Design for Co-creation: Ultra-Personalisation of Philips Electric Breast Pump

NEXT UPPS project team, Philips Experience Design (MCC)

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by **Weichun Lin**

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Design for Co-creation: Ultra-Personalisation of Philips Electric Breast Pump

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Graduation report
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PREFACE

“I’m sorry, can you give me a second? I need to feed her”.
“Please give me a moment. I have to change his diaper”.

These are a few sentences I keep hearing while doing user interviews with mothers. I was not at all impatient but respectful as I waited. Maybe we can do something with design. We should.

First, I would like to thank every mother who provided input for my research. Whether it is an interview or a user test, this seemingly short time is precious to them, and I am sincerely grateful for this. Second, I want to thank my supervisors, Daan, Iemkje, and Mar, who continued to give me rational but warm guidance during this research journey. Additionally, I would like to thank my friends who have been by my side during this time. Every Friday night gathering is what keeps me going.

Thanks to my family in Taiwan for always keeping faith in me. Without their support, I would not be who I am today. I also thank myself for embarking on this fantastic journey two years ago.

A mother told me breastfeeding or pumping for your baby is like riding a tandem bike for the first time. In the beginning, neither of them could find a balance, which was very hard and frustrating. Although it will get started sooner or later, I was wondering if I could play the third role, steadying the bike as they wobbled and nudging the bulky car to make it easier for them to move forward.

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EXECUTIVE SUMMARY

Since everyone's body, needs, and goals are unique, frequent and close interactions with unsuitable products can result in negative physical and mental experiences. Yet breast pumps are still mass-produced products, and finding the right product for themselves can be challenging for mothers. As a result, a new design strategy, product personalisation, is offered to address the problem of users' particular demands not being satisfied.

This collaboration between Philips Experience Design and the NEXT UPPS project team explores the UPPS framework's application possibilities in its MCC (Mother and Child Care) context. NEXT UPPS team, on the other hand, intends to complete different aspects of its design approach through the application of concepts to real-world case studies.

This graduation project aims to help mothers better engage in the co-creation process to obtain a more personalised breast pumping product that truly fits their needs. To design a co-creation experience that can motivate participation, research activities were carried out to understand mothers' needs and concerns regarding breast pumping from multiple perspectives and to explore appropriate design opportunities across the whole breast pumping journey.

The research revealed that it could be challenging for inexperienced moms to articulate their needs to get personalised products. In addition, the mother's high reliance on medical professionals in the early stages of childbirth shows that the co-creation of unfamiliar products is even more difficult. To overcome this problem, the goal of the design phase was to design a supportive and informative process that guides mothers to finish the task easily within co-creation. The design should provide an experience that mothers can feel secure, as easily facing unknown challenges with the support of medical professionals.

This project presented a product customisation webpage and a self-scanning mobile App to conquer the challenge. The product customization webpage guides participants step-by-step through a question-and-answer interaction to customize breast pump products while allowing them to explore and understand their needs. The self-scanning mobile app guides women to easily and independently complete body measurement through clear and simple instructions, so as to obtain more personalized offers in product personalization.It has been proven in user testing that the Q&A interaction can motivate users' participation while stimulating them to reflect on their product needs. However, although the guidance of the body scan can help users complete body measurement quickly and effectively, users still have concerns about data sharing.

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01.INTRODUCTION

This chapter introduces the project by first laying out the background information on the topic and a basic understanding of why Philips is involved. The initial problem statement is then elaborated upon, along with the project goal, scope, focus, and research questions. Finally, the project approaches are presented to indicate the project's perspective and different stages of development.

1.1. Topic background

Although a breast pump can help moms express breast milk more freely, the pumping process is typically stressful and unpleasant for mothers (Bower et al., 2017). Since everyone's body, needs, and goals are unique, frequent and close interactions with unsuitable products can result in negative physical and mental experiences. Yet breast pumps are still mass-produced products, and finding the right product for themselves can be challenging for mothers. As a result, a new design strategy, product personalisation, is offered to address the problem of users' particular demands not being satisfied.

As one of the leading players in the healthcare domain, Philips intends to explore new ways of providing users with a better experience through human-centred design and technology innovation. In the past, they have designed and manufactured a variety of breast pumps to meet the needs of most women. Now they aim to go further, paying more attention to individual differences, and providing consumers with more tailored offerings.

With the development of manufacturing and distribution technologies and the widespread use of personal data applications, companies are now able to personalise their products and services to fulfil the heterogeneous needs of consumers. Ideally, this would benefit both companies and consumers in terms of user experience and customer loyalty, respectively.

However, along with personalisation comes the involvement of users in the design process, which changes the relationship between the company and consumers. Therefore, there is a need to conduct research on the interaction of the personalization process from the user's perspective regarding the co-creation experience to align with other aspects (e.g., data analysis, manufacturing) of development within the UPPS (Ultra-Personalised Products and Services) system.

This project explores what are the opportunities and what it takes to apply a personalisation strategy to the current product/service acquiring process. That is, understanding what would drive customers' preference over mass-produced offerings.

1.2.Problem Statement

Within this project the following problem statement is addressed:

Personalization requires active user participation in the design process. This potential barrier negatively affects the willingness of customers and companies to seek personalised solutions, which makes it challenging to truly fulfil one's personal needs.

1.3.Project goal and scope

1.3.1.Project goal

To create a service that motivates mothers to engage in the co-create process of personalisation, that facilitates providing users with a tailored breast-pumping experience.


AVENT


PHILIPS
AVENT

1.3.2.Project scope and focus

This project is a collaboration between Philips Experience Design and the NEXT UPPS project team. Through the integration of academia and industry, Philips aims to explore the application possibilities of the UPPS framework in its MCC (Mother and Child Care) context. NEXT UPPS team, on the other hand, intends to complete different aspects of its design approach through the application of concepts to real-world case studies.

For Philips, existing product and service designs mainly adopt a universal design strategy, which is "the design of products be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design" (NC State University, The Centre for Universal Design, 1997). However, a single product or service is unlikely to meet the needs of all users. Therefore, in this project, Philips aims to explore the possibility of applying design for personalisation strategy in the current MCC domain (in this case, electric breast pumps) to pay more attention to the differences between users.

Academically, the NEXT UPPS project team actively conducts interdisciplinary research between three Dutch universities to explore personalised design and production possibilities in collaboration with manufacturing industries and design studios. Most of the existing research done by the UPPS team is mainly about technological manufacturing and analysis, such as body scanning, data encoding, and 3D printing applications. For example, another IDE student (Qing) is currently working on the same topic but with a focus on capturing breast pumping motion through photography. In addition, based on Philips' interest in the user-perceived level of personalisation rather than product design itself.

Therefore, the author discovered an opportunity ***to focus on the user experience of the co-creating process within personalisation, which is the crucial touch-point between customers and companies. And the scope of the project is covering the whole journey of pregnancy and maternal care***, as Tseng (2010) and Jiao (2011) argued that personalisation should take the whole life cycle experience into account. For this project to understand and meet the needs of moms in the whole pumping journey. The key point of this research is not about customising and improving the breast pumping device itself, but exploring how to provide a different way of acquiring offerings in terms of personalising products and services.

Fig.1.1 *Philips Avent electric breast pump*

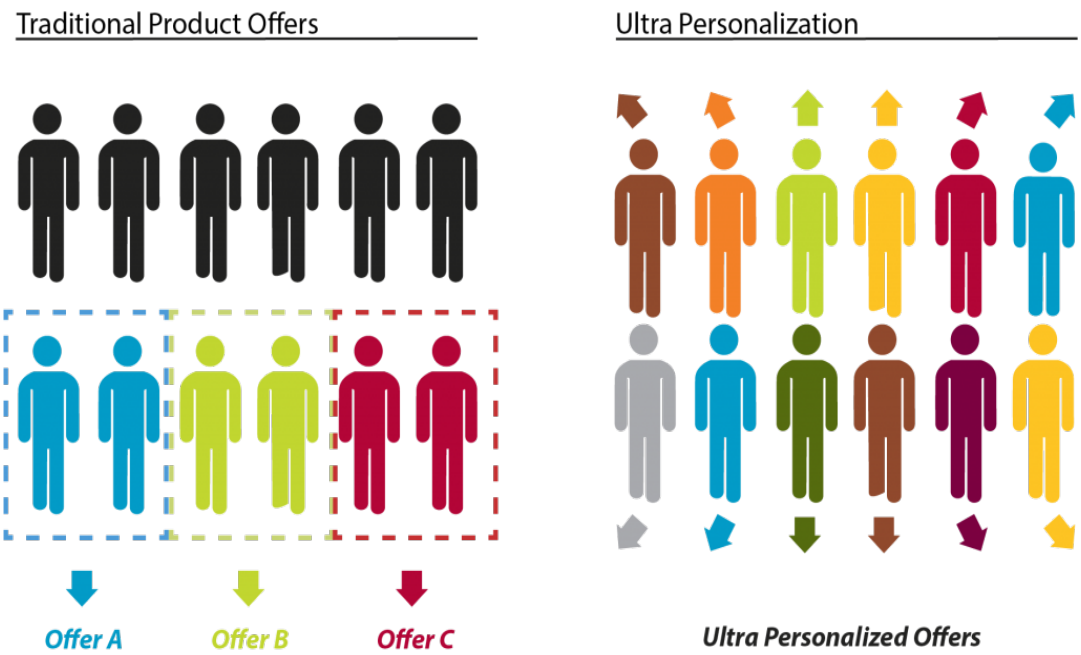


Fig.1.2 *NEXT UPPS (Ultra Personalised Products and Services)*

1.4. Research questions

Two research questions were proposed to explore why breastfeeding should take a personalized strategy and how to achieve it if it is valuable. Currently, Philips have the strategy of providing one-size-fit-all breast pumping shields, so this research first needs to know what is the benefit of implementing a personalisation strategy, and also the challenge for Philips to apply and for users to accept it.

Why should companies apply a personalisation strategy?

- What are personalisation and customisation?
- What is the value of applying a personalised strategy for customers and companies?
- What is the challenge of design for personalisation?

How to provide personalised breast pumping experience for mothers?

- What are the explicit and implicit needs regarding breast pumping activities?
- What are the shared but unique needs of mothers?
- What personalised offerings could provide mothers with a better pumping experience?
- What are the customer's potential needs during breast pumping?
- What are the attitudes, concerns, and emotions involved in pregnant women and new moms in a breast pumping journey?
- How do moms currently get pumping devices that match their needs?
- What are the scenarios regarding acquiring a pump device?
- What does Philips or other brands currently provide that helps mothers to get products that fit their needs?
- What are the key service moments in an envisioned end-to-end experience?
- What new business models could emerge from ultra-personalised products/services in the context of breast pumping?
- What are attitudes towards personalised and tailored solutions of breast pump users and what would drive preference over mass-produced offerings?

1.5. Project approach

1.5.1. User-Centred approach

A user-centred approach is used to create a design solution for a personalised breast pumping journey that truly meets the user's demands and expectations. In this effort, breast pumping mothers are at the centre of the process, which means that throughout the research phase, users are the most crucial source of information, and their needs and feedback shape the design outcome.

In order to understand the relevant experience from a more comprehensive perspective, many stakeholders besides the users were also involved in the research, such as the local breastfeeding centre, kraamzorg, designers and researchers at Philips, etc. In this way, a balance between user needs and feasibility can be achieved when developing design directions and solutions.

1.5.2. Double Diamond design process

The project is divided into two primary parts based on the double diamond structure (the British Design Council, 2005): research and design. The first part of the project—research phase focuses on uncovering the problems, which entails identifying the mother's explicit and latent needs for breast pumping activities. The final goal of this phase is to define the problems for developing design solutions, that is, to design for the right problem.

The second part—the design phase, involves a number of design and evaluation cycles to explore various design options, aiming to design the problem right. An appropriate solution to the identified problem is developed by iterating valuable concepts.

1.6. Report structure

The report structure is based on the double-diamond approach, which is divided into four main chapters: Discover, Define, Design, and Deliver, as shown in **Fig.1.3**. The second chapter, Discover, mainly describes the research methods used in the project and the insights discovered during the research process. The Define chapter organizes and analyzes the insights to form a design brief, including problem definitions, goals, design requirements etc., as the starting point for the design phase.

The Design chapter presents the development process from initial ideas and concepts to form the final solution. This includes rapid user testing and design iterations. In the Deliver part, the final design results are produced and presented in the form of an overview and details, respectively, and final user evaluations are also carried out to review the design results from the perspective of users and potential users.

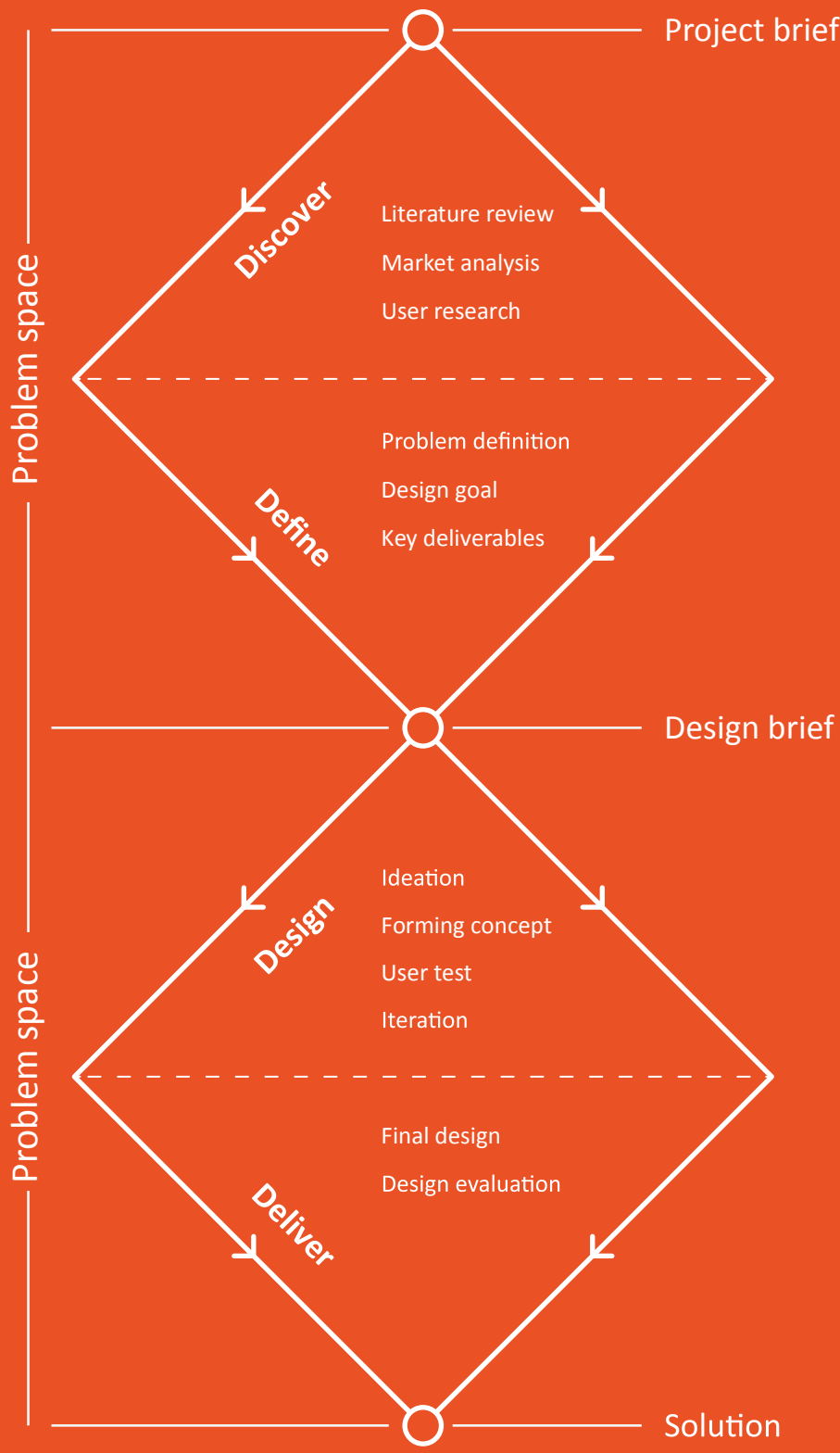


Fig.1.3 *Double diamond design process*

02.DISCOVER

The Discover phase is aiming to understand what is the major problem that needs to be solved. From a basic understanding of personalisation and customisation to the differences between the two strategies, the role of co-creation within the tailoring process and its challenges. Following with an in-depth exploration of mothers' breastfeeding experience. In addition to the product usage problems, the focus is more on mothers' perceptions and attitudes towards breast pumping activities. The Discover part is concluded with several key findings, which will be used as materials to form a design brief in the next phase—Define.

2.1. From mass production to ultra-personalisation

To explore the possibility of applying the personalisation design method to breast pumping products, it is crucial to understand the strategy's rationale and the current market application. This section presents the results of reviewing literature regarding the ultra-personalisation to explore the following research questions.

Why should companies apply a personalisation strategy?

- What are personalisation and customisation?
- What is the value of applying a personalised strategy for customers and companies?
- What is the challenge of design for personalisation?

Desk research was conducted to get essential understanding of the current studies and literatures on personalisation, customisation strategies, and breast pumping activities. In addition, with the analysis of current breast pumping devices and the market analysis, the results will have an adequate basis for developing personalising breast pumps in the next phase.

2.1.1. Mass production, customisation and personalisation

In the era of product diversification, mass-produced products have gradually lost the interest of consumers and cannot fully meet their individual needs (Piller & Müller, 2004). With the development of technology, companies are now expanding their market strategy by applying mass customisation and mass personalisation.

In general, customisation and personalisation are similar marketing strategies that meet customers' individual needs by providing tailored offerings, as Nielsen Norman Group (2022) indicated the term "individualization" to describe both strategies. The two strategies have a wide and diverse range of product applications, from physical mug pattern printing, and assembling one's own computer (Dell), to digital content recommendation (Amazon recommendation) and personal service (greeting consumers by name in the email). Both strategies are defined and executed differently in various product areas or companies.

However, in terms of the interaction between users and the offering providers, as shown in **Fig.2.7**, customisation refers to the process of selecting and configuring product variants in the framework predefined by the product provider based on the user's own explicit need and preference. Personalisation is a way for companies to anticipate consumers' latent needs based on their knowledge of individual users (e.g. user profile, behavioural data, etc.) and provide users with matching offers.

By exploring the differences between the two strategies in existing research, the characteristics of customisation and personalisation can be better understood and applied in the design phase. There have been many studies comparing these two strategies in different ways. The multiverse framework **[Fig 2.8]** proposed by Jiao (2011) based on three different aspects (user experience, product change, and co-creation) broadly includes these different arguments. However, the part of co-creation showing that personalisation is active participation and customisation is passive is clearly in conflict with other studies.

Due to the development of technology and the complexity of hardware and software product integration, it is no longer practical to take physical or digital products as the basis for identifying the two strategies. Traditionally, customization mainly solves functional problems and mainly occurs in physical products, such as shoes, computers and other modular products. Personalization is mainly based on digital products or services (Jiao 2011), such as related content recommendations. However, many traditional manufacturing companies have transformed or expanded their service industries through corporate transformation. Through the integration of product-service systems, physical products, digital products, and services are closely integrated, leading to blurred boundaries between different strategies. It can be seen from the cases in the market that the product type is not completely suitable for distinguishing the difference between customization and personalization. For example, users can customize the news topics they want to see according to their preferences on digital news sites or get personalized shoes based on their own body data (Nachtigall et al., 2019).

Despite product types being unlikely to be used as identification criteria, functional requirements with soft characteristics are more feasible to implement personalisation due to the differences in nature. Tseng et al. (2010) suggested that what should be personalized are the "soft" functional requirements related to customer perception (i.e., affective needs) and serviceability, which requires customers' participation to identify. In terms of product fulfilment, the changeable, adaptable, and configurable features of personalisation allow customers to not only tailored the final product, but also the basic design and product structure (Jiao, 2011). As a result, the "soft" components of the product, such as the software or digital goods and services, may be the ideal parts for personalisation.

Even though the distinctions between the two strategies are outlined above, there is no clear boundary between personalisation and customisation. As shown in Jiao's framework, the two strategies are more like a spectrum, positioned according to context and company strategy. Hu (2013) and Jiao (2011) explained that together with mass production, these strategies usually coexist in parallel and can even complement each other under the market continuum to meet the individual needs of users to the greatest extent. For example, when purchasing a BMW car, functions and paint colours can be customised according to consumer preferences, while the car's digital system will collect data and provide personalised content as the owner uses it (Kabasakal et al., 2017). Therefore, when adopting strategies, instead of selecting one between two, it is possible for companies to combine these two methods based on different goals to achieve.

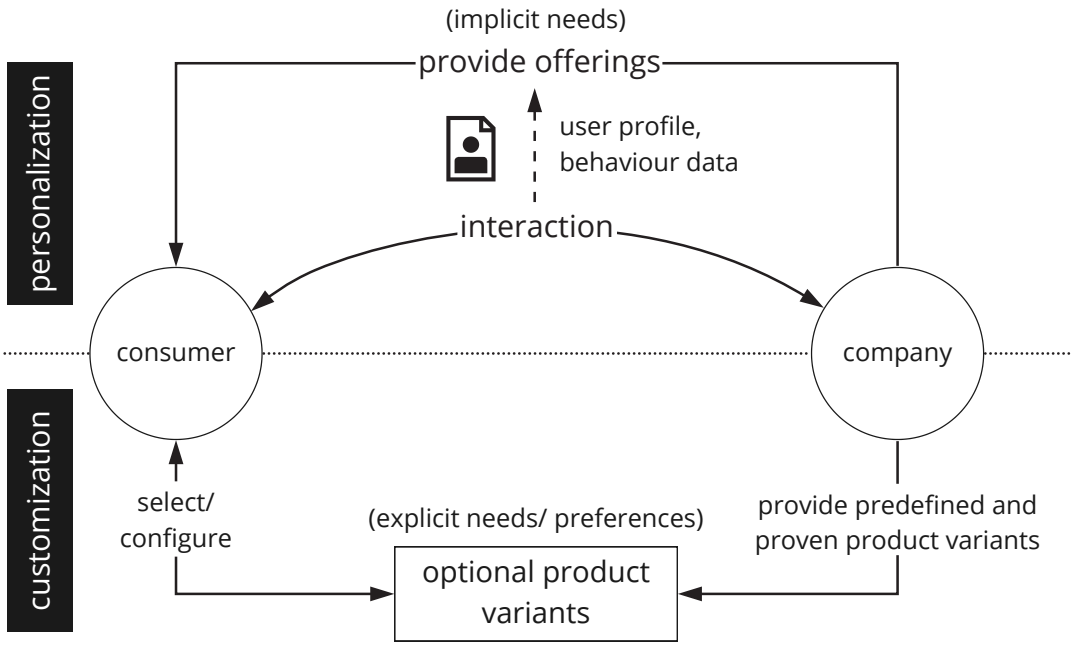


Fig.2.7 *The interactions between consumers and companies in personalization and customization.*

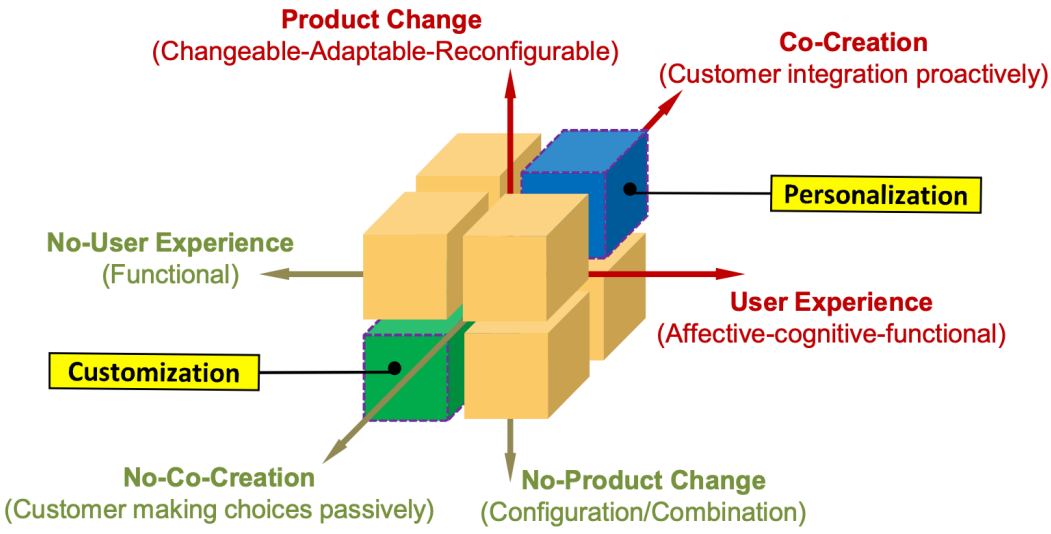


Fig.2.8 *The multiverse of customisation and personalisation (Jiao 2011).*

2.1.2. Co-creation for customisation and personalisation

In this project, the main focus is on the interaction level, which is the co-creation between consumers and company. In the case of personalising breast pumps with customers, as described by Sanders and Stappers (2008), that co-design, is the collaboration of designers and others who are not trained in design in the design development process. As shown in **Fig.2.9**, users are invited to participate in the design process to inspire designers at the fuzzy front-end phase.

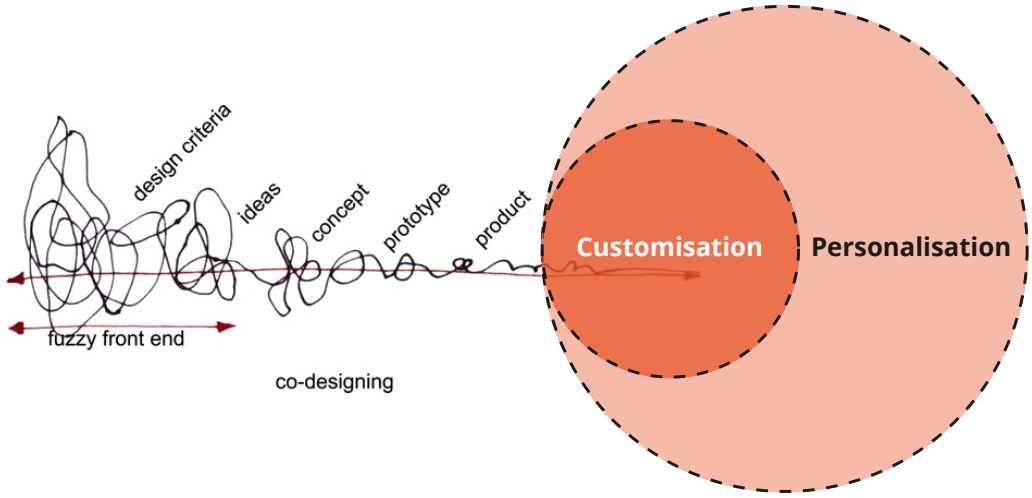


Fig.2.9 *The co-creation of customisation and personalisation (Adapted from Sanders & Stappers, 2008).*

In the case of customization and personalization, the stage of co-creation is delayed and extended to the end of product design and the stage of use which brings great benefit to both customers and companies. For customisation, consumers select and configure product variants based on pre-defined options, which can be seen as co-create at the endpoint of the design phase to make the tailored product, which is, the delayed differentiation (Lee and Tang, 1997). Under such a delay, in addition to meeting consumers' personal needs, the company can also reduce costs through better flexible manufacturing and inventory control.

For personalisation, the co-creation goes beyond the design stage and takes place at every moment when consumers are using the product. The personalisation provider collected data through the interaction with their consumers in order to better understand their latent needs and satisfy them with matching offerings. For example, Amazon's users received recommendations through their browsing and purchasing history on the Amazon website.

Although co-creation in customisation gives customers the opportunity to design and configure their own products, it may be challenging for them to do so. As argued by Arora et al (2008), the selection process of customisation may make the acquiring decision even more difficult. Information overload in processing the configuration may result in customers staying with the default option (Johnson et al., 2002). In addition to the difficulty of configuration, Franke et al., (2009) also revealed that the consumers' lack of understanding of their preferences may lead to reduced benefits of customisation.

Nonetheless, customization may still be used as a tool of helping consumers raise their awareness of their needs and preferences (Franke et al., 2009). To achieve that, throughout the customizing process, it is more valuable to demonstrate the product benefits to customers with less expertise instead of product features. As Randall et al., (2007) discovered through the Dell computer customised interface experiment, it is more advantageous to apply a needs-based interface for novice consumers. Furthermore, since consumers are likely to be novices with no design training, interactive aid, such as visualised consequences or support from experts might be necessary (Hu, 2013). It is also worth noting that Mugge et al. (2008) pointed out that when consumers participate in co-creating their own products, they will have a stronger perceived fit for the product.

2.1.3. Key takeaways

- Customization and personalization are similar concepts and are not mutually exclusive. Both meet different individual needs through the participation of users. Ideally, the two strategies can complement each other to maximize the implementation of UPPS.

- In addition to meeting user needs, customization and personalization strategies may also increase brand loyalty in the long run.

- Product customization is challenging for consumers, but through the process of co-creation, inexperienced users may be guided to understand their own needs during the process and increase the perceived fit of the obtained outcome.

- The challenge of adopting product customization and personalization comes from how to provide appropriate guidance to help users participate in and complete the co-creation of products.

- Product personalization should consider the entire user journey, not just the purchase stage. There should be an ongoing relationship with consumers to keep offering them more personalized offerings.

2.2. Breast pump and the market analysis

A market analysis is conducted to better understand the possibilities and opportunities of personalizing breast pumps. This analysis mainly focuses on three parts. First, the introduction of the product itself and the difference between products. Second, how do companies meet the needs of different users in various ways, and finally, how do these companies help users get breast pumps that fit their needs.

