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**HOW TO MEASURE THE IMPACT OF DESIGN THINKING ON CUSTOMER SATISFACTION  
IN TECHNOLOGY COMPANIES**

**Henriette Marleen Classen**

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Dissertation

Master in Innovation and Technological Entrepreneurship

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Supervised by

**Prof. Katja Tschimmel**

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**Honor pledge**

I declare that the present research proposal for my master dissertation is of my own authorship and has not been previously used in another course or curricular unit of this or any other institution.

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## **Abstract**

The multidisciplinary and human-centered approach of Design Thinking has gained increasing attention for problem-solving and innovation in both academic literature and especially in the business field. However, as recent literature suggests, there is a significant knowledge gap concerning the precise measurement and evaluation of the impacts that Design Thinking has in practice. To address this gap, initially, the research aimed to explore the impacts of Design Thinking on tech companies. However, due to the scarcity of publicly available information the focus of the research shifted specifically to customer satisfaction, as it is one of the major impacts of Design Thinking on companies.

This research was divided into two phases; firstly, desk research by an in-depth analysis of the five selected tech companies: IBM, SAP, Google, Microsoft, and Adobe. This analysis explored how these companies employ Design Thinking and measure customer satisfaction. Based on this analysis, a model was developed to visualize the customer satisfaction measurement process.

In the second phase, to ensure the validity and enhance the model, interviews were conducted with four tech companies based in Porto. These interviews aimed to gather valuable insights and suggestions for further enhancement. The resulting model provides a framework that visually represents the customer satisfaction measurement process; however, the model remains unproven and requires validation and testing efforts through additional research.

**Keywords:** Design Thinking, impacts, customer satisfaction, measurement, tech companies

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# 1. Introduction

Within the last years, interest in alternative innovative approaches in the business field has been peaking (Beckman & Berry, 2007; Carlgren, Elmquist & Rauth, 2016; Johansson-Sköldberg, Woodilla & Çetinkaya, 2013; Seidel & Fixson, 2013). Recently, the focus of Design Thinking has shifted from a process perspective to a managerial one that both individuals and teams can practice (Zafar, Ul Haq, Siddiquei & Nazir, 2022). Whereas interest previously was laid upon how designers think and operate in the architectural and Design area, this interest has shifted to the management area, where tools of Design Thinking are used to solve management and organizational problems (Elsbach & Stigliani, 2018). It is proven that Design Thinking has massive potential for innovation management, business, and entrepreneurship due to the fact that it continuously poses new ideas and solutions (Carlgren, Elmquist & Rauth, 2016; Dunne, 2018; Elsbach & Stigliani, 2018). Design Thinking, as the cognitive process of designers, has been researched in the international academic design community to understand better the attributes that contribute to Design Creativity (Tschimmel, 2012).

Design Thinking is recognized today as a sophisticated and collaborative approach, encompassing multiple disciplines. It places a strong emphasis on people and their needs, fostering the generation of innovative ideas. Moreover, its techniques have been successfully applied across various domains of expertise. Design Thinking is an approach that enables people or groups to create and test prototypes, experiment, obtain feedback and improve and design until satisfaction is reached (Zafar, Ul Haq, Siddiquei & Nazir, 2022). It is frequently referred to as a substitute for the analytical reasoning that big companies are using, hence, a more emotional, creative, and subjective approach. Due to the growing importance of this concept, renowned schools of executive education and management like Rotman School of Management, Stanford University, and Harvard Business School have been adding Design Thinking to their curricula (Carlgren, Elmquist & Rauth 2016; Johansson-Sköldberg, Woodilla & Çetinkaya, 2013), as also did in Porto the Faculty of Engineering and the Porto Business School.

As Design Thinking has gained increasing attention, so did Design Thinking's impact in practice (Jaskyte & Liedtka, 2022). Especially in the business sector, where Design Thinking has gained popularity, big consulting companies such as McKinsey have dedicated their efforts to measuring Design Thinking's Impact and its added value. However, researchers claim that Design Thinking outcomes are varied and challenging to measure. Carlgren, Elmquist and Rauth (2016) state that Design Thinking improves innovation performance, however, in industrial settings, it appears to be

complex. Jaskyte and Liedtka (2021) and Rauth, Carlgren and Elmquist (2014) agree that most output-oriented measurements of innovativeness to demonstrate Design Thinking's impact has, do not adequately account for the advantages and perceived benefits of Design Thinking. Hence, outcomes of Design Thinking are very diverse and difficult to measure. Once implemented, the most common way to report the findings is simply to describe the outcomes qualitatively (Dunne, 2018). Jaskyte and Liedtka (2022) state that accurate quantitative evaluation of Design Thinking related outcomes is far away from being sufficient. The authors further declare that a notable example of recurrent topics in the DT literature is a demand for more complex and statistically focused considerations to measuring impact. This is further supported by a call for action by Elsbach and Stigliani (2018) to have "tangible evidence of the measurable value and outcomes of design thinking" (p.27).

Since the literature clearly states the need for a more thorough quantitative method to evaluate Design Thinking's outcomes, it is time to start working towards this aspiration. However, not only the quantitative measurements of Design Thinking's impacts could use elaboration but also the measurement in general and the qualitative impact reporting since there is no known universal way of doing so. There has been evidence that there are positive and negative impacts and that Design Thinking is working. However, only by displaying individual case studies and not utilizing a general method or measurement model. Therefore, this paper aims to give a contribution to filling the identified gap in the literature measuring the impact of Design Thinking.

This paper initially aimed to explore how tech companies measure and portray the impacts of Design Thinking by analyzing five case studies. However, comprehensive desk research resulted in insufficient findings to conduct satisfactory data analysis. There is limited publicly available information on how these companies measure the impacts of their Design Thinking approach. The information on how companies measure the impact of Design Thinking may be internal and not publicly available, or they may not measure and report it at all. However, due to the lack of insider knowledge of these companies, this cannot be clearly concluded.

As mentioned, Design Thinking significantly impacts various areas, but the lack of a generalized measurement model makes evaluating its effectiveness challenging. To break down the overall impact that Design Thinking has on a company, this study aims to focus on specific impact and on a particular setting to produce valuable results. Considering the significance of the human element in

Design Thinking and the fact that companies develop products for their customers, it is evident that Design Thinking significantly impacts customer satisfaction.

Hence, this study focuses on how Design Thinking affects customer satisfaction. Building on five case studies of tech companies that implemented Design Thinking, this study is focused on investigating how they measure customer satisfaction after applying Design Thinking and how they portray those outcomes. It explores the differences and similarities across those companies and seeks to suggest a model to visualize the customer satisfaction measurement process after applying Design Thinking. This will eventually decrease the gap in the quantitative measurement of the impacts of Design Thinking. The tech companies that will be reviewed are IBM, SAP, Google, Microsoft, and Adobe, and differences and similarities across those companies will be explored. Based on this data, a model on how to visualize the customer satisfaction measurement process after implementing Design Thinking will be established. This model will be further validated by four interviews with tech companies to enhance it. Two research questions derived from the gap identified in the literature.

- 1. How do tech companies specifically measure customer satisfaction following the implementation of Design Thinking?**
- 2. How can we visually represent the process of measuring customer satisfaction after implementing Design Thinking?**

This work moves forward as follows: the literature review section will provide an overview of the concept of Design Thinking according to what is said in professional and academic literature with a focus on DT history, process, implementation process, and impacts. The method section will explain the reasoning behind the paper and how the case studies will be collected and analyzed as well how the interviews will be conducted. Further, in the results chapter, a comparison of the companies and a critical review of their measurement and reporting on Design Thinking's impact on customer satisfaction will be given. Moreover, a model proposed to visualize customer satisfaction measurement after implementing Design Thinking will be tested and validated by conducting four interviews with tech companies to seek confirmation or points for improvement. Further, the research questions will be answered and discussion of the paper's practice implications, its limitations, and suggestions for additional research will be made at the end.

## 2. Literature review

The following section will explore and discuss the selected papers. It will show the different standpoints the authors have on the various topics of Design Thinking. The following topics will be approached: defining Design Thinking, from design science to Design Thinking, the Design Thinking Process, implementing Design Thinking, impacts of Design Thinking, Design Thinking for customer satisfaction and customer satisfaction in general.

### 2.1 Defining Design Thinking

As already Edelson (2002) and Liedtka (2013) state, Design Thinking is challenging to define due to the complexity, reliance on creativity, and its open-ended nature. Looking at Design Thinking from a design research perspective, Carlgren, Rauth and Elmquist, (2014) state that the concept of itself is of miscommunications origin. Moreover, the authors state that Design Thinking is difficult to study since there is no clear definition among scholars and there is ambiguity around the concept.

There are many meanings of Design Thinking and that, therefore, it should not be strived for a single definition since it would be destructive to the advancement of the study field of Design and Design Thinking (Johansson-Sköldberg, Woodilla & Çetinkaya, 2013). Hence, Design Thinking is a rather loose term, but significant authors of the Design Thinking literature such as Brown (2008), Carlgren, Elmquist and Rauth (2016), Johansson-Sköldberg, Woodilla and Çetinkaya, (2013) and Kimbell (2011) agree that Design Thinking is a multidisciplinary human-centered approach to innovation that is inspired by how designers think and work. Moreover, most descriptions include, besides being focused on the user also, working iteratively, prototyping, putting fun first, and learning from mistakes (Carlgren, Elmquist & Rauth, 2016). Also, descriptions of Design Thinking span from iterative processes where diverse teams utilize an approach focused on the user to find valuable answers to complex or "wicked" (Buchanan, 1992) problems to cognitive traits taught to managers by designers.

Tim Brown, CEO of IDEO and author of the most prevalent and cited articles on Design Thinking (Design Thinking in *Harvard Business Review*, 2008), defines Design Thinking as "a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos" (p.1) and empathizes with the observation of people's needs, wants, and likes and dislikes. Furthermore, he states that everyone can be a designer that has the right aptitude towards Design Thinking. Regarding this aspect, several authors agree that one does not need a professional design background to be

working in and with Design Thinking (Johansson & Woodilla, 2009; Johansson-Sköldberg, Woodilla & Çetinkaya, 2013; Martin, 2009). However, Jahnke (2012), Kimbell (2011) and Schön (1992) stress the importance of having professionally trained designers in the Design Thinking process to act like intermediaries or interpreters in cultural change. Tschimmel (2022) states that even though designers are not indispensable for teams applying the Design Thinking organizations, having creative individuals with prototype and visualization skills would be beneficial. Moreover, the author states that a professional designer who is not simultaneously Design Thinker cannot be found as a result when contrasting Design and Design Thinking.

Liedtka (2014) states that Design Thinking relies on experimentation and abduction and is best performed in decision-making contexts where there is a lot of ambiguity and things are uncertain. Those uncertain and desperate contexts or ‘wicked problems’ were first mentioned by Horst Rittel in 1972 and further taken up by Buchanan in his work from 1992. Those were particularly challenging issues that were lacking certainty as well as definite formulations as well as solutions. Unlike the analytical problem-solving approach, which did not succeed in solving these issues, the experimental approach combining empathy, creativity, and rationality could shed light on those wicked design problems and can be seen as a strategic business resource (Buchanan, 1992; Liedtka, 2014; Wrigley, Nusem & Straker, 2020).

## **2.2 From design science to Design Thinking**

Design management originated in the 1970s, and designers taught it to management students to convey the idea and relevance of Design Thinking (Johansson-Sköldberg, Woodilla & Çetinkaya, 2013). The so-called design science, which served as the precursor of Design Thinking, emerged in the 1960s and was coined by the works of design methodologists such as Alexander (1964), Simon (1969) and Cross (1984). These authors made divisions between the natural sciences and the science of Design.

Design Thinking as an innovation method, was first mentioned in the early 2000s and several authors state that the design firm IDEO has been influencing the conceptualization (Carlgren, Elmquist & Rauth, 2014; Johansson-Sköldberg, Woodilla & Çetinkaya, 2013; Liedtka, 2014). According to Elsbach and Stigliani (2018), most of earliest empirical researches on Design concentrated on teams in organizations and how they could use specific tools to “think like designers”. The outcome was a methodical strategy for problem resolution that makes use of design techniques like fast prototyping, user observation, concept visualization, and brainstorming. Brown (2008) states that over time, a new

field known as "Design Thinking" emerged from the use of such tools serving to solve problems within organizations. According to Brown (2008), Design Thinking has a lot to offer to the business field since, at this point, products as well as processes can be copied by anyone. Thus, innovation is crucial to stay competitive and differentiate oneself in an area. The author further stresses the significance of incorporating Design Thinking in organizational procedures.

According to Johansson-Sköldberg, Woodilla, and Cetinkaya (2013), Design Thinking may be a new approach for the business world, but design research has been talking about how designers operate and function for more than 40 years. Also, the authors state that the management discourse that has gained popularity in the previous years has barely any relation to the prior discourse. It is said to be less thoughtful and robust and is obviously a concept that has been developed not so long ago, but it has recently experienced a remarkable growth.

Johansson-Sköldberg, Woodilla, and Cetinkaya (2013) have already identified two discourses on Design Thinking in their previous publications (Johansson & Woodilla, 2010). One is based on Design and scholarly literature and, the other is based on business media. In their work from 2013, Johansson-Sköldberg, Woodilla, and Cetinkaya, define those two distinct discourses as the following. One is called 'designerly thinking' and describes the practice of expert designers from an academic construction side. Moreover, it refers to theoretical reflections that have to do with the interpretation and characterization of the designers' ability to communicate nonverbally. Hence, designerly thinking combines the practical with the theoretical aspects from the viewpoint of design and is grounded in academic literature and the discipline of Design. The other discourse coined by the authors is 'Design Thinking' and refers to when design practice and competence are put into practice in contexts that are beyond Design. Moreover, the people executing those practices or benefiting from them have management degrees rather than design ones. Therefore, it may be said that 'Design Thinking' refers to a more simplified form of "designerly thinking" or a term for characterizing the use of designers' methods. It is a more popularized version that is used for management nowadays.

Furthermore, the authors distinguish between the discourse's three primary antecedents. The first one is referred to as Design Thinking as design company IDEO's way of working with Design and innovation, which is coined by the founder David Kelley and current CEO Tim Brown. The second origin of the Design Thinking discourse is coined by the work of Dunne and Martin (2006) and Martin (2009) and deals with Design Thinking in organizational contexts. Thirdly, Design Thinking as a component of management philosophy, is coined by Boland and Collopy (2004).

Especially the first two discourses are to be said to have coined the area of Design Thinking, peculiarly, IDEO. The company David Kelley Design, which in 1982 developed Apple Computer's first mouse, and ID Two, which in 1982 invented the first portable computer, merged to establish IDEO in 1991 (Brown & Wyatt, 2010). Whereas the company was first focused on conventional design tasks for businesses, they shifted towards designing customer experience and, ultimately Design Thinking. Tschimmel (2012) describes it well when saying that a change in viewpoint has occurred from traditionally designing 'for users' to 'with users' by means of the Design Thinking approach.

Kimbell (2011) states that two prominent advocates have lately reconfigured Design Thinking. They are Roger Martin, Dean of the Rotman School of Management and Tim Brown, CEO of IDEO. Both examine the place of Design Thinking in businesses, and their research fits with the expanding interest in design in management academia, although they each express it somewhat differently. Martin (2009) believes that applying Design Thinking to businesses provides a competitive edge. Further, he focuses on the strategies employed by the successful managers he spoke with and looked at how businesses as a whole operate. He refers to Design Thinking as striking a more proportionate division of exploitation and exploration and between abductive, inductive, and deductive reasoning. To balance intuitive and analytical thinking, the author contends that Design Thinking is necessary, emphasizing that neither of the two logics is sufficient. Brown (2008), on the other hand, illustrates what professional designers do, make, and what they are interested in. He sees Design Thinking as a loosely- structured process in organizations that spark innovation with an emphasis on human-centered activity.

The third discourse of Design Thinking is DT as a component of management philosophy origins from the researchers and professors in management information systems, Richard Boland and Frank Collopy (2004). They believe that Design Thinking can be interchangeably used with the idea of a design mentality. Hence, Design Thinking is not so much focused on design as a work process or a method of working with specific traits as authors from the IDEO area like to stress it. They see it more as a cognitive characteristic.

### **2.3 The Design Thinking Process**

Dunne (2018) states that the Design Thinking process consists of a sequence of actions needed to solve a problem by iterating between abstract ideas and actual representations. Brown (2008) states that the Design Thinking process optimizes among three areas: business advantage, technology, and

user needs. Rather than picking between solutions that are currently available and well defined, Design Thinkers strive to create novel, desired substitutes through reflection and iteration (Dunne, 2018). Beckman and Berry (2017) and Liedtka (2014) claim that in comparison to conventional management ways of doing things, Design Thinking intentionally avoids making quick decisions and maximizes the problem-finding and uncertainty stage to get the best possible results. Moreover, what differentiates Design Thinking from other approaches is by fusing diverse and several previously unrelated parts (Jaskyte & Liedtka, 2022). Furthermore, the persons that apply Design Thinking experience strong and cumulative personal development as they move through the many phases and utilize various tools in each stage. Liedtka (2014) stresses this aspect with results from her study, where she found that the Design Thinking tools encouraged users to remain engaged with the issue for sufficient time to reframe the opportunity.

As Design Thinking is known as a creative approach for either handling complex issues or creating user-centered innovations with the help of a systematic procedure, the setting should be an open and creative space to foster ideation (Fischer, Lattemann, Redlich, & Guero, 2020). This approach takes place in workshop settings with a Design Thinking facilitator leading and defining the process and a heterogeneous team participating in the Design Thinking methods.

As Brown (2008) believes everyone can be a designer, he believes that people who bring empathy, optimism, integrative thinking, collaboration, and experimentalism to the table have the optimum capacity to practice Design Thinking. Given that the word "Design Thinking" is somewhat vague, it is not surprising that there are various methods for defining Design Thinking models (Carlgren, Elmquist & Rauth, 2016). The one from Stanford University's d.school is one of the most well-known and is also responsible for the increasing awareness of Design Thinking within the last few years. A linear stepwise and iterative process framework has been proposed that comprises the following five phases; Empathize, Define, Ideate, Prototype, and Test.





**Figure 1.** Design Thinking Model by d.school Stanford University. Available at <https://dschool.stanford.edu/resources/the-bootcamp-bootleg>

On another note, Brown (2008) views the process of design as an assembly of spaces that overlap rather than a set of preset steps. In later work with Wyatt (Brown & Wyatt, 2010), he and his co-author explain those spaces in greater depth; Inspiration, Ideation & Implementation. This ‘3 I model’ was created for social innovation and it has gained significant recognition ever since it was founded. Several authors stress the importance of not following the steps/spaces linearly but rather looping back and forwards, especially between Inspiration and Ideation, since this process helps to redefine the problem and pimp the original idea (Brown, 2008; Dunne, 2018; Liedtka, 2014; Jaskyte & Liedtka, 2022).



**Figure 2.** 3 I model. Available at <https://www.zeratech.com/en/the-3-principles-of-design-thinking/>

As already mentioned earlier, there are several proposals for frameworks, and according to Seidel and Fixson (2013), three main methods used in Design Thinking are typically identified: need-finding, brainstorming, and prototyping. On another note, Carlgreen, Rauth and Elmquist (2016) and Jaskyte and Liedtka (2022) conclude that most proposals describe three phases of the Design Thinking

approach: gathering data, generating ideas, and testing. Dunne (2018) further adds that three elements frequently emerge in discussions of the design process; observation, rapid prototyping, and iteration. No matter what kind and how many steps one takes when working with Design Thinking process, at the very beginning, empathy needs to be practiced very well so the user's needs can be fully understood (Dunne, 2018). By completing these stages, users can be served with outcomes that they did not even know they needed, which can create a competitive advantage for the company. However, a Design Thinking approach may be abandoned without achieving potential benefits if adoption issues are not properly addressed (Seidel & Fixson, 2013).

Moreover, a multidisciplinary team can benefit from going through those spaces. According to Liedtka (2014), having diversity in aspects such as experiences, skills, and viewpoints are vital in coming up original and creative ideas. However, coping with diversity can be a problem if not dealt with properly since teams can easily get locked in debates and come up with a compromise, which might be the lowest common denominator. Nonetheless, the interdisciplinary approach of Design Thinking helps multifaceted teams actively utilize their diversity for the group's good (Liedtka, 2014; Seidel & Fixson, 2013).

## **2.4 Implementing Design Thinking**

Implementing a new process in an organization naturally brings on challenges. In his findings, Dunne (2018) states that implementation challenges were that some people misunderstood the Design Thinking approach. People tend to come up with a definition of the problem and its solution too fast, which contradicts the process of Design Thinking. Another challenge found by the authors is managing the relationship with the remaining parts of the organization. The teams that execute Design Thinking and their approach were only accepted in some places. Once the Design Thinking team is not welcomed everywhere, the risk of isolation in one unit can happen, which then cannot contribute to the goal of implementing Design Thinking in all units. Additionally, dealing with the tendency for incrementalism is a challenge.

Wrigley, Nussem and Starker (2020) state that the incorporation of design as a strategic approach within an organization is not yet well understood. Hence, a more in-depth understanding is needed to guarantee successful Design Thinking interventions. Having the right organizational conditions, tangible or intangible, is highly important to assist design integration. As a result, from their study, the authors identify four organizational conditions that are mandatory for a successful design integration; facilities, strategic vision, directives and cultural capital. It is essential to consider these

matters to transform Design Thinking principles from immediate actions to long-term effects. However, it must be recognized, that even when those four organizational conditions are prevalent, successful implementation depends on the right ethos.

According to a framework developed by Nussem, Matthews and Wrigley (2019), awareness, interest, desire, and action can be developed by design interventions and aid the design integration. Using a design catalyst is another enduring approach to integrating design into a company. Martin (2013) even calls for the necessity of an “Innovation Catalyst” to be elected in an organization to lead the Design Thinking process. The design catalyst seeks insights, encourages debates and discussions to question how things have traditionally been done and assists in a more successful design integration (Wrigley, Nussem & Starker, 2020). Carlgren, Elmquist and Rauth (2014) state that innovation is presenting a novel idea that becomes widely used. Knight, Daymond, and Paroutis (2020) define design-led strategy as “the integration of Design Thinking into organizational strategy” (p.31). Wrigley (2016) states that the design-led innovation process is not exclusively for the product level but can take place at the business level as well. It can help companies to grow their businesses by taking advantage of the strategic value of design.

## **2.5 Impacts of Design Thinking**

Since Design Thinking has been given increasing attention, so did Design Thinking’s impact in practice (Jaskyte & Liedka, 2022). Especially in the business sector, where Design Thinking has gained popularity, big consulting companies such as McKinsey have dedicated their efforts to measuring Design Thinking’s Impact and its added value. However, researchers claim that Design Thinking outcomes are varied and challenging to measure. Hence, to assess Design Thinking’s impacts is difficult, specifically to capture perceived benefits.

Carlgren, Elmquist and Rauth (2016) claim that Design Thinking improves innovation performance, however, in industrial settings, it does not appear to be so simple. Jaskyte and Liedtka (2021) and Rauth, Carlgren and Elmquist (2014) agree that the majority of output-oriented measurements of innovativeness to demonstrate Design Thinking’s impact has, do not adequately account for the advantages and perceived benefits of Design Thinking. Hence, outcomes of Design Thinking are very diverse and difficult to measure. Jaskyte and Liedtka (2022) state, however, in academic areas, accurate quantitative evaluation of Design Thinking related outcomes are still in an early stage. Recent literature has been demanding a thorough quantitative approach to assess the impacts of

Design Thinking. According to Liedtka (2014), Design Thinking's mindsets, methods, and tools do not only produce observable results that improve the quality and creativity of the Design but also foster social and emotional experiences. Thus, the observable outcomes are only a tiny portion of the benefits that Design Thinking can foster.

Using tools of Design Thinking effectively in an organization can greatly impact organizational culture (Elsbach & Stigliani, 2018). Thus, using design tools correctly helps develop and support specific organizational cultures. At the same time, the authors uncovered as well that organizational culture could also influence using Design Thinking tools, negatively or positively. Hence, if a company is built upon norms, values, or assumptions that are associated with experimentation and collaboration, Design Thinking tools are likely to be promoted. Lastly, by employing Design Thinking tools and producing physical products and an emotional experience, organizations increased their understanding of why and how DT tools are used productively.

Furthermore, according to Liedtka (2014), within Design Thinking, the innovation failure risk is lower since (1) one is taking advantage of the discovery processes in the early stages, (2) ethnographic research provides insights into unspoken needs of the users by creating empathy that can be translated in solutions, (3) when combined with an iterative experimental testing strategy, potential customers' input will be more accurate when it is presented as a realistic prototype with low fidelity that enhance the process of envisioning. Jaskyte and Liedtka (2022) propose that intermediate outcomes arise at system, organizational and individual levels. Outcomes of implementing Design Thinking at individual level can improve employee competencies, motivation, and empowerment (Carlgren, Rauth & Elmquist, 2014). Thus, employees that are empowered and motivated tend to achieve better performance.

Moreover, Dunne and Martin (2006) suggest that Design Thinking can teach managers to deal with conflicting constraints (abductive thinking). Brown (2008) further adds that sharing knowledge, empathy and collaborative thinking via prototyping are all ways that Design Thinking enhances teamwork and motivation. A study from Liedtka (2018) shows that Design Thinking improves innovation outcomes by generating better ideas, lowering the risk to fail increasing the possibility of implementation and adaptability, and creating local capability sets.

## 2.6 Design Thinking for customer satisfaction

Customer satisfaction is considered a critical success factor in market competition (Henry, Ruslan & Sukwadi, 2021). Knowing what customers need and want is essential for any company to achieve customer satisfaction. However, sometimes it is more challenging than asking them directly what they want. Sometimes one needs to dig deeper and discover what the customers might not even know yet what qualities people seek in a product or service.

To increase customer centricity and satisfaction, companies turn towards implementing Design Thinking principles (Ramanujam & Ravichandran, 2020). Design Thinking is a suitable method for digging deeper by empathizing with the users to discover the real issues by observation, for example (Rapp & Stroup, 2016). When working with the customer, tools such as a journey map or a job-to-be-done analysis are suitable for customers expressing their thoughts and satisfaction with certain situations and steps (Liedtka, 2015). This process allows for identifying needs that clients find difficult to communicate to find solutions for those further. By empathizing with the customers and gaining insights into their perspectives, companies can find solutions and develop products that resonate with them. Especially the iterative approach of Design Thinking which includes constant feedback from the customer, results in satisfied customers. Brown and Katz (2011) state that this kind of empathy differentiates Design Thinking from academic thinking.

Fully understanding the customers' needs, preferences, and pain points is crucial to customer satisfaction (Brown & Wyatt, 2010). Doing user research and creating empathy is an inevitable step in providing customer satisfaction. Design Thinking and its principles can help companies conduct user research to develop practical solutions for customers (Moran, 2021). User research is frequently conducted in Design Thinking's empathy phase and user testing in the prototyping and testing phase. Of course, the process is iterative, and methods can be used where they fit best at every individual approach.

Conducting user research is essential to have insights into users and their behavior to design better products for them with which they will be satisfied (Daae & Boks, 2015). In user centered Design, the first step is always to conduct user research which includes gathering information about the needs, habits, demands, and constraints of future users (Chaniaud & Fleury, 2023).

Involving potential consumers in decision-making processes is a key component of human-centered Design throughout the product development process (Bobbe et al., 2021). While user participation is

frequent at later stages, early user integration is often overlooked. However, the early stage also called the "fuzzy front end", is essential for considering user needs and shaping the direction of development. Participatory design techniques and ethnographic research techniques like observations and interviews can enhance early user integration. Daae and Boks (2015) differentiate between methods for communicating with the user, such as Interviews, Focus Groups, Surveys, Card Sorting, Wants and Need Analysis or Diary Studies, and methods for interrogating what users are doing do, such as User Testing, Shadowing, Observation, Empathic Design or Video Ethnography. Methods that combine those two approaches are Applied Ethnography and Contextual Enquiry. The Nielsen Norman Group, who are one of the world's leading companies in research-based user experience, developed a 3-dimensional framework to display the 20 most used user research methods (Rohren, 2022).



