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**INTERACTIVE DESIGN THINKING PORTFOLIO: A TOOL
FOR USER EXPERIENCE DESIGNERS**

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Reviewer: Associate Prof. Jouni Ikonen

ABSTRACT

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Master's Thesis

2017

71 pages, 35 figures, and 29 tables

Supervisor: Professor Ahmed Seffah

Keywords: design thinking process, user experience, interactive, IDTP, empathy, define, ideate and test

The necessity and advantages of the iterative process of design thinking is proven and nowadays its popularity is growing fast among the user experience (UX) designers as a means for problem statement and creative idea generation. Design thinking is considered as one of the main paths toward innovation. The creation of an artifact is through a frequent iteration among empathizing, defining, ideating, prototyping and testing, which needs the utilization of a set of techniques for each stage. Most of the studies are focused mostly on a specific stage of this process. This study describes five of the best methods for each stage, which are chosen based on the recommendation of several high-accredited literatures. In order to facilitate the adoption of design thinking process for the UX designers, interactive design thinking portfolio (IDTP) is designed by the author of this thesis, as an effective tool that gives a holistic view of this process and assists the designers with the creation, maintenance and management of their projects. Besides, the possibility of integration of the IDTP with a bunch of online services is suggested.

ACKNOWLEDGEMENT

I would first like to express my sincere gratitude for the support of my thesis supervisor, Professor Ahmed Seffah. His guidance helped me to experience a better discovery of my talents and more importantly to nurture my skills in design.

I would also like to acknowledge associate Prof. Jouni Ikonen as the second reviewer of this thesis and I also appreciate his valuable comments on this thesis.

I would also like to thank the department of computer science for their support throughout my studies in Lappeenranta University of Technology.

Last but not least, I would like to thank my father, Iraj. He is a great human being, who made me believe that angels could also be men. His endless encouragement, support and love has always paved the way for me toward a happy, successful and bright life. I truly find it hard to put my appreciations into the words.

Lappeenranta, 07.05.2017

Behnaz Norouzi

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LIST OF ABBREVIATIONS

HCI	Human Computer Interaction
HMV	How Might We...
IDTP	Interactive Design Thinking Portfolio
O	Objective
POV	Point of View
Q	Question
SA	Stakeholder Analysis
SM	Stakeholder Mapping
SOA	Service Oriented Architecture
UCD	User Centered Design
UI	User Interface
UX	User Experience
Woz	Wizard of Oz

1 INTRODUCTION

1.1 Rationale

Today the horizons of user-centered design (UCD) are broadened in the human computer interaction (HCI) community. Design plays an important role in people's life since people need to interact with the final product. Therefore, a good design brings a good experience for the users and a bad one could make life difficult for them. In this era of technology although the functionalities are more complicated, the user interfaces (UI) are demanded to be more simple and understandable for the users.

Since design has become a popular field, there is a significant increase in job opportunities for the UX designers. The UX designers are those who try to understand the needs of the users and find solutions to their problems. If these solutions are proper and well organized, they lead to a pleasant experience for the users. Hence, the UX designers need to be equipped with some necessary tools for generating more creative and effective ideas and solutions.

Nowadays, a considerable number of techniques and tools exist for the UX designers. Lots of books are written in the field of UX design. There are lots of toolkits for different methods of design. Design thinking is one of those very powerful processes. Design thinking process consists of different phases. There are various methods and tools for each phase. Design thinking is counted as perfect equipment for UX designers.

As mentioned above, designers' job is to make life easier for people. But what could make life easier for the UX designers? Those UX designers, who utilize the design thinking process to accomplish their projects, are always involved with figuring out the most powerful methods for each phase of this process. Besides, they need to learn how those methods work and also they need to find the best of the tools, preferably online ones, for each method. Moreover, they should be able to manage those projects.

Consequently, the presence of an interactive tool is essential that provides designers with: 1) the analysis of the best methods for each phase of design thinking process, 2) the possibility of managing of those projects that are being implemented through design

thinking process and 3) the samples of the best interactive design portfolios as a source of inspiration.

1.2 Background

HCI is an area of research that has emerged with the focus of the interaction between computers and human being. HCI community dedicates to discover the ways that lead to the facilitation of the interaction of people with computers. The milestone in HCI is dealing with usability issues.

UX has a lot to talk, when it comes to the behavioral form of user's interaction with the final product. UX plays an essential role when the focus is on the involvement of the users and also on the usability issues. And design is about the visual appeals and its impression on the users, which makes the users eager to buy it.

In HCI, various common terms are suggested for the user experience design, such as: user centered design, dialogue design, information design, interaction design, emotional design and experience design (1).

Unlike some people's conception of the UX as just a means for preventing usability issues, it deals with both "*aesthetic and functional aspects of the design in the context of the rest of the product*" (2), with the purpose of delivering an outstanding experience for the users.

Hassenzahl and Tractinsky propose a holistic definition for UX based on considering three perspectives (beyond the instrumental, emotion and effect, the experiential):

"UX is about technology that fulfils more than just instrumental needs in a way that acknowledges its use as a subjective, situated, complex and dynamic encounter. UX is a consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organisational/social setting, meaningfulness of the activity, voluntariness of use, etc.) ... UX in the sense of a positive HCI would, thus, focus on how to create outstanding quality experiences rather than merely preventing usability problems." (3)

In (1), the emphasis is on the “*design-as-craft*” perspective of the UX, in which the interdisciplinary cross of the science and art opens up new and bright horizons for innovation in research and design.

Design thinking is a powerful user centric approach that paves the way for the UX designers in conducting an effective user experience design by solving design issues and generating creative ideas through utilizing different methods for each stage of the design thinking process (emphasize, define, ideate, prototype and test (4)).

1.3 Problem Statement

Nowadays, a huge number of documentaries, guidelines and tools for different stages of the design thinking process exist. But there is no unified portfolio that covers all the essential needs of the UX designers including educating designers with the most effective and state of the art methods and simultaneously acts as a management tool by itself.

Therefore, designers need to spend a considerable amount of time and energy on: firstly, browsing trustworthy educative resources and secondly, on finding different accredited tools for each stage in various places. Moreover, UX designers might be working on different projects utilizing design-thinking process. In this case, they need to enjoy having a tool that brings all their design artifacts together and gives them the possibility to prioritize and manage their projects or even prioritize different phases of a specific project.

1.4 Objectives of the Thesis

In order to address the problem mentioned above and to make life easier for the UX designers, this thesis proposes the idea of developing a technology-based solution. This solution suggests a unified, interactive and holistic design thinking portfolio as an online service for design thinking process. It even could have the possibility of utilizing the collection of other tools.

The following objectives (O) could be considered for this thesis:

- O1: Developing UX design and design thinking knowledge among designers.
- O2: Providing the UX designers with efficient and sufficient information about the most powerful and the state of the art methods for each stage of the design thinking process.
- O3: Proposing an interactive design thinking portfolio as an online tool for the UX designers.

The main research question (Q) that this thesis answers to is:

- Q1: How to make life easier for the UX designers?
- Q2: How to facilitate generating innovative and creative ideas for the UX designers through adopting design thinking approach and utilizing the “interactive design thinking portfolio”?

1.5 Research Methods

Literature review and design science methodology could be named as two primary research methods in this thesis. The problem mentioned above in the objectives section is addressed in this thesis by adopting the design science research methodology (5) through investigating about design thinking methods and designing of an interactive design portfolio.

Literatures are chosen by the author of the thesis by browsing the high accredited and the most cited scholarly articles and books of several professional authors, who are mostly active in the area of interaction design. The references of each method are listed in chapter 2.

Through the design science methodology, the problem of UX designers in utilizing design thinking process is investigated. This investigation took place by searching for available tools. The result shows that there is no unified tool that covers altogether: the 5 stages of the design thinking process including a set of the best methods, the analysis of the methods and the possibility of managing UX projects. An artifact named “IDTP” is created by the author of this thesis, as a treatment to the stated problem. After some iteration between the artifact and the context, the design is validated to ensure that it is effective and its effects

are satisfactory to the requirements. And finally, this design idea is prototyped by the author of the thesis and evaluated by a professional.

1.6 Structure of the Thesis

As illustrated in figure 1, this thesis includes 5 chapters. Chapter 2 covers a literature study of the design thinking process. It defines design thinking. It gives the reasons for adopting the design thinking process. It also describes how the design thinking process works. Moreover, five stages of the design thinking process are introduced in this chapter.

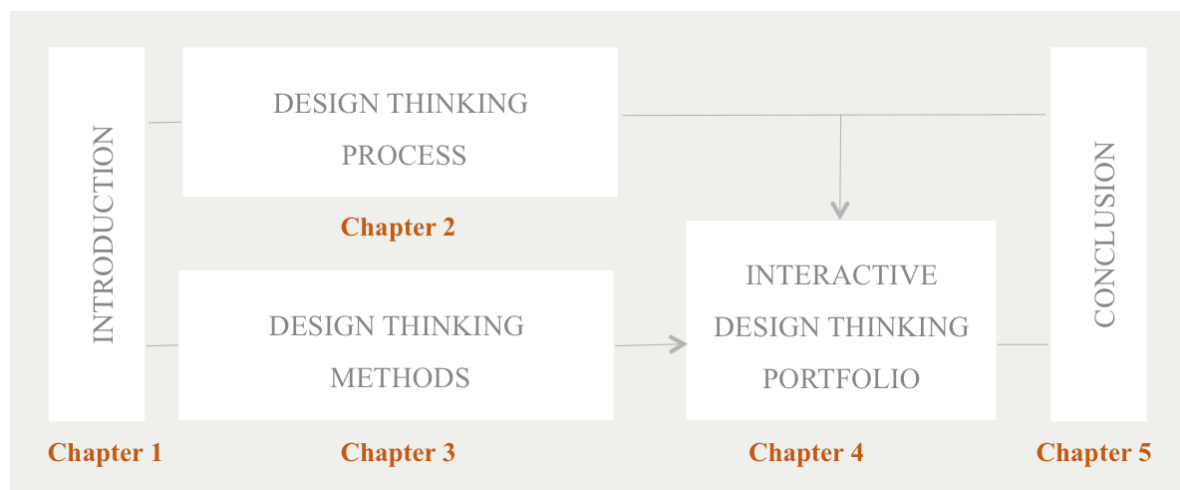


Figure 1. Structure of the Thesis

Chapter 3 analyzes the overall of 25 methods (5 method per each stage of design thinking process) in a format of 25 user-friendly tables (1 table for each method). These tables are designed in a way that the future designers would be able to grasp the idea of each method quickly and effectively, while they are utilizing the interactive design portfolio. In order to illustrate the utility of 25 methods, a detailed design for each method is illustrated by the author, utilizing online tools (for those methods that presenting an example is possible) and by considering the design portfolio as the case (system or product).

In chapter 4 a design for IDTP is proposed. Here, the most important views are illustrated in the form of sketches, wireframes and mockups. And eventually chapter 5 briefly gives the outcome and the summary of this thesis and the possible future extensions.

2 DESIGN THINKING PROCESS

2.1 What Is Design Thinking?

Design thinking is a powerful user centric approach that paves the way for the UX designers in conducting an effective user experience design. This happens by solving design issues and generating creative ideas through utilizing different methods for each stage of the design thinking process. Designers usually initialize this process by empathizing with the users and put themselves in the shoes of the users. Then they try to figure out the problems mostly by using some modern mind mapping tools. After identifying the problems, UX designers would address those identified problems by utilizing a bunch of creative tools. The next step is prototyping the generated ideas by using prototyping tools. And finally, it is time to test those prototypes.

Therefore, this powerful process consists of five major phases: empathizing, defining, ideating, prototyping and testing (4). Design thinking is an effective equipment for organizations to open the doors to the discovery of their innovative potentials. From the competitive point of view, design thinking is essential for organizations to overtake their competitors. This could be achieved by leaving the cliché design styles behind and opening their minds for creating modern, unique and innovative design artifacts.

2.2 Why Design Thinking?

Some authors profoundly emphasize on the key role of the design thinking approach in innovation and creativity (6)(7)(8). Brown believes that the society is in a need of an approach that has more to say than just technological innovation! Design thinking is the desired and brilliant approach for addressing the needs of the human beings (8).

Tschimmel (6) defines design thinking as an effective toolkit for the innovation and explains that: “*design thinking today is not only a cognitive process or a mindset, but has become an effective toolkit for any innovation process, connecting the creative design approach to traditional business thinking, based on planning and rational problem*

solving.” Therefore, innovation by design is a multidisciplinary approach that might occur at the intersection of: technology, business and users (figure 2). It means in order to achieve a successful innovative development of a service, the essential roles of the needs and satisfaction of the users should be highly considered.

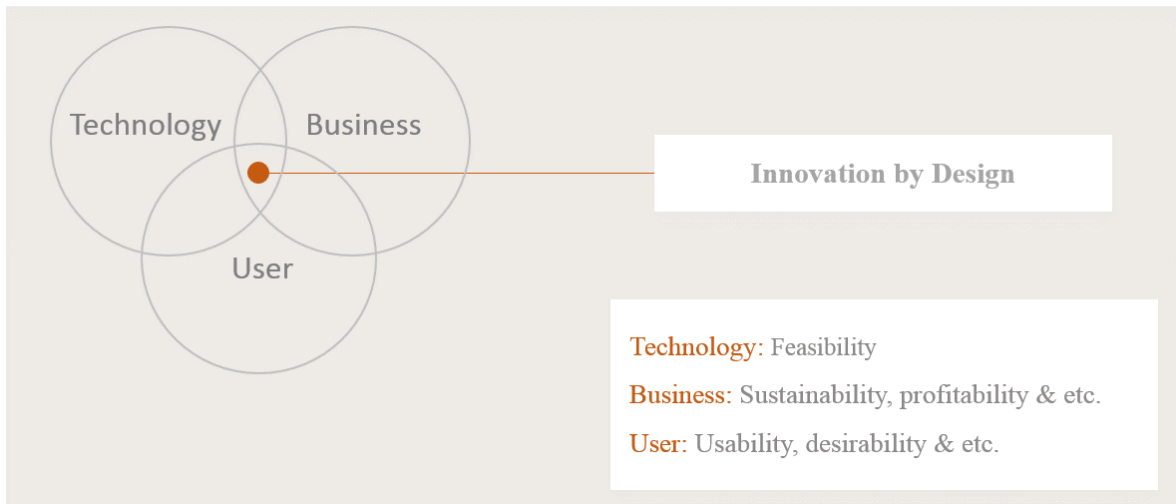


Figure 2. Multidisciplinary Approach to Innovation by Design, inspired by (9)

2.3 How Is the Process of the Design Thinking?

In human computer interaction, in order to facilitate design thinking approach, various frameworks and models are developed, in which the division of this process into several stages is recommended.

A dominant characteristic of the design thinking approach is that it is a human centered creative process. Most of these frameworks share two things in common: 1) emphasizing on the iterative nature of the process as a fundamental for a brilliant design, which results in narrowing a broad concept in an effective way and 2) suggesting five essential stages for the design thinking process: empathize, define, ideate, prototype and test (4)(6)(10). “Creativity is the habit of continually doing things in new ways to make a positive difference to our life” (11).

The function of these stages could be simplified into the following statement:

According to Jakob Nielsen, “a wonderful interface solving a wrong problem will fail” (10), so the whole idea is about researching the right problem to solve or the

right question to ask. And as soon as you find it, you need to ensure performing it the right way (11).

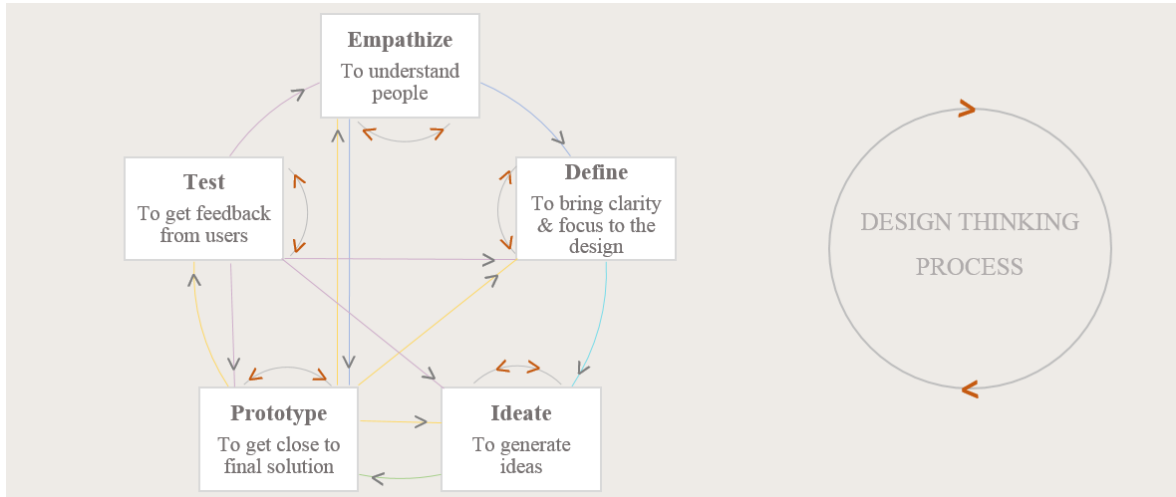


Figure 3. Design Thinking Process

2.4 Five Phases of the Design Thinking Process

2.4.1 Empathizing

“The design literature addresses empathy as a quality of a design process.” (12) The centerpiece and the basis of the design thinking process is empathizing. In those situations, when the concern is designing a product that meets the user’s need, designers should observe, empathize and build a meaningful emotional relation with the users. The result of this observation would be a deep, rich and detailed understanding of all the needs of users form physical to psychological ones including how they perform a task, why they do it in such a way and how it is meaningful and important from their point of view. Through involving people and giving credit to their feeling, empathy flies beyond just testing the subjects. This designer-user encounter, results in considerable insights that paves the way for the creation of innovative solutions (4)(6)(10)(12)(13). There should be no judgment while empathizing.