2.2.1. About breast pump

A breast pump is a device that helps mothers pass breast milk out of the breast. It is mainly used when babies are away from mothers or cannot be breastfed, such as when the baby is at rest, when the mother is separated from the baby for work, or when the baby has difficulty latching. It can be seen as a temporary replacement for the baby's role in releasing breast milk. In addition to expressing milk and storing it for subsequent bottle feeding, using a breast pump can also help mothers remove excess breast milk to relieve the discomfort of breast engorgement or stimulate a ***let-down reflex*** (what makes breastmilk flow) in some latest products.

The operation of the breast pump is mainly divided into two forms, manual and electric. Both forms attach the pumping shield to the breast and create a negative pressure within it so that the angle between the shield and the tunnel exerts a certain degree of pressure on the areola to allow the nipple to enter and exit. Therefore, breast milk is not pumped out by physically pulling the nipple but sucking the nipple into the tunnel in the shield by simulating the negative pressure generated in the mouth when the baby is lactating. In this way, using the appropriate tunnel diameter to match the diameter of your nipple will significantly affect the user's breast pumping experience and performance and avoid areola tearing and skin injury (Jones et al., 2009). **[Fig.2.10]**

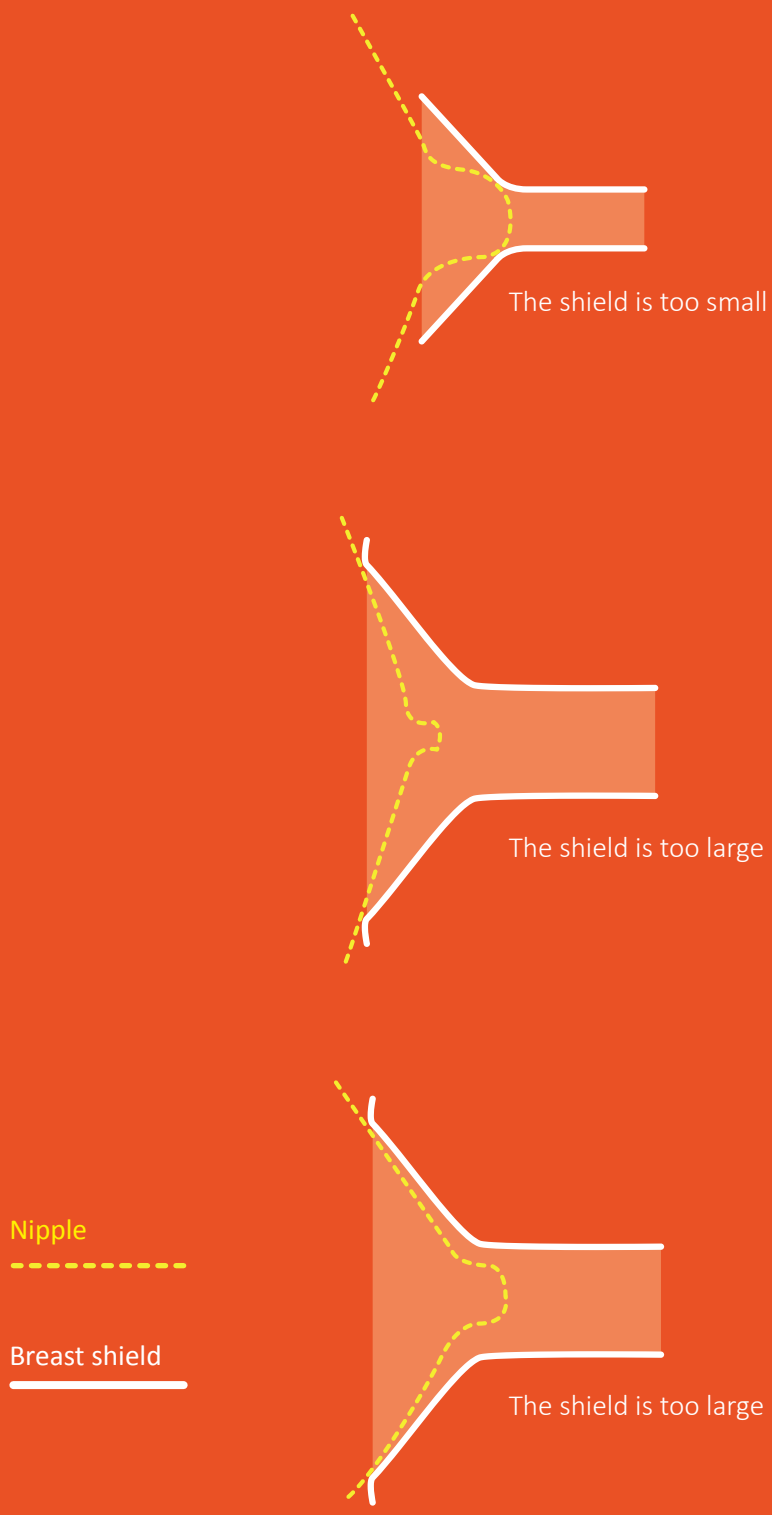
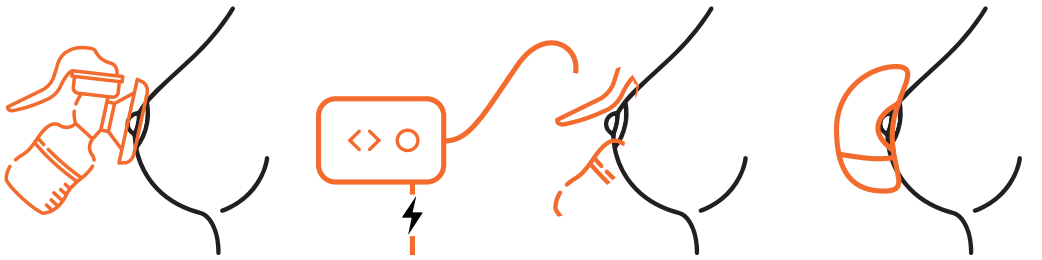


Fig.2.10 *Breast shield fitting (Jones et al., 2009)*

2.2.2. What are the options?

There are already many different brands and various products on the market. Based on the above introduction, the composition of the breastfeeding device should include a pump, a breast shield and a container for collecting breast milk. In terms of how the breast pump is used, it can be divided into three types: manual, electric, and wearable **[Fig.2.11]**.



Manual breast pump Electric breast pump Eearable breast pump

Fig.2.11 *Three main types of breast pumps: manual/ electric/ wearable breast pump*

- **Manual breast pump**

A manual pump requires constant pressing to generate negative pressure, but it can control the power and speed most freely and is not limited by electrical energy. However, by using a manual pump, mothers can only pump one side of their breast pump at a time.

- **Electric breast pump**

Electric breast pumps are the most common product type. The user needs to press the shield against the breast to pump automatically, and if used with a nursing bra, it can be hands-free. Although no manual power is required, the pipeline can restricts the movement. Depending on the energy supply, it can be subdivided into electric-powered and battery-powered. If an electric-powered one is used, mobility will be minimal, while a battery-powered one will be partly determined by the pipeline between the pump and the shield. With a proper power unit, one motor can allow mothers to pump both sides of the breast simultaneously, saving half the time and increasing production (Prime et al., 2012).

- **Wearable breast pump**

The wearable breast pumps are products that have been introduced in recent years. Integrating the motor, shield, and bottle allows mothers to place it in the bra, eliminating the need for connecting pipes and wires, which enabling mothers to achieve hands-free breast pumping.

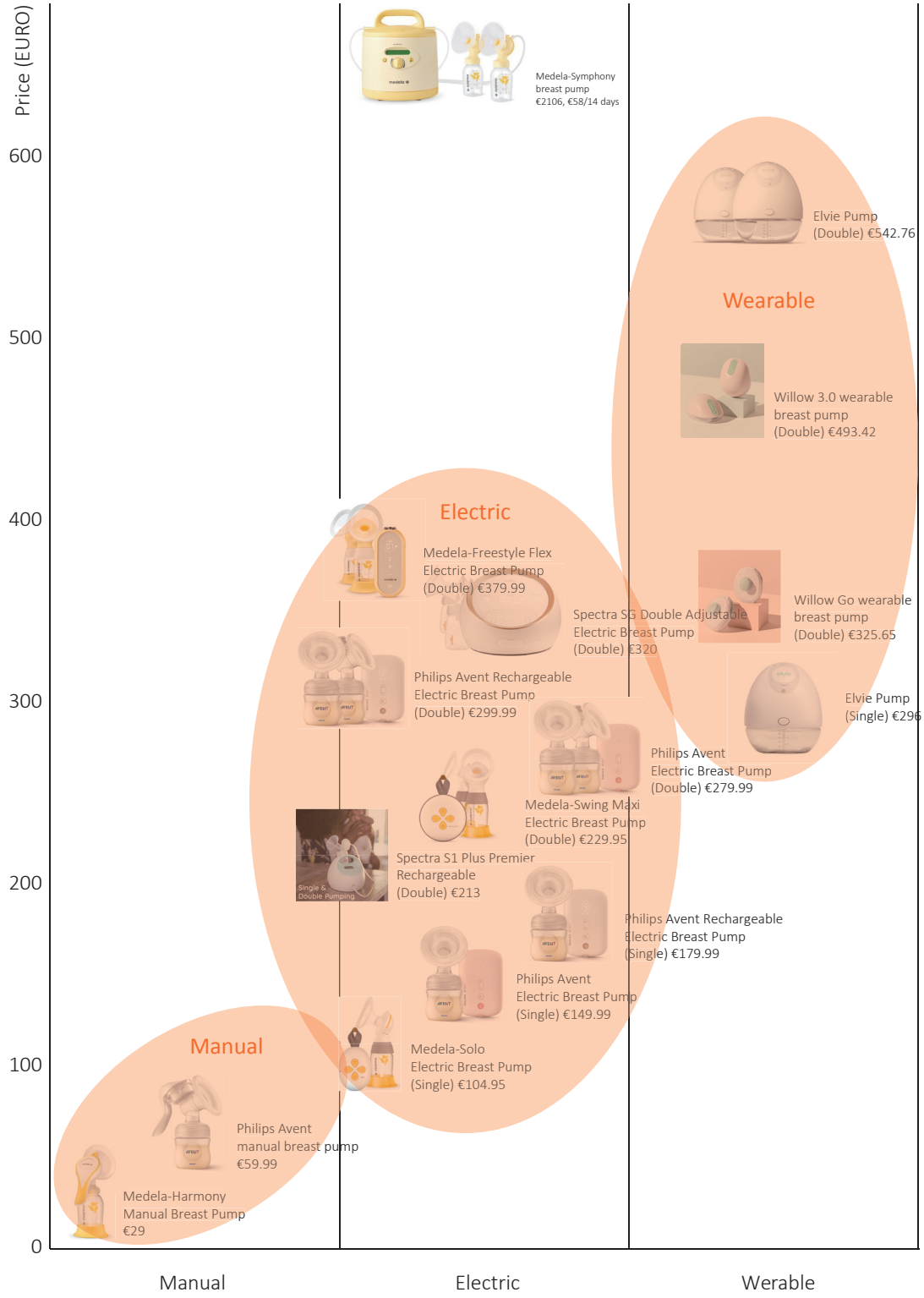


Fig.2.12 *Market positioning of current breast pumping products*

In the three main products, it can be seen that in addition to affecting breast milk production, different product types also include physical effort, limb freedom and portability when breast pumping. Many different brands and products can be found on the market today **[Fig.2.12]**. It can be observed that the wearable pumps are near twice the price of the electric ones. In addition to the convenience, the wearable product also has certain advantages in functionality since many functions can be controlled through the mobile phone. However, considering the price, the electric pump should be cost-effective to obtain the same performance and functions.

2.2.3. How to meet different needs?

Due to individual differences, from measurable body shape and size, to different internal breast composition, external factors resulting in different dependence on the pump, and even psychological attitudes towards breastfeeding can cause differences in product requirements. According to Jones and Hilton (2009) and Meier et al. (2016), it is important that mothers have a pumping product that suits them not only the size of the shield but also the type of breast pump. The following analysis describes how companies are meeting the needs of different users in breast shields and pumps.

Breast pump shield (flange)

In order to meet the size requirements of different users, the current market is mainly divided into two strategies for pumping shields, which are to provide multiple sizes and one-size-fits-all. Most brands offer different sizes for consumers to choose from, ranging from 21mm to 30mm in nipple diameter. Among them, the brand—Willow not only provides the average size but also sells the cushion(adapter) that can be installed in the shield to meet the size requirements of 15, 17 and 19mm. At present, only Philips takes a single-size strategy in the market. Although the Philips soft silicone cushion is also installed on the shield in a similar form to the adapter, the deformability of the soft material along with the negative pressure generated during pumping makes the flange in the shield deform to adapt to different nipples sizes. **[Fig.2.13]**

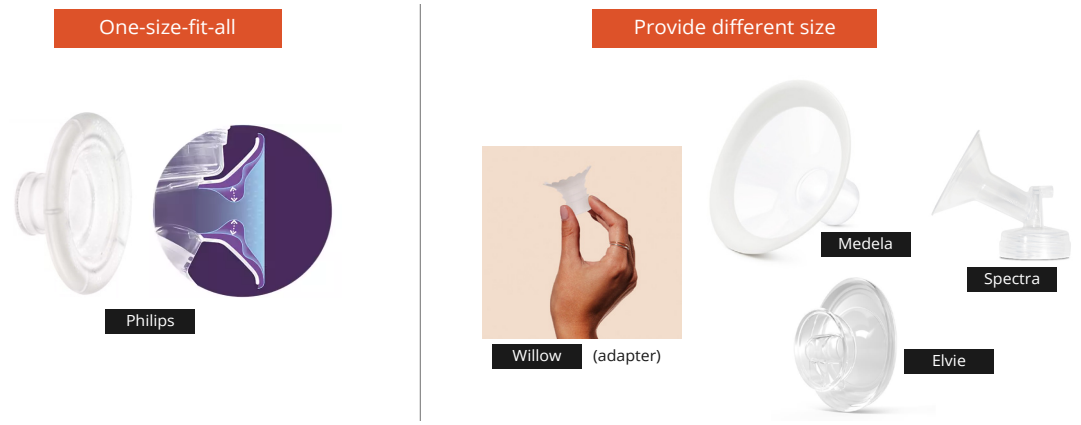


Fig.2.13 *One-size-fits-all cushion & Multiple size/ adapter*

On the one hand, choosing a fit size of the flange can be challenging for new mothers without experience. According to Jones and Hilton (2009), some space should be reserved between the nipple and the tunnel to ensure that the nipple can enter and exit freely during suction, while the gap should not be too large to cause the areola to be sucked and pulled during the process. Therefore, many companies try to guide users to identify their suitable shield sizes. For example, Medela provides guidelines on how to measure nipple diameters, while Spectra and Willow provide simple toolkits that users can print by themselves and can identify nipple size by cutting out the guidelines on paper **[Fig.2.14]**.

On the other hand, although Philips claims that the one-size-fits-all cushion can meet 99.98% of size requirements and accommodate nipples up to 30mm in diameter, user interviews and online customer reviews reveal this strategy may not be sufficient to meet the varying needs of users. It can be seen from the customer reviews of online shopping platforms such as Amazon and bol.com that the cushion may not fully meet the needs of different nipple sizes, especially smaller nipples. In addition, a mother who used the product claimed that although the cushion can successfully generate negative pressure between the breast and the pump, it cannot provide sufficient performance. Therefore, it can be inferred that the basis for identifying flange size may need to include parts other than the diameter of nipples, such as the angle between the nipple and the areola, etc. Sakalidis et al. (2020) pointed out that different flange angles can affect the efficiency, effectiveness and comfort of breast pumping.

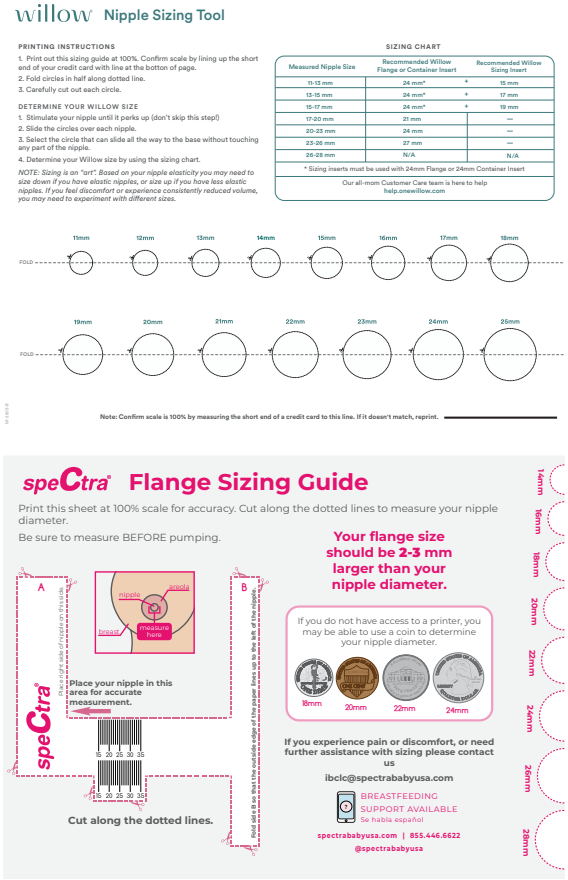


Fig.2.14 *Toolkit for measring nipple size (Willow, Spectra)*

Breast pump (motor)
In addition to the breast shield, which is in direct contact with the chest, other parts of the product should also meet the user's individual needs. Meier et al. (2016) summed up three bases for choosing a breastpumping device:

- The comparison of breastfeeding efficiency between breastfeeding and breastfeeding
- The degree of dependence on breast pumping device (minimal, partial, and complete)
- The stage of using the breast pump

The diversity of pumping motors not only has different performances in the effect and efficiency of breast pumping but also plays a vital role in the degree of freedom and portability. Motors launched by various brands have various types, including size and energy supply. Among them, the size of the devices is accompanied by the number of functions. For example, the motor from Spectra and the medical-grade version from Medela can be adjusted individually for the strength and speed of pumping. However, although there are more limitations in function when the size of the motor is smaller, it is accompanied by a high degree of freedom and easy portability.

2.1.4. Key takeaways

- Presently, the strategies adopted in the market to meet the needs of different individuals are mainly to provide different sizes for consumers to choose from, rather than tailor-made. The one-size-fit-all cushion used by Philips is also difficult to meet all size or performance requirements to a certain extent.

- Different product forms have their own advantages and suitable groups. It is difficult for a single product to satisfy all levels of needs. Although the new wearable pump can meet the needs of function and freedom at the same time, its advantages are also reflected in the price. What users may need to reflect on is what are their own needs? Do they really need high-performance, multi-functional advanced products?

2.3. User experience of pumping journey

To explore the possibility of applying the personalisation design method to breast pumping products, it is crucial to understand the strategy's rationale and the current market application. This section presents the results of reviewing literature regarding the ultra-personalisation to explore the following research questions.

How to provide a more personalised breast pumping experience for mothers?

- What are the explicit and implicit needs regarding breast pumping activities?
- What are the shared but unique needs of mothers?
- What personalised offerings could provide mothers with a better pumping experience?
- What are the customer's potential needs during breast pumping?
- What are the attitudes, concerns, and emotions involved in pregnant women and new moms in a breast pumping journey?
- How do moms currently get pumping devices that match their needs?
- What are the scenarios regarding acquiring a pump device?
- What does Philips or other brands currently provide that helps mothers to get products that fit their needs?
- What are the key service moments in an envisioned end-to-end experience?
- What new business models could emerge from ultra-personalised products/ services in the context of breast pumping?
- What are attitudes towards personalised and tailored solutions of breast pump users and what would drive preference over mass-produced offerings?

2.3.1. User research approach—Contextmapping

In order to gain a deep understanding of the latent needs of the breast pumping activity from the user's perspective, the contextmapping method is used **(Fig.2.15)**. Contextmapping consists of five main steps, including participant recruitment, sensitizing, interview, generative session, and data analysis, as shown in **Fig.2.16**.

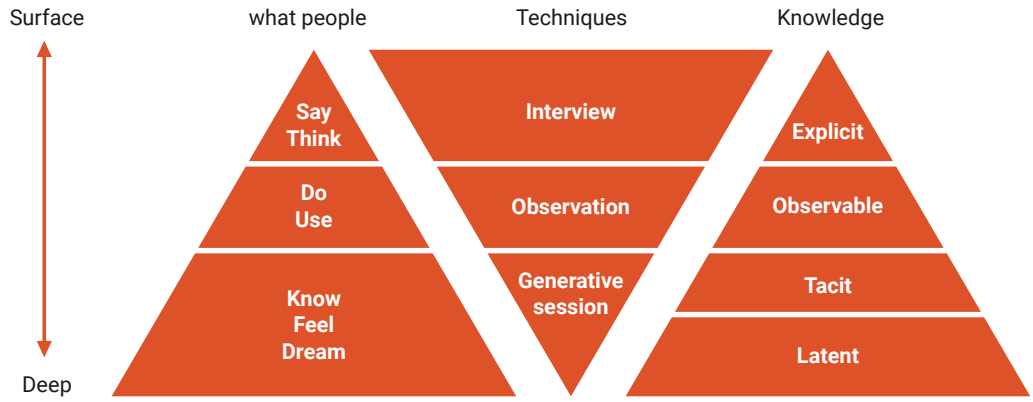


Fig.2.15 *Different levels of knowledge about experience are accessed by different techniques. (Sleeswijk Visser et al., 2005)*

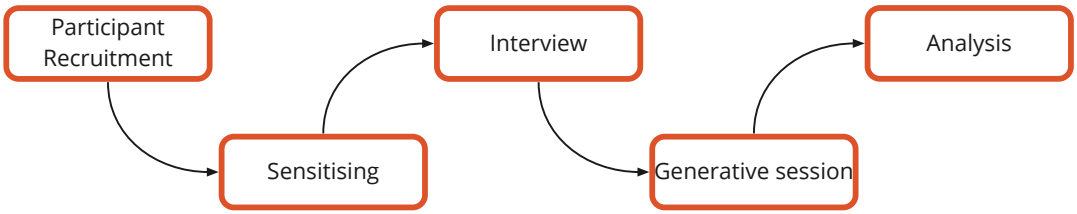


Fig.2.16 *The procedure of generative design research*

Participant recruitment

For recruiting, mothers with diverse situations (e.g., ages, numbers of babies, nationalities, working conditions, etc. As shown in **Table.2.17**), mothers were invited to explore the problem space at the early phase of research, but the requirement is to have experience with using a breast pump. The recruiting poster **(see appendix C)** was made and shared through the local mother community platform, in this case, Facebook and Whatapps. In the end, a total of nine mothers from eight different countries were recruited, ranging in age from 27 to 43 years old.

Age	Nationality	Numbers of baby	Pumping duration
43	Venezuelan	1	18 months
40	Spanish	2	12/14 months
39	Spanish	2	30/10 months
33	Italian	1	8 months
33	South Korean	1	5 months (on-going)
41	Dutch/Mexican	2	8/10 months
32	Dutch	2	6 months, ongoing since 7 months
27	Taiwan	1	5 months

Table.2.17 *Overview of participants*

Sensitising booklet

In order to gain the most insightful content, a sensitising booklet, both physical and digital **[Fig.2.18]** was made and given to participants one week in advance to better prepare them for the interview. Since some mothers have already stopped pumping, it is necessary to help them recall the memory by raising their selective attention regarding breast pumping activities. Besides, the content in the booklet from mothers was further used as material during the interview.

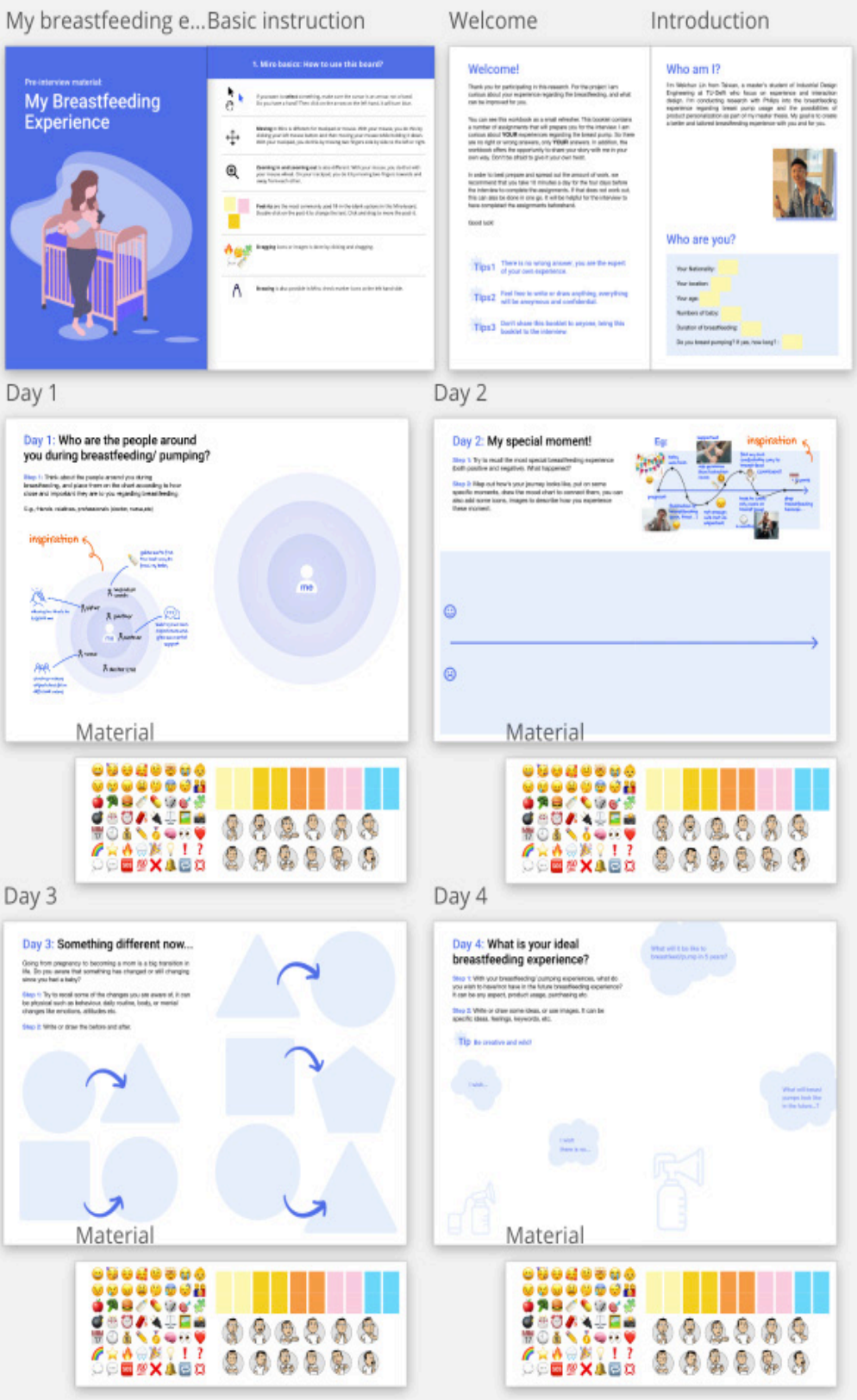


Fig.2.18 *Sensitizing booklet (Digital version: Miro)* ***(Appendix D)***

User interview

Due to the sensitivity of the topic, the interviews were held individually. And based on the mother's preference, the interviews took place both in-person and online. To better explore the problem space, Interviews were conducted in a semi-structured way. Combined with the generative session, in the last part of the interview, part of the sensitising booklet was used to co-create with mothers. **[Fig.2.19]**

Fig.2.19 *User interview analysis*

Analysis

The interview data were analyzed by selecting interesting quotes from the transcripts and making them into statement cards, which include quotes, interpretation, and an abstract title that are able to indicate the concept of the card. Then, statement cards were clustered in order to derive latent needs from the mother's explicit needs. **[Fig.2.20/2.21]**

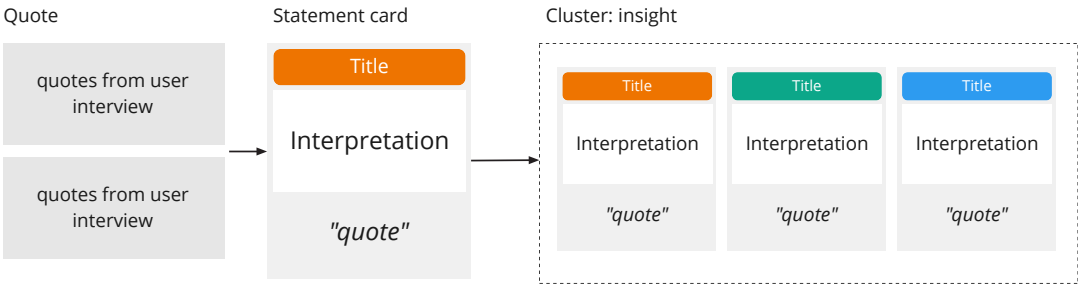


Fig.2.20 *User interview analysis method*

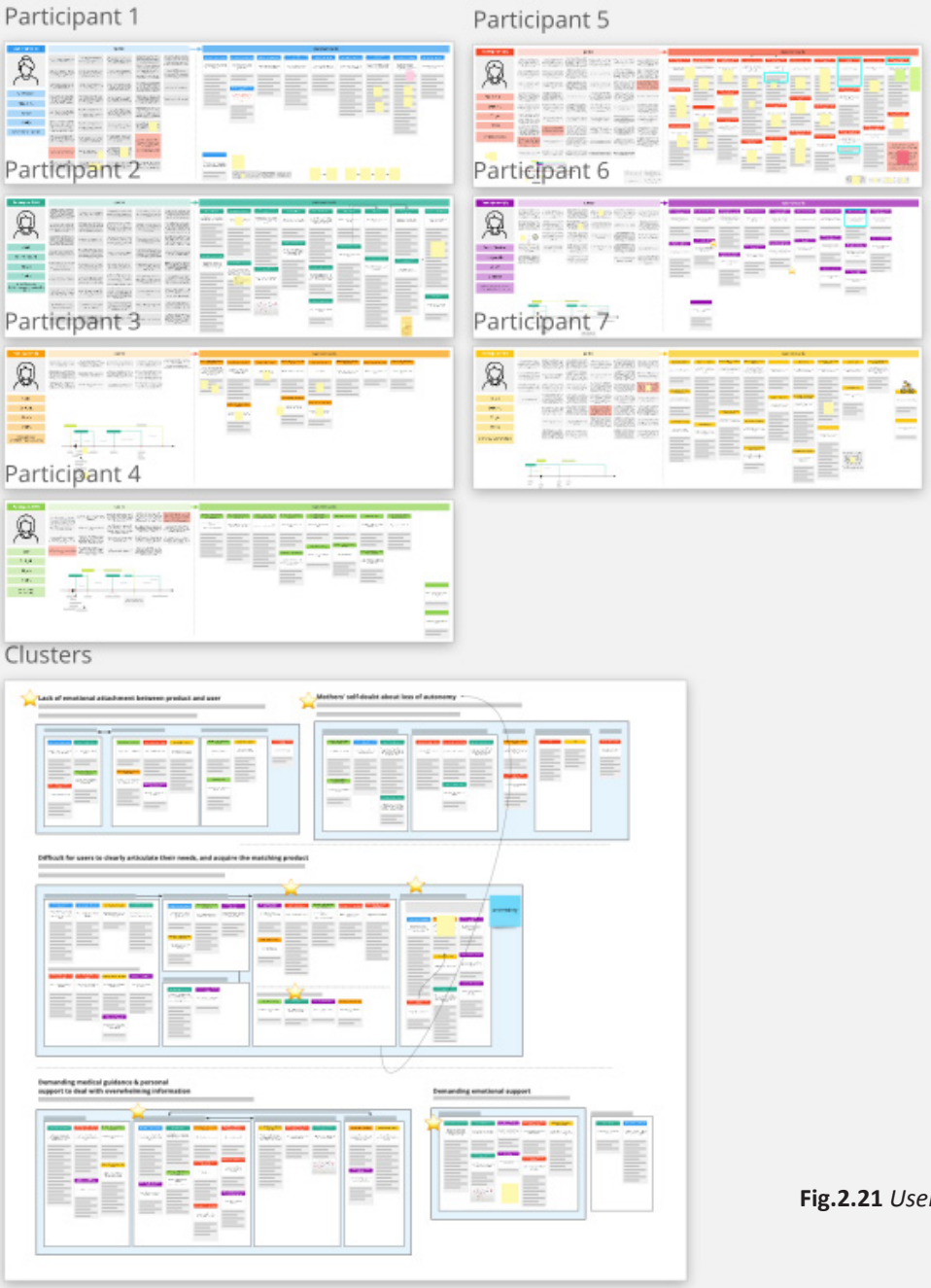


Fig.2.21 *User interviews analysis*

Five main insights were identified, listed below:

1. Lack of emotional attachment between product and user
2. Difficult for users to clearly articulate product demands
3. Relying on medical guidance & personal support to deal with overwhelming and unfamiliar information
4. Requiring emotional support
5. Losing autonomy and self-doubting

2.3.2. Lack of emotional attachment between product and user

Breast pumps are used as a substitute for babies to help mothers collect and release breast milk when they cannot breastfeed, which should create a certain emotional attachment to the product. According to Schifferstein et al. (2008), frequently used products may give consumers a sense of familiarity, which increases product attachment indirectly. However, no apparent emotional attachment was found between mothers and breast pumps from interviews, despite their prolonged, frequent and intimate use of the product. Therefore, breast pumping can be considered a task-oriented activity for moms.