**Figure 3.** A Landscape of User Research Methods. Available at <https://www.nngroup.com/articles/which-ux-research-methods/>

Within the last decades, designers have been adjusting their focus on the user they are designing the product for, ultimately leading to co-designing with the user (Sanders & Spatters, 2008). It should follow the motto "us-with-them" (Brown & Katz, 2011). Including them in the development process has several advantages for the company and the user. Problems are considered from the user perspective, and products and services are iterated until sufficiently improved and intuitive (Ward, Runcie & Lesley, 2009). Therefore, it is no surprise that companies that use a human-centered approach, such as Design Thinking, achieve more excellent results, especially regarding higher customer satisfaction levels and brand loyalty (Orbulov, 2020). The same can be said regarding a high level of employee satisfaction.

## 2.7 Customer Satisfaction

Over the last decades, customer satisfaction has gained increasing attention and is one of the critical goals to reach for every company (João, 2019). It is well known that satisfied customers can give several advantages, such as fewer costs to keep existing customers rather than winning new ones. Truong (2005) argues that there are many ways to define satisfaction. Still, most definitions acknowledge satisfaction as a post-purchase construct that indicates how much the consumer liked or disliked a product after consuming it. One of the most cited definitions of customer satisfaction is "the consumer's fulfillment response" by Oliver (1997).

According to Ceylan and Ozcelik (2016), satisfaction occurs within the range of the customer's values after completing an experience. Customer satisfaction occurs when their expectations towards a product are met or even exceeded (Anderson & Hair, 1972). Keiningham, Cooil, Aksoy, Andreassen, and Weiner (2007) state that customer expectations highly influence customer satisfaction. Expectancy disconfirmation is a term that refers to the gap between expected quality and perceived quality. However, Truong (2005) states that some criticize this definition since it assumes that expectations are preconditioned to reach satisfaction. There can be very satisfactory experiences that were not previously expected.

A popular instrument to identify what influences customer satisfaction is the SERVQUAL analysis by Parasuraman, Zeithaml and Berry (1988), which focuses on the discrepancy between the consumers' and perceptions and expectations of service. The SERVQUAL method is highly suitable for identifying a service provider's strengths and weaknesses and measuring its service quality using the dimensions of empathy, assurance, responsiveness, tangibility and reliability. Those areas of service quality can influence customer satisfaction. Moreover, the customer-delivered-value theory states that the satisfaction of the customer is influenced by the following: currency and non-currency cost, image value, product value and personnel and service value (Otto, Szymanski & Varadarajan, 2020).

Customer satisfaction is a valid and practical marketing indicator to assess the current and future state of a company's most precious asset, its customers (Mittal & Frennea, 2010). Having satisfied customers can have several positive effects on a company, such as increased life of current customers, strong trust and reputation, a leading indicator of future economic returns, lower costs of future transactions, reduced operating costs, and many more. Further positive effects can be price

toleration, word of mouth, loyal customers, cross-purchase activity, customer retention and recommending to others.

### **2.7.1 Measurements of customer satisfaction**

Regarding customer feedback, managers favor easy comprehensible metrics which are also connected with future business performance (Morgan & Rego, 2006). According to Hill, Brierley, and MacDougall (2003), measuring customer satisfaction can indicate the total product's performance regarding specific customer requirements. The authors propose measurements such as surveys, depth interviews, focus groups, and customer feedback to determine customer satisfaction. Customer surveys use measures such as overall satisfaction, attribute level, behavior-based intentions of loyalty such as how likely one is to recommend or re buy something, loyalty measures such as making recommendations to others. Morgan and Rego (2006) argue that the most popular metric for customer satisfaction is a firm's "Top 2 Box". Furthermore, several authors suggest the average customer satisfaction score, customer satisfaction score (CSAT), American Customer Satisfaction Score (ACSI), customer effort score (CES), the proportion of customers complaining, Net promoters (NPS), repurchase likelihood, and the number of recommendations as customer feedback metrics (De Haan, Verhoef & Wiesel, 2015; Morgan & Rego, 2006; Manzano, 2021).

### **2.7.2 Drivers of satisfaction**

Drivers of customer satisfaction vary depending on the industry and products one is looking for, and there is not one set of drivers that fits all (Chakraborty, Marshall & Srivastava, 2008). For example, some state that corporate image, quality of staff and service output quality are drivers of satisfied customers in the service industry (Erjavec, Dmitrović & Povalej Bržan, 2016). Others state the importance of image, customer expectation, product quality, and service quality in banking, insurance, telco, and energy (Hallencreutz & Parmler, 2019). The authors also state that there has been a shift from focusing on product quality to service quality as an essential driver. Consequently, the entire customer experience needs to get careful consideration. Regarding the tech industry, documentation, maintainability, installability, reliability, performance, usability and capability are drivers identified that drive overall customer satisfaction for software products (Kekre, Krishnan & Srinivasan, 1995). Especially usability, capability, and performance are important drivers.

As previously mentioned, nowadays, service quality and experience, in general, are critical drivers of customer satisfaction. Customer experience results in several interactions between a customer and a company that entail several "moments of truth" which could affect how customers perform (Bolton



et al., 2018). Therefore, the customer experience is holistic, consisting of interacting with many touchpoints that engage the customer's social, emotional, sensory, affective and cognitive elements. Thus, customer experience refers to how a customer feels about a certain business. Another term frequently used is user experience which is similar to customer experience but cannot be interchanged. By making a product simple to use and enjoyable to interact with, user experience design aims to increase user satisfaction and loyalty (Kujala, Roto, Väänänen-Vainio-Mattila, Karapanos, & Sinnelä, 2011). User experience is a dynamic concept since users' emotions and perceptions of particular features of products change before, during, and after engaging with a product (Alharbi & Zarour, 2017). This dynamic and context-dependent aspect of user experience makes it difficult for its design and evaluation activities. A common definition of user experience is "A person's perceptions and responses that result from the use or anticipated use of a product, system or service" (ISO, 2010).

Although both concepts are essential for customer satisfaction, there are some differences between those terms. Whereas customer experience considers the viewpoint of the customer who pays for a product or service and refers to the whole purchasing experience, user experience instead refers to the perspective of a direct user using an interactive system, service, or product (Geis & Polkehn, 2017). Hence, user satisfaction relates to the level of satisfaction a user feels after using a specific product, system, or service. Customer satisfaction, on the other side, derives from customer experience and how satisfied customers are with a company in general.

## **2.8 Knowledge gap**

As already stated in the introduction, a knowledge gap has been identified in the Design Thinking literature. Even though Design Thinking has been given increasing attention over the last years, the evaluation of its impacts is still in an early stage. Especially in business, Design Thinking has become an essential tool for solving management and organizational problems. Everyone is talking about Design Thinking and how it is the new cure for any problem, as complex as it may be. However, the Design Thinking literature clearly demands more in-depth approaches to measure the impacts of DT. While it is often praised for its ability to generate creative solutions, some critics argue that it can be challenging to measure the effectiveness of DT methods. The knowledge gap in measuring Design Thinking relates to the need for more precise and consistent methods for evaluating the effectiveness of DT processes. Of course, some reports qualitatively portray the impacts of Design

Thinking by stating what they have observed. However, they are very individual and cannot be generalized. However, a quantitative approach to demonstrating the impacts of Design Thinking is not yet established.

Some of the main challenges in measuring Design Thinking are difficulty in quantifying the results of DT since the iterative and open-ended nature of DT can make it challenging to measure the impact of the process in terms of specific metrics. There is also a lack of standardized and acknowledged methods to evaluate Design Thinking, making it difficult to compare the results of different studies. Moreover, it is difficult to measure especially the impacts of long-term outcomes of Design Thinking, and usually, since it is often focused on creating user-centered solutions in the short term.

Looking at five case studies of tech companies and how they apply Design Thinking and, more importantly, measure and portray its impact can contribute new insights and understanding of the area. Analyzing and comparing how those companies measure and Design Thinking impacts on customer satisfaction could help to get a better understanding. Moreover, building a model that visualizes the customer satisfaction measurement process and further validating it with other companies can contribute to closing the knowledge gap.

### **3. Methodology**

The following chapter explains the methods used in this research. The research questions will be stated, and the research design will be explained including the selection criteria and sampling method for the secondary data analysis. Furthermore, the primary data analysis in forms of interview will be explained as well as the companies that will be interviewed, and lastly the validity and reliability of this research will be explored.

#### **3.1 Research questions**

Deriving from the gap in the literature, the two research questions of this thesis will be the following:

- 1. How do tech companies specifically measure customer satisfaction following the implementation of Design Thinking?**
- 2. How can we visually represent the process of measuring customer satisfaction after implementing Design Thinking?**

This study aims to answer these questions and contribute to closing the knowledge gap identified in the literature on Design Thinking, in order to improve our understanding of the Design Thinking field.

#### **3.2 Design Science Approach**

In order to understand better the plan of research, the design science approach was applied. The design science research is a methodology used to create and evaluate novel artifacts to solve specific problems (Vaishnavi & Kuechler, 2004). In this case, the artifact would be a model to visualize customer satisfaction measurement after applying Design Thinking.

The proposed model to visualize the measurement customer satisfaction would indicate what could be a suitable process for tech companies and is based on how the 5 chosen companies are measuring customer satisfaction. Of course, this model needs to be evaluated by several studies in the future to see where it needs to be improved and how effective it is before it can contribute to the literature. To start, the artifact will be validated by conducting four interviews with people working at tech companies to get feedback and possible points for improvement. They will all be shown the original model and will be asked how it could be enhanced. According to their ideas, four new models can be built and eventually in the end, one final model will be outcome that shows the customer satisfaction measurement process best which will be followed by a critical discussion.

### **3.2.1 Research Design: Comparative case study**

The method used for this research is the comparative case study analysis. According to Ragin (2014), the comparative approach is a group of analytical techniques that include comparing and contrasting two or more cases, typically to find patterns or causal relationships. This method is especially helpful when working with complex social phenomena that may not so easily understood with other methods. Since measuring the impacts of Design Thinking is such a complex social phenomenon, this comparative case study analysis can help close the literature gap. Flexibility is one of the key benefits of this approach since various sources and analysis techniques can be used depending on the type of research. Moreover, since several cases can be analyzed it allows for conceptualizations across those cases, hinting at patterns and differences that could not be found by just analyzing one case.

### **3.2.2 Selection criteria & sampling method**

The chosen non probability method is purposive sampling since cases are selected that provide the most useful information and are most relevant to the research question. However, it must be noted that the sample being chosen is not representative. Regarding the case studies, the companies were chosen due to some criteria that are relevant to the research questions:

1. The companies are in the technology industry to be aligned with this Master's program.
2. The companies all have successfully implemented Design Thinking for several years.
3. Besides being in the tech industry, the companies are developing and selling software to other businesses and customers.
4. The companies are well-known and global players in technology and invest a lot in innovation development.
5. The companies are recognized as leaders in their respective areas of expertise. They have established themselves as industry standards and set benchmarks for innovation, quality, and performance in their respective sectors.
6. The companies prioritize customer satisfaction and strive to provide solutions that meet their customers' needs.

In this case, the data collection will be to select case studies and other relevant data of the tech companies carefully. For this, it is vital to evaluate the document's reliability and credibility and

ensure their results are reliable and valid since they will be a primary resource for developing the artifact. Regarding the data analysis, the method used will be document analysis, content analysis, and synthesis. The analysis will be guided by the research questions identified previously. Conclusions will be drawn, and recommendations will be made. Of course, also limitations of this thesis will be stated at the end. Below, one can see the five chosen companies, including a short description:

1. **IBM** is a multinational tech company that provides several services and products, including hardware, software, and services of consulting.
2. **SAP** is an abbreviation and is short for systems, applications, and products in data processing. The company is a multinational software corporation currently the market leader in ERP software.
3. **Google** is a multinational tech company that focuses on online services and products such as computer software, hardware, search engine technology, online advertising and cloud computing,
4. **Microsoft** is the biggest software provider in the world and supplies software such as Windows, Microsoft Office suite, or Internet Explorer, as well as hardware products such as Xbox.
5. **Adobe** is the market leader in creativity software products and is also known for its multimedia products, such as Photoshop or Creative Cloud.

### 3.3 Interviews

The contacts of the companies were provided by the supervisor of this thesis, Katja Tschimmel. Employees from the following companies were interviewed: Natixis, Promptly, Porto Digital and a leading automobile software development company. Natixis is a global financial company that provides investment banking, financing, corporate banking and much more. Promptly is a health tech company that developed a digital healthcare technology that helps to comprehend data for patients, clinicians, and providers. Porto Digital is a private non-profit association that has the goal to promote projects in innovation and digital technology. Lastly, there is one of the leading automobile software development companies that prefers to stay anonymous. At Natixis two people were interviewed, one being Innovation Project Leader and the other Team Manager. At Promptly a Senior Product Designer was interviewed, at the automobile software development company a Scrum Master and at Porto Digital the Head of Innovation Management and Experimentation.

The interview guide can be divided into three parts and ultimately has the goal to answer the second research question. The first part aims to find out about the companies Design Thinking practices. The second part asks how the companies are measuring customer satisfaction. Lastly, the third part aims to validate and improve the model by asking a few questions about that. Three out of the four interviews will be conducted online and one in person. To make sure all the information can be used, it was asked for permission to record the interviews vocally. With the help of that, the transcripts were created which were the base of the analysis. The interview guide as well as the transcripts can be found in the appendix.

### **3.4 Validity and Reliability**

The trustworthiness of research depends on the methods developed and how they have been executed and can be measured in validity and reliability. Veal (2006) defines validity as “the extent to which information presented in the research truly reflects the phenomena the researcher claims it reflects”. The research is highly valid since there is clearly a gap in the literature around Design Thinking and how to measure its impacts. This paper aims to contribute to decrease this gap and to suggest a visualization of a model to measure customer satisfaction after implementing Design Thinking. This will be further validated by interviewing four tech companies. Since not just one case will be analyzed, but five common and different ways of measuring Design Thinking can be found across those cases, making it possible to conceptualize the findings. Also, after further research is done in the future to improve and validate the model, other tech companies that have just started using Design Thinking or want to establish it in the future could benefit from this model. They can profit from this model, adjust their way of measuring customer satisfaction, and learn from those five chosen companies that achieve high customer satisfaction. However, the research and sampling method account for weaknesses in validity. There is a potential for selection bias since convenient sampling was used, and therefore, the sample may not be representative of the population. Also, using the comparative method, data availability and quality may be limited since only secondary sources are used, and essential internal information about the companies may be missing.

Research needs to be reliable so it can be repeated by several times and should lead to the same results if the method is duplicated accurately. Reliability is defined by Veal (2006) as “the extent to which research findings would be the same if the research were to be repeated at a later date or with a different sample of subjects”. It must be stated that in social science, reliability is always lower than in natural sciences because researchers deal with humans, and their social situations tend to change

constantly. To increase the reliability, similar companies were chosen for this study to get a complete picture. Moreover, the plan of research was described in detail, and the sources were all given; hence research could be replicated. Furthermore, the interviews were transcribed and the developed model was validated and improved by interviews with four tech companies.

## 4. Findings

The result chapter of this comparative case study focuses on analyzing customer satisfaction measurement practices after implementing Design Thinking in the processes of five tech companies, namely IBM, SAP, Google, Microsoft, and Adobe. This chapter aims to examine how these companies measure customer satisfaction and their approach's effectiveness. The analysis explores the different methods these companies employ to measure customer satisfaction. By comparing these companies' practices, this chapter anticipates providing insights into the best practices for measuring customer satisfaction after applying Design Thinking. Ultimately, the goal is to establish a model for measuring customer satisfaction to aid tech companies that recently adopted Design Thinking through the process. An in depth analysis of the five companies can be found in the Appendix, including all consulted sources. For the comparative analysis, the most important key points are discussed. Also, it needs to be said that the companies are probably doing more efforts on measuring customer satisfaction. However, there is only a limited amount of information that is publicly available. Hence, only this data was analyzed.

**Table 1.** Company Information

	<b>IBM</b>	<b>SAP</b>	<b>Google</b>	<b>Microsoft</b>	<b>Adobe</b>
<b>Founding Date</b>	1911	1972	1998	1975	1982
<b>Type</b>	Public	Public	Subsidiary	Public	Public
<b>Location</b>	Armonk, US	Walldorf, DE	Mountain View, US	Redmond, US	San Jose, US
<b>Employees</b>	345,000	105,000	190,234	221,000	25,988

### 4.1 Design Thinking in the companies

All companies are known to work with Design Thinking successfully and have certain principles that guide them daily. For example, *user outcomes*, *restless innovation*, and *diverse empowered teams* are the



principles that guide IBM. Google emphasizes that *everyone is creative and ideas can come from anywhere*, and Microsoft's principles are *to recognize exclusion, solve for one, extend to many, and learn from diversity*. SAP stresses the importance of *process, people, and place*. Adobe's principles are the *focus on the user, thinking the best about other people, and fostering creative confidence*.

Besides Adobe and Microsoft, which are making use of IDEO's five-stage Design Thinking model, the other companies have come up with their DT process models, such as *IBM Design Thinking* (Observe, Reflect & Make), *Google Design Sprint Methodology* (Understand, Define, Sketch, Decide, Prototype & Validate) and *Googles 3 E's* (Empathy, Expansive Thinking & Experimentation), and *SAP Design Thinking* (Explore, Discover, Design, Deliver & Run).

Furthermore, the companies all provide Design Thinking toolkits such as the *Innovation Toolkit* by SAP which includes several methods and other learning material. Adobe's toolkit includes Adobe's ideas, systems, and tools. Also, Adobe created *Adobe XD*, a tool for prototyping for user experience and interaction designers used to design apps, websites, marketing campaigns, and others. Prototypes can be created quickly, and it can be worked on collaboratively. Microsoft published the *Inclusive 101 Guidebook*, which entails Microsoft's principles and an extensive toolkit with suitable methods. Google has a *Design Sprint toolkit* that includes methods, tools, and templates. Google also has another kit, the *Design Thinking Toolkit*, that is especially useful for high schools or universities that use Design Thinking to create technology-based solutions. *IBM's Enterprise Design Thinking toolkit* contains several templates, methods, and tools.

In conclusion, all five companies recognize the value Design Thinking has when implemented. All have developed certain principles that guide them on their daily operations and while Adobe and Microsoft utilize IDEO's five stage Design Thinking model, SAP, IBM and Google have created their own DT process models. Moreover, all companies provide Design Thinking toolkits and other resources to empower their employees but also for their customers and other stakeholders.

## **4.2 Creative workspace**

In order to spark innovation and creativity, the companies need creative workspaces to support new ideas, solve problems and drive overall success. The *IBM Garage* uses an iterative framework that covers all essential steps from ideation to build and to scale. Co-creation, co-execution, and co-operation are highly valued and at the core of the *IBM Garage* Methodology. It helps clients generate creative ideas and provides them with the skills, know-how, and resources they need to quickly turn

those ideas into successful business operations. What started with 16 locations worldwide, some still being used, has grown post covid towards a rather virtual experience which has been even more efficient.

Microsoft has dedicated a program and space for innovation, collaboration, experimentation, and creativity called *The Garage*, which currently holds 14 locations worldwide. Their motto is "doers, not talkers" and the space provides everything a team needs to Design Thinking workshops. Customers are also invited to co-work with developers on new products to ensure their input and feedback are included.

The SAP *AppHaus* is a collaborative innovation space with a human-centered approach. SAP's Design Thinking teams work with customers, end-users, or partners to co-create solutions. There are currently five *AppHaus* locations in Berlin, New York, Seoul, Palo Alto and Heidelberg.

What started off in a garage has developed into *Googleplex*, Google's headquarters in Mountain View, California. The space is designed to release the inner child out of Googles employees, to stay curious and asks questions. Hence, their offices are designed to recreate a children's playground with the mission of creating a happy place that fosters innovation and creativity.

Adobe believes that employee performance is connected to professional wellbeing and satisfaction with their workplace. That is why their office in San Jose is well-designed to inspire creativity and productivity. The open and bright architected office has green spaces, meditation rooms, and several creative workspaces for its employees.

It can be concluded that all of the five companies recognize the importance of having creative workspaces to foster innovation. The workspaces invite employees to collaborate, stimulate creativity and productivity and contribute to the overall wellbeing, which is vital to have successful results for the company.

### **4.3 Customer Satisfaction at the companies**

Monitoring and measuring customer satisfaction is a critical aspect for all the companies. Several methods exist to obtain valuable insights into customer experiences, preferences, and needs. Once identified, companies can make changes and improve products. It is advised to combine qualitative and quantitative data to gain a comprehensive understanding of customer satisfaction.

### 4.3.1 Customer feedback management tools

Customer feedback management tools are powerful for tracking and managing several metrics related to customer satisfaction since they can analyze feedback from multiple channels. Google has its analytical platform called *Google Analytics*, which tracks and examines what happens on their users' websites and reveals insights into their user behavior. Google has been working with *Kantar*, the top data, insights, and consulting firm in the world, to gain better insights into the users' underlying motivation. Besides *Kantar*, Google has over 20 measuring providers that help to measure for specializations ranging from marketing mix modeling, sales lift app attribution, brand lift, brand safety, reach and viewability.

SAP bought *Qualtrics*, a leading customer experience management (CXM) platform. By integrating *Qualtrics* into its portfolio, SAP has gained the ability to capture better and analyze feedback which results in a better understanding of where are points for improvement in the customer experience as well as what are drivers of customer satisfaction. Also, *SAP Customer Experience and CRM Solution* help to manage customer experience by unifying data across the company and using artificial intelligence to create profiles of the customer to comprehend their preferences. Marketing, E-Commerce, Customer Data, Sales, and Service are part of the SAP Customer Experience and provide end-to-end insights by connecting all this data. Furthermore, *SAP User Experience Management (UEM)* by *Knoa* is a software tool that allows SAP to monitor and optimize the user experience of their applications.

IBM has several analytic tools, such as *IBM Watson Customer Experience Analytics*. The platform helps quantify and visualize customer journeys, providing a clear understanding of how to improve underperforming trips and duplicate successful ones. In addition, IBM has other customer satisfaction measurement tools, such as *IBM Tealeaf Customer Experience*, which provides insights into customer behavior. It captures interactions, identifies points for improvements, analyses the customers' experience, and finds areas where customers have problems.

Adobe's analytics platform, *Adobe Analytics*, collects and analyzes data from any digital point in the customer journey. Its insights allow for better customer experiences. Furthermore, *Adobe Experience Platform* is a customer experience management platform to collect and analyze customer data, which entails three applications: *Adobe Customer Journey Analytics*, *Adobe Journey Optimizer*, and *Adobe Real-Time CDP*.

Microsoft developed *Microsoft Dynamics 365*, a platform integrating customer relationship management and enterprise resource planning. Especially *Dynamics 365 Customer Insights* allows to analyze customer data to discover insights and improve customer experience.

In conclusion, all companies have invested in customer feedback management tools and platforms to track and analyze several metrics related to customer satisfaction. Whether the companies developed their platform, partnered with external companies, or have strategically acquired other companies, all companies leverage feedback management tools to gain valuable insights and improve customer experience and satisfaction.

#### **4.3.2 Feedback**

All companies would agree that customer feedback is crucial in measuring customer satisfaction. Customer feedback gives the companies insights into what customers think about their products. They can find areas where they are satisfied or dissatisfied and eventually improve those with low satisfaction. Obtaining and analyzing feedback at every stage of the customer journey is essential to ensure customer satisfaction and, therefore, customer loyalty.

After a customer interacts with the company, all companies measure three crucial metrics that are said to be the most important, and the best insights are gained when combined. Those three are the *Net Promotor Score* (NPS), which measures the likelihood of recommending to another person; *Customer Satisfaction Score* (CSAT), which measures satisfaction with a particular product or service and lastly, the *Customer Effort Score* (CES), which measures the level of effort of accomplishing a task. These metrics are typically retrieved through customer surveys. All companies mention and are assumed to use these customer service metrics. All companies have different programs to obtain user feedback, sometimes even incentivizing participants. IBM has a UX Program called *UXP* that gives badges to partners, which are IBM customers who help improve the user experience, innovate, and contribute to future products through their feedback. Badges that can be achieved are contributor, influencer, or advocate. Also, IBM has websites to ask for product feedback and how those can be enhanced.

*SAP Product Experience Management* captures real-time and anonymous feedback directly from the product since feedback capabilities are directly integrated. The user is asked about satisfaction, usefulness, usability, and additional feedback. Also, SAP asks its users for product reviews and offers 25 \$ Gift cards for every published review. Furthermore, on several websites of SAP, at the bottom,

the visitor is asked for their experience with a specific website to be rated with a thumbs up or down.

Adobe has a website dedicated to Feature Requests and Bug Report Submissions to obtain customer feedback. Further, Adobe is working with *UserVoice*, a user feedback software, to get feedback on several applications such as *Acrobat*, *Adobe Acrobat Sign*, *Adobe Aero*, and several more. Channels to collect feedback that Adobe recommends are one-to-one interviews, in-app or on-site feedback, emails, social media feedback, or through usability testing.

Microsoft provides several channels for users to send feedback, such as the *Feedback web portal*, in-product experiences, *Windows Feedback Hub App*, *Microsoft Tech Community*, or the *Microsoft Store*. Also, on Microsoft's websites, there is frequently the option to submit feedback about the demonstrated product on the website or the website itself. Microsoft asks customers for ratings and reviews in the Microsoft store. Those can be analyzed in the Partner Center, where filters can be applied, ratings can be broken down, and insight into categories can be gained. Also, Microsoft collects feedback via Surveys, One-on-one Conversations, or Focus Groups with their users to deliver the best possible experience for them.

Google has several studies to obtain user feedback to improve their products and services where current and non-current users can participate. Further, Google Feedback makes it easy for its users to send feedback to the company. Also, through Google Customer Reviews, valuable feedback from users that purchased something can be obtained. Combining this with the product rating feature, customer satisfaction with specific products can be seen.

In conclusion, obtaining and analyzing customer feedback is crucial for all companies to improve their products and services. The most important metrics for measuring customer satisfaction are NPS, CSAT, and CES, which are typically retrieved through customer surveys. Each company has different programs and channels to obtain customer feedback, often incentivizing participants. In today's digital age, companies have several tools and platforms available to obtain customer feedback, such as anonymous feedback directly from products, user feedback software, dedicated feedback websites, and feedback web portals. With the help of customer feedback, companies can make ongoing improvements to their goods and services to finally satisfy the changing demands and expectations of their clients.

### 4.3.3 User research

All companies state that it is vital to ask for feedback at all stages of the product development process to deliver the best product for the users. Fully understanding the customers' needs, preferences, and pain points is crucial to customer satisfaction. All companies conduct user research when developing or improving products, which is an ongoing cycle. With its framework loop of observing, reflecting, and making, IBM shows this iterative and refining process well. The companies use several user research methods. SAP has its own suggested framework that suggests user research methods paired with their Design Thinking phases.



**Figure 4.** User Research at SAP. Available at <https://blogs.sap.com/2021/08/31/user-research-for-user-experience-a-collective-roundup/>

Also, Google conducts many user research efforts, and the users participating in research sessions are rewarded. Google is conducting user research studies that can either be in person or remote and are open to everyone, no matter how long one has had experience with Google products. Google published a guide for user research and suggested the following methods; Field Studies, Focus Groups, Card Sorting, Surveys, Interviews, Diary Studies and Evaluation Methods, which can be divided into Usability Inspection Methods, Usability Testing, and Live Experiments. As Google has a Persona Template, it can be assumed that Google is also using Personas as a method in their user research.