Although people generally assume that gaining insight through observation is as easy and fast as a blink of an eye, engaging with users is a tricky task and it has its own complications. So designers need to be educated, informed and aware of the best

techniques and methods of empathy (4). Emphatics methods have three major characteristics in common, which is described in table 1.

The common ways to get empathy are usually: observation techniques, engaging with the users and conducting a dialogue with them through adopting some techniques such as interview, watching and listening to users and registering visuals such as photographs (4)(6).

Table 1. Three Common Characteristics of Empathic Methods, Quoted from (13)

- *“The designer’s orientation to the other person, and whether they are motivated to understand and help.”*
- *“Their attention to the affective and emotional in relationships as the empathic response is specifically attuned to the perceived emotions and needs of the other.”*
- *“The kind and quality of relationship between designer and user that they propose, most particularly whether it is likely to provide opportunities to attune to the needs and emotional responses of the user.”*

In chapter three, five of the best methods for empathy are represented: 1) empathy mapping that is suggested by Tschimmel in (6), Vianna et al. in (7) and Ferreira et al. in (14), 2) persona suggested by Friess in (15), Haikara in (16) and Grudin and PRuITT in (17), 3) stakeholder mapping suggested by Martin and Hanington in (18), Kloosterman in (19), Simon and Murray-Webster in (20) and Stickdorn et al. in (21), 4) user journey mapping suggested by Nenonen et al. in (22) and Temkin in (23), and 5) user shadowing suggested by Vianna et al. in (7), Martin and Hanington in (18), Stickdorn et al. in (21) and Quinlan in (24).

Empathy phase could be considered as a process (12). It iterates within itself in case of the necessity, otherwise this is the time for a transition from the empathy to the define phase.

2.4.2 Defining

The second phase in design thinking process is all about passing the insights, which are collected from the empathy phase through a filter. The purpose is removing ambiguities and bringing focus and clarity to the design (4)(6)(7)(10). Define phase is also defined as “*converging phase*”, which means the ideas and findings are narrowed and condensed (6)(11). Synthesizing information and making sense of them are the heart of the defining (4)(11). To put it in a nutshell, here the goal is gleaning insights and propose a frame for problems.

Nessler suggests summarizing the findings, clustering learning, finding insights and creating “how might we...” (HMW) questions as the steps for synthesizing (11). In (4), the result of the define phase is named “*point-of-view (POV): the explicit expression of the problem you are striving to address.*” POV is useful in facing with design challenges and also a valuable entry to the next stage, ideate. Table 2 lists the characteristics of a good POV.

Table 2. Characteristics of a Good POV, Quoted from (2)

<ul style="list-style-type: none"> □ “Provides focus and frames the problem”
<ul style="list-style-type: none"> □ “Inspires your team”
<ul style="list-style-type: none"> □ “Informs criteria for evaluating competing ideas”
<ul style="list-style-type: none"> □ “Empowers your team to make decisions independently in parallel”
<ul style="list-style-type: none"> □ “Captures the hearts and minds of people you meet”
<ul style="list-style-type: none"> □ “Saves you from the impossible task of developing concepts that are all things to all people”

In chapter three, five of the best methods for defining are represented: 1) affinity diagramming suggested by Vianna et al. in (7), Martin and Hanington in (18), and Shafer et al. in (25), 2) mind mapping suggested by Martin and Hanington in (18), Buzan et al. in (26) and Davies in (27), 3) task model suggested by Mori et al. in (28), Paterno in (29) and Paternò et al. in (30), 4) touch points suggested by Stickdorn et al. in (21), Dhebar in (31) and Patterson

and Marketing in (32), and 5) user scenarios suggested by Bødker in (33), Carroll in (34) and Rosson and Carroll in (35).

Define phase iterates until it delivers a well-defined POV and then it is the time to take advantage of this POV and start generating ideas.

2.4.3 Ideating

Ideation takes place when the problems are identified in the define phase. Now it is the time for creating solutions to these identified problems. Ideation is the heart of the design thinking process and it focuses on generating new ideas (4)(6)(7)(21). This phase provides a good opportunity for designers for incorporating their understanding from the real problem with their own imaginations (4). Ideation is not just about presenting the best ideas. A wide range of ideas is expected and welcome (4). There is no categorization of good ideas and bad ideas, especially in the early stages of ideating. Those characteristics that different forms of ideation are leveraged to them, are specified in table 3.

Although lots of methods exist for ideation, brainstorming sessions are the most important ones (4)(6)(7)(21). Visual materials and representation of the concept is highly suggested in order to facilitate understanding the complex ideas for other group members (6)(21). The generated ideas in this phase are counted as the primary materials for prototyping.

In chapter three, five of the best methods for ideation are represented: 1) body storming suggested by Martin and Hanington in (18), Oulasvirta et al. in (36), Schleicher et al. in (37), 2) card sorting suggested by Martin and Hanington in (18), Gaffney in (38) and Nielsen in (39), 3) concept mapping suggested by Martin and Hanington in (18), Chris Bank in (40) and Novak in (41), 4) story boarding suggested by Vianna et al. in (7), Martin and Hanington in (18) and Van der Lelie in (42), and 5) video brainstorming suggested by Beaudouin-Lafon and Mackay in (43), Mackay in (44) and Mackay in (45).

Multiple of the best-selected ideas are passed to the next phase to be prototyped.

Table 3. Characteristics of an Effective Ideation, Quoted from (4)

□ “Step beyond obvious solutions and thus increase the innovation potential of your solution set”
□ “Harness the collective perspectives and strengths of your teams”
□ “Uncover unexpected areas of exploration”
□ “Create fluency (volume) and flexibility (variety) in your innovation options”
□ “Get obvious solutions out of your heads, and drive your team beyond them”

2.4.4 Prototyping

“Prototyping is the core of the implementation process.” (6). Prototype is considered as one of the last phases of the design thinking (7), through which the validation of the generated solutions and the discovery of the proper answers to those questions takes place. This leads the designer to the final solution (4)(6)(7)(10). There are consequent iterations between ideate, prototype and test phases (21). In this phase, addressing the intangibility issues of the product need to be dealt with. This happens by adopting some methods that include the real interaction of the users with the product in reality or in the simulated environment that is close to reality (7)(21).

Different reasons are noted for building prototypes: to ideate and think by building, to communicate not only with words but also with lots of worthy pictures, to initialize a conversation with the users, to lose less money in case of the failure and to make a complicated problem plain (4)(6).

Functionality, usability, production feasibility, cost and pricing and market response are some of those factors that play a role in building a prototype (21). Three levels of fidelity are considered for prototypes: low, middle and high. A low-fidelity prototype is a “conceptual representation” of the solution usually in the early phases. A medium-fidelity prototype contains more aspects and details of the idea and a high-fidelity prototype is almost similar to the final product (7).

Moreover, various levels of contexts are spoken for the prototypes such as: 1) restricted: a controlled environment, 2) general: any user, any environment, 3) partial: final user/environment and 4) total: final user/environment (7).

Chapter three speaks of the five of the best methods among existing techniques for prototyping: 1) sketches suggested by Baskinger in (46), Buxton in (47), Johnson et al. in (48) and Landay and Myers in (49), 2) mockups suggested by Snell in (50), Rivero et al. in (51) and Lopes et al. in (52), 3) wireframes suggested by Garrett in (2), Lapniramai in (53) and Wallach and Scholz in (54), 4) pictive prototyping suggested by Miller et al. in (55), Muller in (56) and Muller et al. in (57) and 5) video prototyping suggested by Beaudouin-Lafon and Mackay in (43), Mackay in (45), Klemmer in (58) and Young and Greenlee (59).

Having a prototype in hand, the transition to the next phase, which is evaluating of the created prototype, happens. The iteration between these two phases is repeated until the discovery of a definite and well defined solution.

2.4.5 Testing

In order to figure out whether the proposed solution, which is embedded in the created prototype in the previous phase would be a proper fit to the needs and expectations of the users or not, the test phase takes place. UX designers or researchers try to understand the feelings of the users while using the product and consequently try to discover some ways to improve their ideas for a better experience (12). Therefore, the testing phase could be considered as “*another opportunity to gain empathy*” for the users (4). But this empathy differs from the initial one in the empathy phase. Here the problem has been framed, the ideas and solutions has been generated and the prototype has been developed and now it is the time to collect feedbacks from users.

Sengers and Gaver believe in the incorporation of the user interpretation into the evaluation process and define evaluation as a form of interpretation:

“Evaluation shifts from determining whether an authoritative interpretation was successfully communicated to identifying, coordinating, stimulating, and analyzing processes of (evaluative) interpretation in practice.” (60)

Usability inspection is an effective evaluation method with the purpose of finding usability issues in the design (46). HCI suggests conducting a usability inspection in the early phases of early prototyping (61).

There are some factors that justify the crucial role of the test phase and the necessity of the utilization of the evaluation methods. Those factors are: refining prototypes or solutions, producing unforeseen insights by gaining empathy for the users, refining the POV generated in the define stage in case of the noticing the failure in the problem statement stage (4) and detecting design problems and making them flawless (61).

There are four basic ways to evaluate a user interface: 1) automatically by a computerized procedure using some programs, 2) formally by using some formulas and analysis methods, 3) empirically by experiments with assessing users and 4) informally (heuristically) by the judgement of the evaluators (46)(62).

Chapter three represents five evaluation methods: 1) AB testing suggested by Martin and Hanington in (18), Nielsen in (63) and Nielsen in (64), 2) cognitive walkthrough suggested by Martin and Hanington in (18), Rieman et al. in (61), Nielsen (65) and Polson et al. in (66), 3) thinking aloud suggested by Martin and Hanington in (18), Nielsen in (67) and Van Den Haak et al. in (68), 4) wizard of Oz suggested by Martin and Hanington in (18), w et al. in (69) and Green in (70) and 5) heuristic evaluation suggested by Martin and Hanington in (18), Nielsen and Molich in (62) and Nielsen in (71).

3 DESIGN THINKING METHODS

A combination of literature review about design thinking methods and created artifacts by the author of the thesis for each method are covered in this chapter. The author of the thesis has considered IDTP as the final product and has adopted these methods for designing IDTP through the design thinking process.

This chapter describes a wide range of methods (table 4) for the all stages of the design thinking process (empathizing, defining, ideating, prototyping and testing). Although the references for each method are mentioned in the previous chapter, good to mention that these are the most popular and effective approaches, through which a high quality and iterative project could be conducted.

Each method is described in a form of a table. Why using tables? The idea is providing an easy to grasp set of valuable and necessary information for each method including “what is the method?”, “what is the method used for? (Why?)”, “considerations that need to be taken into account?”, “what are the creation steps?”, “where to find more information?” (This item is available only in electronic version of this thesis.), and “a customized example considering designing of the IDTP as the case”. On the other hand, it facilitates the task of the designers and helps enormously in saving time. Because utilizing these exclusive set of tables as the source of gaining information about the best of the design thinking methods lead in elimination of the need for browsing the web and articles to find information. Besides, currently finding a holistic service with a proper categorization of the design thinking stages including introducing and describing different methods for each stage is almost difficult. The outcome of utilizing these methods is discovering new perspectives and developing new insights and consequently designing an innovative, successful and user-friendly product.

Table 4. List of 25 Methods

Empathizing	Defining	Ideating	Prototyping	Testing
Empathy Map (Table 8)	Affinity Diagram (Table 14)	Body Storm (Table 16)	Sketches (Table 20)	AB Testing (Table 25)
Persona (Table 5)	Mind Map (Table 13)	Card Sort (Table 15)	Mock ups (Table 22)	Wizard of Oz (Table 29)
Stakeholder Map (Table 7)	Task Model (Table 12)	Concept Map (Table 17)	Wireframes (Table 21)	Think Aloud (Table 28)
User Journey Map (Table 6)	Touch Point (Table 10)	Story Board (Table 18)	Pictive Prototype (Table 24)	CognitiveWalkthrouh (Table 26)
User Shadowing (Table 9)	User Scenario (Table 11)	Video Brainstorm (Table 19)	Video Prototype (Table 23)	Heuristic Evaluation (Table 27)

Table 5. Persona

What is persona?

- In UCD, was popularized by Cooper as a primary interaction design method.
- “An archetype of a user.” & “An infrastructure for engagement.” (15)

What are personas used for?

- As a discussion tool, to focus on identifying users’ needs, goals and tasks in early phases of design through fictionalizing a human-like characteristic. (17)
- To empathize toward users in decision making sessions in design process. (15)

What are creation phases of a persona? (15)(16)(17)

1. User research: could be conducted via various methods such as interviews, observation, Market research, technology white papers and field study.
2. Modeling: revising hypothesis, mapping subject to behavioral variables, identifying significant behavior patterns and finally designate persona type.
3. Requirement definition: identifying persona expectations, problems and needs.
4. Framework definition: defining data elements, sketching interaction framework and constructing key path scenarios.
5. Refinement: look & feel drafting and finalizing design.

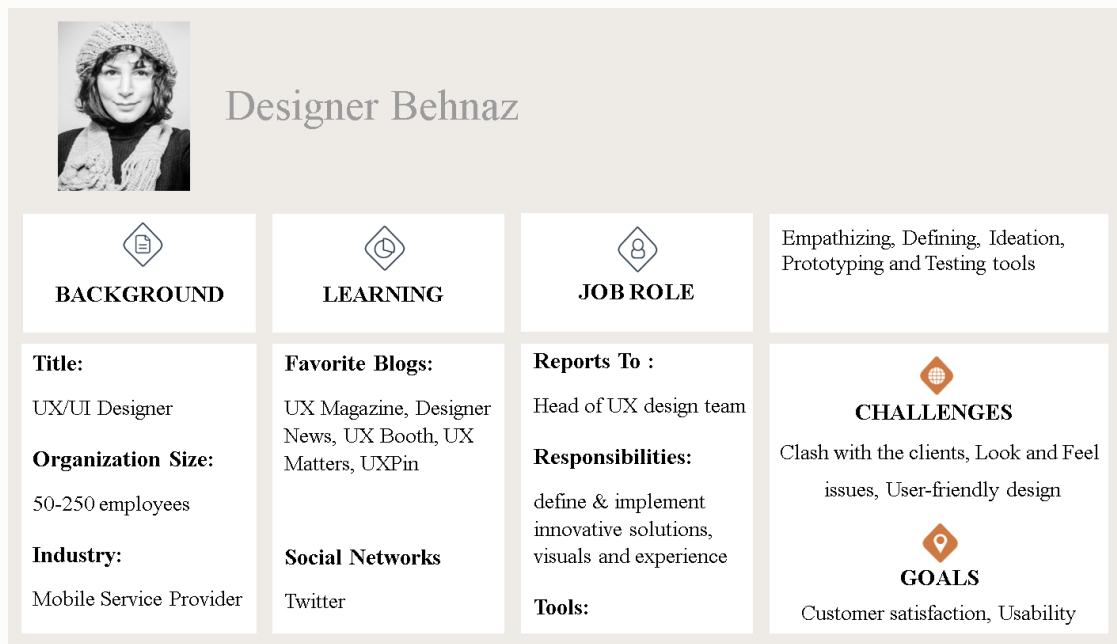


Figure 4. An Example of a Persona

Where to find more useful information about Persona?