"It is not like… I like or dislike pumping. The pumping is just like the only thing that you need to do, like you need to put a coat to go outside because otherwise you are cold."—P3

"I think that the pumping is not something nice, something that you relax, but you have to do it."—P4

"I think it's something that you do because it's needed. Well, it's not really that you look forward to it. So yeah. You just have to get it done."—P6

In contrast, with the same goal of giving enough nutrition to the baby, most moms enjoy breastfeeding. Since feeding allows them to develop a strong bond with their baby through the feeding process, such as intimate skin contact. Many mothers are even frustrated at the moment of stopping breastfeeding their babies.

"Do you think that it (stop feeding) was a release? Yeah. I was thinking that, but at the same time, I got a little depressed because I wasn't ready to stop breastfeeding."—P1

"I really liked the breastfeeding. When my baby stopped to want my breast and she prefer the bottles. So you have to use the pump, it was very painful, like emotionally painful for me, because I really love that kind of connection."—P4

Although breast pumps actually play an important and long-term role in a mother's post-partum care, the lack of a breastfeeding-like interaction for mothers can lead to a negative experience by making them feel like they are just a milk-producing machine.

"...there is this feeling of you really feeling like a cow because it's not a pleasant moment. At least breastfeeding was a moment of intimacy with the baby."—P2

2.3.3. Difficult for mothers to clearly articulate their product demands

Unlike buying a pair of shoes, new moms have no prior experience with nursing activities. Without any relevant knowledge, it is difficult for mothers to translate their feeding goals into specific needs to get the matching product. In other words, it is challenging for new mothers to choose pumping devices according to their own needs.

"But for, thinking about these things or personalized products. You need to have information. What is coming?...you need to know what is going on with pumping, but you don't have any information."—P1

"I decide I am going to be breastfeeding, okay. What's that imply?"—P1

Moreover, little experience and information about the product could also make it difficult to identify the product differences. Since breast pumps come in many different variants (as described in **section 2.2.2**), such as electric or manual, single or double pumps, motor strength, etc., these variations can easily lead to confusion for mothers. Therefore it was easier and common for mothers to follow others' recommendations, which is not actually buying products based on their own needs.

"I look different pumping things on the internet, all looks the same for me with different colours."—P1

"I understand we still able to share our opinions, thoughts with friends, but they still have their own view, their own perspective, but experts are dealing with customers, a lot of customers that have different needs. And I believe they have sort of a guideline or things like that…"—P5

"I heard experiences from other friends. They told me like…this brand is the best. It works really well. And they did tell me to get a double electric. So then I looked for those characteristics, based on personal experience of other people."—P6

Even after the product is acquired, it is still challenging to tell whether the product is suitable or not based on own experience. Some mothers need professional confirmation because they may mistake unsuitable products for pain caused by early breast sensitivity.

"...the problem is, it is really hard to define what is a problem for mothers themselves. Even though I'm experiencing it…of course we know there is a lot of room to improve, But we don't know what to ask. Do I have to ask like, is there a better part or a smaller or bigger one? I don't know if it's the right size for me…"—P5

"...when we were at the hospital, it was nurses that said like, 'no the size is not good because then it can be painful' "—P6

And last but not least, breastfeeding and pumping activities may change under different circumstances, resulting in dynamic product demand. Since breastfeeding can take up to two years or more from the start to weaning (Geddes & Perrella, 2019), the needs of a single individual in terms of breastfeeding behaviour will continue to change. For example, product size differences due to changes in body shape (Cox et al., 1999) (Infant and Young Child Feeding, 2009) (Kent et al., 1999), functional needs vary due to different breastfeeding phases, breast pump dependency (Meier et al., 2016), and scenarios (e.g., back to work), shifts in attitudes and emotions towards breastfeeding (Kronborg et al., 2015). In addition, the condition of the baby needs to be considered, including the baby's birth condition, drinking condition, milk production, and preference for breastfeeding and bottle feeding may vary at different stages, and there may also be distinctions between babies.

"I didn't care about anything regarding breastfeeding before giving birth. I only focused on what my delivery would be like. I didn't expect the breastfeeding would be really the hardest thing."—P5

"I was not expecting to do it (buy a breast pump) so soon, I was expecting to do it later when I went to work"—P3

"...at that age (premature baby) they can not breastfeed themselves. So they get tube feeding. So I pumped from day one…"—P7

"I don't think you can measure it in advance, because the breast changes when the milk comes"—P6

"my first daughter, she was born very early, she was born at 33 weeks. So she was not able to swap and swallow….She was using a feeding tube...and then it was completely different situation...with the second child, you have to breastfeed right away…"—P6

However, the price of a breast pump is relatively high. Therefore it is unlikely for every mother to get the one that fits them or another product when they find the product is not fitting them. In addition to costs, and contextual limitations such as the accessibility of product information, insurance subsidies can also constrain users to acquire products that best meet their needs.

"I do think pumps are very expensive. I do think it's a bit ridiculous because I think moms of every type of income should be able to afford a normal pump...Luckily I got it from my sister, but I think if I would've had to buy one myself, I may have not bought this one because it's too expensive."—P7

"information from other people that I know, that other moms that have used, but also it was about the price as well"—P3

"in the Netherlands, which I had almost seven months of maternity leave. And then I didn't then need to pump as much because she went back to daycare...it was very different"—P2

2.3.4. Relying on medical guidance & personal support

Lack of relevant experience, along with the physical and mental vulnerability after childbirth, mothers rely heavily on the support and assistance of professional medical experts. Despite the overwhelming amount of information about newborn care, mothers are able to learn to breastfeed and pump confidently surrounded by physicians, nurses, lactation specialists in the hospital, and Kraamzorg (who provides home care for postpartum women in the Netherlands), with their ongoing and close guidance. Lamontagne et al. (2008) discovered that the physical and mental support from health professionals and physicians at the breastfeeding clinic was recognized as the element that had the greatest beneficial impact on the nursing experience.

"When I was in the hospital, they teach you how to latch, how well maybe you should be latching. And they teach you some things, which is very nice because you are surrounded with healthcare providers, you can ask questions and everything, but the reality is, it's just one day and you don't even have your milk yet."—P2

"And I was totally on my own. I couldn't find support. The paediatrician is the only healthcare provider that you see because as a mom you don't see any healthcare provider after one month and a half after giving birth. So no one is following you."—P2

"during the whole process, there was like a lactation consultant and the whole team of nurses that were really very supportive"—P6

"The lactation specialist came just when she was born, just to tell me, okay, this is the pump. This is how you need to use it. And it, yeah, it was very, just simple instructions. Yeah. And the nurses helped to figure out like how to do it cleverly and they would suggest something."—P7

2.3.5. Losing autonomy and self-doubting

With the birth of a new life, most people only focus on the baby, including the mothers themselves; therefore, mothers' own needs and feelings are often ignored. In addition, too much goodwill from others, including parenting advice and praise for breast milk, can easily bring enormous pressure and mental burden to mothers. In this case, it is easy for mothers to lose their autonomy as individuals and thus self-doubt.

Even though breastfeeding has been shown to have a positive impact on the development of the child (Lyons et al., 2020), the overvaluation of its value has resulted in invisible social pressure on the mother due to the more challenging parts were not addressed (Lamontagne et al., 2008).

"there is a social pressure for the woman breastfeeding a kid. Like, if you don't do it, you are a very bad woman… my mother was judging me, like I'm not doing my job. I don't have enough milk, everything's my fault. That was very stressful..."—P1

"You are a woman, you are a milk producer...it's on your responsibility. And everybody's like, 'oh, how beautiful it is to be a mom. It's so nice.' But it's so intense, and sometimes you lose yourself as a woman."—P2

"Everybody has an opinion, like please, it's this world of everybody knows what is best for your baby or for yourself that is sometimes creates a lot of frustrations."—P2

In addition to external social pressure, mothers themselves will also have self-examination because of poor breastfeeding or pumping performance. As shown in the interview, mothers are more likely to question themselves when something goes wrong regarding milk production.

"Sometimes I was not feeling comfortable with the amount I was pumping out and I was not sure if it was because of me or because of how I was using the pump. Not sure I use the product right or not."—P3

"it(breast pumping) makes the breast milk measurable. Like we can also see like, oh, the 50 or 100 CC comes out. It's more than yesterday or not. But it's also become a very obsessive standard that I have to follow up, and worries come to me when I can't produce as much as yesterday"—P5

To sum up, the current infant-centred breastfeeding phenomenon may directly or indirectly lead to mothers being deprived of their autonomy as individuals or women.

"suddenly you need to put so much time only in the baby, it's like, oh, what am I? So, could pumping or breastfeeding, not only being around maternity, but can we enhance something else? in terms of being a woman"—P2

"During the power pumping. With the supporting bra, I was able to do house working and house chores… But it is really weird to wander around my house while wearing a pump. So I liked to do it just on my bed, even if I am hands-free, and do whatever I want to do."—P5

2.3.6. Requiring emotional support

Mothers feel lonely and isolated after giving birth due to a lack of people around them who have similar experiences. They want attention and support from others and are eager to interact and share personal experiences about raising children.

"I was very lost because it wasn't an issue that anyone around me had before. So it took me really a while to find a community. I'll say it was my community that teach me how to try to breastfeed the baby in a different position."—P2

"I could share it with my colleagues at work. And that was very nice to say, okay, we keep motivated. Let's do it for our babies...it was nice to have someone that was on the same thing."—P2

"if you asked me like the, who helped me a lot? they are anonymous, the mother community. There is a sort of like the community site."—P5

I'm going to give up...but she (lactation coach) then call me and said like, 'oh, maybe you can try this...' And then I would get to a point where like, I'm giving up, I'm not doing it. And then she'd be like, again. And eventually, we did it."—P7

2.3.7. Conclusion of user interview

In conclusion, the latent needs of mothers in breast pumping activities are more at the perceptual level than the product or function itself. Through in-depth user interviews, it was found that although mothers have many negative comments about breast pumping, most of them revolve around breast pump rather than itself. Among them, the support that new mothers need accounts for a large part, which can be found in two parts, as shown in **Fig.2.22**.

Firstly, it is the early stage of breast pumping **[Frame 1 marked in Fig.2.22]**, when mothers are mostly isolated and helpless. Without the assistance of medical staff, most mothers rely on themselves to learn, practice and nurture their children, raising the need to provide initial support regarding the pumping activities and related product information.

Secondly, after experiencing frequent and long-term pumping activities **[Frame 2 marked in Fig.2.22]**, mothers are under a huge physical and mental burden. Because mothers focus too much on their baby's needs and ignore their own feelings, which can lead to loss of autonomy as an individual and as a woman during the long-term breastfeeding journey. This demonstrates the demands for emotional support and cares for mothers themselves in the following pumping journey.

Therefore, the abstract goal of the project can be concluded as providing support for new mothers in their pumping journey. And the latent needs can be set as design requirements for the whole journey.

Breast pumping journey of new mothers

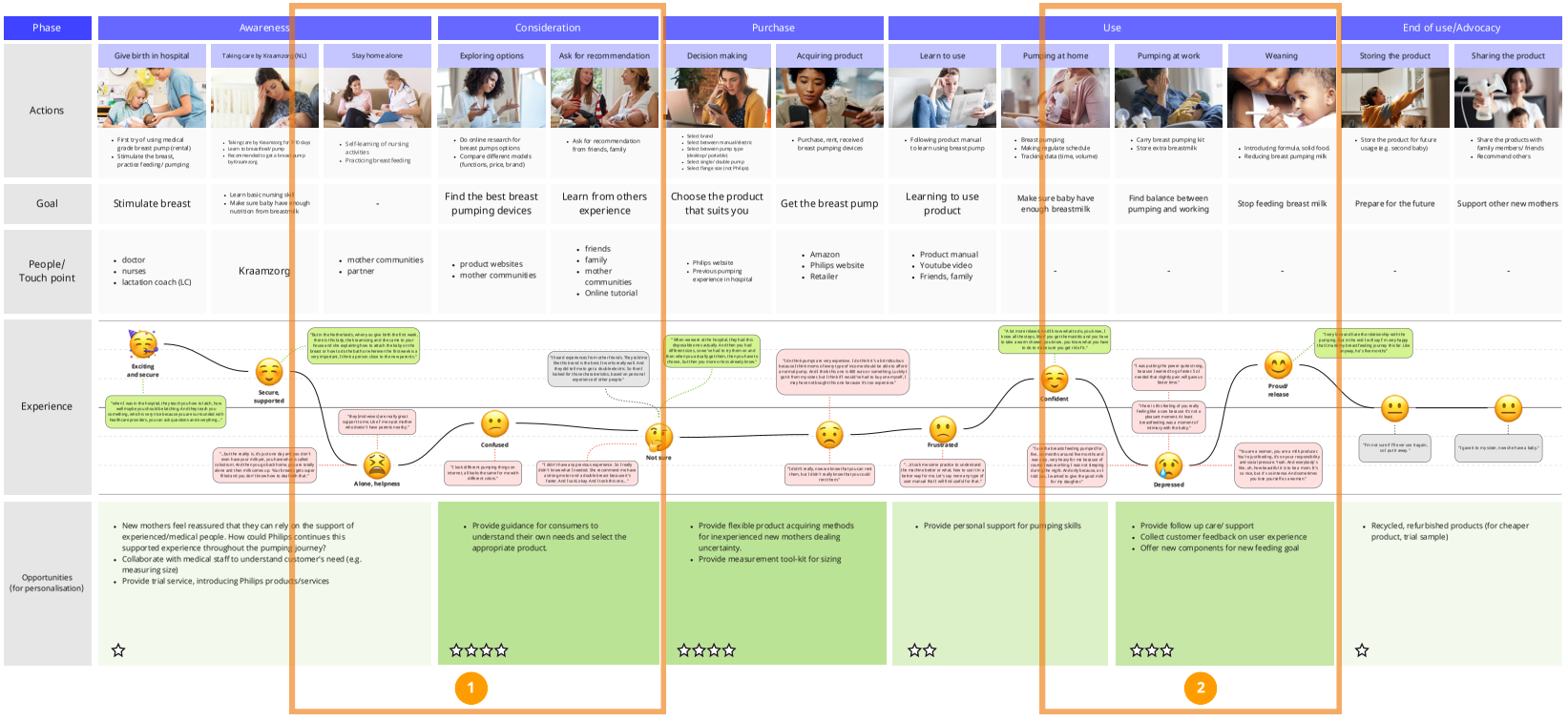


Fig.2.22 *Breast pumping journey* ***(appendix E)***

2.4. Conclusion

To summarise the previous research, breastfeeding and pumping is a complex behaviour, and there will be corresponding product needs according to each individual's situation. However, changing needs combined with a lack of relevant experience make it difficult to provide a perfectly matched breast pumping product to the user at the outset. Therefore, when applying UPPS to breast pumps, it should not only provide consumers with a perfect fit when they buy the product. Ideally, it should also work closely with customers to adapt to their changing needs and continually offer more personalized products or services to meet their individual needs.

The ideal personalised pumping journey **[Fig.2.23]** should include two parts, the initial product customisation and the subsequent personalisation service. First, the user performs product customization and body measurements to input initial product requirements and user profiles. Second, users will evaluate the customized product after using it to understand whether the initial settings meet their needs. Such a feedback loop allows users to continuously review their breast pumping experience and adjust feeding goals as needs change. In addition to the user experience of the product itself, under such a service, the message it conveys to the user is more valuable; that is, the negative breastfeeding and pumping experience is not a mistake they made.

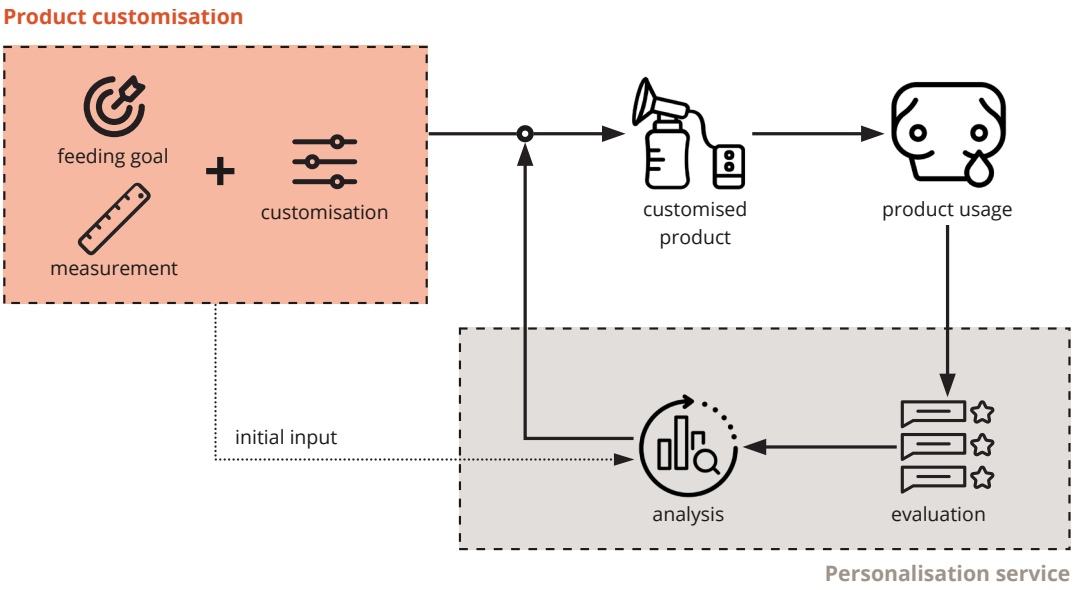


Fig.2.23 *UPPS: Product customisation and personalisation service*

However, due to time constraints, this project will only be designed for the part of Product customisation and put forward discussions for the follow-up research and development of personalisation service.

2.4.1. Key takeaways of research

1. Participating in co-creation is inherently challenging for those from a non-design background, but it is even more pronounced when faced with a breast pump. In addition to the lack of relevant experience of new mothers, the variability and unpredictability of breast pumping needs are also factors that increase the difficulty.

2. In the case of breast pumping, new mothers mostly know their feeding goals (i.e. explicit needs: yield, speed, mobility, and comfort) despite their lack of relevant experience. The problem is that they have difficulty translating it into the corresponding product requirements. Therefore, in the co-creation, it is necessary to show them the benefits of personalization in life rather than product features to convey the strategy's value.

3. In the early postpartum period, mothers rely heavily on professional support and guidance due to physical, mental and information overload. Whether in nursing, pumping or product purchasing, most of them prefer to get clear and simple instructions that they can easily execute or choose.

4. Customising product for pumping devices might provide a opportunity for inexperience mothers to explore and understand their needs through the co-creation process at the early postpartum period.

5. Participating in the product customisation process may enhance the user's perceived fit for using the product and establish an attachment between the user and the product.

03.DEFINE

By analysing and integrating the research information from the literature review regarding personalisation strategies, product characteristics, and user research about new mothers' needs, the design brief was created and described in this chapter to serve as the starting point for the next phase, Design. Provide guidance and demonstrate the main focus in the design process to create the final solution.

3.1. Problem definition

The customer co-creation required in the customisation and personalisation process is challenging for new mothers who are inexperienced in breast pumping. Besides, pumping activities may change under different circumstances, resulting in dynamic product demand.

These factors negatively influence the possibilities for new moms to acquire the offerings that truly meet their individual functional and affective needs.

- **Dynamic product demand:** Due to the complexity of maternal care, including changes in body shape, feeding phases, breast pump dependency, as well as baby delivery status, preference for breast milk, etc. This has resulted in the inadequacy of a single product offered initially to meet the changing needs of the pumping journey.

- **Affective needs:** To shift more attention back to the mother, regaining their individual autonomy. Prioritise the mother's experience of pumping activities instead of milk production goal.

3.2. Design goal

To design an informative and supportive service that motivates new mothers to engage in the co-creation process of tailoring breast pumps while empowering them to be aware of and value their own needs.

- The design requirements, i.e. supportive, and informative, analysed from interviews and research, are designed to meet the user's implicit needs at the experience level and carry through the entire pumping journey. However, the explicit needs of users obtained in the generative research stage are used as design cases in the personalisation process of this project to demonstrate how to achieve the design goals.

- In this study, the user's explicit needs for the product were mostly functional, such as higher production, better mobility, shorter pumping time, and a more comfortable pumping experience. Therefore, components that represent the above functions and experiences, flange, motor (portable, desktop), single or double pump, and size, were selected as customization options. Since breast pumping is a relatively private activity, personalisation in terms of product styling and aesthetics will not be discussed within this project's focus but instead on the feeding goals of the mother's pumping experience.

3.3. Key project deliverables

The design deliverables will be (mainly focus on the product customisation part, which included the goal setting and body measurement) divided into two parts, namely product customisation and personalisation service. Firstly, in terms of interaction, supporting and guiding consumers to translate their feeding goal into product demands, and co-create products that fit them through customised processes, including a customisation interface and self-measurement toolkit. Secondly, in the product-service aspect, a personalisation service that interacts with users to gather data and deliver personalised offerings will be developed, along with a business model that allows customers to obtain offerings in a more flexible manner.

Design requirement for Product Customisation

- **Supportive:** Extend the supportive experience mothers have from medical experts to the whole pumping journey. Empower mothers to confidently participate in the co-creation process of product customization.

- **Informative:** Demonstrate the benefits of acquiring customised products and personalised support, that would drive customers' preference over mass-produced offerings.

04.DESIGN

Based on the design goals and requirements defined in the previous chapter, this chapter describes the process, outcome, and user evaluation of developing final design solutions. The design process includes ideation, conceptualization, rapid user testing, evaluation and iterations.

4.1. Ideation

First, a certain number of ideas were generated through group and individual ideation. Several potential design directions that meet the design requirements and are feasible were summarized through clustering and selection. These ideas are then integrated into a more complete concept to provide a prototype for user testing with users to get feedback for design iterations.

4.1.1. Brainstorming

The design phase begins with ideation based on the design requirements defined in the research phase, where quantity is emphasized over quality in an effort to generate as many ideas as possible (Heijne & der, 2019). In order to achieve the design goal, the session is divided into two parts, namely, the process of product customization and the interaction of body measurement.

The group brainstorming was held online **[Fig.4.1]**, and three IDE master students were invited, while the author played the role of participant and facilitator simultaneously. In addition, the meeting is conducted through the following four steps, which guide the participants step by step:

1. Icebreaker
2. Problem introduction
3. Ideation with “How-Tos” methods (Boeijen et al., 2017)
4. Idea sharing and clustering

How-Tos questions

How to measure mother’s breast (nipple and areola)?

- How to help mothers measure their nipple/breast?
- How to help moms measure their nipples themselves?

How to support user co-create their product?

- How to raised mothers’ awareness of their own product demands?
- How to demonstrate product benefits during the customisation?

After the group session, self ideation was conducted by author to generate more ideas base on the previous results while integrated the ideas into more complete design (concept).

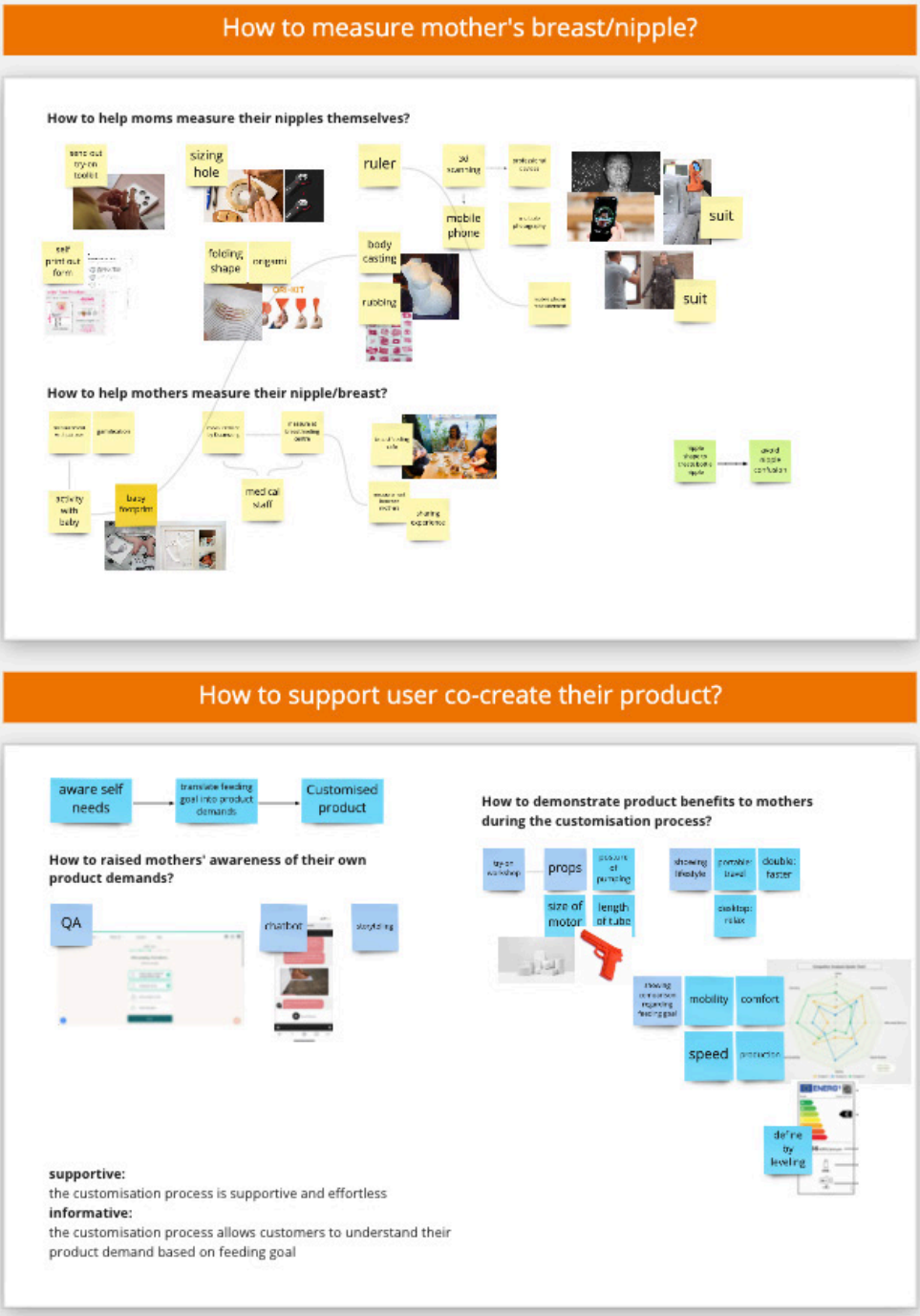


Fig.4.1 *Brainstorming session*

4.2. Preliminary concept

Some preliminary concepts were proposed through the integration of some ideas, which can be divided into two parts: the interaction of body measurement and the customization process of the product. The proposed concept is quickly tested with users through the story-telling method and graphics to provide the direction for subsequent iterative development.