User research is a crucial component of IBM's Enterprise Design Thinking and is conducted at several stages of the design and development process. IBM uses several design techniques like Minimum Viable Product Definition, Hypothesis-Driven Design, Wireframe Sketches, To-be Scenarios, Design Ideation, As-is Scenarios, Empathy Maps or Personas. Further, IBM has a *Sponsor User Program* where users can participate in design workshops/activities or usability testing to give feedback. Additionally, participants can receive a reward when participating in user research studies.

The different kinds of user research studies are Remote Usability Studies, Diary Studies, Field Studies, Surveys, and Usability Studies. IBM is using Eye-tracking in its user research as well.

Adobe publishes an extensive amount of insightful blog posts about the area of user research. Adobe also rewards participants of their user research program with an incentive. User studies could be in Workshops, One-on-one Feedback Sessions, or Surveys. Regarding user research methods, Adobe suggests several on their blog; hence, it can be assumed that Adobe is using those. Qualitative user experience research methods are Interviews, Personas, Ethnographic Field Studies, Diary Studies, Focus Groups, Card Sorting, Moderate Usability Testing, and Participatory Design. Quantitative user experience research, on the other hand, measures the behavior of users guided by questions with “how many, how much, or how often” and can be beneficial for making decisions with surveys or A/B testing. Qualitative user research methods are User Interviews, Usability Testing, Contextual Inquiry, Guerilla Testing, or Focus Groups. Quantitative user research methods, on the other side, include Surveys, Eye-tracking, or Product Analysis. Adobe suggests three types of user testing questions: screening, in-test, and post-test. Furthermore, Adobe suggests user testing methods such as Survey, A/B Testing, Beta Testing, Focus Groups or Usability Testing. To further dive into usability testing methods, Adobe suggests Session Recording, Card Sorting, Phone Interviews, Contextual Inquiry, Unmoderated Remote Usability Testing, Lab Usability Testing, and Guerilla Testing. Three usability metrics measure the usability of a service or product: effectiveness, efficiency, and satisfaction, which are preconditioned for it to succeed. Adobe suggests five usability metrics: task time, errors, completion rate, usability problems, and task satisfaction. Moreover, A/B Testing, allowing users to compare two designs, will aid in identifying usability.

Microsoft has a profound User Research program to create better and user-centered products in the future. During this, users try new technology and demonstrate how they use products daily to observe and receive real-time feedback. Microsoft can identify pain points and opportunities for improvement during those usability studies and further develop its products. The one-on-one research sessions are done online and are anonymous. Microsoft uses Personas, Customer Segments, and Role-Based Models in their user research process. Furthermore, Microsoft also works with Experience Reviews, Focus Groups, Usability Studies, and Customer Conversations. Besides conducting user research in the lab, Microsoft also does Field Studies to meet the users in their natural environment. Regarding user testing, Microsoft uses A/B Testing to determine which version of a product the users prefer. Also, Eye-tracking is used to test products.

The table below summarizes the most common user research methods used by the analyzed companies. However, it may be possible that companies that are not indicating to be using specific methods which they actually use, but no public information is available.

**Table 2.** User Research Methods

	<b>IBM</b>	<b>SAP</b>	<b>Google</b>	<b>Microsoft</b>	<b>Adobe</b>
<b>Interviews</b>	X	X	X	X	X
<b>Survey</b>	X	X	X	X	X
<b>Focus Groups</b>		X	X	X	X
<b>A/B Testing</b>	X	X	X	X	X
<b>Card Sorting</b>		X	X		X
<b>Usability Testing</b>	X	X	X	X	X
<b>Personas</b>	X	X	X	X	X
<b>Field studies</b>	X	X	X	X	X
<b>Diary studies</b>	X		X		X
<b>Eye-tracking</b>	X		X	X	X

It can be concluded that user research is essential to product development, and companies use various methods to gather user feedback. Design Thinking principles are used to guide the process, and user research is conducted iteratively throughout the design and development process. SAP, IBM, Google, Adobe, and Microsoft conduct extensive user research programs and use various techniques, which are summarized in the table. User research methods vary across companies, but all emphasize the importance of gathering user feedback at different stages to be able to create user-centered products.

#### 4.3.4 Metrics

One crucial metric for SAP is the *Customer Health Score*, which is calculated by the *Customer Health Dashboard*. It includes all customer-related activities such as consulting activities, sale support services, and marketing activities. With this and the help of built-in machine learning capabilities that



the *SAP Business Technology Platform*, has SAP can obtain the *Customer Health Score*. Besides the three primary metrics mentioned above (CSAT, NPS & CES), *Qualtrics* lists some more customer service metrics that should be paid attention to, such as average ticket handling time, customer ticket request volume, first contact resolution rate, overall resolution rate, first response time, customer churn and social media monitoring. Since SAP purchased *Qualtrics* for its customer experience management, it can be assumed that SAP is using those metrics to measure and manage customer satisfaction. SAP is most likely to measure retention as well as sentiment to keep track of their customers satisfaction since they are publishing information about it. The same can be said about measuring bounce rate and customer lifetime value.

Microsoft measures customer satisfaction through the *Voice of the Customer*, and besides CSAT, NPS and CES collects Sentiment, Custom Score, Overall Customer Satisfaction (OCS), and Customer Loyalty Index (CLI). Furthermore, Microsoft uses tools from the American Customer Satisfaction Index (ACSI) to measure and improve customer satisfaction by conducting surveys and interviews. Those tools are available through Microsoft Dynamics 365 Customer Voice. Customer lifetime value and customer retention can be measured via Dynamics 365. Furthermore, Microsoft measures bounce rate and customer churn.

*Adobe Analytics* measure 41 metrics, and some that could indicate customer satisfaction are bounce rate, conversion rate, cart additions, checkouts, orders, revenue, searches, or time spent on site. Adobe is also likely to measure customer churn, which refers to the turnover of the customers as they write in the blog about it. The same can be said about the analysis of sentiment. Also, customer lifetime value (CLV) can indicate customer satisfaction. Adobe published several tips for a customer retention strategy; hence it can be assumed that they are measuring customer retention.

Google came up with *Google Analytics*. Through a website tracking code, real-time data can be obtained that gives inside into the duration of user sessions, pageviews, average time on page, bounce rates, entrances or exit rate, and many other metrics. Regarding user engagement, Google Analytics measures Engagement Rate, Engaged Sessions, Engaged Sessions Per User, and Average Engagement Time by the amount of time a user spends at a session, where the user is focused, and how the session is terminated. Furthermore, the Google research team designed a new framework focusing on user experience. It is called *HEART* and includes the categories of Happiness, Engagement, Adoption, Retention, and Task success. This approach enables large-scale user experience measurement and can be applied to support product development decision-making.

Furthermore, Google publishes information about sentiment, customer churn, and customer lifetime value which indicates that Google uses those to track customer satisfaction.

IBM allows to measure the overall customer satisfaction (OCS) in their analytics. Furthermore, customer churn, as well as customer lifetime value, are important metrics to calculate for IBM. Through *IBM Watson*, sentiment analysis can be conducted, and therefore, important customer insights can be gained. Also, IBM tracks customer retention and uses the three most used metrics for this, such as the customer lifetime value, customer churn rate, and customer retention rate. Lastly, IBM is also calculating the bounce rate.

The table below summarizes the metrics found that all of the companies are using to measure customer satisfaction. CSAT, NPS, and CES have been already explained previously. Customer retention refers to the rate at which customers stay with a company for a certain; hence certainly, the goal of any company is high retention. Metrics to calculate this are obviously retention rate, customer churn rate, which refers to the loss of customers in a specific time, and customer lifetime value which indicates the total predicted revenue from a customer interacting with a company during their relationship with their business. Sentiment analysis scans all kinds of reviews and opinions online and classifies that text information into data. Lastly, bounce rate relates to the number of website visitors who arrive but don't do anything.

**Table 3.** Metrics

	<b>IBM</b>	<b>SAP</b>	<b>Google</b>	<b>Microsoft</b>	<b>Adobe</b>
<b>CSAT</b>	X	X	X	X	X
<b>NPS</b>	X	X	X	X	X
<b>CES</b>	X	X	X	X	X
<b>Sentiment</b>	X	X	X	X	X
<b>Churn</b>	X	X	X	X	X
<b>Customer Retention</b>	X	X	X (user retention)	X	X
<b>Customer lifetime value</b>	X	X	X	X	X
<b>Bounce rate</b>	X	X	X	X	X

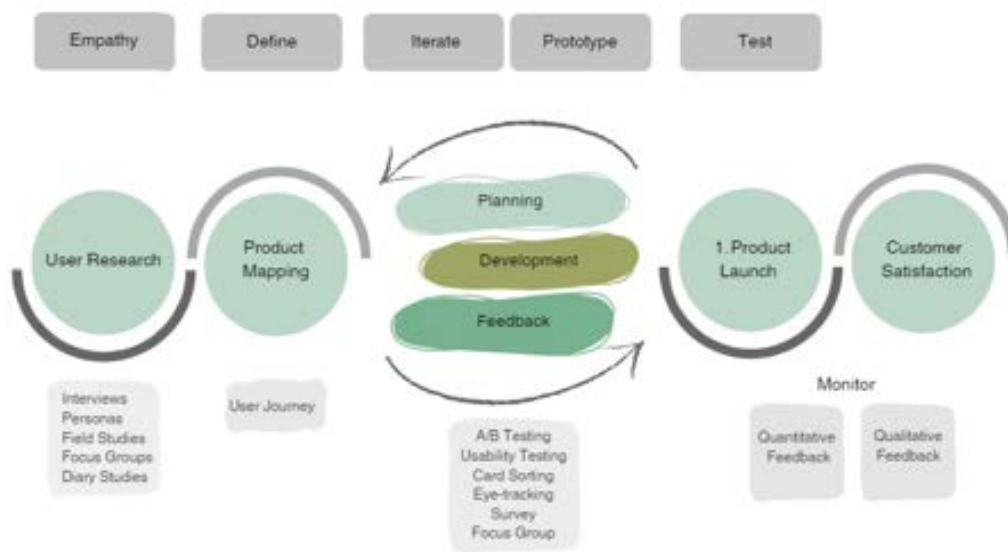
In conclusion, the companies use various metrics to measure and manage customer satisfaction. While some of the primary metrics used by these companies include CSAT, NPS, and CES, other metrics such as sentiment, customer churn, customer retention, customer lifetime value, and bounce rate are also important customer satisfaction indicators. Additionally, companies may use advanced analytics tools like the HEART framework by Google, the customer health score by SAP, or the American Customer Satisfaction Index that Microsoft uses to measure user experience. Using these metrics and tools allows companies to improve their customer experience and, ultimately, their customers' satisfaction and loyalty.

#### 4.3.5 Conclusion

In conclusion, this chapter focused on analyzing customer satisfaction measurement practices after implementing Design Thinking in the processes of five tech companies: IBM, SAP, Google, Microsoft, and Adobe. The analysis explored the different methods these companies employ to measure customer satisfaction, including their Design Thinking approaches, customer feedback measuring tools, user research methods, and metrics. All those methods contribute to a complete understanding of what the customers want and need, enabling the companies to deliver customer satisfaction.

#### 4.4 Preliminary model and validation

Based on the analysis of the five companies, a draft of a preliminary model of the customer satisfaction measurement process was established that can be seen below.



**Figure 5.** Preliminary Model

The model visualizes the customer satisfaction measurement process according to the different phases based on what the five companies are doing. The process starts with doing user research and common methods that are used by the five companies are shown. This is followed by product mapping and then the iterative process of planning, developing and feedback starts whereas user testing methods can be helpful to determine the user level of satisfaction and find points for improvement. After, the product moves for the first product launch and the process of obtaining feedback continues via monitoring the customers and their behavior utilizing metrics, for example. Conversely, qualitative feedback is obtained through feedback programs that could consist of interviews, focus groups, or other methods. However, it needs to be emphasized that that the techniques in the initial phase of the Design Thinking Process aim to assess the customer satisfaction of the existing products and not of new ones. Customer satisfaction of new product only starts to be evaluated on the basis of prototypes.

As already mentioned, this is a preliminary draft of a model which has to be validated by conducting interviews with Natixis, Promptly, Porto Digital and one of the leading automobile software development companies.

#### **4.4.1 Interview results**

The following section focuses on presenting the results and insights gained in the interview with the four companies. A short description of how they are working with Design Thinking and measuring customer satisfaction will be given, followed by a discussion of the perspectives of the preliminary model.

#### **4.4.2 Design Thinking**

The companies have been working with Design Thinking for some time, and it has helped them to have “a better alignment of customer, user and business needs” (Diogo, Promptly) and to “solve problems and to come up with new ideas” (Alexandre, Natixis). Natixis has even developed their own innovation framework. Whereas Natixis, Porto Digital and the automobile software development company (ASDC) use the tools and principles of Design Thinking almost daily, Promptly is “currently not working with it full scale because sometimes we need to speed up” but recognizes the value when developing new products and especially to understand what they can do and what they want to achieve. Joana (Porto Digital) further acknowledges the beauty of using several frameworks and tools and adapting them to their needs.

All companies have stated that working with Design Thinking has positively impacted their customer's satisfaction. Natixis indicated that their customers are more aware of the problems, value being listened to, and have a better understanding of pain points. Further, they state that it is helpful and successful to go in-depth into the problem and not go straight to the solution. Promptly describes this effect as well, that there is a better understanding of what is working, what is needed, and what is not when releasing a new product or feature, leading to greater satisfaction. The ASDC also describes the fact that there is higher satisfaction since user problems and later product details can be defined very well and that the customers enjoy the "structure and the simplicity of Design Thinking" (ASDC). Regarding user research methods, Natixis uses interviews, process mapping, value proposition Canvas, and process observation as user research methods and for Porto Digital it always depends on the scope of their different projects, it can be interviews, focus groups or observation. Co-creation is super important for Porto Digital, to involve the main stakeholders early on. For Promptly, user interviews, surveys, and proto-personas are highly important, and for the ASDC customer journey, persona and empathy maps.

#### **4.4.3 Customer satisfaction measurement**

All companies have different approaches when measuring customer satisfaction. Natixis measures customer satisfaction after a use case is implemented via a simple survey, and they have a testimonial at the end. Usually, the feedback is taken right after, but it may take some time to see the impacts and analyze them. ASDC measures customer satisfaction after every iteration to have the possibility to adapt feedback and to confirm with the customers before going ahead with an important decision. Once a project is finished, customer satisfaction is also measured via surveys. Promptly, on the other hand, states that "it is a little bit messy, sometimes our processes" and states that for them, it is more that they get feedback that there was a problem detected, then they fix it and ask for feedback again. Hence, communication is essential and is done via interviews, user testing, surveys, and other communication forms. Porto Digital is also usually collecting the feedback after a project and then analyze the data afterwards. This feedback could be ratings or also engagement indicators on websites. But also, during the process they include stakeholders to obtain feedback to improve the process.

Promptly is also measuring NPS and CSAT via surveys but "those surveys, from my experience, cannot give you a know-how about what is going on in reality. For that, I think interviews are more

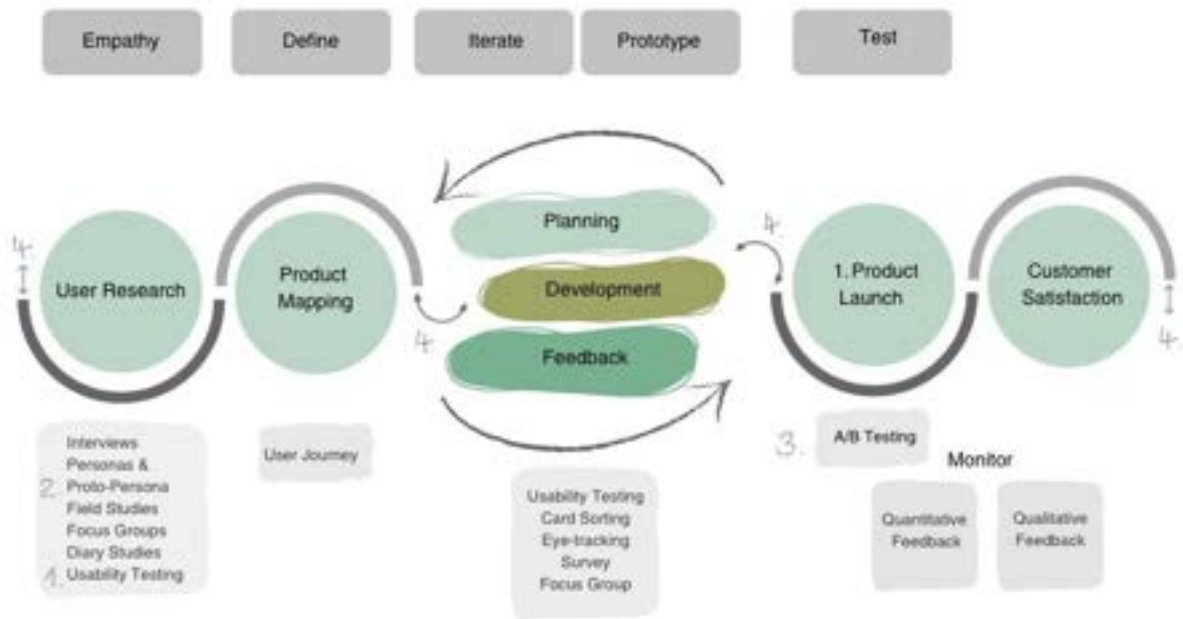
helpful” (Promptly). Porto Digital does measure metrics such as CSAT, NPS and CES, but only in certain projects but collects a lot of data to analyze. Natixis defines certain KPIs before a project, such as “ the number of innovators that we have, the number of use cases or the kind of benefits that you bring overall,” which are evaluated after. Similarly, ASDC defines Objectives and Key Results (OKR) before and evaluates those after. Promptly has several programs and platforms they are working with, such as Mix Panel and Hotjar for interviews, Help Scout for customer support, Sentry to collect user errors, and mix panel to monitor data in the product launch. In the ASDC, no specific programs or platforms are used, and Natixis is currently working on a platform that will improve collecting feedback and will contain an analytics measurement. So far, everything has been analyzed manually. Porto Digital is also not currently using a platform or program to measure data but also expresses the need for one in the future.

#### **4.4.4 Model validation**

The last part of the interview was dedicated to validate the model. The original model was shown to all of the companies, and it was asked if the model is logical to follow and if it makes sense and visualizes the customer satisfaction measurement process. Since the companies all have different approaches to measuring customer satisfaction, all of them had a different view on how the model could be enhanced.

#### **Promptly**

The first thing that Diogo (Promptly) said was, “ This model seems in the environment where everything goes perfectly. This is what should be happening [...], but sometimes it’s not so simple”. Overall, the model was easy to comprehend, but also some points for enhancement were found. Diogo said that they would use usability testing (1) already in the user research phase because “ using usability testing in the user research phase can help to speed up the process”. Also, adding proto-persona (2) to the user research phase was suggested. Moreover, for Diogo, A/B testing (3) is used more in the first product launch and not in the development process. Lastly, it was stated that “the real world is not as linear as this,” which also suggests adding some flexibility to the model to be able to jump between the phases and move back and forth (4). The adapted model can be seen below with the changes according to the numbers.

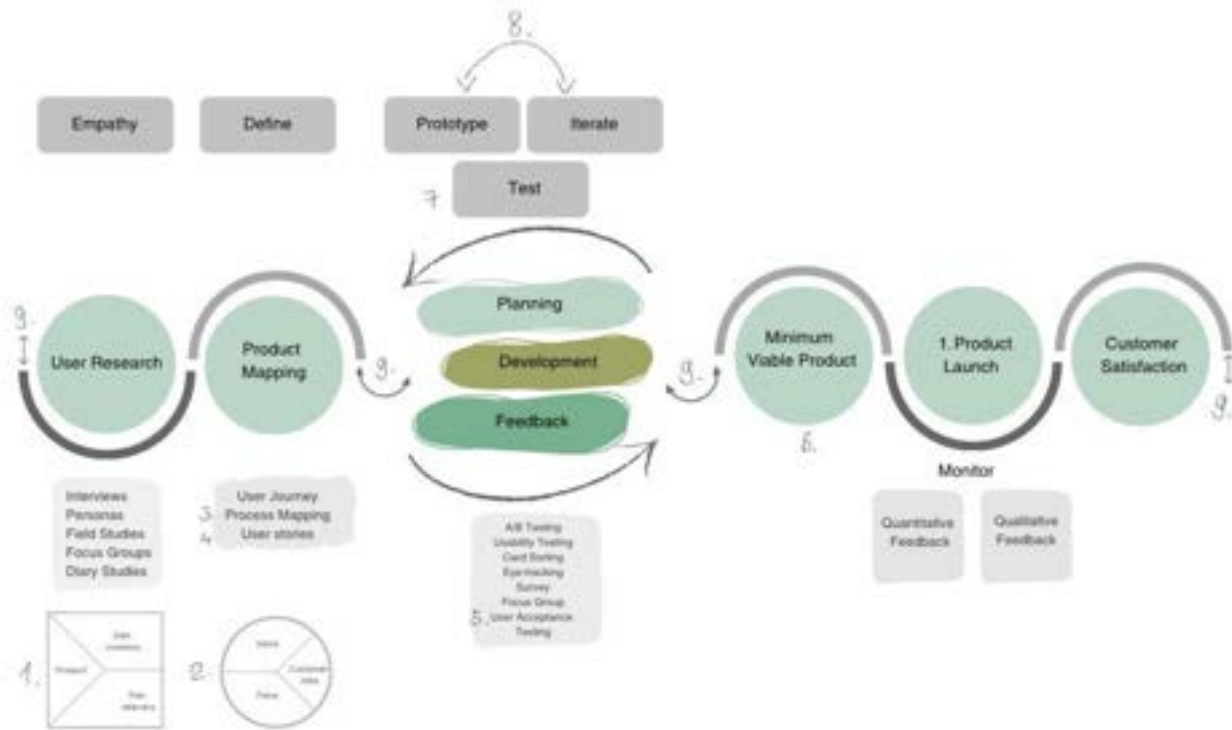


**Figure 6.** Adapted Model by Promptly

## Natixis

Regarding Natixis, it can be said that overall, it made sense to Alexandre and Samuel, and they would be open to trying this model, or how Alexandre said, “if you want a lab rat, we are open to that”. After some discussion, some points that could be added were identified. As Alexandre and Samuel place a strong emphasis on the Value Proposition Canvas in their user research, they proposed to add the one side of the pain killers, gain creators, and product (1) to the model in the user research stage and the other side of gains, pains and the job to be done (2) on the product mapping stage. Furthermore, they suggested adding process mapping (3) and user stories (4) to the product mapping phase and user acceptance testing (5) to the user testing methods underneath the iterative cycle of planning development. Furthermore, it made sense to them to add a minimum viable product (MVP) (6) after the iterative cycle and before the first product launch. In addition to this, to have the “test stage of DT” (7) above the product launch was a bit misleading because Alexandre and Samuel saw this phase also above the iterative cycle next to iterate and prototype. Another comment was to switch iterate with prototype (8), as they said that they prototype first and then iterate and then test. One last comment regarding how to read the model was that it seemed somewhat linear, and the term flexibility as being of high importance was mentioned. Hence, jumping from phase to phase

needs to be possible to adapt and improve, and therefore it should be possible to go from the beginning until the end and the other way around. Furthermore, Alexandre said that having the Design Thinking phases above was good because “it puts everybody on the same page” and it is easy to comprehend. The adapted model can be seen below.

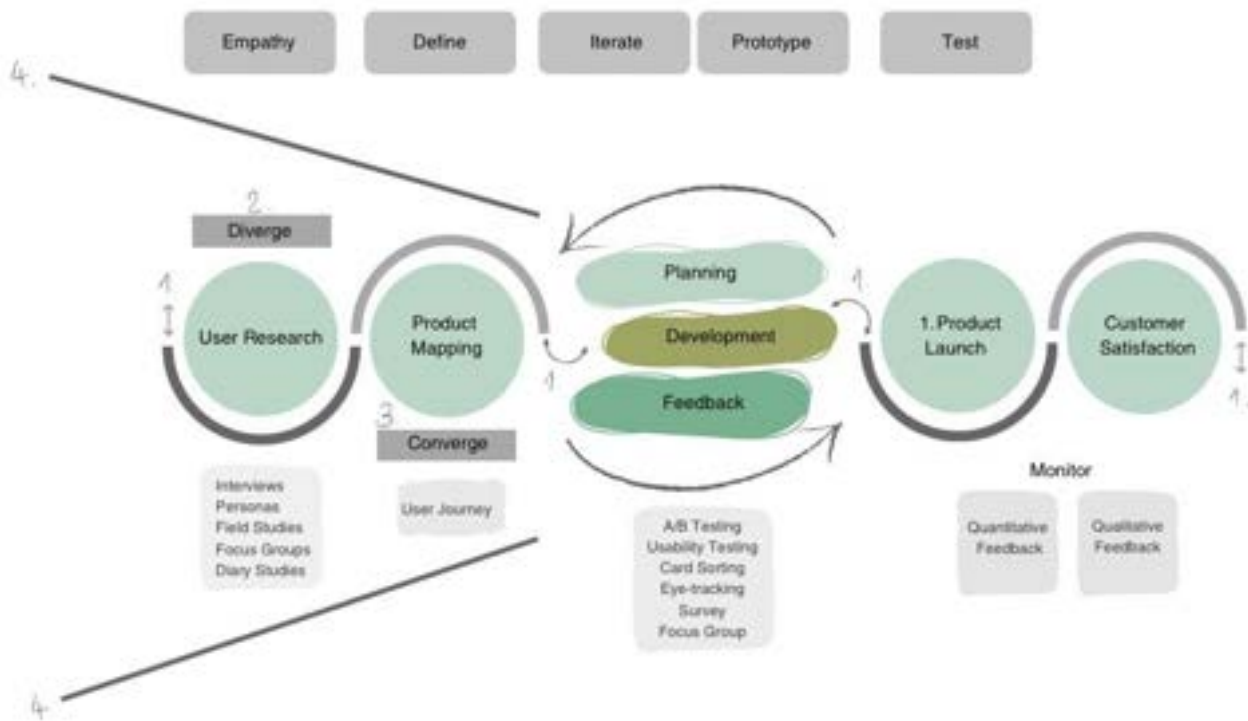


**Figure 7.** Adapted Model by Natixis

### Porto Digital

When talking with Joana (Porto Digital), she said that the model made sense to her overall and she emphasized the importance that there is no sequence and to be able to go back and forth. According to her, there are some things to add such as some arrows in the user research to the user mapping stage (1) as there is a great deal of iteration in the beginning until the start of planning and development. It was further suggested to add divergence (2) in the user research stage and convergence (3) in the product mapping in the beginning. Also, Joana talks about “a funnel that goes from user research wide open to customer satisfaction” (4) that can be added. Furthermore, she emphasizes the importance of doing an MVP that can be considered in the prototype before the product launch. A draft with the proposed changes can be seen below.





**Figure 8.** Adapted Model by Porto Digital

### **Automobile Software Development Company**

Khrystyna (ASDC) stated that the model made sense to her overall, but there were also some things to add. For example, having user acceptance testing (1) as a user testing method was suggested. Again, the fact of flexibility was mentioned, and the framework should not be read linear (2). Also, the Design Thinking phase Test (3) did not make sense where it was and was suggested to be moved. Khrystyna indicated that besides the points above that should be applied nonetheless, there are two ways to further enhance the model for her. The first option is to add a minimum viable product stage (4) after the iterative cycle of planning, development, and feedback and to have another iterative cycle (5) with user testing methods (6) after it and then leading to the product launch. Iterate and test (7) would be the fitting Design Thinking phases with the iterative cycle and prototype (8) with the MVP. The first draft option can be seen below.