- [🔗 How it works?](#)
- [🔗 Best practices!](#)
- [🔗 10 steps to personas!](#)

Table 6. User Journey Mapping

<p>What is user journey map?</p> <ul style="list-style-type: none"> □ User journey map is a systematic approach adopted in the requirement gathering phase. (22)(23) □ It demonstrates the flow of touchpoints and interactions that customers experience during the process of a service. (22) 	
<p>What are user journey maps used for?</p> <ul style="list-style-type: none"> □ Mapping the journey of the customers and identifying their understanding and their expectations of each touchpoint, prevents missing the customer needs and leads to designing and delivering a rich experience and consequently to the customer satisfaction. (22)(23) 	
<p>What are creation phases of user journey mapping? (23)</p> <ol style="list-style-type: none"> 1. Collecting internal insights, which leads to an inventory of the user touchpoints 2. Developing initial hypothesis, which makes an “assumption” user journey map 3. Research customer processes, needs and perceptions. 4. Analyzing customer research, which results in research-based personas. 5. Mapping the customer journey in a form of an illustrated document. 	

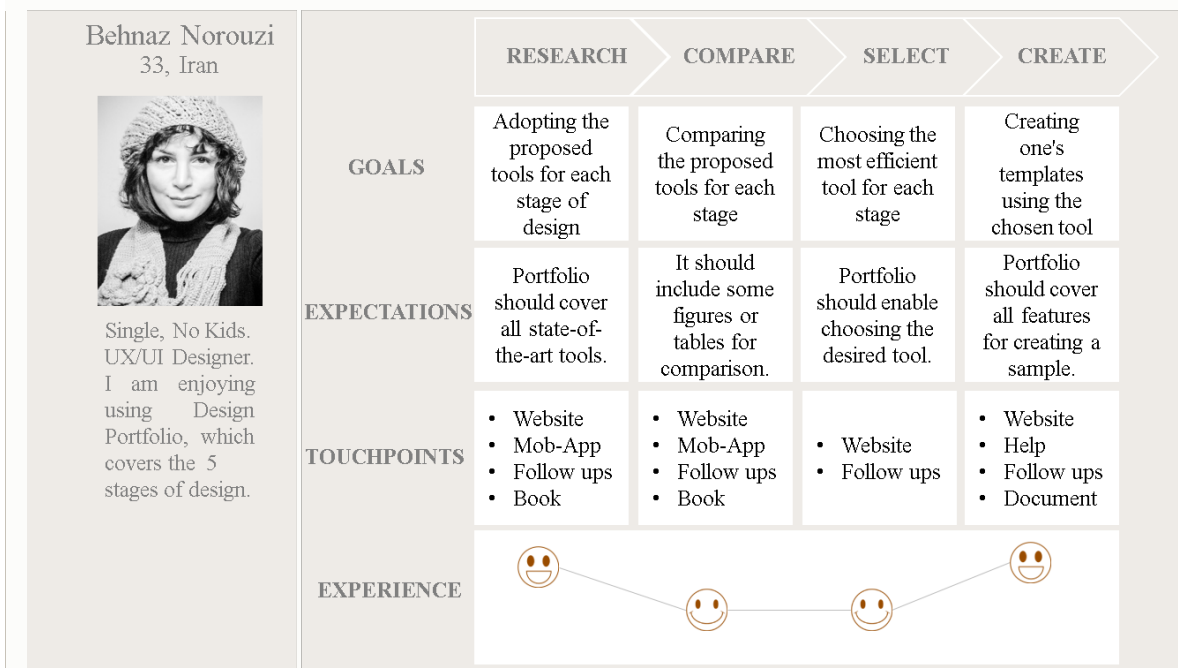


Figure 5. An Example of User Journey Mapping

<p>Where to find more useful information about user journey mapping?</p>		
<p>↻ What is it?</p>	<p>↻ How to create it?</p>	<p>↻ All you need to know!</p>

Table 7. Stakeholder Mapping

What is stakeholder mapping (SM)?

- A form of stakeholder analysis (SA) for representing various groups, who carry a stake in design outcome (18) and a technique for meeting with stakeholder management's approval (20).

What are stakeholder maps used for? (18)(19)(20)(21)

- An effective method utilized mostly in definition phases of the design to bunch up and prioritize those stakeholders, who deal with common interests.
- To overview active actors in complicated situations, via this visualized map.

What are creation phases of stakeholder mapping? (18)(21)

1. Identifying stakeholders by creating a whole list of the involved stakeholders.
2. Analyzing the interactions among matching groups.
3. Prioritizing by classifying stakeholders based on their relevance level.
4. Engagement by interacting with the key stakeholders.

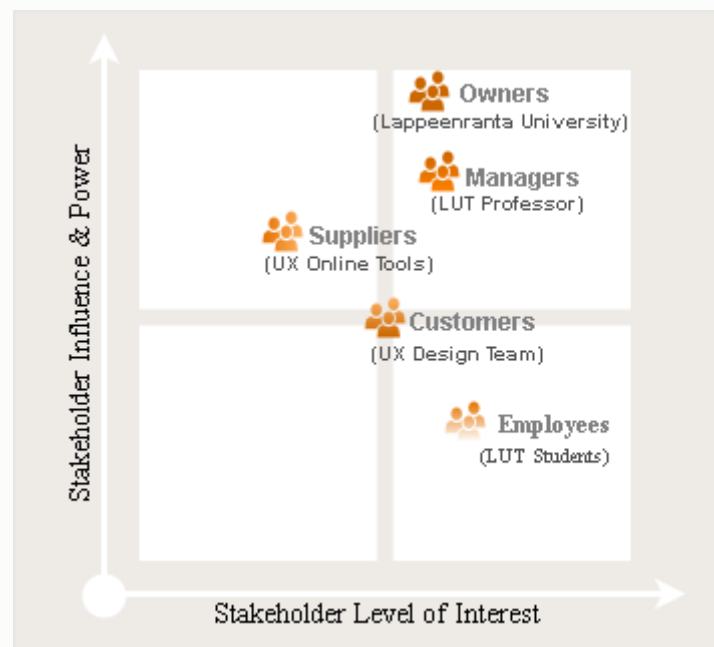


Figure 6. An Example of Stakeholder Mapping

Where to find more useful information about stakeholder mapping?

- [🔗 Stakeholder management!](#)
- [🔗 4 steps!](#)
- [🔗 Reasons for using it?](#)

Table 8. Empathy Mapping

What is empathy mapping?

- A user-centric approach with the focus on visualizing feelings, thoughts and concerns of the potential customers. (6)(7)(14)
- An empathizing tool to expedite the creation of personas. (6)

What are empathy maps used for?

- To improvise the mindset of the end users and the problems that they may encounter. (6)(7)(14)

What are creation phases of empathy mapping? (7)(14)

The designer needs to divide a diagram into six various areas consisting of:

1. See: the description of what the user sees in her/his environment.
2. Hear: the description of how the environment affects the user.
3. Thinking and feeling: the description of what the user holds on her/his mind.
4. Say and do: the description of the behavior of the user in public.
5. Pain: the description of the barriers and frustrations of the user during his/her experience.
6. Gain: the description of the favorable attributes and achievements of the user.

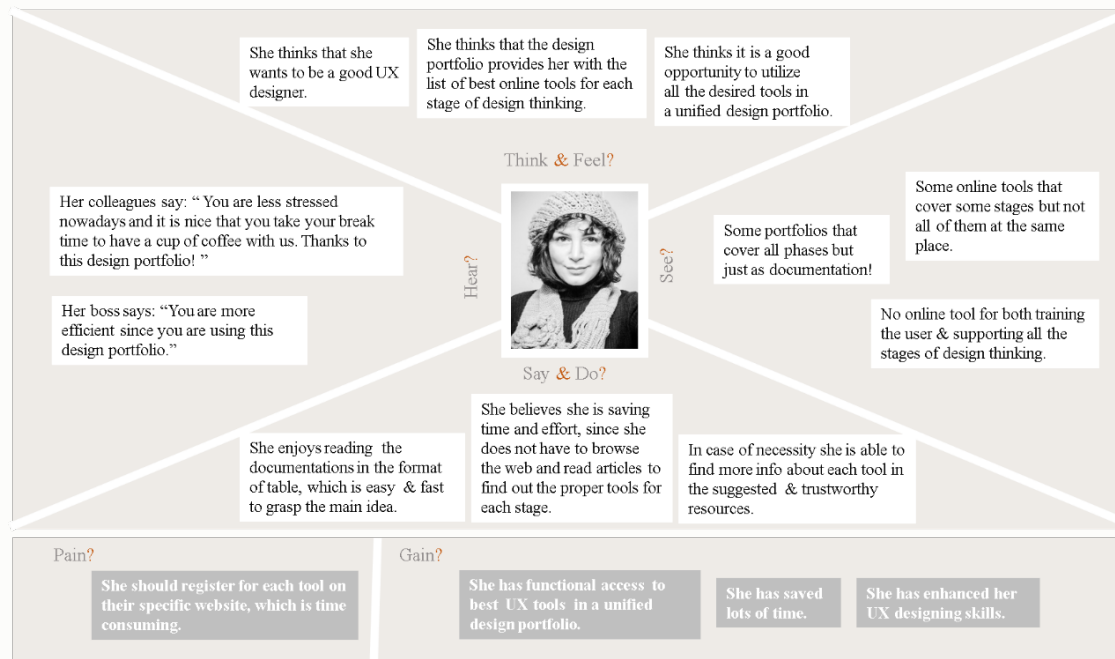


Figure 7. An Example of Empathy Mapping

Where to find more useful information about empathy mapping?

- 🔗 6 easy steps!
- 🔗 Why and how to use it!
- 🔗 Online Tool!

Table 9. Shadowing

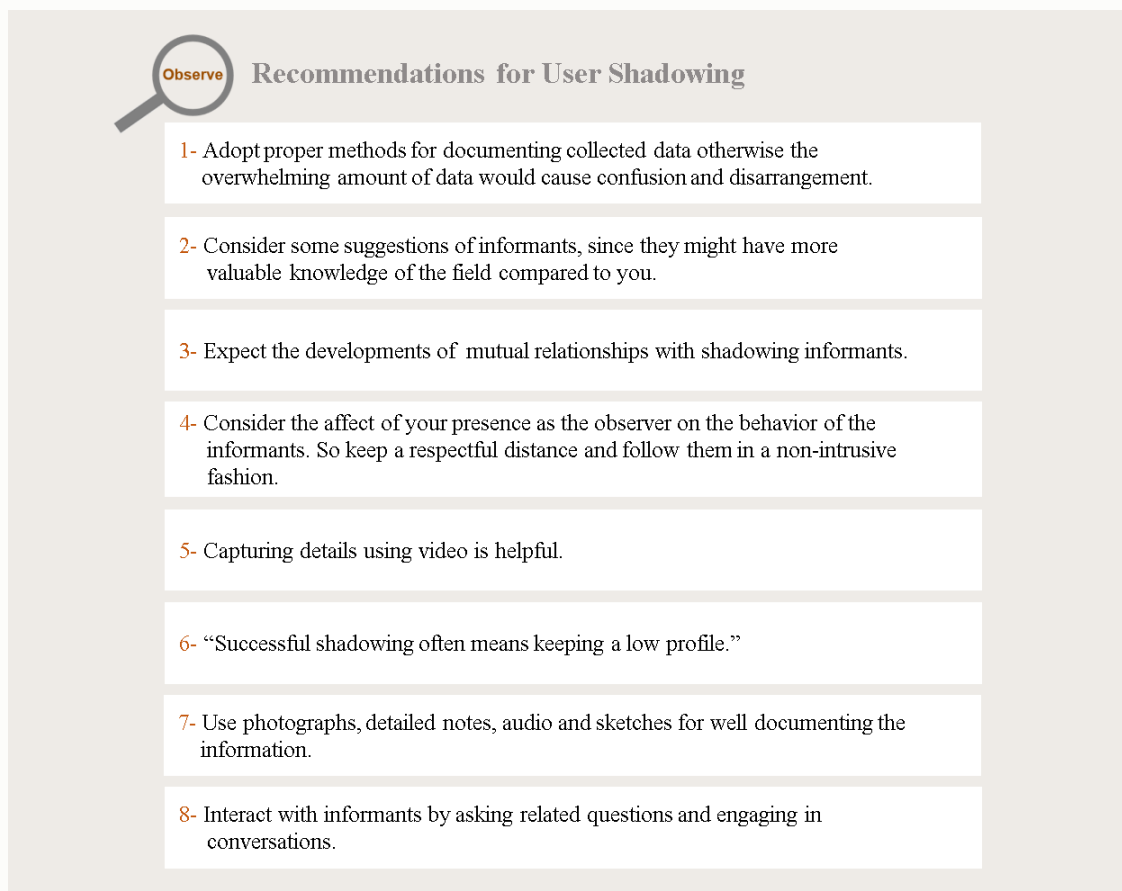
What is shadowing?

- An observational strategy adopted usually in early design stages, in which the researcher follows users closely over a period of the time that they are interacting with the system. (7)(18)(21)(24)

What is shadowing used for?

- For gaining key insight into the actions, activities, expectations, opinions and experiences of the users. (7)(18)(21)(24)
- As a data collection technique, for generating a valuable descriptive data about users, which are grounded in concrete events. (24)
- “For identifying those moments where people may say one thing, and yet do another.” (21)

What are the recommendations for shadowing? (7)(21)



Observe Recommendations for User Shadowing

- 1- Adopt proper methods for documenting collected data otherwise the overwhelming amount of data would cause confusion and disarrangement.
- 2- Consider some suggestions of informants, since they might have more valuable knowledge of the field compared to you.
- 3- Expect the developments of mutual relationships with shadowing informants.
- 4- Consider the affect of your presence as the observer on the behavior of the informants. So keep a respectful distance and follow them in a non-intrusive fashion.
- 5- Capturing details using video is helpful.
- 6- “Successful shadowing often means keeping a low profile.”
- 7- Use photographs, detailed notes, audio and sketches for well documenting the information.
- 8- Interact with informants by asking related questions and engaging in conversations.

Figure 8. Recommendations for User Shadowing

Where to find more useful information about shadowing?

- [🔗 Proceeding & Variants!](#)
 [🔗 Technique Explanation!](#)
 [🔗 The Process!](#)

Table 10. Touchpoints

What is touchpoint?

- “The repeated interactions” (32), through which the customers are in the contact with an organization “over the course of the customer’s experience cycle” (31).

What are the touchpoints used for?

- Identifying the most effective key touch points plays a crucial role as part of a holistic service design in mapping the customer experience. (21)
- To simplify the service experience for further analysis and consequently to explore new creative design alternatives. (31)(32)

What are creation phases of the touchpoints? (32)

1. Creating a holistic inventory of all possible touchpoints encountered by users.
2. Mapping and organizing the touchpoints in order.
3. Indicating the time, on which each touchpoint is encountered in the user lifecycle.
4. Specifying the operational purpose for each touchpoint.
5. Determining the underlying ownership of each touchpoint.
6. Scoring the touchpoints based on their impact on the experience.
7. Rating the operational effectiveness of the touchpoints.
8. Analyzing the functionality.

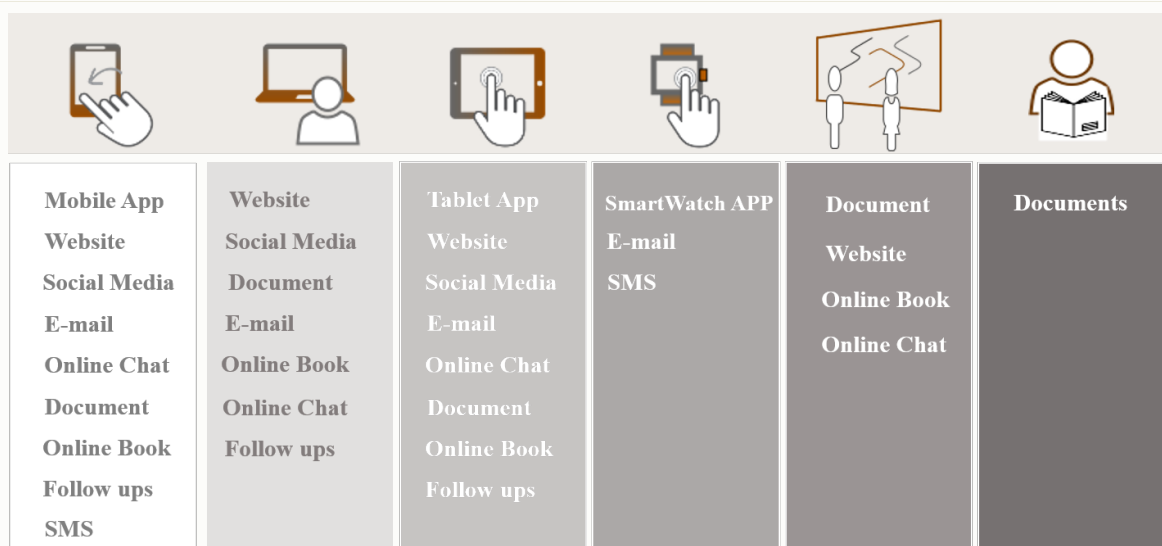


Figure 9. An Example of Touchpoints

Where to find more useful information about touchpoints?