4.2.1. Product customisation

- Customize by answering questions
- Ranking components by pumping expectation

- **Customize by answering questions**

Lack of breastfeeding experience can be challenging for new mothers to choose and customise a breast pump. Therefore, the service can customise and recommend suitable product configurations for new mothers by asking simple questions to understand the current breastfeeding status and consumers' personal needs. The idea comes from the fact that most consumers rely on recommendations from other mothers to buy breast pumping equipment. Rather than following the experience of a single individual, consumers may be able to understand what products are more suitable for them through the company's expertise. **[Fig.4.2]**

Fig.4.2 *Question and answer*

"I think this will be easier…sometime you really need to take lots of time doing research of different products, but I don't know, I just go ask friends"

"normally we let mothers to try on different product, but we first start with asking simple questions, you need to know their situation first"–breastfeeding center

• Ranking components by pumping expectation

Due to new mothers having difficulty distinguishing the functional differences between products, they cannot clearly understand suction, product form, etc. However, mothers know their expectations, such as milk production, mobility, comfort, and pumping duration. Therefore, these four indicators are used to score different components to guide consumers in choosing the product configuration that suits them. **[Fig.4.3]**

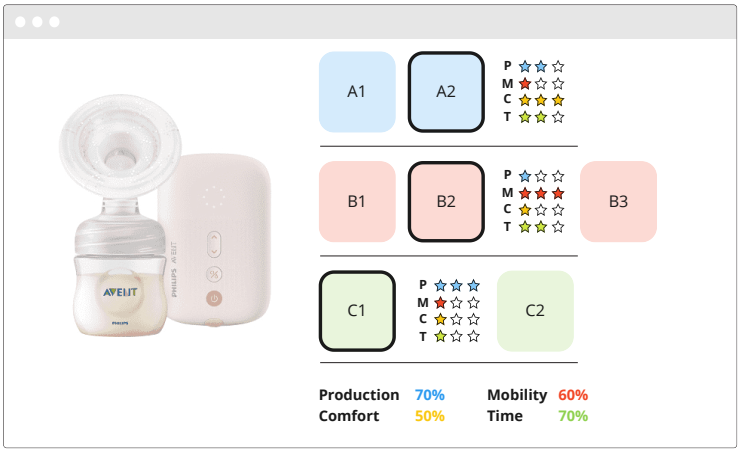


Fig.4.3 *Ranking components*

"good to see the pro and con, it's clear"

"What people might do or expect is to choose the highest point of each part, but it seems impossible..."

However, in testing with users, scoring individual components can be confusing and meaningless. What consumers are concerned with is how the end result matches their needs. It might be more valuable and understandable to score the final configuration. **[Fig.4.4]**

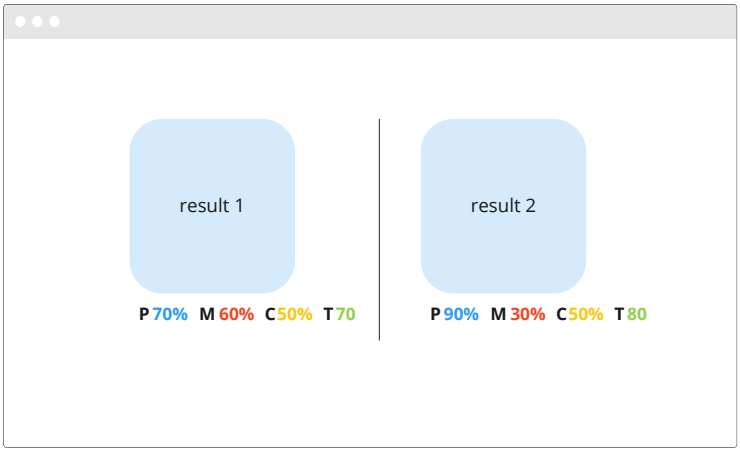


Fig.4.3 *Ranking results*

4.2.2. Measuring Interaction

Instead of start designing measuring toolkit directly, the ideation first focus on interactions. Since we found from the user research that new mother rely on support. Therefore the ideation also explore the possibilities of involving other people in the measuring process. Four interactive concepts for body measurement are proposed, which is self-measurement, measuring by close people, by medical practitioner, by people with similar experience **[Fig.4.5]**. Therefore few interaction concepts was proposed as list below:

- Self-measurement
- Measuring by/with partner
- Measuring by medical practitioners (Kraamzorg, mid-wives)
- Measuring with mothers in breastfeeding centre

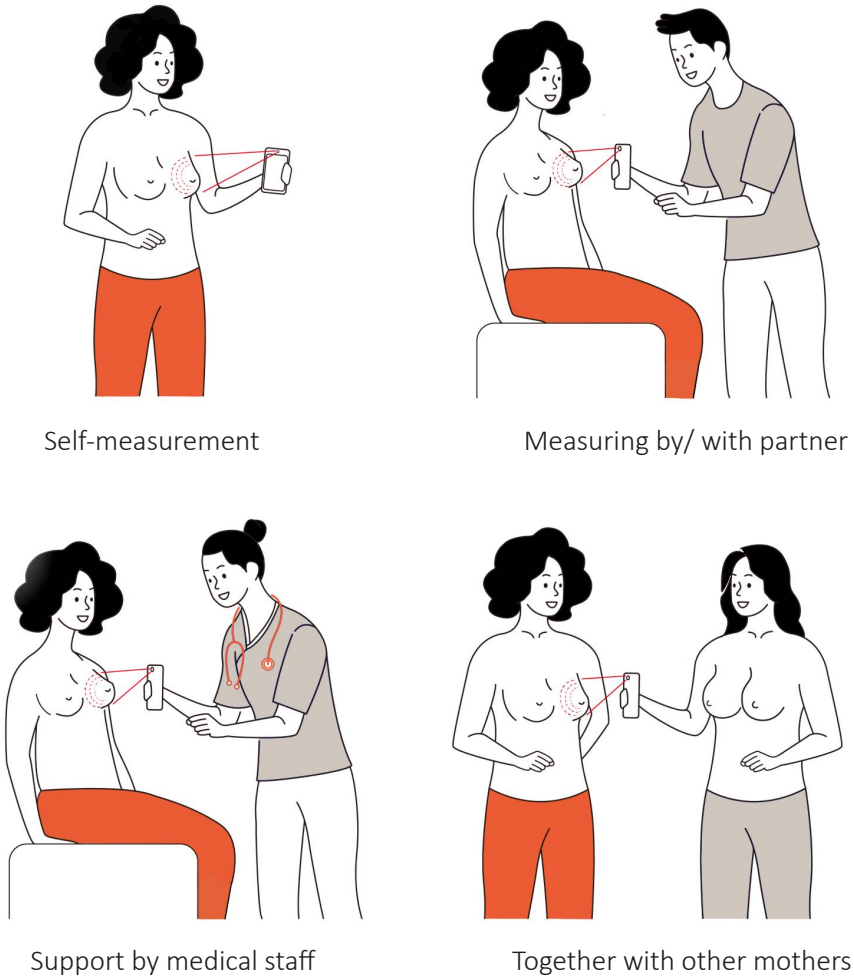


Fig.4.5 *Four different interactions of measuring body*

• Self-measurement

The users themselves operate the measuring tools provided by the company. In addition to reducing the need to move, providing users with self-measurement tools also gives mothers more control **[Fig.4.6]**. Under the condition that the user can choose the measurement time and location, the user can measure in the most comfortable condition. In particular, the breast is a relatively private body part, and the measurement process may cause discomfort to the person being measured. As argued by Mironcika et al. (2020), enabling users to measure themselves may reduce the discomfort of being measured by others. Therefore, providing a measuring tool that mothers can efficiently operate may be the most effortless way to complete the measurement task. In addition, the research of Eklund, A. (2016) pointed out that the current 3D scanning technology on mobile phones has gradually matured and has the ability to capture accurate 3D images in a low-cost way for wearable devices.

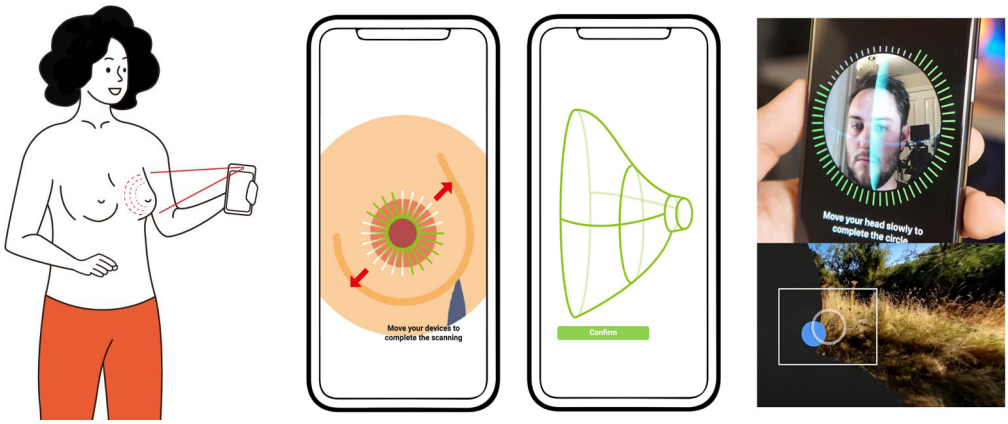


Fig.4.6 *Self-measurement*

"This is probably easier for me since I can do it at home, but I'm not sure if I can do this myself..."

"I think I would prefer this, it's not that I'm afraid of being seen by other people, but I can do it myself anytime I want."

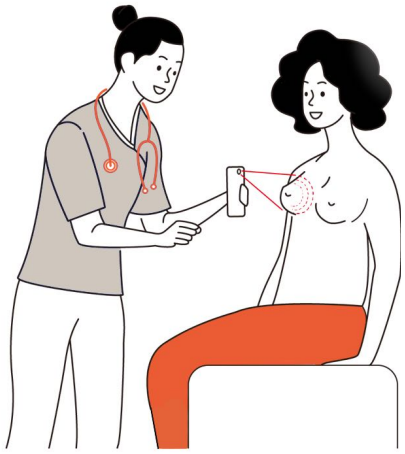
"What I am more concerned about is that I want to make this more efficient, and I don't want to have another exploration on how to do it. Either do it myself or have a professional do it for me as having other moms or partners might make this more complicated."

- **Measured by medical staff (professional) practitioner**

Previous user research found that new mothers rely heavily on the early stages' assistance and support of medical practitioners. Therefore, outsourcing the measurement work to medical practitioners (e.g. kraamzorg, midwife, lactation specialist) may reduce mothers' effort in learning and operating measurement. Moreover, medical personnel may have the opportunity to use more accurate measuring instruments to avoid errors. Combined with the professional identity of the medical staff, it may also reduce mothers' rejection of body measurements. In addition to measuring activities, such interactions provide opportunities for medical staff to care for and check new mothers' health and breastfeeding conditions.

"I don't want my boobs scanned, I think if the nurse would do it (breast measurement) I'll be okay. maybe if you could get something simple that you can measure yourself."

"If it was a professional I would trust them to do this. Yes… but having a professional measure my body feels like a lot of effort if you just want to buy a product… And being scanned by them will link me to some disease…like something serious happened"



"it would be good because she knows your condition and have professional experience."

"Having a medical professional perform the measurements may support the mother, but it also needs to be considered from the medical professional's perspective. What's the benefit of outsourcing the measuring service to medical staff such as kraamzorg and midwives? Can the data help them do their job more precisely in their service?"–Philips medical specialist

- **Measured by/with partner (close people)**

The breast pump is a task-oriented tool for many mothers, leaving the user with no emotional connection. Therefore, measuring and personalising the product with an intimate partner may enhance the user's connection to the pump and thus improve the experience.

The concept was inspired by the foot stamping of babies and the belly casting of pregnant women. As shown in the **[Fig.4.8]**, through hand-made activities with family, in addition to the process, the produced objects also carry precious memories.

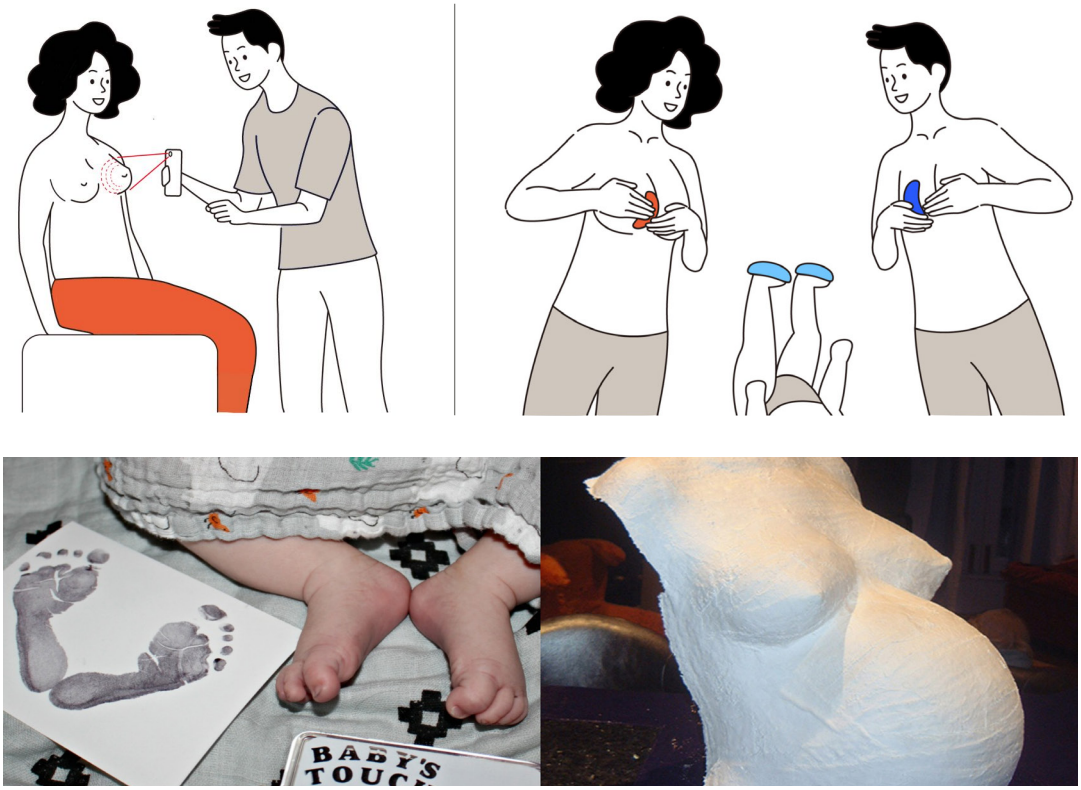


Fig.4.8 *Foot stamping and belly casting*

Fig.4.9 *Shaving together with family*

This concept evolved from the initial measurement performed by the partner to measuring with the partner and baby. A similar interaction is that some parents accompany a child undergoing chemotherapy to have their head shaved to enhance empathy for the child and create a closer bond with the child. Moreover, family participation in the measurement process not only co-creating meaningful memories but also encourage partners to empathize with the role of mothers. **[Fig.4.9]**

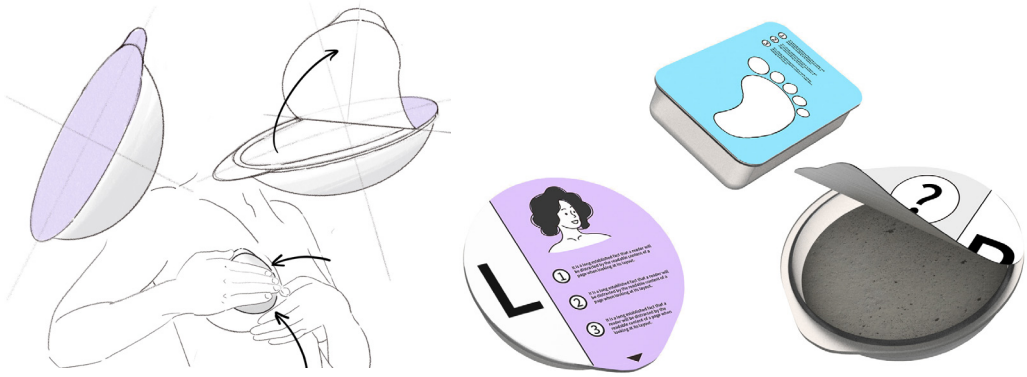


Fig.4.10 *Sketch of body casting kit*

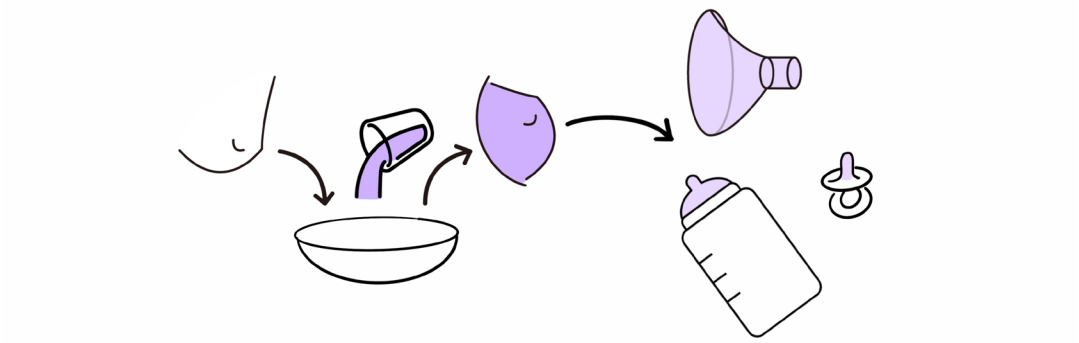


Fig.4.11 *Steps of body casting for pumping products*

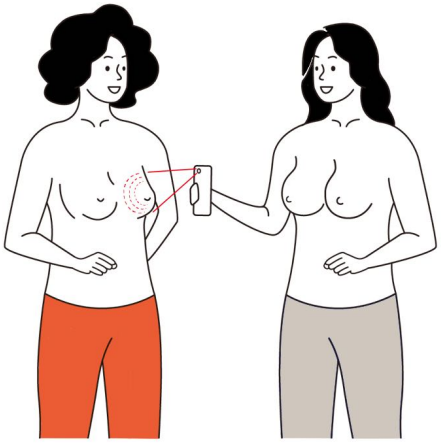
"I think it would be really fun…because when your baby grows up you really want to do a lot with him and create some memories."

"When I was feeding my baby, I always keep my breast clean and dry as possible…I will not put that on my breast…"

It felt fun, but also a bit complicated, and there seemed to be a lot of steps to get to the final product.

- **Measuring with mothers in breastfeeding center**

Local breastfeeding centres play a vital role for many mothers, providing breastfeeding-related information, guidance and a place for mothers to exchange experiences. Use activities like ***breastfeeding cafes*** to conduct body measurement and product customization, providing mothers with an engaging measurement experience in addition to personalizing products.



"I don't want my boobs to be seen by unfamiliar strangers, even if they are moms as well…it feels awkward…maybe it's ok with my mom or friends I know, but it still feels weird."

4.2.3. Conclusion

The rapid user tests provide design direction and improvement points for the next stage of design development. On this basis, higher-fidelity prototypes were created for subsequent more complete user evaluation.

Product customisation

Unlike the traditional form of customization, the question and answer method are used to understand consumers and recommend personalized product configurations, which can reduce the confusion of users when choosing. However, this move may lose the trial and error exploration to understand their own needs. Therefore the association of input and output needs to be informed. In addition, scoring different expectations on different parts can quickly help consumers identify product needs. However, building configurations with different strengths can confuse users, so the final result should be scored rather than a single part.

- Consumers can avoid confusing product choices by answering questions about their own experiences.
- Rank the final results of pesonalized configuration

Measuring interaction

User willingness to participate in body measurement is influenced by how it is performed. Measurement activities need to take into account the accessibility of users. If users are required to travel to a specific location or involve more people in the acitivity, the willingness to participate may be reduced. Simple tasks that individuals can complete independently are more in line with mothers' expectations, especially considering the limitations of mothers who need to take care of children.

However, the challenge for users to complete the measurement alone comes from the fact that the measurement activity may have a certain degree of difficulty, making it difficult for the user to complete the measure independently or having a certain learning cost. Therefore the following design criteria are proposed.

- Provides a self-scanning toolkit to improve execution efficiency.
- Provide sufficient and clear guidance to support users to complete the measurement process by themselves.

4.3. Design and evaluation

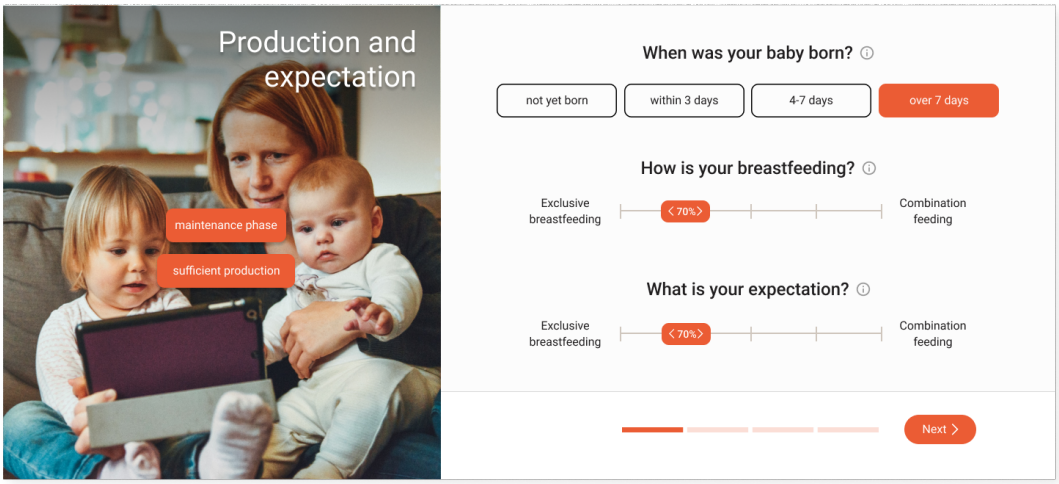
This section mainly presents design results based on user research and rapid user test. In order to gain more accurate feedback from users, high-fidelity interactive prototypes were created with Figma, which allow participants to operate.

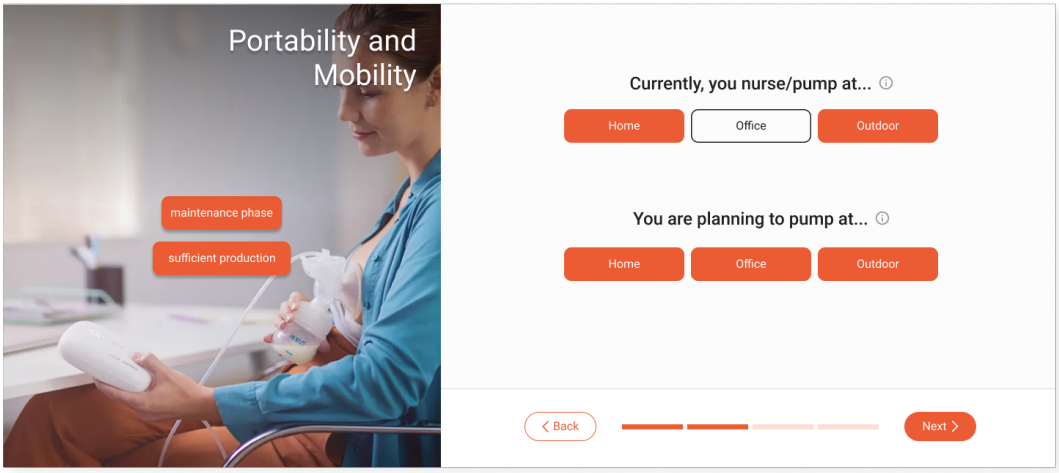
Within the research constraints, user testing was conducted in a simulated manner; therefore, actual body measurements were not included in the process. The design evaluation consists of the introduction, the test and a brief interview. During the evaluation, participants were asked to think aloud to help the author document the observation. Additionally, since the design aimed at new mothers with no experience with breast pumping, both mothers and non-mothers were recruited as participants.

4.3.1. Product customisation webpage

Understand user

Asking consumers questions to build an understanding of the user, including the birth status of the baby, breast milk production, expectations of breast milk production, and current and future breastfeeding/pumping locations. The user's needs for feeding goals such as production and mobility can be identified through these inputs.

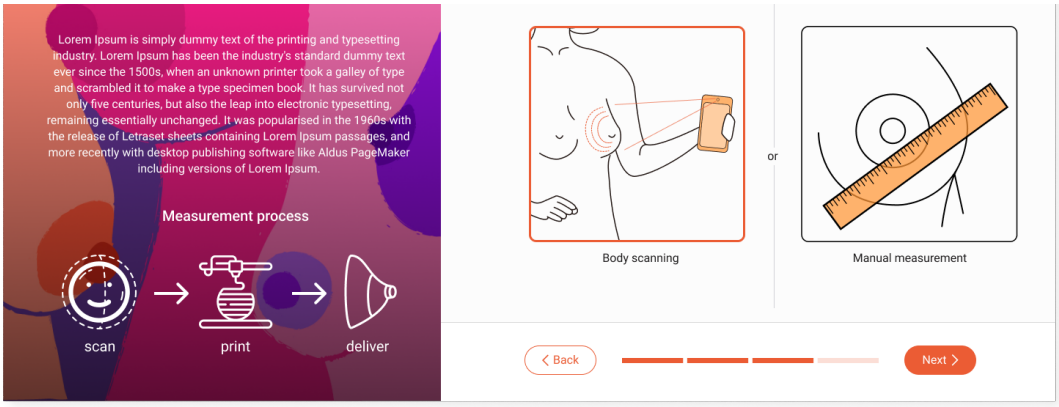




In user tests, it is found that before personalization begins, the user needs to be introduced to the purpose and process of personalization so that the user can anticipate the activities that will be experienced. In addition, the content of the questions asked to the user should be adjusted for each answer, and the topic of each section should be distinguished to avoid user confusion. For example, users whose babies have not yet been born should not see questions about current yields. In terms of user interface, the design should consider consistency and differences, such as the form of buttons and the style of non-buttons must be differentiated to prevent confusion.

Measurement

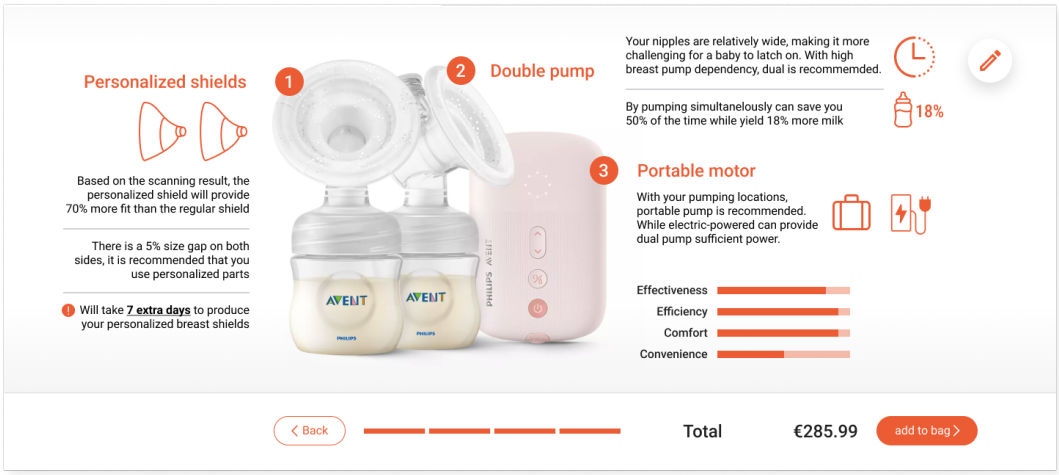
Explain to the user the purpose and process of the measurement. In addition to offering the option of a body scan, it also allows consumers to perform breast measurements with essential tools.