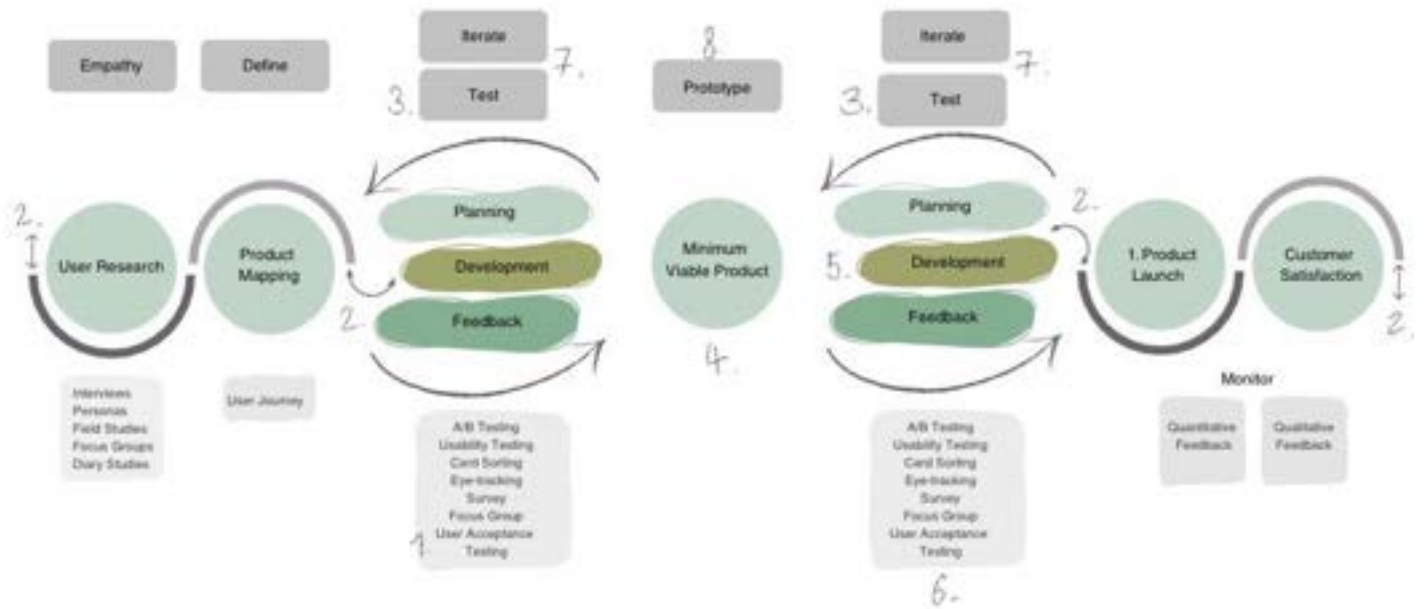


Figure 9. Adapted model by ASDC 1

The second option would be to move the DT phase Test to Iterate and Prototype and create some kind of funnel leading (9) toward the development cycle. Furthermore, she would add a fourth phase there, test (10). The draft of the second option can be seen below.

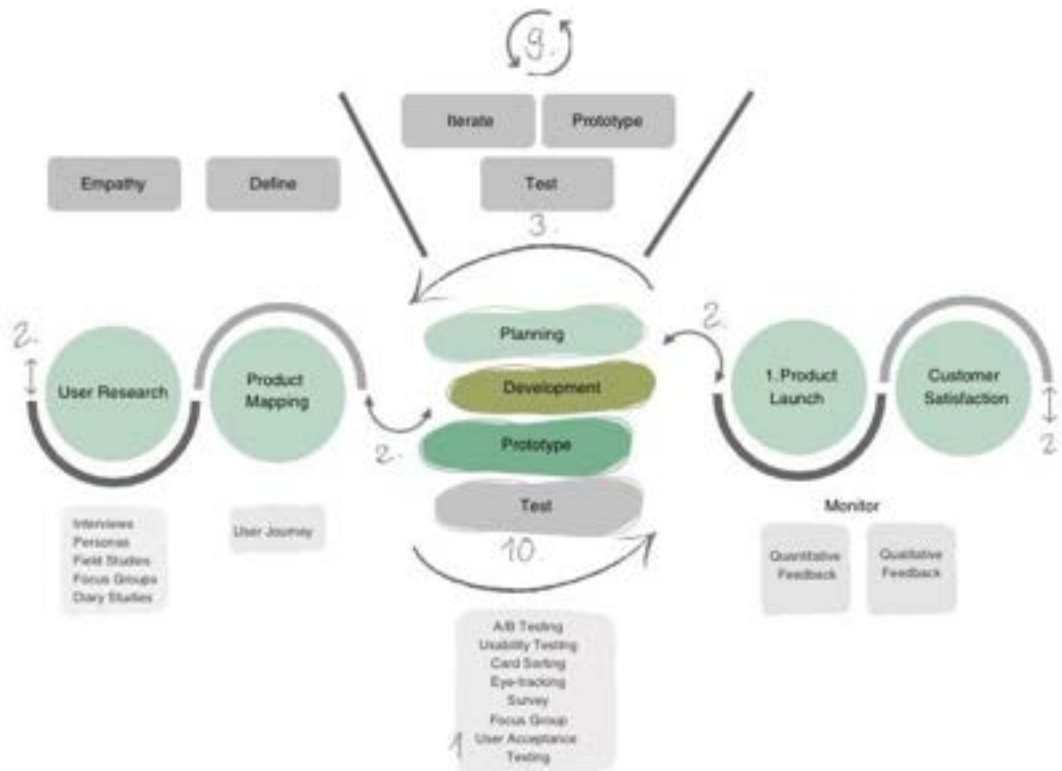


Figure 10. Adapted Model by ASDC 2

## 4.5 Discussion

The following chapter will compare and contrast the research findings with the relevant academic literature previously highlighted in the literature review.

Several alignments have been found between the academic literature and the findings of the five tech companies as well as with the companies that were interviewed. In theory, the process of Design Thinking lets people create and test prototypes, experiment to obtain feedback, and improve and design until satisfaction is reached (Zafar, Ul Haq, Siddiquei & Nazir, 2022). Practical implications have confirmed this since all companies practice Design Thinking and have a throughout feedback program and keep on iterating until customer satisfaction is reached. This process is supported by user research and user testing. Furthermore, the authors claim that Design Thinking is referred to as a substitute for the analytical reasoning that big companies are using, hence, a more emotional, creative, and subjective approach. Promptly stated, “Surveys, from my experience, cannot give you a know-how about what’s going on in reality. For that, I think interviews are more helpful”, showing the importance of emphasizing with the users. The companies lay a great deal on the empathy phase since it is crucial to understand the users’ needs and preferences, which goes in hand with Dunne (2018), stating that empathy needs to be practiced very well so the user’s needs can be fully understood. Also, Natixis and ASDC noted that the most noticeable thing about Design Thinking is to really understand the users and go from there. Furthermore, Beckman and Berry (2017), Dunne (2018), and Liedtka (2014) claim that in comparison to conventional management ways of doing things, Design Thinking intentionally avoids making quick decisions and maximizes the problem-finding and uncertainty stage to get the best possible results. Another alignment can be found here as Natixis stated that one of the benefits of Design Thinking is that they go really deep into the problem and listen very well instead of jumping to a solution straight away. According to the literature, Design Thinking is known as a creative approach, and therefore, the setting should be an open and creative space to foster ideation (Fischer, Lattemann, Redlich, & Guero, 2020). This statement can be confirmed since the five tech companies all have very creative and open office spaces that foster collaboration and creativity. The same can be said about the Natixis office in Porto. The literature states that the Design Thinking model from the d.school is one of the most used and renowned ones (Carlgren, Elmquist & Rauth, 2016). This can be confirmed by Adobe and Microsoft following those steps as well. The fact that the Design Thinking steps are rather overlapping spaces than a set of preset steps (Brown, 2008) can be confirmed since all of the

companies that were interviewed spoke of the processes as flexible or messy and stated that a model should be adaptable to individual needs or processes. Joana (Porto Digital) emphasized creating a strong loop between the initial phases of User Research and Product Mapping. This idea is further supported by Brown and Wyatt's (2010) literature, which highlights the importance of continuous looping between the Inspiration and Ideation stages. Furthermore, the literature suggests that there has been a change in designing from 'for users' to 'with users' (Tschimmel, 2012) or, as Brown & Katz (2011) state, "us-with-them". The findings can confirm this as Porto Digital's primary approach is co-creation with the respective stakeholders. Also, the other companies that were analyzed tried to include their users at some point in the development.

To have diversity in aspects such as experiences, skills, and viewpoints are vital in coming up with original and creative ideas, is stressed by Liedtka (2014), which is fully supported by Microsoft's Inclusive Design approach. As already mentioned in great detail in the introduction and especially in the knowledge gap of this thesis, it is very challenging to measure the impacts of Design Thinking. This can be confirmed by the original approach of this thesis, which changed since only little information on how the five companies capture and measure the impacts that Design Thinking has on them. Only IBM had published a report, "The Total Economic Impact of IBM's Design Thinking Practice" (Forrester, 2018).

The literature on customer satisfaction suggests that knowing what customers need and want is essential for any company to achieve customer satisfaction (Henry, Ruslan & Sukwadi, 2021). However, sometimes it is more challenging than asking them directly what they want. Sometimes one needs to dig deeper and discover what the customers might not even know yet, what qualities people seek in a product or service. This can also be confirmed by the efforts the companies make since all five of the tech companies do field research to understand the users in their natural environment. Also, observation is used frequently. As the literature suggests, Design Thinking and its principles can help companies conduct user research to develop practical solutions for customers to reach customer satisfaction (Moran, 2021). Regarding user research, Daae and Boks (2015) differentiate between methods for communicating with the user, like interviews, focus groups, or surveys, and methods for interrogating what users are doing, such as user testing, shadowing, or observation. The companies also use those different methods, and they are used according to the purpose of the research. Furthermore, out of the 20 user research methods that the Nielsen Norman Group suggests, 18 methods are used at least by one of the companies. The literature further states that

companies working with Design Thinking achieve more excellent results, especially regarding higher customer satisfaction levels and brand loyalty (Orbulov, 2020). The five tech companies can confirm this since they have pretty satisfied customers and also by the interviews since they all stated that working with Design Thinking has impacted their customer satisfaction positively. Regarding measuring customer satisfaction, Hill, Brierley, and MacDougall (2003), measuring customer satisfaction can be measured through surveys, depth interviews, focus groups, and customer feedback. Those measurements are all used by the five companies and partly by the companies that were interviewed. The authors further state that surveys use measures such as overall satisfaction, attribute level, behavior-based intentions of loyalty, such as how likely one is to recommend or re-buy something, and loyalty measures such as making recommendations to others. Proof was found for this as all five companies measure the overall satisfaction and intentions of loyalty (CSAT, NPS, and retention). However, the attribute level was not found. The same goes for the piece of literature stating that the most popular metric for customer satisfaction is a firm's "Top 2 Box" (Morgan & Rego, 2006). It may be possible that companies measure this score internally but not publish it. What all companies do measure, however, and as already partly mentioned, are the CSAT, NPS, and CES, as well as retention metrics such as customer lifetime value, customer churn rate, and customer retention rate. Those customer feedback metrics and the American Customer Satisfaction Score (ACSI), which is only used by Microsoft (as public information is available), are proposed by the literature (De Haan, Verhoef & Wiesel, 2015; Morgan & Rego, 2006; Manzano, 2021). Furthermore, Kekre, Krishnan, and Srinivasan (1995) state that drivers of customer satisfaction in the tech industry are tech documentation, maintainability, installability, reliability, performance, usability, and capability, with a particular emphasis on the last three. Usability as a driver can definitely be confirmed as all companies, the five tech companies, as well as the ones that were interviewed, are doing usability testing.

In conclusion, the comparison and analysis of the findings from the research study with the relevant academic literature have revealed several alignments and confirmations. These findings imply that practical implications draw upon the established theories and concepts.

## 5. Conclusion

### 5.1 Answering the research questions

After having gained insights into the concepts of the topic at the literature review, conducting desk research on companies that operate in the field, and conducting interviews to validate those findings, finally, the research questions can be adequately answered.

#### 1. How do tech companies specifically measure customer satisfaction following the implementation of Design Thinking?

After analyzing the five tech companies and conducting the interviews, the first research question can be answered. All of the five companies analyzed in the first part have implemented Design Thinking in their practices and execute it daily. Also, the companies that were interviewed are or have been working with Design Thinking. The analysis showed that tech companies can use various methods, especially combined, to contribute to a comprehensive understanding of customer satisfaction. All companies analyzed in the first step track specific metrics to get insights, such as the most important ones of CSAT, NPS, and CES, which are typically retrieved via survey after interacting with the customer.

Furthermore, other metrics such as sentiment, customer churn, customer retention, customer lifetime value, and bounce rate are also important customer satisfaction indicators. Of course, other prominent metrics and specific metrics developed by each company are used. The companies that were interviewed use some of those metrics as well or define KPIs or OKRs before a project and track those after. Metrics can be a good indicator of customer satisfaction, loyalty, and retention and are measured and analyzed by customer feedback management tools such as analytics, customer experience management platforms, or customer insight platforms. With those insights, a real-time picture can be captured, and areas for improvement can be found. Feedback from the customers, in general, is a vital element in measuring customer satisfaction which is why the companies invest a lot of capabilities in obtaining and even incentivizing their customers. The companies have different ways of doing so via feedback programs, dedicated websites, quantitative and qualitative studies, feedback software, review portals, or directly integrated feedback capabilities in the products. Also, asking for feedback ranges from every two weeks to after every project or whenever it is needed.

Another way that companies measure customer satisfaction, which is also connected to feedback, is by user research and especially user testing. User research methods are especially helpful in identifying pain points, needs, and expectations and discovering opportunities for improvement, therefore setting the right direction towards developing something the customer will be truly satisfied. User testing then involves evaluating the usability, functionality, and overall experience with a product, gives insights into a current satisfaction level, and, therefore, finds points for improvements. Common user research and user testing methods used by the companies are Interviews, Surveys, Focus Groups, A/B Testing, Card Sorting, Usability Testing, Personas, Field Studies, Diary Studies, and Eye-tracking.

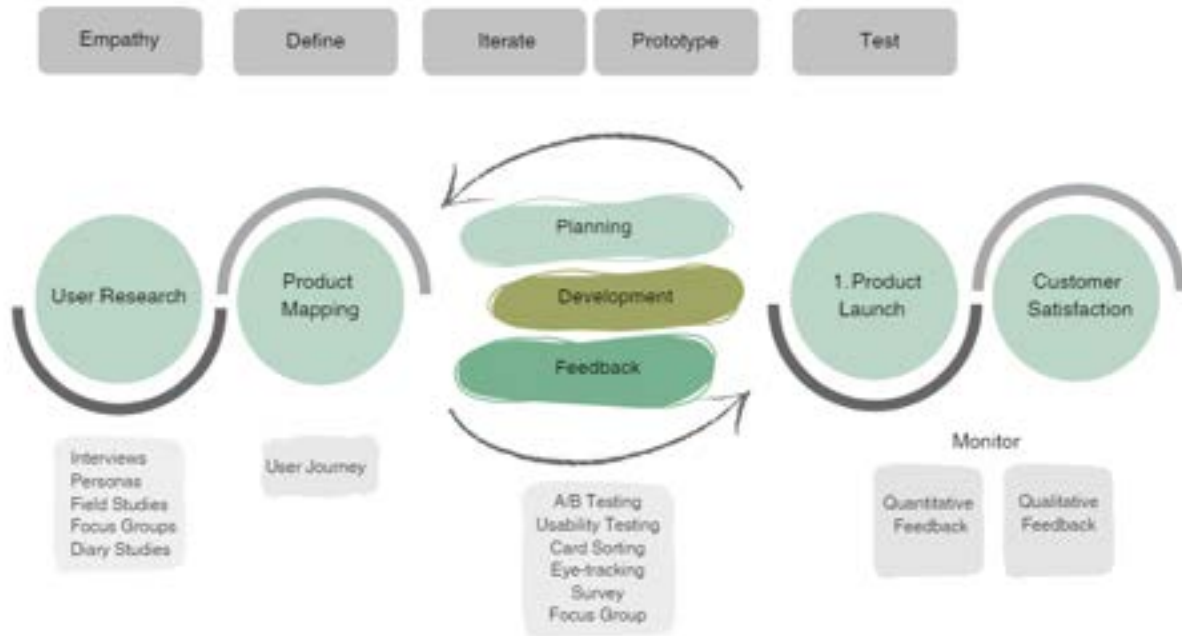
Combining those efforts to measure customer satisfaction can give great insights and the ability to manage customer experiences and eventually increase satisfaction, loyalty, and retention. Which metrics, feedback programs, analytic platforms, and user research methods a company uses always depend on individual goals and objectives. However, customer satisfaction is not a one-time measurement and should be regularly implemented to keep track of changes. Only this way points for improvement can be found, and the effectiveness of initiatives to enhance customer satisfaction can be evaluated.

Hence, it can be said that there are various methods and approaches to measuring customer satisfaction, depending on the company, the field they are operating in, and the step of the development process they are in. It is important that companies note that one approach may not be applicable for several companies or even not for different projects in the same company. What became visible is that asking regularly for feedback is the main way to measure customer satisfaction, in whatever form it may be. Feedback is vital and allows companies to find points for improvement and is a great way to start a conversation with a customer.

## **2. How can we visually represent the process of measuring customer satisfaction after implementing Design Thinking?**

After having interviewed the four companies that have all had interesting points to add to the original model, one final model can be drawn. It shows the customer satisfaction measurement process well based on IBM, SAP, Google, Microsoft, Adobe, Natixis, Promptly, the automobile

software development company, and Porto Digital. Below one can see the original model again that was shown to every interviewee.



**Figure 11.** Original Model

The model was adapted based on what the interviewees' thought could still be enhanced. In the beginning, a funnel was added (1) to show the amount of divergence and convergence at the beginning and the amount of user research methods to understand the user and the problem. It was further suggested to add the step of diverging in the user research stage (2.). Furthermore, some user research methods were added, such as proto-persona (3) and the one side of the value proposition Canvas (4) (product, gain creators & pain relievers). Also, in the second stage of the model, enhancements were made, such as adding the convergence step (5) and some methods as well: process mapping (6), user stories (7), and the other side of the Value Proposition Canvas (8) (gains, pains & customer jobs).

Regarding the iterative process in the middle that consisted of planning, development, and feedback, the steps of prototyping (9) and testing (10) were added to make it more complete because several people spoke about the importance of prototyping and having an MVP. Also, user acceptance testing (11) was added to the user testing methods to see if the prototype or MVP was ready for launch.



Furthermore, several arrows were added to show the flexibility (12) of the model and that it allows one to jump from stage to stage and to return, when necessary, which was stressed by the interviewees. Also, regarding the Design Thinking phases on top, it was mentioned by three out of the four interviewees stated that the test phases did not make sense where it was and that it should be added with the phases of iterate and prototype above the development stage (13). Furthermore, examples of quantitative and qualitative feedback were added (14).

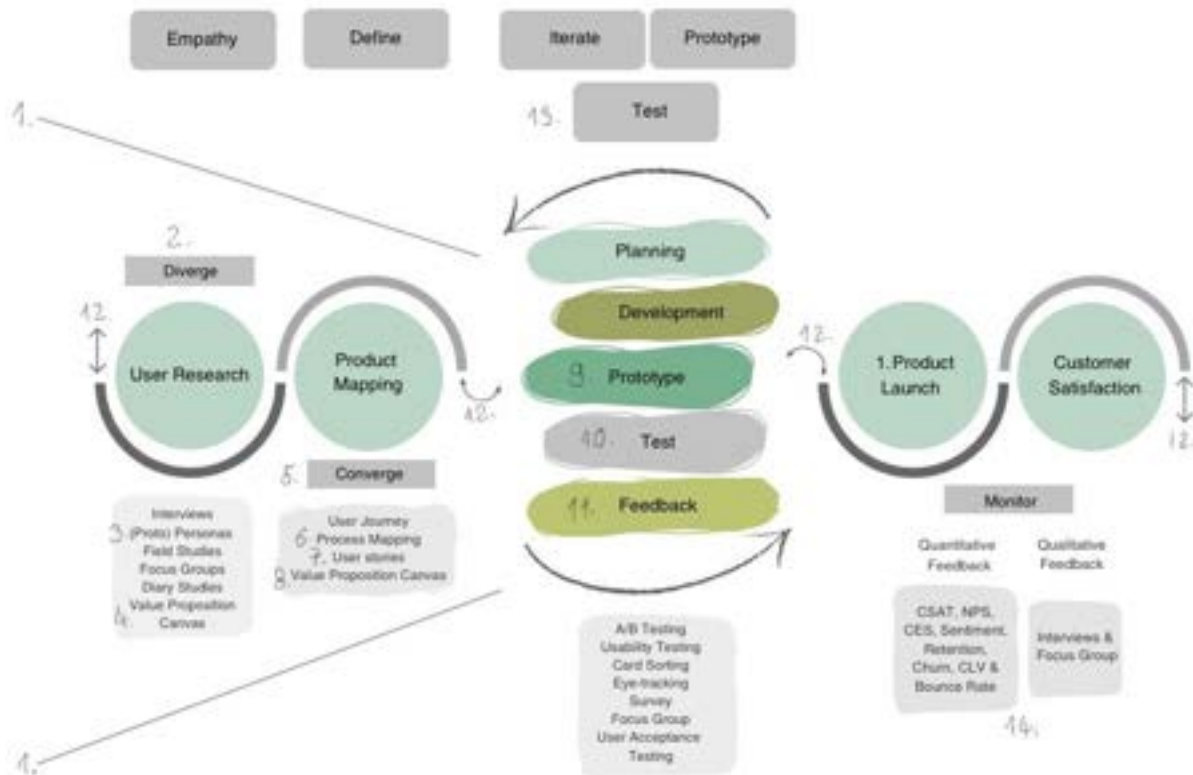


Figure 12. Final Model

## 5.2 Critical discussion of the model

The final model of this research that was developed on the basis of companies analyzed has the purpose of visualizing the customer satisfaction measurement process during the Design Thinking process and at the end. It was created on the information publicly available of IBM, SAP, Google, Microsoft, and Adobe on this matter and was validated via interviews with Natixis, Promptly, Porto

Digital, and an automobile software development company, and points for enhancements were found and applied.

The design of the model incorporates a cyclical structure for the first two and last two phases, effectively illustrating the iterative nature of the process within the first two phases, which are supported by divergence and convergence. Regarding the phases of 1<sup>st</sup> product launch and customer satisfaction, the cyclical structure is supposed to show that even after the product is released, constant efforts need to be made to monitor the performance and find points for improvement. The elements in the middle are in a hand-drawn style which emphasizes the flexibility, adaptability, and organic nature of the creative process, which is supported by the arrows that indicate an ongoing iterative cycle. Also, the little arrows aim to show this as one can go back and forwards in the model. This is further supported by the fact that those ovals are not in a perfectly aligned order, and there is room for flexibility. The oval form was chosen as it is a continuous flowing form that lacks sharp corners and is supposed to show a balance that needs to be kept in the development process. The handwritten numbers, furthermore, support the idea that this model needs to be seen as a draft and that it is still in the development stage and remains unproven. The methods underneath the phases can be seen as a simple checklist of possible tools that one can utilize when going through the process. As green is the primary color of this model, it is supposed to transmit a positive association, growth, and continuous improvement, ultimately leading to customer satisfaction. All in all, the model suggests a draft of how customer satisfaction measurement can be visualized. However, companies can customize their approach and take whatever suits them best in their current process.

It can be said that the approaches of measuring customer satisfaction of the first five tech companies were quite similar, which may be because the companies themselves are similar, being tech companies that mainly develop and sell software products which made the process of creating a model somewhat easy. However, the companies, even though being in the tech sector, are not so similar as they have different clients, activities, and approaches. This can be seen as a positive aspect since diverse perspectives and indications were taken into account, and also primarily positive comments were made, which indicates the generalizability of the model to be applied in different scenarios. However, one of the most significant drawbacks of this could be a lack of relevance for the model since it may not apply to the specific software development industry.

Regarding the model itself, one of the biggest strengths is that it turned out to be very flexible, meaning that it does not need to be read linearly and can be adapted as required. Also, the tools are just a suggestion of the most prominent ones, and there are numerous methods that can be chosen, always depending on the scenario. Moreover, it turned out to show the customer satisfaction measurement process well and gives tools and suggestions for a sequence that can be seen overlapping. A possible weakness could be that the last part only suggests monitoring quantitative and qualitative feedback and does not give any suggestions for those. Furthermore, it does not propose a way to measure this feedback, for example, via a platform or program. Also, it must be stated that the model was validated only for this thesis to reach some draft.

### **5.3 Conclusion, limitations and future research**

The final model gave a good indication of how the customer satisfaction measurement process can be visualized. Credibility was given since the model was validated by four companies. One of the limitations, as previously mentioned, is the lack of high similarity among the companies involved in the interviews, which could result in a lack of relevance. Also, since the time was limited not so many companies could have been interviewed to validate the model. Moreover, as only secondary data was analyzed in the first step, important information may be missing that could have enhanced the model. Furthermore, due to its early stage of development, the model may not yet possess meaningful functionality and cannot be effectively utilized in practice. It is important to note that the author lacks proficiency in graphic design, which accounts for the amateurish visualization of the model. This deficiency may have resulted in the interviewees not fully comprehending the model or for any miscommunications. Also, the fact that some parts were based on assumptions such as methods or metrics that the companies are using may be a limitation. Moreover, since three out of the four interviews were conducted online, some information could have been lost and especially with the model validation, some points may not have been expressed as well as they could have been via an interview in person.

However, those limitations can be decreased by conducting further research which is proposed to enhance the model as it has potential to be applied in practice. The model needs further testing and validation to a larger extent before it can ever be used in practice. This could be done via more interviews with tech companies to get more critical feedback. Also, for further research, the model should be tested for a specific field in order to have valuable and relevant results. Once validated enough, the model should also be tested by some companies.

All in all, this research answered its research question well and was able to contribute in decrease the knowledge gap slightly.

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# Appendix

## Appendix A: Result Visualization Analysis SAP, Adobe, Microsoft, Google & IBM



## Appendix B: Interview Guide

### Part 1: About the company and DT

How long have you been working with Design Thinking?

In which areas have you implemented Design Thinking?

How has working with Design Thinking impacted your customers satisfaction?

What kind of user research methods are you using?

## **Part 2: About customer satisfaction measurement**

How do you currently measure customer satisfaction in your company?

Which metrics or indicators do you use to assess customer satisfaction?

How and how frequently do you collect feedback from customers?

Do you have programs/platforms that analyze and interpret customer satisfaction related data?

## **Part 3: Model validation**

Do you think the model is logical and easy to understand? Could you please tell me how you read this model.

Do you think this model visualizes the Customer Satisfaction Measurement Process well?

Based on your expertise and experience, what could be added to the model to enhance it?

## **Appendix C: Interview with Alexandre Martins and Samuel Moreira (Natixis) 26.05.2023, Natixis office**

**J: How long have you been working with Design Thinking?**

A: I think we started in 2021.

**J: In which areas have you implemented it?**

A: We have implemented it in a transversal way because the framework that we developed in conjunction with Katja was not specific to an area, but a process that promotes innovation inside the company. We already practiced it in an area called BS, it is an area inside the group. But we can apply it to all the areas, it is not specific to just one.

S: And even today, we had a presentation about the framework. And we say in our innovation framework that it's not only to solve problems, but also to come up with new ideas. Because with Design Thinking we can start something from zero, so we wanted it to be flexible to be able to use it in many contexts.

A: Not in this company, but in my personal experience, my first contact with Design Thinking was 2016 in the post-graduation where we touched upon Design Thinking since this moment I was in touch with this concept.

S: I think I also had some touch points with Design Thinking in 2014, when I was working as a web designer. Because I think Design Thinking has a strong emphasis on graphic design, when you are designing a product. I had the opportunity to do some stuff with Design Thinking. I also tried once to start my own start up in 2016, and I also had to pass through the Design Thinking process.

