The role of user research in the development of digital products

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Some names were changed to their initials for GDPR reasons.

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List of abbreviations

HCI: Human computer interaction
IOS: Iphone operating system
KPI: Key performance indicator
LTM: Long term memory
n.a: No author
n.p No place
STM: Short term memory
SUS: System usability scale
TB: Term base
UI: User interface
UX: User experience

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1. Introduction

1.1. Problem state

Digital products and the digital era are a subject that has been established since the last two decades into the everyday life of the human being. The interaction created between humans and technology is a process that was born out of the necessity of society to adapt to the era that we are currently living in. This interaction has two factors that shaped it into the reality. The first of them is the user research, which is defined as the systematic study of the goals, needs, and capabilities of users so as to specify design, construction or improvement of tools to benefit how users work and live[1]. The second factor is human cognition, which is defined as the mental action or process of acquiring knowledge and understanding through thought, experience and the senses[2].

Since inside the studies done by user research, human cognition is implicitly included, these two factors are closely related to each other. A user that is manipulating for a product for the first time, necessarily has to go through a mental process to understand the tool, and then to use it. On the other hand, if the user already knows how to use it, they must remember previous processes previously made in the past to use it again. The increasingly interaction between humans and machines has moved the scope from Humane Machine Interaction (HMI) to Human-Machine Relationships built upon the ability to learn across domains and enabling the resolution of multiple tasks (in advance)[3] Before the digital era, the relationship between humans and technology was established more as an interaction than a relationship, but with the pass of the decades, this interaction has evolved into a human-machine relationship itself. As relationships between humans and technology nowadays are so important and in constant change and improvement, it is decisive to understand and analyze the role of user research, and human cognition in the development and understanding of digital products.

[1] Schumacher (2010, p. 5).
[2] Cabridge cognition (no date).
[3] New European Media (2020, p. 9).

1.2. Importance of analyzing user research

Nowadays organizations and companies want to create fulfilling experiences for their users, but it must be kept in mind that researchers and designers are not the final users. Due to time management problems or budget reasons, companies often forget to include their target market in their product development processes. This leads to businesses developing and releasing their products without having a direct contact with their user, which drives the results from a product that doesn't fulfill the user's needs, to a product that is difficult to understand since the human cognition and the user's needs were not taken in consideration through the process.

The goal of doing user research is to discover what are the user´s pain points, and sometimes what engineers and designers understand as pain points are not exactly what is problematic to people. Also, there is a notion that doing a research is a scooping activity where the researcher goes to the user's typical environment, getting all the needs and aspirations from a short conversation with them. This mindset is a mistake, because the research must not only do a scoping process into the project, where a lot of information can be left behind, but has to dig into the situation to get all the insights settled in the goals, which implies a lot of planning and deliberation.

Without this kind of input, companies put in risk their money, just for the fact that they didn't do the relevant task of understanding how their user think. If the company researches this kind of information from the start, it will lead to the design of better products, services and experiences, and therefore make more impact in the users.

Doing user research is relevant for having reframes, which are defined as the crucial shifts in perspective that flip an initial problem on its head[4]. In order to have this reframes, it is necessary the rigorous analysis and synthesis of data. This analysis leads the research to possibilities that were not taken into consideration in terms of design or innovation. Reframes will also help to understand why the raised solutions would succeed or fail depending on the circumstances.

1.3. State of research

Biological mechanisms that have governed the human evolution for 3.5 million years have been disrupted by the development of human cognition and cultural behaviors[5] .

[4] Portigal (2013, p. 5).
[5] Bryan C. Valerye, Mussgrove and Powers (2018, p. 404).

The study of human behavior and human factors, is something that has been done since the beginning of human existence. Human behaviors are taken in consideration for analyzing the development of a society or a culture because since the beginning of human life, the human being had developed different tools to supply their needs, and depending on their level of development of the civilization, anthropologists could determinate if this society was developed or not, or how complex were their mental processes. From creating a spear to hunt a prey, to creating a digital product for sending e-mails. The fact that humans are always creating objects to supply their needs is one of the main characteristics that differentiates our race from other animal species.

The real study of user research started in the era of industrial revolution. The principles of this era based on productivity and workflow, helped to start a research on how to create tools that would make people produce more in their working hours. The invention of machines to mechanize labor increased the production quantities, and certainly, this increment of production took place when the machine´s producer understood the purpose of It, in order to redesign for its improvement according to the workflow process. The craftsman based his work by observing what the operator had to do to operate the machine, and then designing the specific too, based on this observation. Frederick Winslow Taylor and Henry Ford were the pioneers of the establishment of ways to make human labor more efficient, productive and routinized[6].

The first half of the 19th century saw the ergonomics field emerging, motivated by the world war I and World war II. The human factor departments focused on the design of equipment and devices to align with human capabilities at its best.

In the year 1955, an American industrial designer with the name of Henry Dreyfuss created the classic text “Designing for people” where he states:” When the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed. On the other hand, if people are made safer, more comfortable, more eager to purchase, more efficient—or just plain happier—by contact with the product, then the designer has succeeded.”[7] This shows even from times before the digital era the importance of interaction between humans and tools.

Parallel to the time Henry Dreyfuss was writing his book, other academics were developing a new research into what today is known as cognitive science. This

[6] Tariq (2015).
[7] Dreyfuss (1955, pp. 25–26).

discipline combined concepts like machine and artificial intelligence with human cognition (human capacity and short-term memory specially). The concern to study this science came from the potential that the researchers saw in computers serving as tools for augment human capacities.

In the 70´s Xerox with their research arm PARC, who was in charge of exploring innovations in the workplace technology, gave the opportunity to users to interact with human use computers by using computer interfaces that are still used to this day, as for instance the use of icons, windows and commands.[8] In 1988 Donald Norman, who would be the former "user experience architect" from Apple, wrote the book "the design of everyday things" that determined the importance of design for functionality and usability rather than aesthetics. Norman was the first person to introduce the term of user experience, which was previously called "human interface research".

"Experience is critical, for it determines how fondly people remember their interactions. Was the overall experience positive, or was it frustrating and confusing? When our home technology behaves in an uninterpretable fashion, we can become confused, frustrated, and even angry—all strong negative emotions. When there is understanding it can lead to a feeling of control, of mastery, and of satisfaction or even pride—all strong positive emotions. Cognition and emotion are tightly intertwined, which means that the designers must design with both in mind."[9]

After this decade and until the end of the 90´s with the arrival of the internet, many of the trends listed before assembled between each other. The field of human-computer interaction was the result of the union of graphical user interfaces, cognitive science and the process of developing collaborative design for the people. Given the fact that the population had more access to computers, this spread the concepts of interaction design and usability. This cognitive awareness of processes has enabled an improvement on the existing working methods, since it gives a space into a division and specialization of labor, and therefore a better product as an output, consequence of the process.

With the arrival of the internet, the appearance of jobs related to user research and user experiences started to emerge. Having an established job position inside a

[8] Holusha (1988).
[9] Norman (2013, p. 10).

company with the titles of web designer or user researcher, gave to the industry a wider understanding about the field. Lastly, the cognitive, perceptual functions and theory methods in behavioral sciences established themselves as the three forces that created the nucleus of what is known today as user research. As reflected before, user experience, user research and technology are directly related. Hence, with the evolution of technology this fields are also expected to evolve.

1.4. Research question

This academic thesis is focused on answering this research question by the end of the research:

How can user research be applied in the development of a digital product?

Accordingly to the input that is going to be received from theoretical and practical research, this question is going to be answered.

Objectives

Beside answering the question and proving the hypothesis written above, this research is going to focus on reaching the following objectives:

- Define the role and steps of user research inside the development of digital products.
- Analyze what is the role of human intuition in the user experience of a product.
- Deduct what is the relationship between cognitive processes and user experience.

1.5. Structure

This thesis was conducted through a consequent structure that is going to allow the accomplishment of the goals listed above. First, a theoretical investigation was developed, based on authors, publications, books and articles to explain subject of user research, and the significant factors around it. Therefore, subjects like how to plan a research, types of qualitative and qualitative research and how to analyze results were also taken into consideration. On the other hand, the theoretical section of the research also focused on the concept of human cognition, the principal implications around it and the role that mental practices play inside this process. It is

significant to explain the human cognition from the psychology and mental processes perspective, to get a broader view of the topic.

The empirical part was divided into two sections. The first section, is focused on interviews to experts on the field of user research, user experience and digital products, to get to know their experiences and perspectives on the topic. This data was compared to the findings of the theoretical part in order to come to a conclusion. The second section of the empirical research is based on the application of user research and the testing of a product that was made to be developed for a company in the field of machine translation located in Berlin, to clarify and understand how important is the use of user research on the development of a digital product.

Beyond the methodological requirements, this research aims to fulfill indispensable requirements related to novelty, actuality and originality on the treatment of the subject, and the existent possibilities of it when is being introduced into the practice, to help a business in specific. Other objectives that this research looks to accomplish are to enlarge the limits of scientific knowledge, a critical evaluation on the bibliography, and adequate management of the investigation techniques.

With these theoretical, practical and test phases, the conclusion is made based on the input received from all the scopes of the research. This conclusion is created from what´s established in the introduction. Just as the introduction section of the thesis formulated the research question, objectives and sub questions, the conclusion answers all of the questions at the end. In the given case that the Hypothesis is not confirmed or the research question is not answered, an argument explaining the outcome will be produced. The main objective from the conclusion, is to summarize all the thoughts and theoretical and empirical inputs in order to convey the significance of the study.

2. Literature research

2.1. Definition of user research

This term has been defined by a variety of authors through the time. A very important piece of user research is referred to the usability component. Christian Rohrer, eBay's user experience research director states: "User experience has evolved from addressing mainly utility, to usability, helping users accomplish their goals, eventually becoming an issue of desirability, which meant liking the way the product looks and

feels [10]. Other author explains User research as “the study of people's (user´s) behavior, motivations and needs in a particular context which affect how people understand and use this in their daily lives. Market and user research have different sets of objectives and outcomes[11]”. Lastly, user research is also defined as the systematic study of the goals, needs and capabilities of users so as to specify design, construction or improvement of tools to benefit how users work and live[12].

User research is a derivative from behavioral sciences, which converts it in a systematic study, so it must be thoughtful and well planned. Hence, the researcher must have knowledge about how to perform a research and the tested product as well. Secondly, the human being as a thinking being has goals and sub goals and looks after a way to fulfil them. The task of the user researcher is to gather the goals they have established in the past and determine how well they met by the use of the tool. By understanding these goals, the use of the tools can become realistic. And thirdly, user research is dedicated to build or improve tools for users, theoretical science is not[13]. User research can be done remotely or face to face and moderated or unmoderated depending on the project in discussion.

User research is also be used to be applied to other outcomes different than digital tools ,being valuable in both ways. For example, if the results provided by a user research can be helpful for other departments inside a company (e.g. marketing), despite the fact that the outcome of the research is not for a digital product, the output is being useful to benefit the living of users. In the other hand, the poor usability of a product can be reflected as a bad perception of a brand. The relationship between brand and usability is complex but nevertheless inevitable.

2.1.1. The researcher profile on global research

The profile of the researcher is a critical criterion to consider when doing user research, because all the relationships and outputs that come from doing this research will relapse in this person. The complete understanding of the purpose of the research objectives will be reflected on the success of the study.

There are profiles that must be included for doing a research process depending of the size of the research. In the case of doing a global research that involves a

[10] Ehrlich *et al.* (2005).
[11] Marsh (2018, p. 1).
[12] Schumacher (2010, p. 6).
[13] Schumacher (2010, pp. 6–7).

considerable number of countries, one of them is the project manager, who is in charge of controlling the budget, times, stakeholders and human resources that are going to take part of the project. This person will delimit the range of all the services acquired for the investigation, such as deadlines, their schedules, payments, tracking the stages of the project deliverables and currencies[14].. For the final part of the project, the project manager will be commanding the review of the final report and their conclusions. The most important questions to be asked are if the final report is addressing what was wanted to be answered, and if the objectives correspond to the final input from the research.

Another influential profile on the process is the senior researcher, who is responsible for the implementation of the work in the countries involved in the research. This person defines the information that is going to be taken from the study, the final structure of the final report, makes a briefing session, develop an individual plan for every country to pinpoint the elements of the research when the research is done in several countries, solve the problems that can come up along the way and merge all the different reports into a final one, with the respective recommendations in order to take action from the conclusions. This senior researcher profile is also supported by a Junior researcher. This person is in charge or reviewing the transcriptions of the sessions and analyze quantitative data that may come up during the research process. Lastly, when doing a global research, every country should have a local researcher, that would be in charge of the implementation of the fieldwork previously discussed with the senior lead researcher. For this implementation, a number of tasks have to be kept in mind, such as management of the local recruitment, implementation of the testing and completing the report for further deliver to the senior researcher. Nevertheless, other people can also take part of user research, such as translators, interpreters and external agencies that can make the work easier for the research. Among the main attributes that make a researcher a complete one, are the capacity of being open-minded because there is a chance that they might deal with different cultures and behaviors during the research. Being flexible, since the plan that was once proposed in the beginning, can fluctuate during the research and therefore there can be some situations that were not expected[15]. This is why the researcher profile needs to be decisive and organized.

[14] Schumacher (2010, p. 38).
[15] Schumacher (2010, p. 41).

2.1.2. User research in Germany

Usability testing has become more common in the country of Germany during the past few years. Nowadays big and small companies offering usability testing services are locating in Germany.

Research in Germany is conducted mostly in main cities as Berlin, Hamburg, Frankfurt, Munich and Cologne[16]. Conducting researches among the country sometimes can be quite challenging, due to the several dialects spoken between the regions. A percentage of the German population can speak and understand English, and in some cases French or Spanish as well. The geographical and historical aspect also plays a role in the language understanding. For instance, people located in the border with France, are more likely to speak French rather than English, and people located in the former German Democratic Republic, used to learn Russian instead of English. 65,5% of German workers declare not to have good knowledge of English[17], which means that assets like translators or interpreted might be required for conducting the research. For doing testing in Germany, it is highly recommended to do it over the weekday, due to the value that Germans give to their free time. The history of research in Germany has shown that the average dropout rate is approximately 10% for user research studies, depending on the study and the time of the year. For this reason, is better to recruit an additional 10-15%, in case there are any dropouts[18]. German population is known for being very direct and going straight to the point, which means that in terms of digital interfaces, they prefer neutral layouts without any overloaded design, since they see digital tools in a utility-driven way[19].

Depending on the research target, the tested material should be in German or English, and it must be kept in mind that the material language can have a relevant influence on the research results.

2.2. Research planning

User research has sometimes very unexpected results, due to inherent challenges that can come up like language barriers, environment, and people characters in general. Planning plays a significant role in the research in order to have as controlled

[16] Schumacher (2010, p. 214).
[17] Groll (2013).
[18] Schumacher (2010, p. 214).
[19] Schumacher (2010, p. 216).

as many aspects of the process as possible. The first point to consider when doing user research is the establishment of the problem and objectives that are going to be investigated through the investigation[20]. Without a problem the investigation will turn very difficult to manage, and therefore, useful findings will not come up as a result. Bad research is superficial, not inviting to any analysis and does not bring new knowledge.

For creating an objective, the opinion of the stakeholders must be considered. Agreeing with them on the objectives upfront avoids future creep[21]. Meetings must be arranged with them in order to receive the knowledge that they have and their opinion regarding the situation. The purpose of these meetings is to cover topics as their beliefs about the customer, the final user and what the stakeholder's think is an optimal solution for the problem. Other materials as previous reports, existing products and developed prototypes must also be examined before conducting research[22]. This discovers the pressure points and potential target for the research. The researcher will get to know about the background of the story by seeing the situation through the eyes of other people as the stakeholder and determine the priorities, in order to write down the objectives. Questions like: What is needed to be measured, what are the independent variables to be controlled and how to analyze the given data, give light into the further planning of the project and help the researcher to understand the nature of the problem.

Test plans are valuable documents for the study. This document is a plan that must be shared among the people involved to align everyone into a goal in common. It is written with the goal of setting the expectations of what is intended to be found, because the recipients of the results should know the purpose of the research, how it is being done and what results are expected from the investigation[23]. This document must contain aspects like the objectives for the research, target user's description, methodologies to be used, schedules of the project, props needed for the test, responsibilities of each member, sketches of the setup and expected outputs based on the established goals[24].

[20] Schumacher (2010, p. 54).
[21] Marsh (2018, p. 15).
[22] Portigal (2013, p. 37).
[23] Goodman, Kuniavsky and Moed (2012, p. 64).
[24] Schumacher (2010, p. 61).

2.2.1. Recruiting participants

All products, whether they are digital or not, are aimed to a specific market, and the important question to be made when recruiting a candidate for the research is: Who is needing to be understood for this product in particular?[25] Before conducting the research, the researcher must do the task of visualizing the ideal participants for thee product and imagine the kind of people they see potentially doing the research to. If the wrong participants are tested, the results don't have any value due to the lack of veracity of the findings.

For recruiting the participants, the first step to take into consideration is to screen the contributing participants. Regardless if this step is going to be done by the research team or a recruiting agency, the process begins with identifying the main characteristics of the ideal research candidate, based on the creation of personas. This is developed with the creation of a recruitment brief and a recruitment screener. The recruitment screener is a list of questions created to identify potential candidates and filter them for the actual research, and the recruitment brief, describes exactly the profiles of the people going to be involved in the research and the number of the sample[26].

Describing the characterization of the users involves identifying the relevant behaviors, skills and knowledge of the person using the product[27]. These characterizations can be found in previous work made by the company such as marketing studies and product specification documents. One of the main criteria when classifying groups is the participant expertise. This expertise classifies the people who are going to take part of the investigation, in order to equal the conditions for all of them. This aspect must be identified on the early stages of the research for every group in an objective way, during the screening calls for the participants.

After the participant initial visualization, requirements and classifications are done in order to have a deeper identification of the user profiles. According to the requirements they fulfill, the participants are classified into group. With this category division and visualization of the ideal participant, the profiles are be made for each target audience. The groups may have aspects in common and aspects that differentiate them like their expertise level.

[25] Marsh (2018, p. 31).
[26] Marsh (2018, p. 33).
[27] Rubin and Chisnell (2008, p. 115).

The number of participants to be tested is a relevant factor to consider as well. This is affected by variables as the number of available resources of time and budget to conduct the test, the availability of the participants and the test duration. If the research is aiming to have quantitative results, a bigger number of participants will be needed to have a considerable input to conduct the analyses.

Another option to find participants is to hire agencies or external companies to do this step of the investigation, which depends mainly of variables like time and budget, due to the fact that outsourcing this kind of services increments the costs of the project. These agencies take charge of recruiting the right participants for the research, hire specialists and rent facilities to do the tests and do iterative rounds of research to have a more thorough investigation.

2.2.2. Budget

Budget varies between one project to another, but it is considered under these four aspects: People's time (Researchers and participants), recruiting and incentive costs, equipment costs and travel costs[28]. Depending on the type of research, the costs and time can increase or decrease according to the resources needed.

Figure 1 shows the average duration time of some research methods. Figure 2 and 3 respectively show an excerpt of a budget research plan for a Usability test and focus group for a company.

Task	Time
Preparation for a single research project (for just about anything other than repeated research)	Ten hours
Recruiting and scheduling	Two to three hours per person recruited

[28] Goodman, Kuniavsky and Moed (2012, p. 65)

Task	Time
Conducting research	Five hours per person
Observational research	Three hours per group
Focus groups	Three hours per participant
Usability tests	
Analyzing results	Five hours per person
Observational research	Four hours per group
Focus groups	Two hours per person
Usability tests	
Preparing a report for online delivery	Twelve hours
Preparing one-hour presentation based on report	Six hours

Figure 1. Average duration time for research methods (Rubin,2008)

Five Usability Tests

Preparation	10 hours
Recruiting and scheduling (assuming 40 participants—32 regular and 8 competitive)	80 hours
Conducting tests	120 hours
Analyzing tests	80 hours
Writing report and presenting results	15 hours
Integrating with development (meetings, presentations, etc.)	10 hours
Total time	**315 hours**
Recruiting incentive (25–40 people)	$2500–4000
Supplies (food, videotape, etc.)	$500
Total cost (not counting salary)	**$3000–4500**

Figure 2. Budget for as usability test (Rubin,2008)

Focus Groups

Preparation	10 hours
Recruiting and scheduling	40 hours
Conducting and analyzing groups	20 hours
Writing report and presenting results	15 hours
Integrating with development	5 hours
Total time	**90 hours**
Recruiting incentive	$2400
Supplies (food, videotape, etc.)	$400
Total cost	**$2800**

Figure 3. Budget for a focus group (Rubin,2008)

Quantitative research times varies according to the variables like the time and level of expertise of the researcher. The use of software or technology tools such as eye

tracking specialized software for documentation, and rental of facilities or laboratories to conduct the research also affect the final budget[29].

Methods like ethnography or usability tests are more expensive than other methods like guerilla testing or surveys, nevertheless, the resources and research goals for the project, are factors which decide which method is more suitable for the research. Regardless of the available budget for the investigation, the quality must never be compromised. Tools to maintain quality are for instance low fidelity prototypes, running tests with small numbers of users but more frequently, developing an in-house recruitment process instead of doing it by outsourcing and practicing the remote testing approach (The research is conducted remotely instead of personally).

2.2.3. Written resources for conducting the research

2.2.3.1. Incentives

Incentives are an attractive but not necessary way to attract participants to take part of the research, nevertheless, the use of them decreases the possibilities of having last minute cancellations. The quantity of money to pay depends of the participant profile, the type of research, level of complexity, required time from the participant and the budget intended[30]. It is allowed to pay the participants with different amounts of money, since there are some groups that can bring more value to the investigation. For instance, a participant with a specialist profile is going to expect the offer of more money for the test than a novice. In case the research is done face to face and the participant does not live where the research is taking place, all travel expenses such as accommodation, alimentation and transportation tickets must be covered[31].

On the other hand, the incentives don't have to be paid necessarily in cash but they can be given in vouchers[32]. Is recommended to give vouchers not related to the products offered by the company, because when giving incentives with products related to the business, the participants feel influenced to be positively inclined to anything showed during the test.

2.2.3.2. Consent and non-disclosure agreements

[29] Marsh (2018, p. 68).
[30] Marsh (2018, p. 30).
[31] Consolvo *et al.* (2017, p. 9).
[32] Schumacher (2010, p. 65).

When collecting information about a participant, the research team is in the responsibility to protect this data. It is required to sign an agreement, which must be done during the screening stage[33]. This gives the opportunity to participants to decline before starting if they don't agree with any point, showing that the participation is voluntary and they can stop at any time[34].

The consent of information and non-disclosure agreement is done by a release, which is the legal document that clarifies the rights of every part (researcher and interviewee). This document contains the statement where the participant agrees on having a voluntary participation of the research and being recorded during the test/interview, as well as the compensation (monetary or vouchers) for doing part of it and the compromise to not share the test events with anyone outside the research team.

The participant´s personal information should not be shared with third parties. The partaker is in the right to know the reason for collecting this kind of information to know for how long and how is going to be used for. The participants identity must remain anonymous. This is why during the tests/ interviews, the names of the participants cannot be named, due to the fact that these videos are going to be seen widely in the company. For the moment of labeling the recordings, the anonymity of the users must also be kept in mind. For this, numbers or letters can be used to label them.

2.2.3.3. Recordings

Depending on the type of research, the recording resources might vary to conduct the investigation. For an interview, a camera and a microphone will be enough for conducting the investigation regardless if it is done remote or physically. For remote research, conference applications like WebEx or Zoom allow the recording of the chat and can be saved as resources to analyze for the moment of drawing the conclusions. For other research methods like usability testing, a camera is also a valuable resource to use, but it needs the use of other tools in order to get the usability data. Nowadays software for record mouse clicks, keyboard input and texts are available to apply into the process[35], nevertheless, the use of them varies according to the budget of the project. When doing remote testing, the researcher must make sure that the person

[33] Marsh (2018, p. 39).
[34] Portigal (2013, p. 45).
[35] Schumacher (2010, p. 81).

who is doing the test has the adequate environment to run the test, by downloading or accessing a screen-sharing software or remote usability vendor services and making them feel as comfortable as possible.

2.3. Stakeholders

Stakeholders are defined as “any individual group who can affect or is affected by the actions, decisions, policies, practices or goals in the organization”[36]

The stakeholder engagement throughout a project is integral to success[37]. The presence of a stakeholder during the research sessions positively influences the result from the investigation. It can happen that the stakeholder is not present during the research process due to different factors, such as lack of time on their schedule or lack of interest, but is the challenge of the research team to keep them motivated to be more involved and understand the value of the investigation. There is also the possibility to have stakeholders who are against the perspective given to the investigation, since they are looking for a quick fix to solutions, already concluding without any previous investigation[38].

The research team must maintain a pattern of communication of the details to external parties, to listen to the different stakeholder´s needs in order to do a proper plan of the study. This communication between stakeholders and researchers is relevant for the research since the stakeholders will make use of the data once the study is done. Hence, they need the most accurate information as possible, for taking further product decisions.

The first step for this communication channel is made by meeting the stakeholders (Market researchers, engineers, designers, customer support agents, other use of experience specialists, technical writers, business analysts, and legal experts)[39]. These meetings are done before conducting the actual research, to understand what is the problem that is being experienced, why is now the right moment to solve it, what are the goals of the product and their wishes and concerns. By having this output, the researcher categorizes these needs according to their propriety and importance, in order to know what is needed to be tackled first.