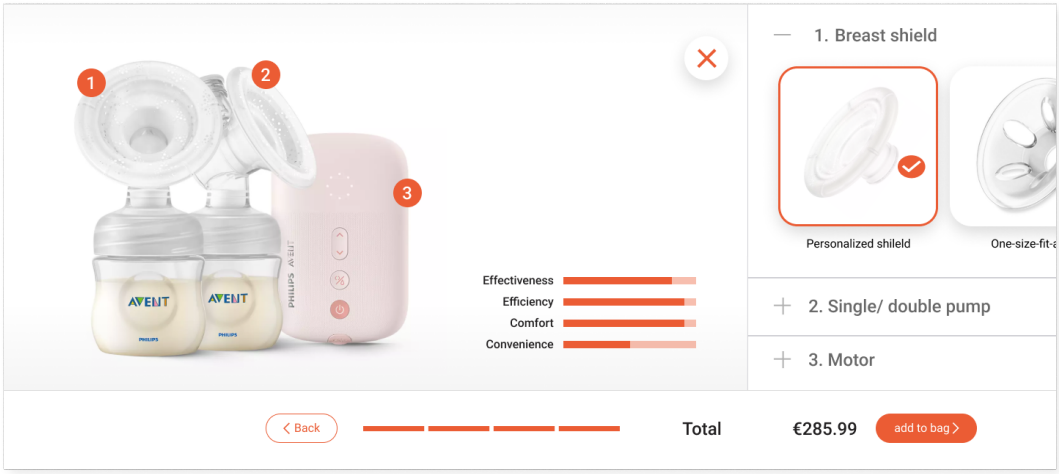


Before the measurement, it should be explained to the user what data will be collected and how the data will be used, that is, transparency. Under such a premise, the user's willingness to choose body scanning will be higher. In addition to reducing the user's negative perception of body scans, its value should also be conveyed to increase user interest.

Personalized Results

Based on the input provided by consumers, including the goals, needs and body data obtained by scanning, the configuration and recommendation of products are carried out. While the system provides personalized results based on the user's input, the user is still allowed to adjust, replace parts of the result, and be able to compare differences in characteristics during the adjustment process.





Personalization results are too fragmented to easily convey to users the value of personalization. Beyond that, there is no apparent direct correlation to be found with one's own input. Therefore, the benefits resulting from the personalization of the user's individual needs require to be explained.

4.3.2. Self-scanning mobile App

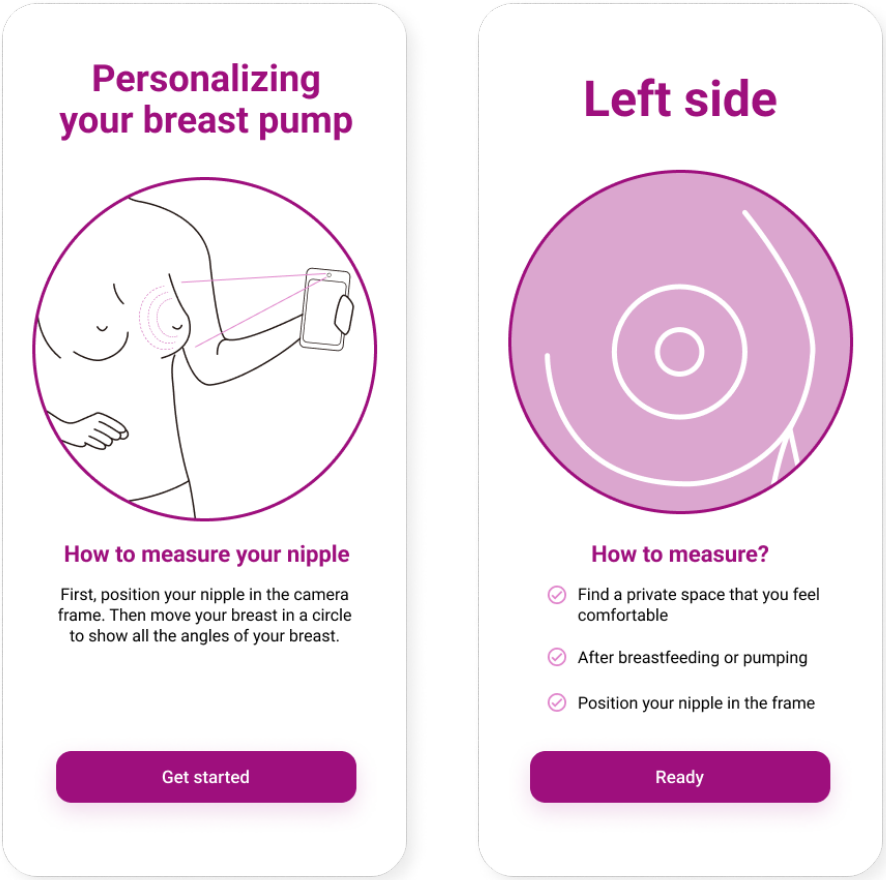


Fig.4.12 *Introduction(left) and instruction(right)*

1.Introduction
The measurement process is shown to the user through graphic and text descriptions so that the person being measured can prepare for the body measurement in advance. **[Fig.4.12]**

2.Instruction
This page shows the user where the breast should be positioned in the camera frame during the measurement through a graphic while guiding users to prepare for the scanning, including finding a comfortable and private place and an appropriate measurement time. **[Fig.4.12]**

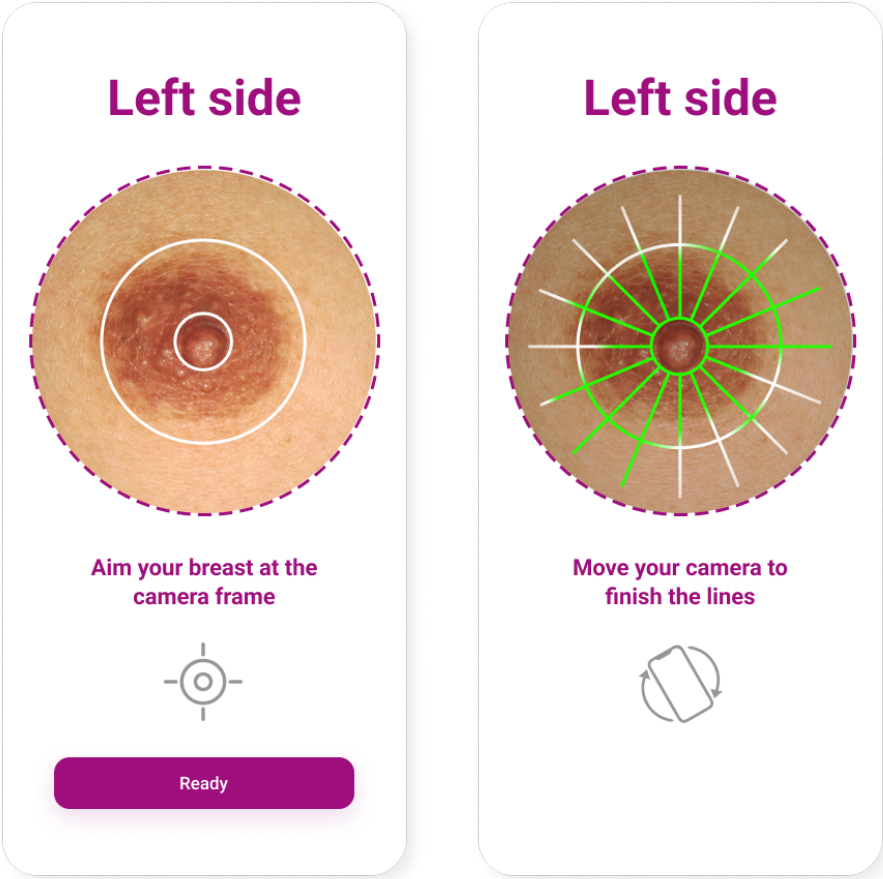


Fig.4.13 *Before(left) and during(right) scanning*

3.Interactive guidance

During the scanning process **[Fig.4.13]**, the frame lines in the camera lens provide guidance for consumers to operate, including initial nipple positioning and breast scanning. In addition, the colour change of lines in the breast scan is designed to help users confirm that all angles that need to be scanned are completed.

(Before scanning)

In the user test, it was found that although the user was reminded to prepare in the previous step, they would still be startled by the camera that was suddenly turned on, in particular, there is a large gap between the conversion from abstract illustrations to actual images.

Therefore, a clear signifier aware the user that the camera is about to be turned on is necessary. In addition, the test also evaluates the image style and form presented by the camera. In addition to the original picture, different filters such as blur, monochrome **[Fig.4.14]**, and graining were applied. User feedback shows that the negative-like effect can reduce the discomfort of being scanned the most due to its low recognition and ultrasound-like visual effects that can be linked to familiar baby ultrasound images.

Moreover, the grey icon below, which represents “aiming”, cannot clearly express the meaning of positioning the breast in the camera frame, and the graphics may need to be adjusted or communicated in other forms.

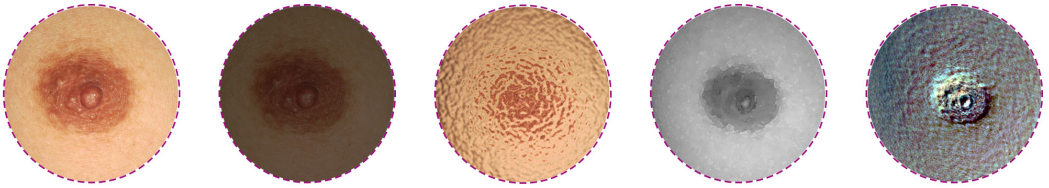
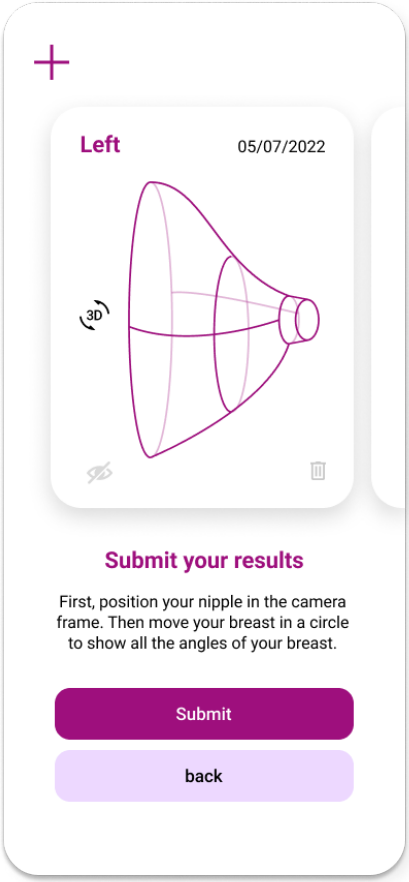


Fig.4.14 *Scanning images of different styles*

(During scanning)

In the user test, it is found that the colour change guide formed by the lines is not obvious enough at the distance required for the measurement, and the user cannot easily identify whether the measurement of each angle is completed. Therefore, the form of interactive guidance needs to be adjusted for better recognition at a certain distance, such as increasing the contrast of colour or adjusting the form of lines.

Fig.4.15 *Rapid user test*



4.Scanning results:
The result of the scan is displayed to the user to confirm that the scan is complete. In order to reduce the user's sense of rejection of body scanning and to provide body data, the result of the scanning is converted into an abstract graphic, which only contains basic information.

Fig.4.16 *Scanning results*

On the page presenting the scan results **[Fig.4.16]**, a simple assessment was also made for different image formats (Mironcika et al., 2020), such as 3D formats, images, abstract illustrations, figures, and no results (Loker et al., 2004) **[Fig.4.17]**. The results show that allowing users to view the scanning results is of great significance to the confidence of the scanning process and results. Not being able to view makes the user questionable and unable to confirm the completion of the task. In addition, abstract lines are the most acceptable in form. However, presenting illustrations with a three-dimensional perspective may be challenging for non-designers to understand.

In addition to this, the ownership of the data should be clearly communicated to the data provider. Users need to know what data is used and how it is used for personalisation and even be allowed to control the accessibility of the data.

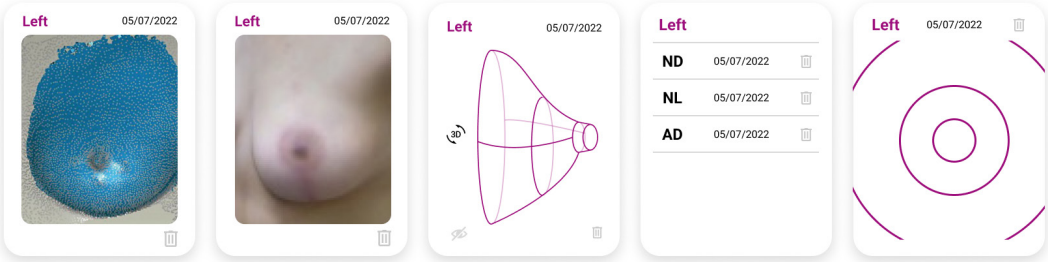


Fig.4.17 *Scanning results of different styles*

4.4. Key takeaways

- The value of personalization needs to be clearly communicated in the process and the results, in addition to which the relationship between input and output needs to be specified.

- The collection and application of user data need to be clearly communicated to users.

- Scanning private body parts require a certain degree of preparation, including the description of the process and the steps of confirmation. The user needs to be able to anticipate what the next steps will be.

- Abstracting images helps reduce user's sense of rejection of body scans.

- Self-scanning needs to take into account the image reading limitations of the user when moving the device, such as distance, angle, etc.

- In addition to the personalization (scanning) process, the image format also needs to be considered from a non-designer perspective.

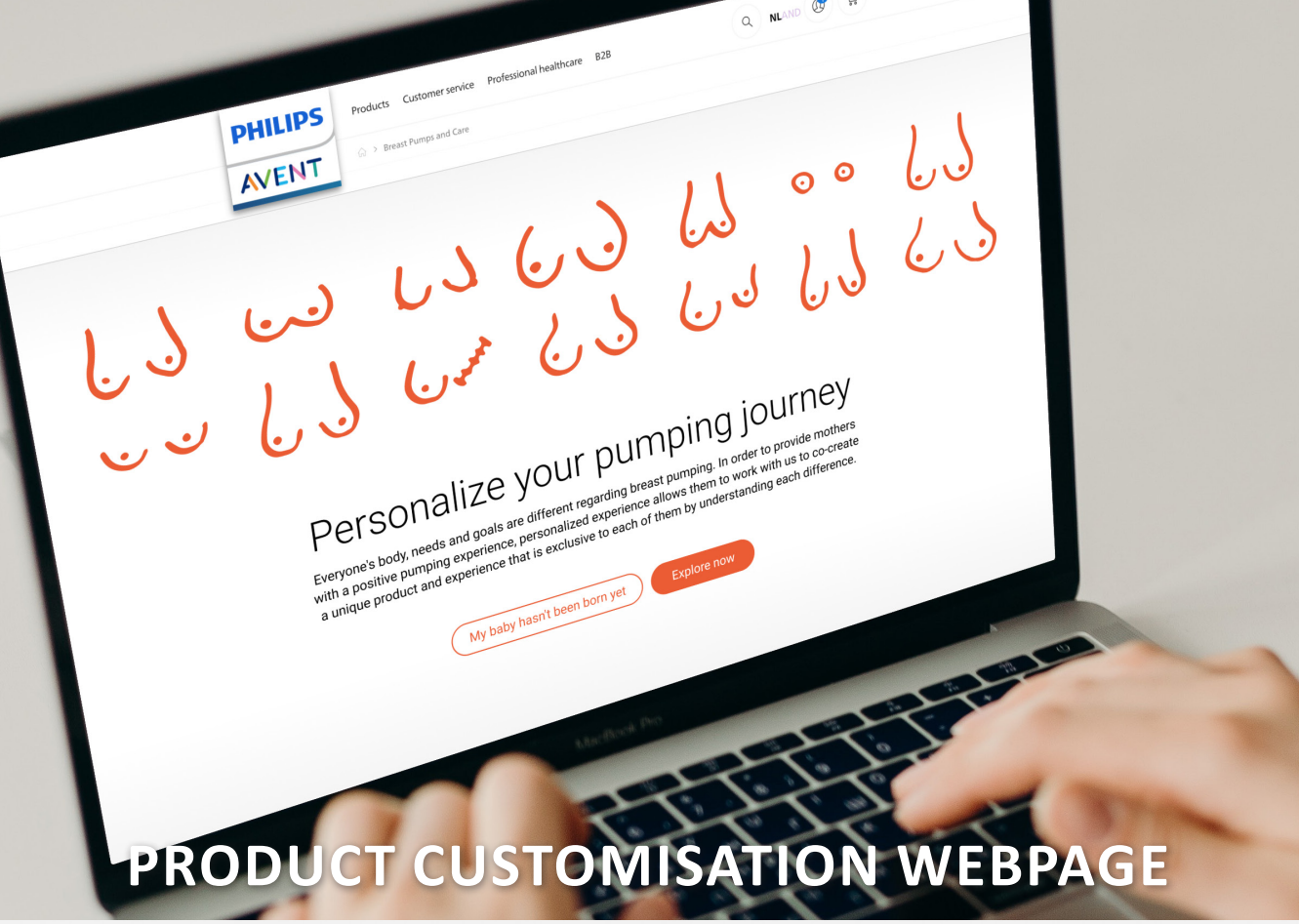
05.DELIVER

This chapter presents a comprehensive presentation of the research and design development that is the project's final deliverable. This part includes an overview of the design, display, and description of the design details.

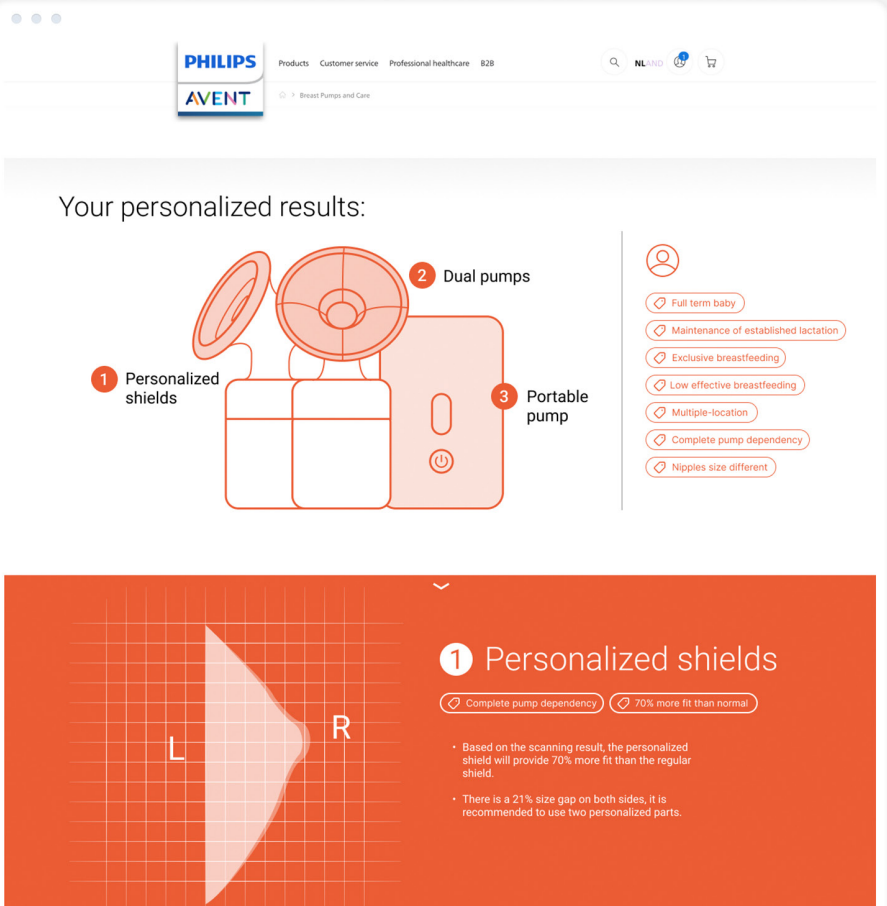
5.1. Final design outcome

This section mainly presents design results based on user research and rapid user test. In order to gain more accurate feedback from users, high-fidelity interactive prototypes were created with Figma, which allow participants to operate.

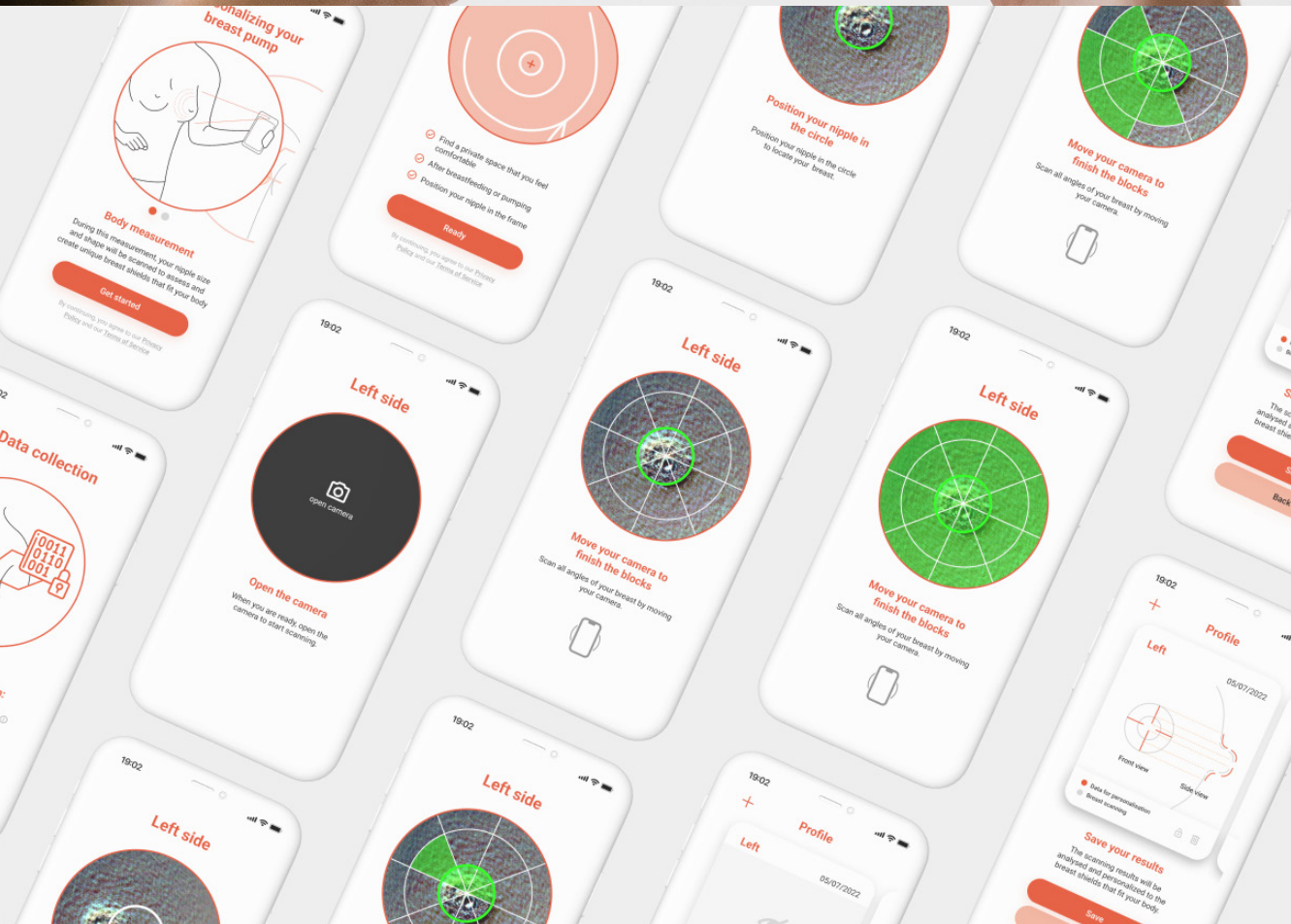
Within the research constraints, user testing was conducted in a simulated manner; therefore, actual body measurements were not included in the process. The design evaluation consists of the introduction, the test and a brief interview. During the evaluation, participants were asked to think aloud to help the author document the observation. Additionally, since the design aimed at new mothers with no experience with breast pumping, both mothers and non-mothers were recruited as participants.



PRODUCT CUSTOMISATION WEBPAGE



SELF-SCANNING MOBILE APP

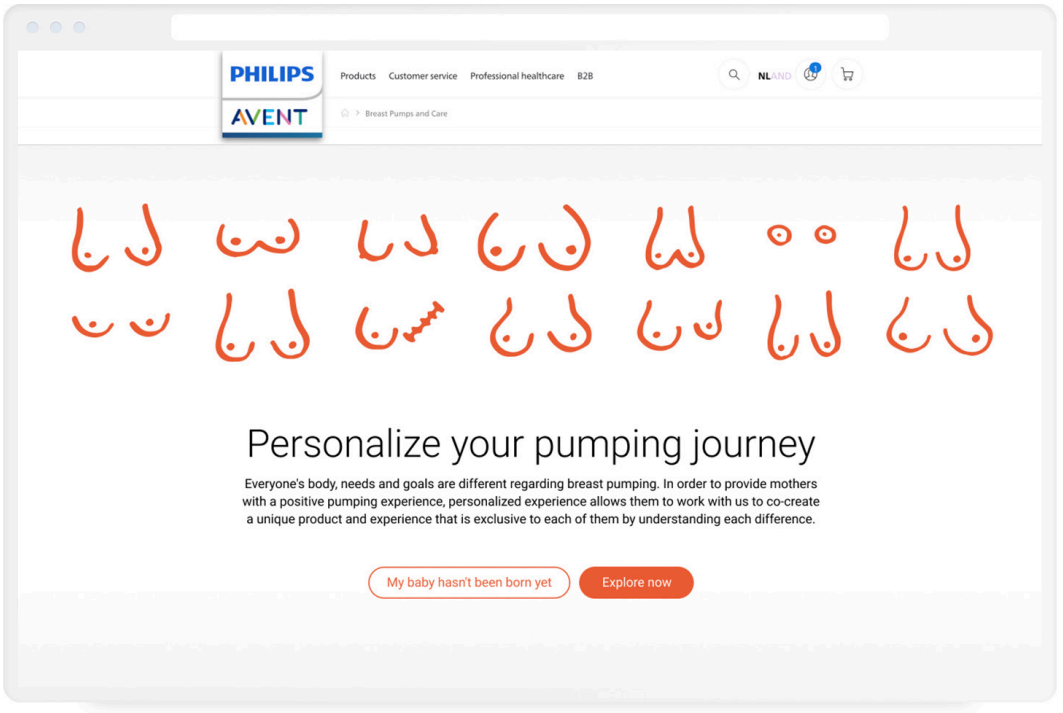


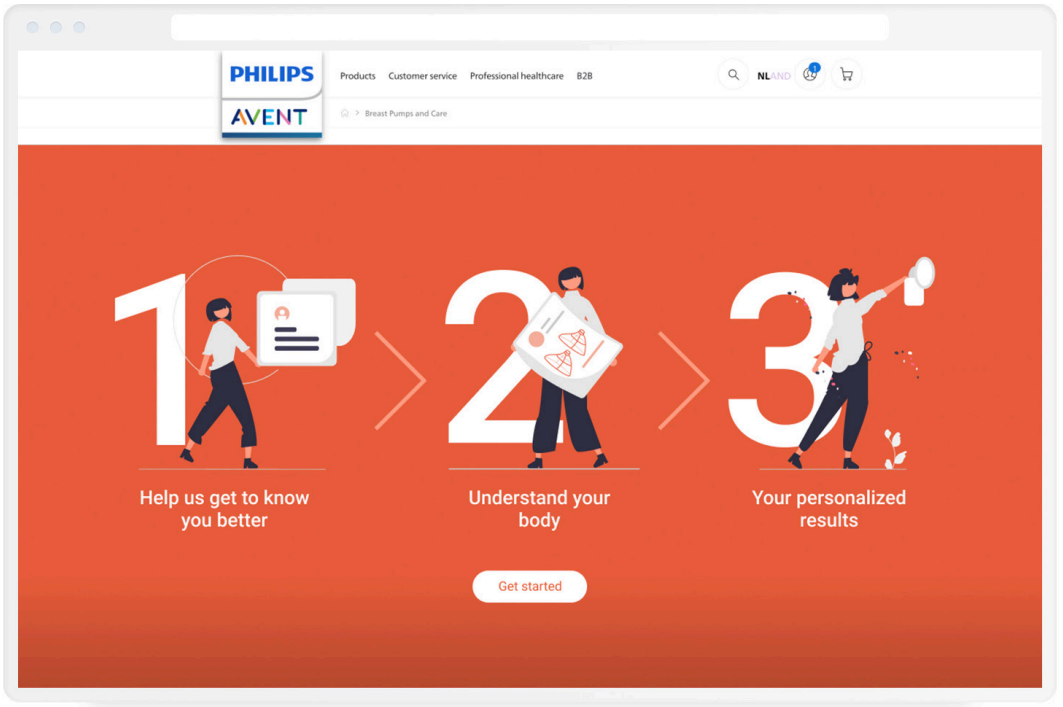
5.2. Design details

5.2.1. Product customisation webpage

Introduction

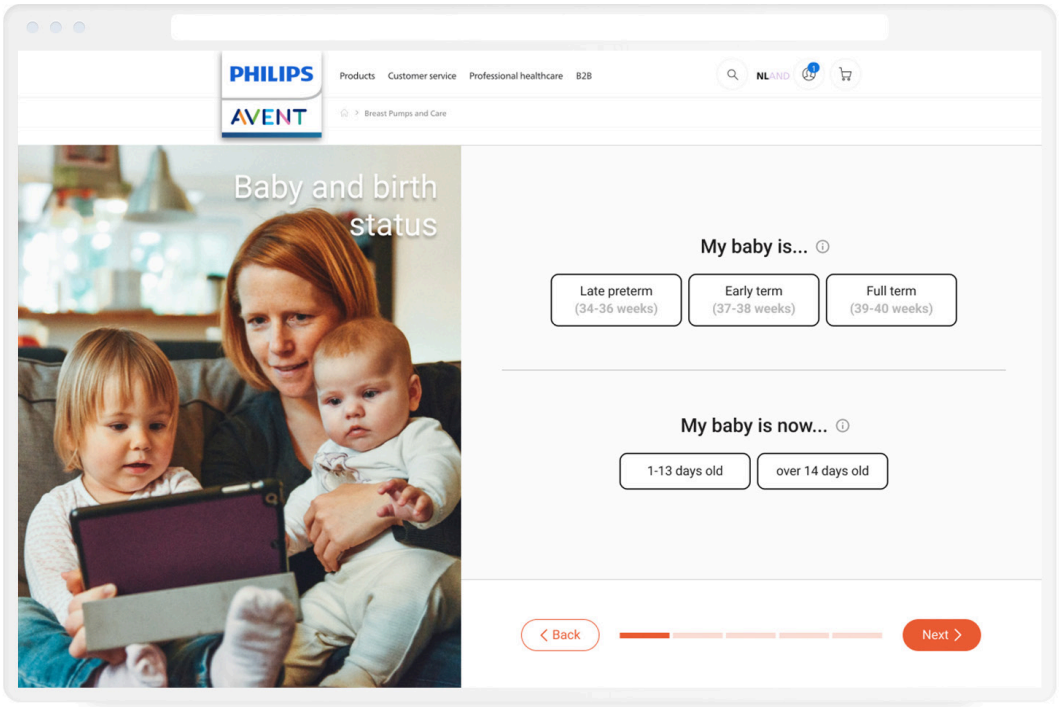
When users enter the customized webpage, they will be briefed on the goal of the activity and the process that the users will go through so that they are fully aware.

