humanVUI

Designing meaningful voice interactions

TU Delft

Leona van der Linden

valsplat

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Master thesis

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Preface

Dear Reader,

I front of you lays the final deliverable of my graduation thesis for the Design for Interaction master program of the Delft University of Technology. This six month project was executed in collaboration with design consultancy Valsplat. The project enabled me to meet and cooperate with many inspiring people whom I would like to thank in advance.

First of all, thanks to my supervisory team.

Anne, for continuously encouraging me, through both good and bad times. You made me believe in my own ability to make this project to a good end. Your personal advice helped me both at project level as felt like a friend giving thoughtful advice.

Gert, for believing in the concept of this project from a relatively unknown area of design. You helped me in narrowing down the research proposal, to make sure I would focus on achieving the desired outcomes. Besides, you repeatedly 'boomeranged' me with the question: “Nice but what to you think yourself?” to remind me that I was doing this project for my personal gain.

Femke, for bringing structure and order to my thesis set-up. You are always able to encourage me to re-structure and improve my argumentation. This to make sure I would push myself to make the most out of the project.

To all of you I give my mayor appreciation for being empathic and flexible when I was searching and redefining the right graduation working pace.

Thanks Rob, Stijn, Marieke, Brechtje, Sezgi, Wally, Tim and Maarten for giving me more insights into the world of VUI. Thanks to KPN for enabling me to validate my tool during a cooperative workshop and thanks to Daan from 'Het Productiehuis' for shooting the amazing video clips. Last of all, thanks to all other participants that shared their thoughts with me.

A special shout out to my dear Valsplat colleagues, reviewing my ideas, helping out with design visions and having a beer/laugh at the vrimibo's. Your personal guidance, patience and confidence in my ability, helped me to get and keep on track. Thanks for giving me the space to do this project at my own pace.

Above everything, I have to reward the continuous support from my dearest family and friends. My parents for their motivational speeches, my roommates for listening to me having annoying conversations with our Google Home Mini and Judith and Mark for replying to my last minute reading requests.

I hope this thesis triggers your curiosity and might spark your mind with some new inspiration.

Enjoy the read!
Leona van der Linden

Executive Summary

humanVUI: Human Centered Voice Design

Voice user interfaces (VUI) have arrived. Worldwide, this technology is in the lift and enabling the exchange of information through voice interactions. As a result of the growing popularity of this technology, companies fanatically started with the designing of their own skills and/or actions. But although, this over-enthusiasm, leaves the 'why-question' unanswered. This is the result of a technology push: the technology is leading, putting human needs in its shade

What is actually the problem that a VUI is solving? And is this really better compared to existing solutions? How do we make sure the integration of voice technology simplifies and enriches our lives? How do we design voice interactions that matter? Human centered voice design is the answer.

Therefore, the central aim of this research is to enhance designers in the creation of meaningful voice interactions. The research has been divided into a theoretical background part and an exploratory research part, with methods including case studies, interviews and observations.

The insights gathered through this research are boiled down into a condensed framework showing how designers could incorporate human centered VUI design in their processes. The argument put forth in this research is that context factors and human centered values determine to what extend a use case is meaningful, in relation to one's job to be done. The proposed human centered values are enlarging accessibility, enhancing convenience and/or enhancing experience.

Building on this argument, a toolkit has been developed, turning the theory into a hands-on product to incorporate in every VUI design project. The toolkit includes: a canvas to discover and validate human centered VUI use cases and a card deck which both clarifies the canvas' elements as well as triggers the designer's VUI imagination with inspiring examples.

With the canvas, you decide step-by-step if voice technology provides the right solution for the fulfillment of a job to be done, putting the needs of the human central to the modal. In chronological order these steps include: Framing the Job to be done, checking the context factors, ensure human centered value and ranking the use case's feasibility. The card deck with examples of contexts, target groups and specific types of interaction in which a VUI could be of extra value stimulates the creative process and hereby enhances the creation of meaningful voice use cases.

Finally, the design approach and toolkit have been evaluated during a cooperative creative session with Valsplat and KPN online. Recommendatory insights gathered during this session create a revised version in the shape of a workshop. This set-up enables Valsplat to help organizations in creating voice solutions based on customer needs. With the results followed from this project they want to initiate a new movement: putting humans in the center of the voice revolution, towards a world with voice interactions that are worthy of humans' precious time! ■

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Bibliography

Abbreviation	Meaning
Action	Voice apps operating on Alexa
AI	Artificial Intelligence
Alexa	Virtual assistant developed by Amazon
ASR	Automatic speech recognition
Google Assistant	Virtual assistant developed by Google
GUI	Graphical user interface
JTBD	Job to be done
NLU	Natural language understanding
Skill	Voice apps operating on Google assistant
STT	Speech to text
TTS	Text to speech
UI	User interface
Utterance	Sentences/word queries that mean the same thing
UX	User experience
VA	Virtual assistant
Voice Persona	Characterization of the VUI's personality and tone of voice
VP	Valsplat
VUI	Voice user interface


A-TRAIN HOTEL
A-TRAIN HOTEL
FRANS BEEKWILDER
Albert Heijn
DISPLAY

1 Project Introduction

This chapter serves to introduce you to this graduation thesis. It describes the project objectives, scope, research questions, and approach.

In this chapter:

1.1 Introduction

Voice assistant technology, that can provide various services by listening for a wake word to become active and perform certain tasks, is rapidly penetrating people's lives. Either through smart-phone apps, like Siri or by means of smart speakers, such as Amazon Echo, Google home and the Apple HomePod. In the U.S., already 1 out of 3 of all households are getting used to talking to their Alexa to add groceries to their shopping lists, change the channel or volume of the TV or to turn down all the lights when going to bed. (Voicebot, 2019)

In the Netherlands, Google recently released a Dutch-speaking assistant, available as an app for your smart-phone. As a contribution to this release, multiple Dutch companies like PostNL, Albert Heijn, and Buienradar were asked to be a launching partner by developing a voice "action" for the Dutch assistant. You are now able to ask the assistant when your package is going to be delivered or whether it is going to rain. It is amazing to try out and see how it actually feels to have a conversation with a computer, however, is this really what customers want? Asking a question and getting a direct answer is nice, but does this interaction need to happen through a VUI? Isn't opening an app way easier and in some contexts even more convenient to answer a question or fulfill a certain job to be done?

Valsplat, a design consultancy with a love for people and digital, helps companies to create experiences that are simple, smart and lovable. They see design as a creative process where every decision is based on insights and always inspired by people. That is what they call design by insight. Recently they revised their purpose to: 'creating time for things that matter' whereby they mean to create experiences that are time well spent. This vision combined with their clients requesting to run VUI projects makes that Valsplat is triggered to know how to design voice interactions that will not waste users time but simplify and enrich their lives.

This situation presents an opportunity for Valsplat to develop a dedicated process for designing voice assistant interfaces from a user-centered perspective. ■

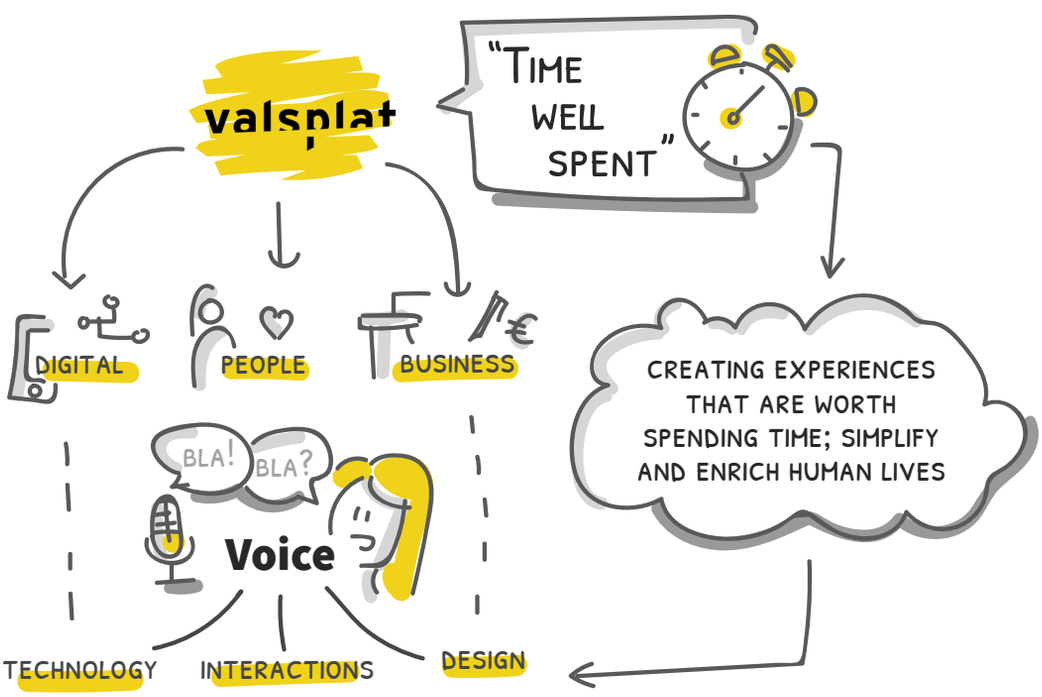


Fig. 1 - The vision of Valsplat plus its relation to VUI

1.2 Project Aim and Approach

Scope

There are two factors that determine the scope for this graduation project.

1. Valsplat

This research project is conducted for Valsplat and focuses on their way of working (A detailed company description can be found in chapter 1.4). The yet to be developed VUI design process, approach guidelines and tools will be created with the aim to be of use for Valsplat designers.

2. Voice assistant design

The topic investigated is the designing for voice assistants. Within this design process the focus has been to map the new process/way of working and making a contribution to this process from a human-centered perspective.

Research question

Currently, there is little known and written about the voice assistant design process. Valsplat, as a design consultancy, sees and feels an opportunity in this newly emerging field of Design. As a result of new VUI related requests that arise from their clients they feel the urge to link VUI to their new purpose: designing experiences that are time well spent.
Therefore, the aim of this project is to investigate the process of designing voice interactions in order to support designers in making them more meaningful. Thus, the research question that guides the investigation in this thesis is:

How can designers create meaningful voice assistant interactions?

To be able to answer this research question, it has been divided into subquestions that each assigns a specific part of the research that has been done.

1. ***What is known about voice assistants?***
2. ***What does the VUI design process look like?***
3. ***What role does a designer fulfill in this process of creating meaningful interactions?***
4. ***Which tools help designers to develop these interactions/gather those insights?***

The results of the research performed should enable to design new methods, tools or guidelines that support interaction designers to discover, design and evaluate voice interaction possibilities.

Significance

Companies feel the need to jump on the opportunity of the VUI field of design since it has been prospected that by 2021 there will be over 7.5 billion digital assistants which is more than the world population. (Ovum, 2017)
The newness of voice assistant technology implies that currently businesses are trying to discover what's the right way to go and tackle this conversational push.
There seems to be no specific method, guidelines or tools for interaction designers yet to discover what could be possible voice interaction moments within a user scenario or customer Journey. Therefor, companies now solve this in an experimental way: copying their existing services into conversational Ones. This way of working lacks argumentation from a human centered perspective.

Therefore this project serves to investigate ways to support Valsplat in how to create meaningful voice interactions through a pro founded VUI process. In turn, contributing to the facilitation of thoughtful human-centered design in a more and more digitizing world.

Project approach

Since the origin of the topic of voice assistant lies within a field of design that is in continuous development and evolving day by day, it is needed to approach this research in a flexible manner, with allowance for a reflexive attitude towards the set-up of the project. This includes critically reflecting on the outcomes of exploratory research performed and incorporating this into the following of the design process.

Therefore, the approach to this project follows the double diamond model constructed by the Design Council UK (2005). This model divides the design process into four distinct phases. Discover , Define, Develop and Deliver. The phases have a diverging or converging objective, to enable the designer to both go broad in the design thinking /exploration and to deliberately narrow down to focus on distinct objectives. This process is illustrated in figure 2. ■

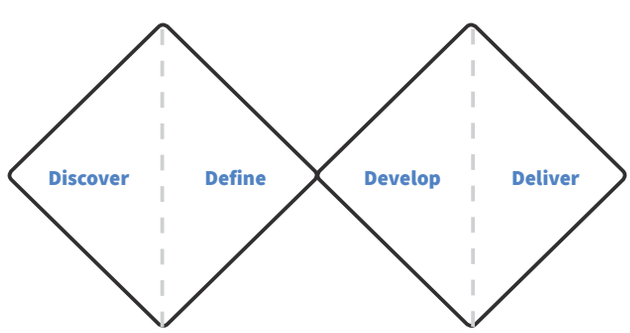


Fig. 2 - Double Diamond design process

1.3 Project Layout

The double diamond approach divides this thesis chapters over four phases. (See figure 3)

In phase 1, Discover, the project starts with exploring the topic. Literature research has been done into the technology to create a common understanding. This is described in the Theoretical Background. Based on these insights, exploratory research has been performed into the topics remained unanswered.

The second phase, Define, focuses on synthesizing all the insights gathered in the discover phase. Ideas are synthesized and aligned with the valsplat objectives, creating a clear brief that frames the design challenge.

In phase 3, Develop, the VUI design process is proposed in combination with a possible range of ideas focused on helping the designer in that belonging phase. This is a process of developing, prototyping, testing and iterating.

The last phase, Deliver, the methods and tools created are put up to the final test through validation. Next to that, the research questions are answered and the project limitations and recommendations are discussed.

It should be noted that, although this report and design process are shown in a linear form, this does not imply that the shown design activities where performed in the same chronological order. Designing is an iterative action that always moves back and ford through the different stages of design. ■

Reading tips!

No time to read? Take a shortcut by reading the key takeaways on the colored pages that sum up the conclusions per chapter. You can also focus on:

★ **Opportunities**

Threats

Dive into chapter 7.1 to directly read the conclusions and recommendations. (Divided over: Industry, Valsplat or Designers)

For explanations of the VUI jargon, look at the bibliography on page 11.

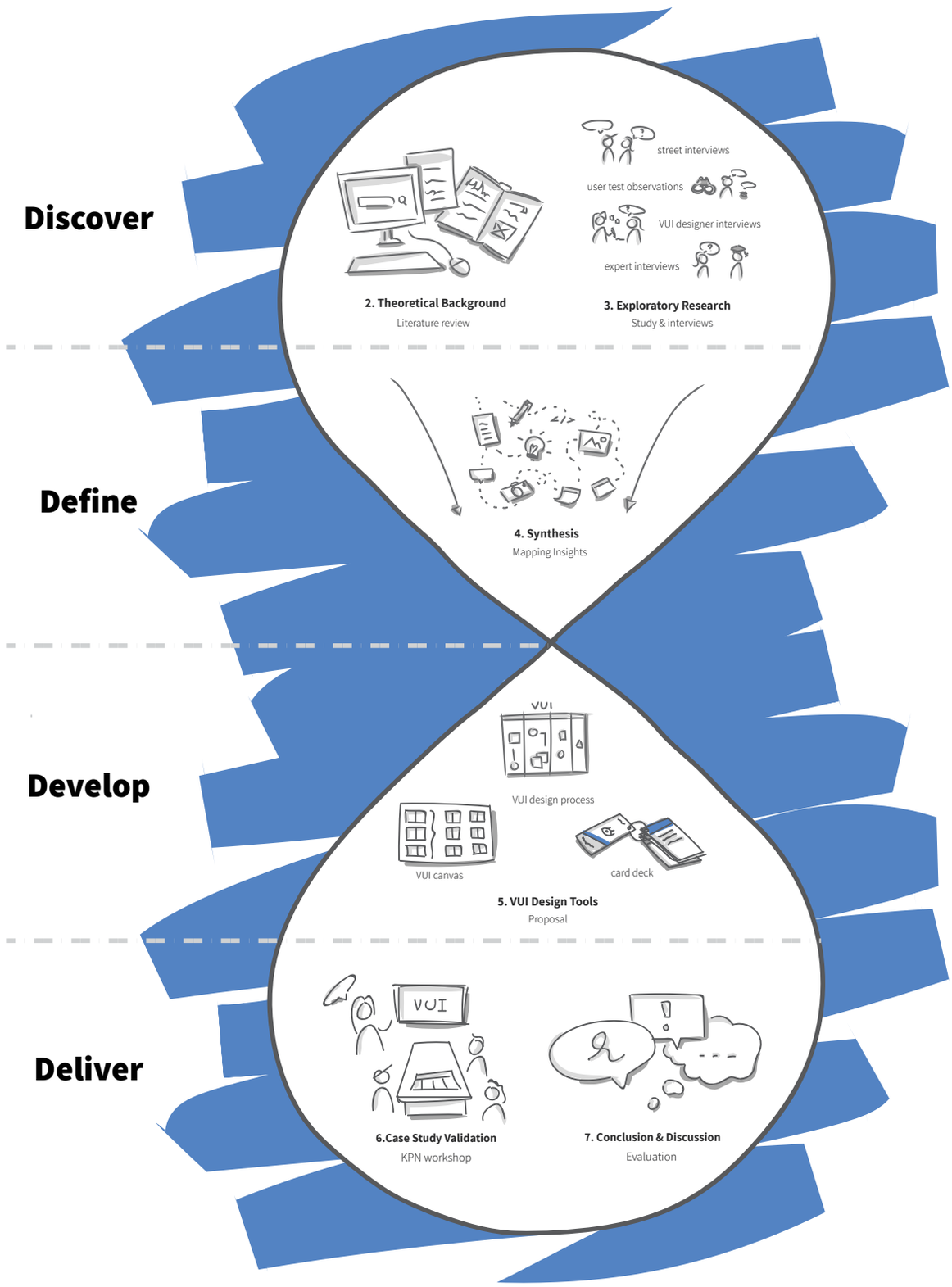


Fig. 3 - Project chapters linked to the design process

1.4 Valsplat introduction

"This project was executed for Valsplat, a design consultancy situated in the Netherlands. These pages tell you in detail what Valsplat does and which purpose they live up to."

This is Valsplat

Valsplat is a design consultancy inspired by a love for both digital and people. They design products and businesses from innovation to interaction. From the very first day on, their business has been about improving digital experiences. Thereby they have a lot of knowledge of the digital world with a focus on experiences that have been designed in favor of the consumer and even bigger, in favor of humanity. They enable businesses to built reliable and sincere relations with their customers. In order to make the world a bit more human centered, day by day.

Design by insight

Valsplat sees design as a creative process to find the perfect solution in which every decision is based on insights and always inspired by people. They pursue a way of thinking in which discovery and delivery seamlessly work together. This is what they call: Design by insight. (Figure 4)

Discovery

Their design process starts by uncovering the real problem, diving into the minds of your customers to see what is wrong or what is missing. By using methods like Customer Journey Mapping, Prototyping ,Design research and Design Sprints they help clients to understand their customers. In this way they create concepts that are inspired by your customers and are guaranteed to make them smile.

Delivery

A great concept is nowhere without the right execution. Valsplat's designers will help bringing ideas to life, always inspired by insights from research and experiments. Methods like lean UX, embedded user testing and A/B testing allow them to improve products before and after they are launched. That's how they create a product that customers will love.