[36] Polonsky (2005, p. 953).
[37] Schumacher (2010, p. 22).
[38] Travis and Hodgson (2019, p. 57).
[39] Travis and Hodgson (2019, p. 46).

During the research process the stakeholders must be updated of every important event that occurs, whether it is positive or negative[40]. Nowadays Web clouds are used with the purpose of keeping every actor up to date about what is happening. The constant communication between stakeholders and the research team gives more trust to the stakeholders towards the whole investigation.

2.4. User research methods

Nowadays there are several methods to use in user research. The election of the proper methods for each study depends on the needs of the current user researcher. There is not a particular method of each study scenario but the depending on the situation the methods can be combined. This study covers the theory of two of the most used qualitative research methods. (Usability testing and interviews).

2.4.1. Usability testing

What makes a product usable whether it is digital or physical is the "absence of frustration in using it"[41]. Usability is defined as the moment when "the user can do what he or she wants to do the way he or she expects to be able to do it, without hindrance hesitation or questions"[42]. A product is defined as usable under 5 principles. Usefulness, efficiency, effectiveness, learnability and satisfaction[43].

Usability testing is one of the techniques used to ensure a good user-centered design, which works against subjective assumptions about user behavior, and a good user experience which compasses how engaging and delightful is a digital product to use[44]. It employs techniques to collect data while observing users doing tasks manipulating the product. Besides usability testing, user centered design is constructed with different techniques, such as Ethnographic researches, participatory design, focus groups, surveys, walk-throughs, card sorting, paper prototyping, expert evaluations and follow up studies.

This research method has as goals to inform the design department from existent usability deficiencies so they can be modified, eliminating frustration for users and making them valued by the target audience. Eliminating frustration for users brings

[40] Schumacher (2010, p. 23).
[41] Rubin and Chisnell (2008, p. 4).
[42] Rubin and Chisnell (2008, p. 4).
[43] Rubin and Chisnell (2008, p. 4).
[44] Lowdermilk (2013, p. 6).

other benefits to the situation such as stablishing the expectation that the products made by one company are always from high quality and easy to be used, bringing a positive relation between customers and the organization[45]. Usability testing is most effective in the early to middle stages of the development, since the product still has the capability of changing on its characteristics. When a finalized product is tested includes a bigger investment than the test of previous versions[46].

Usability testing has the same conducting approach as a classical experiment. First, a hypothesis or objectives must be formulated and then tested by a sufficient sample size in a representation of the actual work environment[47]. The test consists of an observation of the users while they are giving their opinion on using a particular product while and being controlled by the test moderator. After this, the hypothesis is confirmed or rejected by the use of statistical techniques of tasks completion and the analysis of verbal and non-verbal insights given during the test.

The moderated and physical testing session starts with making an introduction of the test that is going to take place at the moment, the techniques that are going to be used and making the participant fill the preliminary documents such as the non-disclosure agreements, permissions to record and background questionnaire if necessary, based on a previously made script. Then, the tests start to be developed while it is being recorded by video or any other type of recording tool. The moderator must read one at a time, all the task scenarios that must be developed by the participant by using the tool and the participant will develop them with or without the saying what comes to their mind in that particular project.

Tasks are defined as representations of typical user activities and sufficiently isolated to focus attention on a single feature of the product[48]. The analysis of tasks is made cognitively to examine performance differences between users, decision-making processes, among other aspects as mental workloads and mental models[49].

A recursive tool to conduct usability testing is the thinking aloud technique, which consists on capture what the participants are thinking while they are working. To perform this technique the participants must provide a running commentary of their

[45] Rubin and Chisnell (2008, p. 22).
[46] Goodman, Kuniavsky and Moed (2012, p. 274).
[47] Rubin and Chisnell (2008, p. 23).
[48] Goodman, Kuniavsky and Moed (2012, p. 283).
[49] Saraiva and Bevan (2012, p. 29).

thinking process while performing the tasks of the test.[50] This technique has the benefit that it serves as a window on the soul of the user, letting the researcher discover what users really think about a design[51]. After finishing all the task scenarios, the participant must complete all the post-test questionnaires followed by the debrief made by the researcher, which consists on having a follow up in some unclear issues or questions that the researcher might have. With this, the testing session is finished by giving the participant the incentive if at any time it was agreed, and letting the next participant come in.

2.4.1.1. Types of usability testing

Inside the usability testing scope, there are three different tests that can possibly be applied depending on the development lifecycle that the product is at. The usability testing is done also during the entire process, since it is almost never a one-time event in a development cycle for a product[52]. The iterative cycle of the product makes use of the user testing to prove or analyze new features or adjustments that might come up in the future.

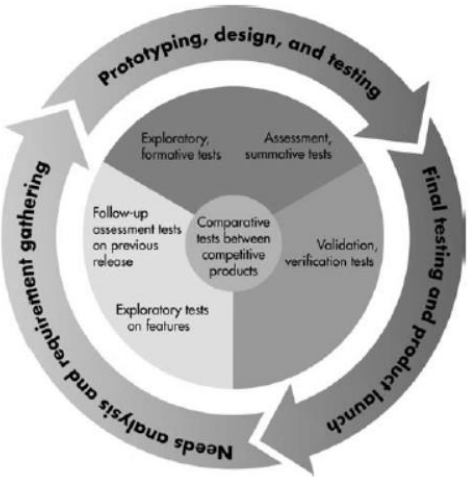

Figure 4. Usability testing through the product cycle (Rubin,2008)

The usability testing process is divided into three tests. Exploratory, assessment and validation[53].There is a fourth type of test (comparative test) which can be used in any step.

[50] Rubin and Chisnell (2008, p. 204).
[51] Nielsen (2012).
[52] Goodman, Kuniavsky and Moed (2012).
[53] Rubin and Chisnell (2008, p. 27).

The exploratory test is made when the test is developed in the earlier stages of the process when it is shaped and designed. The main objective of it is to examine the effectiveness of preliminary design concepts[54]. Since this test is made in the earliest stages of the process, it requires a constant interaction between the participant and the moderator, in order to get the most information as possible from the test.

The assessment test is made to test features during the implementation of them[55]. This type of test is conducted during the early or midway stage of the product´s lifecycle and have a purpose to expand the findings of the first mentioned type of test by evaluating the usability of lower-level operations and aspects of the product[56].

Lastly, the validation test is made to certify that the features have certain standards and benchmarks late in the development process[57]. Since this test is only made to reassure design decisions, is made towards the end of the product iterative cycle and to evaluate and validate sometimes for the first time all the components of a product working together[58].

2.4.1.2. Usability testing participants

A typical physical usability test consists of three to ten participants of each persona profile, which are questioned and moderated from a test supervisor. This process will work the same for all the usability tests that are made during the product lifecycle. Nevertheless, some factors can change depending on the test step that is being developed, like for instance, the interaction between the tester and the participants and the type of pursued objectives. As the product reaches maturity, the help the user needs from the moderator is less.

[54] Rubin and Chisnell (2008, p. 29).
[55] Goodman, Kuniavsky and Moed (2012, p. 274).
[56] Rubin and Chisnell (2008, p. 34).
[57] Goodman, Kuniavsky and Moed (2012, p. 274).
[58] Rubin and Chisnell (2008, p. 36).

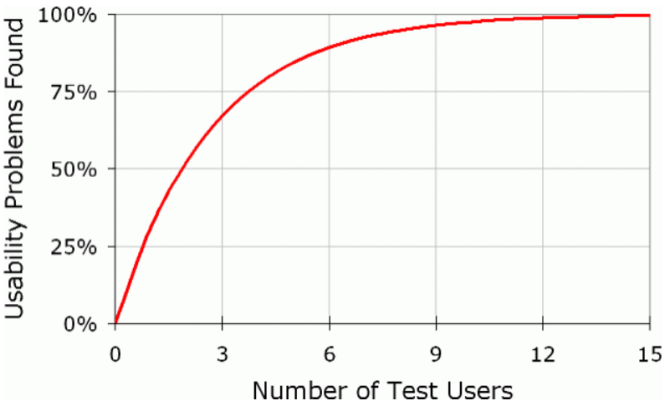

Figure 5. Number of usability problems found in a usability test with n users (Nielsen, 200)

The graph in Figure number 5. Shows that starting from the first user, the insights found during the test are risen and most of the half of the insights that the test will deliver are reached with 3 people tested. As more users are added the less insights will be learned because the same patterns will show up. Even though doing tests with one user, as showed in the graph already brings insights to the studies, doing the test with only one participant brings a risk on being misled by the spurious behavior of a single person who may perform certain actions by accident or in an unrepresentative manner[59].

When choosing participants, the research team has to pick the ones that a suitable for the specific product, since all participants are not representative samples of the users of the product. For this particular type of user research, the participants must be chosen based on criteria as their competence, attitude, state and personality[60]. Competence is the most relevant criteria from the ones above mentioned, since it is the one which classifies the participants between expert or novice on the level of expertise.

The participants are divided between a novice and expert level of expertise. Testing experts focuses on testing optimal uses of the tool while testing novice users focuses on learnability[61]. Novice participants are users that are naïve about the use of the product and therefore have less interaction experience, appearing unskillful at performing tasks[62]. On the other hand, expert users are focused on efficiency, which

[59] Nielsen (2000)
[60] Sauer, Seibel and Rüttinger (2010, p. 133).
[61] Faulkner and Wick (2005, p. 1).
[62] Aquino Shluzas *et al.* (no date, p. 1).

means that for them the tasks must be completed as fast as possible and without errors[63].

2.4.1.3. Analysis of results

For analyzing the output given by the test, a three-stage process must be considered: compiling data, summarizing data and analyzing data from the observations.

Compilation of data, also called as Collecting the observations, involves placing all the data collected into a way that allows the research team to find patterns[64]. Collecting the data from this part of the process takes into consideration the transcription of interviews, backing up recordings and data files, transcription of handwritten notes into a computer, and other quantitative data. The analysis of notes gathered during test are the most important and time-consuming part of the data collection process[65].

Since the collection of data is gathered from different angles and it has different formats, one way to prepare the data to be analyzed, is to display it in the same format by transcribing all the results into an excel sheet. This way, all the data gathered will be visible for the research team, allowing the creation of patterns in the data of the users, which facilitates the analysis of the information.

Secondly, the summarization of data, is the step where the previously collected information gets transferred from data collection sheets onto summary sheets. In these sheets the collected information is analyzed by the task accuracy (number of errors while performing a task) or task timings (How long does a participant take to complete a task)[66]. The measurement of success is evaluated with the percentage of tasks that are completed correctly by the users[67]. There is an existing possibility that the user completes a task but partially. In this case, the score of partial success depends on how big the error was and on which percentage it didn't allow the completion of the task. The other type of collected data such as posttest questionnaires and interviews, depending if they have qualitative or quantitative outputs, must be analyzed by categorizing the answers (Qualitative) or raking the answers until getting an exact score (Quantitative).

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[63] Søgaard (no date).
[64] Rubin and Chisnell (2008, p. 247).
[65] Goodman, Kuniavsky and Moed (2012, p. 314).
[66] Rubin and Chisnell (2008, p. 250).
[67] Nielsen (2001).

Analyzing data is the end of the final step for analyzing results in usability testing. As mentioned on the step of summarizing, the research team has to identify the tasks that didn't meet the success criterion. A task is considered as difficult to develop if at least 70 percent of the participants do not complete the task successfully[68]. Once the success rate for each task is settled, the researcher must identify which ones were the tasks that gave errors or difficulties. The main reason for occurring errors is the nature of the tasks and procedures that require people to behave in unnatural ways[69]. After this, the responsible components for the error must be identified to understand why the errors occurred. Then, these sources of errors must be prioritized how critical they are, in this way, the research team knows in which features is more relevant to work first to fix the most severe usability problems. At the end this errors or usability flaws are used into the test report and to create recommendations on what to improve in the product.

2.4.2. Interviews

This research method is useful for understanding attitudes and preferences (and how they change over time), common behaviors and the context in which the users live and operate, and how they think and associate certain things[70]. Interviews are a good method to understand the user´s experience when using without giving them frustrations that could come up when using other methods, like for instance usability testing. The budget and circumstances of the investigation, will decide if the interview is conducted in person or remotely. One of the main goals of interviewing users is to uncover their pain points[71], as a way to identify improvement opportunities, nevertheless, these sessions are not suitable for moments like asking precise details or doing questions about specific flows inside the products

Interviews can be combined with other research methodologies to create a richer environment as a way to find more insights as for instance the participatory design, which deals with engaging users in the design of new information technology[72], allowing them to interact with the product in the form of mockups or prototypes.

[68] Rubin and Chisnell (2008, p. 258).
[69] Norman (2013, p. 163).
[70] Marsh (2018, p. 129).
[71] Portigal (2013, p. 5).
[72] Simonsen and Robertson (2013, p. 118)

Interviews with users are used around the entire product lifecycle, in order to create a lean method that receives constant feedback to improve the product. Other non-spoken communication skills like body language for instance help to get a great output from the conversation. The listening body language reflects the state that the interviewer is[73], showing if they are really listening the conversation and getting involve with it.

2.4.2.1. Tools for conducting interviews

Beside the previous mentioned materials that are needed to make any type of research, the interview research method is supported by other resources. When is done in the beginning of the design process, at the moment when all stakeholders are starting to understand the idea of the design, low fidelity prototypes of the concepts are used, rather than high fidelity prototypes. For doing the interview, the prototype must be the right one according to the conditions of the cycle of the product. Two main factors are determinant for choosing the right tool in terms of breadth, depth, fidelity and interactivity the state of progress of the project and the design perspective where its being prototyped[74].

The use of low fidelity prototypes gives room to have the possibility to edit the idea without losing the time taken to create high fidelity prototype. These concepts can be shown with different resources as for instance, storyboards, physical mock-ups or wireframes[75]. They are approximations to the final representation that is wanted to be accomplished, but they are not the final product. Hence, during the interview the discussions around the product will be raised and some edits will occur. “Starting a design means starting with a hypothesis and designing tests to validate or invalidate that hypothesis”[76]. Therefore, these prototypes work as tools for the validation process.

[73] Portigal (2013, p. 26).
[74] Hartson and Pyla (2012, p. 402).
[75] Portigal (2013, p. 58).
[76] Klein (2013, p. 113).

Figure 6. Physical mockups used during an interview (Portigal, 2013)

2.4.2.2. Structure of an interview

The guide for making the interview is divided into four steps that will work as a structure to perform the talk, even when it is semi-structured[77].

Introduction: Highlight of logistics and setting of expectations. In this moment the participant can sign all the documents required before the research, while the team settles all the required equipment for the session. The presentation of the researcher and the research process are also discussed during this step. The goal is to make the participant feel comfortable and confident to develop the research without any pressure.

Main body: In this part all the important data from the participant is intended to be collected. During this, the researcher can divide the questions in categories to have a better order of the process. Also testing methods as usability testing, card sorting, demonstrations, thinking aloud are conducted during this part

Projection / dream questions: Taking advantage that the participant is already engaged with the situation of responding to questions, some questions can be done in order to set projections around the subject. The researcher can ask about what is the perspective of the participant for the future related with the subject.

Wrap up: In this moment the research session must be closed by having some wrapping up questions as feedbacks from the participant or other contributions they

[77] Portigal (2013, p. 39).

would like to do for the research. The session finishes with giving the incentive and finishing the recording.

Having a structure for the development of the interview provides logic to understand the subject that is being treated during the conversation, and when this structure is not followed, the benefit of having control is lost, and therefore the power of that logic and the benefit from it is lost too[78].

2.4.2.3. Analysis of interview results

As shown in figure 7., The data analysis is a step that comes right after the evaluation inside the lean cycle, because the final goal of doing user research relies on the fact that de gathered data results will be analyzed and used to improve the studied digital product.

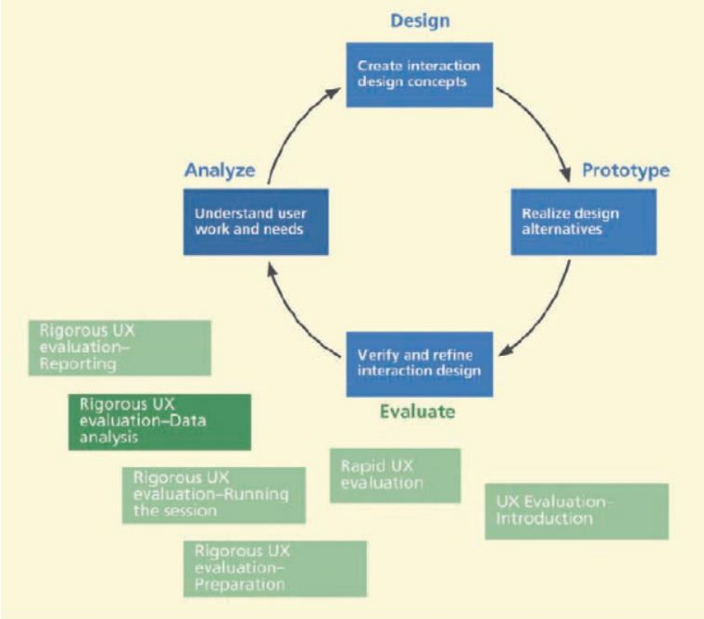

Figure 7. Lean lifecycle of UX (Hartson, Pyla 2012)

The qualitative data must be analyzed in order to come up with a research conclusion to be implemented in the iterative process. The process of determining how to convert collected data into scheduled design and implementation solutions are essentially one of negotiation in which, at various times, all members of the project team are involved[79].

[78] Seidman (2006, p. 19).
[79] Hartson and Pyla (2012, p. 561).

Identifying themes, categorizing data and analyzing critical incidents are the three parts to analyze qualitative data, that can be also used together. Identifying themes is the step where the gathered data is intended to be grouped, to represent patterns of some kind, oriented on the final goal from the study. One technique to display the themed data is the affinity diagram, which is a participatory method, mainly focused on identifying the patterns of qualitative data[80], by organizing ideas into a hierarchical structure. The entire research team participates during the process, and it consists on putting all the outputs from the research sessions into post it´s and group them identifying the patterns. Categorizing data is, as its name explains, is grouping the data in categories of information that are directly related between each other, in order to find valuable insights, usability problems or behavior patterns.

Lastly, A critical incident is described as a way to isolate subsets of data for more detailed analysis, perhaps identifying themes or applying categories[81]. Critical incidents are analyzed to focus on identifying and interpreting significant incidents that can give powerful insights to the investigation. Qualitative raw data, already gives hints about on which insights can be considered as valuable, nevertheless must also be cleaned and filtered at any given moment, which is recommended to be as soon as the research take place, since the researcher is going to have still fresh memories of the session that can be valuable to get into further, non-biased conclusions at the end of the investigation. The researcher must also make use of the previously settled available resources such as video and audio recordings, that will work as a tool to process, remember and have the main take-aways that will appear while the interview is happening[82].

2.5 Tools for conducting research

2.5.1. Prototypes

"The sooner you Fail and understand why, the sooner you can succeed".[83]

Prototypes are defined as any representation of a design idea, regardless of medium[84]. They help the user research to evaluate something before committing to any resources previous to having the final product. The redesign of digital products

[80] Marsh (2018, p. 213).
[81] Sharp and Rogers,Yvonne,Preece Jennifer (2019, p. 320).
[82] Portigal (2013, p. 117).
[83] Hartson and Pyla (2012, p. 331).
[84] Houde and Hill (no date, p. 3).

with software has been in the past a time and budget consuming activity[85], but with the help of prototypes a less expensive and much faster version of the product can be created in order to have an early feedback. Prototypes should be an iterative process themselves because they are created to identify issues or validate a user experience[86].

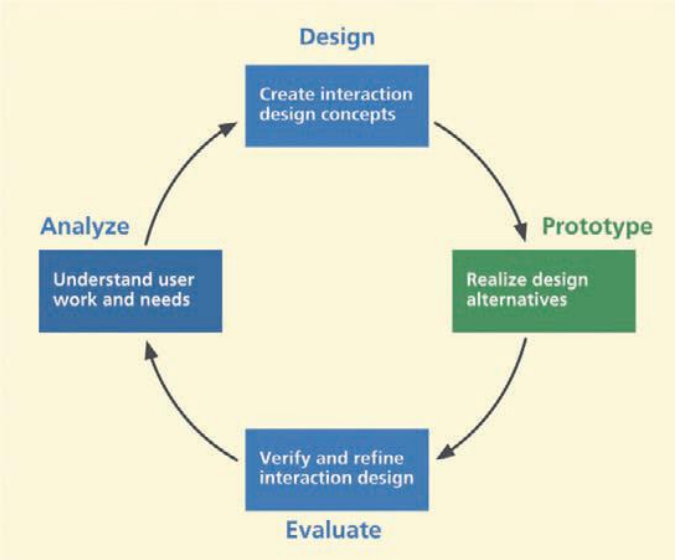

Figure 8. Lean process of user research (Hartson, Pyla 2012)

As displayed in figure 8. The prototype phase on the lean process of user research is a predominant part on the cycle. Prototypes provide a fast and easily changed early view of the envisioned interaction design[87] and most importantly, are always iterating to improve the user´s experience according to their needs.

The use of prototypes on the design cycle has advantages such as the use of participatory design, encouraging users to take part of the design process and give their opinion of products they would potentially use by critiquing the different design prototypes and show the prototypes to users to get feedback on evolving designs[88]. This offers an open line for communication, that allows users and designers to communicate to each other, by having the user showing the designer an immediate feedback of the performance given by the design decisions made earlier in the project. One dimension on prototypes is their level of fidelity, which can be low, medium or high, defined depending on the level of interaction between the user and the product,

[85] Hartson and Pyla (2012, p. 392).
[86] Unger (2012, p. 260).
[87] Hartson and Pyla (2012, p. 393).
[88] Houde and Hill (no date, p. 2).

and the stage of the iteration process that the product is at[89]. Nevertheless, the crucial aspect when developing a prototype is to think how realistically represents the final system[90].

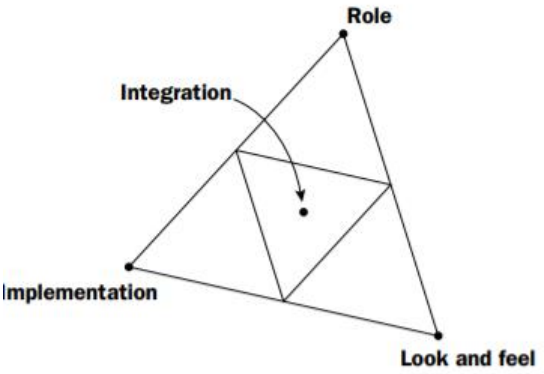

Figure 9. Aspects from a prototype (Houde, Hill. No date)

As shown in figure 9, The design of an interactive artifact has 3 different aspects which are always present in the design of any interactive system. Role, is related to all function questions and the way is useful to the customer. Look and feel talks about the concrete sensory experience when using a product and lastly, implementation refers to the techniques through which an artifact performs its function[91]. The point where they al meet in the center of the diagram, reunites all the previous mentioned aspects to represent the complete user experience of an artifact, denominated as integration.

2.5.2. Eye tracking

This resource, is used to capture the eye positions of a person looking at a visual stimulus, such as a Web site, an image, a video, a product, or even physical surroundings[92]. Based on the path of the eye, the researcher can deduct where was the attention of the eye directed and how the information was processed based on the space-time relations on the eye positions. With this technology the user experience is better understood, taking also into consideration behavioral events that happen during the use of a product such as mouse clicks or movements[93]. Despite of the fact that

[89] Hartson and Pyla (2012, p. 402).
[90] Unger (2012, p. 263).
[91] Houde and Hill (no date, p. 3).
[92] Schumacher (2010, p. 157).
[93] Schumacher (2010, p. 158).

with other research tools is also possible to understand the cognitive process of a user, the use of eye tracking is one of the most detailed ones. It can show in real time all the decision-making process of the customer, which leads to have more insights to design an effective final product.

The use of this tool brings some challenges for the research team. Eye tracking requires a specialized equipment and most of the research labs don´t count with this tool, since it is expensive. In terms of the interaction between the participant and the use of eye tracking, the researcher must be aware that every participant is different, hence, the equipment has to be calibrated for every participant depending on their face, eye shape and height.[94] In case to use this tool, all the use requirements and procedures have to be written during the stage of the research planning, considering time and use restrictions.

Besides challenges, eye tracking brings benefits to the research. For instance, it can determine the visual search efficiency, search strategies and user´s expectations.[95] It helps to understand the search process of a user and their cognitive expectations when they are looking for something. If a user wants to log in into a web platform, eye tracking helps to understand where are they expecting to have this kind of information when they are looking for it. It also helps to match the visual design and the business objectives by proving which particular parts of the product catch their attention first and if these particular parts are aligned with the business objectives[96].

The results from this method are transformed into 3 types of output. Gaze plots and gaze replays (qualitative) and heatmaps (quantitative). Gaze plots show how a participant processes a page in a few minutes representing the fixation points in a whole. The gaze replays are video representations of the gaze plots, on how the participant processed any platform displaying the fixation points through dots and lastly the heat maps are an aggregate of all the results of the participants performing a specific task. The areas that are colored indicate where the people fixed looked and the areas with the warmest colors is where they fixed their attention for the most time as displayed in figure 10.

[94] Moran (2019).
[95] Bojko (2015, p. 3).
[96] Bojko (2015, p. 4).

Figure 10. Example of gaze plots and Heat maps with eye tracking (Nielsen Norman group, 2019)

When performing a test with the eye tracking tool, it is relevant to keep in mind that this tool cannot be combined with other research resources such as think-aloud method, for instance. When the user is applying the think-aloud method, they are conscious of what they are doing, which might affect their eye movements, tending to examine more areas of the display than they would do if they were not talking during the test[97].