- [🔗 Touchpoint matrix!](#)
- [🔗 The origin of It!](#)
- [🔗 How to map it?](#)

Table 11. User Scenarios



<p>What is user scenario?</p> <ul style="list-style-type: none"> □ Narrative description of the users with the emphasis on their significant activities, goals and their situation of using the system in the form of stories, at iterative user-centered design. (33)(34) (35)
<p>What are user scenarios used for?</p> <ul style="list-style-type: none"> □ For: “<i>evoking reflection in the context of the design</i>” and “<i>promoting work-orientation</i>” (works that user accomplish while using the system). (34)(35) □ For addressing various detailed design problems and usability issues and also for proposing solutions and envisioning alternative solutions. (35)(33)
<p>What to keep in mind while writing down user scenarios?</p> <ol style="list-style-type: none"> 1. Empower scenarios by directly involving users in their creation. (35)(34) 2. “Describe multiple levels of details for reflecting on various aspects of the problem situation.” (35)(34) 3. Make scenarios both concrete and flexible at the same time. (34) 4. Make scenarios abstracted and categorized and then apply them in problem instances. (34) 5. Be selective and focus on some particular number of scenarios. (33)
<div style="background-color: #f0f0f0; padding: 10px;"> <p> Behnaz wants to review the list of her Designs</p> <p>She logs in to her account. She opens her profile page. There are different sections for different stages. In each section, there are different subsections for each tool and in each subsection there is a list of projects that she has completed using that tool. When she opens her profile, she wants to see notifications for each section so that she can prioritize her tasks. She gets a bit confused because she cannot remember even with the help of notifications which section is the recent one that she used to work on it. She needs to browse inside different lists to find that specific task. Although she has the search option between the sections and tasks, sometimes she cannot remind the name of some specific projects.</p> <p> Interacting with notifications</p> <ul style="list-style-type: none"> + She gets notified about different tasks in each section. - Important notifications are not animated so they cannot draw her attention. - There is no color specification to prioritize the notifications. </div>
<p>Figure 10. An Example of Plus and Minus User Scenarios</p>
<p>Where to find more useful information about user scenarios?</p> <p>🔗 Pidoco tool! 🔗 What & why? 🔗 Some examples!</p>

Table 12. Task Modeling

What is task model?

- In HCI it is the demonstration of a logical structure, which defines the performance of some activities with the purpose of reaching the goals of the users. (28)(29)(30)
- ConcurTaskTrees (CTT) is “a diagrammatic notation for specifying task models”. (29)(30)

What are task models used for?

- For further understanding of the underlying design and retrieving effective solutions for potential drawbacks and problems. (28)(29)
- For supporting the usability evaluation phase of the design. (28)(29)(30)

What are creation phases of task modeling? Quoted from (30) in CTT:

1. *“A hierarchical logical decomposition of the tasks represented by a tree-like structure.*
2. *An identification of the temporal relationships among tasks at the same level.*
3. *An identification of the objects associated with each task and of the actions which allow them to communicate with each other.”*

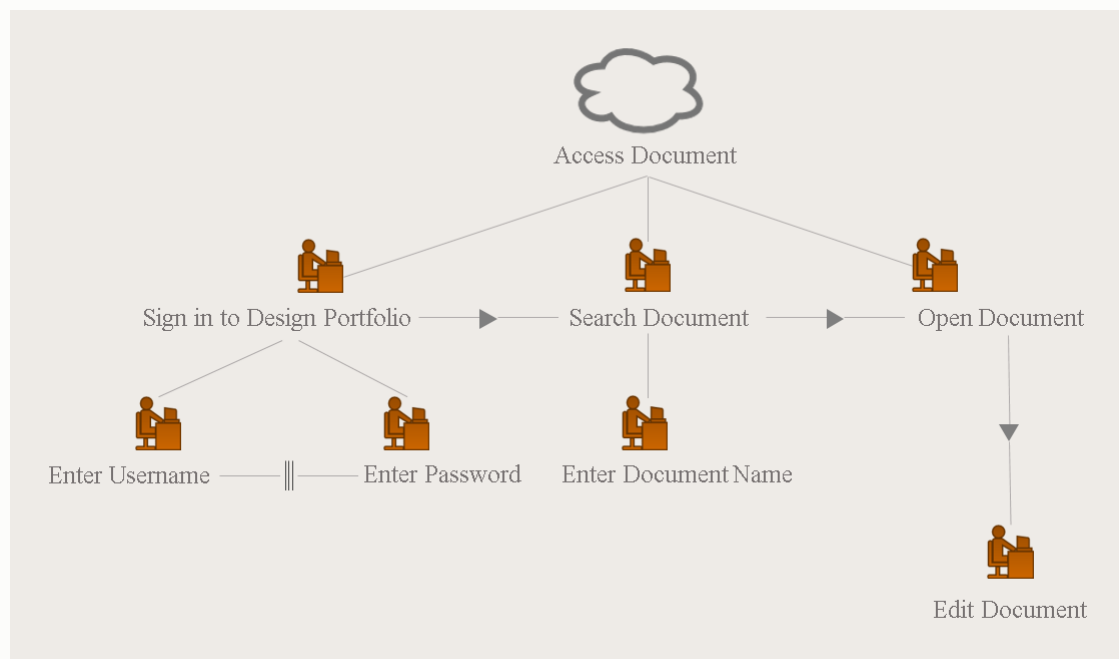


Figure 11. An Example of Task Modeling

Where to find more useful information about task models?

- [🔗 ConcurTaskTrees!](#)
 [🔗 Task models!](#)
 [🔗 Tools & methods!](#)

Table 13. Mind Mapping

What is mind mapping?

- A non-linear visual thinking technique, which is usually adopted in the early stages of design for generating ideas for non-complex problems. (18)(26)(27)

What are the mind maps used for?

- Enhancing the brain efficiency and creative thinking in problem solving. (26)
- Enabling an understanding of relative items within a system. (27)
- Demonstrating the user interaction with the design in user-centered design. (18)

What are creation phases of mind mapping? (18)(26)(27)

1. Drawing a topic or placing an image in the center. Using at least three colors and also images in highly recommended.
2. Drawing extensions from the center in thicker lines as primary connections and labeling them with meaningful names.
3. Drawing thinner extensions as secondary connections from primary connections. The farther they are from the center, the thinner they are.
4. Continuing the same process until covering all relevant information.
5. Trying to develop new understanding or knowledge out of the mind map.

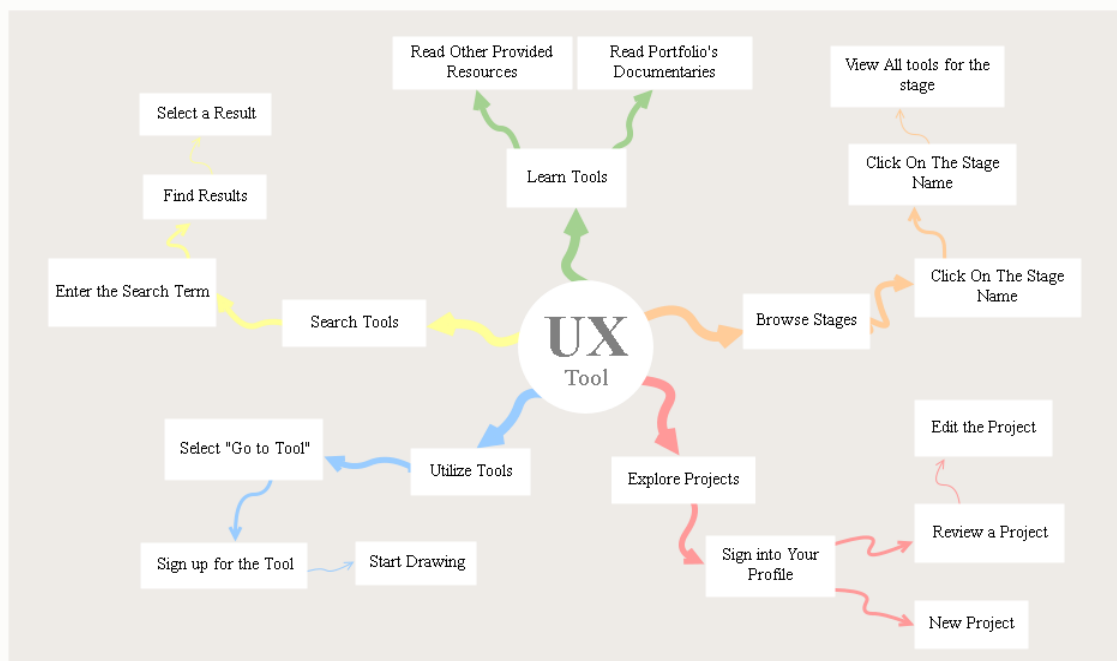


Figure 12. An Example of Mind Mapping for Tracking User Experience

Where to find more useful information about mind mapping?

- 🔗 Tony Buzan mind map!
- 🔗 Tools for mind mapping!
- 🔗 Track UX!

Table 14. Affinity Diagramming

What is affinity diagram? (7)(18)(25)

- An inductive grouping method, which is routinely adopted in define phase of the design thinking.
- Clustering ideas based on their dependencies and similarities.

What are affinity diagrams used for?

- The purpose is organizing and clustering the generated ideas during brainstorming or research insights. (18)(25)
- To figure out the relations and connections among various subjects. (7)

What are creation phases of affinity diagrams? (18)(7)

1. Writing down all existing data on sticky notes.
2. Posting all the notes on a wall or on a board.
3. Clarifying the underlying significance of each note.
4. Rearranging the notes in case of necessity and complexity of the subject.
5. Clustering together all the notes, which share an affinity.
6. Naming each group by setting down headers for each of them.
7. Drawing an affinity diagram using clustered groups as shown in figure x.

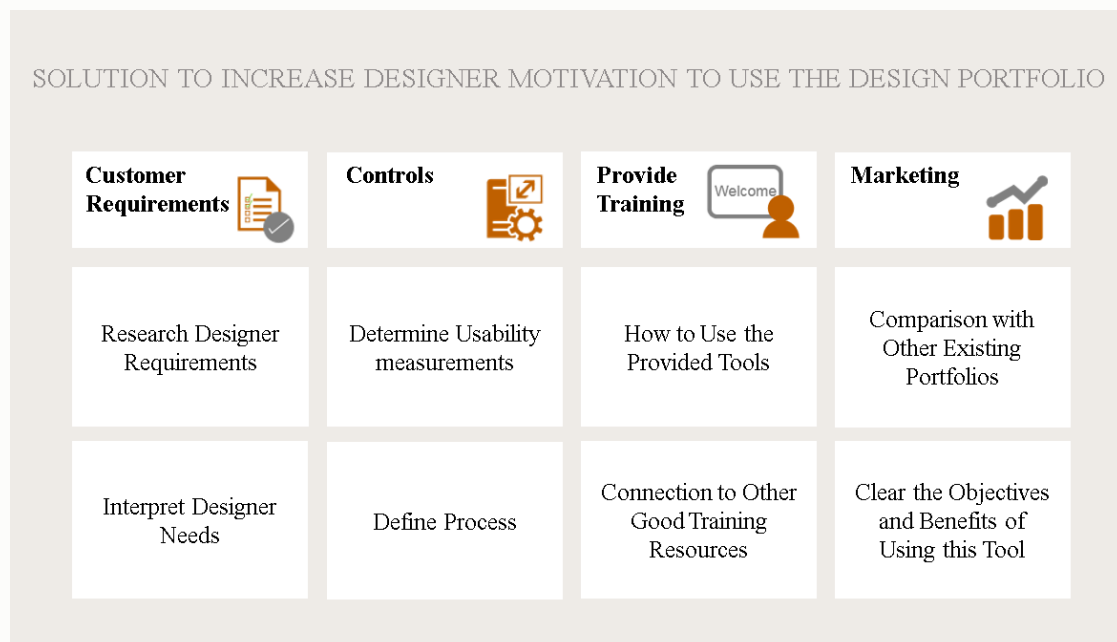


Figure 13. An Example of Affinity Diagramming

Where to find more useful information about affinity diagramming?

- [🔗 Following the steps!](#)
- [🔗 Best practices!](#)
- [🔗 Affinity diagram software!](#)

Table 15. Card Sorting

What is card sorting?

- A participatory, user-centered design method for generating or developing the structure of the information in the early design phase and also for seeking out the creative ideas. (18)(38)

What is card sorting used for? (18)(38)

- For usability testing and evaluation of a prototype.
- For creating or developing structures and discovering novel ideas.
- For identifying and redefining the terminology.
- For determining the implicit needs of end users.

What are the best practices for card sorting? (18)(39)

1. To cautiously choose a well-informed facilitator and also potential participants.
2. To limit the number of the cards from 30 to 100 while preparing the cards.
3. To include a fair number of participants. The recommendation is around 15.
4. To let the participants to modify the cards or to add new cards in case that it is needed from their perspective.
5. To avoid the risk of blinkering participants, use open card sorting over closed card sorting by asking participants to organize and name topics by themselves.

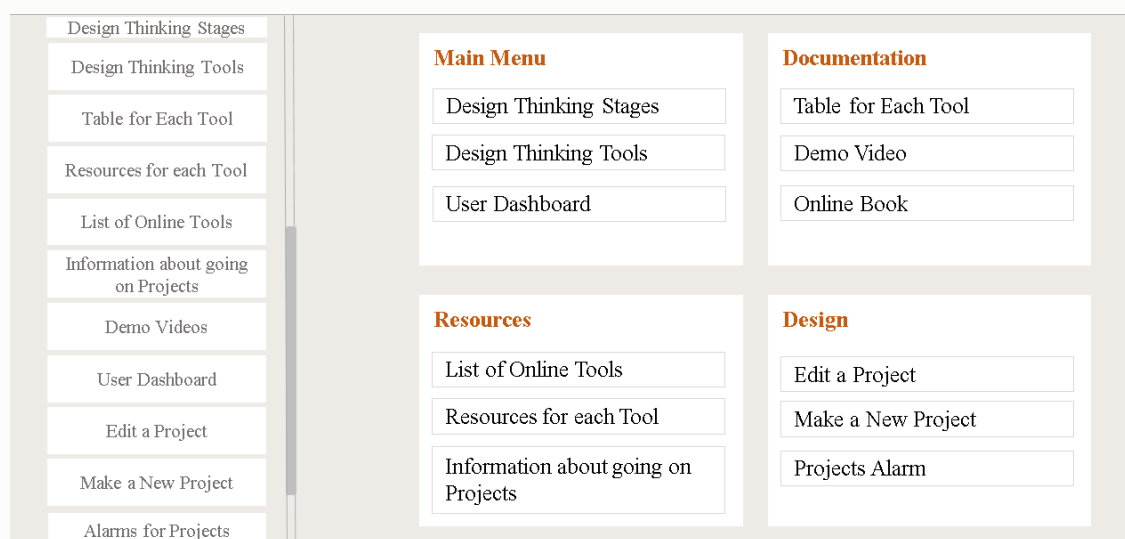


Figure 14. An Example of Card Sorting

Where to find more useful information about card sorting?

- [🔗 Card sorting tool!](#)

 [🔗 Beginner's guide!](#)

 [🔗 Best practices!](#)

Table 16. Body Storming


What is body storming?

- A technique of the physical brainstorming adopted in visualization stage of the design for exploring new ideas. (18)(36)(37)
- A role-playing, in which designers put themselves in user's place and act as the product already exists, to figure out the way that users interact with the product. (18)(36)(37)

What is body storming used for?

- In ideation stage, mainly for generating new ideas and uses. (18)(37)
- In observation stage, for sharing observations from the field. (36)(37)
- In understanding stage, for problem identification. (37)
- In evaluation stage, for enhancing design ideas. (18)(36)(37)

What is the process of body storming? (37)



The Process of BodyStorming

- 1- Form a group of preferably up to 5 people.
- 2- Assign each participant to a different role.
- 3- Create props, including large cards that identify roles. Create thought-bubble cards to show thoughts vs. saying or doing. Your props can have feelings and thoughts, and they can talk.
- 4- Have a narrator, or color commentator, who explain things to observers.
- 5- The narrator can pretend it is like watching TV and use a TV controller to stop play, rewind, or fast-forward.
- 6- When your group is working through its presentation, try to approach it with the spirit of improv's "Yes, and . . ." rather than "No, but . . ."
- 7- Perform at least two skits showing a before and after service scenario.
- 8- Divide larger groups into two or more teams that bodystorm the same scenario.

Figure 15. Body Storming Process, according to (37)

Where to find more useful information about body storming?

- [🔗 Video example!](#)
 [🔗 More about the process!](#)
 [🔗 Sample lesson!](#)

Table 17. Concept Mapping

What is concept mapping?