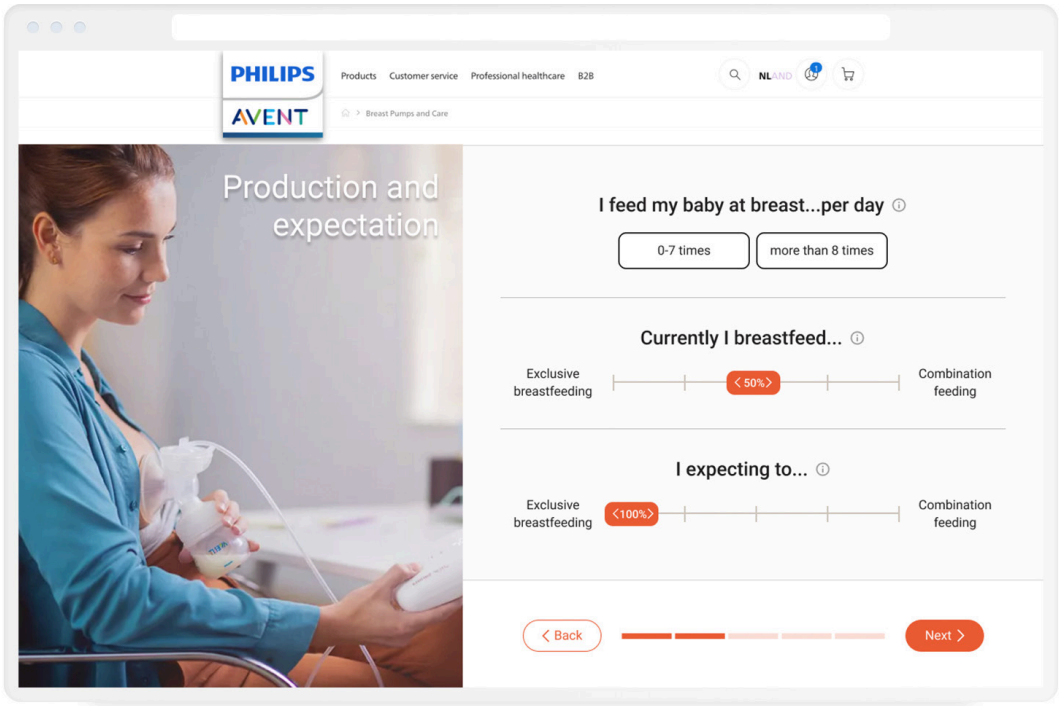


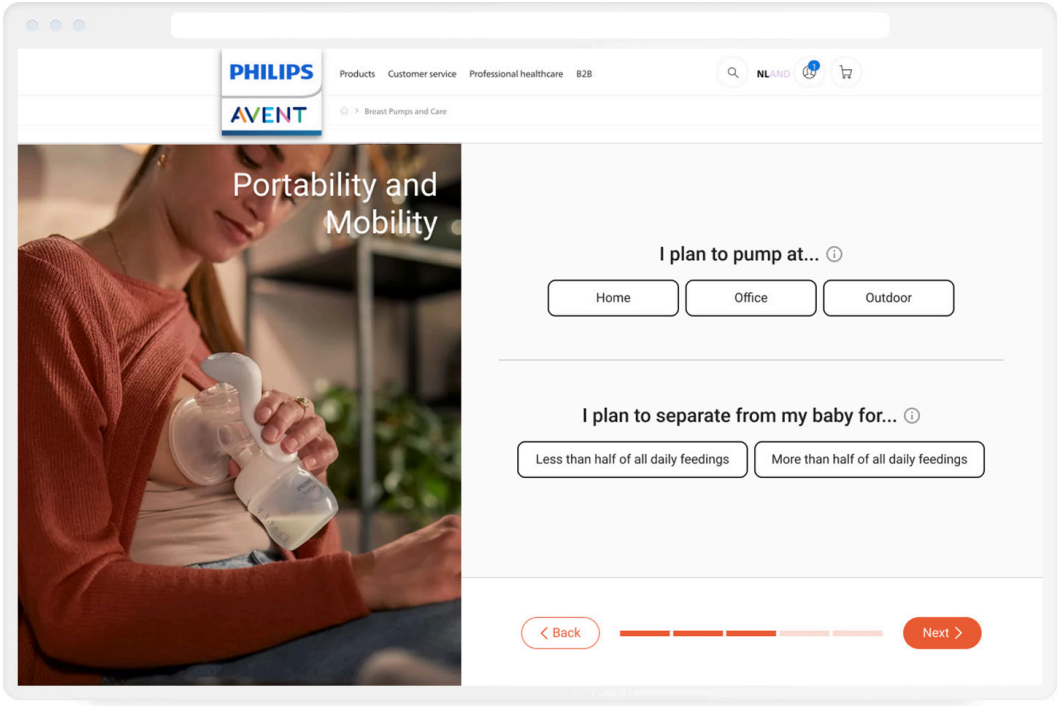

PHILIPS
AVENT
Products
Customer service
Professional healthcare
B2B
NL
Breast Pumps and Care
1
2
3
Help us get to know you better
Understand your body
Your personalized results
Get started

Unserstand user needs

The interaction of question and answer provides users with the same way as a dialogue with medical professionals so that mothers can easily provide the information needed for customized products. The company offers and recommends product configurations suitable for each mother by understanding the mothers' breastfeeding conditions, stages, separation from their babies, and use situations and locations.

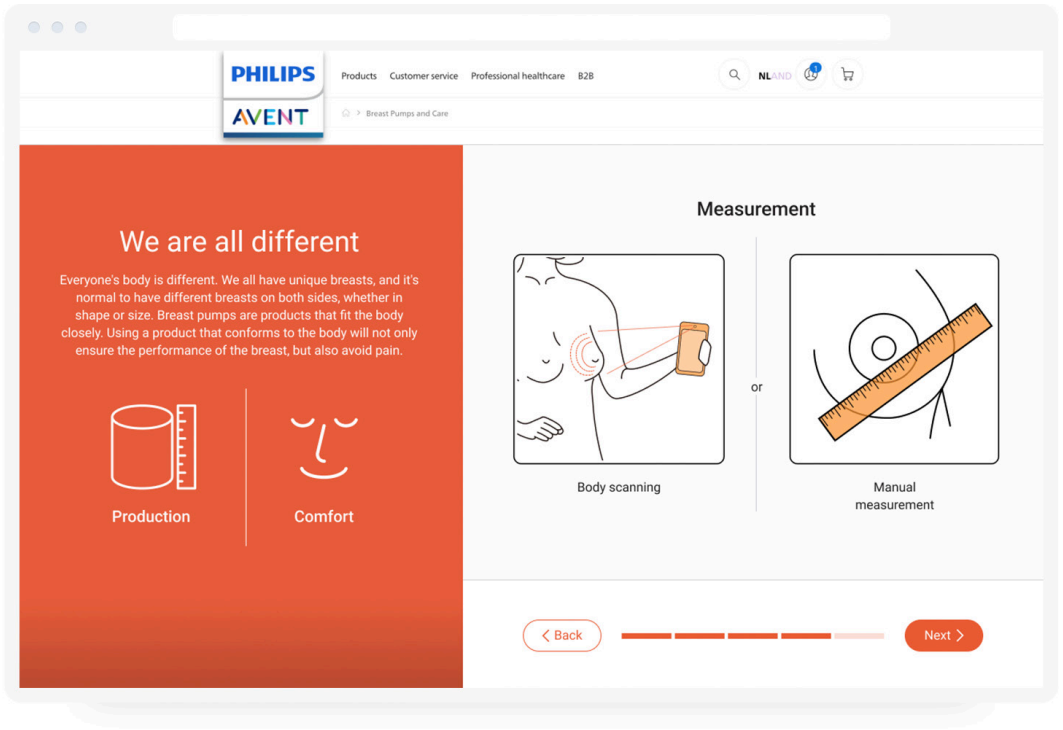


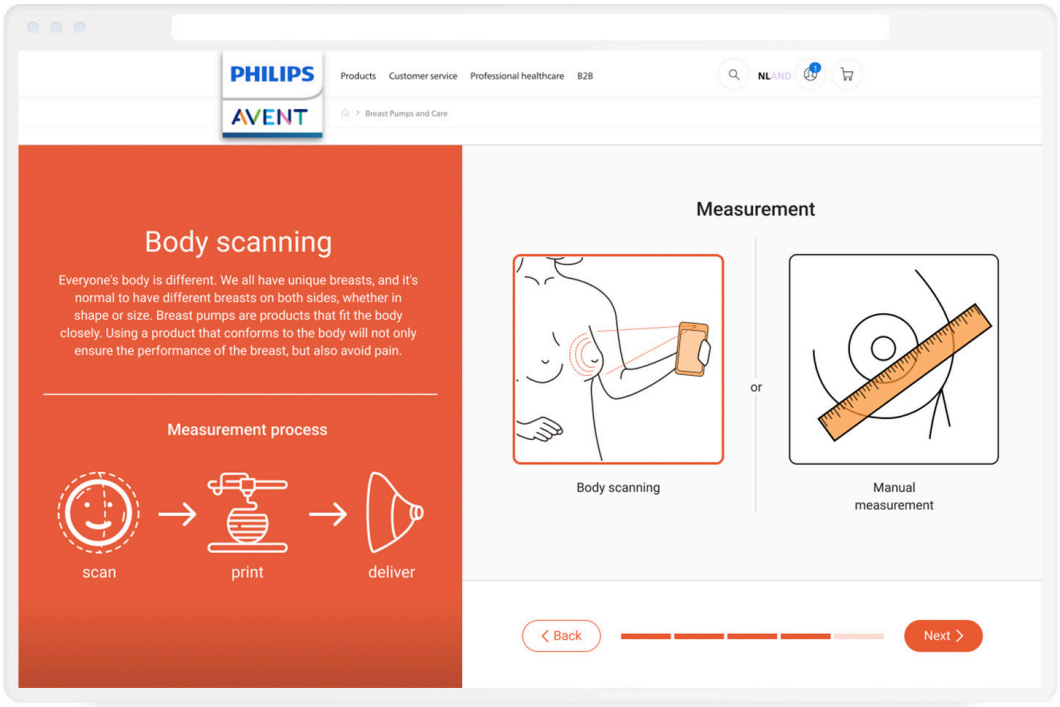

PHILIPS
AVENT
Products
Customer service
Professional healthcare
B2B
NL
Breast Pumps and Care
Production and expectation
I feed my baby at breast...per day
0-7 times
more than 8 times
Currently I breastfeed...
Exclusive breastfeeding
50%
Combination feeding
I expecting to...
Exclusive breastfeeding
100%
Combination feeding
Back
Next


PHILIPS
AVENT
Products
Customer service
Professional healthcare
B2B
NL
Breast Pumps and Care
Portability and Mobility
I plan to pump at...
Home
Office
Outdoor
I plan to separate from my baby for...
Less than half of all daily feedings
More than half of all daily feedings
Back
Next

Measurement

In order to provide mothers with more personalized breast pumping products, users need to provide relevant body data. The content on the left emphasizes the physical differences of each person, not only to convey the purpose of personalization but also to increase the user's awareness of the diversity of the body. And by explaining the data-based product manufacturing process to encourage users to choose more accurate measurement methods. However, to avoid forcing participants, the option of manual measurement methods using essential tools is also provided.



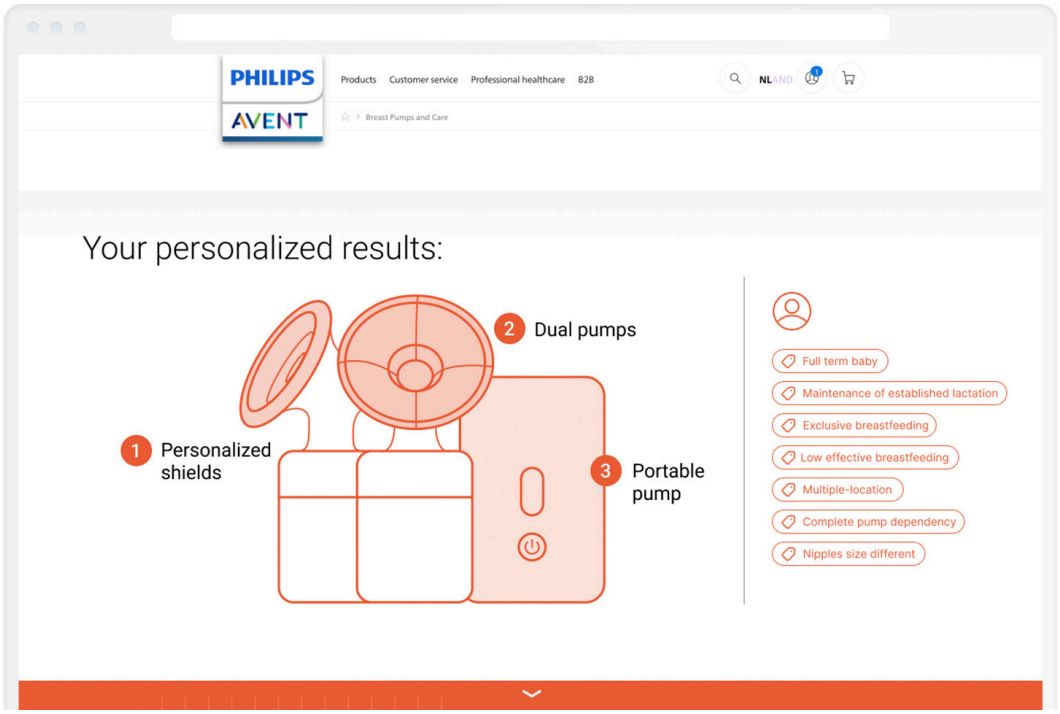

PHILIPS
AVENT
Products
Customer service
Professional healthcare
B2B
NL
Breast Pumps and Care
Body scanning
Everyone's body is different. We all have unique breasts, and it's normal to have different breasts on both sides, whether in shape or size. Breast pumps are products that fit the body closely. Using a product that conforms to the body will not only ensure the performance of the breast, but also avoid pain.
Measurement process
scan
print
deliver
Measurement
or
Body scanning
Manual measurement
Back
Next

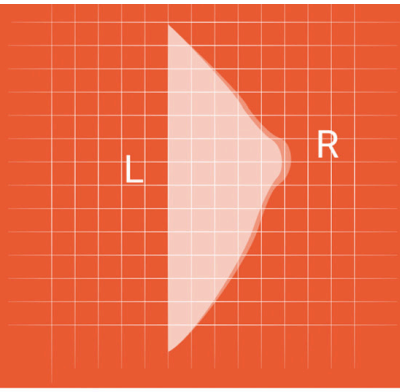
Final results

After completing the information provision and body measurement, the system will generate product configurations based on the obtained user data and recommend them to consumers.

In addition to providing a suitable product configuration, the system will explain to the user the reason for the result. For example, body measurements have found that a particular body shape or size is more suitable for personalizing breast shields. Alternatively, a thin, light, and easy-to-carry motor is configured based on the user's multi-location mobile needs.

Finally, to give users a higher sense of autonomy and participation, the final result can still be adjusted to meet individual preferences.





1 Personalized shields

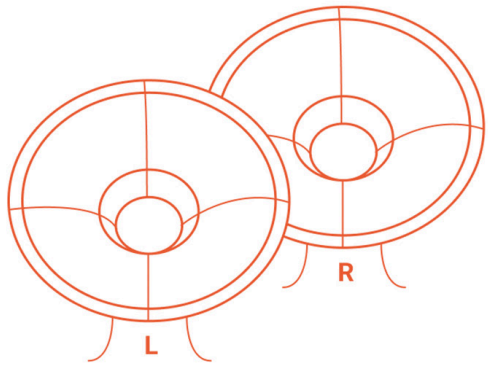
Complete pump dependency | 70% more fit than normal

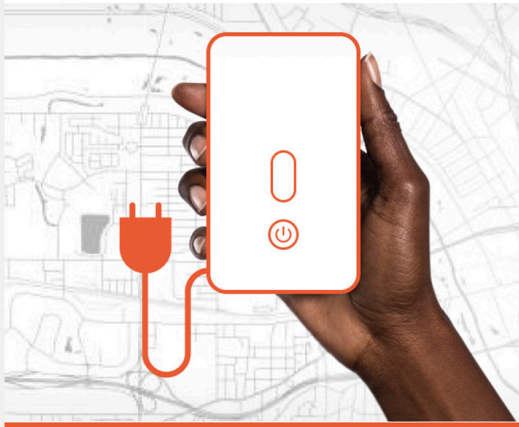
- Based on the scanning result, the personalized shield will provide 70% more fit than the regular shield.
- There is a 21% size gap on both sides, it is recommended to use two personalized parts.

2 Dual pumps

Complete pump dependency | Nipples size different

- Your nipples are relatively wide, making it more challenging for a baby to latch on. With completed breast pump dependency, dual pump is recommemded.
- Pumping simultanelously can save you 50% of the time while yield 18% more milk.





3 Portable motor

Multiple-location | Dual pump

- With your multiple pumping locations, portable pump is recommended. While electric-powered can provide dual pump sufficient power.
- With the rechargable battery (10000mAh*3.7V=37000mWh), you are allowed to pump simultaneously three times outdoor.

Adjust personalized results

Personalized shilelds

Dual pumps

Portable pump

< Back

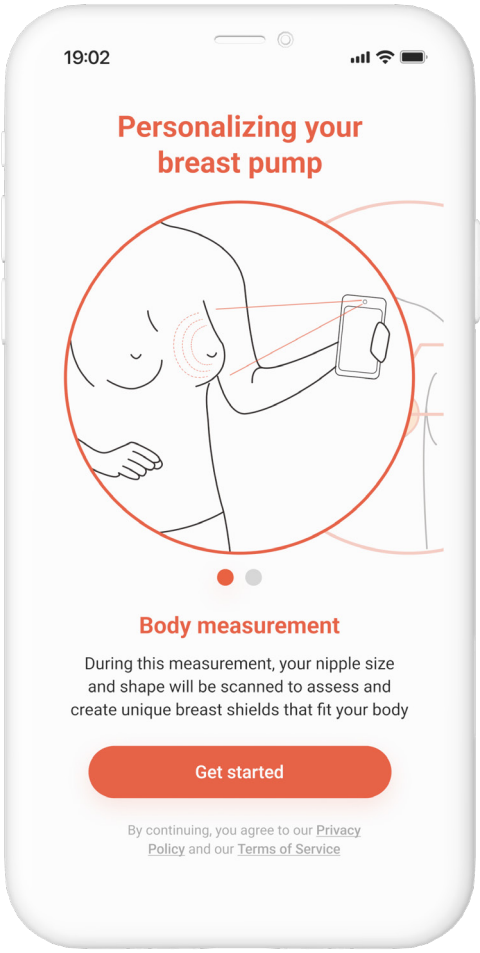
Total €285.99

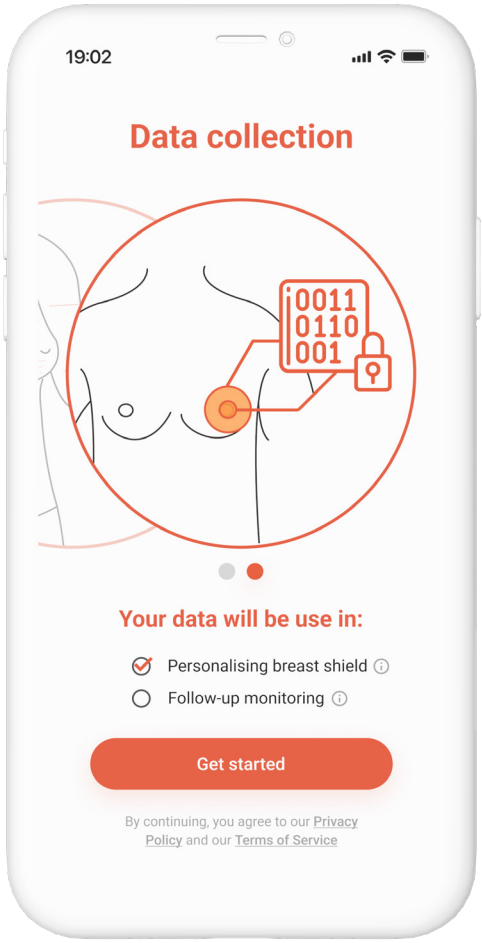
Add to bag >

5.2.2. Self-scanning mobile App

Introduction

On the first page, users are introduced to the purpose and process of personalization through body scanning. After swiping the page, the user can check the collection and use of data, allowing the user to decide the purpose that the company can use.

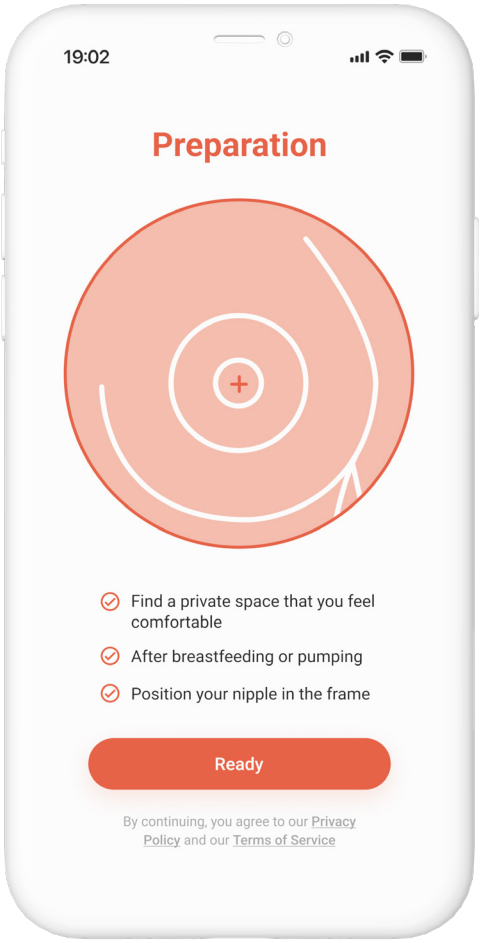


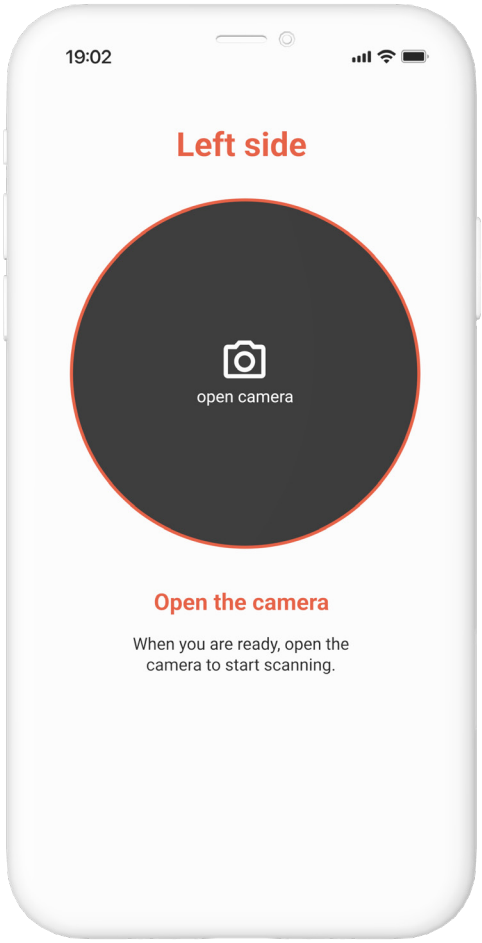


Instruction

On the preparation page, the illustration shows the camera frame that the breast needs to be placed in the following process, and the central cross is added to convey the intention to align the center of the frame. In addition, the text and the check-list icon allow users to prepare for body scanning, including location, timing and scanning method.

An additional step has been added that asks the user to turn on the camera before the user actually starts scanning. This step is intended to reconfirm that the user is fully prepared, including facing the camera, before starting the scan.

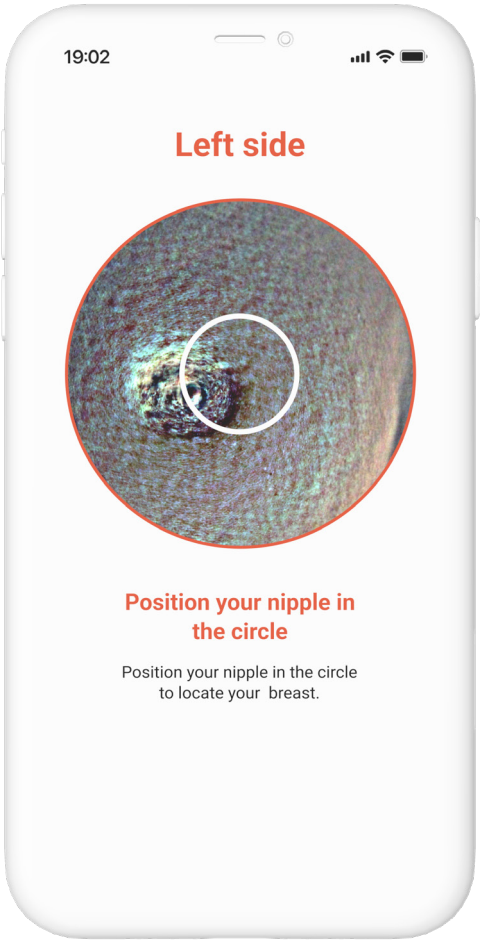


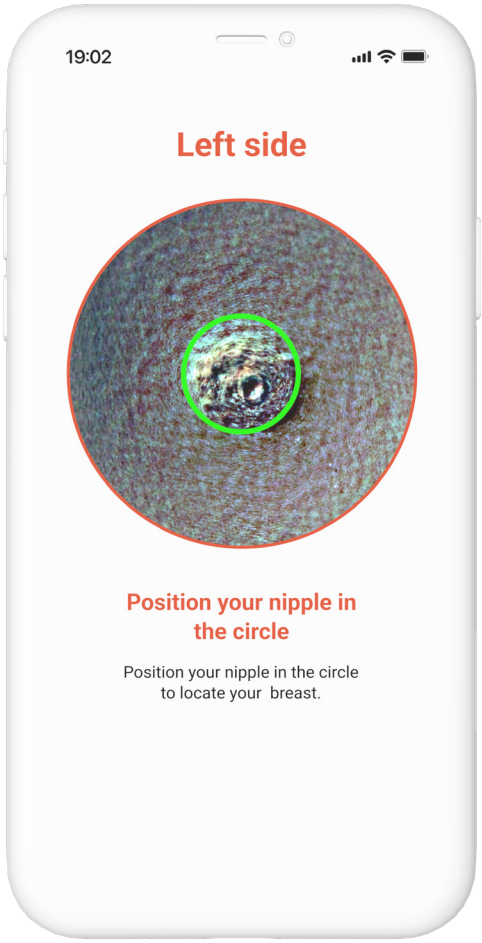


Interactive guidance (nipple positioning)

Although the position of the breast has been described with illustrations in the previous steps, it is still necessary to guide users to position the scanning device in the correct position and distance after the camera is turned on.

Align the nipple with the white wire frame by moving the scanning device. When the system recognizes the alignment, the colour wireframe will change colour to give the user feedback on the correct positioning.





Interactive guidance (breast scanning)

The scan of the breast begins after the nipple is positioned. The grey animated icon **[Fig.5.1]** at the bottom guides the consumer on how to move the mobile phone to scan at different angles and positions.

While moving the camera, grids in the camera frame will turn into solid colour along with the scanned area to inform the user which angles and positions have been completed and which have not been scanned.

