking questions, don't waste time
- Plan for effective question types
 - How do you perform task x?
 - Why do you perform task x?
 - Under what conditions do you perform task x?
 - What do you do before you perform...?
 - What information do you need to...?
 - Whom do you need to communicate with ...?
 - What do you use to...?
 - What happens after you...?
 - What is the result or consequence of...?
 - What is the result or consequence of NOT...?
- See Gordon & Gill, 1992; Graesser, Lang, & Elofson, 1987

Typical Open-ended Questions

- Why do you do this (whatever the task is you are studying)?
- How do you do this?
 - Gets at task-subtask structure
 - Then ask about each subtask
- Why do you do it this way rather than some other way?
 - Attempts to get user to explain method and rationale so you can assess importance of the particular way of doing task (onion)

More Open-ended Questions

- What has to be done before you can do this?
 - To get at sequencing issues
- Please show me the results of doing this
- Do errors ever occur when doing this?
- How do you discover the errors, and how do you correct them? (Adapted from Nielsen et al., CHI '86).
- Encourage digressions; ask for elaborations
- What else should I have asked you?

Good idea / Bad idea

- « Is the daily update an important feature to you? »
- Better : « How do you use the daily update feature? »
- Even better : « The log shows you don't use the daily update. Why? »

Good idea / Bad idea

- « What would you like in a tool? »
- Better : « What are you trying to do? »

Good idea / Bad idea

- « How often do you read your mail? »
- « How often do you read your mail in a typical day? »
- « How often did you read your mail *today*? »
- Measure

Questionnaires

- General Criteria
 - Make questions clear & specific
 - Ask some closed questions with range of answers
 - Sometime also have a neutral or other option
 - Do test run with one or two people

Likert Scale

- Seven-point Likert scale (use odd #)
- Could also just use words (e.g., strongly agree, agree, neutral, disagree, strongly disagree)

Other Typical Questions

- Rank the importance of each of these tasks
- List the four most important tasks that you perform (this is an open question)
- List the pieces of information you need to have before making a decision about X, in order of importance
- Are there any other points you would like to make? (open-ended opinion question; good way to end)
- Same questions can be used in interview and in questionnaire; difference is in follow-up opportunity

Focus Groups

- Group of individuals — 3 to 10
 - Use several different groups with different roles or perspectives
 - And to separate the dominant personalities from the others
 - Want to avoid few people dominating discussion
- Use structured set of questions
 - More specific at beginning, more open as progresses
 - Allow digressions before coming back on track

Study documentation

- Describes how things should be done rather than how they are done
 - Try to understand these discrepancies

Competitive Analysis

- Look at competing products
- Look for both good and bad ideas
 - Functionality
 - UI Style
- Do user task performance metrics to establish bounds for your system

Sense-making

Analysis

- Compile the data in numerical, textual, and multimedia databases
- Quantify data and compile statistics
- Reduce and interpret data
- Refine goals and process used

Reporting

- Consider different audiences and goals
- Prepare a report and present findings

Affinity Diagram

- Useful technique for qualitative data analysis
- Write each observation/quote on a slip of paper
- Put it on a board/wall
- Coalesce items that have affinity
- Give names/colors to groups
- Continue making subgroups
- May yield a hierarchy of groups

Handwritten notes and sticky notes on the top page of the notebook. The notes are organized into columns and contain various statistical concepts and questions.

Summary of data points
Find Attr.

Filter
Find cases with particular values

?

Distribution of variables

Range checks the extremes

Attributes of data set
Count number of a var.

Handwritten notes and sticky notes on the bottom page of the notebook. The notes continue the statistical concepts from the top page, including distribution, range, and attributes of data sets.

extreme value
of attribute

Find
extremum

- Which manufacturers are healthiest?

Do the heaviest cars have the worst MPG?

Find the Fidelity with the highest net asset

Japanese, European and
have the best MPG?

- Which cereals are lowest in fat and
sugar?

- Find the heaviest car.

5 accelerating cars.

What are the highest and lowest purchase
amounts?

Which cars have the highest horsepower and the
best MPG?

- Which car has the biggest engine?

- Which manufacturer have the cars with
the highest horsepower?

Find the shortest and longest film made after year
X that are not music videos.

What is the longest film?

Range kinda like
extremum

What ranges do the middle 75% of funds perform
in the first 3 years?

What is the range of length of films?

What is the range of possible horsepower for cars?

Which is the
movie in the

What is the car
and lower weigh

- Which

- Locate cereals
determine their

Which cereal is the

- Identify the
fiber.