**J: How has working with Design Thinking, impacted your customers satisfaction?**

A: I think now they are more aware about the problems. And we are not in the good scenario yet, but I think they start to understand that they first need to think about the problem and then come up to us with a solution. I see some point of satisfaction after a session where we go deeper to the problem and fall in love with it and really understand their pain points. It is common even after we started this process to receive requests already with the solution and not with the problem to be discussed, but it is the learning process. I see some kind of satisfaction to talk about the problem and to be listened, which I think is the main benefit of the process, to have the effect that they are being listened about their issues and problems.

S: And in another spectrum, we also had to do a testimonial of one of our business analysts. So, for the first time we have someone really using the “do it” like our own work. She is following the phases that we create, and she is saying that it is helping her. It has been an orientation guide for her, so I believe that there is this part of the business where the clients need to think about the problem a lot. And also, for the people that help the clients, in this case, the IT people. For example, my colleague she is a business analyst, and she is working with the “do it” as her own tool.

**J: Regarding user research, what kind of methods are you using?**

A: We use it more internally, it’s different. For example, if you imagine a products online newspaper, there we would have to go outside and talk to people that use this newspaper, but this is not our case. So, we are more focused on the inside and what we use a lot is the Value Proposition Canvas and in terms of user research to understand the pain points, the needs and the gains that are expected. So, the Value Proposition Canvas is the most valuable tool.

S: But right now, for example, our BA is also using a lot of interviews. We created a framework and we have an innovation tool kit that you can use with benchmarking, interviews, storytelling or stakeholder maps, so we mention that. But until now we did not use all of them because it always depends.

A: To answer your question directly, it would be interviews. The Value Proposition Canvas is a Canvas that helps us to have the conversation. It is like an interview, but with an artifact that can help us. And in some case transformation team does observation. So, the track the process of the users in order to identify if what they told us and if it's really the reality. So, I would say also observation, but it was not us that did it. It was another team, but it is part of the process because we use the input of this team.

S: We also do a lot of process mapping and we once did a design sprint, following the "do it". We also use idea selection criteria. When you have, for example, two technologies and people were basically saying which technologies to add to the feature. But this was more specific and during the design sprint.

A: I would say, interviews, some support with the Value Proposition Canvas, process observation, and process mapping would be the main ways that we do the research.

**J: And what would you say who are you users or customers?**

A: Our users are mainly people inside the bank that are executing activity out of the back office. Those are the main users, hence, people that are working to evaluating new clients, people that are doing repetitive work to do reconciliations, that are doing some reports and so on. And on the other hand, innovators that are searching for new ways to do different things are also our clients.

**J: How do you currently measure customer satisfaction in the company?**

A: Inside our process, for the use case that we implemented, at the end we collected the feedback with a simple survey. But we don't have a formal stuff right now. And it was good that you mentioned this because, probably we need to think of a standard way to do it repeatedly. But the other way it's a natural way. For example, for one of the use case that we implemented using the process, we have a testimonial in the end. But we don't have something very concrete and established to collect the feedback at the end.

**J: Do you use some metrics?**

A: We use metrics associated to the use case. And it is a very important point because it is the biggest mindset change that we are searching the process in the project. Because it is very common in the past to work on a project. But what was the expected results? So, in the beginning we talk about the KPIs and about the solution that you are searching and that really solves the problem. So, we

establish KPIs about the use case. Then we implement something and at the end we need to collect those KPIs to see how it went. We implemented it to be more efficient and we decreased the process from three hours to 50 minutes. But it is specific for the use case. In terms of the whole process that we are implementing, the main KPIs are about the number of innovators that we have, the number of use cases and the kind of benefits that you bring overall. But it is not in terms of the satisfaction of the user.

**J: So, you don't measure like the NPS like the Net Promoter score?**

S: No, no. The NPS score, customer effort score, or CSAT, nothing. But it's a good point overall and it would be good to have it at the end in the survey.

**J: The next question is how frequently do you collect feedback? And do you have any programs or platforms that analyze or interpret any data that you get from customers or users, like any analytics or customer relationship management platform?**

S: Well, for example, we are developing an idea that we improve and that we will collect feedback from users. But for example, alongside the innovation framework, we are developing a platform that is totally related to innovation with the people having ideas, clients asking, submitting a need or request. And that platform will also have analytics to measure all of that. So, I will say that the platform will answer to that question. That feature is not yet implemented because first we have to guarantee the functionality of the forms and all. But it is being developed right now and then we can analyze the analytics.

A: Just to have more details about this question, you are asking in the perspective of the process that we are implementing, or the analytics in the perspective of the deliverables that we have inside this process? For example, deliverable when I say, it is a use case. Imagine that we have a use case that we implemented, and we have a result at the end. Or if you are asking about the framework utilization?

J: I think more the first scenario the use case.

A: OK. In terms of use cases, mainly we don't have analytics but, in the beginning, we collect all the efforts that the person had and everything associated to the KPIs and distort this data. At the end we do the same to analyze the data. But we are not talking about huge data. It is Standalone data that we can collect by yourself.



S: And some of this data is not available right after this case. So, it's something that we are only getting after some time.

A: For example, we implemented the dashboard to evaluate and track the training in French for the French class. We implemented it, but we will only be able to collect and evaluate in 3 months because it is the moment that the process will run again. So, we are waiting for when it occurs and then try to track the process. We store the data from this process and evaluate it but they are not huge data in terms of the platform. For example, yesterday we did the presentation for all the leaders at Natixis of the framework of innovation and I went to the analytics of their platform to see how many people are accessing. But it is only this.

J: Thank you! Then the last point. So, to tell you a bit about what I did so far, I analyzed IBM, SAP, Google, Microsoft and Adobe. And based on that I built like a framework that the purpose now is to validate with you guys. **So first, you can see if you think it makes sense. How you would read it?**

A: So, you evaluated those companies that you mentioned and create a framework that goes toward the evaluation of client satisfaction?

J: Exactly, like this is supposed to show, or the goal is to show the customer satisfaction measurement process.

A: And this framework measures the satisfaction in each phase?

J: Yes.

A: It's cool, it can be an experimentation with us. But you brought a very interesting point because we don't have verification after each step of the execution. So, if you want a lab rat, we are open to that.

J: OK, and then you can tell me if it makes sense for you.

A: I will try to explain perfectly. So, after the phase of empathy, you evaluate the satisfaction of the clients through interviews, field study. So, you go to the field in order to check their reactions, how they work and so on and they do focus Group and diary studies.

J: Well, I feel like this first phase is not necessarily yet to measure satisfaction, it's more like in the user research phase. like the companies try to identify who are the users, what do they need. And they do this like with interviews with potential users, with personas, field studies, to like. Observe

people in their natural environment to see what they need, what the pain points are, what they wish for. And I guess in somewhat you can already see some satisfaction, like if they're like happy with the process or maybe they don't need what we're looking for now.

A: So, you were asking us about the client satisfaction, not about the work that we are doing?

J: It's both, I mean, it's kind of connected in a way.

A: Okay because if it is about the process itself, we use interviews.

J: Yeah. And then it moves to a product mapping where you can, for example, use user journey. And then it moves to this framework which is a mix of the double diamond, the design sprint methodology from Google and the product development process.

S: One of our phases it's cliché, but it's also called Iterate. Our framework is called "do it" and our third phase is Iterate and it's basically the moment where we are already going on the direction of doing the prototype. I believe that in our second phase we try to come up with possible solutions, like to find what is the best. Maybe this is something that could be done with this technology or another one.

A: For this one (Monitor feedback), I totally agree because it is exactly what we are doing. I understand, the quantitative feedback, for example, the collection of the KPIs for a specific use case. The quantitative feedback is what we discussed which would be good for us to do. Right now, we have testimonials and informal stuff, but qualitative feedback can be interesting. We have more in our case, besides the AB test, the usability testing. As we are talking about internal process, probably we would include functional tests. Eye tracking, we don't have because it's more related to usability and for our case it's not relevant, but it makes sense. With my previous experience, for example, in a newspaper when we created the website of "the global" that was a newspaper in Brazil. We use a lot of eye tracking, surveys, focus group to identify the menu of the newspaper. The focus group helped a lot of course to identify things when we started to create the project and to integrate and so on.

J: Yeah, I feel like this is since the companies are big on software development.

A: I think we could use those if we would create an application for the bank. And what you mean by user journey in the perspective of product mapping? At this moment we are defining the new way to do steps, right?

J: Yes, the process the user is going through with the product to see where the pain points are

S: In our case somewhere, correct me if I'm wrong, the Value Proposition Canvas is what brought out a lot of pain points.

**J: And would you think it also fits in the product mapping phase?**

A: Yes. I think the Value Proposition Canvas probably would fit in the two sides. So, the part of the pain and gain creators and the pain gains and job to be done, it will be in this part, that is the right side (Product mapping) and then the left side that you talk about pain killers, gain creators and the product itself (User research). I would add this artifact as it is valuable. Another thing that we also did, is the user stories because we use the agile approach. In order to define the project, it, we create the personas that we use in the system or in the process. And then we create the user stories following the entire approach. The user stories help us to put ourselves in the perspective of the user and we see the value that will be extracted. We use it mainly in the "do it" phase.

S: And also, we start writing user stories as a foundation which is again the process mapping. We ask in this case if one can extract user stories from there. Instead of trying to write with nothing in your hands, you have something that is like a real visual scenario that you can extract from the user stories.

**J: If after the first product launch you detect like that there is an issue, would you go back to this kind of phase (iterative cycle) or back to the product mapping or even back to the user research phase, to fix it?**

A: Depending on the "profundancy", I even don't know if the word exists. Depends on how deep the problem is. I think this framework should be as flexible as possible and not like, "oh you went wrong and you cannot return to the previous stage". No, I think that you can return anywhere

S: One thing, I would see the test phase also on the iterative phase, because you are iterating and you are testing.

J: So that can be a bit confusing, the test there? it should belong to the iterative?

S: I mean it's not confusing, but for me I'm a bit biased. When I see this, I feel that we are always iterating. For our endpoint we have a phase, which is our treat phase, it's basically very directly the "done" and the "done" could be like user acceptance testing. They will see the final version which

could be the MVP for example. And like I said the “do it” is not only for example, on the treat phase, where we also have the possibility of doing a pitch. A pitch is part of our toolkit, because if you are innovator and you have an idea and you want to submit the idea. When you are ready, you do a pitch. At the same time, you might do a pitch but you don't have nothing developed but at the same time you can have an MVP already developed. So again, using the word flexibility is what we want to be as flexible.

A: And just to give you an example about the process mapping, it is a kind of output that we created in this phase. (shows process mapping)

S: I would add the Value Proposition Canvas and the process mapping. In the phase of iterate we start to put the technologies that we will be using to implement.

A: Just one question when I first saw here seems that you pass here, and then return here and then go here. Based on your question, I think you need to come here again because imagine that the launch was a failure, and you need to return.

**J: OK, that's a good point. That's a good point. I'll try to connect it somehow. And would you say the Design Thinking phases on top are necessary?**

S: I think it's, because I think more in terms of acculturation, because, when we create the framework, we put a mindset. So, those words can help people outside to understand. It is the kind of expectation that others have of this phase, to put yourself in the shoes of the others to define something. I think it helps in this way because what matters is that you use the concept of this in each phase, even if you don't put the name. But the name helps. I think it helps to say to others about what you are supposed to do. It might seem like just a detail, but for example in our case it's called “do it”. Our mindset is like, get the job done. So, get the job, do it. Just do it. It was a hard exercise for us to try to come up with this name because we are limited with words. I remember it was fun also to try to find the words like something that sticks. I remember Katja saying in the beginning, that she didn't like too much the “do it” and we pass for different names. You can say it's the “do it mindset” and people will have a “light in their heads”.

A: What I really like in the names in the top is that it puts everybody on the same page. Now this section is about empathy. Why it's empathy? Because we need to identify the pain points of the client. Because the majority of the people wants to bring the solution first. Now, for example, during

this process we have a lot of difficulties to diverge. But to converge, we are very good. So, it's important to say no, you are now entering the section that will do this. But yes, in terms of what you put, I would only add those other points. Yeah, and maybe move tests underneath iterate and prototype, which makes sense because like you test before you launch the product anyway. In our case the prototype is before the iterate, right? Because when we do it, we can test different possibilities at this moment that you do the prototype. When we go to iterate, we already have the first thing, but it can be a prototype in terms of a first version.

#### **Appendix D: Interview with Diogo Sousa (Promptly) 26.05.2023, online via Zoom**

**J: Are you working with Design Thinking at the company?**

D: Yes, one of the processes is Design Thinking, but currently we don't have a full scale because it's very complex to use and sometimes we need to speed up. For example, for a new product it is great, but we rarely create new products. We can use the Design Thinking methodology to understand what we can do and what we can't do to achieve our objectives. And Design Thinking, helps us with this. But for our day to day, we don't use Design Thinking, there are more suitable options for our operations.

**J: And when do use Design Thinking, would you say that it impacts your customer satisfaction?**

D: Yes, it's a little bit more complex than that. Design Thinking helps us to have better alignment of customer needs, user needs, business needs and trying to have a good direction for us to go. But it's a good starting point when we release the products in the stage that we will enter in the feedback loop to understand what is working and what is not working and what is needed and what is not needed. We don't use Design Thinking because it is a bit more complex, but we use parts of Design Thinking. Because Design Thinking is a very broad area. But for example, when we launch, we try to have some interviews and surveys and those interviews can be online or in the same room with the person. We are trying to understand the clients and see with customer support if we have that products and analyze the data that we are trying to improve and trying to understand what are the pain points and we are trying to improve. In these interviews, sometimes one thing we do, is that we start with a talk to understand what is working or and what is not working and we go back to our office to try to find solutions. And then we prototype those solutions and trying to make real

products or simulated products. Sometimes we present them in the second interview with the same user to try to understand if it solves the problem or not. Because sometimes when we talk to the customers or users, it's complicated for them to understand how something is going to work and how it's going to feel in the real field. And we do this in some steps trying to be sure that's the right solution when we launch but sometimes it's not.

**J: What kind of other user research or user testing methods are you using?**

D: In user research we can have what is called points of interest, so we can have the typical user interviews trying to schedule a time to go back and forth, or we could have surveys. I think surveys help us to get quantitative data about products or specific features and we are trying to understand what the majority of users think about that. But those surveys from my experience cannot give you a know-how about what's going on in reality. For that, I think interviews are more helpful.

**J: Do you measure any metrics like customers scores?**

D: Yes, we do measure NPS every quarter for example. Sometimes we do some CSAT for example for a specific feature we launch we can have a specific CSAT with one or two more questions trying to understand something a bit better. We have interviews and we have some tools that help us too. In interviews we have used two methods. One is a tool, I don't know if you know it, it is user testing. So, if we want to have a review from someone that has never used our product, this can be beneficial. And in some cases, we use our current users to make a session with them. So, we have two tools to understand our user behavior. One of them is mixed panels and the other one Hotjar. It is more Swiss Army knife thing because you have many tools in there like a screen recording session of the users when they interact with the products. They also have something similar with user testing now, but I haven't used it yet but from what I understand it is very similar. And they also have surveys so it's very easy for us to deploy the surveys and our products.

**J: How frequently do you collect the feedback from your customers? Is it a set schedule or is it kind of whenever?**

D: It is a little bit messy, sometimes our processes. We do not have a specific time. We detect some kind of problem, and then we try to find a fix for that problem. So, we can detect the problem from the survey or some data that we are analyzing in a mixed panel or directly from our database and from there we try to use or create a strategy to understand better to problem. So, you can have a specific problem for like a user or you can also have a problem with like integration so it's a little bit

messy and we try to understand the problem and come up with a plan to trying to understand and to fix it. One method for example for trying to find solutions that I think it's really helpful not from my experience, but from experience from other colleagues is the design sprint from Google. I think it works. I never tried it, but it is a good process for like a speed up version of Design Thinking.

**J: Do you have like any platforms to measure customer satisfaction?**

D: Yes, we use mix panel and Hotjar, and we cannot consider this an analytic platform, but we can use that data. In customer support we use Help Scout, it is a tool where users can engage and if they have questions or something is not working, they can report it there. Our platform collects errors from users. It is called sentry and when a user is trying to submit a form or something like that, it cannot send the information to our servers we display a little message to try it again. It is not necessarily opening a ticket but rather report this information and try to give more details on what happened but this is more for development.

**J: So, you would say you use the customer satisfaction, mostly via interviews and qualitative research but also surveys with some metrics and do you also use a customer effort scored as well?**

D: No, just CSAT and NSP and depending on the cycle, or if it is for a product or for a feature because for products is always NPS.

**J: Do you think the model is logical and easy to understand?**

D: This model seems in the environment where everything goes perfectly. This is what should be happening and it's very similar to the double diamond methodology which is very common to use in the technology sector. So, this is what we are trying to follow, but sometimes it's not so simple. One thing here, we have in the middle testing, card sorting, eye tracking, surveys, and focus group. For example, usability testing, for me, it is in the phase of user research and not in the development phase. Of course, you can also do usability testing in that stage, but if you were doing that, I think you are missing time. Because if you can pick that and use in the early prototype in user research phase in the middle phase, you have the product or the feature more "not so perfect" or a bit more developed. So, using usability testing in the user research phase can help to speed up the process because if you do in that phase, you can find that you need to restructure everything and your development already started. So, developers need to pick that code crush it and start it again. So, I think it helps. We don't use eye tracking so I don't know if it really works or not. AB testing of

course, needs to be in this phase because you are going to monitor data. We use mix panel to monitor the data in the product, launch, or feature launch. So, when users start to interact with the product or feature start collecting data and starting to analyze data. Of course, in the real world you need to make some tweaking in the early phase of AB testing, because some events on mix panel forget it, or some events are not clustered in the right sequence, for example, a funnel etc. Ideally in product launch for AB testing starts on product launch.

**J: Do you also use the card sorting technique?**

D: I think I have used it once or twice, but it is not usual.

**J: Regarding the user research phase, do use, interviews and do you use personas and field studies and diary studies?**

D: Yes, not focus groups and diary studies in my current company we never use because it takes a lot of time, but it is a useful technique. The problem with the diary is that takes a lot of time. In the start-up environment if you need to have two month or a quarter to make a diary study, it is not possible. So, we need techniques to speed up and try to get feedback earlier. Interviews and personas, it depends on the stage. My process starts with a Proto-persona when we have a new idea for a new feature or product and we have an idea for what type of people will use it, and for that we create a type of Proto-persona. At this point, we do not have any data, we are starting from scratch. This helps us to have some kind of empathy, trying to understand what is possibly suitable for this persona. We need to have this in mind when we want to move on to step two to have some interviews or build a real persona. So, we need something for the beginning. So, when we go ahead, those Proto-personas are proved and tweaked, and more real personas come out. Because personas are always changing because our customer base is expanding and the people that use our products also change, so it is a living organism. For example, we can have in this stage something that the users like to use, but if we expand, for example, to a new country this might not be the case. That is why we need to re-tweak the personas in the interviews because the software is not static. We are doing new releases every day, like something is tweaked or some bug is corrected.

**J: Anything else that you would add or improve to enhance this model?**

D: This monitoring part of quantitative and qualitative feedback, I would use surveys and mix panel. And trying to have some qualitative feedback is also helpful. Sometimes the user says that some feature is not working and the feature is actually working. And the problem is that it is not very



usable for the user and you can start having a conversation with that, like with messages or emails or trying to schedule an interview. So, like I have said it is really messy, we do not follow this.

**J: So, I have one last question. If a user has a problem or something has to be fixed after the product launch. Would you say you have to go back to the iterative phase of planning and development and feedback or does it have to go back to the user research or into the product mapping?**

D: Since in the real world, it is not as linear is that. If we have a user that reports a problem, we are trying to explain how the feature works so that user can try to solve this. But if they're like several users are not understanding or not engaging with this feature or products, we are trying to plan sessions of interviews or surveys or some technique that gives us feedback to understand. In our case, it is sometimes a little bit complicated because we are business to business, to consumers. We have professionals that are not paying because of the institution of those professionals are the clients and we have consumers that are patients and are also not paying. So sometimes it's difficult to make this whole wheel spinning.

## **Appendix E: Interview with Khrystyna Dratovana (Automobile Software Development) 27.05.2023, online via Zoom**

**J: So how long have you been working with Design Thinking?**

K: I have been working with Design Thinking for around three years. I've been working starting from my academic experience. And also, the rest of the two years I've been working with Design Thinking in the professional experience in the different field of the company that I've worked for. For example, the consulting companies and also the software developing companies.

**J: Okay. And in which areas have you implemented Design Thinking?**

K: So, as I mentioned, in my case I implemented first of all for the academic purposes, it was for my masters. I did different kind of innovation projects and also, I implemented the Design Thinking in the consulting of different companies. It included companies from different fields. And also, now I do implement the Design Thinking for the software development companies, more specifically in the automobile software development. We use it a lot on our day-to-day basis.

**J: And how has working of Design Thinking impacted your customer's satisfaction?**

K: So, when we talk about with the consulting users that I'm working for, I am constructing the proposals for the customers of different projects. And also, I use it for delivery of the project as well as defining of the final project or product. When we talk more about the software development companies, the customer satisfaction increased because we do use it a lot. I used it a lot for workshops with the users to define the users and also to define the product and some details of the product. And at the end, we also use some kind of service to just measure the customer satisfaction and the feedback that we get is really positive. The customers love the structure of the Design Thinking and also the simplicity. When we talk about the implementing of workshops, it helps them a lot to put in the shoes of the users once they are not users. And it also helps them to think in the different perspectives instead of only thinking directly. So, it does help them to get out of their comfort zone and to think from other perspective especially, from the user perspective.

**J: Okay. And with what kind of user research methods have you worked so far?**

So, for example, in my consulting experience I used the different methods, for example Customer journey or the persona. Also, in the the software development project and I used the customer journey and also empathy maps just to understand what the customer potential needs and I could be also used user interviews and focus groups. So, it really depends on the kind of project, but both for consulting and for software development I've been using a lot of different methods.

**J: And how do you measure customer satisfaction?**

K: From my previous experience in the consulting, I measured the customer satisfaction in a way of doing of doing the feedback at the end of each project. I would say to send the survey to the customer. Also, I measure on the process, meaning that each time we've been in contact with the customer and trying to understand if the customer likes it or not. And also in software development, every iteration we try to measure the customer satisfaction. By gathering the feedback of the entire product and adapted it if needed. Also, at the end of the product or project we would also conduct the surveys.

**J: Okay And are they like some metrics or indicators that you use to assess the customer satisfaction?**

K: Previously I used of course mostly the answers from the survey and trying to adopt it in the general understanding, but also, I use some OKR's. So key objectives, the objectives and key performance metrics.

**J: OK. And do you collect the feedback from customers frequently or is it random?**

K: Of course, frequently. It applies both to the consulting and also software development. In consulting we didn't have any specific forms of gathering the feedback. It was mostly when we would to get in interaction with a customer or when we would do the development of phase of the project, we would always ask for the feedback of the customer before going ahead with that decision. Now in the software development since I'm using the Scrum, from my experience, we collect their feedback by every iteration. In our case it's every two weeks and also at the end of the launch of the product. So yes, so normally it's at least every two weeks.

**J: Okay and do you use any programs or platforms to analyze and interpret customer satisfaction related data?**

K: Not exactly the programs or platforms. It's mostly something like I use the Google Analytics and also the Google Forms to understand it, but nothing really specific.

**J: Okay. Are there actually some things on like the Google Analytics for example that are most useful or is it like a really broad mix?**

K: It of course depends on the project and the product, but in my case, in one of the of the project that I worked for, it was something like a series. We were filming the series for some kind of fashion organization and in that case, we used the Google Analytics a lot in order to analyze what would be the user engagement and just to understand. If our videos were actually delivering cloud, their value or and etc. So yes, we use it for our general understanding of how useful our product would be to the users based on their iteration.

**J: OK, great. So, regarding this model, do you think it's logic to you?**

K: Let me see. Yes, I do believe it's really logic. The only thing that I could potentially add is the phase of the MVP or prototyping as a separate circle. And in that case, I would put it after iteration circles, after planning development and feedback. But after having the MVP and the prototype, I would repeat again the iteration the circle because. Because the circle also has to continue the product development has to continue after the MVP. Even after the MVP would be launched to

production environment, still we would need to continue with the product development. So possibly I would also add the MVP phase as a separate or also we could include it inside of the development cycle. And I would add user acceptance testing as one of the user testing methods. Or another option that I could see is to move the DT phase of Test with the Iterate and Prototype phase because I think it does not make sense in the product launch phase. You could make like a funnel with those three Design Thinking phases leading to the iteration. Those three Design Thinking phase are iterative as well I would say. Like connecting it to them. And then I would also add prototype and test to the iterative cycle, like to have planning, development, prototype and test as phases of this iterative cycle. And I think that it should not be linear, so that you can switch between the phases to correct things or improve.

## **Appendix F: Interview with Joana Moreira (Porto Digital) 01.06.2023, online via Zoom**

**JC: Are you working with Design Thinking currently?**

JM: Yeah, so basically the methodology that is our baseline of work is the Design Thinking methodology and although we have toolkits that explain the process through the double diamond, we don't properly stick to 1 model. Because there's several and they have different phases, right? But the thing is that they are going to kind of be the same at some point. And I think the important thing to have in mind is like the process, even if it's 1,2,3,4,5 or 6 phases. I think the most important thing is that you know well the tools, that you are able to apply them and to navigate through them by yourself. And that, at the same time you are able to adjust the tools to your needs. Although we have in our toolkits the double diamond, we don't fully follow the double diamonds. Also, because Porto Digital is basically the toolbox for innovation and digital transition for the city. One of the things that we also do it that we design services because we're talking about a city and the city has many services. So, we have *Cartão Porto Ponto* and we have *Explore Porto*. Those are all services that we also design within Porto Digital together with other municipality teams that have ownership of these topics. And therefore, we also follow the service design process sometimes. But I believe it's somehow well, they are not the same thing, but they are very similar at some points.

**JC: That makes sense. So, in those kinds of things that you're designing for, who are your actual customers?**

JM: It really depends on because we're talking about a city. So, our clients can be internal clients, and by that, I mean employees from the municipality. We work with and for the City Hall, but we are on paper an NGO that was created by Porto University, Porto City and the Metro and basically the City Hall owns most of the organization. Therefore, we work as a municipality company. And that means that we have different clients and sometimes, although we do lots of work in partnership with the city, sometimes they are also our clients. So, we can design products or services or have co-creation workshops. And we are also doing some training sometimes for the municipality teams and sometimes they are our clients. But sometimes the citizen can also be the client. And when we are talking about citizens it is like a whole world, because the interesting part of working for the city is that it's a very systemic approach and we need to have in mind that although we have a target group that we design and work for, we know that other private groups will be impacted by whatever we are designing. So sometimes we focus on the elderly, sometimes we focus on young people or sometimes we focus on people that live in the periphery. Well, I can go on and on, because there's even the tourists sometimes, they are the target, or the residents of course of the city. So, it really depends on the scope of the project and what we are doing. But the thing that we always have in mind is that when we are designing a product, service or an experience that we are designing for the target group and that solution might scale and might embrace other groups of people that we haven't considered until that moment.

**JC: Yeah, for sure, for sure. And what would you say, how is working with Design Thinking impacted your customer satisfaction?**

JM: In terms of customer satisfaction, to be honest, I'm not sure. So, we collect feedback obviously, but sometimes it's a very informal kind of feedback. And regarding our products, sometimes we have like the rating with the stars. So, it's a very simple way to get feedback, but and I think because we are no kind of giving this customer support and talking to the citizens every day like there are some municipality teams that basically are in the in the city. I don't know, the gardeners or like there are certain types of people within the structure of the City Hall that have close relation with the public. And we are somehow hidden from that, so we don't have that direct contact. I mean sometimes we do, sometimes we don't. And depending on the scope again of the project, but we always try to collect some feedback.

**JC: OK. My next question would be what kinds of user research methods you are using when designing like a new product?**

JM: Can you give me an example of what you are thinking? Yeah.

JC: Sure. Like, interviews, surveys or empathy map.