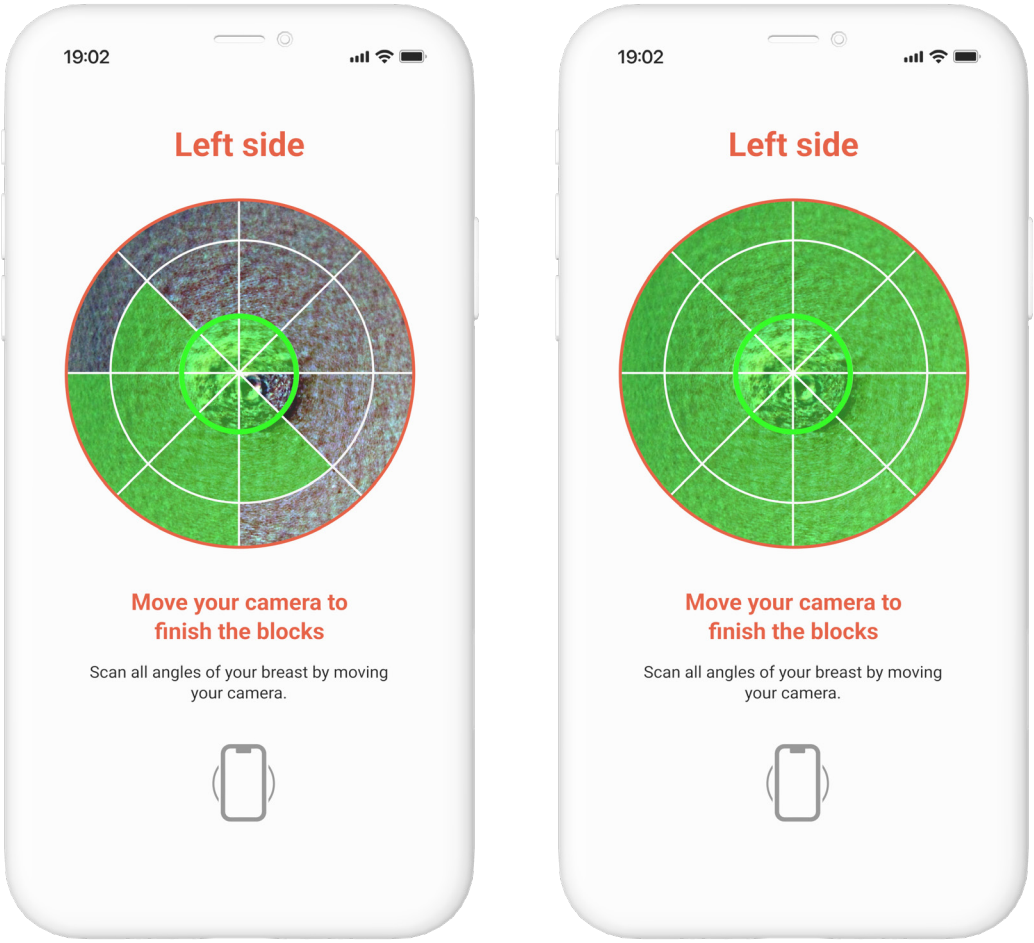
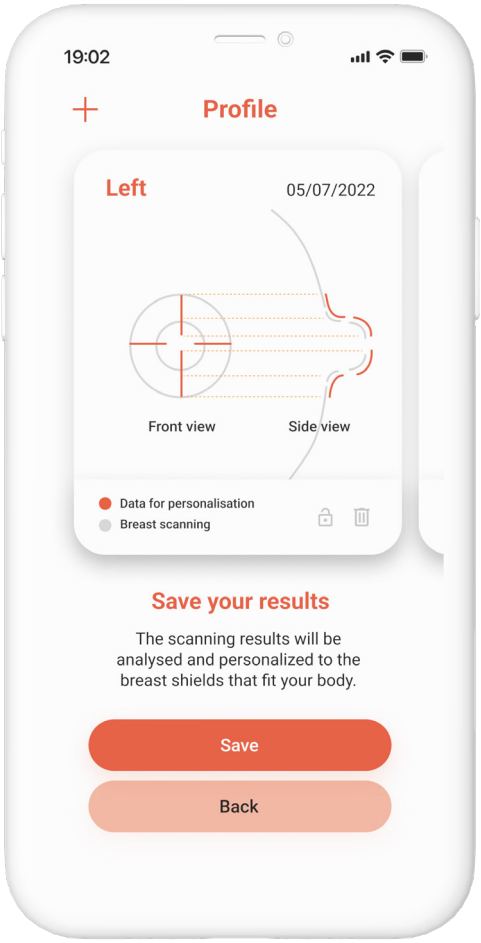


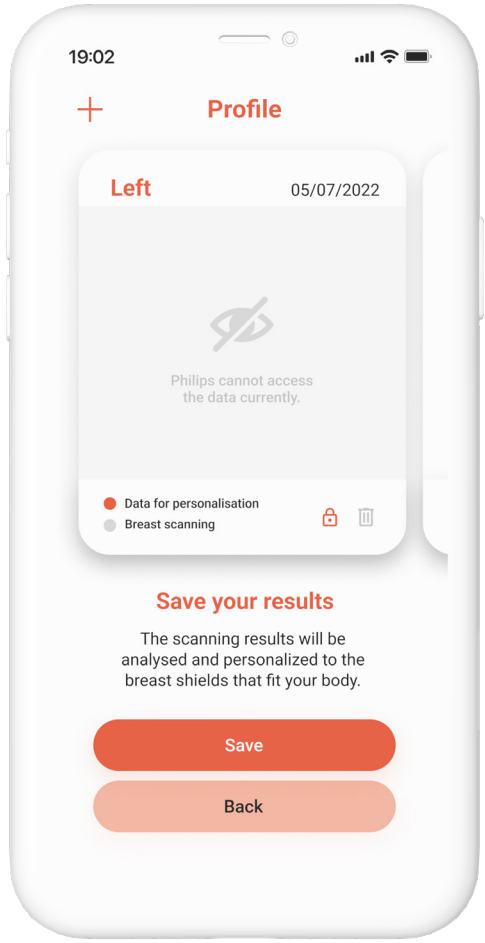
Fig.4.9 *Exploded view of animated icons*

Scanning results

After scanning, the scanned data will be converted into low-resolution abstract lines to reduce the user's sense of insecurity. In addition, the graphics are presented in front and side views for non-design-trained users to read easier.

The results included scanned body images and the data needed to personalize the breast shield, where only minimal data were used. In order to allow users to decide their own data accessibility, users can block the company's access to the data or delete the data completely.





5.3. Evaluation of final design

5.3.1. User test setup

In order to evaluate the final design outcome, a series of user tests were conducted. Since this design is for inexperienced mothers, non-mother women are also invited to join the user test. The user test includes introducing the project, operating prototypes, filling out questionnaires and a short interview. Due to the sensitivity of body measurements, coupled with the gender of the author, the user tests were carried out individually, while the body scanning was operated in a simulated manner.

A total of ten women participated in the test, including four mothers and six women with no relevant experience. In addition, users' ages ranged from 24 to 44, including five different nationalities, as shown in **Table.5.1**.

Age	Nationality	With breast-pumping experience
25	Dutch	No
24	Norwegian	No
27	Taiwanese	No
28	Taiwanese	Yes
27	Taiwanese	No
24	Taiwanese	No
30	Taiwanese	No
44	Dutch	Yes
33	South Korean	Yes
40	Dutch	Yes
39	German	Yes

Table.5.1 *Overview of participants*

5.3.2. Evaluation results

The user evaluation of the final design identified two main points, which are listed below:

- **Concerns about body measurement and sharing body data**

The willingness of users to participate in body measurement can be partially improved through design and guidance, but users still have concerns about the provision of data. Overall, the interface, process, introduction, and interactive guidance of body measurement can help women easily complete the measurement task in terms of convenience. However, the participants' primary concern came from a degree of scepticism about how the company would use the data, even if it had been explained in the interface.

Therefore, it can be inferred that this design partially achieves the design goal in the personalization process, motivating participants in co-creation. Yet, this result clearly pointed out a significant problem: the user's lack of trust in the overall system. However, it was found in the evaluation that younger participants were more receptive and willing to undergo body scans and provide body data. This phenomenon may come from the fact that the younger generation is more familiar with technology and has been sharing data on the Internet for a long time. In addition, the participants also revealed that due to the popularity of smartphones, facing the camera or taking selfies is a fairly common activity. If a better product experience can be obtained through body measurement, especially personal care related, they will be more willing to participate.

"the scanning is simple and clear, but I'm still a little worried about what companies will do with my data...I know big companies will be more cautious...I'm just a little concerned."

- **Guide inexperienced users to explore and understand their needs**

By answering questions and observing their corresponding personalised outputs, users can understand their own needs or potential needs. In the past buying experience, new mothers often randomly selected unsuitable products without understanding their product needs. However, in the process of product customisation, by answering questions, users reflect on their body condition and the product corresponding to the use situation more actively and consciously. This effect can be seen especially in young women without breastfeeding/pumping experience. For example, participants were more consciously aware of the importance of fit shield size and noticed the difference between their two breasts.

"When you're a beginner you always don't know what you're doing. But with this...I can just tell my information, and I don't have to do my homework to find out what I need."

"I think I have a better understanding of the breast pump...I can see what the problem could be even before the baby is born."

06.CONCLUSION

The project aims to help mothers better engage in the co-creation process to obtain a more personalised breast pumping product that truly fits their needs. To design a co-creation experience that can motivate participation, research activities were carried out to understand mothers' needs and concerns regarding breast pumping from multiple perspectives and to explore appropriate design opportunities across the whole breast pumping journey.

The research phase revealed that it could be challenging for inexperienced moms to articulate their needs to get personalised products. In addition, the mother's high reliance on medical professionals in the early stages of childbirth shows that the co-creation of unfamiliar products is even more difficult. To overcome this problem, the goal of the design phase was to design a supportive and informative process that guides mothers to finish the task easily within co-creation. The design should provide an experience that mothers can feel secure, as easily facing unknown challenges with the support of medical professionals.

The research insights and design direction led to a product customization webpage and self-scanning mobile App. The product customization webpage guides participants step by step to explore and understand their breast pumping needs through a question-and-answer interaction. In addition, in the face of personalized output, users can also be more aware of their own bodies and breast pumping condition. The self-scanning mobile App supports women to easily and independently complete body measurements through clear and simple instructions to obtain more accurate results during the personalization process. However, concerns about users sharing data may be the direction of future research, and one crucial direction is building users' trust in the system.

To conclude, the design of this project motivates women to participate in the personalization of breast pump products by providing clear guidance and information in the co-creation process. And these effects ultimately all point to the same goal: to provide mothers with a more positive and comfortable pumping journey.

LIMITATION

Focus on the experience at the user's perceptual level

This project focuses on the co-creation process of product personalisation, meaning that the user's feelings and emotions during the process were the main research goals. Although the function and performance of the pumping product itself have also been explored in the research, it is only to provide background knowledge for designing a personalised experience. Furthermore, as the project focused on the user experience of design, the application of technology was not much considered in the project research and results.

The inconvenience of the research topic and the role of the author

The sensitivity of this project is relatively high as this topic is about the personalisation of breast pumping products, which involves measurements of the body (boobs and nipples). In addition, as the author is biologically male, when interacting with users, such as conducting user interviews, the author must be more cautious and avoid certain content to prevent making the interviewee uncomfortable. Furthermore, the user test can only be carried out through simulation, which also reduces the accuracy of the evaluation.

The complexities of breast pumping

Breast pumping is a complex and subjective activity. Because the outcome of breastfeeding involves a large number of variables, it is somewhat challenging to understand its mechanisms fully. In addition to the product, breast pumping involves the mother's physical condition (external parts, internal tissues, hormone secretion, etc.) and other external factors such as the baby's condition, preferences, etc. In addition, since everyone's subjective feelings are different, even if a suitable product is provided according to the same standard, users' perceived experience may be very different. The complexity of the experience makes it difficult to have a clear entry point when defining the problem and exploring design solutions.

Project scope and time limitation

It is found in the research that the ideal personalisation should include follow-up tracking and the change of offering. However, under the constraints of the scope and time of the project, it is impossible to design the entire personalised system. It can only focus on the part of the system, product customisation. Because the whole experience is not provided, only a portion of the design output may risk reducing the willingness of users to participate in co-creation.

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APPENDIX

A. Project brief
B. Consent form
C. Recruiting poster
D. Sensitizing booklet
E. User journey map
F. Prototype (figma)
G. Evaluation questionnaire

DESIGN FOR our future

5650

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name [redacted]
initials [redacted] given name [redacted]
student number [redacted]
street & no. [redacted]
zipcode & city [redacted]
country [redacted]
phone [redacted]
email [redacted]

Your master programme (only select the options that apply to you):

IDE master(s): ( ) IPD ( ) DfI ( ) SPD
2nd non-IDE master:
individual programme: - - (give date of approval)
honours programme: ( ) Honours Programme Master
specialisation / annotation: ( ) Medisign
( ) Tech. in Sustainable Design
( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Daan van Eijk — dept. / section: HCD/AED
** mentor: Iemkje Ruiter — dept. / section: HCD/AED
2nd mentor: Mar Llinés Montserrat
organisation: Philips
city: Amsterdam/ Eindhoven — country: the Netherlands

comments (optional): This project is part of the NEXT UPPS lab. Daan van Eijk, as the project leader, can provide me with professional guidance related to UPPS. As this project is related to women's products, Iemkje Ruiter will be perfect mentor to guide me with anthropometry profession and female perspective.

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

A. Project brief

TU Delft

Procedural Checks - IDE Master Graduation

APPROVAL PROJECT BRIEF
To be filled in by the chair of the supervisory team.

chair Daan van Eijk date 22 - 03 - 2022 signature

CHECK STUDY PROGRESS
To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 27 EC
Of which, taking the conditional requirements into account, can be part of the exam programme 27 EC
List of electives obtained before the third semester without approval of the BoE

(X) YES all 1st year master courses passed
( ) NO missing 1st year master courses are:

name K. Veldman date 5 - 4 - 2022 signature

FORMAL APPROVAL GRADUATION PROJECT
To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: (V) APPROVED ( ) NOT APPROVED
Procedure: (V) APPROVED ( ) NOT APPROVED

comments

name Monique von Morgen date 11/4/2022 signature MvM

Initials & Name W.L Lin Student number 5192641

Title of Project Design for data-sharing experience:Personalization of Philips breastpump

A. Project brief

Personal Project Brief - IDE Master Graduation

TU Delft

Design for data-sharing experience:Personalization of Philips breastpump project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 07 - 03 - 2022 25 - 08 - 2022 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

In the era of product diversification, mass-produced products have gradually lost the interest of consumers and cannot fully meet their individual needs **[1]**. With the popularization of personal data applications and the development of manufacturing and distribution technologies **[2,3]**, companies are now able to personalize their products and services to fulfill the heterogeneous needs of consumers. However, along with personalization comes the involvement of users in the design and manufacturing process, which changes the relationship between company and consumers **[4]**. Therefore, there is a need to conduct research on the interaction of the personalization process from the user's perspective regarding the measuring and data-sharing experiences to align with other aspects (e.g., data analysis, manufacturing) **[5]** of development within the UPPS (Ultra-Personalized Products and Services) system.

In the context of mother and child care, there is a demand to provide better and tailored solutions for mothers who suffer from negative breastfeeding experiences **[6,7]**. However, in addition to the personalization of differences between individuals, it is also necessary to consider changes in individual needs over time **[8]**. Since breastfeeding can take up to two years or more from the start to weaning [9], the needs of a single individual in terms of breastfeeding behaviour will continue to change. For example, product size differences due to changes in body shape **[10,11,12]**, functional needs vary due to different breastfeeding phases and scenarios, and shifts in attitudes and emotions towards breastfeeding **[13]**. Thus, iterative personalization may be an opportunity to improve the user experience physically and mentally by closely involving users in the design and manufacturing process of a product-service offering to deliver the right product and a positive experience **[8]**.

This project is a collaboration between Philips Experience Design and the NEXT UPPS project team. As one of the leading players in the healthcare domain, Philips intends to explore new ways to provide users with a better experience through human-centered design and technology innovation. Academically, the NEXT UPPS project team actively conducts interdisciplinary research between three dutch universities to explore personalized design and production possibilities in collaboration with manufacturing industries and design studios.

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image / figure 1: Philips-Avent-electric breast pump

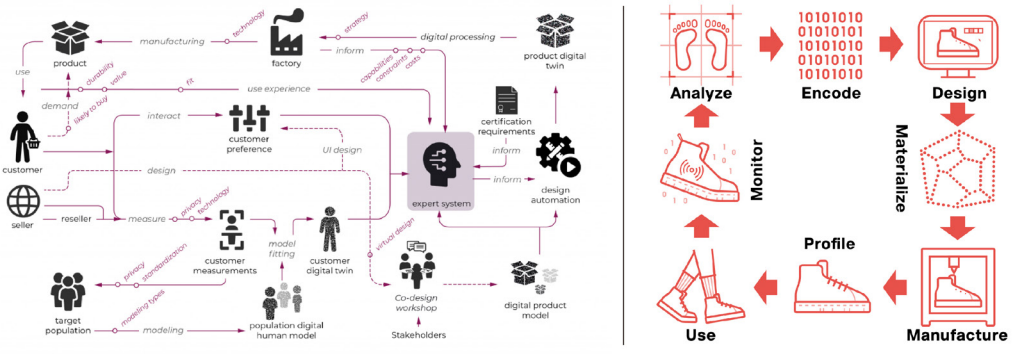


image / figure 2: UPPS (Ultra Personalised Products and Services) journey and model

Initials & Name W.L Lin Student number 5192641

Title of Project Design for data-sharing experience:Personalization of Philips breastpump

A. Project brief

TU Delft

Personal Project Brief - IDE Master Graduation

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

This graduation project focuses on the personalized interaction and co-creation level within the UPPS system regarding customer experiences. The uniform specifications of the existing mass-produced breast pumps cannot meet the needs of all new moms (over time), for example, women with challenges to start breastfeeding/pumping concerning health issues or situation changes, such as returning to work. A shift from traditional offerings for a group of some people to personalized offerings for one has led to a closer involvement of users in the design process, which results in a changing relationship between humans and technology.

Within the co-creation, data sharing can be a significant issue in personalizing breast pumps since sharing own body data and behaviour with a company requires considerable trust. The challenge of this project is to motivate users to start and continue to share their data, close the loop of the UPPS model **[5]** and provide users with a more personalized experience.

The project scope will cover the whole journey of pregnancy and maternal care to understand the needs and concerns of women, and the focus will be the data-sharing experience within the breastfeeding personalization process.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

To create a solution that motivates mothers to share their data regarding breastfeeding, that facilitates in providing users with a personalized and reliable breast-pumping experience.

The main research questions will be:
1. What are the attitudes, concerns, and emotions involved of pregnant women and new moms in breast pumping?
2. What is pregnant women and new moms attitude toward personalized products and the co- creation process?
3. What does "fit" mean in breast pumping activities? And what is the value?
4. What are the key service moments in an envisioned end to end experience?
5. What makes the data collecting process comfortable for a user?
6. What makes the data-sharing process trustworthy for a user?
7. What is the attitude towards personalized and tailored solutions of breast pump users and what would drive preference over mass produced offerings?
8. What new business models could emerge from Ultra Personalized and Products and Services in the context of breast pumping?
9. What data should be collect and in what way?

The expected design outcome of this project will be a product-service combination, focusing on the user experience. The final deliverables for Philips will be an insight report with executive summary. The insights will mainly focus on the user's perception of breastfeeding/-pumping and related product usage experience. Two aspects of insight will be presented, including the UPPS system in the context of breastfeeding and insights that can be introduced in a broader context for other similar Philips healthcare products.

Initials & Name W.L Lin Student number 5192641

Title of Project Design for data-sharing experience:Personalization of Philips breastpump

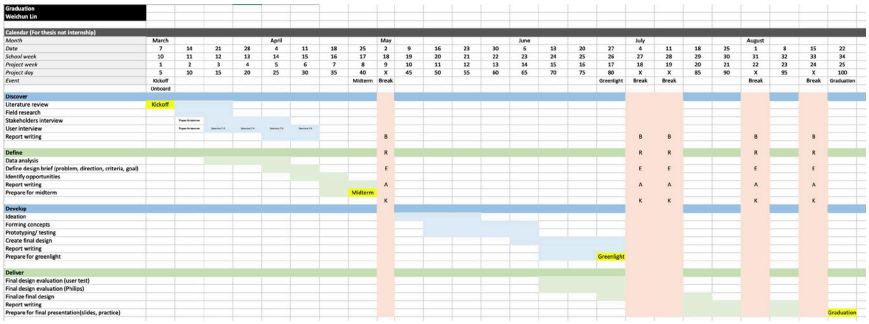
TU Delft

Personal Project Brief - IDE Master Graduation

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 7 - 3 - 2022 25 - 8 - 2022 end date



The total duration of this project will be limited to 100 working days and divided into four stages based on the double diamond approach, which is Discover, Define, Develop, and Deliver.

1. Discover: The project will start with explorative research and be followed by more in-depth user research. Literature review and field research will be conducted to understand the UPPS system, pregnancy/breastfeeding knowledge, and personalized products case study. At the same time, the interview plan will be formed based on the desktop research findings. Context mapping methods will be used to identify users/customers' experiences and needs. To gain insights from a user-centered yet feasible perspective, both consumers and stakeholders will be invited for the interview.
2. Define: All the materials and findings collected will be analyzed in the Define phase. The design brief will be defined within the converging process, including problem definition, design direction, criteria, and goal. Moreover, design opportunities will be identified for further ideation activities.
3. Develop: In the third phase-Develop, ideation activities will be conducted in various forms, including individual brainstorming and group creative sessions with users and stakeholders. Generated ideas will be further clustered and selected to form into concepts. Concepts will be created, prototyped, and tested iteratively with stakeholders and peers.
4. Deliver: In the last Deliver phase, a final design will be created and further be evaluated with users and stakeholders through several user tests. The completed report includes the description of the process, main insights, final design and its evaluation, and recommendation will be delivered. Furthermore, a presentation will demonstrate the final research and design outcomes.

*The research and design process will be iterative across different phases. Research findings and design ideas continue to evolve until final design decisions are made.

key event dates:
Kickoff: 70/03/2022
Midterm: 29/04/2022
Greenlight: 01/07/2022
Final graduation defence: 25/08/2022
*The time plan may be adjusted according to the actual research situation and results

Initials & Name W.L Lin Student number 5192641

Title of Project Design for data-sharing experience:Personalization of Philips breastpump

A. Project brief

Personal Project Brief - IDE Master Graduation

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

Women's experiences and health-related topics have always captured my attention since my undergraduate studies in industrial design. With the rapid development of technology, we have the opportunity to provide the right products for each individual. In this project, I want to create and offer a new possibility for mothers who are suffering from negative experiences during breastfeeding.

After more than a year of education in DFI, I hope to apply what I have learned to this project. Not only the practical aspects of using design methods or conducting interviews, but also how to perform design research and provide solutions truly from an empathy perspective. In this project I want to explore the possibilities of products personalization and to gain a deeper understanding of healthcare domain by working closely with NEXT UPPS team and Philips.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

B. Consent form

Information letter for Volunteers

Study Title: <Data-sharing for personalization: Breast-pumping experience>

Dear Sir/Madam,

This information letter is intended to help you decide about your participation in this research study. It describes the study, what you may expect if you decide to take part, and important information to help you make your decision.

- Participating in this study is voluntary – it is your choice;
- If you join this study, you can change your mind and withdraw at any time;
- It is important you understand why and how this study will be conducted;
- The potential benefits and risks of study participation are described.

Please take time to read this information, and if you like, discuss it with friends or family to the extent necessary to help you decide about participation. Contact the Responsible Researcher if you do not understand something or if you need more information. The names and contact details can be found under “Contact Information” below in this document.

Only participate in this study if your questions have been answered sufficiently, and you voluntarily decide that you want to be part of this study.

Thank you for reading this information and for considering your participation.

B. Consent form

Summary of what the study involves:

- This study is a combination of multiple activities including interview, ideation, and concept evaluation.
- The interview session will take about 1.5 hours including preparation in advance. The evaluation session will take about 15-30 minutes (If participants agree to join).
- The collected data will be used to explore user needs and identify opportunities for design intervention.
- Personal information including age, nationality, location will be collected. Information related to the topic will be collected (e.g. Number of babies, duration of breastfeeding etc.). Participants' precious experiences and attitudes toward the activities will be discussed in the interview.
- The study will take place in participants' homes/workplaces and on online communication platforms, depending on participants' preferences.
- Two supervisors from TU Delft and a supervisor from Philips are involved in the study.
- Participant is encouraged to contact the responsible researcher if they have any questions.

For more details on what the study involves and who the key persons are please read the rest of the information letter. For more details on how your data is processed please read the privacy notice(s) belonging to this study.

What is the purpose of this research?

To provide better and tailored solutions for mothers who suffer from negative breastfeeding experiences, Philips is exploring the possibilities of breast pumps personalization. The goal of this study is to first understand mothers' concerns about breastfeeding experience and attitudes toward personalization. Further, creating a solution that motivates mothers to share their breastfeeding data facilitates providing users with a personalized and reliable breast-pumping experience.

Where will the study be conducted?

The study will be conducted in physical or online format according to the needs of the participants. Physical interviews will take place in the participant's home or work space. Online interviews will use online communication platform such as Zoom, Microsoft Teams, Google meet, etc.

Duration of your participation in the study.

Your participation in the interview session will take about 1.5 hours of your time, including the preparation in advance. If you agree to join, the evaluation session will take about 20–30 minutes of your time. The Responsible Researcher will contact you about the exact time and place.

Who organised and paid for the study?

This study is organized and paid for by Philips Electronics Nederland B.V..
Philips has carefully prepared this study and the set-up has been reviewed by an independent internal review committee.

Who is involved in the study – which partners

This research is a collaboration between TU Delft and Philips. Therefore, supervisors on both sides are involved in the study. This includes a chair and a mentor from the university, and a designer from Philips.

What are the steps in the study and what is expected from me?

- After the recruitment, you will be asked to fill in a brochure (sensitizing booklet) as preparation before the interview session, which will take 5-10 minutes for four days (or can be done in one go).
- After finished the brochure, you will be invited to an interview session which will take about 50-60 minutes. During the session, you will have a discussion with researcher, Only topic-related questions will be asked.

- If you agree to join the evaluation session, you will be invited to a second interview, which will take about 20-30 minutes. Concepts will be shown to you and you will be asked relevant questions and feedback.

Which equipment will be used in this study?

Depending on the situation, participants might be invited to the interview through online communication platforms such as Zoom, Microsoft Teams, Google meet, etc. Miro (online collaboration platform) will be used If participants fill out the pre-interview material online. All the software mentioned above are commercially available. Computational devices such as a computer, a laptop will be needed to run the softwares.

Can I stop my participation?

You can stop your participation in the study at any time without giving reasons. The Responsible Researcher may ask why you decided to stop, but you do not have to give an answer.

The Responsible Researcher may end your participation in the research study if:

- You did not comply with the instructions for participation given to you.
- You no longer meet the criteria for participation.
- Philips decides to stop the study.

If your participation is no longer possible, the Responsible Researcher will inform you.
Please note, in case your participation stops, personal data already collected about you will be further processed by Philips as described in this information letter; however, you always have the right to have it deleted if you wish so. The privacy notice that has been handed out to you will tell how this can be done.

What are the potential risks of participating in the study

No specific risks associated with this study were identified. The equipment used in the study are considered safe for use on human participants.

What are the potential benefits of participating in the study?

Participation in this research can contribute to the development of future breastfeeding experiences for mothers by providing a wealth of insights. Provide developers with a more human-centred way of understanding the field, improving existing breast pumping experiences from a mother's point of view and provide potential future users with a more positive breastfeeding journey.

Insurance

General liability insurance is arranged by Royal Philips. If you would like more information or to receive a certificate of insurance, please contact the Responsible Researcher.

Compensation

To compensate participants for their time and effort, participants receive 10 Euro vouchers. An incentive will be provided to participants at the end of the interview session.

Confidentiality of personal data collection

Philips is committed to respect your privacy rights. Your participant and personal data will be confidential. To protect your privacy, all personal data will be de-identified. The following methods will be applied. Identifiable personal data (e.g., name, e-mail address, address, etc.), which is only for communication purposes will be stored in file separate from research data and will be kept with a password.

B. Consent form

Unidentifiable personal data including age, nationality, and location will be collected during the interview session. Additional data related to the topic will be collected such as numbers of baby, duration of breastfeeding, etc.).

Collection and usage of research data

Audio recordings and images will be collected during the interview, only with your permission in the consent form.

Collected audio recordings will be used for analysis purposes only, and will be deleted after conversion to the transcript. Quotations without identifiable information may be used for the report.

Images may be used for reports and publications, all identifiable features will be blurred and the original files will be deleted. All images will be filtered by participants at the end of the interview.

All data mentioned above will be deleted at the end of this study.

Confidentiality of Philips' confidential information

During the study you might come across confidential information of Philips. The information brochures, study descriptions, equipment, user manuals, instructions, together with information generated by you during the study, e.g. measurement results, user feedback, is confidential information belonging to Philips.

You agree to keep the confidentiality of such information and use it only for the purpose of your participation in the study.

Thank you very much for reading this information letter and the privacy notice and for considering your participation in the study.

If you decide to participate you will get a copy of this information letter and a copy of the signed informed consent form.

Contact Information

If you have any questions regarding this study including requests for additional information about the study or your rights as a participant (before, during or after your participation), please contact the Responsible Researcher.