2.6 User experience

The etymology of the word term user experience is decomposed into two. The term user is derived from the Latin verb “utii” which stands for “make use of”[98]. The word experience is derived from the Latin “experientia” which means “knowledge gained from repeated trials. When joining these two terms, the term of user experience is created, which can be defined as “knowledge gained by doing something”.[99]

User research focuses on well-being and not in performance, as an outcome of the human-product interaction[100]. Perceptions of the relation between user experience and usability as shown in Figure 11, state that user experience includes usability[101], and on the other hand, others state that usability includes user experience[102]. A third perception states that usability and user experience are closely related concepts but one is not inside the other. User experience is conceived as an abstract and hedonist concept, while usability is focused more in task performance and objectivity[103].

[97] Bojko (2015, p. 6).
[98] online etymology dictionary (no date).
[99] Stull (2018, p. 4).
[100] Im Moczarny, Villiers and van Biljon (2012, p. 216).
[101] Rubinoff (2014).
[102] Bevan (2009, p. 3).
[103] Im Moczarny, Villiers and van Biljon (2012, p. 217).

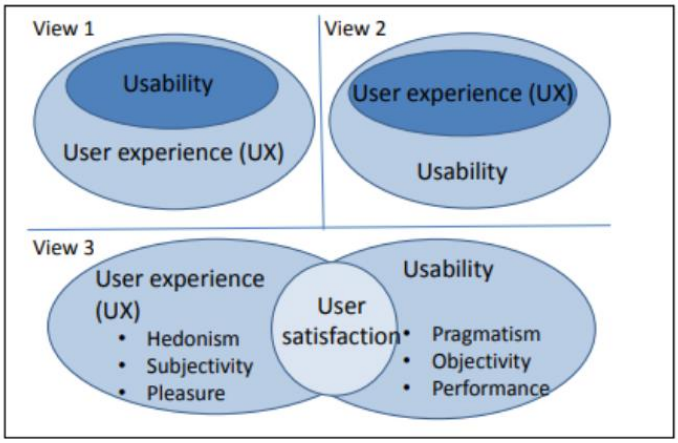

Figure 11. Models of relationship between user experience and usability. (Bevan, 2009)

Unger and Chandler describe user experience as the creation and synchronization of the elements that affect user´s experience with a particular company, with the intent of influencing their perceptions[104]. These elements include the things a user can touch, hear, interact and smell[105].

This term covers several fields that are not necessarily directly involved with design. User experience is linked as well with disciplines as anthropology, human-computer interaction, engineering, journalism and psychology. Any of the previously mentioned disciplines fits into any of the two camps of user research: User experience design, which involves the design of something (product or services), or user experience research, which takes into consideration the primary research in order to report the customer behavior of potential customers.[106].

Inside an organization there are a number of KPI´s or goals to fulfill depending on the department that sets them. For instance, the sales team of a company has a goal which is particularly strictly targeted to revenue, and at the same time for the same project, the design team has a goal strictly targeted to brand consistency and aesthetic. nevertheless, all goals inside an organization are targeted into a same end, which is the final user, or in other words the individual having the experience. User experience is present to help achieving those goals, while refining and aligning the business goals with the user needs. Where business goals and user needs converge should be the sole determiner of functionality.[107]

[104] Unger (2012, p. 3).
[105] Unger (2012, p. 3).
[106] Stull (2018, p. 4).
[107] Stull (2018, p. 5).

The average user has a big number of inputs going through cognitive processes at all times, and even more when using a digital product. Building a digital product with an optimal user experience, facilitates these processes helping the user the user to keep the focus in a particular task and therefore improve the experience. Any journey made by the user when using a product, regardless of its complexity, could lead to potential off-ramps from the experience, which can potentially slow down their pursuit of goals. Hence, building a structured user experience, provides guidance when needed.

2.6.1. Personas

A persona is defined as a fictional user constructed from different types of field data.[108] They are symbolic constructions of the user groups of a product that can be created based on an interview, survey or field study. They represent a specific person in a specific work role and sub-role, with specific user class characteristics[109].

By having personas to look at when doing the design process, the design team feels empathy for their potential users. This brings interest on the way of thinking the final user. The use of personas gives life to the user and helps team to feel connected to them[110].This makes clear what features must be included and which ones should be omitted. The process is not as accurate as any other testing, but it will guide the research to concrete answers.

Personas are focused to distinguish the different target groups selected for a product. Given to the fact that the final product is aimed to work for all the target groups, but is not going to work for all groups of people in general. It is better to design for a small group of the population and satisfy this population completely, converting them into loyal customers, than designing for the entire population but at the end not satisfy their needs. “The persona profile created for each type of user should be iterative and seen as living, breathing things that change over time.[111]”

2.6.2. Design principles (Gestalt laws)

Design principles work as guides for the moment of starting a product development from the design perspective. Gestalt grouping laws describe how people perceive objects as organized patterns. The laws cover similarity, proximity, continuity and

[108] Schumacher (2010, p. 195).
[109] Hartson and Pyla (2012, p. 264).
[110] Courage, Baxter and Caine (2015, p. 41).
[111] Marsh (2018, p. 236).

closure.[112] This theory grew from the field of psychology but it has developed to be used in other disciplines like linguistics, design, art and communication. It is special for the design discipline in particular, because it explains the concept of the tendency of the human being to group things from a pattern seeking method. It provides rational explanations for why determined design decisions can have an effect on the meaning of the displayed information. Ignoring Gestalt visual theory may result in unexpected interpretations of the reader, and therefore impede clear communication[113]. The gestalt laws have been crafted from the study of cognition and human behavior, and the designer is the one who uses these principles to educate the users that can have a hard time expressing what they need[114].

The human mind makes use of these grouping laws to improve the experience for the user. For instance, the human mind tends to perceive objects that are close to each other as a group, and therefore that the subjects are related between each other. This phenomenon is known at the proximity law from Gestalt. The law of similarity occurs when two objects that are similar between each other. This law also is applied in digital products, in the way of the perception of similarity between products that offer the same service. For instance, the users expect that if they use two search engine products, both of them work similarly, since they have the same function. The closure law states that humans have tendency to close gaps in forms ignoring the missing parts to complete a final form, making it stable. Lastly, the continuity law, where the eye follows a line, curve or sequence of shape. Even when it crosses over negative and positive shapes.[115]

2.7. Human computer interaction (HCI)

HCI was an unknown concept on the first half of the XX century, but with time and the evolution of technology, has taken more leadership through the years. Human computer interaction takes care of the creation of digital products that help users in the development of tasks, aiming to the improve the usability, execution times, reduction of errors[116], and therefore, the experience. This discipline takes care of subjects that don't belong only to one disciplinary field, hence, HCI addresses issues

[112] Stull (2018, p. 82).
[113] Graham (2008, p. 1).
[114] Lowdermilk (2013, p. 63).
[115] Graham (2008, p. 10).
[116] Marcos (2001, p. 4).

that have to do with psychology, informatics, design and linguistics. From all these disciplines, cognitive psychology is the most important one since this discipline is the one that studies the perception, memory and mental models that have to be kept in mind for designing informatic systems. The concept of human computer interaction also includes the fundamental characteristics of people, like the memory limitations and limits of transferring information between the human and the machine. The interaction between humans and computers can be analyzed according to the style (the way the user receives the information, structure (organization of components) and content (Semantic and pragmatic meanings produced during the interaction[117]. The users interact with systems through a medium known as interface, which is built by a series of physic and logic mechanisms that allow them to interact in a concrete way with the system. These systems are created to enable the users to conduct their activities in a productive way with the adequate usability levels.

The interaction between humans and computers doesn't start with just one click, it starts with a desire to act, and the understanding that something can be acted on[118]. During these understanding of actions, the overlap between visual design and interaction can be spotted. Before a user clicks a button on a product, they have to know that this button can be clicked. To create this kind of overlaps, the design process makes use of cognitive theories as the previously mentioned gestalt laws and affordance. The affordance of an object is the relationship between the capabilities from the user and the features of a product that determine how a product could be used.[119]. The look and feel properties of a specific feature in digital products can reflect desired affordances that help to explain their final purpose. After the user understands that an action on an icon/button can be taken, now it is impulse to take it. The effectiveness of the action depends on the distance that must be taken, this is known as the Fitts´ law, which predicts that the time required to move to a target area is a function of the distance to the target and size of the target[120]. The final response comes to meet the expectations of the user, which sometimes can be fulfilled and sometimes not, leading to frustration of annoyance. The unfulfillment of expectations comes from different reasons, as poor performance, poor error handling and lack of feedback.

[117] Marcos (2001, p. 6).
[118] Unger (2012, p. 196).
[119] Norman (2013, p. 11).
[120] Hartson and Pyla (2012, p. 680).

Positive or negative responses reassure the process taken by a user during the manipulation of an App.

2.7.1. Temporal information processing

When using a digital product, the human mind faces temporary interruptions during the flow, such as the save of a file or downloading a program, which often leads to irritation and decrease of a UX in the product when is done incorrectly. The understanding of the users cognitive functioning is a key factor for an effective user experience, and the temporal judgement is a critical psychological capacity for human beings to interact with the environment. The sense of time cannot be perceived directly, but the perception is saved in the user´s mind. The perception of time is constructed under two paradigms depending on the time where an evaluation is perceived by the subject. In the prospective paradigm the users know that the task is going to take an estimated time, depending of attentional processes and in the contrary in the retrospective paradigm the users don't know how much time is going to take the development of the task, influenced my memory processes[121].

In the context of HCI, the attention affects the information processing, because developing a task on a digital product involves the use of cognitive resources, such as attention, and without any sense of it the time to understand processes is going to be longer. Previously developed studies made in the beginning of the HCI concept development, show that and acceptable waiting time expected from a user when interacts with a product, is a 10 second-threshold[122]. A waiting time of more than 10 seconds could lead to a lower work effectiveness. The user's uncertainty of the process when using a product is supported by the provision of feedback, which is delivered with different visual stimuli, such as icons, progress bars, and messages. The use of detailed feedback messages increases the willing of a user to wait, and improves the user experience. Nevertheless, it must be kept in mind that the amount of feedback has to me provided in an informative way. Is proven that if the waiting time is too long, users carry other activities during the wait[123]

During the usability process another factor that affects the temporal information processing is the cognitive workload, which is defined as "the psychological and

[121] Carine Lallemand and Guillaume Gronier (2012, p. 752).
[122] Carine Lallemand and Guillaume Gronier (2012, p. 753).
[123] Carine Lallemand and Guillaume Gronier (2012, p. 759).

mental demands that occur while performing a task or a combination of tasks"[124]. This factor is focused more on the characteristics that can affect the development of a task, and therefore, when a task requires a high level of information processing, it requires a higher level of attention, and therefore, the user tends to focus the attention into the non-temporal information, with the goal of giving all the concentration to this task.

The temporal information processing works under two concepts of the mental process of information, which are stated as short term working memory (STM) and long-term working memory (LTM). STM retains information automatically from most recent experiences, but since it retains recent information, the limit for STM is only between five to seven items[125]. It is valuable for remembering items like names, phrases or other items that are valued as fragile. The capacity of short-term memory also depends of the level of familiarity and experience that the user has with the tool, given the fact that the retention from the brain increases when the user feels familiarity with the material. Nevertheless, for digital product development purposes, is better not to count with short term memory to display critical information, in order to avoid frustrations on the user experience. Even though the STM has limitations, these limitations can be mitigated through the use of multiple sensor modalities like audition and the sense of touch can complement the vision to improve the retention capacity of the brain.

On the other hand, the LTM is known as the memory from the past. The experiences and thoughts that are saved in the long-term memory "are pieces that are reconstructed and interpreted each time we recover the memories, which means they are subject to all the distortions and changes that the human explanatory mechanism imposes upon life.[126]" This type of memory is wide enough to not have a measure unit, hence, is has been difficult to understand how works the organization inside it. Because of the existing distortion of memories in LTM, sometimes what is retrieved from memories can be false. How well these experiences are retrieved depends highly upon the material that was interpreted in the first place[127].

2.7.2 The interaction cycle

Donald Norman stablished in the year 1984 a stages-of-action model that states the average sequence of user actions when a user interacts with a machine. It is relevant

[124] FAA Human Factors (no date).
[125] Norman (2013, p. 92).
[126] Norman (2013, p. 96).
[127] Norman (2013, p. 96).

to analyze the interaction cycle for the UI of a product, because it can help to predict difficulties that users might have with the design, as well as suggesting if a user needs a skill in particular when they work with the UI[128].

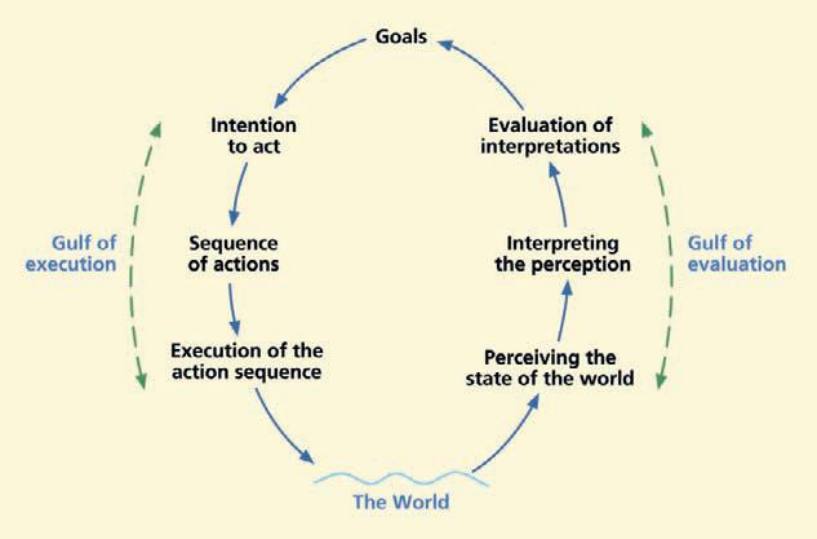

Figure 12. Norman´s stages-of-action model. (Hartson, Pyla.2012)

The user activities start with the intention to act, as it can be seen in the top left part of Figure 12. The intention is defined as "the internal specification of action responsible for the initiation and guidance of the resulting activity"[129]. They can be conscious or unconscious. The next step is the sequence of actions where the user is converting their intentions into a possible action available at the moment. For this, the user must see in the available options, which one can be the best for driving into a satisfaction of the intention. The satisfaction of these goals can be a single action or require a flow inside the process. To the decide this, is relevant to know about the final user and see how they think, in order to create the flows. The considerations on how to decide during the user´s process may come from memory retrieves, be reminded or thought by third parties or manuals, or derived by the possibilities available.

Once the decision is made, the act of entering those selections into the machine, is called in the figure execution of the action sequence, which involves a physical movement from part of the user. These movement can be done by pointing, where the alternative actions are visually present and the user moves to perform the action, or by naming, where the user specifies the desired action by naming it.

[128] Stone *et al.* (2005, p. 190).
[129] Norman (1984, p. 365).

These first three actions make part of the gulf of execution, which lies “between the user knowing the effect that is desired and what to do to the system to make it happen”[130]. The design of the user experiences bridges the system to the gulf of execution to help the user to have a correct mental model of the process. When the user executes the execution gulf, this in consequence causes changes in what is seen in the figure as the world (The digital product or system). These changes are reflected in the next three final steps.

These next three actions make part of the gulf of evaluation. This gulf bridges the language gap from system to user, which is reflected as feedback for the user to understand what is happening. The outcomes on how the users see the consequences from their actions depends again on the previously established interaction design and and how understandable it is. A failure on the interaction of the model will lead in a binding on the flow, because the user will not understand the given feedback. In this gulf, the evaluation process happens when the users perceive the state of the world by getting feedback from the system, then interpreting the perceptions of the giving feedbacks and lastly, evaluating these interpretations accordingly to the previously stablished goals. One can say that a cycle of interaction is successful when the expectations and results are compared and the actions in the cycle have brought the user closer to their goals.

As previously mentioned, the feedback is one of the integral parts of the evaluation of an interaction, because it gives the user a state of the process, even if the operation was successful or failed. Due to the fact that this cycle is created for all kinds of tasks, the cycle can last from a few seconds to hours, which illustrates the analysis of this complex process[131].

2.7.3. Intuition

Intuition is defined as the power or faculty to direct knowledge or cognition without evident rational thought and inference.[132] Intuition also is encompassed by the sense of “just knowing” without a rational or previous experience.[133]

Nowadays and because of the era we are currently living in the human being is exposed to the interaction with several interfaces, but not all of them are intuitive. An

[130] Hartson and Pyla (2012, p. 666).
[131] Stone *et al.* (2005, p. 188).
[132] N.A (no date).
[133] Kurosu (2015, p. 5).

intuitive interface is one that works the way the user expects to[134]. When an interface is intuitive, the user follows the flow in a smooth way without focusing too much effort to complete the interaction. The mental effort to fulfill a task is known as cognitive load. When an interface has a low cognitive load is easier for the user to focus all the efforts on completing the task and instead of understanding the interface itself or learning how to use it. Intuition is encountered by knowing the user and knowing what they are expecting from the interaction with the interface, based on the user´s mental models. Mental models contain concepts like basic level of knowledge from the user (related to the level of expertise), or scripts, defined as the user´s expectations for a given situation[135], which can be known and confirmed trough user research and usability testing.

Interfaces are intuitive when they have a proper combination of affordance, expectation, efficiency, responsiveness, forgiveness, exportability and no frustration.[136] Affordance is the property that gives clues to the user about what the UI is going to do, expectation states what the user expects from the interaction, efficiency is what lets the users perform an action without the minimum amount of effort, responsiveness is what gives clear and fast feedback to let the user know what is happening, forgiveness stands for undoing mistakes or incorrect actions with ease, exportability is shown when the users can navigate around the interface without fear and no frustration is when the users are satisfied with the interaction.

Human intuition is understood under a four-layer model[137], established by James Foley and Andries van Dam in 1982 and it decomposes the human processing of information into 4 levels: A conceptual layer, which describes the mental models of the users of the interactive system, a semantic layer that describes the meanings conveyed by the user´s output, like flows and responses, the syntactic level defines how the words that convey semantics can be connected into a sentence that instructs the computer to perform a task and the lexical level deal with device dependencies and how user specifies the syntax of words. All of these levels are related to each other and the changes that are done in one layer are going to affect the result of the others.

2.8. Cognitive Psychology

[134] Kreitzberg (2017).
[135] Kreitzberg (2017).
[136] McKay (2010).
[137] Naumann *et al.* (2007, p. 3).

This subdiscipline of psychology that studies internal mental processes.[138] ,concerns the way we take information from the outside world, how we make sense of that information, and what user we make of it.[139]

Cognitive psychology is presented through a sequence of stages, that take place every time the brain gets a sensory input.

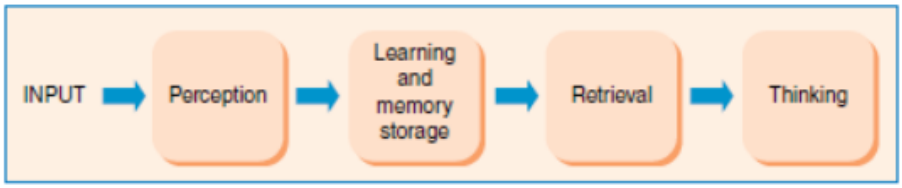

Figure 13. Stages of cognitive processing (Groome. 2014)

Some theories state that human mind contributes to its own perceptual input from its own knowledge. One of these theories is the Schema theory proposed by Frederic Bartlett in 1932, that proposes that all new perceptual input is analyzed by comparing it with items which are already in our memory store, such as shapes and sounds which are familiar from the past experience. These items are referred as “schemas”[140].

Cognitive psychology is in charge of developing theoretical knowledge and methodologies for supporting the innovation process that precedes UX evaluation. Its challenge is to manage the theoretical methods that support the design choices in the UI process, and work as a tool to develop those design decisions on the design process.[141]

The human cognition and emotion have 3 different levels of processing, called visceral, behavioral and reflective. The visceral level refers to the most basic instincts of the brain, that make quick subconscious judgments of the environment, responding to immediate impulses, precursors of emotions. From the design perspective, this level is valuable in the sense that based on style, the designers use aesthetic sensibilities to drive these visceral responses[142]. The behavioral level is where skills that were learned by the users are used by situations that require this skill. For instance, when a person eats an apple the person does the act of chewing because they know that by performing this act, they are going to reach the goal of eating. For the design of digital products is that the performance of these actions is matched with

[138] Paschalidis (2018).
[139] Groome (2014, p. 3).
[140] Groome (2014, p. 8).
[141] Marchitto and Cañas (2011, p. 270).
[142] Norman (2013, p. 51).

expectations[143]. Hence, when these expectations are satisfied, the positive outcome throws a positive emotional environment for the user. The last level is the reflective one, where the mind is completely conscious, giving place to decision-making processes. Since this level holds a conscious process, deeper and slow analysis from the mind side is required. Reflectiveness is entirely focused into looking back to events and reflecting on what happened, leading to feeling emotions from this reflection, showing that emotion and cognition are tightly intertwined.[144]. From the design perspective, this level is where the designer can play with the emotions of the user, converting these emotions into the memories that domain the visceral and behavioral levels.

2.8.1. Attention

It is defined as a state of focused awareness on a subset of the available perceptual information[145]. It enables the human mind to filter all the received inputs and focus only into what is relevant. As explained before, the human mind is only capable to process a small amount of information depending on the use of STM or LTM, hence, the attention cognitive process focuses all cognitive efforts in one or a few tasks. In visual design, visual attention is used for detecting and selecting what to process and selection action to take.

When a user pays attention to an object in particular, the inputs of information associated to this are represented in the working memory that enables us to consciously know about what it attended[146]. Attention can be controlled, which is driven by the objective to reach a goal that was settled from the person. This attention provoked by the own person to perform a task is called endogenous. Contrary to this, in the exogenous attention, the stimulus is given by another from another factor different that the user itself[147]. When the user is developing tasks, they are not familiarized with, attention is necessary to reach the proposed goal, hence, the design must make the user comfortable to focus all the attention into the proposed task.

In order to improve the process of attention from the scope of design, surface attention and content attention must be taken into consideration. The first one is clear when a

[143] Norman (2013, p. 52).
[144] Norman (2013, p. 53).
[145] Flemming (2019, p. 4).
[146] Groome (2014, p. 72).
[147] Groome (2014, p. 78).

user is focused in the superficial aspects of a product and the second one refers to when the user is actually seeing and retaining the information that the digital product wants to transmit[148]. An optimal user experience sets the spotlight in the right place to guide the user´s attention through the digital product. From the design perspective, attention is caught in several ways like motion, pattern breaking, changes of text sizes, contrasts and sounds to involve the other senses in the experience, but always reminding to be as reductive, because if a UX designer wants to design all the features at one, they miss the point of from attention from the user.

2.8.2. Perception

"We sense the world through our eyes, ears, nose, mouth and skin. We see a fire´s flame, hear its roar, smell and taste its smoke and feel its warmth. Our minds shape these senses into the perception of fire". [149]

Perception is defined as the subjective experience of sensory information after having been subjected to cognitive processing[150]. The human mind in order to sense perception has to receive signals that will convert into a stimulation inside the sensory system. Perception is not only the passive receipt of these signals, but it´s also shaped by the recipient´s learning, memory, expectation and attention[151]. This cognitive process is based in all senses, but the one that recalls most of the information is the vision, that can identify attributes of perceived objects like shape, size and color, which makes this process complex, since it involves other cognitive processes such as memory, attention and language[152] But this perceived information is different for every user. The Gestalt movement states that the organization of the input must be contributed by the perceiver. This is why, the perceptual whole is often different from the sum of its parts[153], and this whole is governed by the before mentioned gestalt principles. As shown in figure 14. The brain can perceive the visual information in different ways. None of them is incorrect, is just the input organization process inside the brain the one that makes the figure be seen in one way or another.

[148] Harrison. Krysta (2016).
[149] Stull (2018, p. 73).
[150] Groome (2014, p. 25).
[151] Groome (2014, p. 33).
[152] Sharp and Rogers,Yvonne,Preece Jennifer (2019, p. 108).
[153] Reisberg (2016, p. 82).

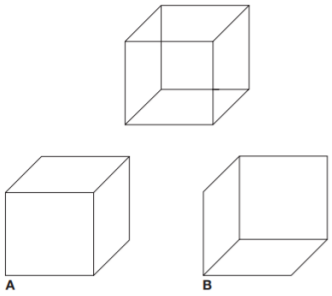

FIGURE 3.11 THE NECKER CUBE

The top cube can be perceived as if viewed from above (in which case it is a transparent version of Cube A) or as if viewed from below (i.e., a transparent version of Cube B).

Figure 14. The Necker cube (Reisberg,2016)

Another crucial term to understand perception is constancy. This term explains the fact that the human eye can perceive different properties in objects even if the censored information changes when the visual circumstances change[154]. So, for example a shape can be perceived at some distance, but if the person comes closer, then the size will grow, caused by the change of the visual circumstances.

2.8.3. Memory

For a user to have a memory of something, there is a process that must be followed which starts with the acquirer of information. This first step of information reception is called acquisition. After the information is acquired, this new input must be saved in any place, which is the memory. This process to save input of information in the memory is called storage. Lastly, when the user needs to use this previously stored information the act of bringing it to active use is defined as retrieval[155].