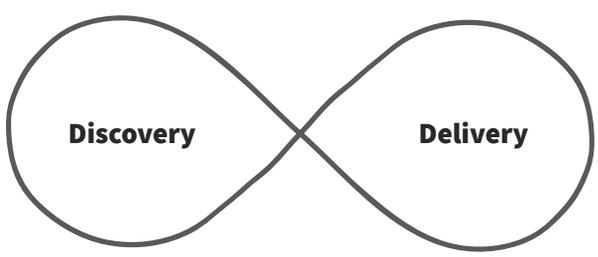


Fig. 4 - Valsplat process: Infinite loop of discovery & Delivery

Time well spent

In 2018, valsplat revised their purpose to: "Make time well spent." Hereby they say they want to e uncover what people really need, to create digital solutions that really matter, because it's their purpose to make time well spent. They want to make sure that the time that people spend online is meaningful and well spent. With online they mean whenever you are using a product with an interface that is connected to the Internet. Think about computers, smartphones, smart appliances (IoT), car interfaces, In flight entertainment, voice interfaces, etc.

They want to decrease the time you spent on operating tools, to free-up more time for achieving goals. Thereby they want to use of products to move from meaningless (without use, value or worth) in to meaningful experiences (significant, important, useful, worthwhile)

Valsplat client projects steps

Despite the fact that every project and client is different and it could last from 1 week to a few months, every project goes about through these same steps:

1. Intake

Inquire and discuss which method should be applied to the project to be able to meet the research question from the client.

2. Kick-off

Meeting at the client with all relevant stakeholders to check the research set-up and make agreements about participants, dates, deliverables etc.

3. Project set-up

Translating the research questions into a project set-up . This could be usability test/ group sessions/ diary studies/ deep-dive interviews/ design sprints/ expert reviews, etc.

4. Executing

Execution of the project according to the script with a set number of participants below the eye of the client (watching live from another room)

5. Reporting

Gathering all insights from the research performed and translating them into either sticktail stories (Valsplat's reporting tool: www.sticktail.com), a visual representation and/or a presentation.

6. Evaluation

Evaluation with all stakeholders to be able to check whether the research questions have been answered and to come up with next steps for the design process.

Valsplat and voice

In the past, Valsplat has already worked on a couple of voice Projects. They believe in the new technology because it is a more natural way of human computer interaction that has the potential to liberate us from our screens. Besides, since Google's release of the Dutch assistant, more clients start requesting Valsplat to perform VUI projects.

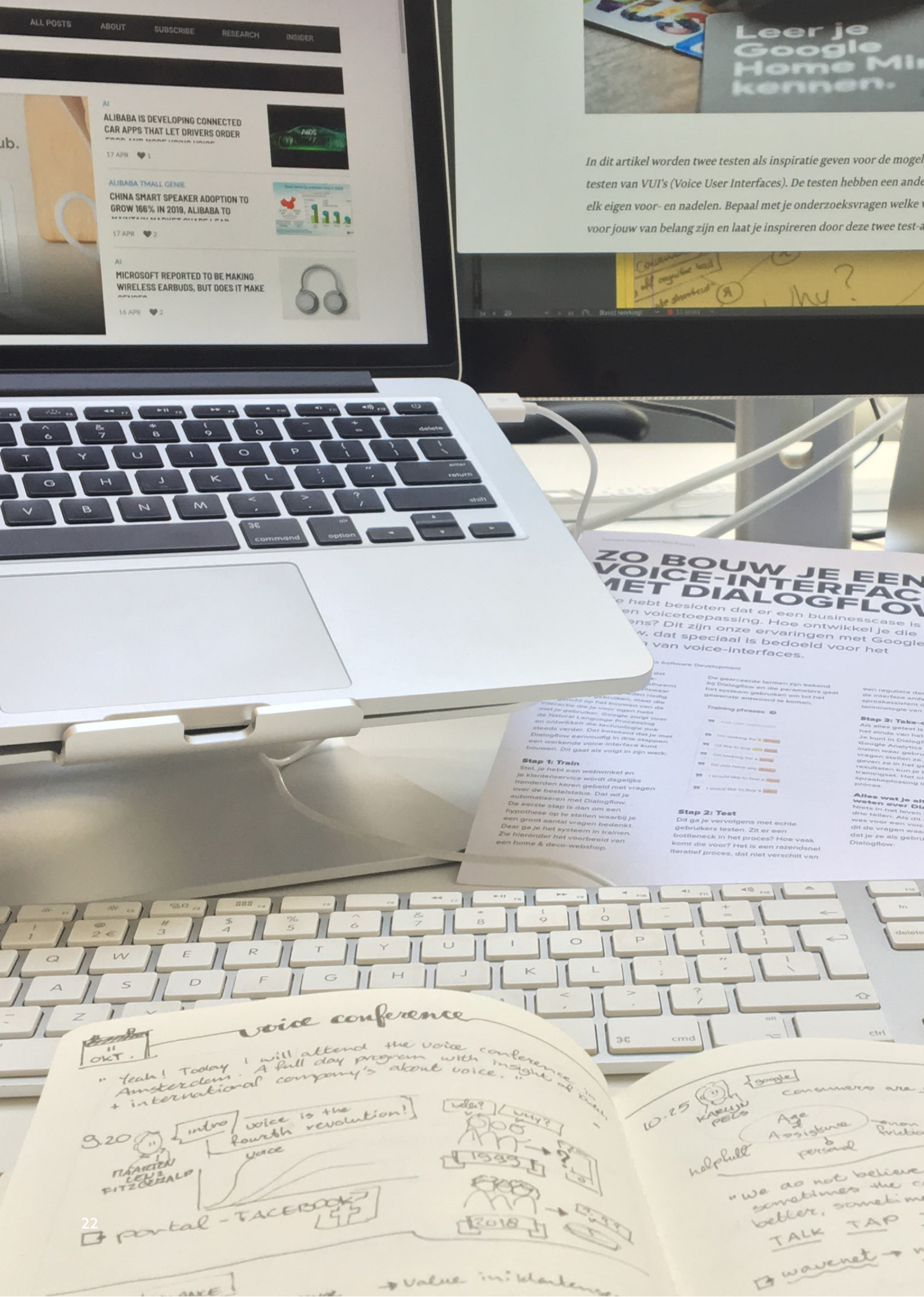
Conclusion

Valsplat uses a combination of discovery and delivery to shape their projects. This way of working is leading for any of the projects they execute and thereby also defines which methods to use in certain phases.

Their new purpose: 'Time well spent' shows a clear link to human centered design which should be enhanced in their VUI design approach

Since every client has their own needs and wishes, valsplat acts upon this by creating personal projects.

With Valsplat's purpose to be known for their design consultant role, it is important to create a clear way of working for VUI. ■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Leer je Google Home Mi
kennen.
In dit artikel worden twee testen als inspiratie geven voor de mogel
testen van VUI's (Voice User Interfaces). De testen hebben een ande
elk eigen voor- en nadelen. Bepaal met je onderzoeksvragen welke
voor jouw van belang zijn en laat je inspireren door deze twee test-a
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2 Theoretical Background

This chapter serves to give a broader understanding of voice assistants: what is the definition of a voice assistant, how did the technology develop over time, what is the technology behind it and what is the current state of voice assistants.

In this chapter:

2.1 Voice Assistants

"Voice assistant, what is that? In the following pages, you are introduced to the topic of voice assistants. The what, when, where and why will be explained, including a technical description of the design itself."

The term GUI, graphical user interface, belongs to every designers vocabulary. Recently, the term VUI has been added to this, voice user interface.

VUI enable users to communicate with computers through speech, a method that human use as their prime form of interaction. Voice interfaces could therefor enable an extraordinary pleasant and effective way to interact with technology. (Nass & Brave, 2005)

Definition: Voice assistant

A voice user interface is inseparable connected to a voice assistant. The invention makes use of three different kind of technologies. See figure 5.

- **Automatic speech recognition (ASR)** is the ability of a machine or program to receive, measure and extract the information-bearing elements present in the speech signal. (Hughes, 1961)
- **Natural language understanding (NLU)** describes a computer program's ability to understand these conversation elements (Chowdhury, 2003)
- **Speech synthesis** is the building of natural-sounding synthetic voices from diverse databases of natural speech. (Zen, 2009)

The combination of the three technologies make the term voice assistant. In this project, voice assistant is defined as:
"A digital assistant that uses voice recognition, natural language processing, and speech synthesis to provide aid to users through phones and voice recognition applications. (Haughn, 2017)

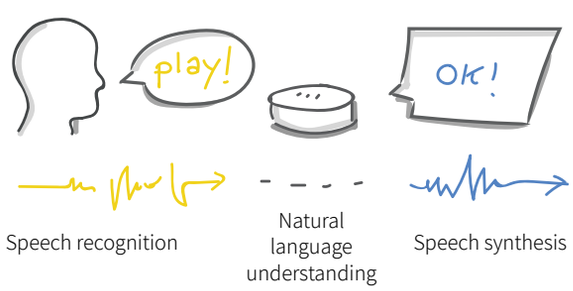


Fig. 5 - Technology behind a voice assistant

History of voice technology

The creation of voice technology started in the previous century, illustrated in figure 6. In the 1960's, IBM developed its first speech recognition tool called Shoebox which could comprehend around 16 words as well as the digits 0-9. This was the first machine that demonstrated the use of voice recognition in an combination with NLP. (IBM, 2013)

After this introduction, DARPA (Defense Advanced Research Projects Agency) funded research into this voice recognition technology which resulted in the Harpy Program. Harpy is a speech understanding system that could recognize 1000 words out of continuous speech with a 90% accuracy. (Newell, 1978)

It took 18 more years before this technology made its first introduction to the commercial market. The Dragon dictate was created by Dragon systems, later acquired by Nuance. (Sarnataro, 2012) The speech recognition software program released for DOS and was therefore the first consumer product.

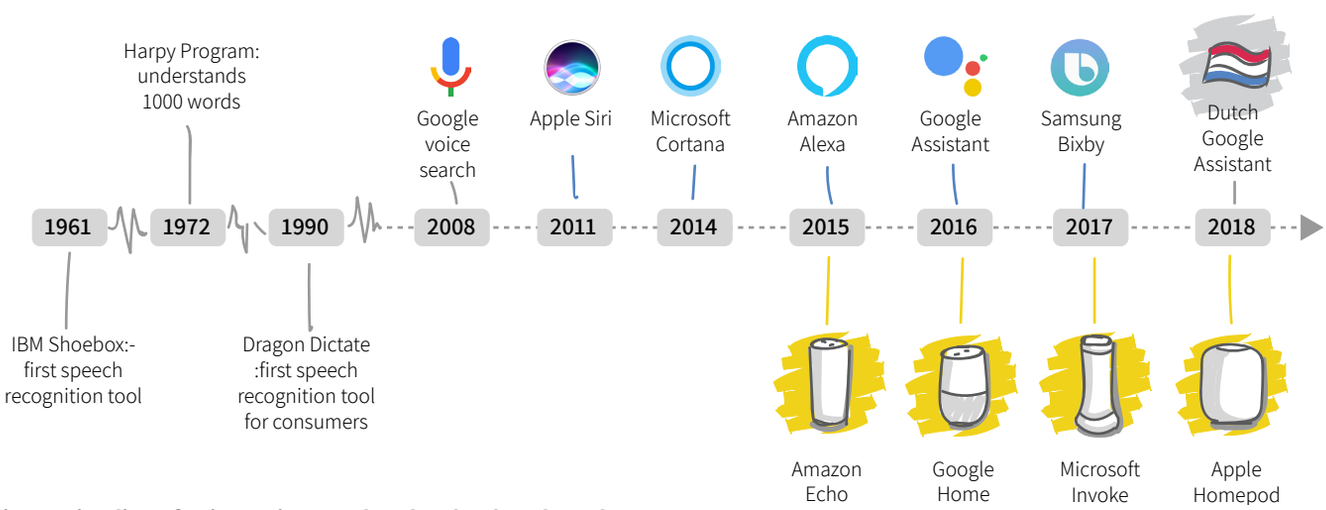


Fig. 6 - Timeline of voice assistant related technology launches

These three voice recognition discoveries built the foundation of a new concept that made its reveal at the beginning of the 21st century: The voice assistant.

"We were first used to typing on a computer with hyperlinked websites showed in browsers. Then we started to tap our touch apps run on smartphones. And now we can use our voice to talk with conversational agents coordinated by assistants." - Karlijn Pels (Google)

Apple was the first company to make the combination of the three technologies available to customers by integrating in into their iPhones, which we know as Siri(originally built by Nuance). In the years after this release, also Microsoft, Google, and Amazon announced their voice assistants: Cortana, Google Assistant and Alexa. Hereby, voice assistants have become a common feature of mobile devices, such as tables and smartphones, as well as desktops.

Since Amazon did not own its own brand of mobile devices to deploy its assistant to they came up with something different. They announced the Alexa alongside the Amazon Echo: a smart speaker that could be activated with a wake word. (Amazon, 2017) Hereby, they were first in entering the smart speaker market, after which also Google, Microsoft, and Apple followed with their own versions of the smart speaker. With this new product group, voice assistants become a part of home appliances.

Through the sales of this new product group, voice assistants made their entry into our lives in the living room. And moreover, with the integration of the technology to the three most prevalent smartphone operating systems, voice assistants have become accessible to many new users in the last few years. ▶

Technological Framework

As shown in the time-line in figure 6, there are multiple different companies that developed their own voice assistant software. To be able to talk to one of these different assistants, users need to operate them through a device that supports the technology. When they talk to a device they can let the assistant perform certain tasks like setting a timer, controlling music or asking for the status of a package. (Figure, 7)

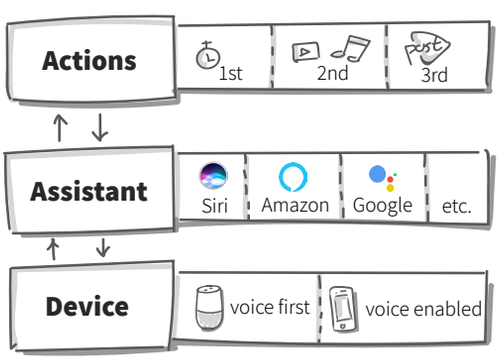


Fig. 7 - VUI interaction framework

Devices

Voice assistant devices can be divided into two different product groups: voice-first and voice-enabled devices.

1. **Voice-first devices** are systems which primarily accept user input via voice commands, and give audio output as a response. Examples: Google Home mini, Amazon Echo
2. **Voice-enabled devices** accept multiple types of input (tapping, typing, speaking) and give output in both audio and visuals. Examples: Siri on a telephone or Cortana on a Microsoft laptop.

These two different kinds of product groups give users different ways to interact through voice: being it mandatory or optional. However, the interaction in its core stays the same: having a conversation with a device to get something done.

"We do not believe that voice only is the one solution. Sometimes the combination with a screen is better, sometimes tapping even faster and sometimes voice only will be enough."- Karlijn Pels (Google)

'We will never design for a screen-less future and also not for a touch-less future, we have to acknowledge all the different ways of interacting and incorporate them in the right way at the right moments."- Ruben Klerks (KLM)

Companies see these two different product groups connected in a multi-channel way: two different touch points with their voice service. This implies that when developing a VUI, they should decide how to enable the same seamless experience in both touch points. This is called: multi-modal voice design. According to Amazon (2018), adding visual elements and touch can make your voice-first experiences even more delightful, engaging, and easy to use. To be able to succeed in this, research is needed to define how to incorporate the right user interaction in the right way at the right moments.

"Designers have a real challenge now, in enabling users to have the same seamless experience in both voice plus screens as in voice only. You should design once and deploy many to create a multi-channel support."- Sebastian Reeve (Nuance)

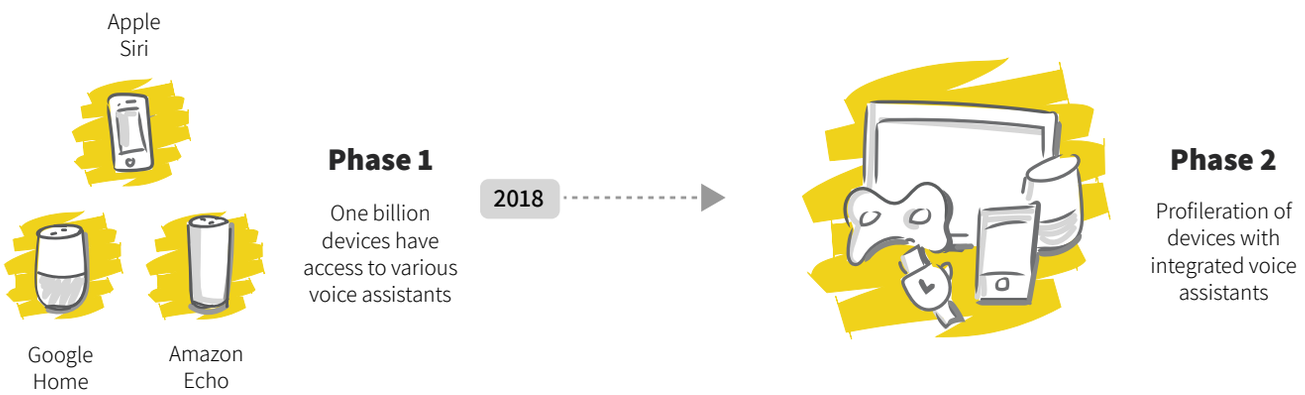


Fig. 8 - Movement of the two voice phases (Kinsella & Mutchler)

Going even one step further, it is predicted that besides the two types of voice devices, voice assistants will be integrated into other appliances. (See figure 8) Smart speakers might fade away in a few years because many electrical devices like televisions and refrigerators will have their own voice assistants integrated. This movement has also been called 'Phase 2' by voicebot.ai, a website that gathers the most important news, commentary, research and analysis of voice technology in one place.

Phase 1 introduced consumers to the idea of using voice to perform tasks. Phase 2 is about voice becoming a pervasive interaction mode that has more capabilities and is used more frequently across more devices and contexts. (Kinsella & Mutchler, 2018) This movement is shown in figure 8. ▶

1st, 2nd, 3rd party actions

When users talk to a voice assistants through a device, they can let them perform a certain task. This task is coupled to a service, called Skill by Alexa and Action by Google. Skills or Actions are comparable to mobile phone apps. Smartphones have apps, and smart speakers have "skills" or "actions". As shown in figure 9, there are three different levels of VUI apps: 1st, 2nd and 3rd party actions.

**(From now on, the terms related to voice design will be named according to the Google dictionary, since Google is the only company that supports the use of voice assistant design in The Netherlands.)*

First-party actions are handled via the voice operating system. For example: Search requests (Internet search), setting alarms, and asking for the current time. They are provided directly by the voice assistant platform.

Second party actions are mostly offered by a different division of the voice operating system or by a company with close relations to the brand. Playing music is generally considered a second party service.

Third-party actions can be created by any company/ designer, similarly to designing custom apps for mobile phones. News is always third-party action as are most smart home control- and sports offering-actions.

When operating a voice assistant, users can only open 3rd party actions if they directly refer to them within a query. For example: "Ask Albert Heijn what the bonus of today is."

