- differenza tra goal e task Goal is what the user wants to achieve. Task is how to achieve this goal, the operations/actions to do. The goal must be at a high conceptual level, while the task must be more detailed. The last task must be related to the achievement of the goal. The more we go deep in subgoal and subtask, the more difficult it is to separate the two entities.

- one model to implement goals:
  Donald Norman's model
  • Seven stages
    – user establishes the goal
    – formulates intention
    – specifies actions at interface
    – executes action
    – perceives system state
    – interprets system state
    – evaluates system state with respect to goal
  Norman's model concentrates on user's view of the interface

  Abowd and Beale framework
  extension of Norman…
  their interaction framework has 4 parts
    – user
    – input
    – system
    – output
  each has its own unique language
  interaction fi translation between languages
  problems in interaction = problems in translation

- Persona: It is a description of the user that we keep in mind when making design decisions. It is the ideal user that interfaces with our system. It is an instance of the user profile we model at the initial steps of the development (perfectioned after the information gathering), because all the decisions we make for the design of the system have to take into account that type of user.

- Scenario: It is a description in which there is a person's interaction with our system. It can be useful to understand in which situations our system could be useful for the user. It helps us to identify characteristics of the user that may impact the design, and task and context that the system needs to support. Since it is like a practical example, it helps developers discuss ideas.

Requirements gathering:

- Interviews: can be structured or unstructured, they are more detailed than questionnaires, so a lot of info can be taken. But they take much more time and less subjects are reached.

- Questionnaires: collect data from a larger population, so can reach more users in less time. But are more general and cannot keep more detailed data.
- Type of questions on a survey The questionnaire must not be very long and not take much time. Avoid unnecessary questions. Questions are clear, precise and unambiguous (if multichoice, it must be manifest). One question at a time. Not biased questions. Do not use absolute in questions. Questions and answers are short and easily readable. Predefined answers must be appropriate to the question. For voting questions, a middle answer is very well accepted (so an odd number of votes is good).

- Focus groups: are a technique for collecting data from a range of users (6-10). A moderator is required to lead the group, but the session should be as fluid as possible whilst staying on topic. All participants should contribute, and care should be taken to cover a broad range of topics and not allow one person to dominate.
  Advantage: Many interesting ideas can arise.
  Disadv: The collected data may be difficult to organize, but audio recording should help; hard for the moderator to keep under control the discussion.

User Centered Design

- What is UCD: The User Centered Design is only for interactive systems, and aims to maximize the usability of the system through analysis of characteristics and methods of a process design and implementation. The UCD process focuses on users through all the life-cycle phases, and it is iterative. Users are involved both in system design and in testing. It is a multi-disciplinary activity, involving many human factors, ergonomics knowledge and techniques.
  Working on usability gives us: allows us to focus on user needs, increases productivity of the user, reduces user's stress and increases satisfaction, improves the quality of the product.

- le tre definizioni di Usability:

- Learnability, the ease in which a new user can start the interaction with maximal performance. It has 5 properties:
  a. predictability
  b. synthesizability
  c. familiarity
  d. generalizability
  e. consistency

- And two different types of errors: Design errors and interfaces errors

- Types of error:
- Slips: are less serious and means that right intention but failed attempt. Improve interface to solve slips.
- Mistakes(= disaster = have to re-design the system): when the system is not built to support the user in what he wants to achieve (the goal).
  solution: better understanding of the system (improve interaction).

> For example, a mistake would be to buy a Microsoft Excel licence because you want to store data that should be made accessible to web clients through SQL-queries, as Microsoft Excel is not designed for that purpose. In other words, you choose a wrong method for achieving your objective. However, if you installed a Postgresql Server for the same reason but in your haste forgot to give the programme privileges to go through your firewall, that would be a slip. You chose the right method of achieving your objective, but you made an error in carrying out the method.

Expert Evaluation Techniques

- Type of expert evaluation: CW, HE, Review-based Evaluation.