JM: Well, I would say again, it really depends on the scope. But we can do interviews or we can do focus group. So, we have other tools with us and what we do is that we try to adapt to each context. Sometimes we can just do, for example, observation, just understanding how people react to a certain thing or how people use something for the first time. And that's very interesting. But we always have this approach of co-creation. So, whatever we do, we try to involve the main stakeholders early on. So, if that means talking to the target group or if that means that the target group is a certain type, I don't know, residents, tourists, whatever, then we try to approach them. Or we have some data from people that visit the city. How? I don't know, for example, about mobility, how people use the scooters. And sometimes, because we have all that data, because we have the different departments such as the mobility department that collects information of the mobility. Our people basically use their cars or the scooters or whatever in the city, so they know what are the main paths that people take, like they can understand the flow of the city very well. And sometimes we use that data as well. So, it can go from something more structured, to something semi structured, to something completely open.

**JC: Okay, that makes sense. And I know you already said you have different customers and it all really depends. But do you have like an approach to measure the customer satisfaction?**

JM: That's what I was saying before because I believe that the main thing that we do is some sort of feedback form or something that we collect afterwards. Obviously, for example, if we do a workshop, then at the end we always try to collect some feedback. But about the way that we collect feedbacks about the products, it's basically analyzing the data. How people use that website and very simple things like rating, you know, like 5 stars. I might be wrong here, but I believe that's mainly what we do. Yeah, obviously other municipality teams they have more contact with the citizens so they I am sure they have other ways to collect.

**JC: And I guess then you don't measure like any metrics like the customer satisfaction score or Net Promoter score or something?**

JM: Well, depending on the activities that we do, for example, we have one activity that is the "call for activities" and basically that's something like an initiative that we have to promote the innovation

ecosystem in the city. And basically, anyone with a project or an entity can apply with an initiative. It can be an event, can be a workshop, can be a series of videos, whatever that goes through a process of evaluation. So, there's a jury that goes to that, evaluates the solution and then according to the rating, there's a selection to the rating and to the money that we have to fund. Because usually it's 100K in total. And that means that if we have 10 entities that win, then it's like 10K each. That's the maximum that we fund and then. That we always try to do this sort of analysis and we measure the NPS and others.

**JC: Do you have a special platform that measures those kinds of things for you?**

JM: Well, no, and that's actually something. I started working with the call for activities. I've been thinking that well, we are Porto Digital, we need to have a platform for this to make it easier. Yeah, but we don't. It's basically all the activities. They send out the reports and then we do that analysis and we compare to previous years because we have been collecting that information ever since the start of the initiative. And then we have numbers such as people that visit the Porto innovation hub, number of users of the Porto free Wi-Fi, those kind of tracking things.

**JC: And then I guess you collect the feedback after you launched a product or service in a way?**

JM: Well, I believe that really depends if it is something internal or external. As I said before, our approach is always co-creation. So even if it's an external, something that we are designing for the citizens, then we make sure that we involve the teams that are close. Like, the teams that are responsible for those areas since the beginning. For example, internally we are doing training sessions about innovation. So, it's basically an innovation Sprint and what we do is that we are working together with the HR from the City Hall team because they are the ones choosing the people. We design the plan because we are the experts in innovation. So, we basically designed the program to sprint and then we share that with them so that they can kind of manage to find the people. And basically, then we facilitate the training session. But also, another example on something external is *Cartão Porto Ponto*. *Cartão Porto Ponto* is only for the residents and there's a specific team which is called *Gabinete do Município*. I'm sorry I forgot the words in English for it. But it's like a townsman office and they have always customer supports via phone, e-mail at the counter and the desk office. And every time that we are designing something for the citizens, first we involve the responsible team, in this case the team from *Gabinete do Município*, and at some point, we involve some citizens so that they can

participate in the in the process and give input. But overall, the teams that are responsible for the areas, they have lots of inputs, lots of experience and they have data records that can help us and will support the design of a new product or service.

**JC: OK, so the last point I want to talk with you about is like the model I created based on analyzing IBM, SAP, Google, Microsoft and Adobe, I try to visualize the customer measurement, customer satisfaction measurement process. So, my first question would be if you think the model makes sense, can you?**

JM: Yeah, I think it makes sense. So, I think it for me, it's very easy to understand what you have here. On top you have the design thinking process. Basically, on the bottom you have several tools that kind of fits in these sections. So, the model that you are designing is the one in the center, like the greenish.

JC: Yeah, it's supposed to show how a tech company should start, like to achieve customer satisfaction, like they should have the user research and this and then the iterative phase and everything. And yeah, that's basically the main concept here.

JM: I think, I think it makes sense regarding the tools. I mean, there's a lot of tools that you can use. I think there are so many that I even forget their name sometimes and I want to say something like that. I think the beauty, once you are comfortable with the model, I think this is like helpful to visualize and to understand the process because these processes are never easy to understand. So, we design models a visual reference to help us understand a little bit better. But I also believe that, and I think you try to represent that here, that like it's not a step by step, it's not a recipe that you follow. You can move from one to the other. There's no sequence. It's like going back and forth and back and forth. I believe that's more emphasized in the arrows that you have. But I also believe that in the beginning you have these arrows as well. So, you go from user research to journey mapping back and forth several times until you start planning and developing and collecting feedback about the development. So, before you prototype anything or create an MVP or whatever, I think there's more iteration in the beginning. And when I visualize this kind of processes in my head, it's always that there's more divergence in the beginning than at the end. But I also believe that when you are prototyping, there's some space to diverge as well and to iterate again. But definitely, I believe there's always more iteration and divergence and convergence moments in the beginning. And then it's kind of, you know, like a funnel, that goes from user research wide open to customer satisfaction. And I



think the beauty of the tools is that once you are capable to understand them all, then you can attack them, and I do that here quite often. I take a journey and I transform, for example, a blueprint into a flow map that will have several layers and it will help me understand the flow of a product and at the same time it will support the requirements definition process. Because what I hear a lot from product teams "what are the requirements of?" Wait, I don't understand anything about technology. I'm not a developer, so for me it's also hard to kind of understand what are exactly the requirements that they need. So, what we do here is that we do this user research and product mapping early on, but we also involve the developers at some point early. Because they will say to us if it is possible because we already have this technology in place or this is not possible. Or it's possible that we need to buy something and they help us designing the requirements in a way that they will also understand. Because I also believe that it's a language problem because everyone that is in the innovation and design has a language that is also hard to translate for the developers or for engineers. Sometimes there's a gap and sometimes we are talking about the same things, just using different words.

**JC: Is there like anything you would add to like enhance the model?**

JM: Well, I believe that's just like as I said before, like maybe showing in some more visual way that between user research and product mapping, you can also go back and forward. And I think that something that is missing here is like the divergence and converge. Because user research is definitely a divergent moment. But then product mapping is some sort of convergent, but at the same time you can still diverge inside. But once you define the scope in the empathy moment, so in the user research then you won't probably diverge as much as you did in the beginning. So that's the reason why I said it's some sort of a funnel that allows you to diverge and converge along the way. It's not as big as it was in the beginning. I think the funnel is easy to understand because it's a wide opening in the user research.

**JC: And you also mentioned like the MVP at one point. Would you think it makes sense to have like after the iterative development planning feedback circle to have like a step of MVP before the product launch?**

JM: Yes. Or you can consider that in the prototype. In the planning and development, because I think it's very important that sometimes we do MVP, so we do viable prototypes or products before product launch. Because sometimes we jump directly to product launch. And then shit happens, pretty much. Many resources used, and the product is ready and the customer doesn't want it. That's

the reason why I believe that involving people early on in the process, sometimes it might be tricky because we say, there's so many people to comment or to talk about. But then I think there's moments that we can do those checkpoints and make sure that we are all aligned and then also having prototypes from very early on. And to have quick prototyping to MVPs to AB testing.

JC: Yeah. No, that totally makes sense. **And just regarding the metrics again, so you said sometimes you use the customer satisfaction score, NPS and also the customer effort score?**

JM: Yes.

## **Appendix G: In depth analysis of the companies**

### **Analysis SAP**

SAP, founded in 1972 in Germany was formerly known as System Analysis Program Development (Systemanalyse Programmentwicklung), which led to the abbreviation on SAP.<sup>1</sup> The company is among the top in the world management and business-process software producers. They create solutions that support efficient data processing and communication across organizations. With their software SAP R/2 and SAP R/3 they created a norm for enterprise resource planning software (ERP).

SAP is building its products with human-centered principles based on some aspects.<sup>2</sup> User research is of fundamental for the company to ensure measurability and that needs and expectations are met. Moreover, their experiences are designed straightforwardly, accessible, and inclusive for all. Scaling and evolving the design system is of high importance for SAP as well as to lead technological innovations in the future such as AI, virtual and augmented reality blockchain and web3.

### **SAP Design Thinking**

Design Thinking is an essential element in SAP's approach to innovation.<sup>3</sup> It is a human-centered approach that empathizes with the end user to discover what they really need and want. SAP uses a mixture of Design Thinking and Architecture Thinking to come up with solutions. SAP created its own Framework using those two, starting with Design Thinking and Scaling with Architecture

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<sup>1</sup> SAP. (n.d.). What is SAP? Available at <https://www.sap.com/portugal/about/company/what-is-sap.html> (Accessed 13/03/2023).

<sup>2</sup> SAP. (n.d.). Designing the future of work. Available at <https://www.sap.com/design.html> (Accessed 13/03/2023).

<sup>3</sup> SAP AppHaus. (n.d.). Our Approach. Available at <https://apphaus.sap.com/approach> (Accessed 13/03/2023).

Thinking. It is divided into five phases which are Explore, Discover, Design, Deliver and Run. SAP also has Design Thinking toolkit called Innovation Toolkit which includes several methods and other learning material such as how to do a field research, best way to capture feedback or how to map the user experience journey.<sup>4</sup>

SAP applied their Design Thinking approach to develop software products that are more intuitive to use and are more user friendly such as the SAP Fiori user interface.<sup>5</sup> Moreover, SAP Design Thinking designed tailored customer experience that appeal to certain customer needs such as personalized experiences which have led in increase customer satisfaction. SAP also used Design Thinking to develop their business strategy that is innovative and focused on the customer. With this, new market opportunities were identified and well as new services and products that meet the customers needs. Furthermore, Design Thinking has helped SAP to find and cut out bottlenecks in supply chain processes which has led to reduced costs and faster delivery times since processes were optimized

### **Cornerstones**

SAP identifies three critical success factors to come up with novel innovations.<sup>6</sup> The first is the process itself; it needs to be a human-centered approach to Innovation. Focusing on empathy for all stakeholders are key of this holistic approach. The second factor is to have a multi-disciplinary team with different perspectives and expertise from various backgrounds, such as Design Thinkers, Designers, Industry Experts, User Researchers, Enterprise Architects, and many more. The third critical success factor to innovation is to have a creative environment for creativity and innovative ideas to flow. Those three factors combined with the SAP Business Technology Platform can create real added value for the customers and users.

### **SAP AppHaus**

The AppHaus, established in 2013, is a collaborative innovation space with a human-centered approach where SAP's Design Thinking teams work with customers, end-users or partners to co-

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<sup>4</sup> SAP AppHaus. (n.d.). Methods. Available at <https://apphaus.sap.com/toolkit/methods#understand-people> (Accessed 17/03/2023).

<sup>5</sup> Pandey, V. (2023). The Power of SAP Design Thinking: Creating User-Centered Solutions for a Digital World. Available at <https://www.linkedin.com/pulse/power-sap-design-thinking-creating-user-centered-solutions-pandey/> (Accessed 21/03/2023).

<sup>6</sup> SAP AppHaus. (n.d.). Network. Available at <https://apphaus.sap.com/network> (Accessed 13/03/2023).

create and co-innovate solutions.<sup>7</sup> There are currently five *AppHaus* locations in Berlin, New York, Seoul, Palo Alto and Heidelberg. The AppHaus locations offer creative spaces with the perfect requirements with several different rooms, Design Thinking tools, and open spaces to come up with innovative ideas.<sup>8</sup> The global SAP AppHaus accumulated in-depth knowledge in interpreting client and end user needs into UX designs and eventually providing the solution. and assisting in fostering the adoption of SAP products and technologies. Over the years, over 20 partners have joined the SAP AppHaus Network, where knowledge and ideas are exchanged. By working closely with partners and customers, SAP can receive immediate feedback and implement it immediately. SAP's human-centered approach to Innovation allows moving from Design Thinking to Design Doing, where valuable solutions based on the newest technologies are developed.

## **Qualtrics**

SAP bought the company Qualtrics which is a leading customer experience management (CXM) platform, in 2018 to broaden its product portfolio beyond conventional enterprise software and into customer experience management.<sup>9</sup> As already said, Qualtrics focuses on customer experience but also on customer relationship management (CRM) which deals with monitoring customer experiences and responding to problems and providing and offering relevant advertising or services based on prior behavior.<sup>10</sup>

By integrating Qualtrics into its portfolio, SAP has gained the ability to capture better and analyze feedback which results in a better understanding of where are points for improvement in the customer experience as well as what are drivers of customer satisfaction. Hence, this platform helps close user experience gaps by improving or correcting efforts in real-time. Now SAP can combine its operational data (O-data), which has the goal of efficiently operating the business, with the

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<sup>7</sup> Jakob, J. (2022). SAP AppHaus Network: 22 Locations and Counting in 2022. Available at <https://news.sap.com/2022/10/sap-apphaus-network-22-locations-and-counting/> (Accessed 13/03/2023).

<sup>8</sup> Klebeck, E. (2021). Das SAP AppHaus Network: Eine wachsende und inspirierende Innovationscommunity. Available at <https://news.sap.com/germany/2021/08/apphaus-network-innovation-community-technologie/> (Accessed 13/03/2023).

<sup>9</sup> Enslin, R. (2018). Experience Management eröffnet beispiellose Chancen. Available at <https://news.sap.com/germany/2018/11/experience-management-qualtrics/> (Accessed 13/03/2023).

<sup>10</sup> Qualtrics XM. (n.d.). Combining your CRM and customer experience data. Available at <https://www.qualtrics.com/uk/experience-management/customer/crm-customer-experience-data/> (Accessed 13/03/2023).

experience data (X-data), which will reveal why the company succeeds or fails in the market, which leads to great business success.<sup>11</sup>

## **User Experience Management**

SAP Customer Experience and CRM Solution help to manage customer experience by unifying data across the company and using artificial intelligence to create profiles of the customer to comprehend their preferences.<sup>12</sup> Marketing, E-Commerce, Customer Data, Sales and Service are part of the SAP Customer Experience and provide end-to-end insights by connecting all this data.

SAP User Experience Management (UEM) by Knoa is a software tool that allows SAP to monitor and optimize the user experience of their applications.<sup>13</sup> SAP's workforce is optimized with the help of the SAP User Experience Management application by Knoa.<sup>14</sup> Ultimately, SAP UEM boosts adoption to realize efficiencies and save money by identifying how employees engage with SAP applications. This information is used to analyze the impact on daily operations and to make sure that users are more productive, responsive, and engaged.

## **User research practice**

There has been a trend towards hybrid ad remote work, which also affects a shift in user research methods moving away from in-person to online.<sup>15</sup> The global SAP Research practice has therefore adapted tools like UserZoom and virtual whiteboarding tools to include the perspectives of users and customers in shaping product experiences. Research laboratories have conducted almost 200 remote studies on UserZoom with over 5,000 participants in just the past year alone (2021), an increase of approximately 80%.

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<sup>11</sup> Bagnoli, G., Heusermann, K., Martinez, T. & Neveux, E. (2019). XO for SMBs. Available at <https://blogs.sap.com/2019/06/14/xo-for-smb/> (Accessed 13/03/2023).

<sup>12</sup> SAP. (n.d.). SAP Customer Experience (CX) and CRM Solutions. Available at [https://www.sap.com/products/crm.html?campaigncode=crm-ya22-int-1517066&source=ppc-es-google\\_ads-search-71700000104607450-58700008223366427-cx\\_cx-x-x-x&dfa=1](https://www.sap.com/products/crm.html?campaigncode=crm-ya22-int-1517066&source=ppc-es-google_ads-search-71700000104607450-58700008223366427-cx_cx-x-x-x&dfa=1) (Accessed 03/05/23).

<sup>13</sup> SAP. (n.d.). SAP User Experience Management by Knoa. Available at <https://www.sap.com/products/hcm/knoa-user-experience.html> (Accessed 13/03/2023).

<sup>14</sup> KNOA. (n.d.). Knoa User Experience Management (UEM) for SAP. Available at <https://www.knoa.com/sap-uem/> (Accessed 13/03/2023).

<sup>15</sup> SAP Design. (2022). Top 5 Trends in User Research & Insights. Available at <https://medium.com/sap-design/top-5-trends-in-user-research-2022-edition-ed16d8c37da6> (Accessed 13/03/2023).

## User research methods

There are many different methods for conducting user research that are chosen according to the phase, objectives and context of the user research.<sup>16</sup> In the exploration phase SAP suggests 360 Degree Analysis, Fish Bowl , Card Sorting, and Interviews, Focus groups, Shadowing, Use Case Validation, Survey and Questionnaire are proposed for the discovery phase to get to know the users, their behavior and activities. Then, useful methods for the Design phase are A/B Testing, Tree Test, Heuristics Evaluation, Survey & Questionnaire, Usability Testing and Cognitive Walkthrough to validate low and high-fidelity prototypes. Lastly in the Deliver phase, when the product needs to be evaluated, SAP suggests using Survey, Questionnaire and Usability Benchmarking.

## User experience

User experience metrics (KPIs) allow improved product decisions that increase user and customer satisfaction and value.<sup>17</sup> SAP uses measures such as task completion rates, error rates, and completion rates to help coordinate product teams around user-centered product experience quality. Hence, those are product experience (PX) indicators to predict user experiences, usage patterns, and renewal rates to produce better business results. Moreover, SAP uses usability scores for User Experience (UMUX), Net Promotor Score (NPS), and System Usability scale (SUS) to gain insights into perceived usability and user satisfaction. Those indicators enhance root cause analysis, guide product planning, and identify trends.

SAP also measures Product Experience Management (PX).<sup>18</sup> PX helps to develop products from SAP from the initial creation through the whole process to guarantee that the products meet the users' needs and expectations. Real-time and anonymous feedback can be obtained directly from the product since feedback capabilities are directly integrated. The user is asked about satisfaction, usefulness, and usability by rating two statements (1) Home capabilities meet my requirements, and (2) Home is easy to use. (5-point Scale from 'strongly agree' to 'strongly disagree'). Further, it is

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<sup>16</sup> Guckenbug, S. (2021). User Research at SAP – The Resource Library. Available at <https://blogs.sap.com/2021/08/31/user-research-for-user-experience-a-collective-roundup/> (Accessed 11/04/2023).

<sup>17</sup> SAP Design. (2022). Top 5 Trends in User Research & Insights. Available at <https://medium.com/sap-design/top-5-trends-in-user-research-2022-edition-ed16d8c37da6> (Accessed 11/04/2023).

<sup>18</sup> Waisgluss, A. (2021). 3 Tools to Measure User Experience Data for Enterprise Applications. Available at <https://blogs.sap.com/2021/06/21/3-tools-to-measure-user-experience-data-for-enterprise-applications/> (Accessed 13/03/2023).

asked in a third question to share any additional feedback that could help SAP to improve the customer experience.

SAP asks its users for Product reviews and offers 25 \$ Gift cards for every published review.<sup>19</sup>

Furthermore, on several websites of SAP, at the bottom the visitor is asked for their experience with the certain website, to be rated with a thumbs up or down. Hence customer reviews are important to measure customer satisfaction.

## **User Testing**

One crucial facet of Design Thinking is the testing phase to validate if the prototypes meet the needs of the users.<sup>20</sup> Usability testing is a good tool for this since the users are observed how they are interacting with the prototype. Direct feedback can be obtained on the usability and satisfaction of the users. This feedback can be obtained through observation, interviews or surveys for example. SAP also suggests A/B Testing to see which version of a prototype has a better performance and level of satisfaction. Another tool to get feedback is through focus groups that discuss the prototype and how it can be improved. An expert can also be part of this to identify usability problems and where can be points for improvement.

## **Customer satisfaction metrics**

One crucial metric for SAP is the Customer Health Score, which is calculated by the Customer Health Dashboard. It includes all customer-related activities such as consulting activities, sale support services, and marketing activities. With this and the help of built-in machine learning capabilities that the SAP Business Technology Platform, has SAP can obtain the Customer Health Score.<sup>21</sup>

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<sup>19</sup> SAP. (n.d.) Share your SAP experience: write a product review. Available at <https://www.sap.com/programs/product-review.html> (Accessed 28/04/2023).

<sup>20</sup> Waisgluss, A. (2021). 3 Tools to Measure User Experience Data for Enterprise Applications. Available at <https://blogs.sap.com/2021/06/21/3-tools-to-measure-user-experience-data-for-enterprise-applications/> (Accessed 13/03/2023).

<sup>21</sup> Guther, M. (2022). Inside SAP – How SAP measures customer satisfaction with SAP Business Technology Platform. Available at <https://blogs.sap.com/2022/05/23/inside-sap-how-sap-measures-customer-satisfaction-with-sap-business-technology-platform/> (Accessed 13/03/2023).

Qualtrics also suggests three main customer service metrics that can be complemented to reach the best results.<sup>22</sup> Moreover, SAP calculates customer satisfaction with the help of the Qualtrics survey (CSAT), which helps the company understand the client's relationship with the product or service.<sup>23</sup> At the bottom of a customer feedback survey, it is asked to rate the overall satisfaction of the product/service from 1 to 5 ranging from very unsatisfied to very satisfied. To calculate the CSAT, only responses of 4 (satisfied) and 5 (very satisfied) are taken into account because research has shown that the most accurate way to estimate client retention is to use the two highest numbers on feedback surveys.

Therefore, the calculation is:  $\text{Number of satisfied customers (4 and 5)} / \text{Number of survey responses} \times 100 = \% \text{ of satisfied customers.}^{24}$  Similar, SAP calculates the Net Promoter Score (NPS =  $\% \text{ of promoters} - \% \text{ of detractors}$ ) to measure customer loyalty.<sup>25</sup>

Besides those three main metrics, Qualtrics lists some more customer service metrics that should be paid attention to such as such as average ticket handling time, customer ticket request volume, first contact resolution rate, overall resolution rate, first response time, customer churn and social media monitoring.<sup>26</sup> Since SAP purchased Qualtrics to use it for its customer experience management, it can be assumed that SAP is using those metrics to measure and manage customer satisfaction.

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<sup>22</sup> Qualtrics. (n.d.). What is customer effort score (CES) & how do I measure it? Available at <https://www.qualtrics.com/uk/experience-management/customer/customer-effort-score/> (Accessed 13/04/2023).

<sup>23</sup> SAP Help Portal. (n.d.). Qualtrics Customer Satisfaction Score. Available at [https://help.sap.com/docs/SAP\\_ANALYTICS\\_CLOUD/42093f14b43c485f3e3adbbe81eff6c8/d46c4fed1c62402a8bb3ae671d402c21.html](https://help.sap.com/docs/SAP_ANALYTICS_CLOUD/42093f14b43c485f3e3adbbe81eff6c8/d46c4fed1c62402a8bb3ae671d402c21.html) (Accessed 13/03/2023).

<sup>24</sup> Qualtrics XM. (n.d.). What is CSAT (customer satisfaction score)? Available at <https://www.qualtrics.com/uk/experience-management/customer/what-is-csat/?rid=ip&prevsite=en&newsite=uk&geo=PT&geomatch=uk> (Accessed 13/03/2023).

<sup>25</sup> SAP Help Portal. (n.d.). Net Promoter Score Available at [https://help.sap.com/docs/SAP\\_MARKETING/0204678aad934e5da0ecf4d40ba38ca9/2869ed552684787fe1000000a441470.html](https://help.sap.com/docs/SAP_MARKETING/0204678aad934e5da0ecf4d40ba38ca9/2869ed552684787fe1000000a441470.html) (Accessed 13/03/2023).

<sup>26</sup> Qualtrics. (n.d.). The top customer service metrics to measure. Available at <https://www.qualtrics.com/uk/experience-management/customer/service-metrics/> (13/04/2023).



SAP is most likely to measure retention as well as sentiment to keep track of their customers satisfaction since they are publishing information about it.<sup>27 28</sup> The same can be said about measuring bounce rate and customer lifetime value.<sup>29 30</sup>

### **Spotlight by SAP**

Spotlight by SAP is a process discovery cloud solution that provides a concise, data-driven report on transaction and process utilization in the ERP system.<sup>31</sup> Users can quickly examine, visualize, and share data insights, either process performance data or transactional data, using this analytics and data management tool from SAP. Spotlight offers interactive dashboards, reports, and visualizations to assist customers in obtaining more profound insights into their business data. It allows SAP to understand which ERP components, processes, and interactions are used heavily, and it can identify areas that have the highest potential for automation and process improvement. It can determine which solutions can bring immediate value to business operations.

### **Case study - Rethinking Strategic Planning at SAP**

SAP publishes many case studies of their works to demonstrate that their Design Thinking approach works. For example, SAP was rethinking the strategic planning in the company and worked with Design Thinking which had a positive outcome.<sup>32</sup> This was combining Design Thinking with conventional strategies to create and communicate new shared, significant, and tangible strategies for staff members at all organizational levels. Design thinking, such as prototyping, contributes to a motivated and excited team. Moreover, talking to customers early on gives advantages to the quality

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<sup>27</sup> SAP. (n.d.). Getting Customer Retention Right. Available at <https://www.sap.com/documents/2021/06/f805737b-e57d-0010-bca6-c68f7e60039b.html> (Accessed 03/05/2023).

<sup>28</sup> SAP. (n.d.). HANA Sentiment Analysis. Available at [https://help.sap.com/docs/SAP\\_PREDICTIVE\\_ANALYTICS/94dbf2ba9d4047618880187451c3b253/606c20d38d334b71ac60112e2c9b885a.html](https://help.sap.com/docs/SAP_PREDICTIVE_ANALYTICS/94dbf2ba9d4047618880187451c3b253/606c20d38d334b71ac60112e2c9b885a.html) (Accessed 03/05/2023).

<sup>29</sup> Kamperud, B. (2023). Reduce Bounce Rates with Intelligent Selling Services for SAP Commerce Cloud (Part 1). Available at <https://blogs.sap.com/2023/02/06/reduce-bounce-rates-with-intelligent-selling-services-for-sap-commerce-cloud-part-1/> (Accessed 03/05/2023).

<sup>30</sup> SAP. (n.d.). CLTV Model. Available at [https://help.sap.com/saphelp\\_scm700\\_chp02/helpdata/en/31/c98853f65d3d58e10000000a174cb4/frameset.htm](https://help.sap.com/saphelp_scm700_chp02/helpdata/en/31/c98853f65d3d58e10000000a174cb4/frameset.htm) (Accessed 03/05/2023).

<sup>31</sup> Spotlight by SAP. (2021). Quick Start Guide for Customer Admins. Available at [https://help.sap.com/SPOTLIGHT\\_GETTING\\_STARTED\\_PDF/Spotlight by SAP Quick Start Guide.pdf](https://help.sap.com/SPOTLIGHT_GETTING_STARTED_PDF/Spotlight%20by%20SAP%20Quick%20Start%20Guide.pdf) (Accessed 13/03/2023).

<sup>32</sup> Liedtka, J., King, A., & Bennett, K. (2013). *Solving problems with design thinking: Ten stories of what works*. Columbia University Press.

of the prototypes. Also, a contribution seen as most important by the traditional business strategist is to have an excuse to work differently and to have different kinds of conversations.

## **Analysis Google**

Google is a multinational technology company founded in 1998 in California and was originally a search engine that has developed massively ever since with many products and services.<sup>33</sup> Google Search today is still one of the most popular search engines on the internet. Other successful products are Android, YouTube, Google Maps, Google Chrome, Google Drive, Google Meet, and Google Analytics, only to name a few.<sup>34</sup> Besides being known for its various products, Google has a strong reputation for innovation, research, and development. Google is a subsidiary and has 190,234 employees.<sup>35 36</sup>

What started off in a garage has developed into Googleplex, Google's headquarter in Mountain View, California.<sup>37</sup> The space is designed to release the inner child out of Google's employees to stay curious and asks questions. Hence, their offices are designed to recreate a children's playground having the mission to create a happy place that fosters the flow of innovation and creativity.