As explained before, the mind works with two kinds of memory. The STM for design provides an easier and quicker experience, particularly if data does not need to be effectively remembered[156]. Miller´s law theory states that information is processed in organizational unit memories, which are more digestive pieces of information to allow a more effective processing of the information[157]. This organization of units of information is done with the application of Gestalt laws in order to understand all the conforming elements in a more compressible way.

Human memory, whether it is LTM or STM has a limited capacity, hence, if a task requires too much information to be kept in the working memory, the human mind

[154] Reisberg (2016, p. 87).
[155] Reisberg (2016, p. 187).
[156] Owen (2019).
[157] Owen (2019).

needs to free up some of the occupied slots to make space for that information[158]. If the lost information is required to be used again, the cognitive process done by the user is going to take longer, because the user will have to recall the memories, which might lead to mistakes during the execution of the task. The used memory to perform the task is defined as working memory, that is conceptualized as a buffer or scratchpad in which the mind deposits information relevant to the current task[159]. Other factors like age, education level and IQ affect its performance.

The short-term memory limitations work as guidelines to design digital products. For instance, since this type of memory can only retain information for about 20 seconds[160], the response and feedback times must be fast to not lose the user´s attention, and also must be repetitive to reinforce the input until it becomes an LTM, minimizing the cognition process. Another option is by the use of assistance features to help the user not to get lost in the process, with the use of external memory, which helps the user to save and access information when performing a task. Other option is creating design patterns through the design to help the user feel familiarized with the product and not feel disrupted with the change of some placements. Providing familiarity can enable correct memory processing and avoid creating new cognition processes[161].

2.8.4. Problem-solving

One of the main characteristics of human mind, is its capacity to have a conscious character. One of the first schools that began to apply cognitive theories into the area of problem solving was the Gestalt. The gestalt theory states that one could have “insight” into the problem´s structure and “restructure” a problem in order to solve it[162]. This means that for the Gestalt group, problem solving is something more than to reproduce learned experiences but it involves the restructuration of ideas. It is relevant to clarify, that the way to solve problems in every human being is different, given that factors as they personalities, level of expertise or level of cognition, can influence the problem-solving method. One way to solve problems is trough analogy. When a user finds a problem, an approach to solve it is by creating relations between this problem

[158] Budiu (2018).
[159] Budiu (2018).
[160] Nielsen (2009).
[161] Owen (2019).
[162] Eysenck and Keane (1990, p. 371).

and other problems that were previously solved, the user can create analogies on how to solve it an come easier and faster with a solution. As explained before, the level of expertise has to do on the problem-solving methods[163]. Expert people tend to set structures to think and solve their problems and use analogies to help themselves on the way. Setting structures also means setting subgoals into the process, hence, is helpful to solve a problem by breaking it into pieces than solving it all at once, depending on the level of complexity. Other tool used for problem-solving is creativity. Some studies state that creative people have special skills when searching through how to solve a problem [164]. From the product perspective, the design team must keep in mind that when a digital product is designed, the main goal from the beginning is to solve a problem in specific. If a product does not solve the problem of a group of users then is going to be worthless, so digital products are problem solvers themselves.

2.8.5. Decision-making

Decision making is a central ability and cognitive process that is born from the existence of a problem and the urge to solve it. Digital products aim to fix this problem going through the user experience and for this, the team must know how the customer define the problem they are solving, this is known as redefining the problem space[165]. Inside the decision-making process, the role of digital products is to guide the user through a series of steps that involves decision making of some points in order to solve a problem. Decision-making requires evaluating at least two alternatives that differ on a number of attributes[166]. For evaluating the alternative, the user makes use of inductive reasoning, which means where people make a generalized conclusion from premises that describe particular instances, or deductive reasoning where they determine what conclusion necessarily follows when certain statements or premises are assumed to be true[167].

The decision-making process brings along some moments where the user gets stuck between the alternatives and to solve this, there are different mental models that help to solve these blockers around it. Each model has its specific features, and factors that can interfere its existence, for instance, if the user is using a product with a low

[163] Eysenck and Keane (1990, p. 486).
[164] Eysenck and Keane (1990, p. 500).
[165] John Whalen Ph.D. (2019, p. 49).
[166] Oliver (2018).
[167] Eysenck and Keane (1990, p. 418).

cognitive load, the elimination by aspects model is the best one to use. There, the user unconsciously selects attributes from a product depending on positive attributes like color or price. Besides the level of cognitive load, another factor that can affect the decision-making process of a user is the way as the cognitive flow helps the user to find what they are looking for. This model is called conjunctive model and it is understood as when the user selects the first alternative that satisfies the minimum criteria from its search[168]. Depending of the conditions of the decision-making process, the user might feel a sense of uncertainty, and therefore be not sure about their decisions. With the help of designing the right user experience, the sense of uncertainty is lowered and therefore the user start taking points of reference and comparison to make its own decisions. Every design experience has an effect on the decision-making process of the user.

2.9. Communicating results

2.9.1. User research report

Reports can vary depending on the type of group that the information is destined to, how the information is going to be used, and which step inside the iterative process the research taking care of. All the effort and cost you invested thus far in UX evaluation can be wasted at the last minute if the team is not informed about the UX problems in the design and, this does not persuade the team of the need to invest even more in fixing those problems[169].

A written user research report is destinated to readers like board members, business units, product managers and development team who need the specified information with recommendations. If user research reports are presented in a written form, the Common Industry Format (CIF) for usability test report work a as guide to have a report structure[170], created in 1997. This report started an effort to increase the visibility of software usability[171]. The items to follow include an executive summary, introduction, goals of the testing, summary of participants (The identities of the participants must remain anonymous), tasks performed during the test, technical setup for the test,

[168] Oliver (2018).
[169] Hartson and Pyla (2012, p. 594).
[170] Schumacher (2010, p. 131).
[171] Hartson and Pyla (2012, p. 598).

research method, data collection methods, numerical results with their corresponding supports. If there is audio or video material of the research, this must also be collected. The research team has at this stage the goal of convince the other to take actions on the project and to show that the recommended changes are needed. For this, the idea is to provide what is necessary for a designer to understand and fix the problem[172]. Special attention must be provided for those problems that have an emotional impact into them because abording these problems can cause the biggest improvement in the product.

3. Methodology

3.1. Theoretical part

3.1.1. Research interest

As explained before, this research is going to be entirely based on the following question:

How can user research be applied in the development of a digital product?

This formulation of the question decisive, for both qualitative and quantitative research processes, given that this question in particular narrowed the objectives of the research and research purpose to specific questions that researchers attempt to address in their studies[173].

With the purpose of setting a path to go through the investigation, three sub questions were formulated:

- **Sub question 1:** What are the steps for conducting user research?
- **Sub question 2:** How is the relation between cognitive processes and user experience when using a product?
- **Sub question 3:** What is the role of human intuition in user experience?

.

These sub questions are going helped to maintain the research scoped limited and ensure that any change in the research sub questions is matched to associated changes to the overarching research question[174].

[172] Hartson and Pyla (2012, p. 599).
[173] Cresswell (2014, p. 51).
[174] Pockett and Fawcett (2015, p. 51).

3.1.2. Chosen literature

The books chosen for the research were picked with the purpose of having the core and antecedents of the subject from different perspectives. Providing a critical analysis of the literature leads to the formulation of valuable arguments that will help to the development of the empirical research and therefore, the conclusion of the investigation. Beyond choosing a literature based on finding information for the research, it is required from the researcher to develop a critical view and have a deep interpretation of the particular sources. Doing research on specific chosen literatures can provide a new perspective on old and new texts by combining different points of view from different authors and can highlight relevant subjects between the research. Having a chosen literature persuades the reader from the perspective that the discussion developed during the thesis is pertinent for the time and that the arguments developed from the research are justified.

To make sure to have a balanced research, different kinds of academic resources were used for the theoretical investigation, such as articles, books and blogs which combined, are aimed to help to narrow the research scope.

The theoretical research will narrow the research scope based on numerous resources, but will be mainly based on three distinctive chosen books.

1. *Interaction design beyond Human-computer interaction. By Helen Sharp, Jenny Preece, Yvonne Rogers*

This book is aimed to professionals and students who want to find out more about interaction design, human computer interaction and communications technology. This text provides an introduction to areas like understanding the capabilities and desires of people and the kinds of available technologies, how cognitive, social and affective issues apply to interaction design and how to gather, analyze and present data for interaction design[175].

2. *User research: A practical guide to designing better products and services. By Stephanie Marsh.*

It walks the user through all the components a researcher should have in mind when conducting a research and all the questions a research team should ask themselves

[175] Sharp and Rogers,Yvonne,Preece Jennifer (2019, XVI).

before having a contact with the user. It highlights user research, showing that it is a relevant topic for the use of digital products, and that is why is relevant for this research

3. The Handbook of global user research. By Robert M. Schumacher.

Its relevance for this research states on the collection of insights from UX professionals from 9 countries and their points of view on particular user research situations in different parts of the world and presents a practical insight on the preparation, field work, analysis and overall project management related to this research field.

The authors, who are recognized experts on the field, were chosen based on their background, field experience and reputation around the industry. Also, the chosen books are contemporary to the present, in order to have the most up to date information as possible.

The internet sources criteria selection is in general the same as the literature criteria. These internet sources were only chosen if they come from a scientific or academic website that produces original or quoted content.

3.1.3. Theoretical research structure

The process for developing the theoretical research will have a process itself.

This structure came up from the examination of the thesis title and the research problem, followed by a brainstorming of the what were considered as the key variables of this research. These variables are user experience, user research and cognitive psychology.

The user research variable touched points like how to choose participants, how to plan and conduct a research session, usability tests and interviews for the correct validation of digital products and analysis of results in order to apply the outputs into a product or platform. Cognitive psychology, as explained before, is relevant to analyze because is one of the main factors that can influence the experience of a user and therefore the results of user research done for a product.

Is essential to understand the user and the existing gap between who the designers think their user is like and how are him and his cognitive processes really like. For this reason, this part of the research was focused on studying the principles of the decision-making process of the user, problem solving and human factors related to this such as attention focus, human computer interaction, memory, reasonability, persuasion and problem solving. On the other hand, the third variable is explained the

connection between the user research and the user experience, showing that they are directly related between each other.

This structure was developed as an explanatory research, where concepts like “how” or “why” will be conducted for answering the research question. This type of research discovers a relation between the variables previously studied for understanding the findings of the subject. A creation of a research structure supports the research study and aims to explain the theory on how to respond the research question. This research configuration connects the existing knowledge and will creates a skeleton for the empirical research made after that. The structure permits this research to not only describe a phenomenon but to generalize about various aspects from it[176].

3.2. Empirical part

3.2.1. Chosen research method

For this research, the chosen research method is Qualitative research. As mentioned before, the empirical research focused in two phases: an interview to the experts and a user testing session to put in practice what it was learned from the theoretical research and the interview experts.

Qualitative research is the perfect empiric method to put into practice for this research because it is mainly focused on placing emphasis on insights meanings and interpretations[177]. This type of research is relevant nowadays because of the pluralization that the society is now living on. The rapid change of life styles and human ways of living, challenge the researchers to find way to study phenomenon and make use of inductive strategies [178]. The relevance of doing qualitative research stands on the specific study of social relations due to the pluralization of life and the need to find insights to solve this pluralization.

The ideas that guide qualitative research, differ from the quantitative research guides. Qualitative research features focus on the recognition and analysis from different perspectives, reflexivity on the researcher and the research and the variety of methods to apply. Hence, it aims to collect quantitative data and analyzing through a set of already established variables.

[176] Philipsen (n.d.).
[177] Pockett and Fawcett (2015, p. 55).
[178] Flick (2006, p. 12).

With the qualitative approach, the investigation can learn about experiences and what happens at everyday life, seeking for unusual or extraordinary facts. The richness about qualitative research is the variety of positions and contexts that the research can find through the process. It demonstrates the variety of perspectives on the studied object and starts from the social meaning related to it [179]. Qualitative research is all about studying the practices and knowledge from the participants. It takes into account that the practices in the chosen field are different because of the different perspective humans can have on the different subject. This kind of research is focused on designing ways for social sciences to make concrete tendencies like the return to oral traditions, the return to treat specific and concrete problems, return to local traditions and return to solve specific solutions placed on a specific time or historical context. The fact that qualitative research is more focused in experiences, doesn´t give away the truth that it has to be strategically well planned and conducted.

Depending on the type of qualitative research that is developed, the researcher should decide how rigid the process is going to be like. With qualitative research being put in practice into the investigation, the key goal is to understand the different positions that can come up from the subject and identifying how is the behavior and practices of the people inside the sample.A quantitative research was not chosen for doing this research because normally, this position drives from a more philosophical position, therefore is done particularly in order to have a deductive investigation to determine relationships between variables and at the end, come up with a numerical outcome.

3.2.2. Interview perspectives

The first phase of the qualitative research was done as a semi structured interview. This kind of interview is very wide on its practical field and it opens a big scope of possibilities because it has the structure to address topics that are related to the research subject, but it also leaves some space for the participants to give new insights and meanings to the study focus.[180]The goals from this kind of interview is to motivate the person to speak with their own words to get a first-hand explanation[181].

This kind of interview can be structured into segments, going from experience or opinion questions into theory questions while the interview goes through. This allows

[179] Flick (2009, p. 353).
[180] Galletta (2013).
[181] Packer (2018, p. 64).

the attention to the experiences of the participant while addressing the theory topics of interest. It is a one or several times event that requires the involvement of both the participant and the researcher in order to have a valuable reciprocity.

The second phase of the empirical research is going to be made through a user testing to the linguists of a CAT tool inside a machine translation company located in Berlin, Germany. This kind of test is optimal for having an iterative kind of research and understanding the preferences of the user. Also, to see common behaviors that the users sample deal with while operating the tool. These interviews were done in person. Final users, are the ones who know the tool better and what is best for it, but also, they can differ during the interview on what they do or say in real life. This is why is relevant not to ask precise details on journeys, but to examine what is really happening, the feeling, expectations of the user and their expected outcome.

For both phases of the empirical research the interview followed a structure given by an introduction to give some context and explain the thesis subject. This gave the opportunity for the participant to ask for clarification before the start of the session. Warm up questions to get to know the participants more with neutral and easy to answer questions, having some insights about them and the researched area, the main questions that are a set of specific questions aimed to be answered during the interviews by all the participants. These questions were as a guide for the interview but nevertheless, where dictated according to how the interview was developed. Some new lines of questions that were not considered were asked during the conversation Lastly, a wrap up session of a set of easy to answer questions was made to finish the interview. The idea was to make a light note environment at the end of the interview to leave a good sensation from the experience. The interview length varied depending on how long are the answers from the interviewed and the number of questions asked. Generally, the interview lasts 30-90 minutes[182]. The interview process required an interview guide, an element to take notes, and recording equipment if the interview is done face to face.

3.2.2.1. Sample and Experts for interviews

3.2.2.2. Expert interviews

[182] Marsh (2018, p. 130).

On the first phase of the theoretical research, a sample of experts from different stakeholders in the field of user research, user experience and digital products was be interviewed. These experts for this phase of research were chosen because they have a significant experience on the field and have valuable insights on the discussed subject. These interview experts have an influence on the subject and count with an established network in the industry to support this influence. Since they come from different backgrounds, they can provide a specific perspective in the discussion coming from their particular background. Also, the participants on the expert interview phase were chosen purposely with locations in different cities, to get a broader concept of what is happening in the field around the world.

Interviews are the most used technique to collect data. Interviews are the method per excellence to collect qualitative data[183]. Compared to conventional surveys that are totally standardized, semi structured interview doesn't have to be completely standardized. In conventional surveys the interviewer is not allowed to add or clarify questions, and looks for specific response categories, leading receive have short questions as an output in order to be easily statistically analyzed.

Compared to an everyday conversation, interviews can be said that are based on conversation, but it is not an everyday one since it has a structure and a purpose, without losing naturalness that characterizes it. Interviews are a specific form of conversation that turns into a question method with the purpose of getting proven expertise.

Expert interviews have been developed considerably since the early 1990s[184]. Depending on the role that they are playing in a research the use of expert interviews has a different approach, but their role has been present in history through the years. The expert can indicate also potential candidates for doing an interview, and then expanding the circle of experts, because of the wide networking range they maintain by being an expert.

Doing the interviews with experts guarantees the fact of getting real data,accurate results and a legitimate outcome. Who is identified as an expert does not depend of the researcher´s judgement, but someone is considered an expert when the person possesses an "institutionalized authority to construct reality."[185]

[183] Packer (2018, p. 63).
[184] Bogner, Littig and Menz (2009, p. 1).
[185] Bogner, Littig and Menz (2009, p. 19).

For this part of the research four experts were interviewed:

Table 1: Expert interviews

Interviewee	**Field of expertise**
1. Maya Ninova	UX researcher and designer. Freelance assessment on research for innovation and strategy for companies. Barcelona, Spain
2. Andrés Paez	Director of RAD (Academic network of design) and UX/UI design professor at Pontificia Universidad Javeriana. Bogotá, Colombia.
3. Sebastián Namur	Product researcher and UX designer at Hogaru. Bogota, Colombia
4. Alberto Orsini	UX/UI researcher and designer at Royal Caribbean Cruises. Miami, USA.

The expected outcome from these interviews was to have as a result a group of insights listed as reliable information and additional components that were not found during the theoretical research, since they count with a professional and serious opinion. Since the experts come from different backgrounds these expected outcomes were heterogeneous, and therefore, valuable for the research.

3.2.2.2.1. Evaluation of experts

Evaluating an expert is a crucial part inside the research because it is going to be one of the results, that mixed with the other researches during the process, will lead to the conclusion. In qualitative research studies, data analysis may recommence and continue when findings are being written into a report.[186] For all evaluation of the interviews is necessary to codify, which is the first step of the analysis, defined as the

[186] Schneinder *et al.* (2014, p. 133).

effort to organize portions of the interview into categories. Is the task of the researcher, to develop a positive outcome from these analysis given that they are the most important part of the process. This codification processes are made by the interrogation of data. This interrogation is done through the complete revision of the empirical part (in this case the interviews converted to transcripts), and the labeling of their words, themes and concepts. It can be done with the line-by-line code method or the scanning methods. For this time, the line-by-line code method was used, which is focused on the careful examination of words, phrases or sentences for data relevant to the overall research question[187].

After the coding process, the next step called categorization was be performed, which consists mainly in the logical grouping of the coding process previously made. Lastly, in order to find valuable insights to develop further conclusions, was made an establishment of categories and subcategories in a hierarchical order. At the end, the idea is to have the smaller number of categories as possible. This search of repetitive ideas aims firstly to identify concepts that are taken as common during the interviews, and secondly, to divide the transcription of the whole conversation into more digestible ideas.

3.2.2.2.2. Formulation of questions

The questions were created with the main goal of answering the research questions and objectives proposed in the beginning of the investigation from the expertise and insights that every expert had in their opinions. As mentioned before, the interviews were conducted as a semi-structured interview, having the questions as a guide, but not as a rigid outline for the research. In some occasions the interviewed answered to some questions before they were asked, but the interview guide worked as a tool to guide the interviewer to see which topics where already discussed and which of them where missing, in order to not lose sight of the ultimate goal that was wanted to be achieved after the interviews. Following the structure of a semi-structured interview, the interview was handled as a conversation, which the implicit purpose of making the interviewee feel comfortable. The interviewer had before starting a small chat with the interviewee to break the ice, followed by and introduction, where the interviewer

[187] Schneinder *et al.* (2014, p. 133).

presented herself, presented how the interview was going to take place and the interviewee also presented himself and presented their work expertise on the field.

Set of questions:

1. Do you use user research normally to develop your projects? How would you define the concept of user research?

2. What do you consider that is the role of user research in the development of digital products?

3. In which moment or moments of the product´s life cycle, do you apply user research for the development or improvement of a digital product?

4. Which are the steps that you follow to apply user research in a project? Can they change according to the stage of the iterative cycle that the product is at?

5. Have you ever had experiences developing digital products without any kind of user research as a resource?

- If yes: How was the experience compared to a project where user research was used?
- If not: How do you think a project without the use of user research would be developed?

6. What factors do you think can influence a satisfactory user experience of a product when used?

7. What do you think is the role of human intuition when a user is manipulating a digital product? How does this affect the user experience?

8. What is in your opinion in the relationship between the mental processes of cognitive psychology (Attention, memory, perception, decision making, problem resolution), and the user experience of a product when used?

9. In which way can the design team adopt the theory of cognitive psychology for the design of a product?

10. How can be measured the UX of a product when is tested?

11. Beside what was previously mentioned, is there something else that you would like to add?

The questions followed a structure dictated by what is wanted to know from the expert as explained next:

Table 2: Categorization of questions

Objective	Question number
Definition of concepts	Q1
Relationship between concepts	Q7, Q8
Role of user research in the digital products industry	Q2, Q3, Q4, Q5
Understanding of user experience	Q6, Q9, Q10

3.2.2.2.3. Translation and transcription

The interviews were developed in a language that was spoken by all the interviewees in order to maintain the same conditions, which is in this case, Spanish. All the questions and introductory paragraph where done in Spanish for all interviews, in order to establish the same input for each of them. The transcription of each interview was made by the author of this thesis, as a way to start the analysis of the interviews from before, and having an appropriation of concepts for the analysis of information brought for further conclusions.

During the transcription of interviews different things were taken into consideration, as the choices of punctuation, spelling and detail of the transcript all affect how it is read by those analyzing it[188]. Punctuation is a relevant factor inside the process because the correct use of punctuation is significant for the transcription results. Participants do not speak in paragraphs or always clearly indicate the of a sentence by voice inflection[189].

The transcriptions can be edited in two ways. One of them is by the act of transcription itself, because simply representing words in standard spelling already "edits" our speech[190], and the second way to edit is when the transcript is altered by cutting words, to smooth the quality of the text.

Inside the transcription process there are a set of steps to follow: The initial transcription where everything is typed word by word or as previously mentioned before edited, and a proofreading of the transcription to check that everything is in

[188] Green and Thorogood (2004, p. 101).
[189] Seidman (2006, p. 115).
[190] Roberts Powers (2005, p. 40).

order. Also, if its relevant, the transcript can be read by other people inside the team to review the results one more time. If it is necessary to some final changes this is the moment to do them.

3.2.2.2.4. Participation

8 People were contacted for the research. From these 8 people, 5 people agreed to do the interview and 4 of them where successfully interviewed. One person agreed to do the interview and accepted the scheduled appointment, but never logged in for the videocall. The contacts were made through the use of social media platforms like LinkedIn and the share of contacts through networking. Since the interviewees are not located in Berlin, and the social distancing conditions due to corona virus, all the interviews were done remotely through videocall and previously scheduled by the researcher, not without first asking the interviewee about their availability. All the participants showed themselves very open and very happy to part of the research, which showed their interest on the subject and their willingness to communicate their ideas.

3.2.2.3. User testing

For the user testing, the research was made for linguists that work with a translation tool product in partnership with a machine translation company, located in Berlin, Germany. The test was developed under the form of an assessment test, which means that the overall functionality of the tool was reviewed. The methodology of the test was moderated and in person, which means that during the complete duration of the test, the participant had a moderator who made sure that the test was being developed according to the script. The research had as a goal two main objectives: to test the correct use of the flows inside the tool and to see which were the most important features for the user when using the platform.

Conducting user testing requires a high level of preparation and previous consideration of factors. This preparation of the work plays a big impact on the test results and the main priority with this research is to reach the objectives settled in the start. One part of this previous preparations is the recruiting of participants. In this case the sample of the population was already chosen before the start, since they work with the company and use the tool often to develop their job. The participants were chosen based on previously defined key characteristics that they must fulfil to be chosen as

an interviewee. Aspects like having a novice-intermediate level of expertise by using the tool to be tested, having experience with the use of CAT tools and to have work experience as the role of translators, were taken in consideration for the participants selection. In consequence, from the available sample of the company linguist´s, three translators were chosen. In addition to the participant recruitment, a test plan and script were written to conduct the test.

Table 3: Test participants

User	**Field/role inside the company**
1. F.B (France)	Linguist
2. V.L (Italy)	Linguist
3. A.M (France)	Linguist

This preparation allows the research to be structured and creates and alignment between the process development and the research objectives. The test was divided in two parts. The first part was a started by an introductory interview followed by a user testing where the participant was moderated by an expert on the tool (the moderator), who read all the task scenarios included in the test plan to the participant in order to perform what was expected from them using the thinking aloud technique, where the user participants explain verbally their thoughts about their interaction experience including their motives rationale and perceptions of UX problems[191]. Each task to perform included the goal expected from it and the predicted flow on how to execute it. Nevertheless, the user will not have access to this solution.

After the test, a small closing interview was conducted. The interview was treated as a semi-structured interview, shaped by 7 open questions, that were related to the overall experience with the product, for an estimated time of 30 minutes, followed by a questionnaire based on the System Usability Scales (SUS). This usability scale is a standard that is commonly used for conducting usability testing, providing a global measure of system satisfaction and subscales of usability and learnability[192].

[191] Hartson and Pyla (2012, p. 440).
[192] Sauro (2011).

The entire data as procedure, analysis and conclusions of the user test can be found in the appendix II of this document and will be disaggregated next.

3.2.2.3.1 Preparation of testing

The preparation of the test was made accordingly to the guidelines found during the development of the research theory. The whole planning of the test consisted on the preparation of a test plan, a testing script and a consent of recording, items that can be found on the appendix of this document.