- HE: The Heuristic-Evaluation is based on the identification of the usability criteria, and the expert examines the design in order to check violations in such criteria. It is used to discover bugs in the design (not the interaction for completing a task, like cognitive-walkthrough). In HE the expert does not need to know the purpose of the system.
  1. Visibility of system status
  2. Match between system and real world
  3. User control and freedom
  4. Consistency and standards
  5. Error prevention
  6. Recognition > Recall
  7. Flexibility and efficiency
  8. Aesthetic and minimal design
  9. Help user recognize, diagnose and recover from errors
  10. Help and documentation

- CW: Cognitive-Walkthrough is a method for evaluating the design and how well the system supports the user in executing tasks and goals (suitability with respect to

user's goals and task). The evaluator works through a series of tasks and asks a set of questions from the perspective of the user, to understand the system's learnability for new or infrequent users. He checks problems based on psychological principles.

1. Is the effect of the action the same as the user's goal at that point?
2. Will users see that the action is available?
3. Once users have found the correct action, will they know it is the one they need?
4. After the action is taken, will users understand the feedback they get?

- Differenza tra HE & CW: In HE the expert does not need to know the purpose of the system, while in CW the execution of task is a central element.

- Review-based Evaluation: Starting from similar systems, the expert checks the adequacy and problems of our system. He can predict a user's performance using cognitive models. The evaluation is on a more abstract level than the other evaluation techniques.

User Evaluation Techniques

- Type of user evaluation: laboratories studies, field studies, think aloud, post-task walkthrough, cooperate evaluation, controlled experiment, questionnaires, interviews, biological methods.

- Differenze tra Lab experiment e Field experiment: In the Lab-experiment the user is concentrated only on the test, there is no interruption, the context is built for the execution of that test. It is good if the system to test has an impractical location in reality or impractical conditions (a system for earthquakes, system for surger, for space). Obviously there is no real context.
  In the Field-experiment the user is in the natural context in which the system should work and interact with each other. It is good for Longitudinal studies, that can be carried through the observation of the interacts for a long time. Possible distractions and noise may come from third parties, and also the user must know that he is being observed (for privacy issues). Field-studies are carried out on the final steps of the development (prove sul campo delle auto tesla).
  A longitudinal study is a type of correlational research study that involves looking at variables over an extended period. This research can take place over a period of weeks, months, or even years.

- In caso dovessi fare un app da utilizzare in auto quali sarebbero le differenze tra Lab experiment e Field experiment: The Lab-experiment is more secure than the Field-one, because all the environment can be well controlled, and also more precise observations can be carried out. The Field-experiment can be carried out when the system is at the final step of development, and from the analyses there may be no incidents or fatal errors for the user.

- Come risolveresti queste differenze nell'implementazione pratica dell'interfaccia dell'app: Simplifying the app interface with minimal buttons and design. Icons must be easily recognizable and the tasks have to be performed with minimal interaction. A voice assistant and voice control can be very useful in this case.

- Think-aloud: It is an observational method in which we simply observe the user performing the tasks with our system. While performing the task the user comments what is doing, why, what is thinking. The evaluator cannot help the user, that can quit at every time, and that must be kept talking.
  Advantages: Really simple, doesn't need expertise and can show how the system is actually used. Can show the frustration of the user.
  Disadvantages: Is subjective and commenting may alter the performance.

- Cooperative evaluation: There is more conversation between the user and the evaluator than the Think-Aloud. The two can talk during the evaluation for clarifying problems arising, and the user can make his own considerations and give hints or criticize the system.
  Advantages: easier than think-aloud.
  Disadvantages: Too much support to the user does not allow us to identify major usability problems.

- Post-Task Walkthrough: While the user interacts with the system, the evaluator takes note of problems occurring, the expressions and the behaviour itself. At the end, once the tasks are computed, the evaluator asks for clarification to the user (the sooner, the better).
  Advantages: less intrusive than cooperative.
  Disadvantages: lack of freshness about the behaviour of the user.

- Compare think aloud and cooperative evaluation and that other methodology similar to think aloud where you ask questions to the user after he did the task without talking. One question she really likes is the advantages and disadvantages of each method and when it is done (They can be conducted when a functional prototype is available; first in the laboratory, then in the field).

  Think aloud:
  Advantages: Really simple, doesn't need expertise and can show how the system is actually used. Can show the frustration of the user.
  Disadvantages: Is subjective and commenting may alter the performance.