## **Design Thinking and Google**

One fundamental belief in Google's innovation culture is that everyone is creative and ideas can come from anywhere.<sup>38</sup> At the core of Google's Design Thinking approach is to foster an innovative culture, develop and test new ideas, and everything else that has to do with the Design Thinking

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<sup>33</sup> About Google. (n.d.). From the garage to the Googleplex. Available at <https://about.google/our-story/> (Accessed 02/05/2023).

<sup>34</sup> About Google. (n.d.). Helpful products. Build with you in mind. Available at <https://about.google/products/#all-products> (Accessed 02/05/2023).

<sup>35</sup> Bianchi, T. (2023). Number of full-time Alphabet employees from 2007 to 2022. Available at <https://www.statista.com/statistics/273744/number-of-full-time-google-employees/> (Accessed 02/05/2023).

<sup>36</sup> Hartmans, A., & Meisenzahl, M. (2020). All the companies and divisions under Google's parent company, Alphabet, which just made yet another shake-up to its structure. Available at <https://www.businessinsider.com/alphabet-google-company-list-2017-4> (Accessed 02/05/2023).

<sup>37</sup> Batitis, K. (2017). The Googleplex – googolplex times the fun. Available at <https://medium.com/@RyersonKamilla/the-googleplex-googolplex-times-the-fun-a2b4a13c83d> (Accessed 16/05/2023).

<sup>38</sup> Pferdt, F. (2019). Design Thinking in 3 steps: How to build a culture of innovation. Available at <https://www.thinkwithgoogle.com/future-of-marketing/creativity/design-thinking-principles/> (Accessed 12/03/2023).

process. Google uses Design Thinking as one of its learning methods to encourage teams and people to think creatively, a crucial stage in the innovation process.<sup>39</sup>

Google has developed three core Design Thinking principles called the 3 E's: Empathy, Expansive thinking, and Experimentation. Practicing empathy ensures that one focuses on the users' needs and demands, which helps create valuable solutions to real-life problems. Expansive thinking focuses on gathering various solutions to a problem or methods to improve something. It is also known as brainstorming, where there are no bad ideas; the more input, the better. Lastly, Experimentation deals with putting the last stage's ideas into practice and testing them based on prototypes. After some rounds of testing, receiving feedback, and improvement, the prototype will be ready to go to the market. Google also stresses the importance of having diverse teams since those can work with more skills, perspectives, and different experiences, leading to a greater flow of creativity and, ultimately, innovation.<sup>40</sup>

Google developed Design Sprints, time-limited processes that usually evolve over five days and help teams quickly develop and test new ideas.<sup>41</sup> Six phases need to be followed: understanding, defining, sketching, deciding, prototyping, and validating. Google is providing a toolkit with useful tools, methods and templates. Google also has another kit, the Design Thinking Toolkit, that is especially useful for high schools or universities that use Design Thinking to create technology-based solutions.<sup>42</sup>

## **Consumer research**

Google needs to understand its consumer behavior. Google has been working with *Kantar*, the top data, insights, and consulting firm in the world, to gain better insights into the users' underlying motivation.<sup>43</sup> Kantar uses a segmentation approach, quantitative and qualitative, that identifies the

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<sup>39</sup> Re:Work. (n.d.). Guide: Practice innovation with design thinking: Introduction. Available at <https://rework.withgoogle.com/guides/design-thinking/steps/introduction/> (Accessed 12/03/2023).

<sup>40</sup> Slocum, D. (2019). The power of difference: How to hire and retain diverse teams in brands and agencies. Available at <https://www.thinkwithgoogle.com/future-of-marketing/management-and-culture/diversity-and-inclusion/-diversity-in-the-workplace/> (Accessed 12/03/2023).

<sup>41</sup> Design Sprints. (n.d.). Design Sprint Methodology. Available at <https://designsprintkit.withgoogle.com/methodology/overview> (Accessed 12/03/2023).

<sup>42</sup> geekStarter. (n.d.). geekStarter Design Thinking Toolkit. Available at <https://sites.google.com/mindfuel.ca/designthinking/home> (Accessed 26/03/2023).

<sup>43</sup> Kantar. (n.d.). Understand People Inspire Growth. Available at <https://www.kantar.com/> (Accessed 12/03/2023).

emotional, social, and psychological factors that influence customer behavior in a particular market.<sup>44</sup> Since searches are not random, there is always a need to drive them; figuring out and satisfying those needs is crucial.

Besides Kantar, Google has over 20 measuring providers that help to measure for specializations ranging from marketing mix modeling, sales lift app attribution, brand lift, brand safety, reach and viewability.<sup>45</sup> Google itself has three measurement solutions: Brand Lift, Unique Reach, and Active View.

## User research

Google is researching a lot regarding user experience to improve products.<sup>46</sup> They are conducting user research studies that can either be in person or remote and are open for everyone, no matter how long one has had experience with Google products. Participating in a research session will also give a reward to the user. Google published a guide for user research and suggested the following methods; Field Studies, Focus Groups, Card Sorting, Surveys, Interviews, Diary Studies and Evaluation Methods, which can be divided into Usability Inspection Methods, Usability Testing, and Live Experiments.<sup>47</sup> As Google has a Persona Template, it can be assumed that Google is also using Personas as a method in their user research.<sup>48</sup>

## User Experience Research

The so-called PULSE metrics are used in user experience but focus more on the direct impact KPIs to measure the performance of the business or technical side of a product and are short for the metrics Page views, Uptime, Latency, Seven-day active users and Earnings.<sup>49</sup> Google acknowledged some points for improvements in this framework, and therefore the google research team designed a

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<sup>44</sup> De Graaf, J. (2019). How consumer needs shape search behavior and drive intent. Available at <https://www.thinkwithgoogle.com/marketing-strategies/search/consumer-needs-and-behavior/> (Accessed 12/03/2023).

<sup>45</sup> Pahlavan, B. (2019). Why partners play a critical role in Google's measurement strategy. Available at <https://www.thinkwithgoogle.com/consumer-insights/consumer-trends/marketing-measurement-strategy/> (Accessed 12/03/2023).

<sup>46</sup> Google. (n.d.). Help shape the future of Google. Available at <https://userresearch.google.com/> (Accessed 21/03/2023).

<sup>47</sup> Baxter, K., Courage, C., & Caine, K. (2015). *Understanding your users: a practical guide to user research methods*. Morgan Kaufmann.

<sup>48</sup> Frigola, G. (2021). Personas. Available at <https://medium.com/@genis.hti/personas-c8f61e516ef9> (Accessed 12/0/2023).

<sup>49</sup> Rodden, K., Hutchinson, H. & Fu, X. (2010). Measuring the User Experience on a Large Scale: User-Centered Metrics for Web Applications. Available at <https://storage.googleapis.com/pub-tools-public-publication-data/pdf/36299.pdf> (Accessed 12/03/2023).

new framework that focuses more on the actual user experience. It is called HEART, which includes the categories of Happiness, Engagement, Adoption, Retention, and Task success. This approach enables large-scale user experience measurement and can be applied to support product development decision-making. Of course, not all categories need to be always used, they can be freely combined as required.

## Feedback & Testing

Google has several studies to obtain user feedback to improve their products and services where current and non-current users can participate.<sup>50</sup> Also, Google is asking the users when developing new products/services for their feedback since it will be created for the users.<sup>51</sup> Further, Google Feedback makes it easy for its users to send feedback to the company.<sup>52</sup> Also, through Google Customer Reviews, valuable feedback from users that purchased something can be obtained. Combined with the Product ratings feature, customer satisfaction with certain product can be seen.<sup>53</sup> In general, Google tests their products in all stages to obtain feedback to constantly improve. The user experience researchers are frequently talking to customers about their experience with the products and even let them test new features before those are released.<sup>54</sup> To obtain feedback, Google uses a variety of research methods such as Remote Usability Studies, Experiential Sampling Studies or Surveys. Google uses A/B Testing to retrieve user feedback about their preferences for different website versions, for example, and to improve their offerings accordingly.<sup>55</sup> Moreover, Google also conducts Usability Studies which are Design Sprint methods to determine user satisfaction and to find out if there are usability issues.<sup>56</sup> In those sprints, the user is supposed to use the product in different scenarios and is carefully observed so valuable feedback can be obtained.

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<sup>50</sup> Google User Experience Research. (n.d.). Help shape the future of Google. Available at <https://userresearch.google.com/> (Accessed 12/03/2023).

<sup>51</sup> Wojcicki, S. (2011). The Eight Pillars of Innovation. Available at <https://www.thinkwithgoogle.com/future-of-marketing/creativity/8-pillars-of-innovation/> (Accessed 12/03/2023).

<sup>52</sup> Google Feedback. (n.d.). How to use Google Feedback. Available at <https://www.google.com/tools/feedback/intl/en-GB/learnmore.html> (Accessed 03/05/2023).

<sup>53</sup> Google Merchant Center Help. (n.d.). Collect reviews via Google Customer Reviews. Available at <https://support.google.com/merchants/answer/7548675?hl=en> (Accessed 03/05/2023).

<sup>54</sup> Google Help. (n.d.). Provide product feedback. Available at <https://support.google.com/searchads/answer/11275433?hl=en> (Accessed 12/03/2023).

<sup>55</sup> Google Search Central. (n.d.). Minimize A/B testing in Google Search. Available at <https://developers.google.com/search/docs/crawling-indexing/website-testing> (Accessed 12/03/2023).

<sup>56</sup> Design Sprints. (n.d.). Usability Study. Available at [https://designsprintkit.withgoogle.com/methodology/phase6-validate/usability-study\\_1](https://designsprintkit.withgoogle.com/methodology/phase6-validate/usability-study_1) (Accessed 12/03/2023).

## Product development

One of Google's main principles is to focus on the user and its needs and demands and not to focus on the potential profits.<sup>57</sup> Constantly measuring during the process is of highly important to keep learning and improving.<sup>58</sup> Google also doesn't aim to be perfect right away. Instead, they prefer to launch faster and improve regularly or even daily. Because most of the time, quick feedback from real users in an early stage reveals more insights and points of improvement than several rounds of internal iteration. Also, to gather new inspiration, all employees are supposed to take 20% of their working time to work on side projects to come up with new ideas. Google is also very transparent in all processes and stages. All employees are kept in the loop, which encourages discussions, reinterpretations, and knowledge exchange, naturally leading to more ideas.

## Google Analytics

Google Analytics allows users to track and analyze what happens on their websites and gives insights into their users' behavior for free.<sup>59</sup> Through a website tracking code, real-time data can be obtained that gives insight into the duration of user sessions, pageviews, average time on page, bounce rates, entrances or exit rate, and many other metrics. Even though Google Analytics is free, it has two benefits. First, it helps Google supply its clients with more specialized and efficient advertising options. Second, it offers insightful data about user behavior and trends that Google can use to improve its goods and services. Regarding user engagement, Google Analytics measures retention, engagement rate, engaged sessions, engaged sessions per user, bounce rate and average engagement time by the amount of time a user spends at a session, where the user is focused and how the session is terminated.<sup>60</sup> <sup>61</sup> Google uses the Net Promoter Score (NPS) to measure customer loyalty and satisfaction. To further measure user satisfaction, Google measures user retention to get insights into how frequently and how users engage with their website. It can be further differentiated into new

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<sup>57</sup> Extern Labs Inc. (2021). What is Google's Approach to Product Development? Available at <https://medium.com/@externlabs/what-is-googles-approach-to-product-development-9fef6cb5dd19> (Accessed 12/03/2023).

<sup>58</sup> Wojcicki, S. (2011). The Eight Pillars of Innovation. Available at <https://www.thinkwithgoogle.com/future-of-marketing/creativity/8-pillars-of-innovation/> (Accessed 12/03/2023).

<sup>59</sup> Bonini, J. (2023). The Most-Tracked Google Analytics Metrics [Original Data]. Available at <https://databox.com/the-most-tracked-google-analytics-metrics> (Accessed 12/03/2023).

<sup>60</sup> Optizent. (2021). User Engagement in Google Analytics 4 (GA4) – Everything You Need to Know. Available at <https://www.optizent.com/blog/user-engagement-in-google-analytics-4-ga4-everything-you-need-to-know/> (Accessed 12/03/2023).

<sup>61</sup> Analytics Help. (n.d.). [GA4] Retention overview report. Available at <https://support.google.com/analytics/answer/11004084?hl=en> (Accessed 12/03/2023).

users and returning users. Furthermore, Google publishes information about sentiment, customer churn and customer lifetime value which indicates that Google uses those to track customer satisfaction.<sup>62 63 64</sup>

## **Employee satisfaction**

Google encourages their employees to think and act like entrepreneurs to uncover the innovation potential at the company thoroughly.<sup>65</sup> Keeping employees satisfied and motivated is essential for Google since satisfied employees produce better results.<sup>66</sup> The Design Thinking approach positively influences Google's company culture. In fact, Google was voted for six years as the 'best company to work for.' At Google, employees feel acknowledged, excited about their daily work, inspired, and encouraged. They frequently conduct surveys to measure their employee satisfaction. They are also dedicating a lot of research to improve the employee's work environment.

## **Analysis Adobe**

Adobe is a creativity software company founded in 1982 and has its headquarter in California.<sup>67</sup> Adobe believes that creativity can empower transformation and drive innovation. Values of the company are to create the future, own the outcome, raise the bar and to be genuine. Adobes main three products are Adobe Experience Cloud, Adobe Document Cloud, and Adobe Creative Cloud. Adobe is a public company and has 25,988 employees.<sup>68</sup>

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<sup>62</sup> Google Workspace. (n.d.). Connect to an API: Analyze feedback sentiment. Available at <https://developers.google.com/apps-script/samples/automations/feedback-sentiment-analysis#services> (Accessed 04/05/2023).

<sup>63</sup> Google Cloud. (n.d.). Predicting Customer Lifetime Value with AI Platform: training the models. Available at <https://cloud.google.com/ai-platform/docs/clv-prediction-with-offline-training-train> (Accessed 04/05/2023).

<sup>64</sup> Yoon, S., Koehler, J., & Ghobarah, A. (n.d.). Prediction of Advertiser Churn for Google AdWords. Available at <https://static.googleusercontent.com/media/research.google.com/en//pubs/archive/36678.pdf> (Accessed 04/05/2023).

<sup>65</sup> Copelands, P. & Savoia, A. (2011). Entrepreneurial Innovation at Google. Available at <https://research.google/pubs/pub41469/> (Accessed 12/03/2023).

<sup>66</sup> Akram, U. (n.d.). Case Study: How Google Boosts its Employees' Engagement. Available at <https://inside.6q.io/google-boosts-employees-engagement/> (Accessed 12/03/2023).

<sup>67</sup> Adobe. (n.d.). Adobe fast facts. Available at <https://www.adobe.com/about-adobe/fast-facts.html> (Accessed 29/03/2023).

<sup>68</sup> IBISWorld. (n.d.). Adobe Inc.- Company Profile. Available at <https://www.ibisworld.com/us/company/adobe-inc/10098/> (Accessed 12/05/2023).

Adobe believes that the employee performance is connected to the professional wellbeing and satisfaction with their workplace.<sup>69</sup> That is why their office in San Jose is well designed to inspire creativity and productivity. The open and bright architected office has greenspaces, meditation rooms and several different creative workspaces for its employees.

### **Design Thinking at Adobe**

Adobe does not have their own framework for their Design Thinking approach but refer to the five-stage Design Thinking model from developed by IDEO.<sup>70</sup> The Design Thinking team is an crucial tool of the Design Thinking approach and to reach its full potential Adobe has defined a set of rules such as to always focus on the user, think the best about other people and to encourage creative assurance. Even though Adobe does not have their own Design Thinking Framework, they do have several design tools that can be useful throughout the process. Adobe further stresses the importance of having a multidisciplinary team made up of t-shaped designers, product managers, program managers engineers and marketing managers.<sup>71</sup> Adobe has its own toolkit that includes Adobes ideas, systems and tools.<sup>72</sup>

### **Adobe User Research**

Adobe has a user research program where they encourage people to participate and to give feedback.<sup>73</sup> Participants can help in building new products and services and eventually get a sneak peek at what future products could look like and participation is rewarded with an incentive. User studies could be in form of workshops, one-on-one Feedback Sessions or Surveys.

### **Usability framework**

There are three usability metrics that measures the usability of a product or service which are satisfaction, efficiency, and effectiveness that are preconditioned in order for it to be successful.<sup>74</sup>

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<sup>69</sup> The Creative Cloud Team. (2017). The Power of the Creative Workspace. Available at <https://blog.adobe.com/en/publish/2017/12/04/the-power-of-the-creative-workspace> (Accessed 16/05/2023).

<sup>70</sup> Adobe. (n.d.). An introductory guide to design thinking. Available at <https://www.adobe.com/creativecloud/design/discover/design-thinking.html> (Accessed 29/03/2023).

<sup>71</sup> Borba, D. (2016). Design Thinking: A Manual for Innovation. Available at <https://blog.adobe.com/en/publish/2016/06/28/design-thinking-a-manual-for-innovation> (Accessed 29/03/2023).

<sup>72</sup> Adobe Design. (n.d.). Our toolkit. Available at <https://adobe.design/toolkit/> (Accessed 29/03/2023).

<sup>73</sup> Adobe. (n.d.). Adobe wants to hear from you. Available at <https://www.adobe.com/userresearch.html> (Accessed 02/04/2023).

<sup>74</sup> Batagoda, M. (2020). Usability Metrics: Measuring UX Design Success. Available at <https://xd.adobe.com/ideas/process/user-testing/usability-metrics-measuring-ux-design-success/> (Accessed 02/04/2023).



Adobe suggests five usability metrics: task time, errors, completion rate, usability problems and task satisfaction. Moreover, A/B testing, hence allowing users to compare two designs will aid in identifying usability.

User research can be divided into qualitative and quantitative research that combined deliver great insights.<sup>75</sup> Which research should be applied depends on several factors and is different in every design process scenario and should be selected according to the objectives. In qualitative user experience research, the focus is on meaning or quality of the end user's experience. The goal of UX research methods is to get an in-depth understanding of the experience. Common methods are Interviews, Ethnographic Field Studies, Focus Groups, Diary Studies, Card Sorting, Moderate Usability Testing and Participatory Design. Quantitative user experience research on the other side, measures the behavior of users guided by questions with "how many, how much or how often" and can be beneficial for making decisions with for example surveys or A/B Testing. Also, Adobe suggests Personas to be a valuable tool.<sup>76</sup>

Qualitative user research methods are user Interviews, Usability Testing, Contextual Inquiry, Guerilla Testing or Focus Groups.<sup>77</sup> Quantitative user research methods on the other side include Surveys, Eye-tracking or Product Analysis.

## **User testing**

User testing is a type of user research and highly important when developing a new product/service.<sup>78</sup> Adobe suggests three types of user testing questions which are screening questions, in-test questions and post-test questions. The "Five Whys" can help to reach to the point and gain in depth insights.

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<sup>75</sup> Babich, N. (2020). The "Why" Behind Qualitative User Research. Available at <https://xd.adobe.com/ideas/process/user-research/why-behind-qualitative-user-research/> (Accessed 02/04/2023).

<sup>76</sup> Babich, N. (2017). Putting Personas to Work in UX Design: What They Are and Why They're Important. Available at <https://blog.adobe.com/en/publish/2017/09/29/putting-personas-to-work-in-ux-design-what-they-are-and-why-theyre-important> (Accessed 24/04/2023).

<sup>77</sup> Adobe. (n.d.). User Research. Available at <https://xd.adobe.com/ideas/process/user-research/> (Accessed 02/04/2023).

<sup>78</sup> Babich, N. (2021). User & Usability Testing Questions: Ultimate Guide. Available at <https://xd.adobe.com/ideas/process/user-testing/usability-testing-questions-tips-examples/> (Accessed 02/04/2023).

There are several user testing methods such as Survey, A/B Testing, Beta Testing, Focus Groups or Usability Testing.<sup>79</sup> According to Adobe, the steps to conduct user testing are define and outline testing goals and after metrics for those test session. After this, the user testing method is chosen and test scenarios as well as plans are laid out. Of course, suitable participants need to be gathered and the testing needs be conducted. After, the results are collected and analyzed.

Looking at usability testing methods, it is essential to have a insights of the users and the objectives as well as resources to choose the right method.<sup>80</sup> Common methods Recording, Card Sorting, Phone Interviews, Contextual Inquiry, Unmoderated Remote Usability Testing, Lab Usability Testing, and Guerilla Testing.

### **Adobe analytics**

Adobe has its own analytics platform called Adobe Analytics.<sup>81</sup> It collects and analyzes data from any digital point in the customer journey and its insights allow to create better customer experiences. Metrics that could indicate customer satisfaction that are available on Adobe Analytics are bounce rate, cart additions, checkouts, orders, product views, revenue, searches or time spent on site.<sup>82</sup>

Adobe is also likely to measure customer churn which refers to the turnover of the customers as they write in the blog about it.<sup>83</sup> The same can be said about the analysis of sentiment.<sup>84</sup> Also, customer

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<sup>79</sup> Lindberg, O. (2019). User Testing: Tools and Tips to Perfect the User Experience. Available at <https://xd.adobe.com/ideas/process/user-testing/user-testing-tools-tips-to-perfect-user-experience/> (Accessed 02/04/2023).

<sup>80</sup> Babich, N. (2019). Top 7 Usability Testing Methods. Available at <https://xd.adobe.com/ideas/process/user-testing/top-7-usability-testing-methods/> (Accessed 02/04/2023).

<sup>81</sup> Adobe. (n.d.). Adobe Analytics. Available at [https://business.adobe.com/uk/products/analytics/adobe-analytics.html?ef\\_id=Cj0KCCQjwxYOiBhC9ARIsANiEIfYQZqPPbYssojVkJT9HOMa6\\_pTY3jq3S8U\\_aQidjxk9DrVas8P-2FtIaAv2tEALw\\_wcB%253AG%253As&s\\_kwid=AI%213085%213%21621686762343%21e%21%21g%21%21adobe%2520analytics%2117862401935%21143020578201&sdid=SGDJMF16&mv=search&gad=1](https://business.adobe.com/uk/products/analytics/adobe-analytics.html?ef_id=Cj0KCCQjwxYOiBhC9ARIsANiEIfYQZqPPbYssojVkJT9HOMa6_pTY3jq3S8U_aQidjxk9DrVas8P-2FtIaAv2tEALw_wcB%253AG%253As&s_kwid=AI%213085%213%21621686762343%21e%21%21g%21%21adobe%2520analytics%2117862401935%21143020578201&sdid=SGDJMF16&mv=search&gad=1) (Accessed 02/04/2023).

<sup>82</sup> Adobe. (n.d.). Metrics overview. Available at <https://experienceleague.adobe.com/docs/analytics/components/metrics/overview.html?lang=en> (Accessed 02/04/2023).

<sup>83</sup> DX Adobe. (2021). Customer Churn. Available at <https://business.adobe.com/blog/basics/customer-churn> (Accessed 02/04/2023).

<sup>84</sup> Hatwar, S. (2020). Sentiment Analysis: A Key to Measure and Improve the Customer Experience. Available at <https://business.adobe.com/blog/basics/sentiment-analysis-a-key-to-measure-and-improve-the-customer-experience> (Accessed 28/04/2023).

lifetime value (CLV) can indicate customer satisfaction.<sup>85</sup> Adobe published several tips for a customer retention strategy; hence it can be assumed that they are measuring customer retention.<sup>86</sup>

### **Adobe experience platform**

Adobe Experience Platform is a customer experience management platform by Adobe to collect and analyze data from customers.<sup>87</sup> It contains several capabilities such as analytics, digital advertising, email, customer data management, social media, call centers and commerce that show the Real-time Customer Profile. There are three applications entailed on the Adobe Experience Platform that are Adobe Customer Journey Analytics, Adobe Journey Optimizer, and Adobe Real-Time CDP.

### **Feedback**

Adobe believes that user research, and especially their feedback is a very important process of product design.<sup>88</sup> Adobe asks for feedback at the prototyping stages to ensure the product meets the users needs and demands. But also, once the product is finished, it is asked for feedback frequently to check the satisfaction with the product. Adobe suggests three metrics to use when asking for user feedback that are Net Promotor Score (NPS), Customer Effort Score (CES) and Customer Satisfaction (CSAT). Channels to collect feedback that Adobe recommends are one-to-one interviews, in-app or on-site feedback, emails, social media feedback or through usability testing. Adobe believes that feedback should be a two-way process and can be visualized as a loop since users' feedback can be seen as outputs that Adobe uses as inputs to iterate and improve the design process. In addition, to the metrics above, Adobe suggests to measure customer experience through revenue growth and customer churn.<sup>89</sup>

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<sup>85</sup> Experience League. (2023). Track data signals to generate your customer lifetime value. Available at <https://experienceleague.adobe.com/docs/experience-platform/query/use-cases/customer-lifetime-value.html?lang=en> (Accessed 28/04/2023).

<sup>86</sup> Adobe Communications Team. (2022). 6 simple customer retention strategies. Available at <https://business.adobe.com/blog/basics/customer-retention-strategies> (Accessed 28/04/2023).

<sup>87</sup> Adobe Experience Platform. (n.d.). A supercharged engine, finely tuned to make customer experience hum. Available at <https://business.adobe.com/products/experience-platform/adobe-experience-platform.html> (Accessed 02/04/2023).

<sup>88</sup> Babich, N. (2020). Collecting User Feedback: 10 Practices. Available at <https://xd.adobe.com/ideas/process/user-research/collecting-user-feedback/> (Accessed 02/04/2023).

<sup>89</sup> Adobe Communication Team. (2022). Customer experience – what it is, why it's important, and how to deliver it. Available at <https://business.adobe.com/blog/basics/what-is-customer-experience> (Accessed 02/04/2023).

Adobe has a website dedicated to Feature Requests and Bug Report Submissions to obtain feedback regarding those aspects from its customers.<sup>90</sup> It uses that information to improve products and services. Further, Adobe is working with UserVoice, a user feedback software, to get feedback on several of the application such as Acrobat, Adobe Acrobat Sign, Adobe Aero and several more.<sup>91</sup>

## **Adobe XD**

Adobe XD is a tool for prototyping for user experience and interaction designers which is used to design apps, websites, marketing campaigns and others.<sup>92</sup> Prototypes can be created easily and fast and it can be worked collaborative. Adobe XD has several plugins that help to test designs and obtain feedback an insight such as remote interviews with UserZoom GO or testing prototypes with real users with Maze.<sup>93</sup> Furthermore, Adobe is using the Marpipe plugin for Adobe XD to come up with create variants or the User Testing Quick Answer plugin for Adobe XD to get real-time feedback from actual customers. To see how actual users see a design, Attention Insights is a heat tool to create heatmaps and see where the user's attention is focused on. Lastly Adobe XD uses Preely which allows for conducting remote and unmoderated user tests.

## **Analysis Microsoft**

Microsoft is a global technology corporation that was founded in 1975 in the United States.<sup>94</sup> It has become one of the largest and most prosperous software corporations in the world known for its operating systems, productivity software, and gaming consoles. Well-known products include Windows, Microsoft Office, Microsoft Surface, Microsoft teams, Xbox, Azure, LinkedIn, Dynamics 365, and many more.<sup>95</sup> Microsoft is a public company and has around 221,000 employees.<sup>96</sup>

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<sup>90</sup> Adobe. (n.d.). Welcome to the Feature Request and Bug Report Submission Form. Available at <https://www.adobe.com/products/wishform.html> (Accessed 02/04/2023).

<sup>91</sup> Adobe. (2023). How to use UserVoice to request new features and report bugs. Available at <https://helpx.adobe.com/x-productkb/global/how-to-user-voice.html> (Accessed 02/04/2023).