Which car has the best

Which actor is the most pop

What were the most p
they mostly recent?

What category

Identify the chain with the highest
purchase amount.

- Find the car with
acceleration.

Which category of funds has the best
performance?

- What car has the best accele

Which cereals are low in carbohydrates

Which of the more efficient
accelerate the best?

type of film generated the most awards?
 Oscars been in both Sift and Westerns?
 have been in the most film that have won awards?

type of film
 did not take
 form of an "X"

SAVE
 Please do not erase

Organizational operations
 vs.
 transformation ops.
 (filter, cluster, categ.)
 (avg, count, ...)

see!
 find extremum

aggregate Filter
 Cluster
 Categorize

What is the car w/ highest MPG?
 What director has won the most awards?
 What film has release date ↑?
 What Robin Williams film has release date ↑?

→ case(s) at extreme of range of attr(s)

Computed meta-value
 → Computed meta-value
 → What is the average calorie content of Post cereals?
 → What is the gross income of all stores combined?

Filter
 → What Kellogg's cereals have > 3g fiber?
 → What comedies have won awards?
 → mapping from attr → cases
 → What funds underperformed S&P 500?

Count
 → How many films are 127 mins long?
 → How many manufacturers of cars are there?
 → Find cardinality of set of cases

look-up value(s)
 (find entity)
 → What is mpg of Audi TT?
 → How long is Gone w/ Wind?
 → Given case(s), what are some attributes?

Simple Comparison
 → compare scalar values
 → compare the MPG of American and Japanese cars.

Outliers
 → "outlier" values
 → Are there any outliers to the # of awards vs. relationship?
 → Are there any outliers in protein?

Extremum of X
 → Extremum of a set of values
 → What mfg has largest # of cereals?
 → Who starred in most films in 1978?

Range
 → Range of an attribute in a set of cases
 → What is the range of the length of films?
 → What is the range of horsepower of cars?

Distribution
 → Characterization of distribution of an attribute over set of cases
 → What is the distribution of carbs in cereals?
 → What is age distribution of shoppers?

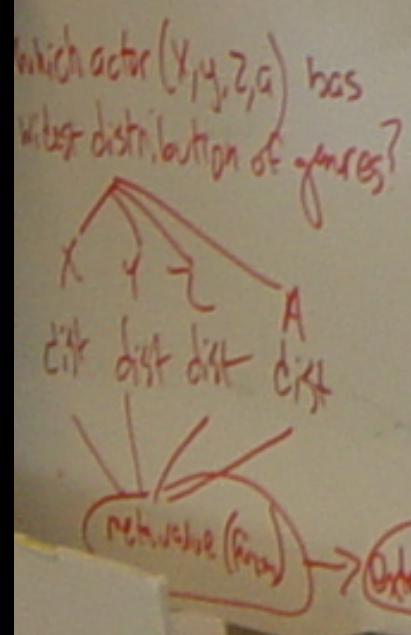
Categorical Correlation
 → Correlation w/ categorical attributes
 → Is there a correlation between Country of origin and MPG?
 → Do different genders have a preferred payment method?

Correlation
 → correlation of 2 numeric attributes
 → Is there a correlation between # of awards and fat?
 → Are shorter films more popular?

Sort
 → order a set of cases by some metric
 → Order the cars by weight
 → Rank the cereals by calories

Clustering
 → Find clusters of attribute values in a set of cases
 → Are there groups of cereals w/ similar fat, cal, sugar?
 → Is there a cluster of typical film lengths

Browse
 → Locally guided exploration of data
 → Do any variables correlate w/ fat?
 → Are there trends among countries of origin?



trend vs. correlate
 "X"
 "Y"

Why is this Useful?

- Can help gain a rich and true assessment of user needs
 - Helps to define requirements
- Uncovers true nature of user's needs
 - Discover things that are outside job description, documentation
- Allows you to put yourself in the role of an end-user
- Open-ended and unbiased nature promotes discovery

Types of Findings

- Qualitative
 - Observe trends, habits, patterns, ...
- Quantitative
 - How often was something done, what percent of the time did something occur, how many errors, ...

Drawbacks

- Takes a lot of time
- Scale : small numbers
- Qualitative results are subjective and difficult to generalize
- Acquired skill
 - Identifying and extracting meaningful and “interesting” things is challenging

Organizing Observations

- Organizing the observations serves two purposes
 - Understand the data
 - Helps present the data

Now What?