If users ask the assistant: "What is the bonus of today?" the voice assistant will handle this with their own voice search action and show you the results data found on the Internet.

This shows that next to the naming of the first/ second/third party services, there also exists a ranking in how the operating system picks a service.

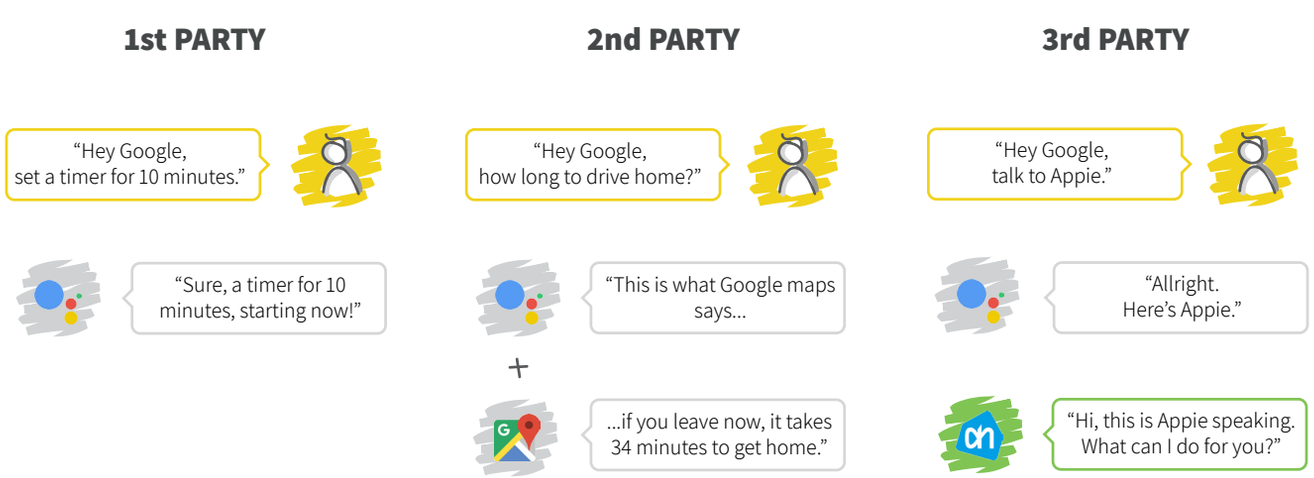


Fig. 9 - Difference between a first, second and third party VUI

Design elements of an action

The design of an action goes beyond writing down the intended conversation. The conversation needs to be stripped down into the following design elements, illustrated in figure 10:

- Wake Word
  The wake word activates the voice assistant, after which it will start listening to you. The wake word for Google is either 'Hey Google' or 'Oke Google'.
- Invocation Name
  The invocation name is a trigger which tells Google to open a specific action.
- Intent
  An intent is the action invoked by the user in the form of a request or response. This intent could also be seen as the user's Job to be done.
- Utterances
  Utterances are the phrases and words defined to invoke intents. During conversations, humans use many different ways of expressing themselves, which lead to a big variety of utterances.
  For example, the following phrase “Let me have” could be expressed in several ways:
  “I will have …”
  “Give me …”
  “I'll go with …”
  “I would like …”
- Slots
  To each Intent belong parameters known as slots, which are used by Google to capture user input. Built-in slot types include the date, number, or duration. Custom slot types are used for lists of items that are not covered by one of Google's built-in slot types. ■

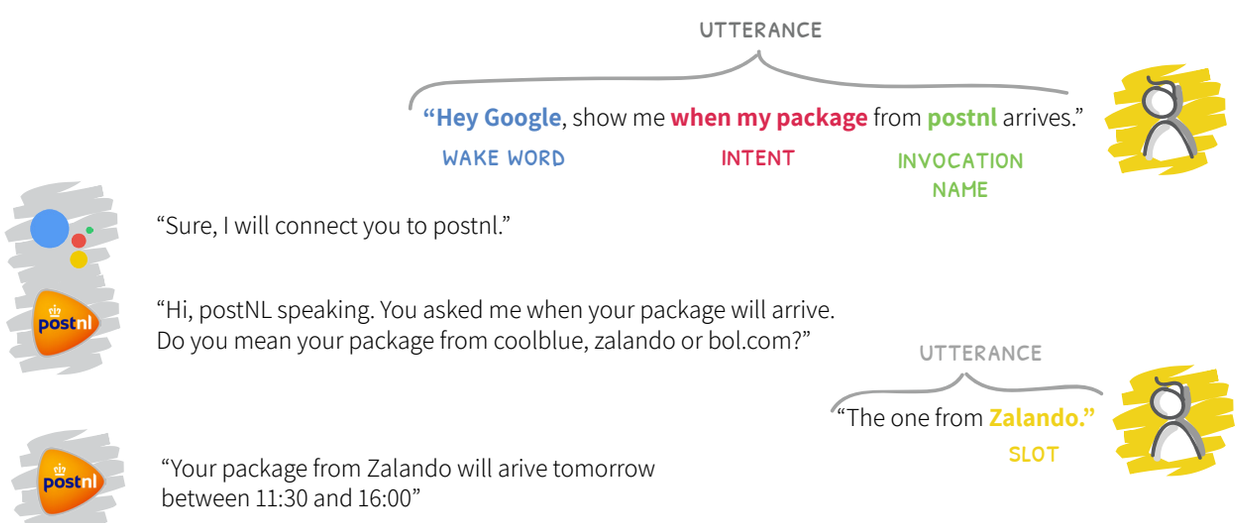


Fig. 10 - Overview of the different design elements within a conversation

2.2 State of Voice

"Even though the technology has been around for a while, the term 'voice assistant' feels rather new. This chapter gives a reflection about the current adoption and usage of the technology accompanied by some figures and stats."

Voice assistant adoption

Where normally the consumer adoption to a new technology or device takes a lot of time, it is forecasted that smart speaker adoption is likely to be faster than any other consumer device as shown in figure 11.

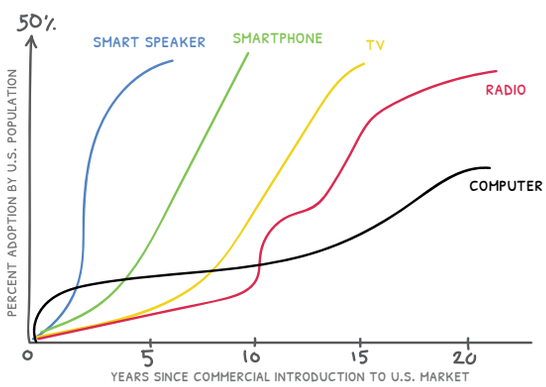


Fig. 11 - Technology adoption curve

This is mostly based on the fact that speech has been argued to be the most natural and comfortable way of communication and such a form of communication is for almost every human being easy to learn and very natural in use. (Tadeusiewcz, 2010)

This adoption can be visualized in a bell-curve shape, called the diffusion of innovation created by Rogers (2003). This theory, visualized in figure 12, looks into the technology adoption life cycle. Within this cycle there are five consumer groups: the innovators, early adopters, early majority, late majority and the laggards. Between the group of early adopters and the early majority, there is such thing existing as 'the chasm'. Many technical products face the significant problem of 'crossing the chasm'. (Moore, 2002)

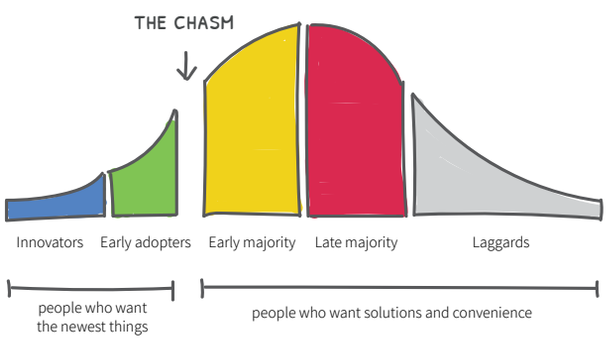


Fig. 12 - Crossing the chasm (Rogers)

Companies mainly fail in crossing the chasm because they do not take the different behaviors of the groups into account.
To know which target group you should design for, companies often look at Gartner's Hype Cycle which visualizes the maturity and adoption of technologies. (Figure 13) This Hype cycle shows that VUI are now in the midst of the peak of inflated expectations.

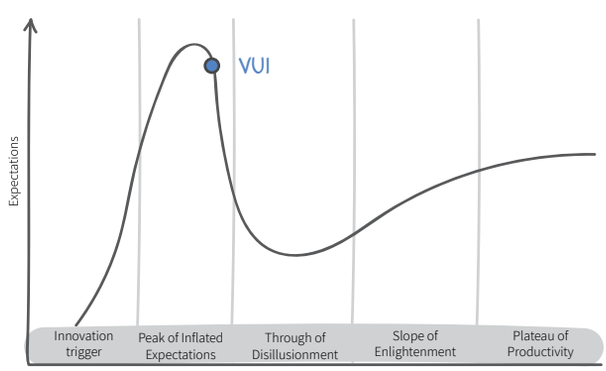


Fig. 13 - Hype cycle for emerging technologies 2018 (Gartner)

When looking at active voice assistant users in America, 45.7 million actively use their smart speaker and 90.1 million actively control their phones via voice assistant. (of the total 252 million U.S. population) (Voicebot.AI,2019) These numbers show that in America, the chasm has already been crossed and companies are designing for a new target group, the early majority. However, other countries are still behind, since language made that it took longer for the voice assistants to also deploy across the borders. See figure 14. As the technology matures, companies should follow the target group they are developing for.

So, in order to design a relevant application for the early majority, companies should look into their specific needs, wishes and behavior towards technology and therefor be able to locate where their users are located on this curve.

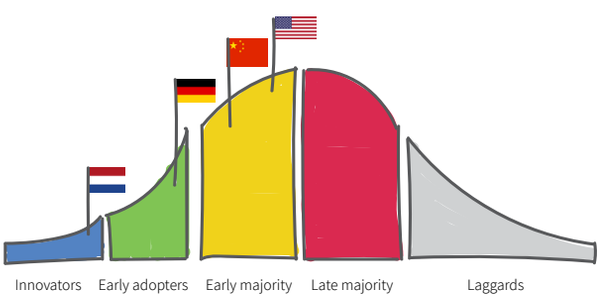


Fig. 14 - Voice assistant technology adoption by country (voicebot.AI)

There is little known about the usage of voice assistants in the Netherlands, regardless to the fact that the technology has already been able to use on iPhones through Siri since 2011. This could be due to the fact that the first Dutch speaking smart speaker, the Google home mini, was released mid October 2018.

On the 15th of March 2019, the first Dutch research numbers were published by Kantar TNS, showing that 29% of the Dutch households use voice assistants through their phone and 5% through a smart speakers (Kantar, 2019). Therefor, the assumption has been made that, when looking at the diffusion bell curve, the Netherlands are still at the innovators phase, but are approaching the early adopters. ▶

Current usage

Nielsen Norman group performed research in a study with 211 daily users from the U.S. with either voice assistants on a smartphone or on a smart speaker. (Whitenton & Budiu, 2018) This study revealed the most common use cases with today's assistants shown in figure 15.

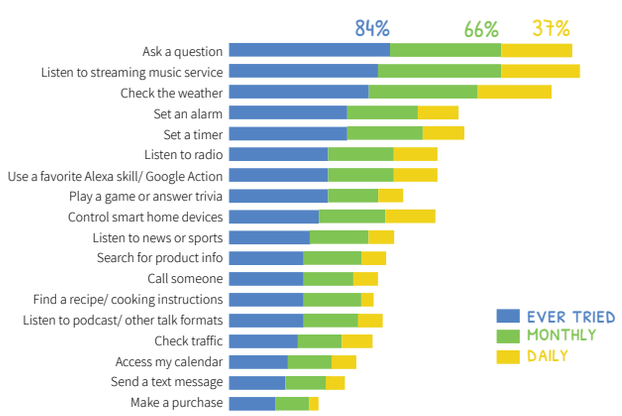


Fig. 15 - Smart speaker use case frequency (NN group)

These use cases can be divided over four different categories:

1. Task & Information: info retrieval, weather, IOT control, traffic and/or directions, timer/alarm
2. Entertainment: streaming music, game or trivia, audio books/ podcast
3. Communication & Productivity: phone control, scheduling, sent a text/email, reminder
4. Commerce: shopping, add item to list, transaction

Research from Voicebot.ai shows that, when you divide this research into smart speakers and smart phones, it gives a contrast in usage data. (Voicebot.ai, 2018)

Their research shows that when looking at just smart speaker usage, entertainment use cases like listening to the latest sport news, streaming music and radio are significantly more used than communication use cases.

When looking at smart-phone usage, 'asking a general question' (task & Information) is the most popular, followed by finding directions, phone control, alerts and navigation queries. This data shows that consumers view voice assistants on smartphones as utilities first. All these tasks can be easily performed by touch on a smartphone, but the convenience of voice interaction in general or specific contexts (like inside of a car) is replacing the touch interaction.

This difference in data can be explained by a differences in context and expectations associated with the two different devices.

The context in which you use a Smartphone, is having reach of communication and productivity on the go. (lean-in experiences) Smart speakers are bound to a closed context with a certain place and situation in which people have more entertainment and information related needs. (lean-back experiences)

Then there are expectations. Consumers have not typically thought of smart speakers as communication devices. Similarly, entertainment use cases were not available when the first smartphone-based voice assistants arrived. As a result, users don't expect those features and therefore making them a habit requires a shift in expectations.

" It's clear that voice is not just 'skills' or 'assistants' — it's a way that people are choosing to query and command the world around them for efficiency, knowledge, entertainment and more." - Greg Hedges

Why (not) using voice assistants

It is prevalent that a lot of people are using and therefore adapting to this new technology, but the question remains what their intentions are towards the usage of these devices. Is it just for fun, or does it really provide value?

Research from the studies from PwC (2018), Voicebot. AI (2018), NN group (2018) and NPR (2018) could be combined into phrasing the following benefits and downfalls of using voice assistants:

Reasons to use a voice assistant

1. **Convenience**
   Consumers see voice assistants as the faster, and easier way to perform everyday activities Talking is a faster means of human computer interaction, compared to typing. Next to this it provides the ultimate shortcut in performing tasks, avoiding opening a website or app menus. You do not have to think how to spell a certain word, search for the correct page or learn how to use a new interface, but could simply say whatever you want.
2. **Accessibility**
   The convenience of hands free and eyes free interaction gives the ability to multi task and enables the performance of new use cases in certain contexts,like inside the car or during cooking.
3. **Experience**
   Talking with a computer could enhance a personal and enjoyable way of interaction

Concluding, voice interaction has become a complementary user interface that is preferable in certain situations and contexts.

Reasons to not use a voice assistant

1. **Limited knowledge of the full breadth of capabilities**
   The biggest hurdle for people is awareness; understanding what they are able to do with these devices.
2. **Afraid of privacy issues**
   Consumers are nervous about inviting AI into their homes, thinking it would continuously listen to all of their conversations. Besides, it remains unclear what happens with this recorded data, whether everything is stored and how has access to this information.
3. **A lack of trust as a result of bad experiences**
   Voice assistants aren't able to reply to all questions asked by users and have a lot of usability issues. This decreases their trust in the whole system and creates discrepancy into use cases that are completely relying on trust, like making money transactions.
4. **Hesitation due to complexity or price**
   There is a lack of information currently about what benefits a VUI provides. People fear to invest in something that doesn't show a clear meaningful value for them to use it yet. ■

2.3 Design process review

"Design processes follow a certain structure to get to a required result. In this chapter, different design processes are discussed and compared with both Valsplat's as three VUI specific design approaches. "

The understanding of the design process is important both to manage the design activity and to aid the improvement of products; it is also the foundation on which a lot of design research is based.

General design process

In general, the act of designing consists of a continuous circle of thought, action and decision. Being aware of this basic circle helps designers to organize thoughts and design activities within all stages of a design project. (Roozenburg & Eekels, 1995)

Over time, there have been described multiple different approaches and phases of a design project. Howard, Culley, & Dekoninck (2008) introduced a framework to define the boundaries of the design process, see figure 16. The column headings used in this table show the general agreement and overlay of design authors on often synonymously named stages. The six headings consist of four major design phases: 'analysis of task, 'conceptual design', 'embodiment design' and 'detailed design'. Preceding these four phases is the 'Establishing a Need' phase, where the design brief is constructed, hence stating a problem to solve. Following the four major phases is the 'implementation phase', explaining what needs to happen to manufacture and commercialize the design.

From the complete table, five general design processes are shown. When an X is marking a cell, it means that the model does not include this phase in its process.

Valsplat design process

As introduced in chapter 1.4, Valsplat accommodated the double diamond into their own way of working, merging the four design phases into two general ones: Discovery and Delivery. This two-part division was depleted to be able to simplify the different projects that they run for clients: 'uncovering the real problem' and/or 'design the right solution'.
It therefor does not imply that the two phases cover less parts of the design process.

When spreading these two phases out over the six headings as described by Howard et al. (2008), it shows that Valsplat covers the utmost of the general design process. Notwithstanding, the last implementation phase is only covered for a minor part. Valsplat does execute the usability testing of a design, but leaves the final implementation up to their clients.

VUI specific design processes

Next to the general design processes and Valsplat's approach, there exist publications of VUI specific design approaches.

Three different processes are reviewed: Google (2018), USEEDS (2017) & Answerlabs (2017). Google approaches VUI design from a develop perspective, Useed (being a design agency) from a design perspective and Answerlab (insight minded institute) from a research perspective.

Models/Phases	Establishing a need	Analysis of a task	Conceptual design	Embodiment design	Detailed design	Implementation
Booz et al. (1967)	X	New product strategy development	Idea Generation / Evaluation	Business analysis	Development	Commercialization
Pahl and Beitz (1984)	Task	Clarification of task	Conceptual design	Embodiment design	Detail Design	X
Pugh (1991)	Market	Specification	Concept design		Detail design	Manufacture / Sell
Design Council (2006)	Discover	Define	Develop		Deliver	X
Industrial Innovation Process (2006)	Mission statement	Market research	Ideas phase	Concept phase	Feasibility phase	Pre production
Valsplat	Discovery		Delivery			X

Fig. 16 - Comparison of design processes & Valsplat, conforming to six design phases (adjusted from Howard et al., 2008)

Google (2018)	X	Go/ No go	Requirements	High level design	Detailed design	Scale the design
USEEDS (2018)	X	X	Ideate	Design	Refine	Test & Iterate
Answerlab (2017)	X	Define	Conceptualize	Develop	Deploy & Evolve	

Fig. 17 - Comparison of three VUI design processes, conforming to six design phases

The three processes have also been distributed over the six phases and added to figure 17.

This shows that both Google's and USEEDS' design process skip the first two phases and take the conceptual design phase as a starting point. Answerlab's approach seems to have the most in common with the Design Councils double diamond.

An overview of the specific activities named in line with the different phases of these three VUI processes are explained on the next pages and in figure 18. ▶

Google

Google, that developed its own voice assistant platform, has published guidelines to help designers creating their own voice actions. The activities therefor focus mainly in the creation of the voice action itself.