  Cooperative:
  Advantages: easier than think-aloud; more hints and considerations from users.
  Disadvantages: Too much support to the user does not allow us to identify major usability problems.

  Post-task walkthrough:
  Advantages: less intrusive than cooperative.
  Disadvantages: lack of freshness about the behaviour of the user.

- Controlled Experiment: The evaluator chooses a hypothesis to test, and a number of experimental conditions are considered, differing only in one controlled variable. Some attributes of user behaviour are measured. The participants should match the expected user and should be at least 10 subjects. The two conditions differ from 1 independent variable; while the dependent variables are measured from the users behaviour (time, #errors, #taps). A within-group or between-group method is chosen and the experiments have to disprove the Null-Hypothesis, using statistics.

- Perché avete scelto between-group e non within-group e qual è la differenza?:
  In the within-groups method each subject involved performs the experiment under each condition, so transfer learning is possible. To limit transfer of learning, half of the people try the two systems in one order (system A and then B) and the other half try them in the opposite order (system B and then A).
  In the between-groups method each subject performs only one condition, so we have to divide users into two groups: one testing one hypothesis, the other groups with the other hypothesis, but high variation between groups can bias results (try to choose users as similar as possible (same age, skill, education, sex…)). So we need more subjects for the between-groups method.
  We chose within-groups when the two conditions were not affected by transfer learning (navigation bar vs homepage-menù); we used between-groups in label vs no-label experiment because we needed users who did not know the meaning of the icons.
- How to mitigate the effect of transfer learning in a within-groups method? To limit transfer of learning, half of the people try the two systems in one order (system A and then B) and the other half try them in the opposite order (system B and then A).

- Null hypothesis in ANOVA: When we perform a controlling experiment we are considering two experimental conditions, differing only in one controlled variable. The Null-Hypothesis states: “there is no difference between the two conditions”, in terms of efforts for the users. So using ANOVA we want to disprove the Null-Hypothesis and, in case of a positive result (disproving), we can analyze the data collected (for example comparing the average time of completion of the two conditions) and decide which condition is better than the other one. In order to disprove we compare the F value with the F-crit value and if F > F-crit we reject the Null-Hypothesis; if not, we cannot use it to decide anything. The F is about the likelihood that the data measured could be false.

- come misuri in un controlled experiment la Satisfaction degli utenti: Because the manifestation of the emotions and satisfaction is not the same for all the users, we cannot derive it only with a direct observation, and biological measurements may result in intrusiveness for the user. A ‘personal’ interview or a proper survey is really good for this purpose. With the first one we can go very deep in the analysis but is more costly in time; the second one can reach more users at a time, but is more general and less flexible.

- Interviews and Questionnaires: Both performed after the usage from the user of the prototype.

- Why do we use HTA? What can we carry out?

- HTa

- un modello di task che non sia HTA e le differenze

- esempio di un HTA nella vita reale e non legato ai computer Teap: take the kettle, fill with water, turn it on; take a bowl, choose a type of tea and put it in the bowl; when the water is boiling put it in the bowl; wait 4-5 minutes, remove the filter, add sugar if you want.

- GOMS: is a technique used for cognitive models. It is mainly aimed to describe the user's efforts and skills needed to interact with computers. So attention is about the user's effort. GOMS is used to describe high level goals.
  Goals; Operators are the basic actions; Methods are from the decomposition into subtasks; Selection is the criteria to choose between methods.

- CCT (cognitive complexity theory): is a technique used to describe the minimal knowledge that is required to reach some goals or tasks. It is about the description of the ‘user production rules’ and ‘device generalised transition networks’. It can represent error behaviour.

- Linguistic notations:
- BNF: it is a syntactic description of the dialog. It uses terminals (low-level) and non-terminals (composed) components. It is more oriented to interaction between user and system.
- TAG: it tries to guarantee consistency of the grammar for the user's understanding. Also reduce the user’s effort including the user's world knowledge.

- KLM: used to represent and evaluate in terms of effort the elementary motion of the user when interacting with the system. It determined time and cognitive effort.

- STN