- You have piles of notes, hours of video, surveys up to here...
- How can you digest and represent the data, to turn it into information?

Representing Data

- Essential use cases
- User characteristics + personae
- Task outlines
- Narratives
- Hierarchies & Network Diagrams
- Flow Charts

Essential Use Case (Scenario)

- Description of important or frequent user interactions
- Used to evaluate/walkthrough various design alternatives
- Three elements
 - Name
 - User intention
 - System responsibility
- *Do not make assumptions about the UI design*

Example Use Case

- Jean regularly commutes by métro. He likes to get off a few stops early and finish the trip on a Vélib. As he approaches the métro station Jussieu, he wants to check if any bikes are free. He also wants to see which station near his home has free space to park.

Get foreign currency

User's purpose	System responsibility
Identify self.	Validate user's identity. Display currencies available.
Select currency required.	Display exchange rate.
Enter amount of foreign currency required.	Calculate exchange (e.g. £ to \$).
Confirm amount.	Request initiation of payment. Obtain authorisation for amount. Give money.
Take money and go.	

[From User Interface Design and Evaluation, The Open University]

User Characteristics & Persona

- Description of user and what he or she wishes to do
- Be specific/detailed, even give names and picture
- Three persona for ATM usage follow
 - Adapted from User Interface Design & Evaluation, The Open University
- Developed by Cooper (1999)

Felix (Teenage ATM User)

- Felix is 13 and gets pocket money each week. He spends it with his friends, so doesn't make regular deposits. He does receive gifts for his birthday, Christmas, etc. and saves that money for special purchases, such as a computer games console or trendy clothes. He has an ATM card allowing him to make withdrawals when needed for his purchases.

Sandra (Young Adult)

- Sandra is 30, is married to Jason, has two children Todd(6) and Carly (18 months). They live in a subdivision that is about three miles from the town center, where the bank and stores are located. Jason uses the car for work, and works long hours, leaving at 6:45 am and returning at 8:00 pm. Sandra does not drive, so has to use public transportation. She tries to run errands and shop while Todd is in school, so she does only has to take Carly to town with her. She typically needs to make two trips to town each week to get everything done. She uses a stroller with Carly, and the bank is one flight up via escalator, so she prefers to use the ATM outside the first floor, even though there is no canopy to protect customers from bad weather.

Grandpa Marvin (Older Adult)

- Marvin is 68 years old, and his social security is deposited into his bank account at the start of each month. He goes to the bank every week, withdrawing enough cash for the week - for miscellaneous expenditure. Regular bills are paid by check. He stands in line for a live teller, as he prefers the social interaction to using an ATM, even though his new artificial hip makes standing in line uncomfortable. He does not have an ATM card.

Task Outlines

- Lists, outlines, matrices
 - Use expanding/collapsing outline tool
 - Add detail progressively
 - Know in advance how much detail is enough
 - Can add linked outlines for specific subtasks
- Good for sequential tasks, not so good for parallel

- Using a lawnmower to cut grass
 - Step 1. Examine lawn
 - Make sure grass is dry
 - Look for objects laying in the grass
 - Step 2. Inspect lawnmower
 - Check components for tightness
 - Check that grass bag handle is securely fastened to the grass bag support
 - Make sure grass bag connector is securely fastened to bag adaptor
 - Make sure that deck cover is in place
 - Check for any loose parts (such as oil caps)
 - Check to make sure blade is attached securely
 - Check engine oil level
 - Remove oil fill cap and dipstick
 - Wipe dipstick
 - Replace dipstick completely in lawnmower
 - Remove dipstick
 - Check that oil is past the level line on dipstick
 - ...

Narratives

- Describe tasks in sentences
- Often expanded version of list or outline
- More effective for communicating general idea of task
- Not effective for
 - details
 - branching tasks
 - parallel tasks
- Great as introduction to diagrams or outlines

Hierarchies & Networks

- Goals – what the user wants to achieve
- Tasks – do these to achieve the goals
 - Sequential dependencies
 - Create new document before entering text
 - Multiple occurrences of tasks
 - Subtasks – lower-level tasks
- The lowest-level subtasks get mapped onto one or several UI commands
- i.e., move done by a copy followed by a paste

0. Conduct accident investigation

Plan 0: On instruction from supervisor do 1;
When all evidence is collected do 2 through 5.

1. Collect evidence

2. Analyze facts

3. Integrate facts and draw conclusions

4. Validate conclusions

5. Make recommendations

Plan 1: First do 1 and 2,
then 3 and 4, then 5;
Repeat 3 and 4 if necessary.