The first step consists of a checklist that helps in deciding whether a VUI is the right solution for your problem. From there, the requirements could be gathered by doing an investigation into the users, use cases and creating a voice persona. The two subsequent design stages contain steps into building a dialogue. Google states that the conversation in pure words should be the first thing to be designed, regardless of the medium/device chosen. Since Google has created its own program (dialogflow) to both prototype and code conversations with, they have the option to provide the opportunity to scale the design after the creation of a conversation. The choice for the device used for VUI can therefor be made at the end of the process.

USEEDS

USEEDS is a user centered digital design firm located in Germany. Their approach starts of ideation phase, having the identification of a use case as the leading activity for the following of the project. Like Google, they also approach the following of the project guided by one written conversation, which is further defined and detailed with the use of role-play. This conversation is then split into technical parts that belong within the programming of the software. Their approach is finished of with a prototype that is tested and iterated on.

Answerlab

Answerlab is a user experience research firm that aims to provide external parties with insights that help them with their problem definitions.
Their approach is therefor seemingly distinctive from USEEDS and Google's, since they are not focused on delivering a product, but on the insights.
The three translucent blocks in the process are not executed by this firm, however needed to understand that these activities are prevalent to move on to the next step in the VUI design process.

Conclusion

Valsplat focuses more on the discover phases than any of the other VUI specific approaches. Furthermore, they exclude the last step of the implementation.

Google and USEEDS start their process with the purpose of using voice technology. The goal of their process is focused on delivering a voice design. They thereby skip the first stages of a design project in which you investigate and collect insights, regardless of any technology, medium or application. This results in a biased vice versa process, creating a problem from a solution instead of coming up with a solution based on a problem.

Answerlab does not focus on designing the VUI itself, but on collecting the needed insights to get there. Therefor, each step has it's own deliverable in the shape of an advice that helps the client to make the right VUI design decisions. This also allows for executing the steps independently.

Concluding: The challenge for creating the right VUI process is finding a balance of keeping the technology in the process without forcing the solution space. Upholding that the discover phase has yet to be defined for VUI projects. ■

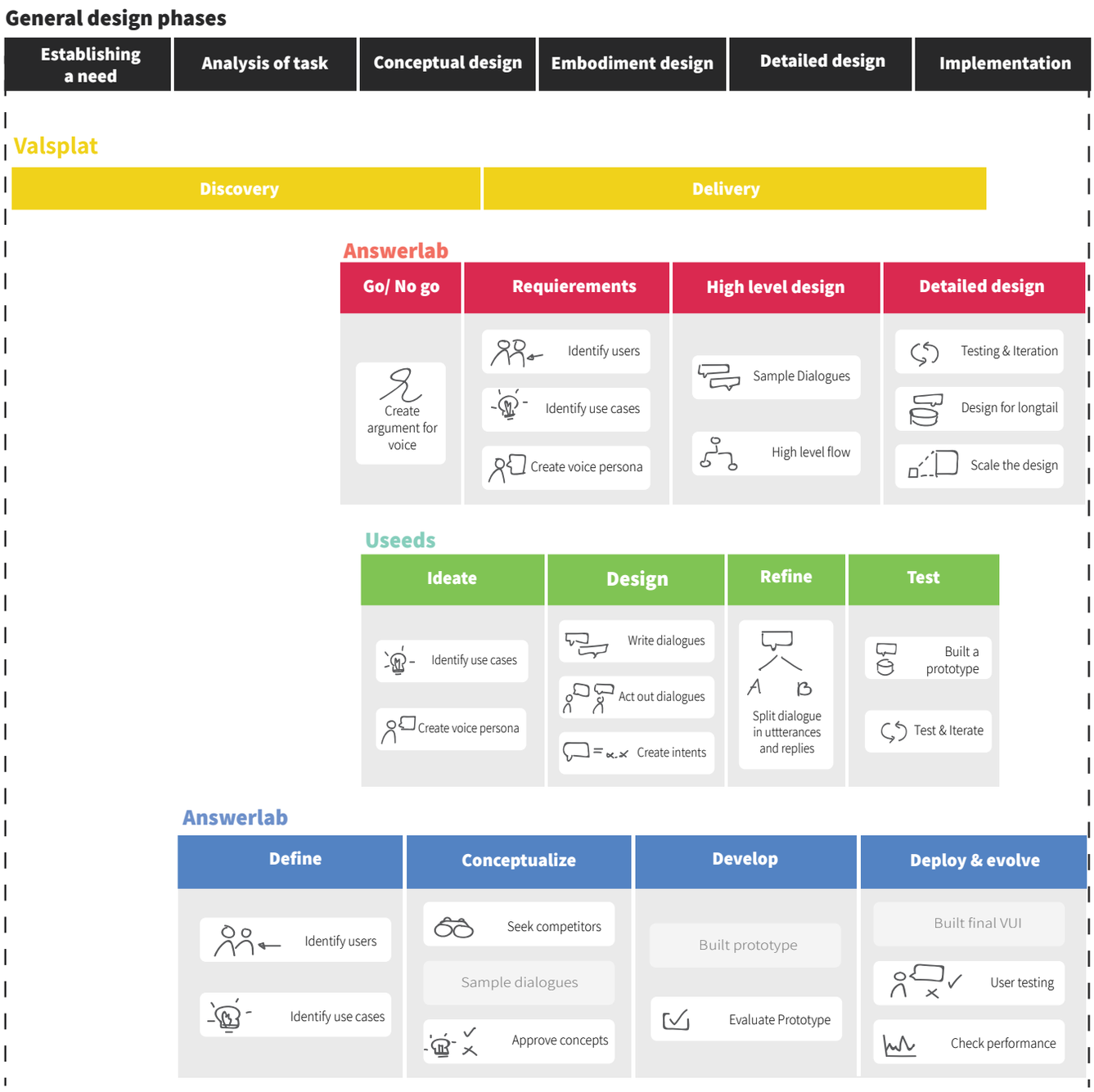


Fig. 18 - Comparison of four different perspectives on the VUI design process

2.4 Key Takeaways

The development of voice technology provides us with a more natural way to interact with computers.

Technology push

Over the years innovation and development improved the three technologies: speech recognition, natural language processing and speech synthesis. These state of the art technologies combined pushed the creation and sales of voice assistants. This development in combination with the release of a new device: the smart speaker, created a fast push on both the creation of the voice applications as of users that started to integrate this technology into their everyday life.

Fast consumer adoption

Consumer adaptation was prospected to be faster than ever when comparing it to the adaptation of previous technologies. This is due to the fact that the 'learning' curve is quite steep since the interaction is based on a natural form of human communication: voice. This prospect indeed came truth in the United States, where now over 40% of all households own a smart speaker and this usage pattern also increased their use of voice assistants on smart-phones.

User centered VUI benefits

The reason why people use voice assistants is mainly because they provide convenience in everyday life. It gives them delight in performing tasks since using their voice is a faster, easier and hands free means to do so. This is reflected in the tasks that they mainly perform with the assistant, most of them being simple 1-action tasks that do not require conversations but simple one way commands like asking a question, streaming music or controlling IoT devices.
This value can be stripped down to three levels:

1. Convenience - Faster & easier
2. Accessibility - Hands-free & eyes free
3. Experience - Natural & personal

Voice-first vs Voice-enabled

There now exist two distinctive different types of voice assistant devices. Voice-first and voice-enabled devices. By companies, these devices are seen as a multi-modal connection. However, the two types of devices show a difference in use cases, mainly by a reflection of the context in which they are used. Besides, the interaction with a voice only device is purely audible content, where voice enabled devices can make use of visual input and output as well.
This adds a new perspective to designing for voice assistants when you have to take the device you are designing for into account and cannot copy paste the service you build from one device to another.

America vs The Netherlands

A big part of the literature reviewed in this chapter represented the adaptation and usage of voice assistants in the U.S.. It is questionable whether the U.S. can be taken as an example of how voice assistants will be used in other countries where the technology just recently became accessible to the consumer like the Netherlands. Innovation will always remain a pendulum between what technology can do and what users want. In the U.S. this technology is way further developed than in the Netherlands. This provides perspective to do further research into the technology adoption of the Netherlands.

The VUI design process

Compared to the common design processes, the VUI design process shows a lot of similarities to the linear approach of product design. However, since the solution space is already narrowed down to a specific means of interaction (voice-first), the processes are more focused on the design phase and therefor skip the phases in which you discover user needs and define the problem to be solved.
Next to this, the processes lack in linking the importance of design research and prototyping to their way of working, since they focus on the creation of the end result. A more insight guided fragmented process, could help in preventing biased VUI design projects.

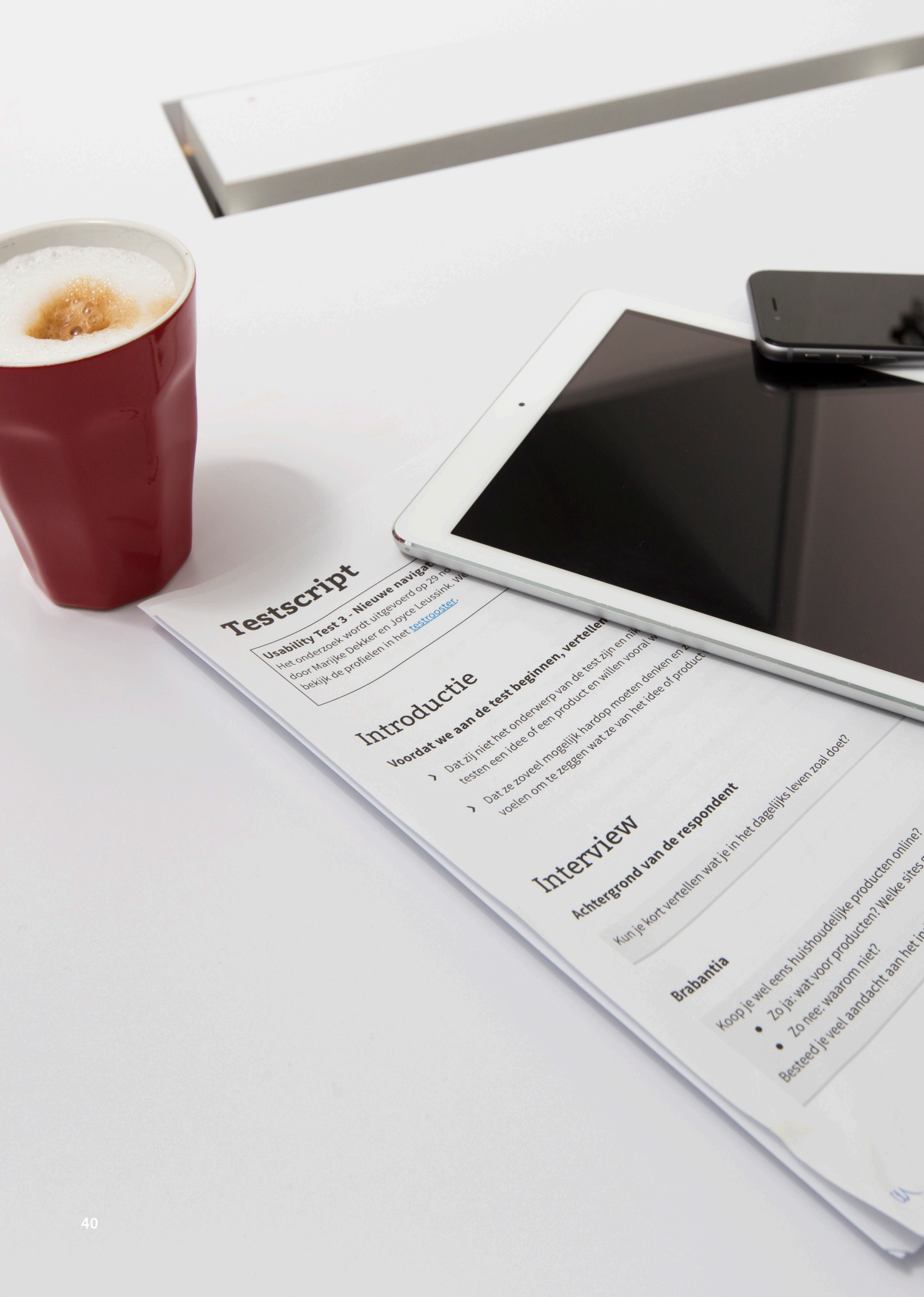
Opportunities & Threats

- ★ Incorporate user centered VUI benefits
- ★ Enrich the discovery phase of VUI projects
- ★ Link design by insight to the VUI process
- ★ Get to know the Dutch VUI users

- ⚡ Technology push: fast market penetration
- ⚡ Voice-first versus voice-enabled applications
- ⚡ Companies focus on designing

"Designers shape reality in many ways as mediators between people's needs and organizations that satisfy them. It is part of their responsibility to encourage a better future."

- Valentina Branada
Senior Designer Transdesign


Testscript
Usability Test 3 - Nieuwe navigat
Het onderzoek wordt uitgevoerd op 29 n
door Marijke Dekker en Joyce Leussink. We
bekijk de profielen in het testrooster.
Introductie
Voordat we aan de test beginnen, vertellen
Dat zij niet het onderwerp van de test zijn en nie
testen een idee of een product en willen vooral w
Dat ze zoveel mogelijk hardop moeten denken en z
voelen om te zeggen wat ze van het idee of product
Interview
Achtergrond van de respondent
Kun je kort vertellen wat je in het dagelijks leven zoal doet?
Brabantia
Koop je wel eens huishoudelijke producten online?
Zo ja: wat voor producten? Welke sites
Zo nee: waarom niet?
Besteed je veel aandacht aan het in

3 Exploratory Research

This chapter builds upon the knowledge of voice assistants and the technology push that made them part of the design landscape by doing multiple analysis. For each analysis, the research goal and method are described followed by an overview of the key findings.

In this chapter:

3.1 Exploratory research set-up

"Every insight should be connected to answering a certain question. This chapter explains why the research performed and how it relates to the previous and following chapter. "

The literature study performed in chapter one provided insights into the current field of voice assistants and indicated further directions for deeper research to be performed. (See figure 19)

During the exploratory research, a focus has been applied to the influence of voice assistants in the Netherlands. Therefore, consumers have been interviewed to gather their experiences and opinion about the technology.

Secondly, observations have been performed during the execution of two VUI usability tests for Albert Heijn. This to uncover both participant as facilitator experiences with testing a voice user interface.

Furthermore, research has been done into the current way of working of voice designers. Five companies shared their experiences about designing voice Interactions. Their approach has been mapped out into a design process with belonging pains and gains.

Lastly, three experts from the field were interviewed in order to get a deeper understanding of their beliefs and considerations. These insights gave a broader perspective to the future vision of voice. ■

Fig. 19 - Overview of the different exploratory research activities

3.2 Street interviews

Goal

There is little known about how voice assistants are perceived by the people in the Netherlands. It is interesting to see how they react to this new technology and what their opinion upholds. The following questions could provide this insight:

1. ***Do you own a voice assistant?***
2. ***Why do/don't you use one?***
3. ***For what cases do/would you use one?***

Method

To be able to get insight in the state of VUI In the Netherlands, street interviews have been performed @Amsterdam Central Station. On The 30th Of October 2018, between 10:00 and 13:00, random passengers were asked to contribute to this little research. In total, 14 pedestrians where interviewed. Their responses were recorded with a camera and microphone-clip, wherefore they gave agreement by signing in a quitclaim. A summary clip made out of all footage from the 14 participants was generated and published for Valsplat. (See figure 20)

Fig. 20 - One of the participants being interviewed near Amsterdam central station

Key findings

Term 'voice assistant' is not known

The reactions to the first question: "Do you own a voice assistant?" made clear that just a few of the participants were aware of the term and technology. However, after further explaining the term and priming with the word 'Siri' all of the participants knew what the technology could do. This shows that the English collective term of the technology is not known. Besides, voice assistant is directly linked to Siri on a telephone, instead of smart speakers.

No clear or necessary benefits

Most of the participants do not see the benefits of using technology like Siri. They say they do not see a specific 'need' that they would be fulfilling with the technology and therefor haven't used it.

Helping with simple tasks

When participants are asked for what cause they do (or would) use the assistant, they mainly name simple tasks like: "Call this person","Turn on the light" or "Put this on my grocery list".

Convenience: Easier and faster

Most of them acknowledge that voice assistants could be of help in providing a higher convenience. It is easier and faster than typing on a mobile phone or finding the remote control.

Value for the disabled

Some of the participants stated that there exists a true value of voice assistants for a certain target group: the disabled. People that have trouble in reading or cannot use their hands to a certain extend would really benefit from the technology.

Afraid of laziness

Participants are afraid that people would get rather lazy of using a voice assistant. In their opinion it only helps in doing their tasks in a faster or easier way, but the technology doesn't enable them to do something they couldn't do before.

Getting used to the 'new' technology

The fact that people aren't used to the technology yet, makes them not buy and or use it. Some of them acknowledge this as a temporary threshold that they will overcome in the future when they are used to talking to computers.

Conclusion

Designers should be aware of the fact that the high numbers for adoption in America are not representative for the people living in the Netherlands. There is just little awareness amongst the participants, whom also have a rather negative attitude towards the technology. They mainly state that they do not use it (yet) since they see no clear benefits.

However, they do acknowledge that when the technology emerges they would slowly get used to it and would be willing to use it for simple tasks. However, they also think on a more ethical level about the fear of getting lazy.

Imaging how to enhance the adoption of this technology and imagining how VUI could provide a clear benefit for its users, remains an interesting task up to designers. ■

3.3 User test observations

Goal

Observations can be performed in order to gather what people 'do' and 'say'. Observing a VUI user test creates an understanding of how prototypes of VUI are experienced. Next to this, knowledge is gathered about user-testing as a tool within the VUI process. Research questions that underlie this observation are:

1. ***How do participants interact with the VUI?***
2. ***Which problems do they encounter?***
3. ***Which test set-up characteristics influence the result of the user test?***

Method

Albert Heijn online developed a new Action for the Google assistant: cooking recipes. The prototype was coded in dialogflow and tested with a telephone and a speaker. Two different tests were executed: one in the kitchen and one in the labs. (See figure 21) Both tests were observed via a remote link. The transcribed observation can be found in appendix C.

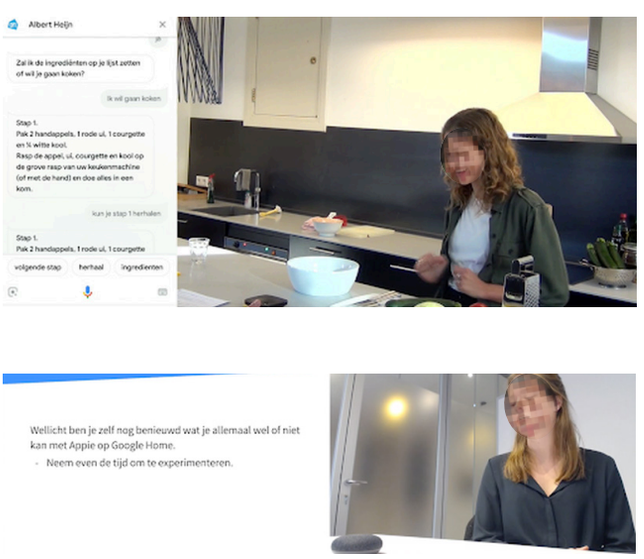


Fig. 21 - Two different VUI test set-ups

Key findings participants

Adjusting vocabulary

People use ‘non natural’ ways of talking and raise their voice whilst speaking.