- A hierarchical representation of the interrelated concepts and ideas of a specific topic. (18)(40)(41)
- A powerful tool, which generates new ideas for an existing domain. (18)

What are the concept maps used for?

- For visualizing the complexities of the designed system. (18)
- For “defining tangible and intangible aspects of the product.” (40)
- “An effective tool in identifying both valid and invalid ideas.” (41)

What are creation phases of concept maps? (18)(41)

1. Clarifying the domain. It is helpful in creating meaningful interconnections.
2. Constructing a focus question, which is effective in providing context.
3. Identifying a list of 15-25 key concepts.
4. Generating a rank ordered list from the most general to the most specific, based on their relation to the focus question.
5. Constructing the preliminary map preferably by using Cmap tools.
6. Linking concepts together and choosing appropriate labels.
7. Revising and repositioning is the final stage.

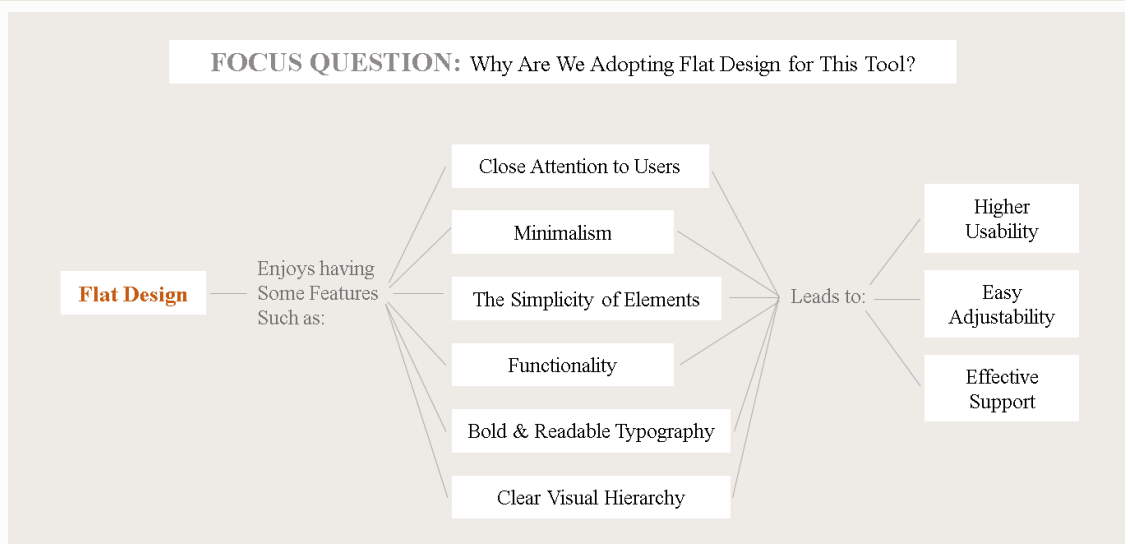


Figure 16. An Example of Concept Mapping

Where to find more useful information about concept maps?

- [🔗 Online tool!](#)
- [🔗 Concept mapping together!](#)
- [🔗 Some examples!](#)

Table 18. Storyboarding

What is storyboarding? (7)(18)

- A common visual structured language that represents a story through static frames.
- A visual aid that builds empathy and put the user-product interaction together.

What are storyboards used for?

- For visualizing the solutions to the complex problems. (7)
- For considering design alternatives. (18)
- For supporting the communication of various people from different backgrounds. (18)

What are creation phases of storyboards? (7)(18)

1. Make the story plain by breaking it down into different sections.
2. Keep the balance in depicting the details. The details should be to the extent that the communication via the pictures is possible. Not too much, not too less.
3. The use of text for supporting the visuals for a quick grasp of the idea is suggested.
4. In order to communicate a single idea, the use of 3-6 panels is recommended.
5. The passage of the time should be shown in the depiction of the storyboards.

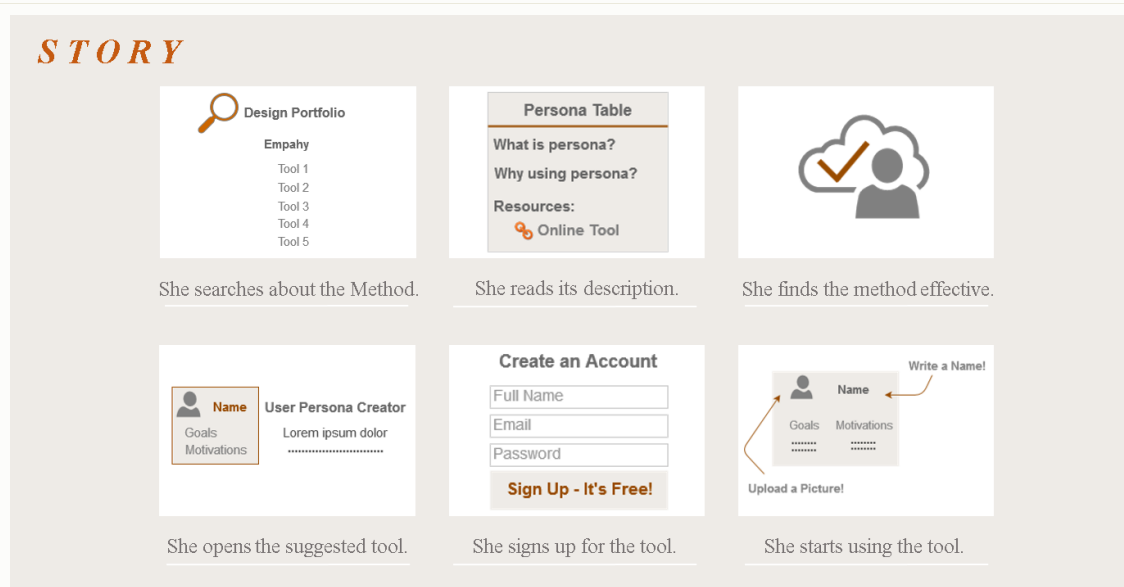


Figure 17. An Example of Storyboarding

Where to find more useful information about storyboards?

- [🔗 Online tool!](#) [🔗 Detailed creation steps!](#) [🔗 Introduction article!](#)

Table 19. Video Brainstorming

What is video brainstorming?

- A technique for generating new design ideas through illustrating the ideas in front of a camera. (43)(44)(45)
- A method that produces ideas, which are more convenient to understand and recall, more concrete and more likely to be adopted in the other stages of the design thinking. (43)(44)(45)

What is video brainstorming used for? (43)(44)(45)

- For simulating new ideas without critiquing them.
- For interpreting ideas from the viewpoint of the users.

What are the steps and considerations for video brainstorming? (43)(44)(45)



The Steps of Video Brainstorming

- 1- Each participant spends 2-5 minutes for writing down his/her ideas.
- 2- Generate all ideas. We don't categorize them into good or bad ones in this stage.
- 3- A moderator is needed for leading the discussions.
- 4- A secretary is needed for taking notes.
- 5- A person is needed for playing the role of monitoring the camera.
- 6- Each individual reads his/her ideas loudly and others just listen to them.
- 7- Take note of all those ideas, which are more interesting for you.
- 8- Use your imagination to illustrate the interaction with the system.
- 9- Shoot 15-30 seconds of the brainstorming title card before taping the first idea.
- 10- Perform the ideas in front of camera and finally vote for the best ones.

Figure 18. Video Brainstorming Steps

Where to find more useful information about video brainstorming?

- [🔗 Video brainstorming!](#)
- [🔗 How to exercise It?](#)
- [🔗 An Article!](#)

Table 20. Sketching

What is Sketching?

- A low-fidelity, provisional and ambiguous representation (47), which is made quickly as a means for facilitating visual thinking in the early stages (48).
- Some authors such as Baskinger, recommend paper sketching because of their great power of persuasion (4), while others such as Myers & Landay suggest electronic sketch because of their interactive and modifiable nature (49).

What are the sketches used for?

- To experiment mostly, vague ideas. (47)
- For further thinking of the problems and passing on the proposed solutions. (48)

What are the boldest attributes of the sketches to keep in mind? (46) (47)

1. Being quick in making sketches.
2. Making them disposable by mostly concentrating on concept over execution.
3. Not considering too much or too little fidelity! Enough fidelity based on its purpose and the stage is suggested.
4. Visualizing not only built up ideas but also more importantly, vague ones.
5. Adopting minimalism style by depicting no more than required.
6. Emphasizing on simplicity by eliminating complex elements.

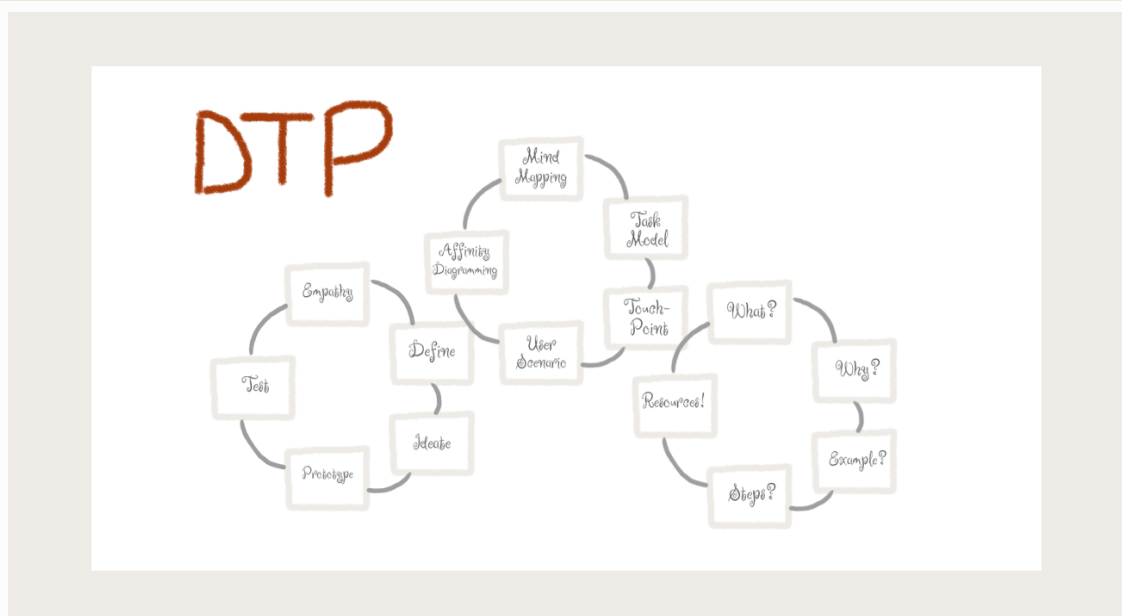


Figure 19. An Example of Sketching for IDTP Homepage for Interactive Walls

Where to find more useful information about the sketches?

- [↻ 5 Good tips!](#)
- [↻ The art of UX sketching!](#)
- [↻ Etch a sketch!](#)

Table 21. Wireframing

What is wireframe?

- A medium-fidelity two-dimensional interactive “bare-bones” representation of the product framework. (2)(53)(54)

What are the wireframes used for?

- For exploring design idea, testing them with the users and refining them in an iterative process. (53)(54)
- For clarifying the ambiguities about the function of the product and arrange a suitable direction for it. (2)

What are the decisions that need to be considered to smooth Wireframing? (53)

1. Confirming the devices that would support the product.
2. Adopting a suitable design-scaling pattern.
3. Considering a default screen size and starting with small screen size.
4. Defining different levels of fidelity and adopting one of them.
5. Aligning your design by using grid systems.
6. Detailing the elements of the design by including interaction feedback, interaction states, gestures, supplementary pages and user types.
7. Improving your wireframes by annotating the.

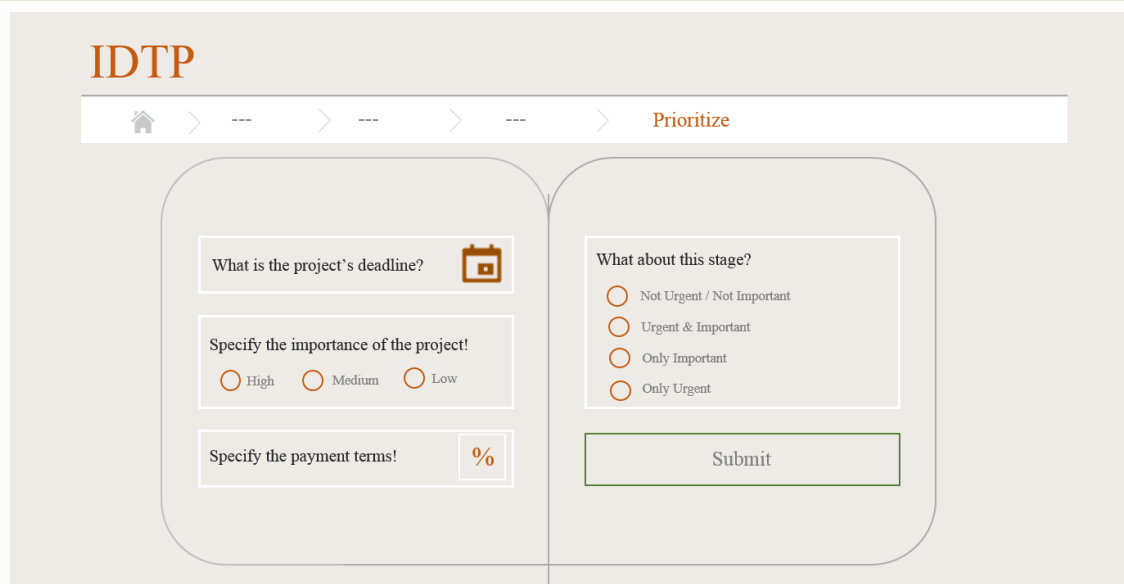


Figure 20. An Example of Wireframing for Task Prioritization

Where to find more useful information about wireframes?

- [🔗 8 Great tools!](#)
- [🔗 What is a wireframe?](#)
- [🔗 A perfect guide!](#)

Table 22. Mockup

What is mockup?

- A medium to high fidelity depiction of a possible user interface. (50)(51)

What are the mockups used for? (50)(51)

- For fast obtaining of various user interface modeling approaches.
- For capturing requirements usually by connecting to other methods such as “user stories”.
- For reflecting user needs in a more concrete way.

What are best practices for creating mockups? (52)

1. Sketching the ideas: as a first draft for organizing your thoughts.
2. Starting with the smallest possible screen: to avoid future complications.
3. Keeping just necessary elements: somehow a minimalist style.
4. Implementing a greed system: for more accurate hierarchy measurement.
5. Using UI and vector elements: to save time.
6. Considering typography, color usage, layouts, navigation and other visuals, which are essential in the structure of a UI.
7. Choosing proper names for different files and layers for better organization and avoiding confusion for everyone in the team.

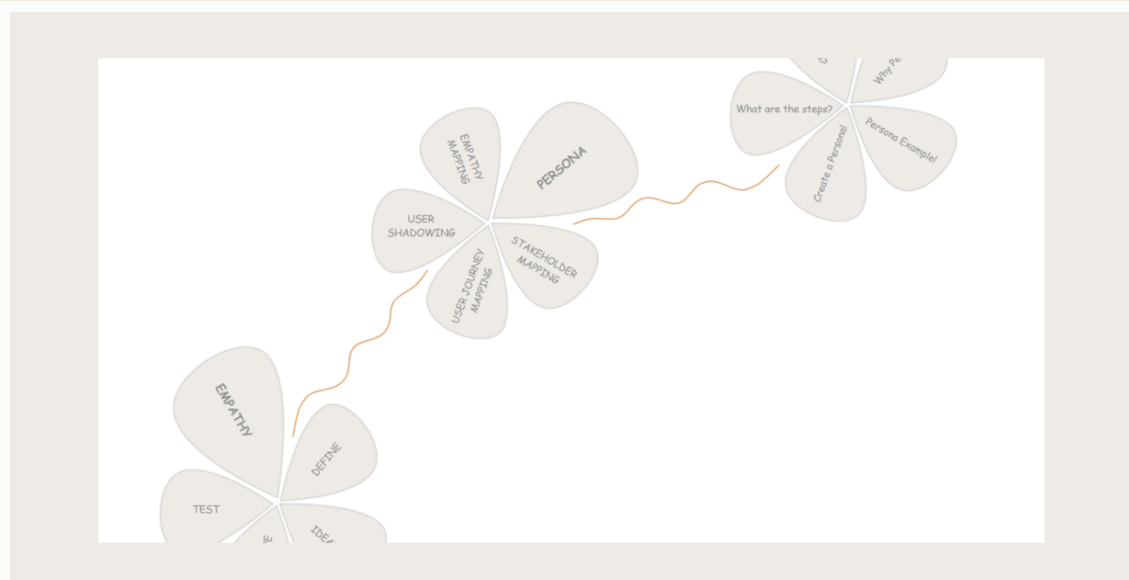


Figure 21. An Example of a Mockup for a Part of the IDTP Homepage for Interactive Walls

Where to find more useful information about mockups?