The tests plan is the document that gathers all the information related to the test. It is composed by the objectives, what is intended to be tested, the methodology on how is it going to be, description of the participants, the tasks scenarios that are going to be evaluated and criteria on how to evaluate the insights taken from the investigation. On the other hand, the consent of recording, as its name explains, is a document that has to be previously signed by the participants in order to have a consented recording from them and take the conclusions from these recordings. The test plan[193], consent of recording[194] and usability test report[195] for this research were developed following the guide of the template created by Usability.gov. Lastly, the testing script[196] is the document that narrates how is the actual testing going to be including the different set of questions asked, and was made accordingly to the structure recommended by Steve Krug. This document is made in order to maintain all the participants in the same conditions and not changing the development of the protocol by any circumstance.

In order to be able to apply the user testing inside the company, the author of this thesis did a pitch of the idea of developing this kind of research to the stakeholders implied on it, explaining them the importance of doing it inside the company, based on the discoveries found during the theoretical part and the interviews with the experts. On a second stage, the test was applied on the 21st and 24th of August 2020, and from the data taken from this test, the final conclusions were developed, showing with this, the user´s pain points that should be tackled during further iterative rounds to refine the product.

3.2.2.3.2. Formulation of questions

[193] Usability.gov (no date).
[194] Usabilty.gov (no date).
[195] Krug (no date).
[196] Usability.gov (no date).

The formulation of questions was developed based on the previously mentioned research objectives, looking from the scope of the overall functionality of the tool. During the interview, the use of open-ended questions helped the participant to feel free to mention any type of feedback that they wanted to give to feed the research. The use of open-ended questions fits the structure of user testing because it can derive qualitative insights that could not be provided by yes/no questions[197].

The following questions were asked before conducting the test to have them as a warm up before starting the session and make the participant feel more comfortable with the testing environment.

Set of warming up questions:

1. How often do you use CAT tools inside your work?
2. How experienced/comfortable are you with using CAT tools?
4. Which device do you normally use for working with CAT tools?
5. Roughly how many hours a week altogether-Just a rough estimate- would you say you use catch/ CAT tools and for which type of projects?
6. What are the main reasons you use CATCH or CAT tools in general?
7. Do you have any favorite CAT tool? And why?
8. Please List the three most important things that you think a CAT tools should have.

Set of post-test questions:

1. After seeing and using the tool, what are the features that you liked about Catch and why?
2. Which features did you dislike about catch?
3. Do you think is there any missing feature on the tool? If so, which one?
4. If you could change something about catch, what would it be?
5. Is there any task that you found particularly difficult to perform? if so, why?
6. What is your overall experience with the tool? In a scale from one to five, where five is the worst and one is the best, which number would you give to it and why?
7. As you remember, I first asked you what was your opinion of Catch at first sight. Now that you used the tool, what would be your second impression of Catch?

SUS Questionnaire:

1= Strongly disagree 5= Strongly agree

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.

[197] Farrell (2016).

4. I think I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I need to learn a lot of things before I could ger going to this system.

The purpose of asking all these sets of questions is to gather the most significant data as possible, always with the main focus of covering the two main objectives that were proposed in the beginning to the user testing process.

3.2.2.3.3. Testing environment

The execution of the test took place inside the startup in Berlin, Germany. Given the fact that the budget for the research was low, the product team made the decision of cutting expenses and do the test inside the office itself, instead of hiring a user testing lab for the test. Executing the test inside the offices also helped the research to be set in a traditional environment, facilitating the most authentic results at the end. When usability tests are conducted in a laboratory setting, experimental control and collection of high-quality data is not a problem. Yet one of the drawbacks of this setting is the lack of realism[198].

The testing environment used for the user testing was a simple single-room setup that can be seen in figure 15. This type of setup is the basic in terms of space and resources required, which fits to the budget settled for the test. The moderator stayed in the room in a considerable distance from the participant, in order to not provoke distractions to them, but always commanding the test.

[198] Beck *et al.* (2003, p. 2).

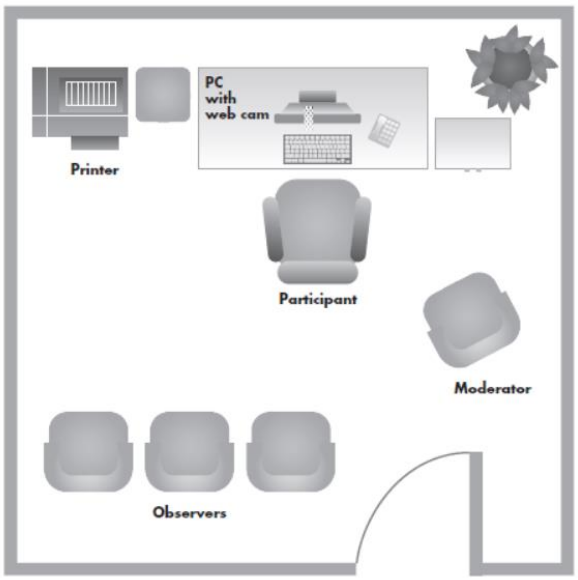

Figure 15. Simple single-room setup (Rubin, Chisnell 2008)

This type of setup remarks advantages that are worthy for the sake of realism. Since the moderator is physically present during the test, they realize the genuine reactions of the body language from the participant. It also enables the moderator to encourage and overcome the participant self-consciousness[199], because the participant feels accompanied by someone. Since the moderator is present in the test the entire time, they must be aware of all the commentary or actions they take, because this can have an effect on the reactions of the participant, which can lead at the end to biased results considered as disadvantages.

Other items from other testing setups were taken into consideration to conduct the test. For instance, the test was recorded from two different angles (standing camera from behind, and recording software from the laptop), in order to gather the most data as possible for further analysis. During the test, the participant performed the task on a PC that was previously settled with the software prepared to perform the tasks, and was not allowed to open new tabs or platforms on this time.

4. Analysis of interviews

4.1. The concept of user research

[199] Rubin and Chisnell (2008, p. 103).

The field of user research is nowadays more defined as a field that is merely dedicated to the digital world, since this is the path that society and humanity is taking in all aspects. Nevertheless, it is often forgotten that the concept of user research covers all kinds of fields that are related with the interaction of the human being and any kind of artefact. User research takes care about the attitudes the human being has, respecting a subject or scenario that could be anything[200]. This scenario doesn't have to be necessarily digital, but when talking about digital products, user research is defined as the user centered design taken into the digital world.[201]

User research focuses mainly in the study of involved personas to try to understand the users in terms of need, user requirements, insights and pains they might have[202]. If this kind of deep investigation is not done to know the user, the researcher simply will not understand the user's way of acting and their frustrations. This is why, as discovered on the theoretical research, the concept of personas must be created before developing user research. These series of personas profiles created for each project, involve the people who are going to use the product and are based on them[203]. Inside the user research concept, the way on how user research is covered as a process is taken into consideration as well. This is a methodic and structured process which enables to synthetize information to see the most specific value[204]. When user research is done in a methodic way, it shows all kind of insights such as pain points, usability flaws, wrong solutions for user problems or simply updates on new features. The term of user research changes depending on the context from where is aborded. If it is done from an existing product or feature, it is used to validate an optimal experience for the users, but if is a new feature or product, is used to know if the idea has enough validation to make the investment to build it[205].

Another important aspect that has be taken in consideration when talking about user research is the existent relationship between the concept of user testing and the business that is working for. User research directly affects the status of the business, because the user who is studied is the individual who is going to buy the product, which ultimately moves the business[206]. This is why the objectives of user research

[200] M, Ninova, personal interview, 9th July 2020. (line 1110-1112)
[201] N, Sebastian, personal interview, 8th July 2020 (line 682.684)
[202] N, Sebastian, personal interview, 8th July 2020 (line 677-678)
[203] P, Andres, personal interview 6th, July 2020 (line 43-45)
[204] P, Andres, personal interview 6th, July 2020 (line 49-50)
[205] O, Alberto, personal interview 8th, July 2020 (line 57-60)
[206] P, Andres, personal interview, 6th July (line 428-431)

have to be aligned from the business perspective, so the application of it improves the product in direction to fulfill the goals of the business. User research as a concept is a discipline that has been known for a while, but at the same time, has a space to be more recognized between digital professionals.

4.2. User research through the product´s lifecycle

User research is a discipline required to be present through the entire lifecycle of the digital product[207]. UR is used to give a better guidance on the decision-making process in the development of a product, tackling the problem from different perspectives such as the validations of hypothesis, validation of features which are still in planification or usability flaws[208]. On the other hand, the user research method that should be taken for each research is defined by the stage of the lifecycle where the product is standing[209] and the objectives of the investigation. First, they research team needs to determine what is the goal of the study, and from there, determine which user research method to use[210].

Every step of the iterative cycle is constantly changing and must be reflected by the researcher in the sense of never stop thinking on doing updates about personas, needs, objectives and expectations. This is the starting point of every iterative process[211]. Since it is a process that is always mutating, it supports itself to de developed by the use of other methodologies such as design thinking to find new opportunities to improve the product[212] and keep a structured outcome.

The presence of user research in the beginning of the design of a product is spotted by clearing the first doubts that the research team could have about a project, focusing in punctual objectives inside the process. These punctual subjects are the needs, competitors, subjects around the market and the existent ways to solve these current needs[213]. For other rounds where the product is already developed, user research focuses more on the subject of seeing if what was proposed is solving the need, how

[207] P, Andres, personal interview, 6th July 2020 (line 86)
[208] O, Alberto, personal interview 8[8h,] July 2020 (line 419-423)
[209] M, Ninova, personal interview, 9th July 2020. (line 1132)
[210] P, Andres, personal interview, 6th July (line 428-431)
[211] P, Andres, personal interview, 6th July 2020 (line 100-102)
[212] N, Sebastian, personal interview, 8th July 2020 (line 728-732)
[213] N, Sebastian, personal interview, 8th July 2020. (line 734-735)

it is improving and can be improved[214]. After this, the iterative cycle starts again, using the method that fits the best for this part of the process.

Since all the companies don't have the same size or the same focus on the user, the approach for them to aboard user research varies. Bigger companies have their own user research department, which allows them to be in constant evolution. And on the other side, other companies that don´t have a strong user research muscle, take the approach of doing a cyclic iterative research, guiding themselves by the use of analytics, which shows them if something is not working, or if its worth it to build new areas inside the product [215]. When user research is done from a freelance point of view, having constant contact with the company who is hiring the services brings benefits to the investigation. This matures the level of sensibilization in UX inside the company, makes them comprehend the dynamics and listen to the voices of the user[216].

The power of talking with people, especially with real users at any stage of the process is determinant to have a successful application of user research. Giving the research team the chance to evaluate a sample of the final user gives the power to the designer and researcher to distinguish the insights in them and filter the ideas. The power to discover patterns on the way of thinking of the user, to give a light on where to move the solution, gives an extreme sense of value at any point of the study[217].

Nowadays the use of agile methodologies where user research method is applied in fast version projects, gives room for the use of assumptions made from the researcher about the user[218]. It is relevant to give the investigation space to identify insights because at the end is this the way where the research is trying to get these "Drops of wisdom" that a researcher should have when developing a product[219] .

4.3. User experience of a product

The role of user experience inside a product is not only defined by the design team. All the involved people in the development teams and stakeholders should

[214] N, Sebastian, personal interview, 8th July 2020. (line 738-742)
[215] O, Alberto, personal interview 8th, July 2020. (line 436-443)
[216] M, Ninova, personal interview, 9th July 2020. (line 1177-1180)
[217] P, Andres, personal interview, 6th July 2020. (line 373-377)
[218] P, Andres, personal interview, 6th July 2020. (line 139-141)
[219] P, Andres, personal interview, 6th July 2020. (line 367-379)

participate[220], because it is an effort between the different departments like design, product, copy, content and others[221], to create and fulfill an optimal design experience. A product is defined with a good user experience when it delivers its stated promise[222]. The meaning of delivering its stated promise also includes the level of trust that a product is reflecting to the user in terms of form and usability, because the biggest mistake that can be done is making the product fail on delivering this promise[223]. The lost trust given by the user to a product when it delivers a bad experience, is never going to be back and the user will always remember this lack of satisfaction, causing and emotional scare for them[224].

For delivering these stated promises the designer must have and holistic vision of the whole context of the product[225]. The fact of it being easy to find between the offered products[226], and having a position inside its market[227], also influence its user experience. The concept of usability also defines the user experience of a product. A product is usable when it works for the user to allow to do its desired function[228]. This includes the clarity the communication between its functions[229], and for products that require the follow-up of flows, also includes the concept of navigability[230]. The navigability allows the user to have a lighter cognitive load with clear, accessible and simple experience.

Having a fulfilling user experience also is related on looking to increment happiness and loyalty from the client[231]. When a user feels happy by using a product, the link between the emotions generated by the use of it and the product gets stronger, which brings up the concept of emotional design. This creates a stronger link further away than just in terms of functionality, creating fidelity from the user to the brand that creates the product[232].

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220 P, Andres, personal interview, 6th July 2020. (line 181-187)
221 O, Alberto, personal interview 8^{8h,} July 2020. (line 515-516)
222 O, Alberto, personal interview 8^{8h,} July 2020. (line 506)
223 P, Andres, personal interview, 6th July 2020. (line 211-215)
224 P, Andres, personal interview, 6th July 2020. (line 291-293)
225 P, Andres, personal interview, 6th July 2020. (line 162-168)
226 P, Andres, personal interview, 6th July 2020. (line 210-211)
227 P, Andres, personal interview, 6th July 2020. (line 205-206)
228 P, Andres, personal interview, 6th July 2020. (line 200-201)
229 P, Andres, personal interview, 6th July 2020. (line 196-197)
230 N, Sebastian, personal interview, 8th July 2020. (line 798-804)
231 P, Andres, personal interview, 6th July 2020. (line 324-329)
232 P, Andres, personal interview, 6th July 2020. (line 226-229)

The importance of doing user research comes in order to secure a positive user experience. The research team determines trough investigation if a product fulfills the needs it aimed to fulfill, and this kind of output is only known when it is tested with the user[233]. For testing user experience, the researcher must have a clear concept of empathy[234]. This concept is going to help the research to get into the thoughts of the user and think through their eyes, in order to get the most insights to do a satisfactory experience.

4.4. Human intuition in user experience

Intuition is a concept that plays a role through the entire design and usage of a product. The researcher must make use of intuition during the analysis process of research, inside the use of hypothesis, which already gives a probable route to take decisions based on experience and intuition[235]. The intuition applied by a researcher in a project is only brought along with the experience, nevertheless, a good researcher must use their intuition to generate hypothesis and measure them with the words of the user[236], not adapting to the user to solutions.

The analysis of intuition from the product usage perspective takes a different approach. The use of intuition has existed always with the interaction between humans and digital products, but the technology and its evolution have a relevant role in the evolution of human intuition[237]. What something was rare or unexpected 10 years ago from a digital product or device, has now become a series of “best practices”[238] that were settled for the use of digital products, establishing trends on its usability. This means that the sense of intuition changes depending the context[239] and the era of time that humans are living in.

It is relevant that intuition is originally defined as an instant comprehension without any reasoning[240],which settles the debate about until which point the user is not making use of intuition when using a product, given the fact that products are built thinking

[233] M, Ninova, personal interview, 9th July 2020. (line 1256-1259)
[234] P, Andres, personal interview, 6th July 2020. (line 177-181)
[235] M, Ninova, personal interview, 9th July 2020. (line 1287-1292)
[236] M, Ninova, personal interview, 9th July 2020. (line 1296-1301)
[237] O, Alberto, personal interview 8th, July 2020. (line 520-521)
[238] N, Sebastian, personal interview, 8th July 2020. (line 814-818)
[239] O, Alberto, personal interview 8th, July 2020. (line 538)
[240] P, Andres, personal interview, 6th July 2020. (line 237-240)

about rationality and therefore rationality is applied when interacting with them. On the other hand, when a user is used to use a product in a certain way, the sense of familiarity[241] comes to place. The users tend to replicate the same conducts they do in one digital product, for all of them, because for them is easier to only remember one type of gesture and they expect to use all the digital product by behaving on the same way. Part of securing a positive user experience comes from bringing processes or gestures that are familiar for the user so they don't have to learn from them twice.
Nevertheless, the UX designer must consider that even if bringing familiar gestures to products could improve the user experience, the concept of innovation must be also thought trough. If a designer only keeps working on the same flows or gestures to be safe, they could be killing the product, because it wouldn't be bringing something new into the mix, starting to compete with other innovative products that could take the safe option out of the game. The designer can make use of strategies such as mixing innovation and familiar gestures[242], in order to not create a hard experience for the user, where they might get lost at some point if they don't understand the innovation.
After the user interacts with it for a period of time, the entire user experience is going to be felt familiar and the innovation will evolve the sense of intuition of the user[243].

4.5. Cognitive Psychology in product design

The comprehension of the cognitive processes of the human mind is determined as fundamental in the design and development of digital products[244]. Is relevant to understand that the cognitive processes made by a human being while using a digital product are almost unconscious and implicit on the way of acting of humans, nevertheless, the design team must keep these principles in mind when designing them[245].
Since the user as a human being is barely aware of these processes, is difficult for people to verbalize these aspects when doing research[246], so Is the task of the design and research team to rescue those insights, even if they are not as visible as others.

[241] P, Andres, personal interview, 6th July 2020. (line 247-250)
[242] P, Andres, personal interview, 6th July 2020. (line 253-259)
[243] P, Andres, personal interview, 6th July 2020. (line 260-266)
[244] P, Andres, personal interview, 6th July 2020. (line 271-272)
[245] M, Ninova, personal interview, 9th July 2020. (line 1331-1334)
[246] M, Ninova, personal interview, 9th July 2020. (line 1335-1339)

The cognition theory based on how the human mind processes information adds some context to argument why some design decisions were made and is a key factor to make a user experience successful[247]. This is why the UX designer needs to make theory explicit, and incorporate the concept of mindset into the scope. The mindset concept means that users can have a fixed, developing and evolutive mentality[248].

Another relevant factor to consider is the repetitive processes that a user faces during a user experience. The human mind doesn't behave the same way when is using a product for the first time, nor when it is using it repetitively. Nevertheless, regardless of the behavior, the user doesn't want to repeat the same amount of repetitive flows such as for instance rating an App more than once. If these factors are not taken into consideration, the UX becomes lame and slow[249]. The designer can help to improve the experience with the use of adequate icons that are already designed by companies dedicated to create human interface guidelines based on the theory of cognition. In consequence, these guidelines should be understood to continue this behavior language in the product[250].

In previous times there was the misconception that a good user experience existed when it had the smaller number of steps to follow[251]. But what is actually better is to delay the experience and give the user the opportunity to understand what is occurring. Making the experience faster could only confuse the user and give them a heavy cognitive workload that has to be decided in fractions of seconds, resulting on a bad user experience.

Normally, the research teams apply fast methodologies with teams that are composed by members that come from different backgrounds than social sciences, so they see they research process from a different perspective. The existence of an individual that comes from this kind of human science could bring interesting insights to the studies. Designers see the Project from the perspective of usability and ways to solve problems, but a researcher focused into cognitive psychology give more a look into the behavior itself from the user[252].

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[247] O, Alberto, personal interview 8[8h,] July 2020. (line 549-550)
[248] P, Andres, personal interview, 6[th] July 2020. (line 290-298)
[249] N, Sebastian, personal interview, 8[th] July 2020. (line 870-877)
[250] O, Alberto, personal interview 8[8h,] July 2020. (line 575-586)
[251] O, Alberto, personal interview 8[8h,] July 2020. (line 551-553)
[252] N, Sebastian, personal interview, 8[th] July 2020. (line 837-840)

4.6. Measuring UX

The measure of UX is already included inside the iterative cycle of user research in order to understand the strengths and opportunities existing for a product has during its life.

All metrics inside the product´s lifecycle must be made with real users, because testing with fake users will not throw good metrics[253], and according to these metrics , the nature of the product[254] and the objectives of the research, the design team makes decision on which kind of user research is more adequate to measure them, based on what is wanted to understand[255]. Metrics like conversion rate, level of usability or overall user experience, give a guidance on how to choose a research method.

Quantitative investigation is based on getting data related to numbers or statistics, while qualitative data is more based into getting insights from the user, so the ways to measure user experience trough qualitative and quantitative methods vary given to the nature of each type of investigation. Qualitative investigation is measured by subjects or topics and in function of these, the finding of which topics were categorized as problematic for the user[256]. The point of qualitative investigation in UX is to see which insights are problems and how to improve them[257]. Nevertheless, Qualitative investigation will never provide a quantification to measure satisfaction[258], and this is one of the reasons why can be combined with quantitative methods according to the scope of the research.

During the measure of UX another factor that must be taken into consideration is the nature of the users. The concept of universal design is applied on this case to include all types of users with physical disadvantages[259], that might potentially use the product, and make user friendly interfaces for them. For the moment of measure this kind of products, this special population should be also analyzed in order to not bias the experiment in any way.

One of the reasons that the product exist for is to give revenue or help operating the business, so I necessary to consider the business objectives when measuring the user experience of a product. In this case, the metrics are followed under the statistics of

[253] P, Andres, personal interview, 6th July 2020. (line 346-348)
[254] O, Alberto, personal interview 8th, July 2020. (line 596-599)
[255] O, Alberto, personal interview 8th, July 2020. (line 615-617)
[256] M, Ninova, personal interview, 9th July 2020. (line 1384-1391)
[257] M, Ninova, personal interview, 9th July 2020. (line 1394-1402)
[258] M, Ninova, personal interview, 9th July 2020. (line 1391-1394)
[259] P, Andres, personal interview, 6th July 2020. (line 220-225)

KPI´s[260]. These establishment of KPI´s, validates in effect if the experience is being good or not in a measurable way[261], and are created by internal teams of hierarchy inside the business or simply by the researcher who is in charge of the investigation. The research team must have a structured plan for conducting the analysis and measure of UX, given the fact that the take of these decisions is going to define the path for future strategies in the product´s lifecycle.

4.7. Limitations of user research

The application of user research faces a lot of challenges for the research teams on a daily basis and different factors affect its performance. Normally in the area of project management, projects can be defined under three circumstances: Times, budget and resources.

The budget is defined depending on the level of decisions that need to be taken with the results of the study[262]. Depending on the budget, decisions like doing inhouse research or hiring external agencies for conducting research are taken. Regardless of the inhouse or external hiring of service for conducting research. The team must have constant contact between the parts to understand what is happening during the process. On the other hand, the resources available for a product also limit a study that is making use of user research. Is not correct to think that the quality of an investigation is directly proportional to the number of resources available to perform it. The researcher has the task to be resourceful with the resoruces and make use of these available assets in the best way as possible. One example of this could be the corona virus pandemic. The social distancing rules are also affecting performing user research, and because of this the researcher must look for methods that doesn't involve a big number of participants, or simply doing remote research, which brings up other type of challenges[263].

The time available for a research is a factor that defines the scope for the research, hence, it must be defined from the start of the investigation. Nowadays the use of agile methodologies to test a product has taken a lot of prominence in the world of user research, that when are not planned correctly can lead to bad research results. This

[260] N, Sebastian, personal interview, 8th July 2020. (line 882-884)
[261] N, Sebastian, personal interview, 8th July 2020. (line 892-894)
[262] O, Alberto, personal interview 8th, July 2020. (line 477-483)
[263] N, Sebastian, personal interview, 8th July 2020. (line 980-983)

happens because sometimes these methodologies are applied just for the sake of conducting user research, creating speculations on who is the user, their interests[264] and needs, or because companies see user research just as a trend[265] .A bad research could also affect the result of the external teams, given the fact that there is the possibility that they hire an expert when already having the desired outcome of the investigation, and don't agree with other result different than this[266]. The teams and members that are external to the process of user research could sub estimate the power of user research and might see it as something easy[267], then can be performed through quantitative software, throwing metrics that will be further analyzed to make decisions on the product. Nevertheless, if the research team goes further than these data and combines this with other types of investigation, this could lead to more valuable insights. A balance between qualitative and quantitative investigation is relevant to consider, because with the use of data, there are intersects of information[268] and clearers numbers on specific trends that measure the product.

5.0. Conclusion and future scope for the research

The following chapter gathers the analysis of the theoretical part compared to the findings of the two empirical ones, aiming to come into a final conclusion for the research question that this thesis focused two answer, followed by the three research questions that composed this research topic. At the end there is going to be an explanation on how the author of the thesis is going to take this new knowledge into consideration for future best practices in user research.

5.1. Conclusion

User research is a discipline that plays a necessary role for a successful future development and improvement of digital product. Having a clear idea of what a user needs and what is valuable for them, brings time and cost efficiency for the design

[264] P, Andres, personal interview, 6th July 2020. (line 156-158)
[265] M, Ninova, personal interview, 9th July 2020. (line 1469-1471)
[266] M, Ninova, personal interview, 9th July 2020. (line 1225-1234)
[267] M, Ninova, personal interview, 9th July 2020. (line 1157-1160)
[268] N, Sebastian, personal interview, 8th July 2020. (line 668)

team and the company who is developing the product as well. Redirecting a product strategy that is almost finished means starting from scratch, which affects the company in terms of time and money. The longer it takes a team to test an idea within the life cycle of a product, the more negative the consequences will be for them.

From a continental perspective, the development of the concept of user research varies between countries. Some countries in Scandinavia have a more developed concept since those countries where the ones who stablished user research as a discipline. On the other hand, companies in some other countries inside Europe still have the opportunity to put more weight in the role of user research, by giving more seriousness to it.