Unaware of VUI actions

At the moment people don’t understand that VUI actions are separate apps that need to be opened and closed to navigate to others.
People with more VUI experience also have a better interaction with it. They can formulate their questions better and also know how to reformulate them when their command was not understood.

Unclear what the action remembers

People expect that questions build on the previous commands, as in a natural conversation. With a voice assistant, the user often doesn’t know what is or isn’t remembered.

Unclear: Not understood or not understandable

In most instances people give quite logical commands. Still the voice assistant does not always understand what is meant. To the user it is often unclear why a command does not work; is it not understood or not understandable?

Visual vs Voice only, Timing and cues

The device has an animated light and gives a sound that indicates when you can start talking. These indicators are often ignored and people answer too quickly. When completing tasks, it can take a while before people give the next command, but after a while the app could close automatically.

Key findings test set up

Think aloud techniques do not work

When a facilitator asks a participant to think aloud, these phrases are sometimes caught up by Google, interrupting the interview.

Accidental wake-ups (Mic on/off control)

During the test, the assistant sometimes 'wakes-up' when this is not wanted or vice versa. This is due to the microphone and the participant, not knowing when Google is listening or not.

On-boarding crucial

It is really important that the facilitator introduces the mental modal of the voice assistant to the participant, to prevent a lot of interventions during the execution of the tasks.

Facilitator in the room = No natural conversation

When the facilitator is in the same room as the participant, he/she automatically also takes part in the conversation with Google. Therefor, the participants tend to have more of a conversation with the facilitator than to keep on trying to talk to Google themselves.

Prototyping: wizard vs dialogflow

The prototype is over-developed which makes that it is not the concept that has been tested but the usage of a voice assistant in general

Written reports do not cover VUI insights

A conversation that is typed out and read in silence, doesn't convey the same things as it is read out loud. Therefor, video footage is crucial for VUI reports.

Conclusion

Both participants and facilitators are learning in this new VUI usability field.

Participants seem to have very little experience with the technology. It is intriguing to see how people adjust their way of talking as a result of how the assistant responds. This raises the question whether designers are creating a more or less natural interaction.

It is proved that voice only is not going to be the single existing and always preferred Interface. Some information, like reading out bonus advertisements, is simply faster obtained by the brain in a visual overview than in a verbal query.

Facilitators have a big influence on the outcomes of the test. Monitoring from a distance and thereby creating a lab setting as close to natural as possible seems crucial for achieving the right test results.

Deciding when to do a user test (regarding the stages of a design project) and the type of prototype used for this test, are still difficult fields which should be uncovered. ■

3.4 VUI designer interviews

Goal

Currently, a lot of companies started to design for voice assistants. Their approach gives insight into answering the following questions:

1. ***Why did companies start to design a VUI?***
2. ***Which people are involved?***
3. ***What does their VUI process look like?***
4. ***What are the activities that voice interaction designers perform in this process?***
5. ***What are their pains/gains in this process?***

Method

To be able to answer these questions, five interviews have been performed with people that are involved in designing a VUI. All five designers made a voice assistant action for a different company. During the interviews a test script has been used accompanied by an empty template to be able to map their design process. (See appendix D)

Rob van Nistelrooij
UX Designer - PostNL

Stijn Verhoeven
Conversational Design Lead - Albert Heijn

Marieke Linssen
UX & Conversation design - Bol.com

Brechtje de Leij
Head of digital product - Independer

Sezgi Kaya
UX designer- Digital agency in Turkey

Key findings

Starting reasons voice project

The rise of voice assistants hasn't gone unnoticed by companies. Besides the fact that the usage of voice assistants in the Netherlands isn't a mainstream yet, the promise of impact that it already has on the rest of the world created a technology push that made companies consider looking into the technology. The value that companies see in VUI could be narrowed down to these three arguments:

- **PR value:** showing innovative character
- **Experiment:** trying out what is possible, getting a team ready
- **New product/service:** create direct value for the end consumer

Picking out use cases

When a company has decided that they want to do something with VUI's, the first thing they start doing is creating use cases. Thinking from a business perspective: what is the key question from our consumer that we would be able to answer through a VUI?

Writing instead of designing

One of the biggest difficulties that designers experience during the further development of the use case, is translating the design into language.

"Making circles and buttons that work, that's easy, but writing a sentence that sounds good, that's a whole new world." - Sezgi Kaya (UX designer)

Making conversation flowcharts

Another difference is the difficulty that conversational design give in terms of variety. Normally, clicking a button leads to a certain action or page, but now, that button is replaces by a spoken user request. Which

gives an open field to the user to all possible ways of communication. Concluding, conversations are not linear and straightforward, they wander wherever the user wants them to go. To be able to cover all these different ways of interaction, designers make use of flowcharts.

The VUI team

Every company has its own way of working accompanied by their own set of personal skills that they combine in a team. Some of these skills needed for a VUI project require the cooperation with experts from out of the field to created better designs. A combination of all named skills during the interviews led to the team visualized in figure 22.

Fig. 22 - The voice team players

VUI Persona creation

None of the teams named the creation of a VUI persona, (a characterization of the tone and type of voice of the VUI) as a part of their design process. They didn't consider is necessary at the beginning stage of making the design, since they first focus on making it work. Afterwards they thought about tone of voice etc.
Regardless, now they gained some experience in designing, they all see how important creating this persona is and how it could help them to differentiate in their services.

Multi-modal designing

Were voice can be seen as a loose service or product, most of the companies address it in a multi-modal way. For PostNL, it is part of their conversational strategy, to which also belongs their chat-bots and customer care. At Albert Heijn, they both look into the voice assistant on a smartphone, as the possibility to talk to Appie on a smart speaker. Both devices have their own type of interactions (screen or no screen) and require different design approaches. Therefor, VUI design tends to have more than one application.
▶

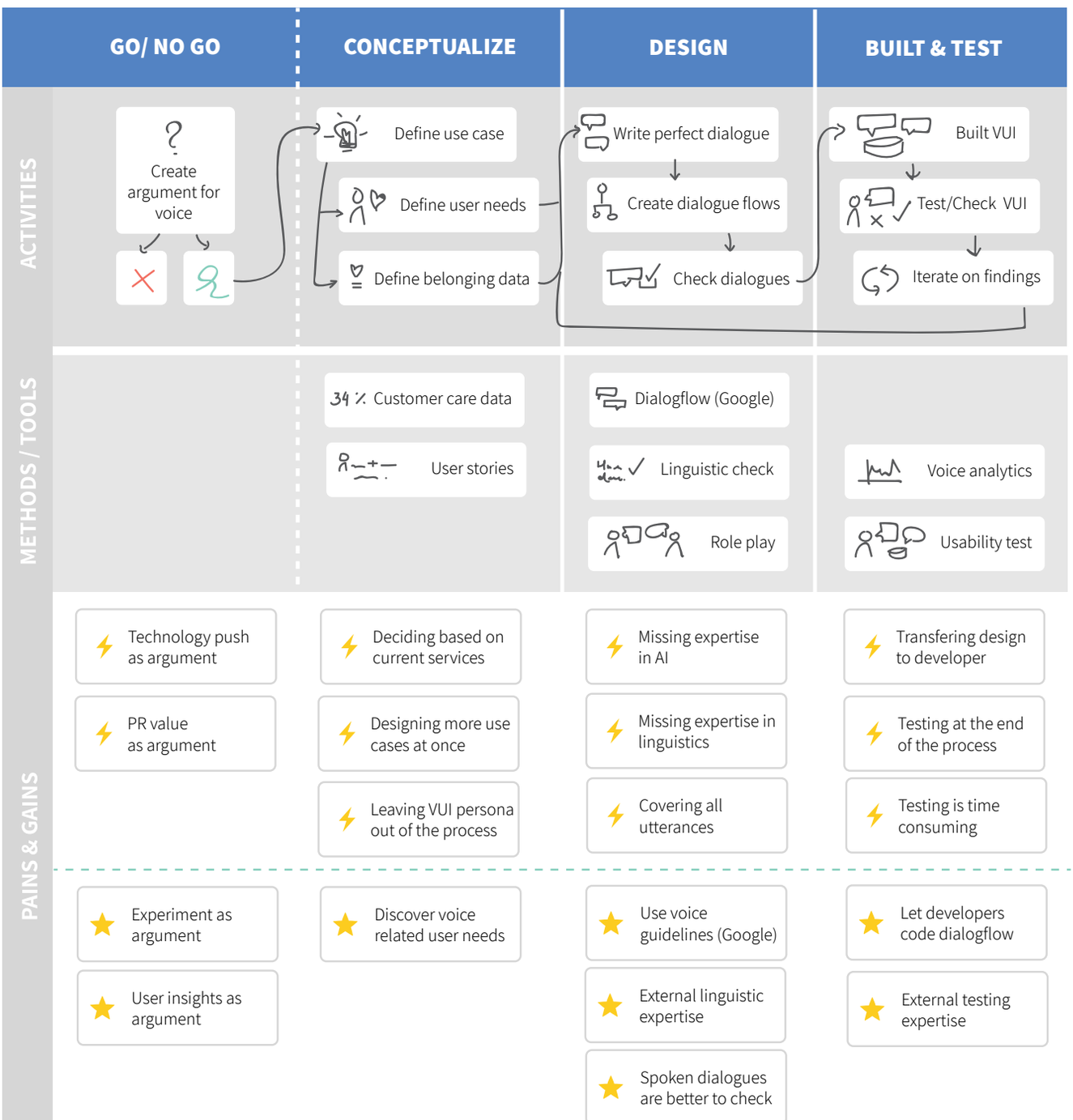


Fig. 23 - Overview of the executed VUI process - combined from the five interviews

VUI designer process experience

The five interviews were merged into one process with pains and gains per design stage, shown in figure 23.

The differences between the five processes lay mainly in the emphasis on the different steps and the pace that they executed them in, since every company has its own way of working (scrum teams etc.)

The argument that the company uses for starting a voice project has a great influence on the steps accordingly. Most of them name the experimental or PR value of creating a VUI as the reason for starting their projects.

They therefor focus more on the development of the conversation, than on picking out the correct use cases. Besides, they underestimate the complexity of writing down good conversations, which makes them designing multiple use cases at once.

As described on the previous page, the creation of a voice persona is not included in the VUI process. Companies see this as a 'side' process, which makes this persona left-out when writing the conversations.

During the design phase, they miss expertise in linguistics and spend a lot of time on understanding the theory of conversations and collecting utterances.

The built and test phase is the first moment were usability tests are performed. The prototype is completely coded into dialogflow, which costs a lot of time.

Conclusion

It shows that currently all companies are trying to figure out their way of working amongst this new technology.

The forming of a team and creation of a certain process is in full development within the adjustments of the current way of working of businesses. When looking at the development of the VUI itself, this requires new knowledge on conversational design. Having an overview of the needed skills and VUI specific expertises helps teams to be better prepared.

Like the processes discussed in chapter 2.3, also the design team tends to skip the first phases of the project since they have their mind focused on the development of a working VUI. Starting reasons for a voice project should be based on human centered arguments, besides just seeing it as an innovative technology push that they have to react upon.

Choosing the correct use cases therefor seems to be a crucial and difficult point in the process. External knowledge and voice specific user insights could help in making these decisions.

In the last phase of the design process the importance of testing comes into place, which should already be incorporated earlier on in the project in order to establish valuable results. ■

3.5 Voice expert interviews

Goal

Interviews with VUI experts are conducted to learn from their expertise in the field of voice assistants. The following questions lead the interview. (A complete overview of the interview set up can be found in appendix E)

1. ***Why do people work in this field of design?***
2. ***What is their opinion on 'meaningful' VUI design?***
3. ***What do they think is important during the VUI design process?***

Method

Three experts were approached for this interview, all with a strong relationship to the topic of VUI design. Tim from the Dutch market perspective, Wally from the educational point of view and Maarten according to his own VUI company strategy.

Tim van de Rijdt

Product Marketing Search & Assistant - Google (Benelux / Nordics)

Wally Brill

Head Of Conversation Design Advocacy & Education - Google

Maarten Lenz-Fitzgerald

Founder - Conva Voice Services
Founder - Open Voice

Key findings

Tim van de Rijdt

“What triggered me was the ‘meaningful’ part, because I think that is what lacks nowadays in this early stage of the technology. Thinking further than the device and looking into what it could mean for the consumers.”
“I agree that companies now use VUI as a means to represent themselves as innovative. They think of VUI's as a new medium and or technology that might have potential in the future.”
“There are a lot of companies/methods now to design for voice assistant, however these are mostly focused on how to design a conversation, and not on which conversation to Design. They will not come into the deeper layer of meaningful voice interactions.”
“Companies should rethink this value of VUI's instead of copy pasting their current services.”

Wally Brill

“What do you mean with meaningful? In my vision it’s all about making the interaction natural.”
"I prospect that in 5 years there will be a voice future, fluent flowing natural interactions with voice assistants."
“Starting a VUI project is all about getting the requirements right. See the Google checklist.”
“A conversation itself is successful and meaningful when it follows:
1. Paul Grices Maxims: Truthful, relevant, informative, manner.”
2. Turn taking - A balance between the bot and the user.
3. Contexts - A relevance contributing to the users context
“Another hot topic now in voice which is yet to be explored, is empathy. It could be very interesting how to make the conversation even more personal and natural with a layer of emotional awareness ”

Maarten Lenz Fitzgerald

"I was one of the first people in the Netherlands that showed interest into this topic. From my own experience with the Alexa, I knew up front that voice was going to be my next technology focus."
"I think of voice as it is the fourth revolution that we go through. It has potential "
"In my opinion there are 4 voice 'beginning points' in for a project:
1. Customer Care - Solving the FAQ's
2. Research based - Finding the key use case
3. Design Fiction - Create future perfect
4. Campaign - Marketing tool "
"Meaningful voice interactions, that sounds very appealing. Especially since we aren't there yet. Voice is still in its baby phase of development. We are now the Nokia 3310, and still need to grow towards the iPhone."
"I do not think that their exists one specific/complete or working voice process yet. We are all trying out know what works best, and besides, it is company dependent. Both on an intentional as company culture level."
"The biggest hurdle nowadays, is the 'hype' versus 'reality' realization. Companies are currently taken over by the whole voice hype. Therefore, it is up to designers to take the stage and help them in defining what does and doesn't work for voice, in order to prevent the creation of gimmicky VUI's."

Conclusion

Experts share their opinion about the technology push in the Netherlands

The term 'Meaningful voice interactions' triggers them to move forward and away from this technology push. This could lie in rethinking thee value of VUI instead of copying existing content and services. This requires a more open mindset from companies and a clear guidance/consultant role from experts to show how this creates value on the long term. Is is beneficial to look for new ways to see VUI as a ‘mediator’ instead of a ‘goal’.

The starting point of a voice project seems to be the key moment in moving from an experimental mindset to a more insight-based one. A more human centered approach could help to step away from the technology mindset in order to create meaningful voice interactions which could result in new use cases. However, this approach is yet to be discovered.
■

3.6 Key Takeaways

State of voice in the NL's

In the Netherlands we still are in the innovator stage having a fairly low adoption of voice technology. People do see possible benefits and use cases if they would own an assistant or know how to access one. But they think they still need to accommodate to the idea of talking to a 'robot' to get things done. It is a case of getting used to this way of human computer interaction, using it in a more daily basis.

The Dutch AI assistant

Since the Dutch version of the Google assistant has just been released in midst 2018, it doesn't have a thoroughly developed VUI AI voice yet. Especially when comparing it to the American version, which also comes with a greater variety of use cases. Google needs to learn a new language, which happens through machine learning. This could eventually help the platform and 'robot sounding voice' to mature.

Why companies want VUI

There can be named three reasons why companies start with a voice project:
1. Pr (showing innovative attitude)
2. Experimental (exploring new platforms)
3. User value (focusing on the added value for the consumers)

Google played an important role in getting companies to start designing for voice by asking them to be a launching partner. This boosted the creation of the first Dutch actions for the Google assistant.

What VUI designers do

VUI design is a complete new profession for the Netherlands. The people that now fulfill this job mostly have a background in UI/UX-design. They therefor encounter a knowledge gap in linguistic expertise and the creation of sentences instead of drawing wire-frames.
This background in visual design, makes that designers focus on the develop phase, creating the actual content for the interaction.
Besides, they underestimate the complexity of conversation which makes them develop multiple use cases at the same time.

User testing a VUI

It is advised to first try out the conversation in a role play way without any code. This is the fastest way to test a VUI.
If you do perform a VUI usability test, you have to consider the learning curve of participants. For them it is a new way of interaction, so you cannot count on the familiarity participants have with for example websites/ or apps.
While facilitating a user test, you also have to change your approach. You cannot use a 'thinking out loud' method to gather user insights. Think about letting the user alone to try out everything without facilitator interruptions.
When drawing conclusions from the test, it is nice to have a screen-shot of the conversation, since it is mostly a series of intents that creates a certain insight.
Creating videos of the conversation between the assistant and users is an convincing way of showing clients what is wrong with their current service. Besides it delivers funny fragments.

The applied VUI design process

In the creation of VUI the first phases of a design project 'Discover and Define' are just slightly incorporated or even skipped. This mainly comes from the fact that companies focus on the experimental character or pr value of the project as an argument to start with a VUI.
These arguments will however fall short in user relevance and benefits which will turn out to be less viable on a longer term.
The biggest question for them therefor remains: "How to pick the right use case?"

Opportunities & Threats

- ★ Create guides for defining VUI use cases
- ★ Design one use case at a time
- ★ Deploy a VUI user test method

- ⚡ Slow adoption in the Netherlands
- ⚡ Dutch assistant's AI is lacking behind
- ⚡ Designers miss linguistic knowledge
- ⚡ Clients VUI requests differ

"The biggest hurdle nowadays, is the 'trend' versus 'reality' realization. Companies are taken over by the whole voice hype. Therefore, it is up to designers to take the stage and define what does and doesn't add value, in order to prevent the creation of gimmicky VUI's."

- Maarten Lenz Fitzgerald
Co-founder Conva

4 Synthesis

This chapter focuses on synthesizing the data retrieved from the first two chapters and translating this into design insights for the valsplat way of working.

In this chapter:

4.1 Mapping insights

"This chapter combines all conclusions of the previous chapters in one big map. This map includes opportunities and threats that form the VUI design guidelines for Valsplat."

The previous chapters were concluded with key take-aways. The opportunities and threats of chapter 2.4 and 3.6 are combined and showed in the lists below.

Opportunities

★ **1. User centered VUI benefits**
Incorporate the three VUI values: 'Accessibility, convenience and experience' and keep them in mind during the full range of the project.

★ **2. Enrich the discovery phase**
Enrich the first phase of the VUI process by adding a pro-founded discover and define phase.