- [🔗 Best tools!](#)
- [🔗 Anatomy of a mockup!](#)
- [🔗 The guide to mockups!](#)

Table 23. Video Prototyping

What is video prototyping?

- A rapid and powerful prototyping technique, through which the simulation of the interaction with the future system occurs. (43)(45)(58)(59)
- Video prototypes could be any fidelity throughout the design lifecycle. (58)

What are video prototypes used for?

- For illustrating the user interaction with the system. (43)(45)(58)(59)
- For refining a single design. (43)
- For exploring and contracting a design space. (43)(45)
- For simulating mainly sophisticated interactions. (45)

What are the steps and considerations for video prototyping? (43)(45)(59)

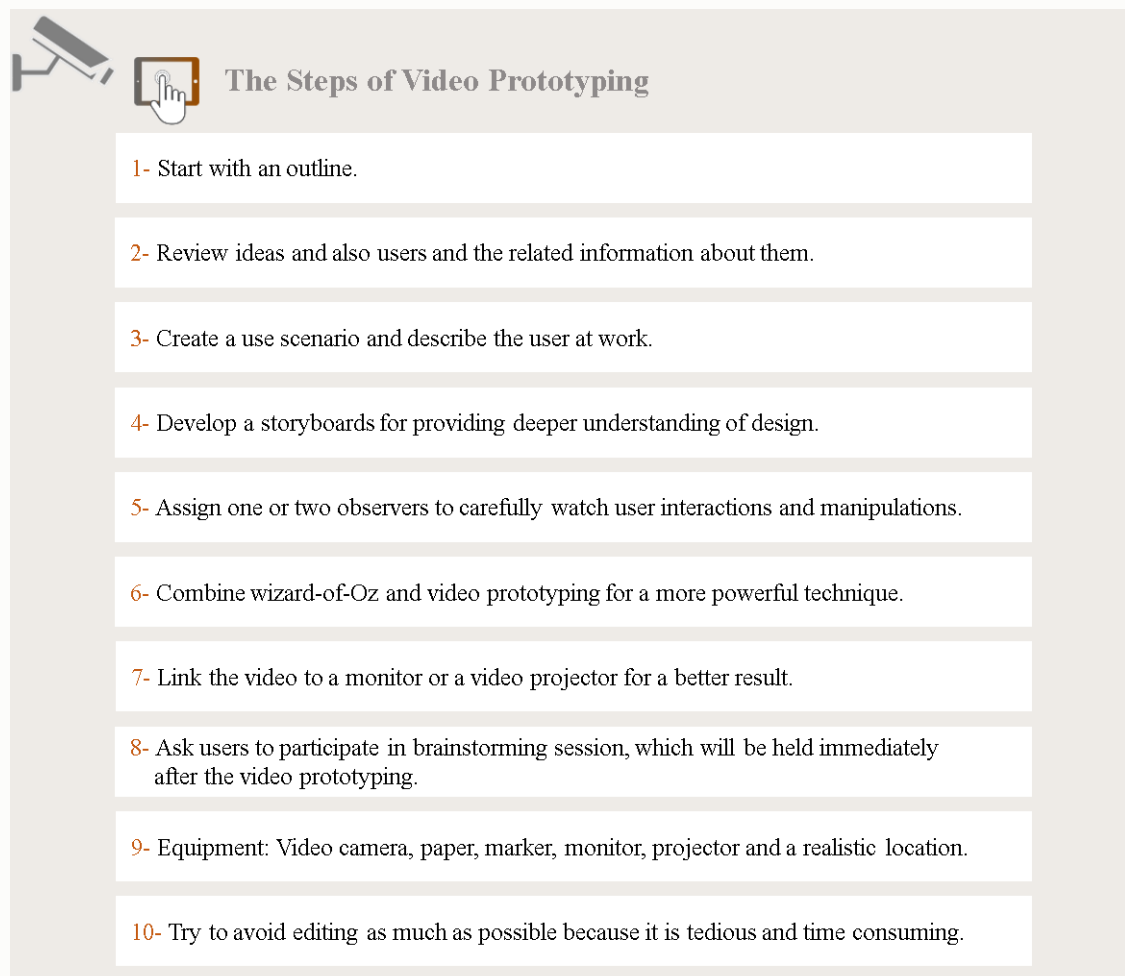


Figure 22. Video Prototyping Steps

Where to find more useful information about video prototyping?

- [🔗 A Coursera video!](#)
- [🔗 Discover whys of the UX!](#)
- [🔗 Tutorial videos!](#)

Table 24. Pictive Prototyping

What is pictive prototyping?

- Pictive is a visual participatory design technique, which merges low-tech objects with high-tech video recording. (55)(56)(57)
- TelePACTIVE is “*an experimental object oriented software prototype*”, which enables non-technical users to contribute and collaborate with experts. (55)

What are the pictive prototypes used for? (55)(56)(57)

- For smoothing design process by empowering users to participate in it through and enjoyable atmosphere.
- Mainly for creating the interface design, rather than evaluating those already created ones.
- For eliminating distance problem and enabling remote collaboration utilizing TelePACTIVE.

What are the required tools for pictive prototyping? (56)(57)

1. Providing users with design objects such as pens, highlighters, notes, stickers, papers, paper clips, labels, scissors, erasers and also menu bars, query fields and other necessary design materials prepared by the developer.
2. Setting the video recording instruments.
3. Asking participants to prepare homework assignments in the form of the job/task scenarios based on their job backgrounds.

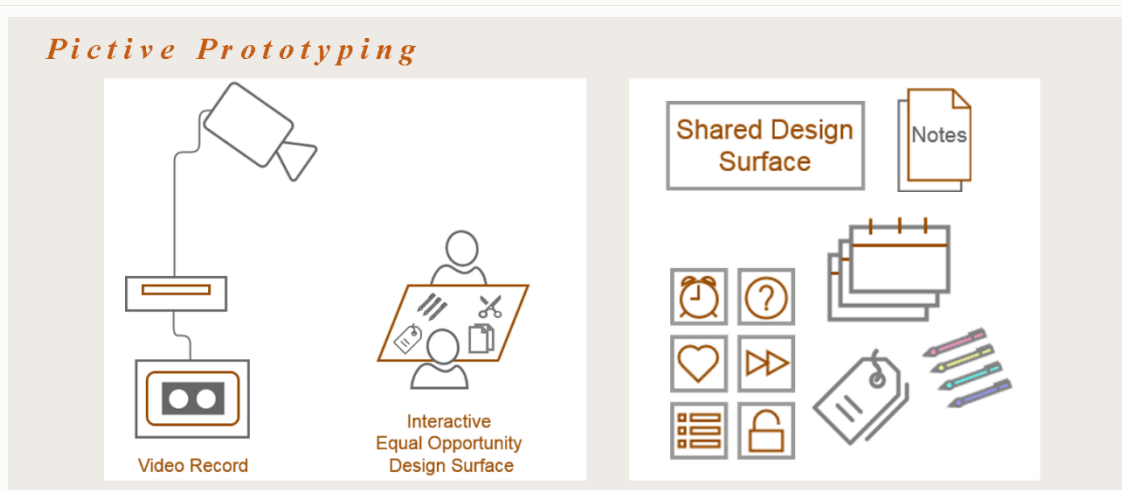


Figure 23. Pictive Design Objects and Setting, Inspired by (56)

Where to find more useful information about pictive prototyping?

- [↻ What is pictive?](#)
- [↻ A pictive demonstration!](#)
- [↻ More about pictive!](#)

Table 25. A/B Testing

What is A/B testing?

- An optimization method, which enables simultaneous comparison between two different ideas of a design and determining the better one. (18)(63)(64)

What is A/B testing used for?

- For comparing different treatments of some design elements and optimizing them in an iterative process. (18)(63)(64)
- For “measuring very small performance differences with high statistical significance.” (64)
- For supplementing qualitative techniques in order to gain deeper insight into customer needs. (18)(64)
- For conversion augmentation, by combining it with UX research methods. (63)

What should be taken into consideration for executing a perfect A/B test? (63)

For each experiment, the following four should be determined:

1. Issue: What is the exact conversion issue?
2. Cause theory: What is your conclusion of the origin of the problem?
3. Variation hypothesis: What do you suggest being modified or changed?
4. Goals: What are your expectations of the results of that change?

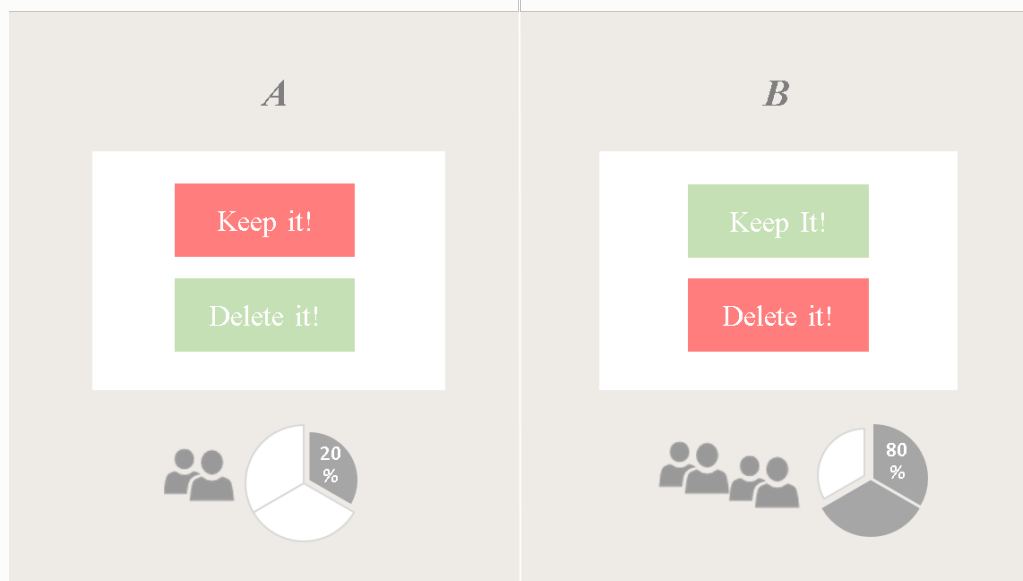


Figure 24. An Example of A/B Testing

Where to find more useful information about A/B testing?

- [🔗 A/B test tool!](#)
- [🔗 Netflix's A/B testing!](#)
- [🔗 The ultimate guide!](#)

Table 26. Cognitive Walkthrough

What is Cognitive Walkthrough? (18)(61)(65)(66)

- A method for evaluating usability issues of a system.
- A technique for figuring out that how well the system is in ease of use by exploration and without training or instructions through asking the 4 questions of CE+ theory (61).

What is Cognitive Walkthrough used for? (18)(61)(65)(66)

- For inspecting the success or failure of the all interaction steps.
- For evaluating user interfaces and discovering usability problems.
- For a quick evaluation of the design in the early stages of the design.

What are the phases of the Cognitive Walkthrough? (18)(66)

Two Phases of Cognitive Walkthrough

1- Preparation

1-1- Selecting suitable tasks to analyze.

- Task: An activity that a user would like to perform with the system being analyzed.

1-2- Providing a task description.

- From the perspective of the first-time user.

1-3- Determining correct sequence of actions.

1-4- Identifying anticipated user population.

- Users with the relevant background to the interface are suggested.

1-5- Describing the initial goals of the users.

- Those goals that the user is likely to form them, when She/he starts the task.

2- Evaluation

2-1- Specifying the appropriate goal structure for the current step.

2-2- Choosing & performing the action based on having an appropriate goal.

2-3- Modifying the changes in the goal structure caused by the user's interpretation of the system's response.

Figure 25. Two Phases of the Cognitive Walkthrough

Where to find more useful information about Cognitive Walkthrough?

- [🔗 How to conduct it?](#)
- [🔗 Special Considerations!](#)
- [🔗 The 4 questions!](#)

Table 27. Heuristic Evaluation

What is heuristic evaluation?

- An informal usability inspection technique. (18)(62)
- A small number of evaluators, preferably double experts, are asked to check an interface out according to some standard rules and comment on it. (18)(62)(71)

What is heuristic evaluation used for?

- For distinguishing and solving usability issues prior to user testing stage. (18)

What are the considerations in conducting a heuristic evaluation? (18)(71)

1. The number of three to five evaluators are suggested.
2. The inspection should be initially individually and finally the findings should be communicated and sum up into a single document.
3. In order to keep the balance of the final report, including both positive and negative findings is recommended.
4. For a better result in the assessment, all the questions of the evaluators should be answered precisely by the observer.
5. In addition to going through “The list of the recognized usability principles”, evaluator is allowed to take the other relevant principles into account.
6. Inspecting each interface at least twice is suggested.
7. Mentioning the reason of a negative comment including the reference.

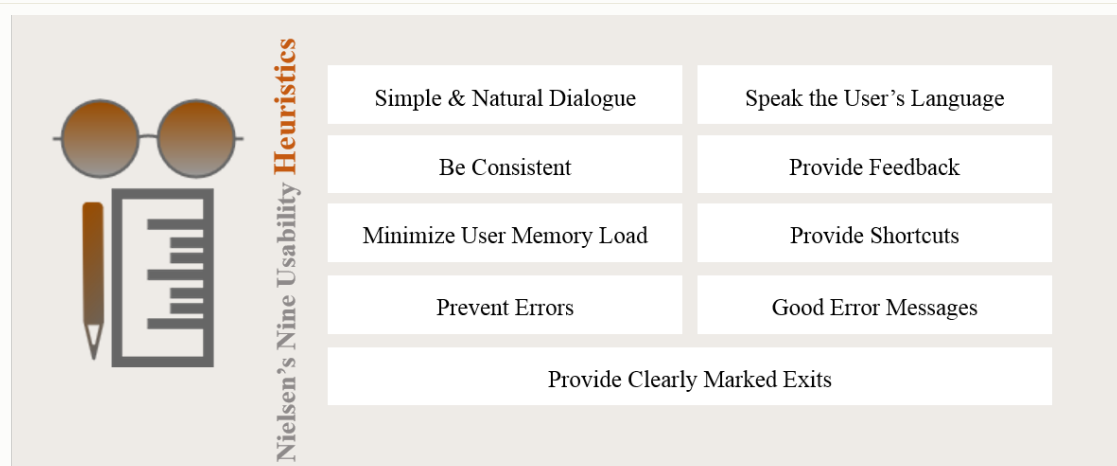


Figure 26. Nine Usability Heuristics, According to (62)

Where to find more useful information about heuristic evaluation?

- [🔗 How to Conduct It?](#)
- [🔗 10 usability heuristics!](#)
- [🔗 Benefits!](#)

Table 28. Thinking-aloud

What is think-aloud?

- An effective and extensively employed technique for the usability evaluation. (18)(67)(68)
- A method, in which the users verbalize all their thoughts and actions while they are accomplishing a task. (18)

What is thinking-aloud used for?

- For revealing all the manners that leads to the delightfulness or frustration of the users. (18)(67)(68)

What are common procedures for the think-aloud protocol? (18)(67)(68)

Two Common Procedures for **Think-aloud Protocol**

1- Concurrent think-aloud:

- Participants do the task and simultaneously verbalize what they are doing, thinking and feeling.
- Problem detection is mostly done by observation.
- “It is more prone to reactivity.”

2- Retrospective think-aloud:

- Initially participants accomplish a task silently and after the task is completed, they are asked to their recorded video and comment on their actions.
- Problem detection is mostly done by verbalization.
- “It is less prone to reactivity.”

Benefits of **Think-aloud**

1- Cheap

1- Robust

3- Convincing

4- Flexible

5- Easy to learn

Figure 27. Two Common Procedures for the Think-aloud Protocol and benefits of Think-aloud

Where to find more useful information about think-aloud?

- 🔗 [The #1 usability testing?](#)
- 🔗 [TA in remote testing!](#)
- 🔗 [Running it!](#)

Table 29. Wizard of OZ (Woz)

What is Wizard of OZ?

- A simulating technique that is adopted in all phases of the iterative design process, in which an experimenter simulates a computer role and responses to the participant's queries. (18)(69)(70)
- The Wizard of Oz paradigm is based upon a story with the same title by L.P.Baum. (70)

What is Wizard of OZ used for?