<sup>92</sup> Rae, M. (2020). What is Adobe XD and what is it used for? Available at <https://www.adobe.com/products/xd/learn/get-started/what-is-adobe-xd-used-for.html> (Accessed 02/04/2023).

<sup>93</sup> Schwartz, M. (2021). 6 Adobe XD plugins to test designs and get user feedback. Available at <https://blog.adobe.com/en/publish/2021/01/14/user-testing-feedback-plugins> (Accessed 02/04/2023).

<sup>94</sup> Bigelow, S.J. & Patrizio, A. (n.d.). Microsoft. Available at <https://www.techtarget.com/searchwindowsserver/definition/Microsoft> (Accessed 14/03/2023).

<sup>95</sup> Microsoft Wiki. (n.d.). List of Microsoft products. Available at [https://microsoft.fandom.com/wiki/List\\_of\\_Microsoft\\_products](https://microsoft.fandom.com/wiki/List_of_Microsoft_products) (Accessed 14/03/2023).

<sup>96</sup> Forbes. (n.d.). Microsoft. Available at <https://www.forbes.com/companies/microsoft/?sh=47e8f8873f7f> (Accessed 29/04/2023).

## **Design Thinking at Microsoft**

As Microsoft experienced increasing competition, it shifted from being a technology-centric company towards a user-centric company and put the user first when developing new products and services.<sup>97</sup> Microsoft has integrated Design Thinking into their everyday process to keep up with competition and has been able to speed up and enhance product development processes.

Microsoft's CEO states that the most important aspect of innovation is empathy since it is at the core of Design Thinking.<sup>98</sup> He stresses the importance of appealing to customers' unmet needs to deliver excellent products that ensure satisfaction. Microsoft has dedicated a program and space for innovation, collaboration, experimentation, and creativity called The Garage which currently holds 14 location all over the world.<sup>99</sup> Their motto is "doers, not talkers" and the space provides everything a team needs to Design Thinking workshops. Customers are also invited to co-work with developers on new products to ensure their input and feedback are included.

Microsoft established its own methodology called Inclusive Design that is user-centered and relies on the full range of human diversity, and aims to include and learn from all kinds of perspectives.<sup>100</sup> Doing so, Microsoft follows three principles; recognize exclusion, solve for one, extend to many and learn from diversity. Microsoft published the Inclusive 101 Guidebook that entails Microsoft's principles as well as an extensive toolkit with suitable methods.

### **Microsoft customer feedback program**

According to Microsoft, their customers come first.<sup>101</sup> That is why customer feedback is essential to them to measure their satisfaction with the company and its products. They collect it via surveys, one-on-one conversations, or focus groups with their users to deliver the best possible experience for them. Feedback is collected with finished products or in the development of products to receive

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<sup>97</sup> Gurung, P. (2022). How Microsoft Reshaped Products by Embracing Design Thinking. Available at <https://www.mygreatlearning.com/blog/how-microsoft-reshaped-products-by-embracing-design-thinking/> (Accessed 14/03/2023).

<sup>98</sup> Murphy, M. (2021). If You Want To Be Innovative, Microsoft's CEO Says You've Got To Have This Psychological Trait. Available at <https://www.forbes.com/sites/markmurphy/2021/11/16/if-you-want-to-be-innovative-microsofts-ceo-says-youve-got-to-have-this-psychological-trait/> (Accessed 14/03/2023).

<sup>99</sup> Microsoft. (n.d.). What is The Garage? Available at <https://www.microsoft.com/en-us/garage/about/> (Accessed 14/03/2023).

<sup>100</sup> Microsoft. (n.d.). Microsoft Inclusive Design. Available at <https://www.microsoft.com/design/inclusive/> (Accessed 14/03/2023).

<sup>101</sup> Microsoft. (n.d.). Microsoft Customer Feedback Program. Available at <https://www.microsoft.com/en-us/customerfeedback> (Accessed 14/03/2023).

feedback on new product features. Moreover, Microsoft provides several channels for the users to send their feedback, such as the Feedback web portal, in-product experiences, Windows Feedback Hub App, Microsoft Tech Community, or the Microsoft Store.<sup>102</sup> Also, on Microsoft's websites, there is frequently the option to submit feedback about the demonstrated product on the website or the website itself. Microsoft asks customers for ratings and reviews in the Microsoft store.<sup>103</sup> Those can be analyzed in the Partner Center where filters can be applied as well as ratings can be broken down and insight into categories can be gained.

## User research

To take it even one step further, Microsoft has a profound User Research program to create better and user-centered products in the future.<sup>104</sup> During this, users try out new technology and demonstrate how they use products daily to observe and receive real-time feedback. Microsoft can identify pain points and opportunities for improvement during those usability studies and further develop its products. The one-on-one research sessions are done online and is anonymous.<sup>105</sup>

Microsoft uses Personas, Customer Segments and Role-Based Models in their user research process.<sup>106</sup> Furthermore, Microsoft is also working with Experience Review, Focus Groups, Usability Studies, and Customer Conversations.<sup>107</sup> <sup>108</sup> Besides conducting user research in the lab, Microsoft also does Field Studies to meet the users in their natural environment.<sup>109</sup> Regarding user testing,

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<sup>102</sup> Microsoft. (n.d.). UserVoice Pages. Available at <https://support.microsoft.com/en-us/office/uservoice-pages-430e1a78-e016-472a-a10f-dc2a3df3450a> (Accessed 14/03/2023).

<sup>103</sup> Microsoft. (2023). Reviews report. Available at <https://learn.microsoft.com/en-us/windows/apps/publish/reviews-report> (Accessed 02/05/2023).

<sup>104</sup> Microsoft. (n.d.). Our products, your way. Available at <https://www.microsoft.com/en-us/usability/default.aspx> (Accessed 14/03/2023).

<sup>105</sup> Microsoft. (n.d.). Welcome to Microsoft User Research. Available at <https://ux.microsoft.com/Talk/Planner> (Accessed 14/04/2023).

<sup>106</sup> Strachan, V. (2020). Want to understand your user base? Try this user modeling. Available at <https://www.microsoft.com/en-us/research/group/customer-insights-research/articles/want-to-understand-your-user-base-try-this-user-modeling-approach/> (Accessed 14/04/2023).

<sup>107</sup> Carlevato, D., & Silva, M. (2020). A guide to conducting experience reviews. Available at <https://www.microsoft.com/en-us/research/group/customer-insights-research/articles/a-guide-to-conducting-experience-reviews/> (Accessed 14/04/2023).

<sup>108</sup> Brown, M. (2020). Designing user experiences that support security and compliance. Available at <https://www.microsoft.com/en-us/research/group/customer-insights-research/articles/designing-user-experiences-that-support-security-and-compliance/> (Accessed 14/04/2023).

<sup>109</sup> Snellinger, A. (2021). Research in the wild: Meeting users where they are. Available at <https://www.microsoft.com/en-us/research/group/customer-insights-research/articles/research-in-the-wild-meeting-users-where-they-are/> (Accessed 14/04/2023).

Microsoft uses A/B Testing to find out which version of a product is preferred by the users.<sup>110</sup> Also, Eye-tracking is used to test products.<sup>111</sup>

## Customer Relationship Management

Microsoft developed Microsoft Dynamics 365, a platform integrating customer relationship management and enterprise resource planning.<sup>112</sup> Microsoft uses its platform to manage its customer relationship management. Besides customer service metrics, Dynamics 365 measures sales, financial, supply chain, and employee metrics.

Regarding customer satisfaction, Microsoft is measuring several metrics such as three standard satisfaction metrics as the Net Promotor Score (NPS), Sentiment and Customer Satisfaction (CSAT).<sup>113</sup> Moreover, Overall Customer Satisfaction (OCS), Customer Loyalty Index, (CLI) Customer Effort Score (CES) and Custom score are important metrics.<sup>114 115</sup> Those metrics are included in a survey and are called satisfaction metrics and are part of the Voice of the Customer process. Furthermore, Microsoft is using tools from the American Customer Satisfaction Index (ACSI) to measure and improve their customer satisfaction by conducting surveys as well as interviews.<sup>116</sup> Those tools are available through Microsoft Dynamics 365 Customer Voice. Especially Dynamics 365 Customer Insights allows to analyze customer data to discover insights and improve

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<sup>110</sup> Microsoft. (2020). A/B Testing Across Products. Available at <https://www.microsoft.com/en-us/research/group/experimentation-platform-exp/articles/a-b-testing-across-products/> (Accessed 14/04/2023).

<sup>111</sup> Microsoft. (2023). Eye tracking on HoloLens 2. Available at <https://learn.microsoft.com/en-us/windows/mixed-reality/design/eye-tracking> (Accessed 14/04/2023).

<sup>112</sup> Microsoft. (n.d.). Microsoft Dynamics 365. Available at <https://dynamics.microsoft.com/en-us/> (Accessed 14/03/2023).

<sup>113</sup> Microsoft. (n.d.). Set up satisfaction metrics in Customer Voice. Available at <https://learn.microsoft.com/en-us/training/modules/metrics-alerts-voice-surveys/2-configure-satisfaction> (Accessed 26/03/2023).

<sup>114</sup> Microsoft. (2022). Add and configure satisfaction metrics. Available at <https://learn.microsoft.com/en-us/dynamics365/customer-voice/satisfaction-metrics> (Accessed 14/03/2023).

<sup>115</sup> Microsoft. (n.d.). What is the voice of the customer? Available at <https://dynamics.microsoft.com/de-de/customer-voice/what-is-the-voice-of-customer/> (Accessed 26/03/2023).

<sup>116</sup> Microsoft. (n.d.). ACSI Analytics for Customer Voice. Available at <https://appsource.microsoft.com/de-de/product/dynamics-365/acsi1593630390618.acsi-satisfaction?tab=overview&exp=ubp8> (Accessed 06/05/2023).

the customers experience.<sup>117</sup> Customer lifetime value and customer retention can be measured via Dynamics 365.<sup>118 119</sup> Furthermore, Microsoft measures bounce rate as well as customer churn.<sup>120 121</sup>

## Product development

Microsoft uses the five phases of Design Thinking of Empathize, Define, Ideate, Prototype, and Test.<sup>122</sup> When developing a new innovative product, Microsoft has the user's needs in mind and includes them in their prototyping and testing process. Also, instead of having separate divisions working on the products as previously done, Microsoft promotes an open and inclusive environment where everyone has access to everything.

## Prototyping

Microsoft uses sketching, body storming, acting, storyboarding, and 360-degree virtual reality scenes to test its ideas for rapid prototyping.<sup>123 124</sup> Microsoft achieved the best results when prototyping with physical props and in real-world scenarios.<sup>125</sup>

## Employee satisfaction

Employees of Microsoft are encouraged to work together with different departments and teams, and it is ensured that they have everything they need to thrive in their position.<sup>126</sup> Microsoft also regularly

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<sup>117</sup> Microsoft Dynamics 365. (n.d.). Leading enterprise customer data platform. Available at <https://dynamics.microsoft.com/en-us/ai/customer-insights/> (Accessed 06/05/2023).

<sup>118</sup> Microsoft. (2023). Predict customer lifetime value (CLV). Available at <https://learn.microsoft.com/en-us/dynamics365/customer-insights/predict-customer-lifetime-value> (Accessed 06/05/2023).

<sup>119</sup> Microsoft Dynamics 365. (n.d.). What is customer retention? Available at <https://dynamics.microsoft.com/en-us/customer-service/what-is-customer-retention/> (Accessed 06/05/2023).

<sup>120</sup> Microsoft. (2022). Fix a high email bounce rate. Available at <https://learn.microsoft.com/en-us/dynamics365/marketing/fix-high-bounce-rate> (Accessed 06/05/2023).

<sup>121</sup> Microsoft. (n.d.). Customer churn prediction using real-time analytics. Available at <https://learn.microsoft.com/en-us/azure/architecture/solution-ideas/articles/customer-churn-prediction> (Accessed 06/05/2023).

<sup>122</sup> Akpuda, O. (2022). #ZeroToOne: Intro to UX and design thinking. Available at <https://startups.microsoft.com/blog/zerotoone-intro-to-ux-and-design-thinking/#:~:text=The%20five%20phases%20of%20design%20thinking&text=Empathize,Prototype> (Accessed 14/03/2023).

<sup>123</sup> Huston, L. (2018). Finally, a way to sketch 360 degree VR scenes. Available at <https://www.microsoft.com/en-us/garage/blog/2018/11/finally-a-way-to-sketch-360-degree-vr-scenes/> (Accessed 14/03/2023).

<sup>124</sup> Microsoft. (2022). Prototyping and manufacturing for enterprises. Available at <https://learn.microsoft.com/en-us/windows/mixed-reality/enthusiast-guide/prototyping-manufacturing> (Accessed 14/03/2023).

<sup>125</sup> Microsoft. (2022). Thinking differently for Mixed Reality. Available at <https://learn.microsoft.com/en-us/windows/mixed-reality/discover/case-study-expanding-the-design-process-for-mixed-reality> (Accessed 14/03/2023).

<sup>126</sup> Szóstek, A. (2012). A look into some practices behind Microsoft UX management. In *CHI'12 Extended Abstracts on Human Factors in Computing Systems* (pp. 605-618).



checks in with their employees and how satisfied they are.<sup>127</sup> If they are unsatisfied, they try to find the issue and solve it, so they have motivated employees again. For instance, Microsoft is constantly researching how to improve their employee's well-being and made a change to measure employee 'thriving' instead of 'engagement'.<sup>128</sup> Working less and being more focused and less employees in the inside network could enable employees to thrive at their workplace for example. Microsoft started to conduct surveys two times a year to find out how many employees are thriving in their work environment.<sup>129</sup> Further, Microsoft organizes intentional career conversations with their employees twice a year or more if needed.

## Analysis IBM

IBM (International Business Machines Corporation) is a global technology provider of a variety of goods and services, such as hardware, software, and consulting services, and is known for shaping the future of innovation and technology.<sup>130</sup> It was founded in 1911 and since then has developed into one of the biggest technology firms in the world. IBM is a public company and has 345,000 employees.<sup>131</sup>

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<sup>127</sup> Matyszczyk, C. (2022). Microsoft researched what made employees truly happy. One result was startling. Available at <https://www.zdnet.com/article/microsoft-researched-what-made-employees-truly-happy-one-result-was-startling/> (Accessed 14/03/2023).

<sup>128</sup> Bariso, J. (n.d.). With Just 1 Word, Microsoft Made A Big Change to How It Measures Employee Success. Available at <https://www.inc.com/justin-bariso/microsoft-research-how-to-measure-employee-engagement-thriving.html> (Accessed 14/03/2023).

<sup>129</sup> Microsoft. (2022). Microsoft's Dawn Klinghoffer on How Leaders Can Tell if Employees Are Thriving. Available at <https://www.microsoft.com/en-us/worklab/podcast/microsofts-dawn-klingshoffer-on-how-leaders-can-tell-if-employees-are-thriving#:~:text=The%20company%20began%20seeking%20twice,'thriving'%E2%80%94%20number%20Microsoft> (Accessed 14/03/2023).

<sup>130</sup> Patrizio, A. (2023). IBM (International Business Machines Corporation). Available at [https://www.techtarget.com/searchitchannel/definition/IBM-International-Business-Machines#:~:text=IBM%20\(International%20Business%20Machines%20Corporation\)%20is%20a%20multinational%20technology%20company,operations%20in%20over%20170%20countries.](https://www.techtarget.com/searchitchannel/definition/IBM-International-Business-Machines#:~:text=IBM%20(International%20Business%20Machines%20Corporation)%20is%20a%20multinational%20technology%20company,operations%20in%20over%20170%20countries.) (Accessed 13/03/2023).

<sup>131</sup> Pereira, D. (2023). IBM Business Model. Available at <https://businessmodelanalyst.com/ibm-business-model/> (Accessed 13/03/2023).

## **IBM Design Thinking**

The principles of IBM are focus on user outcomes, restless innovation, and diverse empowered teams.<sup>132</sup> IBM developed its own Design Thinking framework called IBM Design Thinking. At the core of this framework is committing yourself and the team around to put yourself in the user's shoes, even if it sometimes means putting this above other business concerns. The team's core is diversity and empowerment, and it should be multi-disciplinary with people from different races, ages, genders, backgrounds, expertise, and experience levels. They must accomplish their goals without relying on other people for technical support or leadership that is outside the team. Those teams can iterate fast while moving through the process since operational decisions are operating at a very low level. Another essential facet of IBM Design Thinking is that everything is considered a prototype, and they constantly reinvent according to their principles.

Moreover, IBM created the Enterprise Design Thinking program to assist enterprises in implementing a Design Thinking strategy for innovation and problem-solving. The program offers instruction, materials, and tools to assist organizations in applying Design Thinking to their unique problems and developing creative solutions that satisfy user needs and provide value to the company. IBM's Enterprise Design Thinking toolkit contains several templates, methods and tools.<sup>133</sup>

### **The loop and keys**

A set of behaviors is at the core of the company called the loop, as it is an ongoing cycle of observing, reflecting, and making.<sup>134</sup> The team needs to observe the behavior, figure out what is important to the users, and then reflect and synthesize what has been seen and learned. Then an action plan is made, resulting in a better prototype, and the loop starts all over again. IBM has come up with three keys to scale IBM Design Thinking across a wide range of geographical regions. Those three keys to maintaining alignment are hills, playbacks, and sponsors. Hills convert user needs into goals or outcomes, and playbacks provide a secure environment for team members to share feedback

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<sup>132</sup> IBM Enterprise Design Thinking. (n.d.). The principles guide us. Available at <https://www.ibm.com/design/thinking/page/framework/principles> (Accessed 13/03/2023).

<sup>133</sup> IBM Enterprise Design Thinking. (n.d.). Toolkit. Available at <https://www.ibm.com/design/thinking/page/toolkit> (Accessed 29/03/2023).

<sup>134</sup> Hamm, S. (2016). IBM Design Thinking: A Framework To Help Teams Continuously Understand and Deliver. Available at <https://www.ibm.com/blogs/think/2016/01/ibm-design-thinking-a-framework-for-teams-to-continuously-understand-and-deliver/> (Accessed 13/03/2023).

and ensure alignment. Lastly, sponsor users are real users not in the organization but are vital to evaluate assumptions and give feedback to ensure the team is aligned with the actual users.

## **IBM Garage**

The IBM Garage uses an iterative framework that covers all important steps from ideation to build and to scale.<sup>135</sup> Co-creation, co-execution and co-operation are highly valued and at the core of the IBM Garage Methodology. It helps clients generate creative ideas and provides them with the skills, know-how, and resources they need to quickly turn those ideas into successful business operations.<sup>136</sup> What started with 16 locations all over the world, some still being used, has grown post covid towards a rather virtual experience which has been even more efficient.<sup>137</sup>

### **Metrics IBM is using:**

IBM measures customer loyalty, satisfaction, and the likelihood of a recommendation to a friend with the Net Promoter Score (NPS = % of promoters - % of detractors).<sup>138</sup> Besides only asking for the rating itself, they also ask for the why of the decision. Besides the NPS, IBM states that there are two more important metrics to capture feedback and measure instant satisfaction that are customer satisfaction score (CSAT) and customer effort score (CES).<sup>139</sup> Those three are typically obtained via surveys.

IBM allows to measure the overall customer satisfaction (OCS) in their analytics.<sup>140</sup> Furthermore, customer churn as well as customer lifetime value are important metrics to calculate for IBM.<sup>141</sup> Through IBM Watson, sentiment analysis can be conducted and therefore, important customer insights can be gained.<sup>142</sup> Also, IBM track customer retention and uses the three most used metrics

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<sup>135</sup> IBM. (n.d.). IBM Garage Methodology. Available at <https://www.ibm.com/garage/method/> (Accessed 28/03/2023).

<sup>136</sup> IBM. (n.d.). IBM Garage. Available at <https://www.ibm.com/garage?p1=Search&p4=43700075177569842&p5=p> (Accessed 29/03/2023).

<sup>137</sup> Reinitz, R. (n.d.). IBM Garage – the soul of a start-up. Available at <https://www.ibm.com/thought-leadership/innovation-explanations/ibm-garage> (Accessed 29/03/2023).

<sup>138</sup> Ziegler, A. (2022). NPS and Badges in IBM. Available at <https://www.ibm.com/blogs/ibm-training/nps-and-badges-in-ibm/> (Accessed 13/03/2023).

<sup>139</sup> IBM. (n.d.). What is customer experience (CX)? Available at <https://www.ibm.com/topics/customer-experience> (Accessed 05/05/2023).

<sup>140</sup> IBM Tririga. (2020). My Overall Customer Satisfaction – Operations metric. Available at [https://www.ibm.com/docs/en/tririga/10.8?topic=SSFCZ3\\_10.8/com.ibm.tri.doc/wpm\\_metrics/r\\_my\\_overall\\_customer\\_satisfaction\\_operations.htm](https://www.ibm.com/docs/en/tririga/10.8?topic=SSFCZ3_10.8/com.ibm.tri.doc/wpm_metrics/r_my_overall_customer_satisfaction_operations.htm) (Accessed 05/05/2023).

<sup>141</sup> IBM Cognos Analytics. (2022). Telco customer churn. Available at <https://www.ibm.com/docs/en/cognos-analytics/11.1.0?topic=samples-telco-customer-churn> (Accessed 05/05/2023).

<sup>142</sup> Solanki, S. (2022). Sentiment analysis using IBM Watson NLP. Available at <https://developer.ibm.com/tutorials/use-the-watson-core-nlp-library-to-perform-sentiment-analysis/> (Accessed 05/05/2023).

for this such as the customer lifetime value, customer churn rate, and customer retention rate.<sup>143</sup> Lastly, IBM is also calculating the bounce rate.<sup>144</sup>

## User research

User research is a crucial component of Enterprise Design Thinking and is conducted at several phases of the design and development process.<sup>145</sup> Sponsor users, selected people from the intended user group, are a crucial component of user research in IBM Enterprise Design Thinking. As the team improves the design of a product or service, sponsors' users continuously submit input. Teams are able to understand reasons and behaviors in real life thanks to this feedback.

IBM uses several design techniques like Minimum Viable Product Definition, Hypothesis-Driven Design, Wireframe Sketches, To-be Scenarios, Design Ideation, As-is Scenarios, Empathy Maps or Personas.<sup>146</sup> Further, IBM is doing several kinds of different user research to find out what users thinking about ongoing or future products and services.<sup>147</sup> Users can have exclusive access on new products and have a great impact on those. Moreover, a reward is granted after a user research study such as a gift card or a donation to a charity of choice. The different kind of user research studies are Remote Usability Study, Diary Study, Field Study, Surveys or Usability Study and at IBM office. IBM is using Eye-tracking in their user research as well.<sup>148</sup> Also, IBM tracks customer retention and uses the three most used metrics for this, such as the customer lifetime value, customer churn rate, and customer retention rate.

## User Experience Program Batches

Receiving feedback from its clients and users is of high importance for IBM to constantly improve. IBM has a User experience Program called UXP that gives badges to partner, which are IBM customers that help to improve the user experience, innovate and contribute to future products

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<sup>143</sup> IBM. (n.d.). What is customer retention? Available at <https://www.ibm.com/topics/customer-retention> (Accessed 05/05/2023).

<sup>144</sup> IBM Support. (2018). Bounce Rate. Available at <https://www.ibm.com/support/pages/bounce-rate> (Accessed 05/05/2023).

<sup>145</sup> Pesot, J., & Sullivan, A. (n.d.). Conduct user research. Available at <https://www.ibm.com/garage/method/practices/think/user-research/> (Accessed 25/03/2023).

<sup>146</sup> Pesot, J., & Plantenberg, S. (n.d.). Get started with Enterprise Design Thinking. Available at <https://www.ibm.com/garage/method/practices/think/enterprise-design-thinking/> (Accessed 25/03/2023).

<sup>147</sup> IBM. (n.d.). Let's shape the future of IBM products together. Available at <https://www.ibm.com/cloud/user-research> (Accessed 25/03/2023).

<sup>148</sup> Yamada, Y., & Kobayashi, M. (2018). Detecting mental fatigue from eye-tracking data gathered while watching video: Evaluation in younger and older adults. Available at <https://research.ibm.com/publications/detecting-mental-fatigue-from-eye-tracking-data-gathered-while-watching-video-evaluation-in-younger-and-older-adults> (Accessed 13/04/2023).

through their feedback.<sup>149</sup> Those users give insights into their cases and provide feedback on in-flight designs. Depending on their involvement, they can receive different badges for participating in user research, such as contributor, influencer, or advocate. Furthermore, clients that wish to connect to IBM on an even closer level can join The Client Support Council to have a permanent role in actively shaping IBM Support over the long term.<sup>150</sup> Another option is to take part in the Sponsor User Program where clients have the chance to be part of design workshops, usability testing and other design activities. IBM has websites to ask for product feedback and how those can be enhanced.<sup>151 152</sup>

## User testing

IBM is conducting moderated and unmoderated research studies to support product development.<sup>153</sup> The company has created the so-called Usability Theater, where they show user testing videos that stakeholders can watch to test and receive feedback. User testing helps IBM to turn the assumptions they have of their products into evidence. Moreover, the company uses A/B testing.<sup>154</sup>

## IBM Customer Experience Analysis

IBM Watson customer experience helps to quantify and visualize customer journeys and a clear understanding of how to improve underperforming trips and duplicate successful ones can be gained.<sup>155</sup> Individual struggle points can be pointed out and issues can be resolved to contribute to a greater customer experience.

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<sup>149</sup> IBM. (n.d.). IBM User Experience Program badges. Available at <https://www.ibm.com/products/feedback/user-experience-program/badges> (Accessed 13/03/2023).

<sup>150</sup> Lam, J. (2010). IBM Support takes home Award for Best Customer Feedback Strategy. Available at <https://www.ibm.com/blogs/ibm-training/ibm-support-takes-home-award-for-best-customer-feedback-strategy/> (Accessed 19/03/2023).

<sup>151</sup> IBM. (n.d.). Product Resources. Available at [https://www.ibm.com/mysupport/s/topic/0TO5000000026r6GAA/ibm-feedback?language=en\\_US](https://www.ibm.com/mysupport/s/topic/0TO5000000026r6GAA/ibm-feedback?language=en_US) (Accessed 29/04/2023).

<sup>152</sup> IBM. (n.d.). Send us feedback. Available at <https://www.ibm.com/community/feedback/> (Accessed 29/04/2023).

<sup>153</sup> User testing. (n.d.). IBM + UserTesting. Available at <https://www.usertesting.com/resources/customers/ibm> (Accessed 13/03/2023).

<sup>154</sup> IBM Garage Methodology. (n.d.). A/B test your site. Available at [https://www.ibm.com/garage/method/practices/learn/practice\\_a\\_b\\_testing/](https://www.ibm.com/garage/method/practices/learn/practice_a_b_testing/) (Accessed 13/03/2023).

<sup>155</sup> IBM United States Software Announcement 218-120. (2018). IBM Watson Customer Experience Analytics delivers capacity options to give organizations more control over volumes and further integrates digital analytics capabilities. Available at [https://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=AN&subtype=CA&htmlfid=897/ENUS218-120&appname=STG\\_TS\\_USEN\\_ANN0](https://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=AN&subtype=CA&htmlfid=897/ENUS218-120&appname=STG_TS_USEN_ANN0) (Accessed 21/03/2023).

In addition, IBM has other customer satisfaction measurement tools such as IBM Tealeaf Customer Experience which provides insights into customer behavior.<sup>156</sup> It captures interactions, identifies points for improvements, analyses the customers experience and finds areas where customers have problems.

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<sup>156</sup> IBM. (2013). IBM Tealeaf Customer Experience, a customer experience management solution, helps optimize online business by eliminating obstacles that prevent successful conversions or completions of business processes. Available at <https://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=an&subtype=ca&appname=gpatem&supplier=897&letternum=ENUS213-096> (Accessed 03/05/2023).