The role of the researcher also plays a significant part for the successful development of user research inside a product, because this is the role who is in charge of gathering the needs of the users and built from there to administrate the tasks of the involved stakeholders, transforming the need of the users into design opportunities to improve the product. They need to have the virtue of being empathic, since they are going to deal with the user´s pain points and also flexible, given the fact that they are dealing with different types of inputs that change depending the product stage in the lifecycle.

In the role of user research, stakeholders are determinant for a positive outcome. So is relevant that during the process they are updated on the status, since they are one of the parts that are looking for solutions through the research.

The main objective of user research is to guarantee an optimal user experience, which is translated to reality on the client´s happiness and their loyalty. This loyalty can be brought when the user experience given by the product creates emotional links with the user, which gives new opportunities for the design team to iterate on the process and add additional features that will satisfy the user in the future even more. Hence, the use of user research is a key factor to measure the acceptance and usability of a product, and therefore, the user experience which is going to be translated into revenue for the business in the long term.

5.1.1. Sub question 1: What are the steps for conducting user research?

Even though there are some stablished steps to conduct a research, they vary according to the method and the step on the product cycle that the product is at. The type of research that is wanted to be done depends on the objectives and budget of

the research, and because of this, the companies approach this issue from a different perspective, which is by outsourcing the investigation or having an inhouse team for conducting the research.

There is a structure that must be followed regardless of the type of research that is conducted or the step in the product´s lifecycle. First of all, the first step of the user research process is the creation of objectives or hypotheses, displaying what is wanted to be solved. After this, the faze of execution comes to place, which varies depending the type of method. After this, the results must be gathered and analyzed in order to come into conclusions and recommendations on which decisions to make to improve the product.

Other minor steps that the methods have in common, such as the recruitment of participants or creation of incentives or protocols, are performed the same way for all types of methods. Nevertheless, the components change according to the needs of it.

The existence of physical proof of the gathered data to analyze the investigation is necessary for conducting research. Without this, the results from the analysis will not be accurate, and therefore will be impossible to conclude the investigation. The process of analysis of the gathered data has to be done meticulously, following protocols for each type of research. Not doing the analysis in a clear and consistent way leads to the loss of valuable insight that could help to the investigation.

The steps also vary according to the step of the lifecycle that the product is at. If the product is in an early stage, the efforts must be concentrated on gathering participants to make the first revisions of the product in order to create the first data related to the product. On the other side, if the product is in a mature step of the cycle, the research team will already have data to compare and will be in a step of improving rather than building like in the first stages.

The use of agile methodologies could provoke the elimination some steps from the research method. Nevertheless, is relevant not to work based on assumptions or invented insights without talking with the real user during the research, because this is the final goal of applying these methodologies into the investigation, and without them nothing would be concretely done, which causes uncertainty in the research.

5.1.2. Sub question 2: How is the relation between cognitive processes and user experience when using a product?

The cognitive processes and cognitive psychology of the human mind are a subject that has been taken into consideration since the beginning of the era of design of digital products. Cognitive psychology aims to understand the theories of the mental processes from the mind in order to comprehend how the user interacts with digital products. This discipline also works as a way to argument the design choices taken for the usability of a product, and considering the fact that the human mind and its working processes are a very complex subject to understand, this discipline takes care of breaking down the points that should be taken into consideration at the moment of designing the product.

The main goal of the user experience is to create products that are easy to understand and that deliver the promised offer and in order to achieve this, cognitive psychology plays a necessary role for the design of the user experience. This discipline is the one who is going to give the parameters on how to design the flows and features of the product. The sense of memory, attention, perception, decision-making and problem-solving, work together as a whole to give these parameters. The design of the product has to be a process of trial and error in order to see which solution fits better for the human mind. Based on these categories, some resources have been constructed through the times like for instance the Gestalt laws, which help to give a guidance to the designer on which path to take on the design. The relation between cognitive psychology and user experience brings up as well the concept of familiarity, because when the user is using a product that seems familiar to them, their cognition is going to be already accustomed to it, and therefore is going to be easier to interact with the product. Beside the Gestalt laws, there are other digital tools like "*material design*" that help the designer to ease the decision-making process of improving the design of the user experience through the use of cognitive psychology.

5.1.3. Sub question3: What is the role of human intuition in user experience?

Intuition is one of the main factors that could categorize a positive user experience. The role of human intuition in user experience is to guide the user to the experience of using a product in a uniform way, making efficient tools without making the user put much effort (cognitive load) to complete an interaction with a digital product. When a product is intuitive means that the it fulfils the expectations of the user and therefore, since it delivers the expected promise, brings a positive user experience to the them without any frustration.

The concept of human intuition in user experience brings along the concept of familiarity and affordance between a user and a product. When a user manipulates a product is expecting it to perform a determinate task, and at the same time are expecting to have the same type of behaviors in different digital products, because cognitively they have the sense that a respective gesture is going to put them in the flow they are trying to complete. This relation also depends on the level of expertise in the relationship from the user with digital products, but is an aspect that comes with the practice, until when in a given moment the repetitive use of a gesture becomes intuitive for them.

The intuition has to adapt to the innovation that is proposed with the design of new digital experiences, but it has to come into a middle ground, where the user experience combines innovation and intuition to propose new solutions, in order to not confuse the user, and therefore have a positive and innovative user experience.

5.2. Future scope for the research

This research opens a new scope on how to aboard user research when designing a product, and the different factors that come into place when discussing about it. The application of the theory in the usability testing and the expert interviews has answered the doubts that this research proposed on the beginning, and gives room to an expectation to explore more into putting the theory in practice in the future investigations of research, as well as a willing to understand how the human mind works when it is interacting with a digital product, something that is done on a daily basis in the current times that human kind is living in.

The situation of corona virus didn’t make any kind of influence in the results of this research, and since the tests were performed in person, all the safety measures were taken. The existence of global pandemics like corona virus raises the questions on how resourceful the researcher must be in order to encounter valuable insights, something that can change the scope the physical user researcher in the future and therefore, the outcome.

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Appendix I – Expert Interviews

Introductory paragraph

First of all, thank you very much for taking the time to help me on my investigation with this interview. I am going to give you a short introduction about what we are going to do during the interview. I am going to ask you eleven questions focused to the role of user research and user experience in the development of digital products. The idea is that you answer these questions to me from your background experience and what you have live at your job previously. If you don't understand the focus of the questions, you can tell me so I can solve the doubts that you have. The answers are going to be entirely used for my investigation and will not have another user beside this one.

Before we start, I would like to ask you if you agree with me recording the interview. It will only be the voice. Do you agree?

Interview #1: Andrés Páez, Director of RAD (Academic network of design) and UX/UI design professor

I: Introductory paragraph

I: First I would like you to introduce yourself and that you would tell me a little bit about your trajectory and what you have done before.

AP: Ok, so I am an industrial designer, since approximately 25 years, I have master in international relationships and specifically in the area of UX I have been working in the part of teaching most of all. I started teaching at Pontificia Universidad Javeriana in 2004, which is like 16 years more or less on the field. I also helped to build the bachelor of Digital Design at Sergio Arboleda University, 3 years ago, which is a new bachelor… I am a teacher at the specialization of Multimedia communication, also at Sergio Arboleda University in the area of infographics and in the area of developing codes, which is another way to see the design subject and the development of products. Also, I am a teacher in the bachelor of digital design that I mentioned before. In the other hand I am the administrative director of the "Academic network of design (RAD)" which is the association that groups design programs at a national level since 10 years… there is more towards the management of projects, even though, the projects that I purpose are about the use of information and the design of digital products between the reach that the association can have.

This is more or less my panorama.

I: Great! Ok… Do you use normally user research for the projects that you have previously developed?

AP: When I read this question I thought… yes, for the academic projects that we work with, yes for the projects that I make at RAD, but from a perspective from where I consider user experience as a very wide subject, but in colloquial terms it is used for the development of technological products… So, for me every project is an experience… Every project consists on looking for which type of person is it made, who I am going to sell it to, what attracts their attention, which are their interest. So, yeah… at big scales or at fast scales in projects that are more like, ok, so for tomorrow I need to present this project so I have to think very fast…so I use it but in different scales. In some occasions I can make it deeper and in other occasions, as we say in Colombia, I don´t know how to translate this to German…"Estupetear" for four hours. But I think the focus of having at most explicit information from the user, whether it is supposed or investigated is fundamental, otherwise I think the product that one is proposing does not have a clear focus, so yeah.

I: And how would you define the concept of user research?

AP: Oh! Here you made things complicated…In my own terms how the thing works?? Because as I am telling you, i see it in any project, so when I am thinking in the concept, at the end, one makes a study that has to be methodic, let's say structured, of the involved users…
In English, and also in Spanish the word has lost a little bit the focus in the sense that there are not a lot of people likes to talk about the "users", but they like to talk about personas… but the study of "personas" involves the people who are going to use it, and the people who are involved in the development process interested in the business. So, I think it is an approach that has to be structured to have the most synthetic results as possible, because you can talk a lot, as we as designers do, like me in this moment, but what helps you to be methodic and structured is that you being able to synthetize this information to be able to see the most specific value… For example, the needs, pains, objectives, contexts, of actual users, if they are interested or not, if they are satisfied or not, opportunities… So, is the study of these involved personas… organized and methodic, to inform about design decisions, to have an

argument to say I am going to making it this way for this reason and it has this characteristic for this reason, so is the study of the people but it has to start to be translated into inputs inside the design process, this is how I see it.
And also important in this concept is that it has to relate the people with the business, I mean, the user is the one who is going to buy and use the product and this is what moves the business, but is the relationship between this and the objective had by the business or the focus that the company, and the technical capacities. It has to be like, what is happening has to link the business or is not going to finish in something that cannot be implemented. This would be the concept in a scattered version (laughs).

I: Which do you consider that is the role of user research in the development of digital products?

AP: Well, ignoring the initial part of one has to investigate about the users, hmmm … on of the main things is that it saves money in the cost of the development. The idea of having clear what is needed, what people will buy or what is what people is going to value, this should simplify the exercise of the development process. In a digital context, where it is more seen, the fact of having to adjust or redirect a product that is already developed is the worst. The most expensive change in terms of software or a digital product is to say after a while like, ok, we have to push the logic in another direction… that is almost the same as starting from scratch… So, in this sense, basically, is that user research says in terms of construction in which direction should be things developed in a correct way. Also, obviously incrementing the client´s happiness and their loyalty. Because what you are doing is trying to surprise, create emotional connections, so you only not get people who buys, but also people who starts to link with the products in an emotional way, discovering new opportunities as pivot points for the development of products or additional characteristics that are going to develop emotional bonds. I think these are the three central things on the role that user research can have in the development of products.

I: In which moments of the product lifecycle do you apply user research?

AP: I see it more as in the whole cycle, but lately, I have been actually preparing a new class for the digital design specialization and I was reviewing this article in terms

of digital products and the fact that we see the design process as an iterative process. So, we say always like there is an investigation, ideation, development, we make tests, and then we go back. In terms of the development of digital products, they make this creative process but is way faster. They expect this process to happen in one week (laughs), so you say like… hmmm, we cannot do it at this speed. I mean, yes, I investigate and develop a minimum subject that can be navigable prototypes, wireframes, something like that… and I prove them and redo the tasks. So, from the design perspective in every step, every time that one is beginning a new process, I think one has to rethink, reflect or reconsider if what you investigated is enough or if it needs something more. If you need more specifications because at the end of the testing, some questions come up that can be answered, as a simple design iteration, or it might happen that they are not completely answered and you have to develop them, so relatively it is at any moment… it is the initial point of every iteration and is a reflection about personas, needs, objectives, expectations and this starting point of any iterative process… I think.

I: Ok yeah. And when it is about steps; do you always use the same steps? Or what is the process?

AP: Well, in the specific terms of user research, what I would say in terms of steps is that you use the same steps but they are very simple. First, it is to identify what is the objective from the investigation, what is what I need to recognize, what is the doubt, yeah?... It has to be explicit to be able to select later the most adequate tool. It depends on in which step I am and what is the objective of the investigation, so I can say, ok, I can from these multiple tools that, use a card sorting, a follow up of eyes or clicks, A/B testing, usability testing…. Everything depends on what is the objective of the investigation. For me, the steps to follow are two steps which are to first identify what I want, and then I determine which tool to use. Inside the tool the steps are practically defined. They are very well-known methodologies, that you sometimes adapt with age… You start to detect things that work and things that don't work, so one starts to create their own procedures, but in general terms, they are the known tools. Nothing new.

I: And do you have any favorite tools?

AP: For me, the usability testing is super important. I mean, to see people working on the tool specially in the low fidelity prototypes (Paper prototypes). Because there is when you are still open to discussion, you can go in any direction, and to see the user using the product is super important to evidence if the product is successful or if it failed and there are new things to fix. I like more practical tests, that are more focused towards seeing people working, or also the following of clicks and eyes, but for that I would need to have a more concrete product… or I least I don't think it works so much with a paper prototype. So, I would say this for the part of products, and the interview method, in the beginning, I think is fundamental for one to make a divergent exercise… for the beginning when you are looking for possibilities, to explore, to ask and to be open. Interviews like ethnographic observation, or unstructured chats before saying I have 35 hypotheses and I have to try them… I like them in the sense that they are divergent, and allow you to move more towards the new than to improve the product. Those are the two that captivate my attention the most in those steps.

I: Have you ever developed a product without performing user research?

AP: Yeah... more than anything in fast version projects. In that sense, I don't make an investigation in specific but I have to sit down and set an assumption, to say this is my user, he thinks like this, I have a hypothesis saying that he wants this other thing… For me, this is still based in the logic of having a person or human being as a center of the product but you have to speculate when saying what he thinks, and then based on that you propose your idea, or that you are expecting to develop this other thing and then you will prove if you succeed or not.

I: And if not, then you start again…

AP: Yeah, is like an informal speculation. Because what I have noticed is that in terms of new ideas it is very difficult to talk about non-existent things, so sometimes is easier to make a test with a draft that is in a direction, than having a catastrophic result, when is not successful at all, so is easier to talk about more concrete stuff, also because in real life the perspective is no so open… products have a context where they tell you in advance what is going to be developed, setting a limit, or they have time and budget restrictions that indicate to you that barely you can propose cost free projects… this

works as a limitation. But a lot of times is also done for the need to present the project quickly, not necessarily developing the product, but you have to make a big speculation about who is the user, what are their interests and so on.

I: Which factors do you think that can influence to have a satisfactory user experience in a product?

AP: Ok… Here we can talk about two scenarios with these questions because I would say it has influence in the product but also in its development. First, on the development of the idea I think you need to have a holistic vision. I think that is the most complex vision is in terms of relating the user experience with the size that the user experience would be. This means if it is actually an experience. Since the user is looking for a product from the type that you are offering, is comparing, looking, buying it, using it and how it is incorporated to everyone´s life. Then, how at any moment it stops being used or at any point it can´t be used anymore, and you need to contemplate what is happening after all this. In all this experience I think you should have this holistic vision of a product… and this is complex, because normally you don´t have time to reflect so widely and normally you need to be centered on the product producing something. So, especially in the development of digital products, people can tell you… I need this in two weeks, and you would think… but you are leaving me no time, so I have to speculate a lot of things, especially in this part… in this holistic vision.

I think that the concept of empathy is fundamental, I think that we as designers have to be super empathic when doing investigation and talking to people, and this part is also something that one has to make explicit in a way or another… Not only saying, I am empathic because I am a human being… well there are human beings that are not so empathic, so no necessarily for being a human, you are empathic. And I also think that in the development teams all the involved people in the business should participate. That is another thing that is going to influence to make the user experience complete... To really involve what the user is needing and waiting for, but is also related with what the business is trying to offer, the value, the proposal and also what can be done. Because if not, you end up imagining stuff, that is what happens to me because I don't work with complete development teams… I am only from the design perspective, and I imagine the most wonderful thing. And in the academic area that is what I like. Imagine always big… but you in real life start with small things, but you

have to learn to think big… in the complete product to then say ok, what is what produces the less value, lets test this step…this is what works in real life, but I think that de designer needs to think big and to have this capacity to do it. The disciplinary focus allows it to have a balance to say I want more, and the tech team saying, ok we can do it, and the business saying ok we give it, and the balance is made. I think that is important in terms of the development.

Product wise, talking very concrete, is that the product needs to be useful, clear in the communication between functions. There are some products that are not necessarily communicating bad stuff, is more that they are not clear communicating that their utility is for multiple functions, like some utilities can be for A or B, so it must be very clear in the functions that it has. Also, that it has usability… that it is usable, that people can use it, and that it allows to do the desired function. There are products that one has to use obligated, that are not usable and that what they do is to product an emotional scare. Every time you talk about this product you start to talk about really bad stuff about it, because is not cool.

I think the product should have a clear position in the market, a place, a niche, that is located between the things you sell…Like for example when you go to the website of a store, like an EXITO (Colombian supermarket) something like that, you see 58 categories and when you are looking for products, in general terms, you go to the category… and the product being in a specific category, and not in the category "others" where is never going to be found. I think it needs to have a character where it is easy to find, and this implies to be found on the market… Definitely that is trustable, that it fulfills what is promised, because to fail is the biggest mistake… A product can say I make this wonderful things, and in digital products, thank god there is the idea, of a test mode so you can prove and say if it works, so I pay what I have to pay for it or not, because I am already trusting on the valuable offering of the product. I think it is very important to have this promise in products that you have to buy to use. It has happened to me that I buy something and it doesn't work for the only thing I need it to work for… Damn it! And then I don't use the product anymore and I talk bad stuff about it.

I think the concept of universal design of products and the logic of accessibility inside the products is extremely important nowadays… A lot of people have physic disadvantages… like auditive, visual, cognitive disadvantages, and products must consider this. You have to find a balance to say I can only make it until this point, but

at least, to have a reflection on how to improve the product in this direction to people with difficulties or disadvantages. I think this is important, to have clear what is the offered value, that it is concrete for the user and the business. Also, that it is an emotional product, that it is a product that has emotional values and can link to people farther away than functionality… creating a personal link with people… Rising the desire that people feel for this… to make it desired, that is something that the user would say. I want to aspire to have that without the need to only do it because of the cost, but to make also an emotional product… and I think that is what should make satisfactory the user experience of a product.

I: What do you think that is the role that human intuition plays when using a digital product and how do you think this affects the UX?

AP: I don't know if you remember I told you this in class, but for me intuition is super important because it is trash. Intuition, according to the royal academy of the Spanish language is the instant comprehension without reasoning. With this said, which sounds amazing, it sounds great that a product is intuitive, but you cannot make a product intuitive, because you build products thinking in a rationality… like people when they see it, they already say oh! It is going to do this thing… There is already a rationality, and we don't know how to build intuitive products because we don't know how the intuition of the person works. For me, this is very important, because people are selling this idea and people says, Wow! This product is really intuitive!!... a kid uses a tablet super easily… Well no!!, they know how to use it because they have seen you using it for two years… well they are going to imitate the things as trial error, like any person… but is not intuitive. For me, the key concept is familiarity, which means that I try to bring stuff that are familiar and this facilitates the fact that something can be learned and easily used. This is for me the clarity, not to talk about it in terms of intuition, but in terms of familiarity…transfer of abilities and knowledge. For example, I already know how my operative system works, so if the application uses the logic of the operative system, I don't have to learn it… I already know it; what others would say is intuitive… I have already seen it, I know how it works, so I bring it. In this subject is to use the experiences and bring stuff so people don't have to learn twice. But I also used to tell you in class… this clash completely with the subject of innovation. When I propose something new, the people don't have this new thig as a reference, so you have to be really thinking what familiar stuff I can bring to not to create a hard

experience, but also how can I keep innovating, because I would be killing my own product… I would be saying, I am not going to change this alternative because people are not going to understand this new thing that I am proposing. I think that products that are really offering something valuable, might get a lot of complains from the people at the beginning, but then they will adapt and say, this is amazing!... and is ok. I think that we need to stop thinking about intuition because we cannot control it and we don't know how it works, so we have to start introducing familiarity and introducing it between the experience that you propose, between an adequate space…Not taking away the opportunity of innovating with a product.

I: What do you think that is the relationship between the mental processes of cognitive psychology and user experience?

AP: When I read it, I said Oh my god!... I think it is absolutely fundamental that one has to comprehend the processes of cognitive psychology…How people thinks, how people understands, how people pays attention…so one can start to reflect on how my product has these things in mind…If it is considering them or not. The problem is that normally we learn this cognitive psychology concepts in an empirical way… Even better, you don't know you know them, and when someone says cognitive psychology you get scared… No, no, no. We are speaking about how people learns and etc… so let´s make it explicit and start to reflect like ok, how is this reflected if we are thinking on the attention of people… how is this reflected in a digital product, where is the center of attention, what is the timing that people are going to have when they see this. So, you have to be able to reflect, to be able to incorporate it, because it is different for every product, but the fact that you have it as an available tool and you are always reflecting on it, helps to think how can you incorporate it to the user experience of a product.

I: The next question is also related to this, and it is how the design team can embrace these concepts?

AP: For this one, you made me think on a very silly formula but I think it starts like this. You have to make the theory explicit. You can stay in the situation of ignoring it… you have to read it, learn it and talk about it, so we have to discuss how to do it between

the design team. I started to incorporate the concept of mindset in my class a while ago, which is like the position of mind that one should have as a human being. And in this study, when I was reviewing this concept one of the most interesting things that I learnt, is that the fact that talks about a mindset makes explicit that people can have a fixed, developing and evolutive mentality… the fact to talk only about this brings up the fact that people can have a developing mentality. So, for me, to make it explicit is fundamental.

One second aspect is that we have to reflect with the group about it, to talk about these subjects in an explicit way when we are developing the product. If I am alone as a designer, i can think like ok, here is the screen, here is where is the attention, where is the cognition, the feeling that the user perceives, but later it must be part of the conversation. In this subject of the light cognitive load that a product should have, there is a really good book that you might like, that is called “think fast, think slow” from Daniel Kahneman, that is about psychology and talks about… Oh! I forgot the term…it is about economy and psychology, but it is super good for design terms, because he talks about how in economy the people always act looking for their own benefit and what he does, is to prove that this is not right. He talks about two ways of thinking… the fast way to think and the slow way to think… The slow way to think is very hard and we use it for important topics, and the fast way to think is the one we use permanently, and we aim to the fast way to think… so we should reflect on how this works and how is this implemented on the practice. This would be for me the way to incorporate it on a team. To stick on a wall like the 10 basic principles of cognitive psychology, to make more interiorized the practice.

I: The Author of the book is K-a-h-n-e-m-a-n?

AP: Yes, K-a-h-n-e-m-a-n. It is really cool, if you want, to hear it on your way to work.

I: Yeah, yeah! Sounds really interesting.

I: How do you think that the use of user research during the design process affects the user experience of the users?

AP: It is directly related to the benefits to say that UR, looks to increment the happiness and loyalty from the client, and that is where I am going to change the experience if it

is incorporated. The idea is that you can anticipate the needs, surprises, create emotional links and create an emotional experience. But it is difficult to create an emotional experience if you don't have clear who is the person product has to deliver what it stated …At the end, discovering opportunities to innovate and improve, for example, when you prioritize a features because your users say that is better, when you discover the obstacles and sufferings that people can have with some stuff that can be fixed, when you are capable to see the competition at the same time that you are looking at your product, compared or valued under the same criteria… This is going to improve the UX. And most of all, by identifying valuable experiences for the user. When you find what moves them, it allows you to do features that more than functionalities, are the components that make you link as a user with a product and say, I really like this stuff. This are stuff that are not necessarily the center of the product, but are the center of the experience.

I: Well, and
this experience of user research, how would you measure it normally at your job?
AP: This is with tests with the users… You can define metrics of UX for product, because every product is different, but after that you make usability testing, desire testing, heuristic revision… these are the things that allow you to test your product. In general terms, with the people that is using it, except for the heuristic revision that is with experts but that would be the set of good practices. But is done with tests with users, there is no other way to have good metrics than having the one I am aiming for and them testing then with the user. The methods are the traditional methods that are very well known tools, but it is that, to have clear what I consider as a good experience with my product that is not always easy to define, because you have to translate this to measurable stuff, and then, make tests with the user that allow me to measure them.

I: Is there something else you would like to add beside what you have told me?

AP: mmmm more stuff… Let´s says that I don't have very clear if the focus was on user research or on user experience… which one of is the main one… I have the impression that it is user research the component that you are working on more.

I: Yeah.

AP: Definitely it is to highlight the importance of this component and the space that is given to the focus on the development of digital product. I think nowadays the time given to have a good conversation with the user is less. The hurry of using agile methodologies and producing everything super-fast, always takes time from the field work… I think this is counterproductive. I am not saying that the agile methodologies are bad, but in my opinion, one in the beginning has to give itself a longer moment to do the user investigation. You must give a particular space to be able to identify those things, because the user investigation is at the end trying to get these drops of wisdom that you should have when developing a product. To say when you see it, uh! this is what moves me, links me, and excites me about the subject. But these drops of wisdom cost tears and sweat to get. They don't come from one day to the other… You can do informed speculations but this only comes from the user and they take time to be identified, they don't come after talking to one person. After you speak with 10,12,15 people you start to distinguish in them and filter this idea, until you say, ok I think is this what they are valuing behind all this they say. So, among things, to give time to this exercise… I think I could have a lot of value in the development of digital products.

Interview #2: Alberto Orsini, UX/UI researcher and designer at Royal Caribbean Cruises.