★ **3. Link design by insight to process**
Use the 'design by insight' mindset to enrich the VUI design process and thereby make insights guiding for every phase.

★ **4. Get to know Dutch VUI users**
Perform research into the Dutch VUI users to discover their motivations, needs and wishes regarding the technology.

★ **5. Create guides for VUI use cases**
Create a method/tool to find and verify use cases.

★ **6.Design One use case at a time**
Do not underestimate the complexity of conversations, start small with a focus at one VUI use case.

★ **7. Deploy a VUI user test method**
Discover, know and explain how and when to test a voice user interface.

Threats

1. Technology push
Let go of the technology push (as an argument for creating VUI's) and move towards a more human centric approach.

2. Voice-first vs Voice-enabled
Consider technological developments that might change the field of design from a voice-first, to a voice-enabled one (with visual elements).

3. Companies focus on designing
Manage expectations that when focusing on the design phase you will miss out on the research phase based on user insights.

4. Slow adaption in the NL's
Investigate how the slow adoption in the Netherlands influences the design process and user tests (having to work with early adopters).

5. Dutch AI is lacking behind
Know that the Dutch assistant is not as good as the native American one.

6. Designers miss linguistic skills
Know that external knowledge is needed in order to create cohesive designs in this new profession.

7. Clients VUI requests differ
Make the VUI process steps adjustable/parametric for each and every client to create a contribution to their level of VUI knowledge.

Insights overview

Next to the overall opportunities and threats collected, a focus has been applied into collecting insights about the VUI design process. The insights gathered in the previous chapters regarding this process are combined into one general overview. See figure 24. *(The complete version can be found in appendix F)

The opportunities and threats have been linked to this general VUI process to show how the conclusions relate to different phases. It shows that most of them lay in the first phase of the design process.
This map forms the design guidelines for a Valsplat way of working, yet to be defined in the following chapters. ■

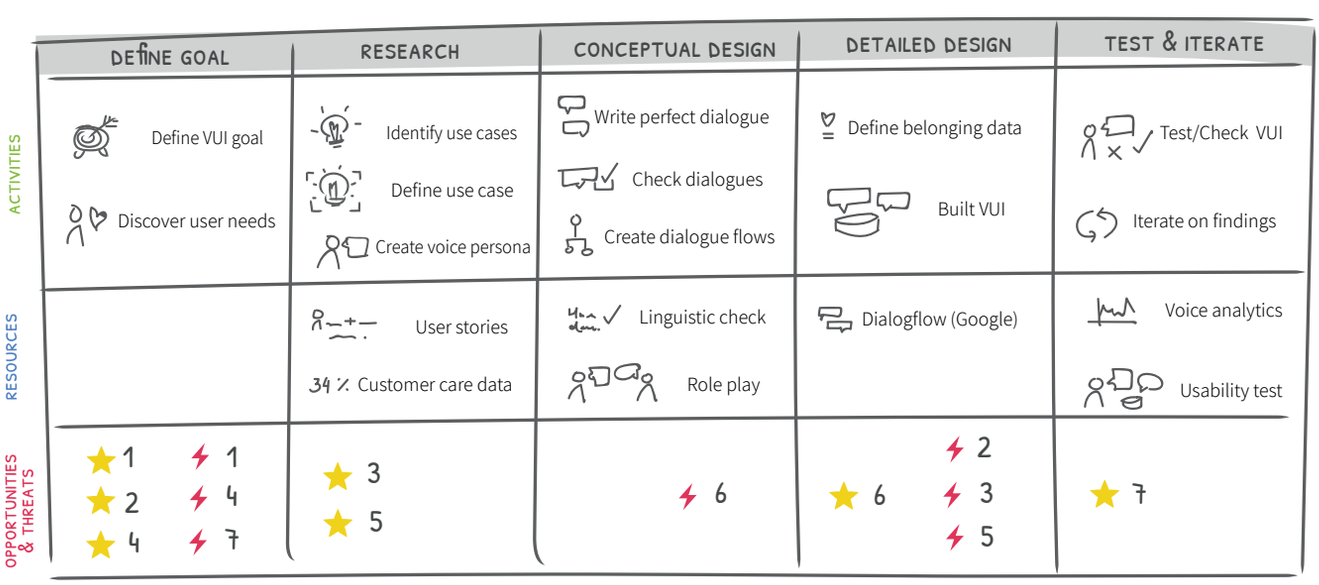


Fig. 24 - Overview of opportunities and threats linked to a VUI process

4.2 Valsplat VUI process

"Based on the general VUI process mapped out on the previous pages, a new Valsplat way of working for VUI projects is constructed. "

Double Diamond VUI process

The opportunities and threats listed on the previous page provide the basis for a new VUI design process for Valsplat. These guidelines have been applied to the discover/deliver cycle that Valsplat uses as their design process. Their design process, normally consisting of two phases has been divided into four steps according to the double diamond of the British design council: Discover, Define, Develop and Deliver. These extra two layers of complexity have been applied to be able to create a bigger distinction in the goals and belonging objectives of each phase. This provides a more extended way to show how and where the design activities would take place. (See figure 25)

VUI process layers

Objectives

The objectives describe the key target of each phase. Based on the double diamond described by the British design council, the objectives have been adjusted to voice design projects, replacing the general terms 'product' by 'VUI'.

Projects

The red and blue blocks name the projects that Valsplat could perform in relation to a phase of the design process. Each project works towards a certain deliverable. These are of great value when talking to clients to convince them by showing the assumed result of a certain project.

Activities

This layer shows all the activities related to a voice design project in chronological order. Some of these activities are design process general, others have an extra importance or are VUI design specific activities (marked with a black icon).

Insights

To be able to perform the activities from the layer above, it is needed to answer the questions from the layer called: insights. Asking these questions during the accompanied design phase will make sure you collect the right insights for your VUI design. This insights layer can be found in appendix H.■

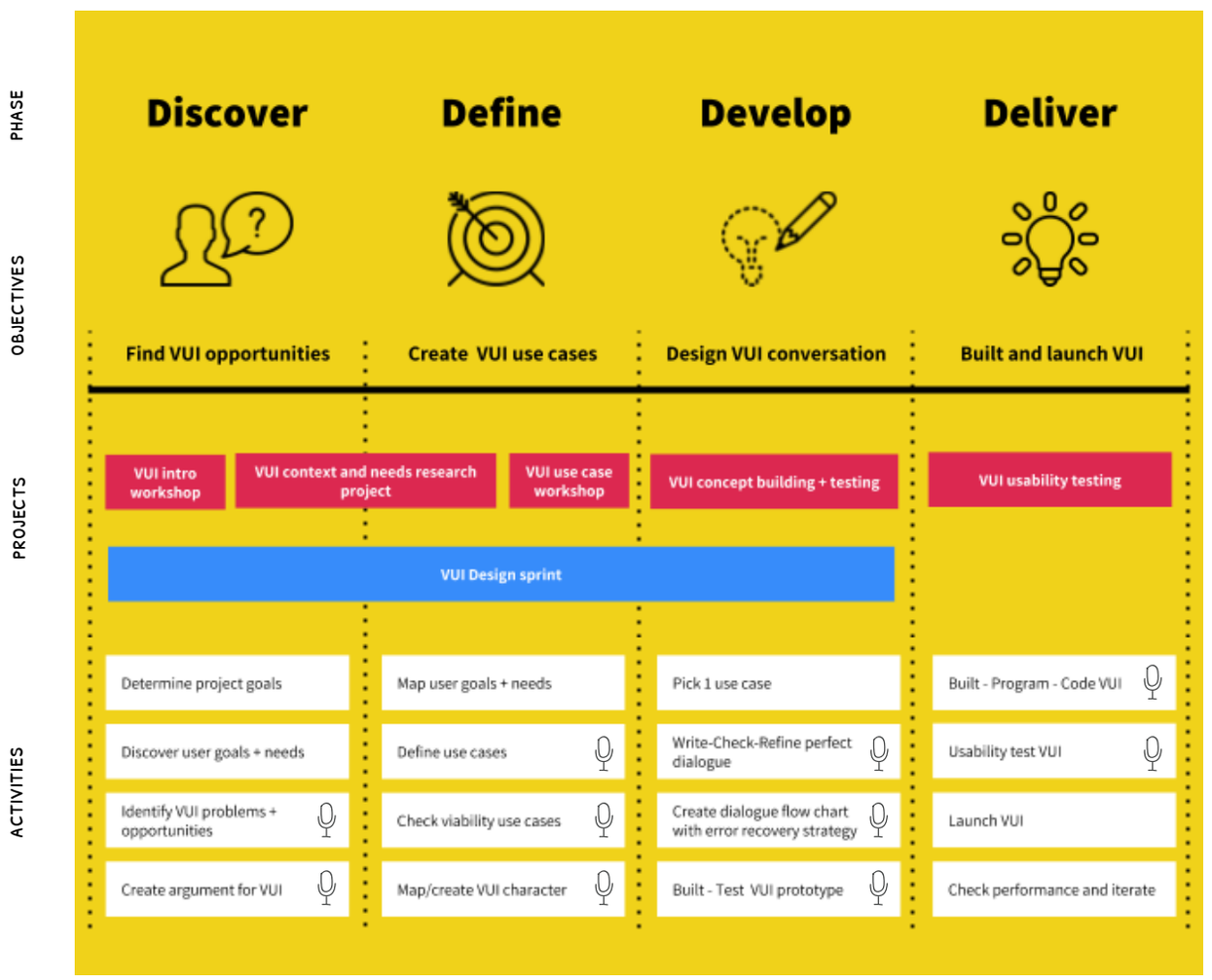


Fig. 25 - Valsplat VUI design process with belonging activities

4.3 Discover new VUI tools

"There are limitless opportunities within this new field of design, it is therefor key to focus on the one thing that provides the greatest value for both Valsplat/clients and designers. Therefor ideas have been generated based on the four VUI design phases."

Discover

1. General VUI slide deck

A slide deck helps to communicate the link between VUI design and Valsplat. It is an online tool that shows an easy and complete overview of how Valsplat approaches this topic to be able to inform clients about the different types of projects.

- ★ Show valsplat specific voice way of working
- ★ Modular version to actively and passively react in a quick manner to client replies

2. Day at customer care

Spending one day at the customer care department of a company could teach you a lot about how customers interact with your brand.

- ★ Learn how customers ask questions
- ★ Discover use cases

3. VUI design sprint

A design sprint is a method in which you quickly create and verify a certain idea in 5 days. A voice version of a design sprint could be a nice starting point of a project with low investment risques.

- ★ Touch upon multiple phases of the VUI design process
- ★ Experimental set-up (learn regardless of outcome)
- ★ Short time investment, high results

Define

4. Mini VUI sprint workshop

A VUI design sprint could also be shortened into a one to two day workshop. This because some clients are only interested in a specific part of the design process.

- ★ Focus on either discover/deliver
- ★ Teach about voice in general
- ★ Learn what is (and is not) possible

5. VUI Use case template

One of the biggest hurdles in creating a VUI design, is coming up with the correct use case. A template with predefined user centered values could help designers in this ideation process.

- ★ Overview of VUI value touch-points
- ★ Incorporating multi-modal design (phone or speaker)
- ★ Create valid go/no go moment for a VUI

6. VUI persona canvas

One of the new disciplines for VUI designers is the creation of the bots voice, also referred to as a VUI persona. Guidelines or a template could help them in knowing what characteristics to map.

- ★ Learning about what voice branding and sonic branding could do
- ★ Know how the persona influences the VUI design process

Develop

7. Utterance collector

Humans have a broad variety of language and know tons of ways to say the same thing. This input sentence is called an utterance and should be covered in the design, to be able to link it to the correct response.

- ★ Collect real user insights
- ★ Save precious time of the developers/designers
- ★ Create better prototypes for usability tests

8. VUI creative session

Creative sessions could help in brainstorming about user needs without having to copy a current service or product from a company. It allows to go broad and a little bit wilder to explore the VUI future.

- ★ Collecting multiple out of the box use cases
- ★ Thinking beyond existing services
- ★ Future thinking (innovation fit)

9. Remote VUI test set-up

VUI tests do not take a lot of time, a conversation could simply be tested in a couple of minutes. Therefore, letting participants come over to a lab could be cumbersome and a waste of time and money.

- ★ Testing without need of a lab (via Internet)
- ★ Shorter test duration (15 min)
- ★ Possibility to test earlier in the process (low investment costs)

Deliver

10. VUI user test with kids

Kids are the most honest user group you will ever encounter and they also have a limitless imagination. They are more likely to keep on trying to get the assistant to do what they want and could probably think of other types of applications.

- ★ Will ask anything to the assistant (no threshold
- ★ Have greater imagination
- ★ Are the future users

11. VUI service blueprint

There now does not exist an overview of the organizational structure of a VUI service. A blue print could help in clarifying this by showing the benefits and competitive advantages from a more strategic point of view.

- ★ Connecting touch-points to customers actions
- ★ Business strategy perspective incorporated
- ★ Product market fit

12. VUI usability test set-up

One of Valsplat core businesses is conducting user tests. Having a pro-founded test set-up for the different types of VUI devices with pro's and con's per method could help them to facilitate it accordingly.

- ★ Creating lab protocol
- ★ Bring out Valsplat expertise
- ★ Educate more researchers how to perform a good VUI user test ■

4.4 Choose new VUI tools

"With the creation of a multiple ideas naturally comes the moment that you have to choose to focus on one of them. These pages show the decision process that guided the selection of VUI tools to develop for Valsplat."

Making a decision

To be able to choose one of the methods/tools for development, they have been rated on a 3 point scale on the following levels in figure 26:

- **Desirability** - Does it address Valsplat clients' values and needs? This has been checked by doing both short interviews with clients [see appendix G] as valsplat designers.
- **Feasibility** - Can it be realized? This has been checked by looking for similar existing solutions.
- **Viability** - Will it survive on a longer term? This has been decided based on the relation to the state of the technology and influence of AI/ machine learning.

The rating on those 3 axes shows a top 5 of ideas to be executed.

	Desirability	Feasibility	Viability
1. General voice slide deck	★★★★	★★★★	★★★
2. Day at customer care	★	★★★★	★★
3. Voice design sprint	★★★	★★★	★★★
4. Mini design sprint	★★	★★★	★★
5. VUI use case template	★★★	★★★	★★★★
6. VUI persona canvas	★	★★	★★
7. Utterance collector	★★★	★★★	★★
8. VUI creative session	★	★★★	★★
9. Remote VUI test set-up	★★★	★★	★★★
10. Voice testing with kids	★★	★★	★★★
11. VUI service blueprint	★★	★★	★★
12. VUI usability test set-up	★★	★★★	★★

Fig. 26 - 12 VUI methods and tools rated on 3 axis on a 4 point scale

Top five of ideas

General VUI slide deck

The VUI slide deck is a quick win for Valsplat, as it can be used as a template for all client requests. It is very feasible since it is a literal translating of the Valsplat VUI design process into a Google slides deck in Valsplat's tone of voice.

VUI design sprint

The VUI design sprint is a project that Valsplat could easily sell to their customers. Having a detailed planning helps them in executing this five day workshop. However, it is not really a new to this field of design. Other companies are providing this service already, which makes it less viable. The VUI design sprint will therefor not be specified, but Valsplat should be able to create a set-up based on the connection with Jake Knapp (author of 'Design Sprint') and Wally Brill (Google voice education specialist).

VUI use case template

A VUI use case template is a tool that could both help designers in general to get a grip on verifying VUI use cases as be a tool that Valsplat could sell as part of a research project. Discovering use cases is one of the things that clients call "the most difficult thing to do well", therefor the desirability is very high. By using the insights from chapter 2 and 3 it should be feasible to create a tool to support this. The viability of such a tool is expected to remain over the years, since it is not a solution, but a method to create solutions.

Utterance collector

Although the desirability of having an automated utterance collector is high at this moment in time, it is expected to be less viable within a couple of years. It is expected that AI will probably play a bigger role in this field of design and automatically solve this for the designers.

Remote VUI test set-up

It would be helpful if a VUI could be tested in an earlier stage of the project and with an MVP instead of a fully developed prototype. Testing in a lab environment is a big investment since VUI tests take around 15 minutes. Therefor, an online remote test set-up could be the solution. Pulselabs, a company located in the US offers these kind of tests through their platform. They also support Dutch, the Google assistant and the recruitment of own participants.

Conclusion

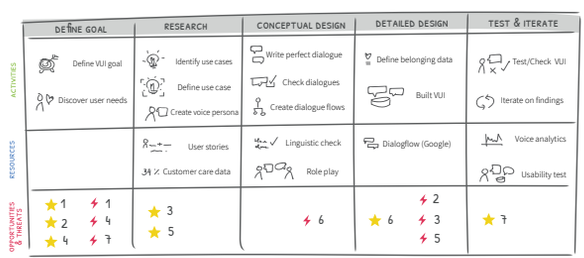
Advised is that Valsplat should look into the remote VUI test set-up from Pulselabs, since it could work both as a testing tool and as a way to collect utterances. The VUI general slide deck will be created based on this report, which could work as a way to sell new VUI projects.
Next to this, they should work on creating their own version of a VUI design sprint. The VUI use case template could be one of their 'exclusive/new attributes' incorporated into one of the sprint days. The VUI use case template will be further explored, designed and validated in the following chapters. ■

4.5 Key Takeaways

Insights map

The previous chapters were concluded with key take-aways. The opportunities and threats from these chapters (2.4 and 3.6) are combined.

Next to these, the insights gathered in the previous chapters regarding the VUI process are mapped onto one general overview. (The complete version can be found in appendix F)

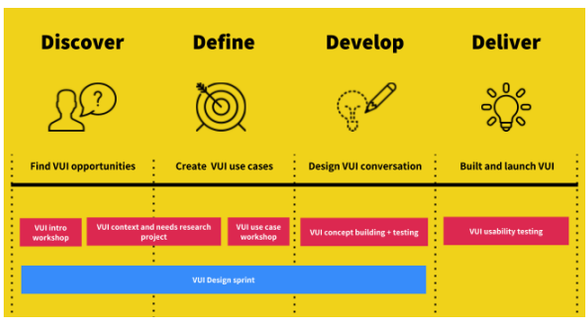


The opportunities and threats have been linked to this general VUI process to show how the conclusions relate to different phases. It shows most of them lay in the first phase of the design process.

This map forms the design guidelines for a Valsplat way of working, yet to be defined in the following chapters.

The valsplat VUI process

The insights map has been applied to the discover/deliver cycle that Valsplat uses as their design process.
Their design process, normally consisting of two phases has been divided into four steps according to the double diamond of the British design council: Discover, Define, Develop and Deliver.



To each of these four phases, VUI specific projects that Valsplat should be able to execute have been linked.

Besides, all the activities related to a VUI design project in chronological order are divided over the four phases. Some of these activities are design process general, others have an extra importance or are VUI design specific activities.

This VUI process overview should enable Valsplat to both understand and communicate the different steps and activities of a VUI project.