1. Walk the accident site

2. Identify and preserve evidence

3. Identify witnesses

4. Interview witnesses

5. Review records

Plan 1.4: Do 1, 2, 3;
Do 4 if insufficient data from 3;
Then do 5;
Repeat 3 and 4 to meet conditions of 5.

1. Establish meeting room

2. State purpose of interview

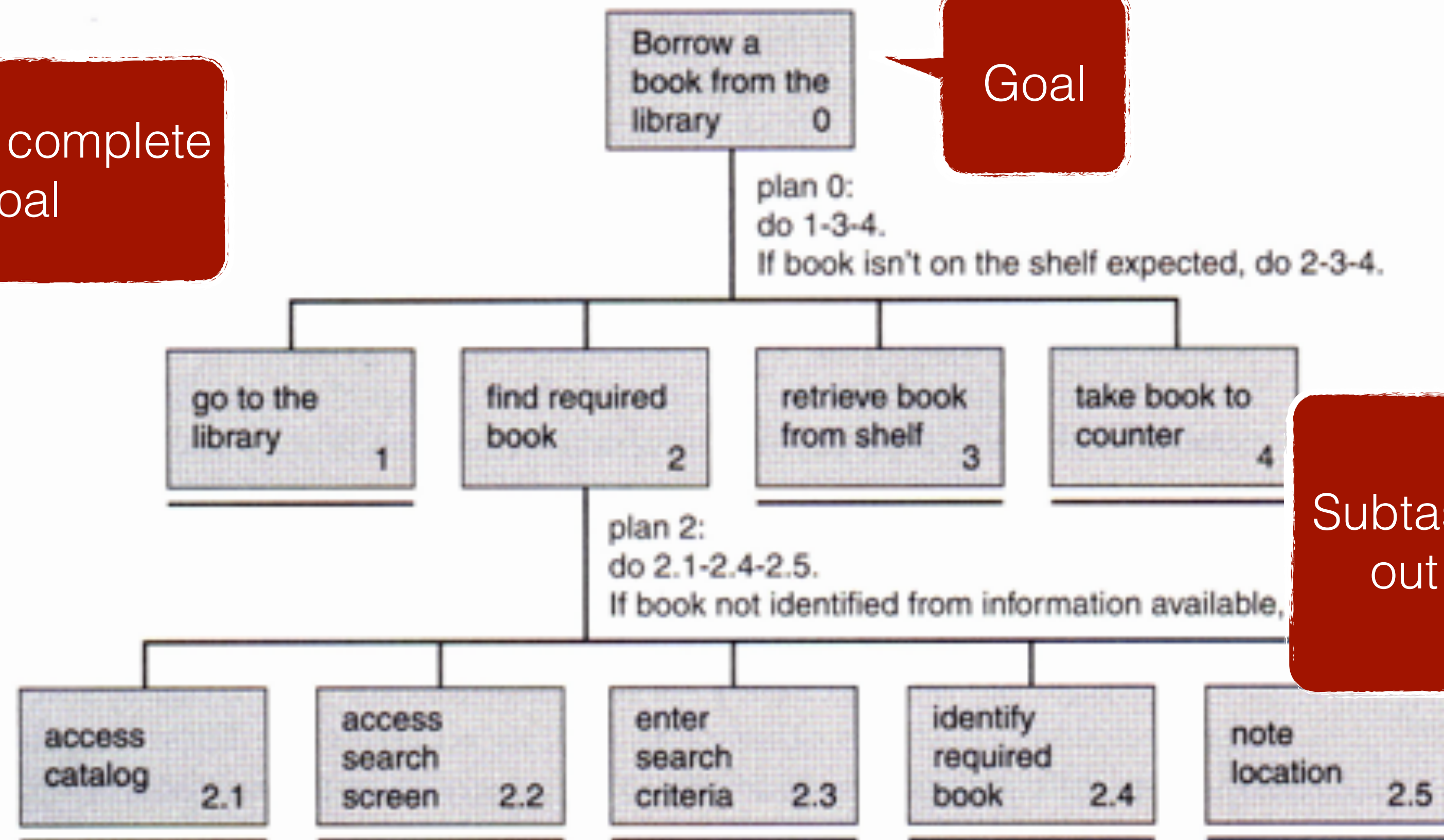
3. Let witness describe what happened

4. Ask open-ended questions