I: Introductory paragraph

I: Ok so for starting I would like to kindly ask you to first introduce yourself, and tell me a little bit about you, about what you have done, you experience…

AO: Yeah, Mi name is Alberto Orsini, I am a Senior manager in product design in this moment in the company of Royal Caribbean. I have been a manager of product design teams for the last 10 years and my role takes a lot of stuff in consideration. Number one, to build the teams and define the team functions inside the company. Number two, to understand which is the role of the product for the consumer and how it is defined. Number three, I work with the people from product management, and with engineering to identify how the different features, from the app are going to evolve through the research that is made and the evolution of technology and which type of "enhancements" … I am sorry for my Spanglish (Laughs)… are necessary. And then you make the planification of the design processes and so on to evolve the platform.

I: Great, so according to what you are telling me, you use user research normally at your work, right?

AO: Yes, everyday… It has been different for every company. For example, in Royal Caribbean we have a UX research area itself, that has different positions, from research directors, to UX researcher. This kind of people are not my subordinates in my position of project manager, but our teams work together, and the designers from my team help the UX researchers to build the scripts, tests, and create the design and prototypes that the UX researchers use in those tests. They make a lot of tests directly in the ships… Royal Caribbean is a cruise company… the designers and the UX researchers get together and go to the ship, in pre-pandemic times, to recruit test subjects or guests inside the ship, and the UX researchers were the ones who were in charge of running the scripts and add all the collected data in the moment of doing the research. This would be for a company like Royal Caribbean, that has its own User research area. In companies like HBO Latin America. I had to build the team from

before, and user research was not a part of the flow before I built the team. So, when having a smaller team, with less people, we were also in charge of designing and running the tests in Latin America. So, what I did is that hired an agency that was dedicated to do research-They had headquarters in different countries and we ran the tests in Colombia, Brazil and Mexico. So, for that, we said to the people what kind of test we wanted to run, and they took part of running it… We participated but externally, we just sat and started thinking like on a focus group where you have a room with a mirror and we were sitting on the other side seeing how the other people ran the tests, but we didn't have a direct input, like the case of Royal Caribbean. All of this research output was added to be used in everything related to the user experience. Starting from the copy, if the text was not clear, or if the person got lost in the platform and did not know how to get to point A to point B, but also to validate hypotheses of stuff that were not built by then, features that were still in a planification point and also to see if it was necessary to build it or not. These types of decisions were taken through testing.

I: According to all of this that you just told me; how could you define the concept of user research?

AO: In my experience, were I have used it, it has different applications. As I said, Number one, is used to validate an optimal experience on the users, and number two, in stuff and features that are not built yet, to know if they have enough validation, to make the investment to build it. You run the test on a prototype instead of in a platform itself and from there you define if it is something that makes sense for the user.

I: In which moments of the product´s lifecycle do you apply user research?

AO: Hmmm, it also depends on the type of company. In Royal Caribbean it is constant, we never stop doing research because the platform is always evolving, there are always new things to improve and to add to the platform, so it actually never stops, they are full time. In companies that are a little bit more involved, like HBO Latin America, it was cyclic and the research was primarily used when there was a clear indication in analytics for example, that something was not working, or when there was a decision point, we had to identify if it was worth it to build a new area for the application or not.

I: According to this, which kind of steps do you normally follow to make the whole process of user research? And also, according to the step of the cycle you are at, do these steps change? Or they are maintained?

AO: I think always is the same, but what it changes it is if the testing is made with something that is already built in the platform itself or if a new design or prototype with something that was not built yet, but must be done. That is the biggest difference. going to what i said before… if it's something that is described as not working from the side of analytics, you use the platform itself to have a bigger understanding of where it is failing…If you have to change a text, or putting images or animations that help the user to understand what we expect from them at this moment. But on the other hand, when it is something that is not built yet, the design and prototype areas are activated to create different variations of the same idea. The split tests, or A/B tests… of option A and B, and see how the user responds and take these notes into consideration to make decisions on the product.

I: Ok, you had told me that you had two experiences using user research, like in this case at Royal Caribbean and also not using user research in the other company you were telling me about, right?
AO: Yeah.

I: How could you compare the fact that user research exists and doesn't exist during the process?

AO: You always need to have it, so my role as manager has been to convince the company that even though we didn't have it, like in the case of HBO Latin America, were was not an internal research, it is important to propose that the research is going to help for us to take important decisions that have an impact in the budget and goals from the company, that you want to achieve through the product. The user research is a very important part of this discovery and helps to have the security when taking these kinds of decisions of investment. When there is not enough budget to build a new tool contrary to the case of Royal Caribbean, my role in HBO Latin America was proposing to hire an agency that allowed us to prove and make tests directly in America. These are the most involved ones. Also, something that I haven't mentioned

is that a lot of times, you make hard tests that you can do with personas, users inside the platform and generally they are made to take bigger and more expensive decisions. But there is also a way to make cyclic tests, I mean continuous, using platforms like usingtesting.com were you can test softer stuff that can be included as part of the development cycle and they don't need a stopping moment where we couldn't do anything until we don't have the result of it.

I: Yeah, so it is more like according to the time and the budget and so on you set yourself up to make the research…

AO: Yeah, and depending on the decision that you have to take, if I am looking to build a completely new feature, that is going to cost… I don't know… 2 million dollars to be built and is going to reach… I don't know… 4 million users… is very different than saying, that we are trying to decide which copy can be read better between pages. That can theoretically fall on any person that says "the text is good" or "the text is confusing me". But it has to be someone who already has this investment, that is already a user, for example, that already knows the platform and has certain expectations to be able to decide a new feature for example, or something that would help to the experience.

I: Ok, which factors do you think that can influence in the UX of a product?

AO: Wow! (laughs)… but in relationship to what? Could you please explain me a little bit more the ground of the question?

I: I mean, which factors do you think that can influence in the user, to say for them when they finish to use a product, that they had a satisfactory experience?

AO: In terms of the product, the product has to deliver the stated promise. For example, if you use a product like Travelduck that allows you to communicate with doctors through video calls using your phone… The minimum goal of this app is that you are able to find a doctor and you can contact this doctor through the app, so the minimum is to have a delivery of the promise to have a satisfactory experience. On top of that, it has to be an accessible experience, welcoming for the users, clear, not

confusing, so the user can get from point A to point B, and this activity has a number of factors including the design, including the copy, animations… everything that contributes to help a person to fulfill their goal with the app. There are a lot of things in between… I think that it is an effort between design, product, copy and content…like all of these factors have ramifications, what makes it a good user experience.

I: What role do you think human intuition plays, when a person uses a digital product?

AO: It plays a significant role, but one of the things we learn as designers, is that, technology has a very important role on evolve human intuition. So, I always use this example… If in 2007 you asked someone how a perfect smartphone would be, nobody would have told you that it would be a glass brick without any buttons. So, this kind of stuff that have pushed us to the front on a technological level, have been always taking some kind of risk. Now, we are all used to use these kinds of devices without any physic buttons, that have an amount of gestures…for example… and all of this is now something that we expect as users…something that 10 or 15 years ago, would have never thought about. So, it is the human intuition but it is combined with what technology allows us to do and what we learn related to it. Another example of this can be, using biometrics in this moment, for example, now you can unlock your phone with your fingerprint, or in this case with your face and see how much are we used to it… For example, now in corona times that we have to use facemasks outside, I cannot unlock my phone with my face, and devices like this one make you miss the feature of the fingerprint.

I: Of course.

AO: So, our behavior changes depending the context.

I: Yeah, I never thought about this thing with the facemask (laughs)… is true.

AO: I want a face mask with the rest of my face (Laugh), to be able to unlock it.

I: Good idea!

I: What do you think it is the relationship between the mental processes existing in psychology such as attention, memory, perception, decision-making, problem-solving and user experience?

AO: They have all to do between each other, and this adds some context to the decisions made in UX and they are part of what makes a user experience successful. One of the things that I saw through my career, that changed a little bit for me my way to think, is that at the beginning, when I started in my career in UX, it was determined that a user experience was good when you had the less number of steps to follow. For example, Or when you could from A to B, faster. When the devices were made with a memory, not everything had to go through the device itself, but trough a broadband connection to make everything faster. I noticed that there was a change in the industry where for doing a good user experience you had to actually, delay this experience, to give time to the user to understand that something is occurring. A lot of times if you interact for instance, with a messaging app, the computer can reply to you instantly, and all the thinking process is going to be made in fractions of seconds. But nevertheless, with a chatbot for instance the developers, on purpose delay the response time… another thing that we talk about when discussing the attention, the decision-making capacity, is that before… a successful UX was something short, that took you from point A to point B quickly… but a lot of times, when you are trying to cut corners you have a lot of information at the same time on the screen and different decisions that you have to take at the same time, so this makes an experience negative. In the industry, wizards, and decision trees were started to being used to create a guided experience, instead of throwing everything in one to the user. Taking decisions to come from point A to point B even if it took you 3 or 4 steps instead of 1, but it is a positive experience.

I: In which way do you think a design team can embrace this theory when they are designing a product?

AO: It is part of the education that I feel is necessary for a team to have and you always have to keep studying… I mean, the UX and the companies that created the UX for example…if we are talking about IOS or about android, you have material design, you have IOS interfaces, or human-interface guidelines…they already have something

before taking all of these metaphors that are available for designers…the gestures themselves… all these kinds of stuff, they already have done the studies because they are part of the UX, they already make part of user expectations in the UX and the users that use this platform. So, we should not ignore those guidelines and we should understand them, understand their psychology of the people that is using our products until some point through this platform, which means to continue this behavior language through our application, in order to make it something like an extension of the same product instead of something that is completely different from the design.

I: In your experience, how do you think the UX of a product can be measured after it is tested? … when you have the results.

AO: You mean how am I going to know if it was successful?

I: Yeah, i mean, when you have done user research in your processes, how do you measure the UX of the product?

AO: There is a variation of categories… Depending on what you are testing. It is an area that is very wide because depends on the nature of the product, the nature of the test and you need to have clarity on what is going to make the test successful from the start. For example, if you are trying to decide if something is valuable or not, you could have a questionnaire at the end of the test where the user could answer to these questions, and this combined with their reaction and use, can give you enough information to make a decision as the owner of the product. But there are different types of tests…for example, one of the things we are testing at Royal Caribbean, is to test people with disabilities. If they are legally blind, can they use the product? … people that have some difficulty to see colors and can use the product… so the metric that you use for the success of this experience has to do a lot with the user´s context. Also depends on the nature of what we are testing… if it is something where we want to understand the success of the platform as it is existing now, or if it is about the capacity of making decisions to prove something new or an improvement that is going to be done to any of the features.

I: Depending the type of product, you choose the research that you want to do? Or on what depends the type of research that you choose?

AO: Yeah, it can be the nature of the product, but it also can depend on what kind of decision want to be made with that test. I mean, what are you trying to understand? it is about to understand if there is a conversion point. For example, for revenue generation, there are a lot of products that are made for free but some decisions make you subscribe the product, or you buy certain premium stuff inside the product. So, there you can know if there is any clarity and if there is enough guidance to take the user to make this decision… like yes, I want to buy this package, yes, I want to subscribe… I took the first class and I liked it, and now I want to subscribe to the monthly or yearly payment. So, this test is very different to another one where it was about something big. It can be used to any type of decision or discovering.

I: Is there any other thing that you would like to mention, like a subject that we didn't touch and you think is important to mention?

AO: I don't know if answered your questions correctly (laugh), if you have a doubt about something that I can elaborate on.

I: No, I think you have a lot experience so this is a lot of help for my investigation. So, thank you very much, really.

AO: My pleasure!

Interview #3: Sebastián Namur, Product researcher and UX designer

I: Introductory paragraph

I: So first, I would like for you to introduce yourself and tell me a little bit about what you are doing and your trajectory.

SN: Ok. Right not I am working at Hogaru, that is a Colombian startup related to cleaning services. Basically, what you can do is that through the App you can reserve cleaning services for your house, office, for whatever you need. There are different kinds of rates, services, depending on the type of service and the type of client. About what I am doing there, my position is as product researcher and I also work as UX designer, so my tasks are mostly related to the side of research and after that how do it to the product in the level of UX. Sometimes, I go a little bit outside from the product part in terms of investigation and I end up working in operational and business subjects, which are subjects that the investigation with the users throws at me. And in my case, I also have to do a lot of investigation with the cleaning professionals which are the ones who do the cleaning, that are hired directly by us. So, they have a different app, and a very important part of the business, so there is an investigation that goes to clients and other with them on the other hand.

Before that, I was working as independent for a while, after that I was also working with a colleague building our own business. There, I had the opportunity to work with apps, so I worked with a group of people that was making an app for jogging that is called “Runsmart”… you can take a look at in in my portfolio if you want… in there my tasks were to create from scratch concepts and so on for them to differentiate, so it was more like building the brand, the purpose of the company, the concept of how was going to work the app, and then, we started the whole part of UX design. Also, I have experience building websites for companies in the US… they were very simple websites… more informative than anything. I did my bachelor in industrial design at Javeriana University and I did some semesters in art… if you are interested about it(laughs)… and that is it.

I: For what you are telling me, you use user research normally in your projects, right?

SN: Yes, totally! One hundred percent.

I: Then how could you define the concept of user research?

SN: Hmmm… I think us, and also you, from what we learnt at University of everything related to user centered design…I think there is a generalized focus for different projects, products, services, that are very interested on this, and I think that is where a real interest user research comes to life. In the actual world, with all the subject of apps and the digital world, this had a need to go to the UX. So, I think there are different models or different approaches, but is to try to understand the users in terms of needs, user requirements, insights, pains that they might have on a business level, and this also needs to be understood in the UX level…of how are you working on it from the digital world. It can be from a website, app, whatever it is, and how you can make this the fastest inside the experience, finding quickly what they are interested for, to know what they are really looking for, how are you going to organize the information…. All of these things, you discover them through investigation, and this is important starting from what I am telling you. The user centered design taken into the digital world.

I: What do you consider that is the role of user research in the development of digital products?

SN: What is the role?

I: Yeah.

SN: I think it depends on the configuration of the team inside a company. Not all companies work the same way. There are some companies that work with agile methodologies, there are some others that don't. Some others use SCRUM or any other, so in that sense, I feel there is more importance on the user research, but I think in this moment, depending on the moment that the company, business, app is at. If it is a startup, maybe it has a very high index because you can pass all your discoveries in product terms very fast, you can iterate very quickly…any finding that you have is extremely important, which is different to a bigger company, that is more developed, stablished, that maybe already has this investigation topic developed form before. There, the value of investigation has to be much more strategic, because any change you make is going to be painful, since you are going to have big number of customers,

and you have to be more assertive in the investigation you make. And as I say, any change is going to be more painful and of bigger care, different to a startup that can iterate faster, and has the ability to change and move more fluently.

In any of both cases I think the role is extremely important. I think that in a business that is beginning, is much clearer its contribution in the sense that any investigation and anything you make is going to be reflected faster… whether it is on the product, service, process and whatever, but is going to be reflected very quickly. In other type of business, or company, well…maybe the value is going to be reflected in a slower way in the investigation, but anyway I think it is fundamental. People change their behaviors and habits from people are in constant change… and more in the actual world where everything is very agile. Right now, we are seeing with the pandemic how everything is changing. The digital world is fundamental so, it doesn't matter the investigation, but right now it becomes totally fundamental.

I: Ok, so accordingly to this, you say it depends on the size of the company and the moment that it is at.

SN: Yes, mostly.

I: But inside the product lifecycle, is there a moment in specific where you apply user research? Or how is this process?

SN: It is applied in different ways, because since they are very iterative processes, in general, design is constantly…I am a big fan of design thinking... so you are normally doing tests, doing changes, retesting other stuff, reinvestigating…so there are different moments. It can be at the beginning when you don't even have the first prototype, you have to be doing market investigations, user investigations… very specific investigations around this stuff. Then, when you have the first prototype or the first ideas of whatever you are going to test, you make another type of investigation. I think that one as user researcher has to have this kind of abilities. Having clear the punctual objectives of every moment inside the process…So, if you are starting, then maybe you want to solve more punctual subjects about the needs, subjects around the market… to know how are the competitors, interviewing…how are they solving the

need they you want to solve differently…how are you going to propose it, and then once you have whatever the product or service that it is… seeing how what you propose is solving the need, how is it improving, what can be improved, in which part inside the experience you have problems, where is the user getting lost… and from there you iterate and test again. So, it is in a lot of moments inside the investigation and maybe with different tools or investigation methods. The are some, that for example when you already have something done, you can use a user testing of the app… maybe interviews or a deeper investigation.

I: Ok, and also depending the type of user research the steps are clearly different, right? But which factors influence for you to choose a determined type of user research...maybe you have a favorite one or one that you think that works the most?

SN: I am very fan of interviews themselves… In these moments of pandemics, I have to do everything through calls, and I think there you can go a little bit deeper. If you make surveys you lose some type of information. So, I always try to speak directly with them. Another method that I like is Shadowing that consists literally on being on the shoes of the client, using the product, or listening how is he doing stuff… So, one example in the subject of shadowing that we have internally inside Hogaru, is that there is a platform that was designed and constantly all of these tools are being added to make the respective changes to improve everything. I´ve had to do shadowing with the cleaning professionals, with people inside the call center and see how is their day to day work, how do they use the tools…this will give me insights… differently if I went to the worker and ask them directly how they use the tool… they could tell me and show me…but that is very different than me being hidden in the job and realizing directly what can be done, because in user research you have to look with a different kind of view and being a little bit more focused into detail…Even the people that interact with the product.

I: Right now, you are telling me that you are using a lot of user research at you job, but maybe in the past, when you had to design websites or the app you were telling me about that you designed in Spain… I don't know if maybe you didn't have to user research or you didn't have it available?

SN: With the app in Spain, yes. We did a very hard investigation with three different publics…With amateur runners and joggers that were interested on improving their lifestyle, and from there it was a mix of men, women, older people, young people, people that were working, employees, with kids and so on. We had another public that was more towards the middle expert runner, that maybe already ran one or two marathons, people that is already interested in the Boston, Chicago or New York marathon and so on. So, this is people that takes seriously the hobby of jogging. And we also interviewed the trainers, people that had already team to run…for example, I had no idea that running teams existed (laugh)…We did a very good investigation, very related to reading scientific articles about how to run. The people that we were working with had a lab for anthropometric measures, to measure the size of the step and they wanted to apply it in the app. They were of a lot of value for the topic of the investigation, and in our side, we did what I tell you about the interviews with the runners and the trainers that gave us insights to propose any type of functionality inside the app.

I: And for the website, the ones you were telling me that were pretty basic…

SN: For the websites, No. I didn't use it… I think worked there most with my own experience that I've had from UX… but we did some tests with some people for them to prove the usability and they were recommendations made more from a context of content and that was it. Maybe we did a par of tests, but nothing that I would consider as a serious investigation.

I: OK, give me a second… Which factors do you think can influence for a user to have a satisfactory user experience when using a product?

SN: I think that first, navigability is key. In this sense I mean that the user finds everything super easily, that no one has to explain to them, and that they don't have to let´s say, go into a tab, button or a new page a thousand times and then go to look on another side and then going in and out. I think that is key. I think when maybe there is a flow to buy something or programing something, the function of memory I think is key… and in that sense the number of clicks is important. The number of clicks that you do is key.

I also depends on the content itself…If I go there, what can I find, and to understand for what is it made.

I: Which role do you think human intuition plays when a user manipulates an app, product or website?

SN: I think is all of it. More nowadays that it has become more in habits with good practices rather than intuition, so during a time it was defined as intuition and now I think it goes more on the path that people are used to certain applications and certain platforms. Let's say like, those you have on Instagram of swiping, closing windows and moving… they are gestures that are not so used by a lot of apps but you will always try to do. They become "best practices" that everyone starts to reply in some way or another because these platforms are the complete muscle of technology and investigation, development and they finish in some way or another leading the trend on these kinds of gestures that also are the end are very intuitive. In this case for example, a gray button you know is something that is blocked, a red button generated a warning, and it is a cognitive subject on how you deal with stuff and the intuition of you saying like… if its red, is danger or something different… if its green I am good to go… so it is a mix of what I am telling you… intuition on a side yes, it is important… but I also think that people is very influenced from the apps they are used to use.

I: Now that you are touching this subject about cognition and cognitive psychology… What do you think is the relation of cognitive psychology and UX? With cognitive psychology I refer to the processes of attention, perception, memory, decision-making…

SN: I think that there is a very good relationship and I think in my case I must go deeper into that…I haven't gone very deep into this subject or I haven't found good material to go deeper into. If you have any recommendation, it is welcome (laugh). I think that in cognitive subjects there is a lot…the people have a very short sense of attention. If you don't show them what they are looking for in your platform or app in a quick way, you lose them, and if you fill them with a bunch of not important information, you lose them again…they start reading about other subjects, and you can end up losing a potential client… or you end up creating a lame, slow UX. In terms of memory… well, I think here the intuition also helps creating a good experience, a good UI… with good

icons that allow the association of quick stuff because if you do a complex experience, they are not going to remember how did they get there. In memory and cognitive terms, that is key. There is some stuff that is only worth it to be done once, and you store all the information internally in order to not be repeating that kind of stuff. People get tired of giving personal information… these kinds of stuff are perceived by the user as annoying… so, they give them once and then stop caring about it. If you are constantly asking them for information, it is very possible that people get bored of it.
I also think that a very behavioral thing from nowadays is that people is always looking for new stuff. So, you have to impress in this first experience and you also have to know how…and when you get to a point where you have to iterate to know how to improve it, make it easier and more agile for understanding everything related to the subject of investigation…to make what the client needs, super easy to find.
Nowadays the subject of customization is also very important…everyone wants their products customized, every user is every time more particular, and is more difficult to have a unique type of user, which make the customization subject something important and I think this obviously affects a lot the cognitive subject.

I: In which way do you think that a design team can embrace this theory to design a product?

SN: The theory of cognitive psychology?

I: Yeah.

SN: I think there must be a leader. It would be really interesting to have an expert leader that has knowledge to everything related to user behavior that could be a help inside the investigation. And making the design team completely understand it to face it. So, is more about thinking how are you going to address this blocking part from the client or the user to solve this, or go further on this to turn this from a blocking point to an advantage. But I think it would be good to have an expert… I know for example, a very few psychologists that work in subjects of UX psychology and is very cool to have something like that… Anthropologists also… These are people that because of their background are used to go to subjects more related to humanities of behavior and that could get super interesting insights. Even though you as a designer can generate very

interesting empathy abilities with users and clients, you have these perspective of landing everything towards the product, the usability, already looking for a solution… and it would be very interesting in terms of psychology and cognitive psychology, to have a psychologist or anthropologist that gives you more a look into the behavior itself from the user.

I: In your experience, when you are doing user research, at the end of the process, how do you measure the user experience?

SN: What we do, is that we propose different KPI´s. So, it depends of the kind of tool that we are implementing, or what we are proving, then you have from there different KPI´s. So, as I said one of them can be, I don't know… We made a short time ago a modification on the buying experience inside the platform, so before we had 18 steps before you got the "pay" button, that was completely ridiculous, so we had to pull that down to less than 5 steps…that was one of the points to measure. Inside of that we had obviously the acquisition of clients, quote of prices for clients, and a little bit more of a qualitative investigation in terms of what clients though about the new experience, if they understood and it was clear…there were different subjects to prove. This on one side.
On the other side you can always keep up with de investigation and validate if in effect the experience is being good or not. I think what is key here, is to set up goals that are in fact measurables, and that is why KPI´s end up being key. And in terms of UX, for me is important to know how much time a user takes from the moment they go to the app until the moment they reserve a service.

I: And who creates those KPI´s?

SN: I am in the area of growth and every week we make a meeting between the whole team and the operations team, where everyone has to present… saying this week I made this much, I have these questions, and I am going to do this, to prove this... I want to measure this KPI… so the KPI´s can be maintenance of client, new client, client acquisition, the person who buys… and measurements of what we already have defined as a business and as a team. There are others that are created from my direct boss, the CEO, and there are others that I define myself…where is say for example…

I want to reduce the buying steps to at least this number… so I propose them on this way based on my experience. There are two moments. One of them, where in effect I am the one who proposes them as the person of investigation an UX, and some others are imposed from the hierarchy of the company, in other words, my direct bosses. But in general, as I said we share them weekly, to see and evaluate what we are doing and how is this affecting the business.

I: The company that you work at, cleans more for companies? Or do you guys also clean houses?

SN: We work on the two of them…houses and companies…Actually they started initially only doing houses, that is where the name come from. But with time they realized that there was a need on small companies that don't hire their employees directly, or middle size companies that can´t afford having a cleaning staff on their payroll. So is easier to have them on a side, where the staff only goes a couple days a week. Or they simply don't want to have to deal with the problem of signing the employee to pay pension, health insurance, taxes, so they prefer to hire those services. We offer services to offices and houses and there are even other clients where we clean the entire building, which is not an office or a house… some clinics and hospitals… but in general is for houses and offices.

I: I was asking you this because in Germany there is a startup that makes something similar… I don't know if you know them… it is called Helpling…

SN: Yes of course! Helpling is very big and very famous…

I: Yes, here is pretty big…

SN: For us, they are a referent and everything. Here the challenge is that in a cultural level we are fighting with a lot of informality. Our competitors are not even the companies that offer cleaning services, that there is a few in Colombia. Maybe Casalimpia and Aseoya can me the biggest ones that can be kind of competitors to us. But the theme of informality here is absurd… You can with COP $50.000 hire a cleaning person, and from there see if they have an insurance, but you don't care

about taxes or pension, and to compete with these prices when you have to pay a payroll and so on, is impossible.