- For developing and testing user interfaces. (18)(69)(70)
- For receiving feedback by exploring the envisioned interaction of the participant with the system and expediting the interaction theories. (69)(70)
- For making interactive applications without coding. (69)(70)

What are the features of Wizard of OZ? (18)(70)

The Features of **WOz** Testing

- 1- The participant and the player of the Wizard role should be in different places.
- 2- The Wizard should actively watch the participant.
- 3- The more improvement in the iteration occurs, the less interference from the Wizard is required.
- 4- There are various roles in this process:
 - Controller: simulates system intelligence.
 - Supervisor: corrects and overrides the decision of the system or participant.
 - Moderator: simulates sensory data

The Process of **WOz** Testing

1- Make out scenarios and application flows.	2- Put together interface "Skeletons".
3- Develop "hooks" for Wizard input.	4- Where and how the Wizard provide input.
5- Rehearse the Wizard role with a colleague.	

Figure 28. The Features and the process of Wizard of OZ

Where to find more useful information about Wizard of OZ?

[🔗 Detailed info!](#)

[🔗 Faking it!](#)

[🔗 Wizard of OZ in HCI!](#)

4 INTERACTIVE DESIGN THINKING PORTFOLIO

This chapter contains the most significant features and characteristics of the IDTP along with some wireframes. These wireframes are medium-high fidelity and represent the bare-bone of the IDTP.

Good to mention that following the instructions, strategies and suggestions of some of the most well-known UX designers, writers, magazines and platforms such as [Don Norman](#), [Nick Babich](#), [Jon Moore](#), [UX Planet](#), [Justinmind](#), [uxdesign.cc](#), [Tubic Studio](#), [Interaction Design Foundation](#), [Smashing Magazine](#) and so on paved the way for this thesis's author in a better understanding, problem statement and idea generation for creating IDTP.

4.1 What Is IDTP?

IDTP is an interactive design thinking portfolio created by the author of this thesis. It makes the designing life easy for the user experience designers. Because it provides UX designers with the analysis of the best methods for each stage of the design thinking process. Besides, it gives the possibility of managing and prioritizing of all of those projects that are implemented through the design thinking process.

IDTP is the result of utilizing different methods for different stages of the design thinking process. In another word, IDTP is the outcome of the chapter three. Because in chapter three in generating all the artifacts for each method, IDTP was considered as the case and the final product. Consequently, some innovative ideas and insights are developed and this effective product is generated.

IDTP consists of three major sections:

First, it analyzes and describes 25 methods for 5 stages of the design thinking process in a very creative and interactive way. The descriptive tables of the various design thinking methods in chapter 3 is embedded into the IDTP service, which roughly fulfill the educational aspects of the IDTP service.

Second, it provides the UX designers with the possibility of organizing and prioritizing their projects. This is a unique feature that provides the users with a container, in which they could add and organize those projects that they are accomplishing by utilizing design thinking process.

And finally, the last section is about motivation. Motivating users is a very important factor in the success of the product. Based on the fact that the final users are the UX designers, showing them the best of the designs that are generated by IDTP users could be considered as a good source of motivation. In this way, users figure out the effectiveness of IDTP. It would be a proof to the final user's expectations. It also could be considered as a good source of learning about design for UX designers. Because for each suggested design, there will be an explanation that why it is cool. Figure 29, illustrates the architecture of the IDTP.

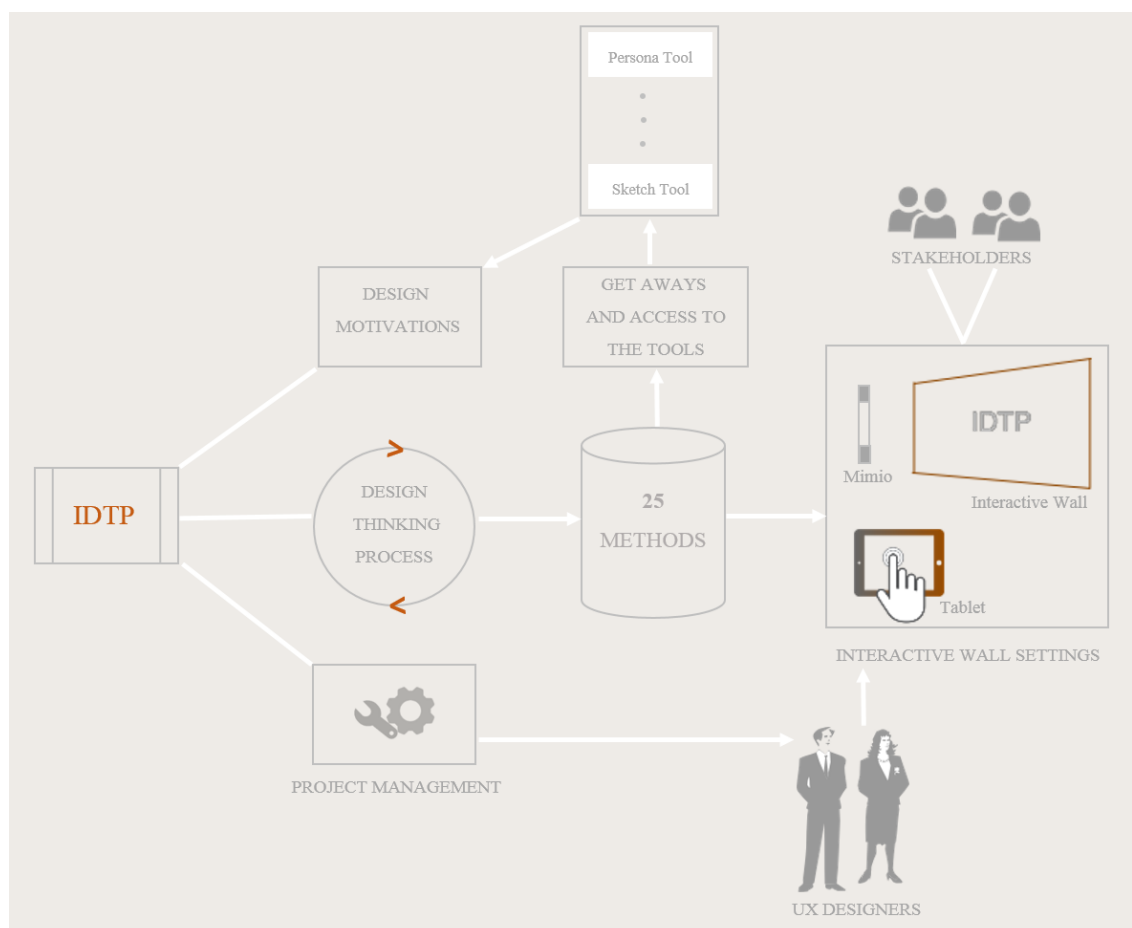


Figure 29. The Architecture of the IDTP

4.2 IDTPS' Main Features

4.2.1 The Homepage of the IDTP

Generally speaking, since a homepage is the first encounter of the users with an online product, it is a considerable aspect and also is one of the most essential factors in the success or failure of the online services. It should be designed in an engaging manner to be able to attract the attention of the expected audiences and acquire their positive reaction. Keeping the balance in feeding the home page with relevant content including texts and images is crucial.

The presence of some elements such as a logo for supporting the communication of the mindset of the product to the users, a navigation for supporting a quick switch between different sections, a searching option for quick finding of elements and a clean and organized content has always been necessary in the homepages. Moreover, recently there has been lots of debates about hero images, which are fundamental toward creating a minimalist design and are becoming an inseparable part of a modern design as an effective and powerful communication tool.

Nielsen believes that: *“homepages are the most valuable real estate in the world.”* and offers 10 guidelines for homepage usability:

“ 1) Include a one-sentence tagline, 2) Write a window title with good visibility in search engines and bookmark lists, 3) Group all corporate information in one distinct area, 4) Emphasize the site's top high-priority tasks, 5) Include a search input box, 6) Show examples of real site content, 7) Begin link names with the most important keyword, 8) Offer easy access to recent homepage features, 9) Don't over-format critical content, such as navigation areas and 10) Use meaningful graphics”
(72)

There are a huge amount of strategies for designing a homepage. From the UX point of view, a homepage should simply contain the vital information for a quick and wise communication of the brand goal to the audiences. Considering UX perspectives and also all of the state of the art characteristics of a homepage, this thesis proposes a simple and

beautiful design for the homepage of the IDTP, which enjoys meeting some modern characteristics for design such as flat design for enhancing usability and visual harmony of the user interfaces, conversational user interfaces, minimalism, custom graphics, animated micro interactions, brutalism, custom grid, specific typography and large thematic image.

Figure 28, illustrates a wireframe of the proposed idea for the homepage of the IDTP. The hero image here talks a lot since it is a combination of a book (a symbol for UX source of information) and an interaction symbol (a hand interacting with a surface). The hand is interacting with a device and keeping a book at the same time. For the sake of the minimalism, all the necessary contents for the homepage are placed inside the hero image. For example, “Design Thinking Portfolio” is written on the waves that are created due to the interaction of the hand with the surface or different stages of design thinking are listed as the inventory of the UX book (the image). The idea is that in the homepage the first page of the book, which includes the inventory is open, and when the user clicks on one of the items (one of the design thinking stages), the book would be flipped through and opens the related section. To make it short, this hero image could be considered as a proper representation of the IDTP. The main content in the homepage is a menu that lists all the stages of the design thinking.

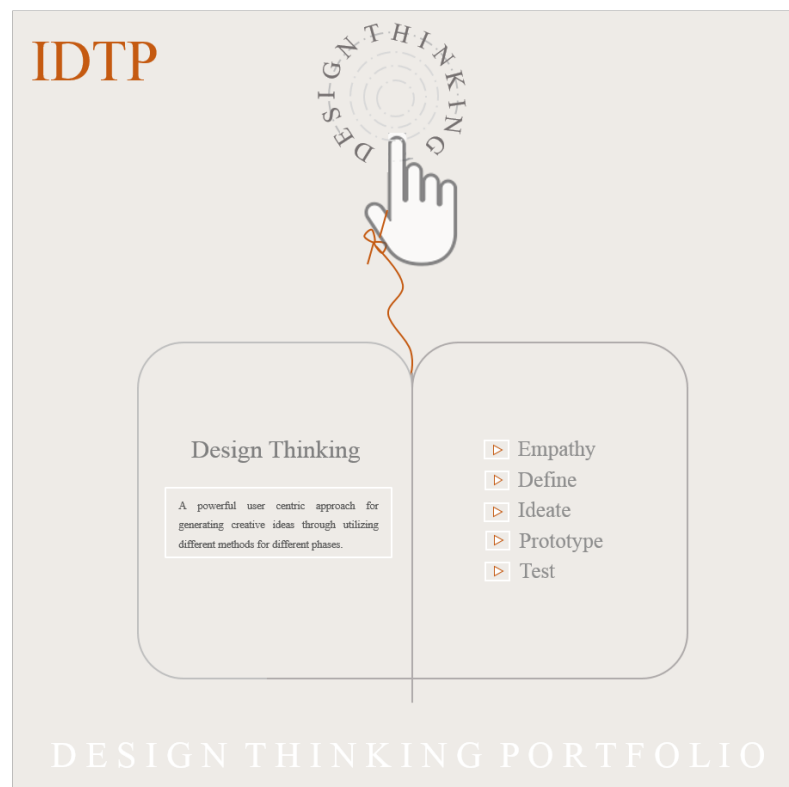


Figure 30. Wireframe for the Homepage

The use of the animation is highly recommended in this design. Animation is a very powerful means for improving UX design if it is used in an appropriate way. Animation is not about entertaining the audiences! It is about enhancing the user's understanding and assisting them in noticing the outcomes of their actions (73). Babich believes: *“We're no longer just designing static screens. We're designing for how the user gets from those screens to actually view content.”* (73)

4.2.2 A Home for Each Stage

As shown in figure 29, a page for each stage of the design thinking is considered, which contains all the necessary information for that stage. Introduction section includes some specific information about the stage such as “what is it?” and “why is it used?”

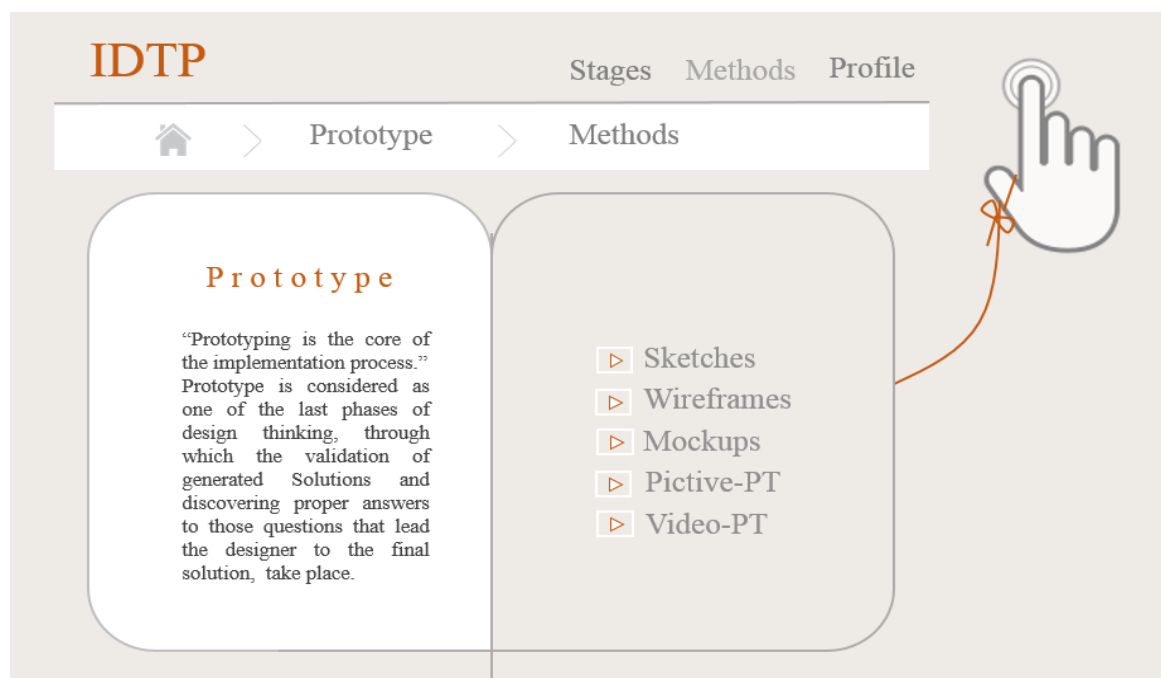


Figure 31. Wireframe for the Main View of the Stages' Homepage (Prototyping Stage in This e.g.)

In order to enhance the usability by letting the users know their current location in the site, the use of a secondary navigation system such as a breadcrumb is suggested. Since IDTP has a hierarchical structure with various categories and sub categories, use of the breadcrumbs is counted as an immense aid for users to figure out where they are, where they could go and whether they should go there or not. In the context of usability, designing in a way that results in the reduction of the number of actions by the users is

preferable. Breadcrumb is one of those elements that leads to the reduction of the actions that should be taken by the users.

4.2.3 A Home for Each Method

Each method is resident in its own specific page. This page contains two main elements: a holistic and comprehensive table that gives all the necessary information about the mentioned method and an example of the mentioned method. Different sections in this page are designed with the purpose of playing an informative and educative role in order to increase the knowledge of the users and preparing them for the utilization of the introduced method. As mentioned earlier, utilizing design thinking methods are the key to achieving a successful and innovative design idea.

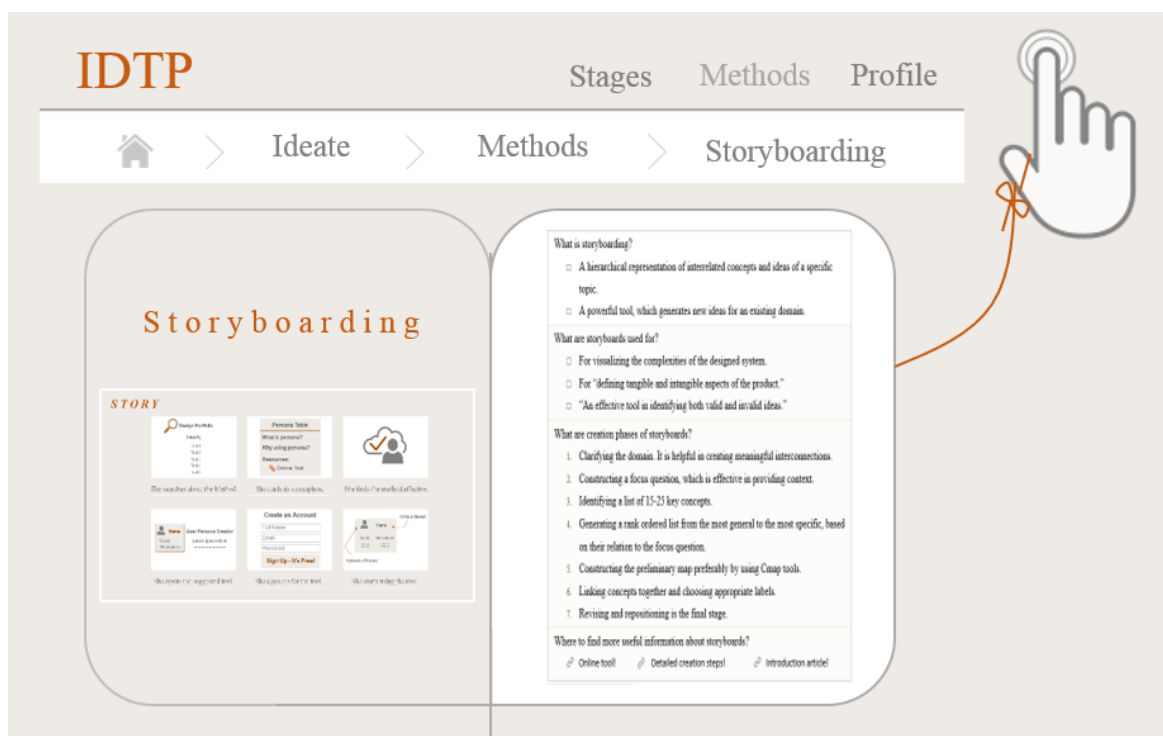


Figure 32. Wireframe for the Main View of the Methods' Homepage (Storyboarding in This e.g.)