5. Ensure that what, where, when, who, how, why is covered

Task Model — Borrow a Book

Tasks to complete goal



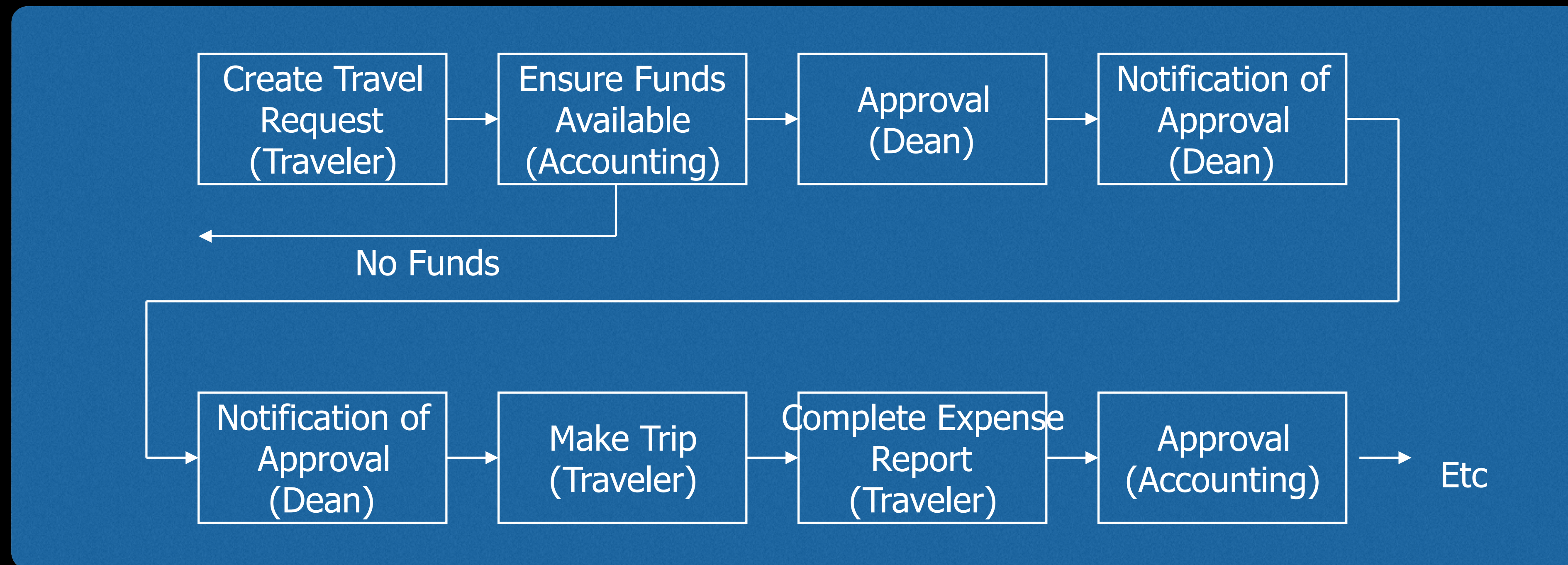
Subtasks to carry out one task

Figure 7.12 A graphical representation of the task analysis for borrowing a book.

Workflows

- Documents going from one person/organization to another
- Multiple participants in an activity
- Web page sequencing
 - Browsing, purchasing, checkout