I: Yes, of course…

SN: So, you have to differentiate yourself in a very different way.

I: Do you have any way to armor yourself?... I don't know how s the process at Hogaru, but if the client contacts the cleaning staff outside the app…

SN: We try this not to happen, but of course it does. Between the terms and conditions, there is a fine if the cleaning staff explicitly says that she is quitting Hogaru to go to work for a client. And this fine is assumed by the client. This is the way we have… obviously we try to make the entire contact through the app, but it is logic and normal the after some time, the client takes their number and calls them to hire them… but the pay is done through the company. The client is not allowed to give money in any form to the staff, and the staff cannot receive it. Because this can be used later for misunderstandings of maybe saying…she already payed to me, she stole from me… and so on. Obviously, it is a very complicated guild.

I: I have some friends here that work on this, and most of them don't do it legally. They went the first time to clean trough helping, and then the next time they did it illegally…

SN: It is difficult, and for sometimes what we tried is that a cleaning staff couldn't be with a client for more than 1 year. To not have this kind of trust between them, but at the end that turned into a problem because they said like… why are you taking the one that I like and sending this other one that I don't like? … So, we said… ok, let´s accept this. We hurt more the company changing the cleaning staff, than by with letting the people take the cleaning staff from us.

I: Ok, and to finish, there is something more that you would like to add in terms for example of how do you see the future of user research?

SN: I think that right now, it is going to change a lot, because at least in Colombia we are seeing a Boom technology wise…there are a lot of excellent apps, there are a lot of startups with great ideas, great businesses, with really well developed apps and platforms, very good technology… Every time there are better developers in different programing languages.

Right now, there is something important happening and, every time the people are going to realize of the importance of developing investigation. In this sense, I also think that is going to change because of the pandemic… people are being really creative to change all the goals on investigation. All the people who was used to make meetings or focus groups with 10 people, making user testing and so on… right they can't do it. Maybe you will have to change it for a survey, phone interviews… beg a client to make a zoom call or Whatsapp… right now people don't want to do anything, so It is very complicated in that matter. I think this is going to develop new tools, to make people to be more creative with research tools… trying to iterate or test and idea with a few insights…Having a research that is going to be more difficult to get, and in general terms I think that is going to take to a developing point where we are going to work differently. People will realize that you can propose, iterate and test very fast… this is the idea of design thinking, and people will encounter with the use of agile methodologies where you can work fast and have ideas quickly. Right now, people are migrating to a technological and digital world, because a lot of businesses were obligated to start working with delivery apps so some of them are already building their websites, and this is going to obligate them to make more agile investigations, more risky at time, when it is understood trough UX. I think it is going to evolve this way, but at the end, it is going to be for the benefit of a lot of people. This is going make more business and ideas appear, companies reinvent themselves quickly, make users more open to try stuff… People nowadays are very open to open a lot of apps… everything has to be digital and they lost a lot of fear, that was still existing in a country like Colombia. Before you paid online, and have the fear of like, am I going to get what I bought or not?... There is an informal sector that we will have to see what is going to happen with them. The people that has shops in San Andresito (Shopping area of Bogotá), in the center…there is an opportunity to make a really good project and from the side of investigation I would be incredible, because this is a group of people that sees the world in a different way. They don't event have Excel! (laugh)…So designing

to this type of public that is at the end 55% of Colombian population can be extraordinary.

I: I don't know if you have seen that "Only" (Traditional Colombian shop) is selling their products through Whatsapp?

SN: Yeah for example! Whatsapp business has been really great for small businesses, and people that had no idea, but at the end Whatsapp businesses has an operational threshold. At the end, you can have any have of data from you clients… I think is difficult… For communication and simplicity for the client is great but if you want to do a further investigation on those clients, of their age, spends… it is very difficult… and to find the data from this is impossible. I tried to have Whatsapp business in Hogaru, but my bosses are totally against it because they can't get the data that they love… they can´t track absolutely nothing. And in our platform, we measure absolutely everything.

I: And this at the end, is the benefit from digital stuff…

SN: Totally! You have all the data, you can do excellent quantitative investigations, intersect information… so obviously there is staff that come late to work, or staff that damages stuff while cleaning so we can compare this by saying… This number of cleaning persons have caused this number of clients leaving the service… This cleaning people have come late to these clients and this can generate the warnings to keep track on, like … this client has a lot of rotation, this cleaning person doesn't have a lot of fixed clients…That is what helps us.

I: Ok well, thank you very much!

SN: No, it was my pleasure! Good look with the master and the rest.

Interview #4: Maya Ninova, UX researcher and designer

I: Introductory paragraph

I: I would like first for you to introduce yourself and tell me a little bit about you experience in the field of UX.

MN: Ok, Maya… I come originally from Bulgaria, right now I live in Barcelona… I came here to do a PHD many years ago on social psychology… To begin on how I got to UX, it has to do with this because I wanted to investigate the relationship between humans and technology. I am a psychologist from my background and I came to Barcelona because the PHD was in social psychology but it had a line of investigation on what we call "human-computer interaction" nowadays but from the point of view of human sciences. I did my thesis with online digital communities from the internet, so I had an interest between technology and people.

(Technical difficulties) ….

I: Sorry, I can hear you now… so you were telling me about your PHD.

MN: Yeah, I was doing the PHD, but I never proposed myself to do academic research as a career. Since i wanted to investigate the theme of how people use technology and the impact of technology on people´s life…how technology influences their lives and how can improve their experiences… well obviously. When I started, the user experience research, at least in Europe, didn't exist as a work field, because I am talking you about 16 years ago. Nevertheless, this existed in USA and Scandinavia, where is where this user centered design processes comes from. So back then, I didn't have pretty clear the path that I should take… I knew I wanted to make applied investigation, but I spent years in the academy. I moved to the private field, which was while I was doing my PHD. Actually, when I was doing my PHD is was already doing investigations outside university… like more applied investigation and I discovered that this was what I wanted to do. So, I migrated to the private sector, which wasn't so easy. Right now I am talking about my experience…I think I Europe this field is just consolidating and I think it is very complicated for those people who come from social sciences… Something that wouldn't happen in other continents where UX research is made by psychologists, sociologists, anthropologists basically…like in big companies like Google, Facebook… the people who work there come from a social

science background … This are sciences where investigation is part of your academic formation. They are research-based careers that are based on investigation. You learn how to make questionnaires, interviews, focus groups, all of these investigation techniques that are used in UX. So, I would say in Europe is very complicated, or at least this has been my personal experience. I also work as a freelance… right now I work as consultant and researcher… and during a couple of years I worked with an agency in London, by doing online qualitative investigation… because I am also specialized on this… on digital ethnographies, online focus groups, and of course interviews. With them I am still collaborating but I would rather say less… because of Brexit, they are re-structuring the entire company… But with them I worked doing investigations for a lot of time, doing research for the Spanish market mostly, and sometimes doing other type of projects for other countries, more related to content analysis, but in Spain was most related to UX, because that is the way the work… They have freelance investigators in every country because you know that in qualitative investigation it is important to know the local culture and get to know the language.

So yeah, I am freelance, I cooperated with Copenhagen institute of interaction design… it was a very big European project. I directed the part of user research but doing a kind of ethnography, that in the context is called contextual inquiry, that it is an ethnographic study that we made in four countries… made face to face… After this, I collaborated with a big company dedicated to digital wallets, which is a very big FinTech that has different finance products. Principally they have digital wallets, paying systems and their biggest product which is an electronic wallet… I worked there as an investigator and organizing a little bit because the company exists since a lot of years but they didn't have a UX/UI unity… I mean they had designers but individually… Some of them were in Canada, others in Bulgaria, but they didn't have something consolidated… They were shaping the team, so I started with them on last year to stablish the investigation and after that, I moved to Sofia for three months… I was there in the office with them and I kept working remotely from Barcelona doing investigation of any kind… Prototype testing, and how people call it… discover investigation… not only validation but also discovery and then different type of projects. So, I don't know, you would have to tell me what you are interested about, more concretely…

I: Ok, I would like for you to tell me what is user research or how could you define this concept?

MN: Ufff… The concept for me, basically is to discover what people needs, in one hand, because it is related to explore the needs of people, their preoccupations and problems in terms of a product in specific. It can be from an already existing product or from something you are going to develop. Basically, that is what it means for me, to make an investigation about what they need, their problems, the attitudes they have respecting a concrete scenario that can be anything. From a public space, a bike path, to a day care, a mobile app or a website. For me, is that, to basically see what is what a person needs respecting a product… because normally, when you do that you starting point comes from a problem or an idea, or you want to validate something that already exists. But basically, is that. Anyways, if it is something that already exists, you are going to explore how the people uses this thing and what are their problems, if this satisfies their needs and so on… If the center is the person…everything that has to do with this Technology, in the widest meaning of the word… it can be a bike lane or a trash can. Design for me is also a very wide concept…because a lot of times people related it automatically with web. So, I do think that contemporary design is wider as a concept and as a result user research has to do with all of this…everything that people does, uses, their lives… you can do investigation with it because those are things and practices wanted by people. So, it has to do with seeing they needs, attitudes, problems for you to be able to create, understand and design a solution for it, or improve something that you have already designed.

I: Accordingly, you gave me your definition centered towards the user, right? But I would also like to know, what do you think is the role of user research when a product is developed, in this case, digital?

MN: It depends on which step of development is this product at. If it is a new product or an already existing one, because both things can happen. It can happen that you already have something developed or it also can happen that you want to create a new product and depending on this, in the design process, where user research goes in an initial stage, before you create anything you have to start from an investigation that can be even a market research, depending on who are you designing for…

Anyways, you can always combine already existing data on market research and then making an investigation with a possible target…that is what you need to have defined as a minimum. And them for me, the initial point inside the design investigation is to start with the user to start those necessities, then with the team that you work with like designers, project managers or whoever it is…the role from the investigator is to do all the insights and to do a brainstorming based on this recommendations, from there building a prototype, and then also iterating this prototype. And there is also when the researcher comes again in the testing of the prototype the times we need it to do it.

I would say the role of user research is very important… a lot of times what I see from my practice is that people don't give the importance that it should have. In the practice this happens a lot... that you have a series of ideas were the teams try to fit with the user and then they are not happy with what comes from the investigation. It would be something pretty common in companies that don't have maturity on UX. In my personal experience, most of the companies in Europe are not on this level. They don't have enough maturity even in their work practices, because I have never had problems with designers…It is more with the engineers, developers and project managers, because they have a lot of ideas and they want to validate their ideas and not the other way around…that is why I say that the mindset is not ready yet… but for me, it is because it is deficient inside the company.

I would say that in a big part, people understand user research as doing tests, or doing quick prototyping, card sorting, looking google analytics and that's it. And a lot of time it is about it, that they do an emphasis on quickly investigation and that's it… something easy. As someone who sells qualitative investigation, I would say that in a lot of companies UX is developed on the level of using tools like google analytics, A/B testing and stuff like that, but qualitative investigation, as it takes more time to develop, is difficult for convincing the company that they have to do it, because when you talk to people, you really see their problems and this sometimes is problematic.

I: Because it takes more time…

MN: Because it takes more time, and according to them there is not a data in numbers…

I: But at the end it is more nutritious…

MN: Yes, and sometimes when you do only five quick moderated tests…even if they were not fast, five tests with five users but moderated… you can take a lot more information that a non-moderated test with five people… and this has happened to me, and when it has happened in practice, I always invite partners from the team to come to this and listen. My way to help companies to mature in terms of UX research is to include them in the investigation process, so they comprehend the dynamics and listen to the voices of the user. Because when you give them a report, they read it and then say… ahh ok looks super cool… but it is very different when they go to the interview, and participate of the interview…. So, they get more involved and see more value into it. But for me, this is also a task of the researcher. Even more when you are working with big companies… I mean they are complex systems, when this startup and digital companies with cross functional teams. The research has to try to connect this. Because if not they are going to be like… I deliver this thing and you will see if you use it, that sometime it can happen that they don't use it or they don't listen to your recommendations, but this is another subject. Sometimes some stuff cannot be implemented because there is to many information in the dashboard… or whatever… but not everything that is recommended is incorporated. I would say that the role of the researcher is to do the investigation but also to teach the colleagues that don't know, when they can. Designers normally know, because they work with it and are more sensitized with this, but the others not so much and they are not used to work with people in this way. So, they see qualitative processes as something that is complicated, as something that because it doesn't provide data, is not so valid. Sometimes the researcher has to explain why is it important to do it and what is the benefit of this compared to the results.

I: According to this, in which moments to you apply user research in the product's life cycle?... When do you think it is the right moment to start applying user research?

MN: Inside the cycle, it depends if it is a product that is just starting…

I: So, you apply user research at any moment?

MN: More or less, yeah… Because it is in the beginning and then when you have a prototype… For me, these are the two main moments… At the beginning of the cycle and then it also depends if you are incorporating it in a product company. Sometimes they want iterations… but if we see it from far away… it is at the beginning of the cycle, before you develop anything you have to kick off from user research to know how to design the thing and then when you develop the product, before putting it into the market, you need to also do user research.

We also have the idea of user centered design where first you have user research then you have brainstorming, generating ideas and then after that, you create a prototype with scenarios and then you apply it with the users which the target that you made the initial investigation with… you keep iterating and improving the prototype until it is the closest to what people said they wanted, and then you putting in production. This for me, would be the ideal.

I: According to this, have you had any kind of experiences where you haven't used user research to design?

MN: You mean to design a product?

I: Yeah.

MN: For me personally, this has not happened… What has happened to me is that they did something and they want me to validate it, but when the results come, they don't agree with what comes up from the research because they actually don't want to change anything inside the product…they want it like that. And even if you explain them, that they think it is complicated, that is not working, that the users don't understand the information… they just don't care… and you cannot do anything because what are you going to do? … you can´t do anything. So, then don´t make me lose my time! Because if you already have an idea that is already developed… and you only need to write that you did UX research… I will tell you that this is not happening. Nevertheless, it has not happened a lot of times.

I: So, is more the times where the user research is implemented than the times that it was not?

MN: Yeah.

I: And well, which factors do you think must exist so there is a satisfactory user experience when a user manipulates a digital product?

MN: You mean the user?

I: Yeah.

MN: Well, it has to be a product that covers the needs from the user. This would be satisfactory for the user. In general, it could be different things… but for my experience the look for simplicity… they look for something that is simple and fast. From the visual point of view, they don't care a lot, even though sometimes designers are really focused on this… I mean, depending on the product, but in general, when a user manipulates a product is for doing something… it must have goal, and this product must fulfill this goal, and there are a lot of ways to fulfill this goal… It can be on a complicated way or in a simple way. Obviously for the users, it has to be the fastest and easiest way, but if you don't do investigation you are not going to know. You need to do the investigation to see if the product fulfills the need. But you cannot know this until you test it with the user, because the user tells you if it is satisfactory or not, and which factors are important for them.

I: Another subject that I am investigating in my thesis and come from the use of user experience, is the human intuition, because I think it is a subject that is really important inside the user experience…It talks about having in mind the human knowledge to be able to design. So, one question that came up into my mind is: What do you think that is the role that human intuition plays when a user uses a digital product, and how this affects the UX?

MN: You say it as you as a designer, when you are creating something thinking about the user?

I: Yes.

MN: Obviously, it plays a role because all people has intuition, and when you design something, you as a designer try to put in the shoes of the user…saying how would you use this? And you do it thinking a little bit in the ideal situation. In the investigation of the user, you as a researcher also have some condition but, in this case, I would say it is more important to listen what the user has to say. Because otherwise, the conclusions that you have could be more biased. Obviously, the more subjective part that is the intuition, helps you to see when you are doing the interviews what is the path that things are taking…when you already interviewed 1 or two people.

In there, intuition as you say, is more about knowing how to read what the user says and trying to comprehend and analyze their intuition, but I would say from your analysis capacity. It is very important, but it depends on the abilities for each researcher. This is from the researcher side… Possibly it is the same with the designers, but, if you make two interviews and you have a lot of experience as a researcher, you already know what is going to happen… obviously it is confirmed at the end, but you can´t move ahead as a researcher… Or I least I never do it.

You already have a developed hypothesis, which is based in your knowledge and intuition, where you say… ok I think this is going to be like this, and then, after that you confirm it or not. Normally in my case, it is confirmed. So, I would say it is intuition but also your knowledge, experience, and analysis capacity, because it is all of those three things together… It is something very subjective… I don't think all researchers are the same… I don't know if this is what you were asking for?

I: Yes, it is. Thank you!

MN: It is a very important subject! Because if you don't have this, the analysis is not going to be good.If you don't create hypothesis…. This comes with the practice. Researchers can be bad, mediocre or good. I think it is the difference between the good researchers and the others. The good researcher uses their intuition to generate hypothesis and measure this with the words of the user… not adapting the user to the intuition… you know what I mean?

I: Yeah, not putting the user first, but already having a scenario of something that could happen.

MN: Yeah.

I: Also, when I was investigating about human intuition and everything related to human-computer interaction, I came up to the subject of cognitive psychology and all the mental processes that are existing when you use a digital product, like attention, memory, perception, decision-making, problem-solving, and all of this. So, one of my questions is, what do you think is the relation between this and user experience?
MN: In which sense? From the user when they use something?

I: Yeah.

MN: Well, I think that is present in everything because it is your cognition. It is a part of you and the human brain works this way. You have a problem and you take a series of steps to find a solution… you make decisions, perceive things, but I think that one of those things is a very wide subject itself. On the decision-making process, I don't think two people take decisions in the same way, or in the subject of perception. I would say that each one of these points is a research subject itself. For example, in user research, when you do discovery research for example… I am going to give you examples on an investigation that I made with Brazilians, were the company wanted to incorporate a new trading digital feature, that was bonus, stock exchange and crypto currency. So, the project manager wanted to understand the trading and crypto currency Brazilian market. I did the investigation with Brazilians, and the interviews that I made had to do with their practices, their perceptions, attitudes, how do they take decisions…which type of decisions they make… how do they prepare for this. Everything that you are saying... their cognition…and so on. So, I would say it is essential but it is almost the same thing. But normally, when you use a digital product, you make this digitally or physically…In all of this, you don't reflect about it… you make it almost unconsciously… because these are things that happen really fast on your head. It is not that you stop and start reflecting on it…. Maybe you could… it depends… there are some stuff that you tend to reflect more on. But when it is about websites and mobile apps, everything happens fast inside your mind. In user research, if you want to discover this, you have to ask people. In the interview, sometimes you talk about this kind of things with the user and it is not easy, because even for people it is difficult to verbalize this process of perception, decision making… sometimes they

don’t even understand it… Then it depends on how you ask them…but I mean, there is a lot of relationship.

I: And how do you think a design team, and in this case a user research team can embrace this psychology for investigation? I mean, inside the project maybe you guys start to plan the objectives and hypothesis based on this?

MN: I would say it is necessary to incorporate it because you need you need to have a series of initial hypothesis. Normally, before you start doing an interview with a user of any field, a country or something new, before you do that, you are going to sit as a researcher or with the research team and search for secondary sources inside the field…. To see which are the new trends… that is why i previously mentioned market research to you. So, you do this first, and this information, picked from previously made internal investigations, already gives you hints on the path that the investigation is going to take. And from there you create a number of hypothesis for the interview that you will have with the user. And from there, what you pick from the user, is already information that you can directly use to develop the product. If they tell you for instance… What is the ritual that you have to buy bonus? Or how do you prepare to take the decision on which bonus to use… and he starts explaining to you… I read online sources, I follow “kingshark” and so on… This is the process for them to make a decision. Then, from there, how do you convert this information into an actionable insight?... Well your app needs to have an informative feature.

I: I wanted to ask you something that I forgot before… I know that the method that you choose depends on your objectives and what you want to aim for. But, which would you say that is the method where you could get more insights and more information? That has worked for you?

MN: Since my specialization is in qualitative investigation, what I do the most, are interviews. Obviously depends a lot of applied environments… there it would be on product. Interviews are very useful and also diary studies… when the user manipulates a product for a determined time, then they tell everything that happened and then you analyze it. This is also very helpful. But I would say all methods are very useful… What I have done the most, are interviews, and basically because for time constrains.

Interviews also take time to be done, but compared to other methods, they are faster than doing an ethnography or a diary study that happened during a settled time… That's why I would say the interview, but it depends a lot of the abilities from the researcher and how is the interview is going to be moderated, because you are going to get information from the user.

I: Another question that I have is: How do you measure the user experience in your investigations? When the interview, survey it testing happened… how do you measure if there was a satisfactory experience?

MN: As I said before, since I make qualitative research, normally what I do on the summary of the insights… they don't have a percentage but they are more given by each subject, or topics. If it is with a prototype, we make focus on what the designer wanted to take a look at. Always we come up with unexpected information… Always we come up with stuff that the designer thought that were not problematic. Normally I organize it by subjects, and in function of these, you can see how many problems are indeed problematic, or not. Basically, it is like this when you do qualitative investigation. It can also be combined… if you do a survey, or a hotjar you can quantify how many people failed… and then you make and interview but you realized they failed not because the product is failing but because another reason… So, you can´t use this quantification to measure satisfaction. Satisfaction when you talk of a product, you measure it with a questionnaire when you finish the study…that would be the easiest way. But in a qualitative investigation you pick the feedback and you organize it with topics… like the interface, comprehension of information, and so on… but this comes up from the users themselves. They tell you the insights and the parts where they are having problems. And in function of this, you organize. You make a conclusion made from this, but you can´t ever say like… yeah! Everyone is satisfied. The point of qualitative investigation in UX is to see which ones are the problems and how to improve those problems.
If you want to ask about overall experience and overall satisfaction, then you make a survey… but you are not going to know why…

I: Yeah, like why or more in detail.

MN: Yeah, and a lot of times this is done in digital products… they put a survey in a popup asking to answer five questions and the make measures from there, but this is wrong.

I: Yes, you are not saying a lot.

MN: Yeah, because they don't tell you why they replied like this… a lot of times they can´t even write on the survey. They do it because they have KPI´s and then they have metrics that need to be evaluated… they do it because of that… to have a number saying: our users are happy with this, but this kind of answers are not very real… or these ways to look for feedback.

I: For my last question, I would like to know if you have something else that you want to tell me about a subject that we didn't touch, or also how you see the future of user research now?

MN: Well, the future… I expect that in Europe at least, because this is more consolidated in other places, that companies start putting more weight on UX research, and that they take it more seriously. In the sense that there is a switch of mentality, i hope there is, because what I am seeing right now is that is used more a as Buzzword… saying UX research…and there is a lot of people that works in this field that has done courses but that's it. The future I see it like this. I hope it doesn't convert into a dead Buzzword and that it is skewed to the practice as I think it is now. To have more weight and that they hire more people who knows about investigation. Because I think the bridge is being built but I hope it is being finished to built between social sciences and this field. In Europe the things are a little bit loose, and I think this is something that needs to change… as I said, in other places is not like this. I don't know why in Europe has been like this, but a lot of times, it is translated as making small courses, having tools that do everything for you, when actually you need researchers that know about investigation.

I: When you say there are other places where it is more established, of which places are you talking about?

MN: USA and Scandinavia… In Scandinavia it is very implemented, but it is a paradigm that they have been working on since the 60´s. Even the government in Denmark, in Copenhagen wants to change the day care system. Before remodeling the day cares, they make an investigation with the users and the parents of the kids, to see which ones are their needs, and then from them they change the places…I am aware of this.

So, we can reach that… that I am seeing it is possible because an entire country works like this. We always take Scandinavians as an example, because they do it like this… but of course, they have been doing this for sixty years, and it is very implemented in their way of designing anything.

In the digital field I see a lot that people don't take user research seriously, sort to say.

I: Do you think the pandemic and this whole isolation situation is going to affect the research?

MN: Well, it shouldn't affect it, because I have been working online for years, so for me, there wouldn't be a difference. When you are working for digital products, you do everything online… like User testing, user zoom, skype, prototype testing… There are a lot of tools and you have access to people all around the world. This is for people that is all around the world. You can select you target, do the screener, the interview… everything! You can even moderate it online. I have used these tools to recruit people for the interview specifically. Like "workshop" which is about card sorting… there are a bunch of tools that can be used all the time. For me, this is not going to be affected. Now, if you have to design something for a nondigital product, it changes… because the impossibility to go out to the street and do a mapping of a city or a neighborhood, is difficult. But in terms of digital products is don't see any changes. The only change would happen, would be if now with this whole covid theme, the companies decide to leave user research a side. As I said, this is concern of mine, because a lot of companies have UX because it is a trend, but they don't see it as something important… So, I hope I am not right… that companies say ok this is not so important, covid is happening right now, so we are not going to do it, because anyway it wasn't important… you know what I mean? … This is the concern that I have, but it is a hypothesis… let´s see if it is going to be true or not. I hope not… But in terms of doing the investigation, there is not a problem and nothing has changed.

I: As you say, maybe it can happen that the budget is going to be lowered and maybe it is not going to be possible to make a detailed research, but faster and more iterative.

MN: Yes, this always happens, because people want you to make it quickly and almost that you have everything ready in two days. So now, maybe this could get worse… less money, less time and more requirements.

I: Those were the questions that I prepared for the interview; I want to thank you again for your help.

MN: You are welcome! I hope it is valuable for you.

Affidavit

I hereby confirm by means of my signature that I have prepared the submitted work independently and without the help of others, and have not used any sources other than those specified.
All texts taken literally or meaningfully from published and non-published publications are indicated as such. The work has not been submitted in the same or similar form – not even as excerpts – to any other examination authority, and has not yet been published.

Berlin, 25-10-2020.

Location, Date, Signature