Role	Name	Institution	E-mail	Address
Responsible researcher	Weichun Lin	TU Delft	W.Lin-5@student.tudelft.nl	Landbergstraat 15 2628 CE Delft
Supervisor	Mar Llinés Montserrat	Philips	mar.llines@philips.com	Amstelplein 2, 1096 BC Amsterdam
Supervisor	Daan van Eijk	TU Delft	D.J.vanEijk@tudelft.nl	Landbergstraat 15 2628 CE Delft
Supervisor	Iemkje Ruiter	TU Delft	I.A.Ruiter@tudelft.nl	Landbergstraat 15 2628 CE Delft

B. Consent form

INFORMED CONSENT for

<Data-sharing for personalization: Breast-pumping experience>

- I have read and understood the information letter about this study and all my questions have been answered by the Responsible Researcher. **[Yes / No]**
- I had sufficient time to consider my participation in this study and I am fully aware that my participation in the study is voluntary. **[Yes / No]**
- I agree to participate in this study and follow the Responsible Researcher's instructions. **[Yes / No]**
- I know that I can decide not to participate or stop my participation at any time without giving any reason for this decision. I understand that there are no consequences if I decide to withdraw. **[Yes / No]**
- I understand that any and all information related to the study, including anything in writing and verbally communicated to me is confidential information belonging to Philips. I hereby agree to keep the aforesaid information confidential and use it exclusively for the purpose of deciding on my participation in the study. **[Yes / No]**

Please clearly select (with a cross) for each of the below statements to indicate your choice.		
	Yes	**No**
I consent to participate in this study.		
I consent to the use of my data (personal and research) for the purposes described in the information letter.		
(Note that both options above need to state 'Yes' to be able to participate in the study.)		
I give permission to the use of my audio-recorded voice, photos data during the study and used as described in the information letter.		

_____ _____ _____

Name (Participant) Signature Date

Responsible Researcher

I have answered all questions about the study and discussed the meaning and scope of this informed consent and signed it in the presence of the volunteer.

_____ _____ _____

Name Signature Date

Are you a new mom?

Have you had experience with breastfeeding in the past few years?

Are you..?

Are you a mother with a 0-3 (+2) years old child? And would you like to talk to me about your breastfeeding experiences? Then I'm looking for you!

Who am I ?
What is this for?

I'm Weichun Lin, a master's student of Industrial Design Engineering at TU-Delft. I'm conducting research with Philips into the breastfeeding experience regarding breast pump usage and the possibilities of product personalization **as part of my master thesis**.

I would like to interview you in order to form an **understanding** of **mothers'** concerns and attitudes toward breastfeeding/pumping. This project aims to create a better and tailored breastfeeding experience for mothers.

Activities

The interview lasts approximately 50-60 minutes, and I would like you ***to fill out a booklet before the interview**. ***As an appreciation for your time and effort** you'll received a 10 Euro Bol.com vouchers as compensation. (The interview time can be shortened depending on the situation)

Contact

If you're interested in sharing your experience, please contact me.

[redacted]

TU Delft

D. Sensitizing booklet

Pre-interview material:

My Breastfeeding Experience

1. Miro basics: How to use this board?

If you want to **select** something, make sure the cursor is an arrow, not a hand. Do you have a hand? Then click on the arrow on the left hand, it will turn blue.

Moving in Miro is different for trackpad or mouse. With your mouse, you do this by clicking your left mouse button and then moving your mouse while holding it down. With your trackpad, you do this by moving two fingers side by side to the left or right.

Zooming in and zooming out is also different. With your mouse, you do that with your mouse wheel. On your trackpad, you do it by moving two fingers towards and away from each other.

Post-its are the most commonly used fill-in-the-blank options in this Miro board. Double-click on the post-it to change the text. Click and drag to move the post-it.

Dragging icons or images is done by clicking and dragging.

Drawing is also possible in Miro, check marker icons at the left hand side.

Welcome!

Thank you for participating in this research. For the project I am curious about your experience regarding the breastfeeding, and what can be improved for you.

You can see this workbook as a small refresher. This booklet contains a number of assignments that will prepare you for the interview. I am curious about **YOUR** experiences regarding the breast pump. So there are no right or wrong answers, only **YOUR** answers. In addition, the workbook offers the opportunity to share your story with me in your own way. Don't be afraid to give it your own twist.

In order to best prepare and spread out the amount of work, we recommend that you take 10 minutes a day for the four days before the interview to complete the assignments. If that does not work out, this can also be done in one go. It will be helpful for the interview to have completed the assignments beforehand.

Good luck!

Tips1 There is no wrong answer, you are the expert of your own experience.

Tips2 Feel free to write or draw anything, everything will be anoymous and confidential.

Tips3 Don't share this booklet to anyone, bring this booklet to the interview.

Who am I?

[redacted] a master's student of Industrial Design Engineering at TU-Delft who focus on experience and interaction design. I'm conducting research with Philips into the breastfeeding experience regarding breast pump usage and the possibilities of product personalization as part of my master thesis. My goal is to create a better and tailored breastfeeding experience with you and for you.

Who are you?

Your Nationality:

Your location:

Your age:

Numbers of baby:

Duration of breastfeeding:

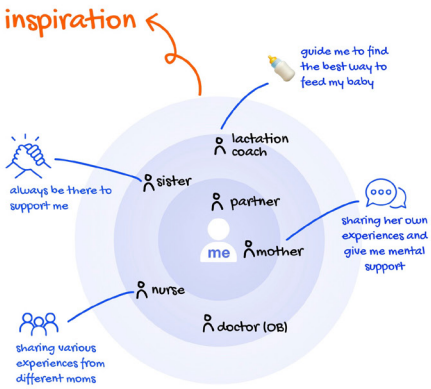
Do you breast pumping? If yes, how long? :

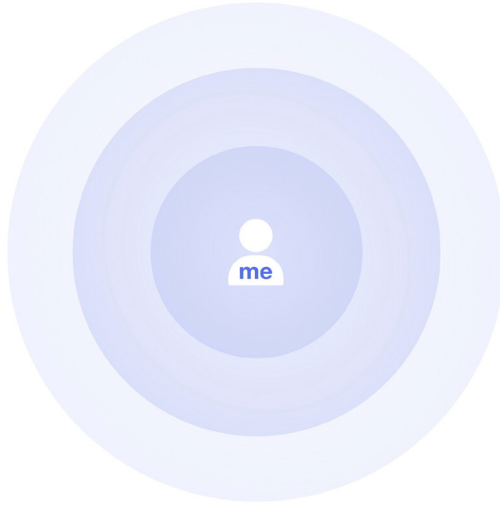
D. Sensitizing booklet

Day 1: Who are the people around you during breastfeeding/ pumping?

Step 1: Think about the people around you during breastfeeding, and place them on the chart according to how close and important they are to you regarding breastfeeding.

E.g., friends, relatives, professionals (doctor, nurse,etc)

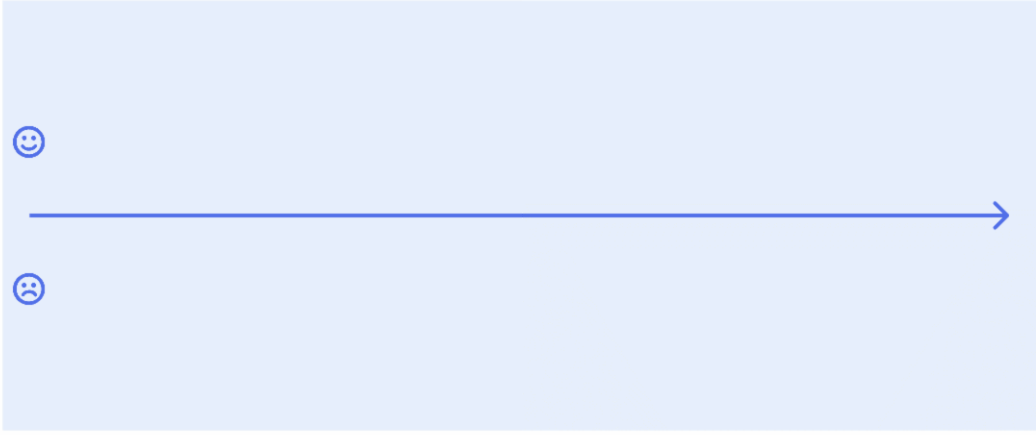




Day 2: My special moment!

Step 1: Try to recall the most special breastfeeding experience (both positive and negative). What happened?

Step 2: Map out how's your journey looks like, put on some specific moments, draw the mood chart to connect them, you can also add some icons, images to describe how you experience these moment.



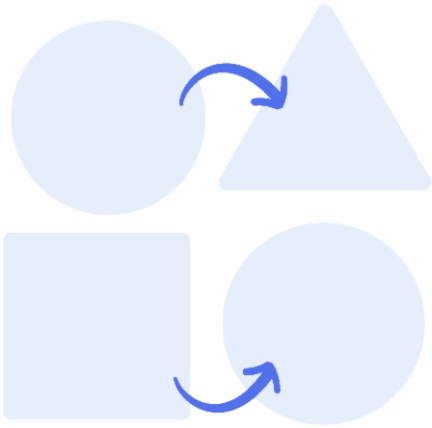
D. Sensitizing booklet

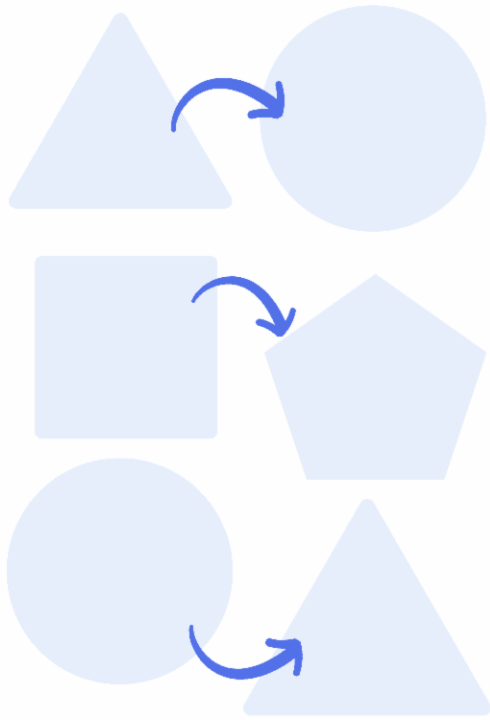
Day 3: Something different now...

Going from pregnancy to becoming a mom is a big transition in life. Do you aware that something has changed or still changing since you had a baby?

Step 1: Try to recall some of the changes you are aware of, it can be physical such as behaviour, daily routine, body, or mental changes like emotions, attitudes etc.

Step 2: Write or draw the before and after.





Day 4: What is your ideal breastfeeding experience?

Step 1: With your breastfeeding/ pumping experiences, what do you wish to have/not have in the future breastfeeding experience? It can be any aspect, product usage, purchasing etc.

Step 2: Write or draw some ideas, or use images. It can be specific ideas, feelings, keywords, etc.

Tip Be creative and wild!

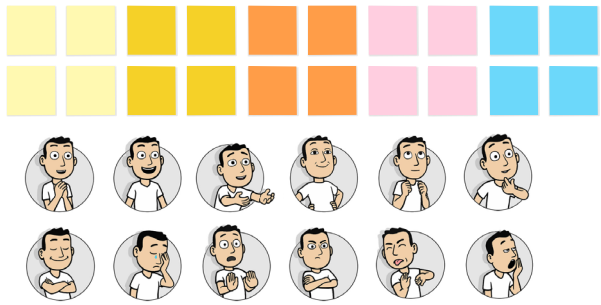
What will it be like to breastfeed/pump in 5 years?

I wish...

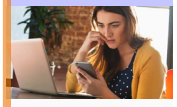
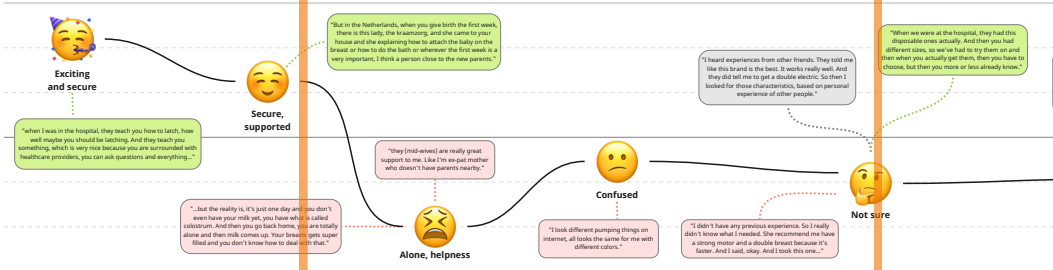
What will breast pumps look like in the future...?

I wish there is no...

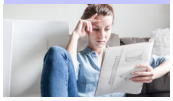
D. Sensitizing booklet

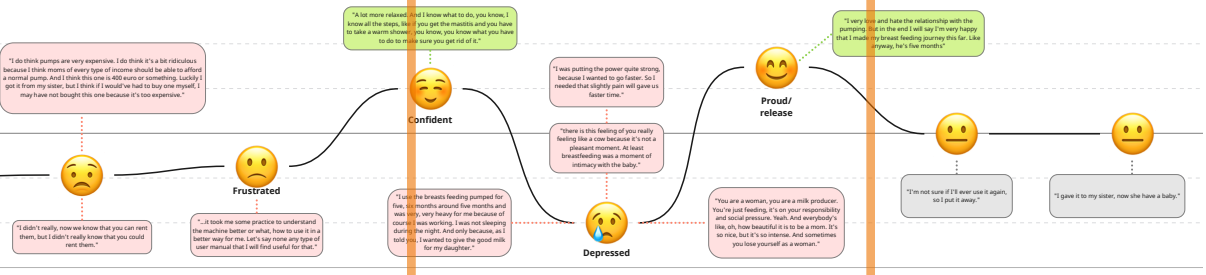


Breast pumping journey of new mothers

Phase	Awareness			Consideration		Purch
Actions	Give birth in hospital	Taking care by Kraamzorg (NL)	Stay home alone	Exploring options	Ask for recommendation	Decision making
						
	• First try of using medical grade breast pump (rental) • Stimulate the breast, practice feeding/ pumping	• Taking care by Kraamzorg for 7-10 days • Learn to breastfeed/ pump • Recommended to get a breast pump by Kraamzorg	• Self-learning of nursing activities • Practicing breastfeeding	• Do online research for breast pumps options • Compare different models (functions, price, brand)	• Ask for recommendation from friends, family	• Select brand • Select between manual/electric • Select between pump type (desktop/ portable) • Select single/ double pump • Select flange size (not Philips)
Goal	Stimulate breast	• Learn basic nursing skill • Make sure baby have enough nutrition from breastmilk	-	Find the best breast pumping devices	Learn from others experience	Choose the product that suits you
People/ Touch point	• doctor • nurses • lactation coach (LC)	Kraamzorg	• mother communities • partner	• product websites • mother communities	• friends • family • mother communities • Online tutorial	• Philips website • Previous pumping experience in hospital
Experience						
Opportunities (for personalisation)	• New mothers feel reassured that they can rely on the support of experienced/medical people. How could Philips continues this supported experience throughout the pumping journey? • Collaborate with medical staff to understand customer's need (e.g. measuring size) • Provide trial service, introducing Philips products/services ☆			• Provide guidance for consumers to understand their own needs and select the appropriate product. ☆☆☆☆		• Provide flexible produ for inexperienced ne uncertainty. • Provide measuremen ☆☆☆☆

1

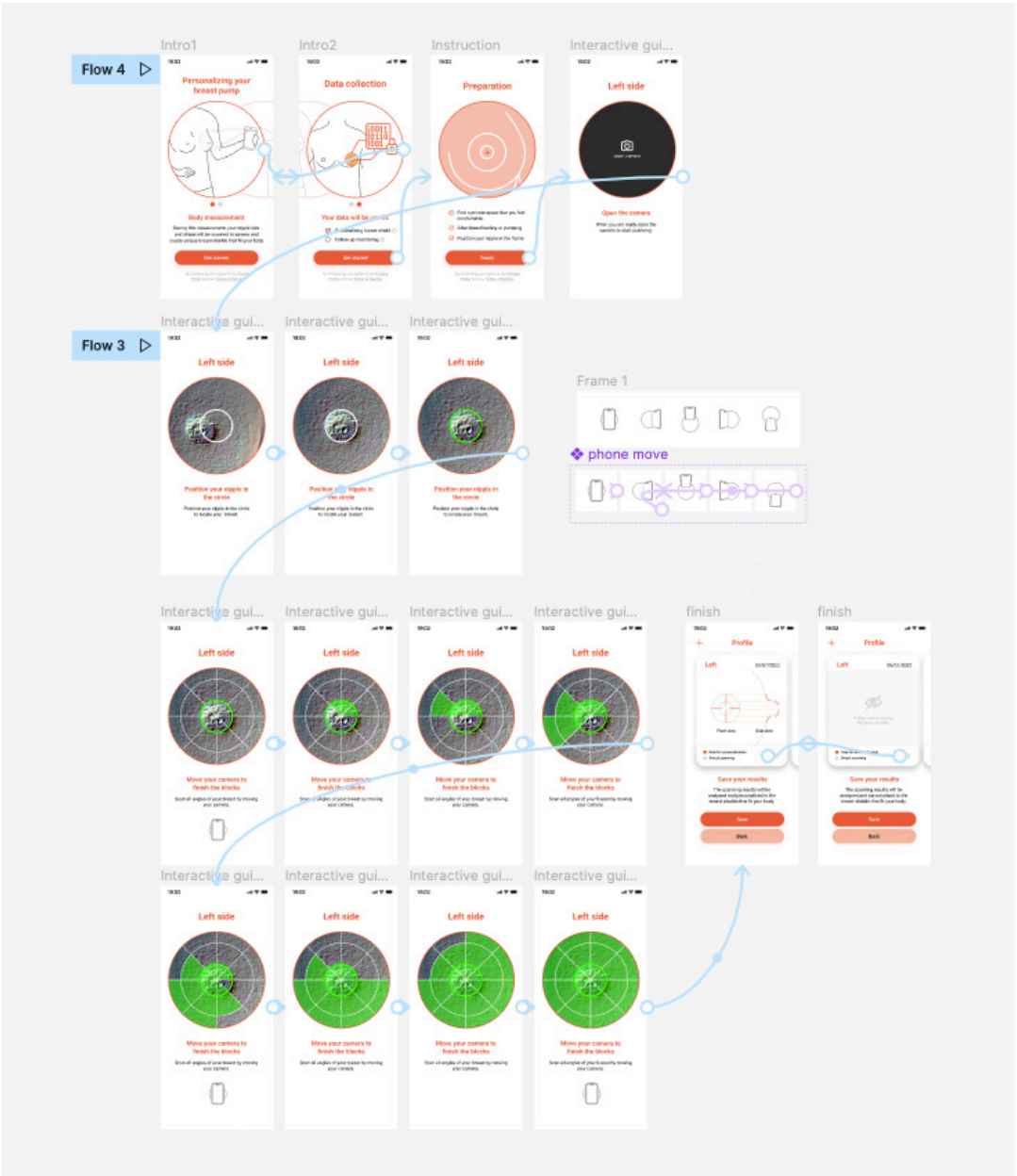
hase	Use				End of use/Advocacy	
Acquiring product	Learn to use	Pumping at home	Pumping at work	Weaning	Storing the product	Sharing the product
						
• Purchase, rent, received breast pumping devices	• Following product manual to learn using breast pump	• Breast pumping • Making regulate schedule • Tracking data (time, volume)	• Carry breast pumping kit • Store extra breastmilk	• Introducing formula, solid food. • Reducing breast pumping milk	• Store the product for future usage (e.g. second baby)	• Share the products with family members/ friends • Recommend others
Get the breast pump	Learning to use product	Make sure baby have enough breastmilk	Find balance between pumping and working	Stop feeding breast milk	Prepare for the future	Support other new mother
• Amazon • Philips website • Retailer	• Product manual • Youtube video • Friends, family	-	-	-	-	-



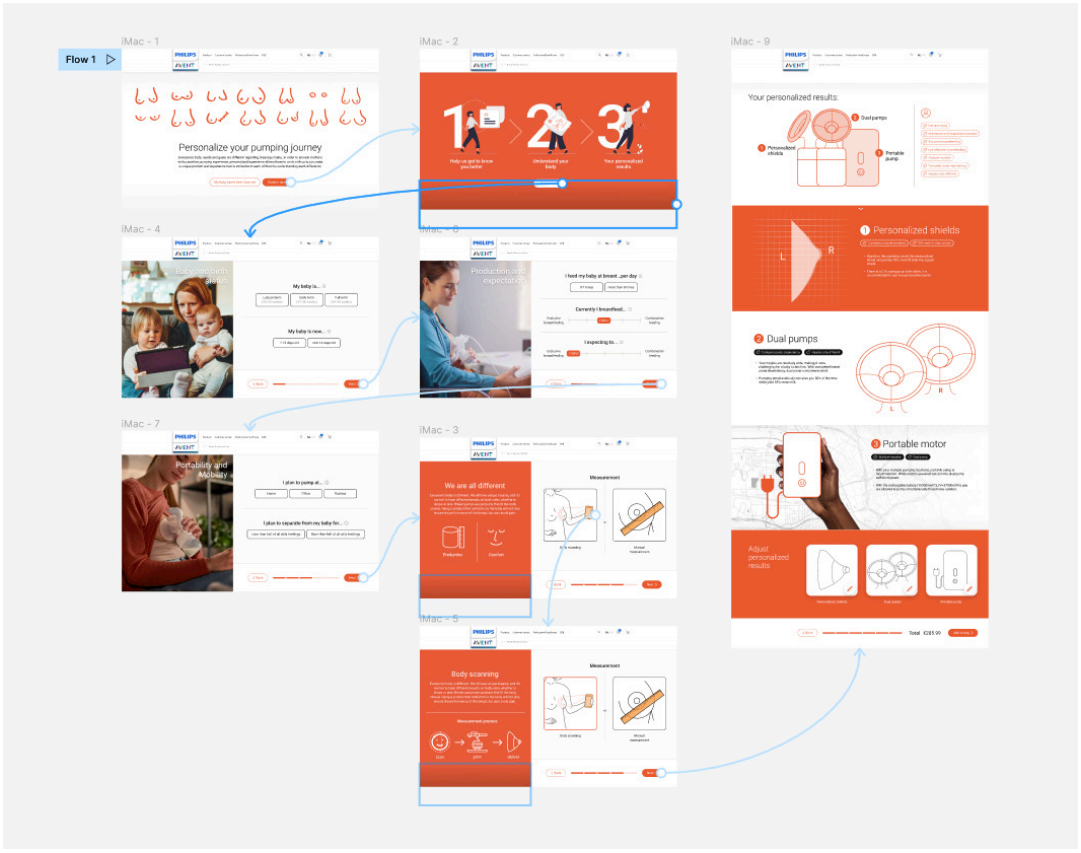
ct acquiring methods v mothers dealing t tool-kit for sizing	• Provide personal support for pumping skills ☆☆	• Provide follow up care/ support • Collect customer feedback on user experience • Offer new components for new feeding goal ☆☆☆	• Recycled, refurbished products (for cheaper product, trial sample) ☆

2

F. Prototype (Figma)



F. Prototype (Figma)



G. Evaluation questionnaire

Final design evaluation

This questionnaire aims to evaluate the final design output, ie the customisation process of the pump product which included physical measurements.The data of the questionnaire is anonymous and will be deleted after analysis.

Please answer the questions based on your own experience. There is no right or wrong answer.

If you have any questions, feel free to contact me[redacted]

[redacted]

*必填

Your age *

您的回答

Do you have breastfeeding/pumping experience? *

- ○ Yes
- ○ No

You got enough support during co-create session. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Sufficient and easy-to-understand information help you accomplish the tasks during the co-create session *

G. Evaluation questionnaire

Sufficient and easy-to-understand information help you accomplish the tasks during the co-create session. *

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

With the support and guidance, you are more willing to participate in the co-create session. *
(product customisation)

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

With the support and guidance, you are more willing to participate in the co-create session. *
(Body scanning)

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

Would you consider using this personalised service when buying a breast pump if pregnant? *

- ○ Yes
- ○ No
- ○ Maybe

G. Evaluation questionnaire

Would you consider using this personalised service when buying a breast pump if pregnant? *

- ◯ Yes
- ◯ No
- ◯ Maybe

According to the answer above, why?

您的回答

Any suggestion for improvement?

您的回答

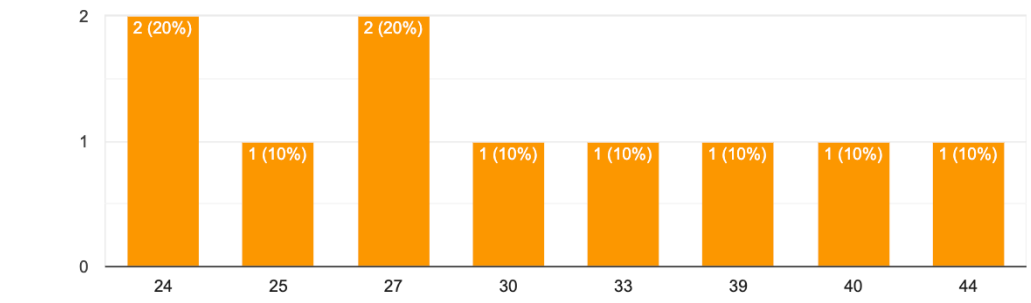
提交 清除表單

請勿利用 Google 表單送出密碼。

Your age

複製

10 則回應

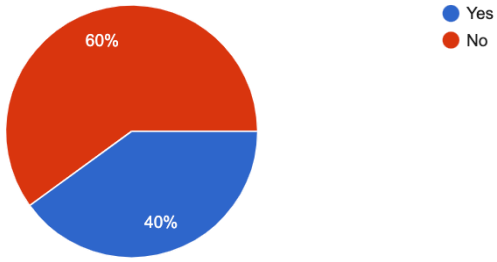


G. Evaluation questionnaire

Do you have breastfeeding/pumping experience?

複製

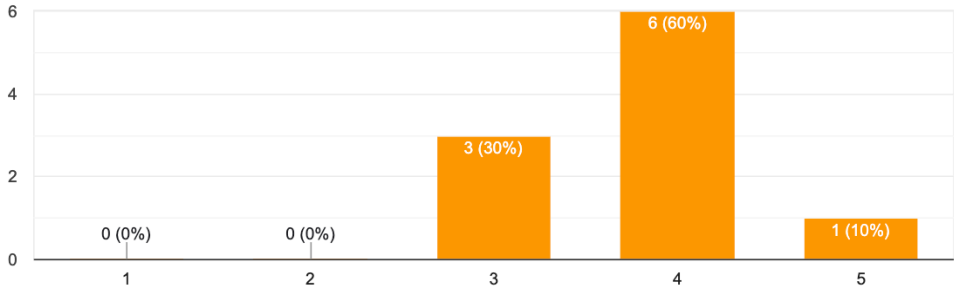
10 則回應



You got enough support during co-create session.

複製

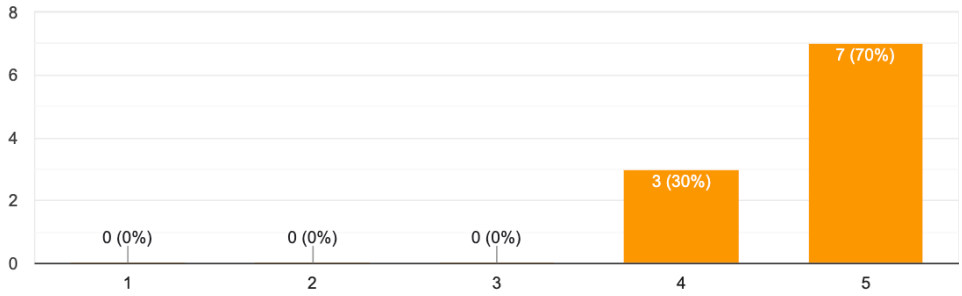
10 則回應



Sufficient and easy-to-understand information help you accomplish the tasks during the co-create session.

複製

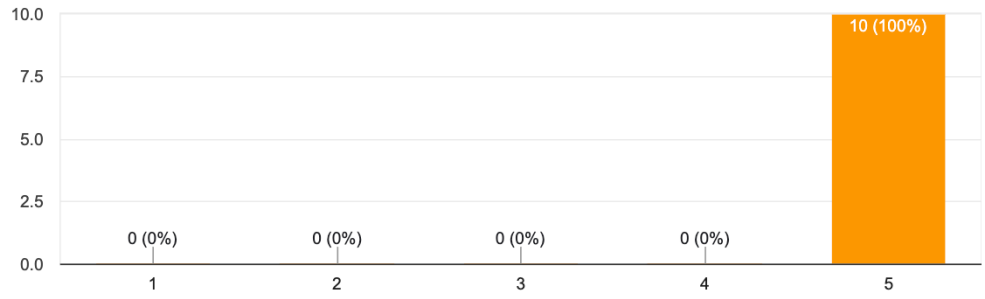
10 則回應



G. Evaluation questionnaire

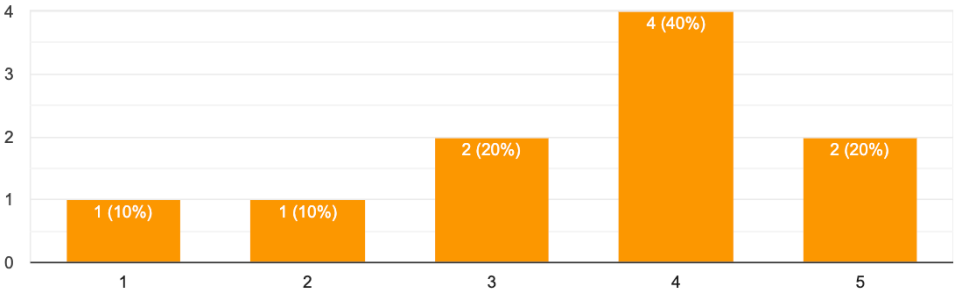
With the support and guidance, you are more willing to participate in the co-create session.

10 則回應



With the support and guidance, you are more willing to participate in the co-create session.

10 則回應



Would you consider using this personalised service when buying a breast pump if pregnant?

10 則回應