Document Flow Example



Multiple Participants

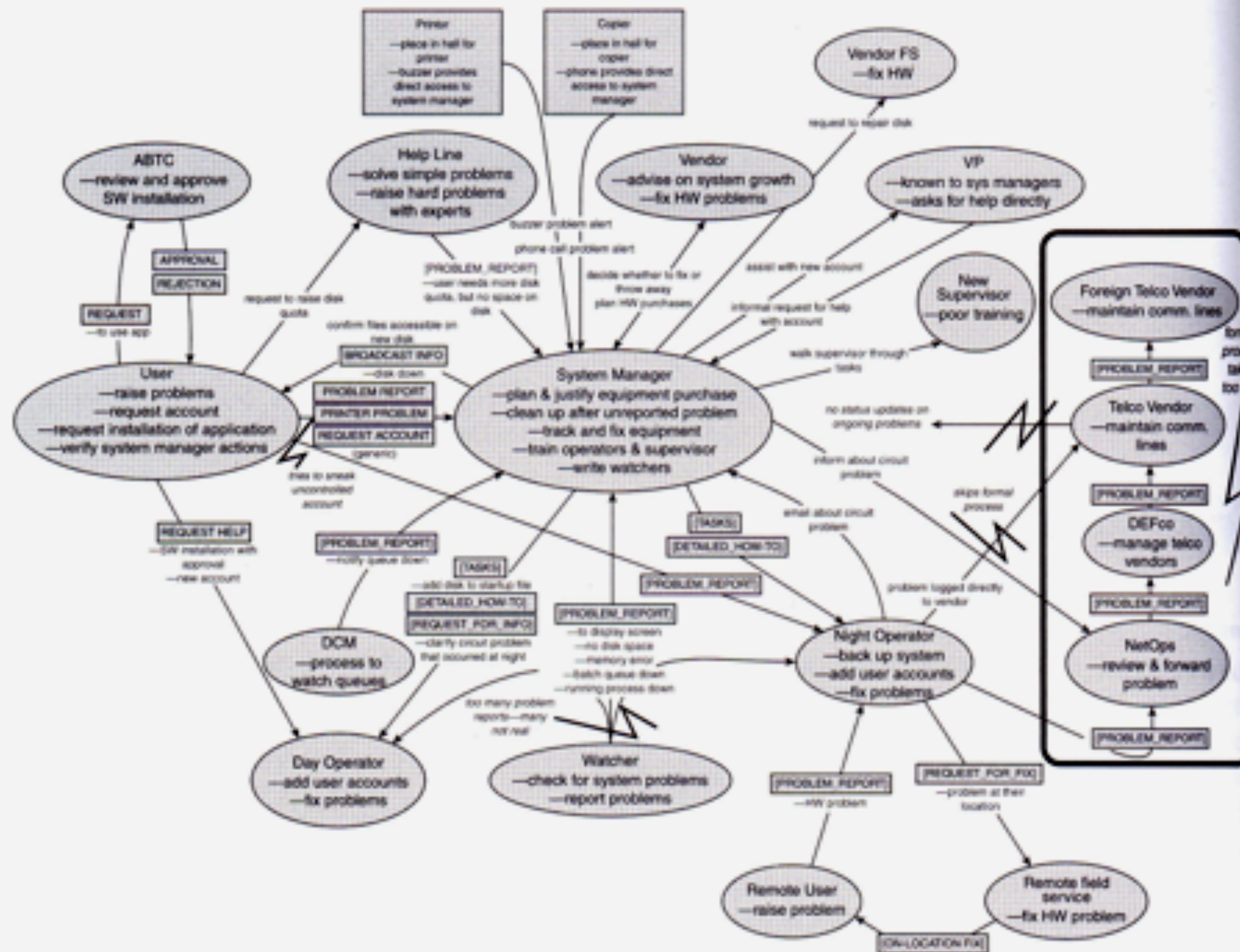


Figure 9.5 An example work flow model.

[From Interaction Design, Preece Rogers and Sharp]

Summary of Task Analysis

- Determine the data you need
 - Gather it using various appropriate methods and techniques
 - Represent the tasks and subtasks, plus other related information
 - Use this data to improve design
-
- Note: be efficient!

Using What You've Learned

- How do attributes of users & their tasks influence the design of user interfaces?
- Are there some design guidelines we can derive from different attributes?

User Profiles

- Attributes:
 - attitude, motivation, reading level, typing skill, education, system experience, task experience, computer literacy, frequency of use, training, color-blindness, handedness, gender,...
- Novice, intermediate, expert
- Manager, employee, contractor, ...

Knowledge & Experience

Experience

task

system

Design goals:

low

low

– Many syntactic & semantic prompts

high

high

– Efficient commands, concise syntax

low

high

– Semantic help facilities

high

low

– Lots of syntactic prompting

Job & Task Implications

- Frequency of use
 - High — Ease of use
 - Low — Ease of learning & remembering
- Task implications
 - High — Ease of use
 - Low — Ease of learning
- System use
 - Mandatory — Ease of use
 - Discretionary — Ease of learning



Define Tasks

- Consider the whole system
- Determine who or what should perform each task and each step : e.g. the system remembers the login, but the user remembers the password
- Determine criteria: efficiency, cognitive effort, time
 - Task x should take no more than y seconds
 - A new user should be able to create a new account in 5 minutes

Projet

Interface Tactile Pour un Restaurant

- Un restaurateur vous approche demandant de créer une interface numérique pour mettre à disposition des clients dans un restaurant pour prendre les commandes.
 - Vous allez faire un recueil de besoins et analyse de tâches
 - Créer plusieurs prototypes bas-fidélité
 - Construire un prototype haut-fidélité

Knowledge Navigator