Voice methods/Tools

Building upon the four different design phases of the VUI process, ideas are generated. Twelve possibilities have been divided over the multiple phases, after which each one is rated on desirability, feasibility and viability. From this ranking, a top five emerged:

- General VUI Slide-deck
- VUI design sprint
- VUI use case template
- Utterance collector
- Remote VUI test set-up

Valsplat should look into the remote VUI test set-up, since it could work both as a testing tool as a way to collect utterances. The VUI general slide deck will be created based on this report, which could work as a way to sell new voice projects.

Next to this, they should work on creating their own version of a design sprint. The VUI use case template could be their exclusive and new VUI tool. This tool will be further explored, designed and validated in the following chapters.

"The dumbest mistake is viewing design as something you do at the end of the process to 'tidy up' the mess, as opposed to understanding it's a 'day-one' issue and part of everything."

- Tom Peterson
American design retailer


x4
sub-kaartjes
sub-kaartjes
x4
"Titel"
"ondertitel"
+
Uitleg
+
front
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Titel
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"HANDLEIDING"
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x 52 %
GUIDE
CONTENTS:....
... rating
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THIS CARDSET IS.....
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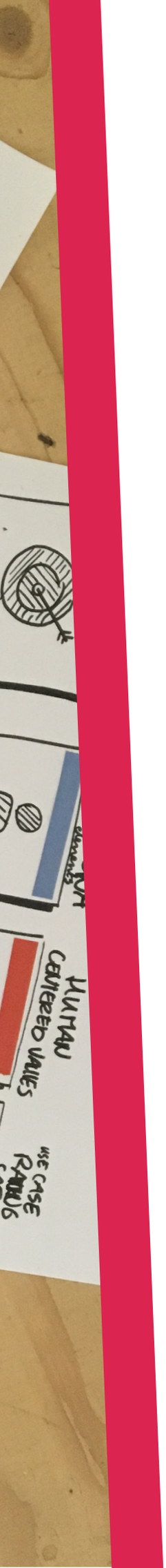


5 VUI Design Tools

In this chapter, the VUI design tools are described. First, an overview of the development of the canvas and card deck are shown, followed by the Valsplat VUI slide deck and an introduction to the humanVUI platform.
All tool materials can be found in appendix I,J and K.

In this chapter:

5.1 VUI use case template

"The VUI use case template should help designers in determining when a VUI is of added value to the user's job to be done. This chapter describes the development of this template."

Design guidelines

This chapter describes the iterative steps taken towards the development of the VUI use case template. First, design guidelines have been elected

What...should this tool do?

- Generate and/or check VUI use cases that are desirable/feasible and viable.
- The output of the tool should be a use case that defines: Who, when, where, what does the use case do and Why this is a good use case to solve with a VUI.

Who...is going to use it?

- Designers from Valsplat
- Clients

When...would you use this tool?

- At the beginning of a design project, mainly in the define phase.
- To distillate user insights (customer journey specific) into use cases. It could work as both an ideation tool, as a decision tool.

How...should this tool work?

It should :

- contain the use case elements
- be easy to fill in
- contain as few steps as possible
- contain a clear description
- work as a communicative format to the client
- work both on and off-line
- work in creative session set-up

Elements

The use case template should consist of the following elements. (The numbers link to the elements indicated on figure 27):

1. Context Framing

- Physical context
- Social Context
- Activity
- Job to be done

2. Context check

- Ears Should be able to listen
- Mouth Should be able to talk out loud
- Eyes Could be focused on something else
- Hands Could be busy doing something else

3. Added value - user perspective

- Accessibility Enrich the users capabilities
- Convenience Perform a task faster or easier
- Experience Enhance the experience

4. Use case validity

- Simple to use
- Relevant (added value user)
- High success rate
- Frequent

Iteration 1 - Ideation

A first version of the use case model was created combining the four elements into one document. Below each element, questions were generated in order to help designers to answer the sub sections.

Self evaluation

- Room should be added to be able to name the target group and title of the document.
- Change the requirements belonging to the ears and mouth: these are not temporary situational or permanent, but a go/no go.
- Add room for comments below all the items
- Create a more cohesive framework by the use of rows and columns.
- Add ticking boxes for the questions that can be answered by 'yes' or 'no' .
- Change the use case layer into a device layer. These use case types limit the solution space, where the choice for a type of device only frames the interaction.
- Create a use case sentence structure with blanks to be filled in. This should be the end result of the model to which the added values could be linked in the shape of USP's. ▶

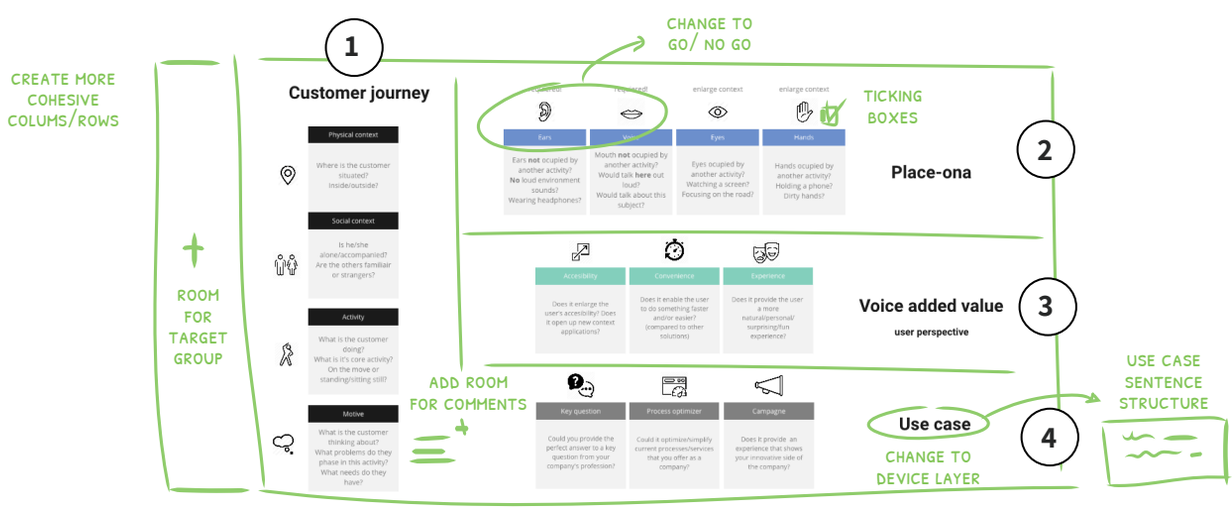


Fig. 27 - VUI use case template V1

Iteration 2 - Expert reviews

A second version of the framework was evaluated with three Valsplat colleagues (figure 28). This was done by means of expert reviews, collecting insights from their different expertises in the field of design.

Fabian (Design researcher)

- Clarify what effect it has when you do/or do not check a box in the place-ona category.
- Device layer give a time-stamp and make it less viable. Over time devices will change.
- Make 'motive' the start of the customer journey, highest in placing on template.
- Reduce the text to a minimum, it is a bit of an overload.

Gina (Strategic Consultant)

- Maybe re-frame the use-case sentence. You did your research from the users point of view, and this is suddenly from the companies.
- A filled in template could work as a great overview for the company to have an argumentation overview of a voice use case.
- Add extra space for comments in digital version.

Bjorn (Designer/developer)

- I would switch around the placing of the use case and the place-ona. Because the use case could directly follow from the context factors.
- The device layer could be changed into more general interaction/interface characteristics. Like: screen, voice input, audio output, tap input, etc.
- You could use this template loose from voice, so not having a device as an output, but a interaction input and output way.
- I would use a physical version of this template in a workshop with the client. To create use cases and see how they could be translated into a VUI.
- A digital version could work as a documentation form; an output of a research project.
- You name a lot of examples, I would like to see them in your model somewhere as well.

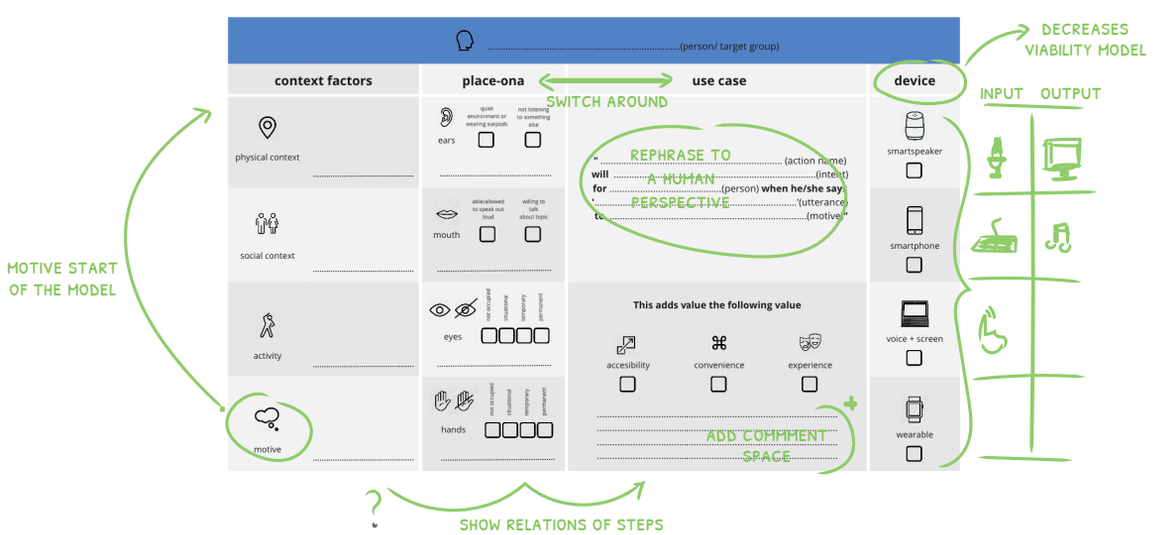


Fig. 28 - VUI use case template V2 + Iteration comments

Iteration 3 - Valsplat validation

The third version of the framework was evaluate by one of the founders of Valsplat (figure 29). This was done in a discussion set up, to validate whether the tool is in line with Valsplat's purpose and vision.

Joris (founder valsplat)

- In my opinion there are two ways of innovation: on a target group or on a service. Your model now predefines a lot of them upfront. This gives the designer less freedom in the creation of use cases.
- I miss a priority layer, if you make multiple use cases, how could you choose amongst them? Maybe by calculating the opportunity score per customer need/motive first.
- I am not sure about the 'personal' card and the 'accessibility' group. Make sure to explain this in a different way on the cards.
- It looks like the accessibility value (red card) is a direct consequences from the blue cards. There exists a lot of overlap here. Either show how these two relate or make them more distinctive.
- I want the design of the cards to be in line with the Valsplat graphical style, so we could eventually use it in other projects. ▶

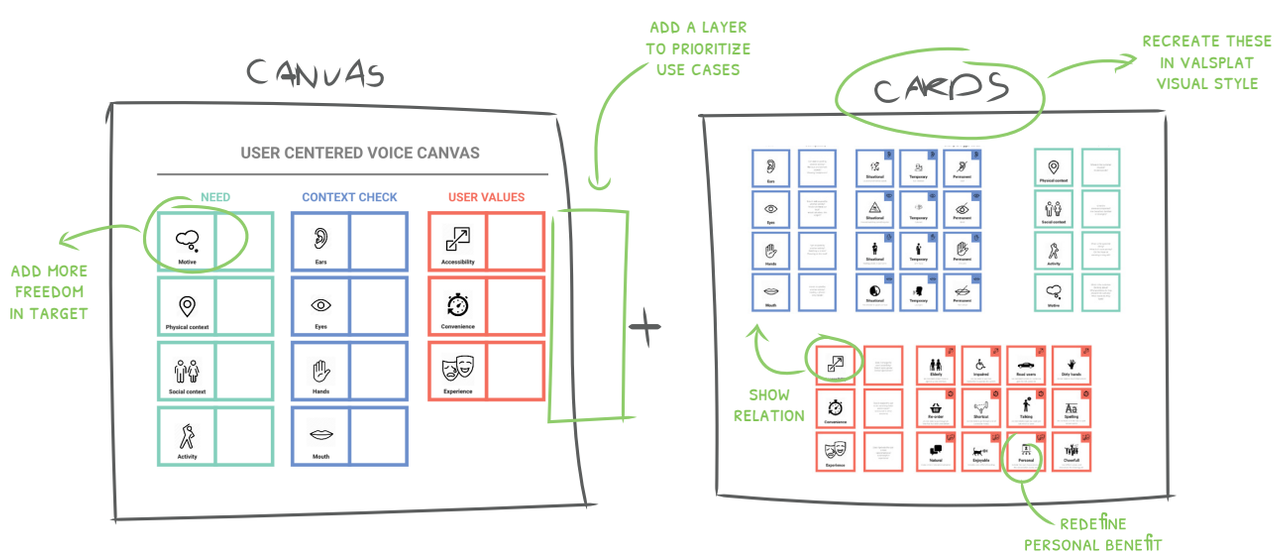


Fig. 29 - VUI use case template play-card version + Iteration comments

Final version - VUI canvas

A fourth iteration led to the final version of the VUI canvas. (See figure 30) This canvas consists of four different phases:

1. **Framing**
   Pick one Job to be Done and frame the belonging context. Do this by both looking at the social and physical context. Also take the users current activity into account.
2. **Checking Context**
   Check whether the context allows the use of a voice assistant by looking at the occupation of the users ears, eyes, hands and mouth.
3. **Ensuring Value**
   When the context allows the use of a voice assistant, fill in at least one of the three red blanks. This in order to enhance either the user's accessibility, convenience and/or experience.
4. **Ranking**
   Rank the use case on the four different elements: frequency, simplicity, thresholds and variables.

An empty canvas can be found in appendix I.

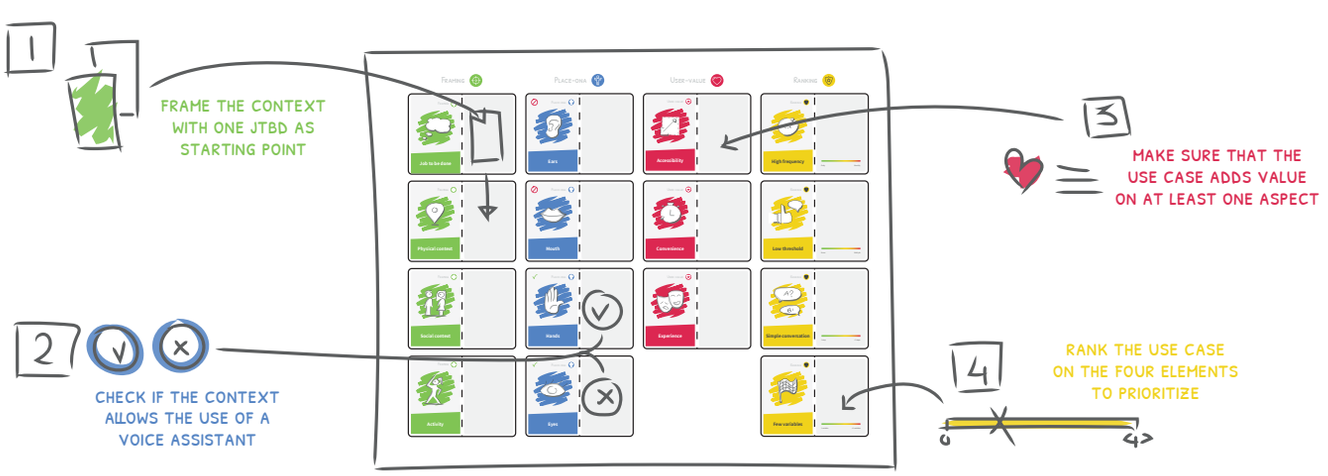


Fig. 30 - VUI use case canvas with explanation

Final version - VUI cards

The examples belonging to the different phases of the canvas were transformed into a card deck, shown in figure 31).

All cards contain a title, visualization and color that correspond with the an element on the canvas. The back of the cards contain an explanation of the element of the canvas and provide the designer with questions to ask themselves in order to fill in the belonging blanks. (See figure 32)

Next to the colored explanation cards, trigger cards have been created containing examples and inspiration for VUI applications.

All VUI cards can be found in appendix J. ■

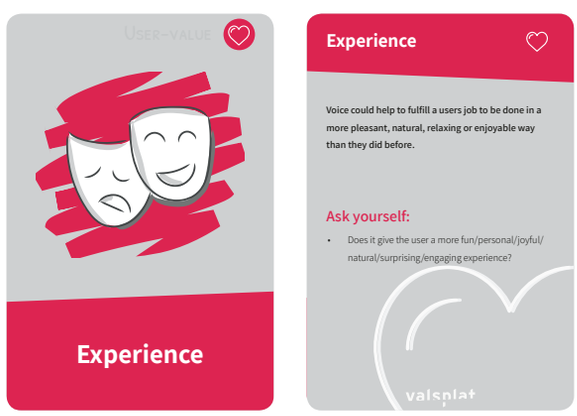


Fig. 32 -Front and back of one of the VUI cards

Fig. 31 -The different types of VUI cards with explanation

5.2 Valsplat VUI slide deck

"A slide deck says more than a 1000 words. This presentation can be used by Valsplat whenever they get a client request regarding VUI's. It's modular origin makes it adjustable to the specific needs and wishes of the client."

Design guidelines

This chapter describes the development of the VUI slide deck First, the following design guidelines have been elected.

What...should this tool do?

- Introduce VUI in general and explain how Valsplat purpose connects to the creation of VUI's.
- Explain the Valsplat VUI specific way of working by showing the VUI design process
- Convince clients to start a project with Valsplat

Who...is going to use it?

- The Valsplat sales-team in combination with Valsplat employees who together will edit/ personalize it for the client
- The client will receive and read the document

When...would you use this tool?

- As a pro-active sales tool to approach new clients
- As a re-active sales tool to quickly respond to a question from a client

How...should this tool work?

- Some slides should be fixed, not editable en general for all versions to convey the same message.
- Other slides should be adjustable, to be able to select the slides with the project lay-out that is advised to the client.