In the first section one could find a proper definition to the method. Then some reasons are given for adopting the method. The next section describes the creation phases of the method or some essential guidelines and consideration for adopting the method. Visual aids have always played a key role in engaging users and providing an adequate information and consequently helping them to properly learn and digest the content.

Therefore, for the most of the methods, a sample is generated by the author. Another advantage of these samples is that they are touchable for the users since they are interacting with the case of the examples, which is IDTP. To some people, they may look simply like pictures but the truth is that each example has a lot to talk about and a considerable amount of time are spent by the author of this thesis on finding the best methods, learning and utilizing them and creating those artifacts. Finally, in the last section, the best resources are suggested, where the users are able to find additional trustworthy information about the mentioned method.

4.2.4 User Profile

One of the main features of the IDTP is the profile of the users. Here the user profile is considered as a container for managing those projects that are created by adopting design thinking process. It avoids the user's confusion because when the number of performing projects grows, designers would be dealing with lots of tools and results. So a user friendly environment should be designed for the convenient of the users. Currently project management is done manually. But some thoughts and solutions are considered for automating it in the future by integrating it with other services and online tools. In the following, one could find the description for two main Views of the user profile:

Firstly, there are four main functionalities for each method: create, save, view and %. And to make things easier for the users, different categorizations for different methods and tools is considered as illustrated in figure 31. Pressing "create" button leads the users to the page of the suggested online tool for the related method. This is a place, where users utilize the tool and save the results in their device. Now it is time for uploading the result manually in their profile in the related category. Uploading supports both image and PDF types. "View" gives the option of viewing the uploaded file. And by pressing "%", users would be asked to write down some information that are crucial in task prioritization such as: the deadline for each stage, the importance of each stage, the percentage of the completed task for each stage, the project deadline, the consequences of passing the deadline and considering the payment terms. Based on these information, a calculation would be done automatically based on some algorithms and the result will be shown as explained in the following paragraph.

Secondly, notifications are powerful aids in sending sensitive information to the users. Integrating a proper notification system leads to the increase in usability because it helps the users to realize the most crucial issues and to prioritize them. A smart notification system is suggested for IDTP. Therefore, there is a view that demonstrates the whole projects that the user has created. The name of the projects is listed in a descending order based on the estimated “%” explained in the previous paragraph. The advantage of this style of organization is that it provides the designers with a great opportunity to manage and prioritize their task effectively by drawing the attention of the designers to those tasks that need the most of their attention. This view is shown in figure 32.

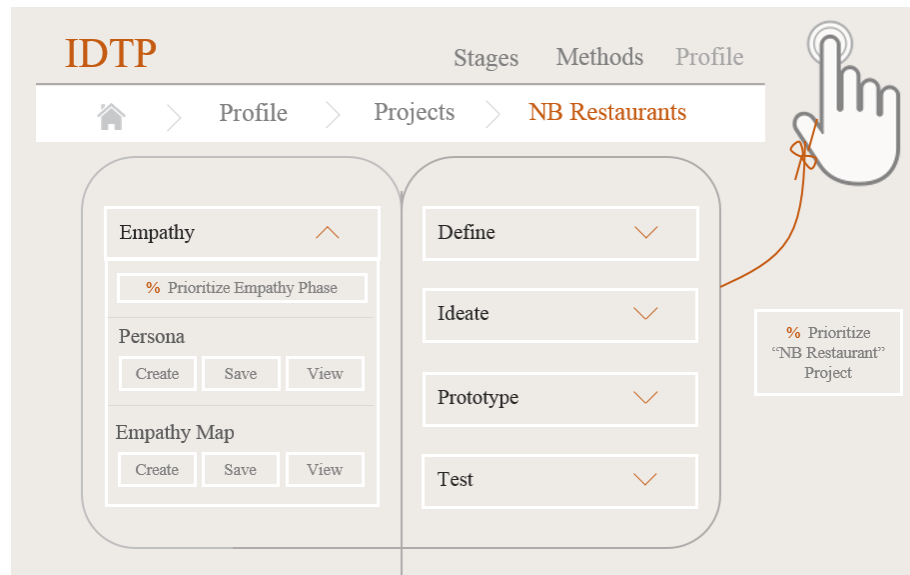


Figure 33. Wireframe for the Main View of the Main Functionalities in the User Profile

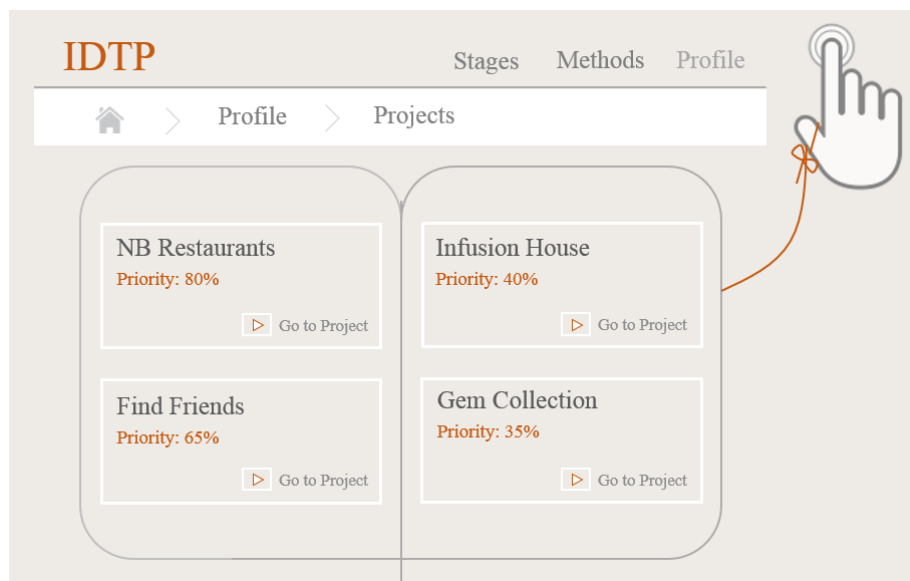


Figure 34. Wireframe for the Main View of All Project's Prioritization in the User Profile

4.2.5 An Interface for IDTP's Homepage for Interactive Whiteboards

Mimio is an interactive whiteboard that attaches easily in any traditional whiteboard and turns that standard whiteboard into a fully interactive and digital whiteboard. It is a light box that is portable and easy to use. Moreover, it is cheaper compared to most of the interactive whiteboards.

The design lab in Lappeenranta University of Technology (LUT) is using Mimio and wishes to utilize IDTP on an interactive wall. Since there would be a big surface with lots of space, the desirable design is a design, which shows all the process of the design thinking process with all the details such as: 5 stages of the design thinking, 5 methods for each stage and 5 necessary information for each method, simultaneously in a single view. Therefore, this section proposes a design that meets those needs and expectations and is available in: <http://d2wlbq.axshare.com/home.html>

Figure 33 represents an interface for IDTP designed specifically for utilizing on an interactive wall by UX designers. This is an ascending approach that initializes with a simple button holding “design thinking” text. Once the designer presses the button, it would be turned into a flower with 5 petals. Each petal indicates each stage of the design thinking. When a petal is selected, it grows bigger to show that it is selected. At this point a stem appears and results in another 5-petal flower that demonstrates 5 suggested methods for the selected stage. Next level appears with the same logic mentioned above and here each petal shows the necessary information for the selected method. And at the end, by selecting each petal, the content would be pulled down out of the selected petal.

This design represents the whole picture of the design thinking process. There is no need for any secondary navigation system since every section is visible and accessible in a single view. It reduces the number of the clicks and enhances the usability. Moreover, the use of animation in the flower petals makes the flow more understandable and easily accessible for the users.

The functionality of the user profile is almost the same as mentioned in section 4.2.4. This is considered in another section that could be accessed by pressing user profile button in the first page of the IDTP.

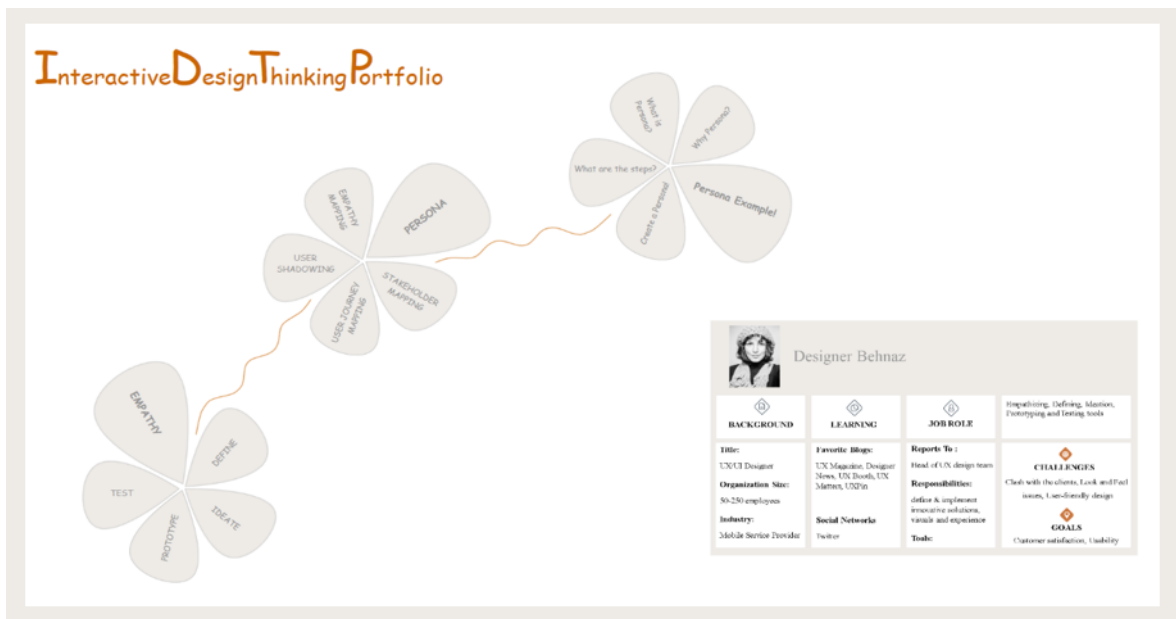


Figure 35. A Mockup for IDTP's Main View for Interactive Whiteboards

4.3 A Scenario of Using IDTP

In this era of technology, mobile phones are an inseparable part of the majority of the people's lives. Mobile devices answer to a bunch of necessary needs of the human beings. Therefore, there is a close competition in mobile phone industry. Moreover, there are considerable examples of the success of those organizations, who figured the importance of the user experience design and adapt themselves to it such as Apple. And there are also some examples of those, who ignored it and faced with failure.

This scenario explains the interaction between IDTP and a UX designer of a mobile phone organization in different steps as following:

1. The UX designer presses the "design thinking" button.
2. Level 1: A flower with five petals appears. Each petal shows a phase of the design thinking process: empathy, define, ideate, prototype and test.
3. Level 2: by choosing each petal in level 1, the best methods for that phase would be shown in another flower with another 5 petals. For example, when the UX designer selects empathy in level 1 then persona, user journey mapping, stakeholder mapping, empathy mapping and user shadowing appears here.

4. Level 3: by choosing each petal in level 2, another flower with another 5 petals would emerge. Here petals illustrate: what the method is, why this method, an example of the method, the steps of the method and the links to the online tools or resources. For example, the UX designer choose persona and all the related information for persona would be shown.
5. The UX designer clicks on one of the links for online tools for persona in level 3.
6. The UX designer would be transferred to an online tool for persona.
7. The UX designer creates a persona and save it on his/her device.
8. The UX designer presses a button named “user profile” on the homepage of the IDTP.
9. The UX designer logs into his/her profile. If the UX designer do not have an account yet, he/she presses the “sign up” and registers in IDTP first.
10. The UX designer adds a new project.
11. The UX designer presses a button named “prioritize this project” and answers to the related questions.
12. The UX designer adds the created persona under the category of empathy.
13. The UX designer presses a button named “prioritize this stage” and answers to the related questions.
14. The UX designer goes to his/her profile homepage. Here the name of the project that is added and the percentage of its priority is appeared automatically. Later when the UX designer adds more projects, he/ she is able to prioritize the tasks and first accomplishes the most important ones.
15. The UX designer wants to create a user journey map but he/she needs to see more samples to get a clearer idea.
16. The UX designer presses a button in the homepage of IDTP named “keep motivated”.
17. The best of created design artifacts by IDTP users would appear with the explanation of why it is cool.
18. The UX designers gets the idea and switches to step 3 and selects user journey mapping and continues to the other steps mentioned above.

Now the outcome of the UX designer’s IDTP profile is a bunch of valuable and creative artifacts that ensures the mobile phone organization gets competitive advantages through

innovation. And consequently, it leads to a noble design for mobile phones as the final product and a satisfactory experience of the customers.

5 CONCLUSION

5.1 Summary

This thesis was represented based on the literature review and design science methodologies. The purpose was enhancing the design thinking knowledge of the user experience designers and providing them with an interactive design thinking portfolio. This study answered to Q1 (How to make life easier for the UX designers?) and Q2 (How to facilitate generating innovative and creative ideas for the UX designers through adopting design thinking approach and utilizing the “interactive design thinking portfolio”?) by representing IDTP as an accredited source of necessary information for the five stages of design thinking. And also by paving the way for the UX designers in managing and prioritizing all of their going-on projects, which utilize design thinking methods and tools.

A proper description of the design thinking and how this process works were clarified. The advantages and necessity of creating an artifact through an iterative design thinking process and how it leads to the generation of innovative and brilliant ideas were indicated.

5.2 Main Contributions

Five stages of the design thinking process were pointed out through literature review: empathy, define, ideate, prototype and test. An overall of 25 methods, five methods for each stage, were analyzed including: the definition for each method (literature review), the reason for utilizing each method (literature review), the creation steps for some methods (literature review), the instructions and considerations for some other ones (literature review), some links to learn more about each method and finally an example of each method (created by the author of the thesis). These artifacts were created by the author of this thesis, utilizing the design thinking methods.

After utilizing the design thinking process and its methods, the outcome was the creation of lots of artifacts for each stage of the design thinking process and consequently the creation of IDTP out of those artifacts. It was developed as an effective and interactive tool

for the UX designers, which gives a holistic representation of the design thinking, design thinking stages and design thinking methods. Another main contribution was providing the UX designers with a unique and well-ordered home for managing and prioritizing all of those projects that they are accomplishing by adopting design thinking methods.

A medium-high fidelity prototype was created. This prototype is the collection of several wireframes that depicts the detailed user interfaces, the structure, the main functionalities and views of the IDTP.

A specific design for IDTP for utilizing on interactive whiteboards such as Mimio was represented. In the following, there is a link to this innovative, nice and neat design idea that is developed by the author of this thesis by an advanced prototyping tool named Axure: <http://d2wlbq.axshare.com/home.html>

5.3 Extensions

Most of the functions are currently getting done manually by the users, such as uploading for example the created Persona and adding it to the empathizing category. A suggestion for the future work is the automation of the IDTP and its adaption to the service oriented architecture (SOA) technology and its integration with a collection of several online services. This connection makes the process of the user' profile management almost automated. In this way, immediately upon the creation of an artifact by the user through clicking the provided link by IDTP to an online tool, the results would be automatically saved in the user's profile. This means that IDTP would send a message to an online tool and requests for the artifact that the user of the IDTP has created. Then the online tool would respond with returning the requested file. Developing this process needs lots of programming and a considerable amount of time because we are not talking to connect with only one service, the goal is the integration of the IDTP with at least 20 online tools for different stages of the design thinking.

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