Elements/Slides

A slide deck has been created in Google slides according to the current visual style of Valsplat. The deck consists of five different parts, shown in figure 33:

1. **Voice general** (fixed)
2. **Valsplat and voice** (fixed)
3. **The voice process** (adjustable)
4. **Personal company project advice** (adjustable)
5. **Cases** (fixed) ■

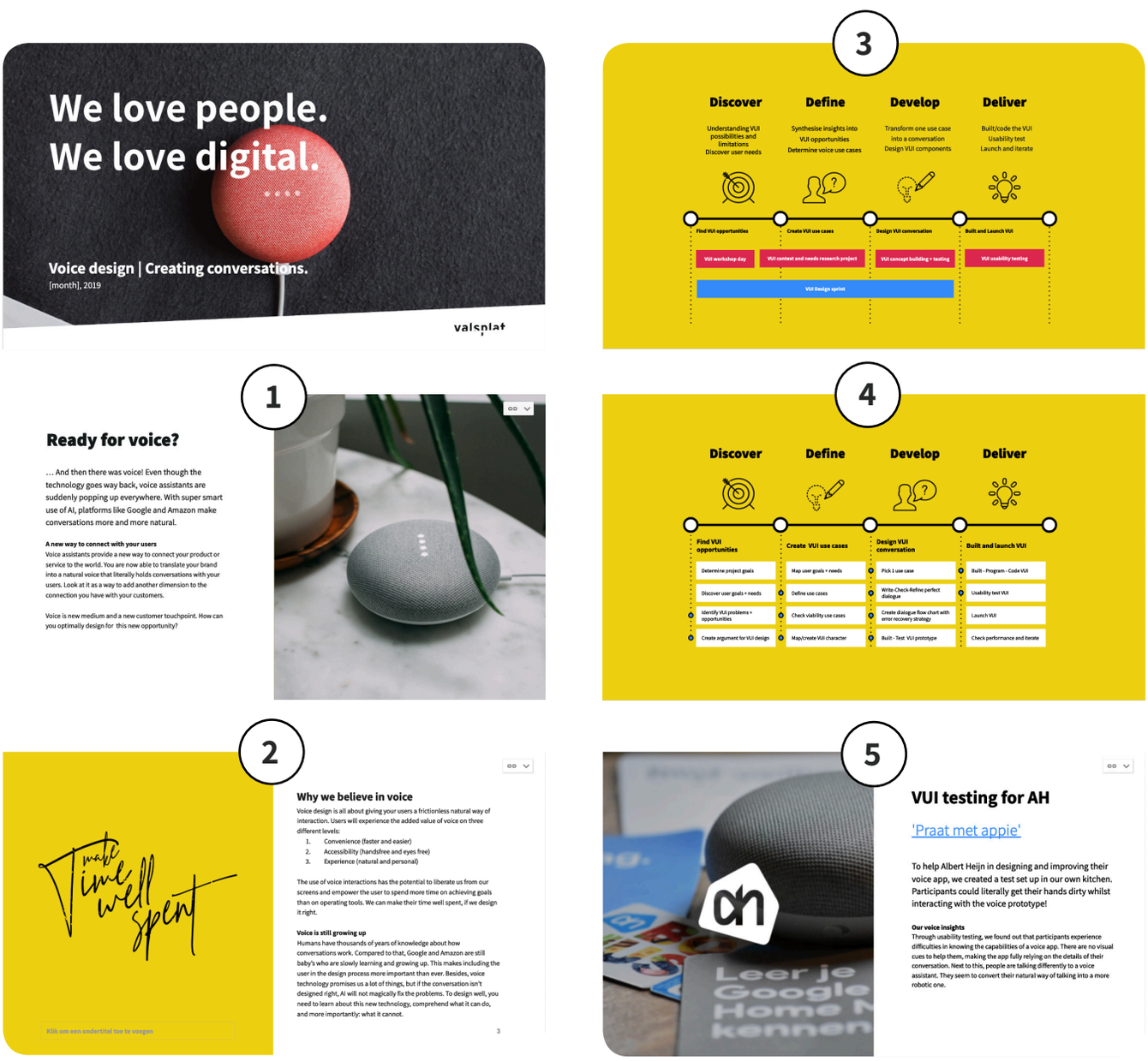


Fig. 33 - A few of the slides belonging to the Voice deck

5.3 humanVUI platform

**"A new way of working deserves a new name.
Therefor, the term humanVUI has been brought to live. "**

humanVUI

To be able to communicate the different parts of the toolkit in a cohesive way, a name and logo for the VUI approach have been designed.
HumanVUI: Human Centered Voice Design.

Fig. 34 - humanVUI logo

www.humanVUI.com

In order to communicate and explain this human centered way of approaching VUI, a website is constructed. This site functions as an online platform for designers and companies that are interested in acquiring more information about the process and toolkit. ■

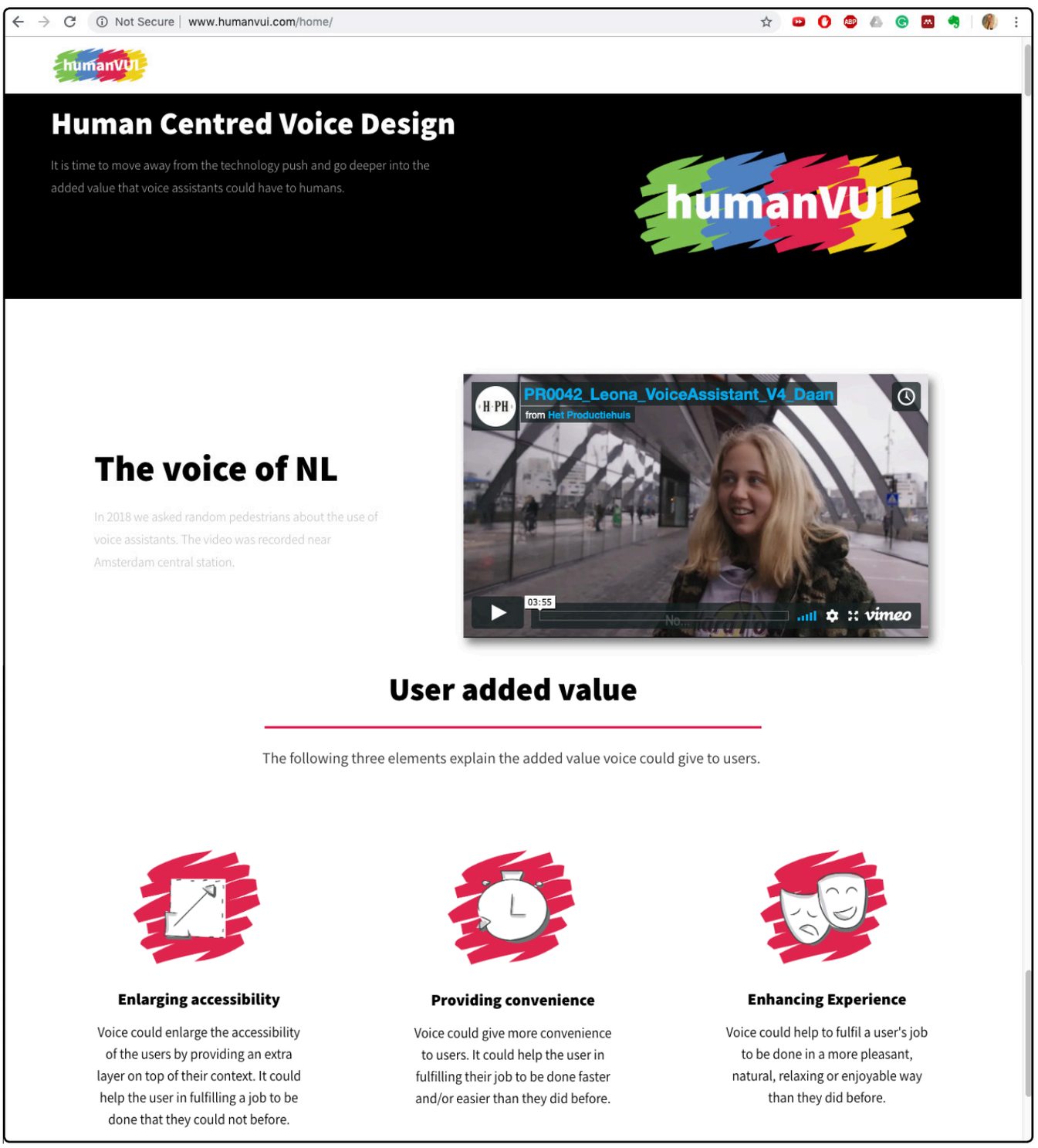


Fig. 35 - An impression of www.humanVUI.com

5.4 Key Takeaways

humanVUI

The insights gathered through this research boiled down into a condensed framework showing how designers could incorporate human centered VUI design in their processes. The argument put forth in this research is that context factors and human centered values determine to what extend a use case is meaningful, in relation to one's job to be done. The proposed human centered approach has been titled: humanVUI.

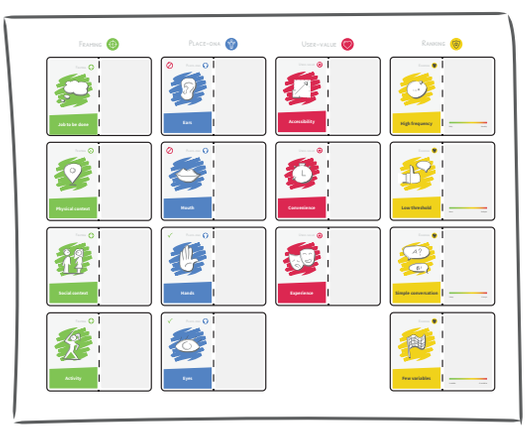
humanVUI
Human Centered Voice Design

humanVUI toolkit

Building on this argument, a toolkit has been developed, turning the theory into a hands-on product to incorporate in every VUI design project. The toolkit includes: a canvas to discover and validate human centered VUI use cases and a card deck which both clarifies the canvas' elements as triggers the designer's VUI imagination with inspiring examples.

humanVUI canvas

With the canvas, you decide step-by-step if voice is the right solution for the fulfillment of a job to be done, putting the needs of the human central to the modal. In chronological order these steps include: Framing the Job to be done, checking the context factors, ensure human centered value and ranking the use case's feasibility.



humanVUI card deck

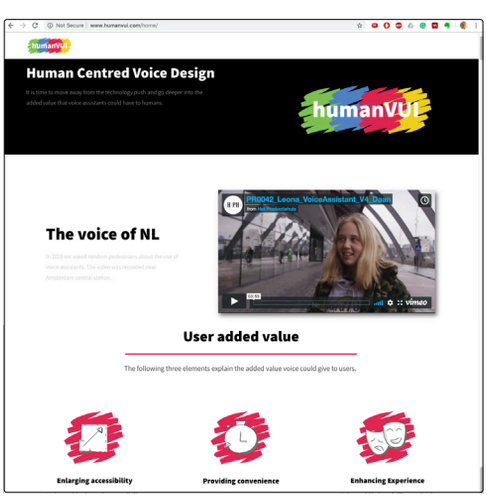
A card deck with examples of contexts, target groups and specific types of interaction in which a VUI could be of extra value stimulates the creative process and hereby enhances the creation of meaningful voice use cases.

humanVUI slide deck

To enable Valsplat to communicate this new way of working to their clients, a slide deck has been created. This deck consists of both general static information about voice technology and its relation to Valsplat, as adjustable content with a VUI process time-line that can be adjusted into a client specific proposal.

humanVUI website

In order to communicate and explain this human centered way of approaching VUI, a website is constructed. This site functions as an online platform for designers and companies that are interested in acquiring more information about the process and toolkit.



"This toolkit has the potential to establish Valsplat as a leader in the movement of human centered voice design."

- Nils van den Broek
Co-founder Valsplat


High frequency
Simple
Few variables
Voice Use Case Canvas

6 Case study Validation

In this chapter, the tools created will be validated through applying them to a client project for valsplat.

In this chapter:

6.1 VUI workshop set up

**"To put the canvas and card deck to work, you need a clear guide!
This will be done in the shape of a workshop."**

What...is the goal of the workshop?

Cooperatively find and/or check VUI use cases that are desirable/feasible and viable. The output of the workshop should be list of VUI use case that define: Who, when, where, what does the use case do and Why this is a good use case to solve with a VUI for the specific client.

Who...is going to attend?

A facilitator from Valsplat accompanied by a design/ research colleague.
A group of people (preferably six) from the client with different backgrounds. Preferred backgrounds include: designers, customer care, copy writers and developers, since these have the closest connection to either the JTBD's or conversational design.

When...would you do a workshop?

At the beginning of a design project, mainly in the define phase, to transform Job to be done's into VUI use cases. It could work as an ideation and validation tool. This gives the opportunity to both sell the workshop as a follow up to a research project as to kick off a VUI design project.

How...would the workshop work?

The workshop is facilitated and guided by people from Valsplat. A complete overview of the different steps of the workshop is explained by the slide deck and the scenario.

Slide deck

A slide deck (See appendix K) helps to explain the participants the information they need to know in order execute a step of the workshop. It also simplifies the execution of the workshop by Valsplat designers that have not given the workshop before.

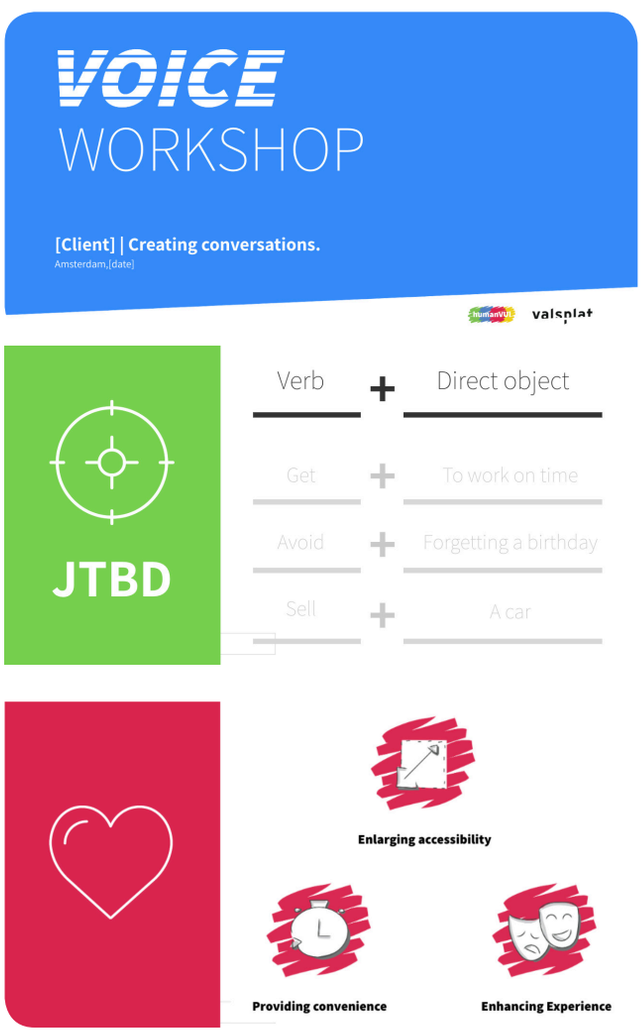


Fig. 36 - A few slides from the workshop slide deck

Scenario and planning

To be able to come to viable VUI use cases, the workshop has been separated into three different parts. One focusing on the creation of JTBD's, one to fill out the canvasses and one step to communicate and structure the findings.

Creative facilitation principles are applied to come to the scenario shown in visual 37. This planning shows all different parts of the workshop including the materials and estimated time needed to perform the steps. ■

Part	Min.	Element	Explanation	Materials
1	30	Introduction	Introduction round Explain the goal, planning and rules	Slide deck
	30	JTBD's	Explain JTBD theory Brainstorm JTBD's on post-its	Post-its + pens
	10	C-BOX	Rank the JTBD's in the C-BOX	C-box frame on brown paper
2	20	Break		
	60	Canvas	Explain the Canvas and card deck Fill out the Canvas (multiple times)	Canvas x10, card decks
	20	Break		
3	20	Presentations	Let groups explain their use cases	
	10	Ranking	Rank the use cases	Dot vote stickers
	10	Wrap-up	Discuss the results Discuss next steps	White-board (markers) or brown paper

Fig. 37 - Scenario of a VUI use case workshop

6.2 VUI workshop for KPN

"The VUI use case workshop has been executed in cooperation with a team from KPN online. The workshop afternoon was completed with an evaluation, regarding both the outcomes as the VUI tools used. This chapter shows the key insights from this evaluation."

Goal

Validate whether the workshop and VUI tools work in a client set-up. The following questions lead the interview. (A complete overview of the interview set up can be found in appendix L)

1. ***To what extend is the client able to cooperatively create VUI use cases?***
2. ***To what extend do the tools (canvas and card deck) help the client/Valsplat to develop these use cases?***
3. ***To what extend is the workshop of added value for the client?***
4. ***Extra goal: Teach people from Valsplat how to use this tool by themselves***

Fig. 38 - Camera set up for the individual interviews

Method + Set-up

On the 16th of April, a VUI use case workshop has been executed for KPN at Valsplat Amsterdam. The workshop set-up as described in chapter 6.1 has been carried out in a 3,5 hour during session. A 30 minute evaluation was added to the session to be able to validate the workshop.

The presentation slides (see appendix K) were guiding during the workshop and continuously presented on a screen. The planning was written down on a brown paper to be visual to the participants at all times.

In another room, a camera was set up in order to record the interviews with the participants. ▶

Fig. 39 - Workshop room: Planning, presentation and canvas.

Fig. 40 - Picture of workshop in action

Participants

Thomas Pel	Channel Manager
Allart Veentjer	Community Manager
Michiel Andringa	Online Marketing
Cindy Feijen	Teamleider Forum Customer service
Jurgen de Mooij	Community Manager Telfort Forum
Justin Wesseling	Team conversational

Facilitators

Leona van der Linden	
Gina Henselmans	Design Consultant
Daan Hettinga	Cameraman Het productiehuis

Key insights: Workshop

Learn when (not) to create VUI

All participants agreed that during the afternoon, they learned when a VUI is of value, and especially when not. After the workshop, they feel like they have more handles to quickly say when a VUI is smart or illogical.

Put the customer in the center

Participants liked the general vision of the model: putting the customers job to be done in the center of the ideation process. This enabled them to step into their shoes and created more empathic designs, especially since they are sometimes blocked by their accustomed KPN way of working.

"It really helped me to step into our clients shoes, this is good since we sometimes forget to do so in our day to day work. " - Thomas Pel

Starting point: own app creation

The starting point for this workshop was not completely unrestricted, we worked from the mindset that the voice content was already existing on the forum and therefor not modular. This withdrew the participants from thinking freely and created somewhat limited voice applications. The workshop probably adds more value to clients who consider to build their own VUI apps.

"Our starting point sometimes limited us in the creation of use cases. I think this could be of even more value for our VUI design time, to create our own app! " - Justin Wesseling

Go in to depth

Since the canvas focuses on one single Job to be done, it enriches the context surrounding the use case. This creates a better ground for VUI argumentation.

Facilitation is essential

While filling in the canvases it showed that the facilitator has an important role in the creative process.

Extra guidance, explaining every step of the canvas to be able to stick post-its with answers on that part was needed, especially during the first canvas. Participants stated that without our help, they probably would not have been able to come to the same rich solutions.

"I actually did not use the card deck but just listened to the facilitators explanation. However, the cards do show nice examples that help me to fill the canvas by myself." - Michiel Andringa

Five new VUI use cases for KPN

The workshop resulted into five completed VUI canvases, which where demonstrated to one another during short presentations.

Fig. 41 - One of the completed VUI canvases

As a follow up, KPN likes to explore these use cases and will translate them into conversations with designers from Valsplat. These concepts will be validated with customers of KPN in Valsplat's usability labs. ▶

"I did not expected it to be this practical. You both showed us the bumps in the road ahead, as a way to turn these risks into opportunities." - Cindy Feijen

Key insights: Framework + cards

Canvas helps in making decisions

The VUI canvas helps the participants to quickly make decisions. The simple questions about the context work like a checklist, that could be easily be answered by yes or no. They therefore would have liked to have a set of post-its with check marks and red flags, to be even quicker at filling in these steps.

Canvas shows missed value opportunities

During the completion of the canvas, participants searched for ways to adjust the context or shuffle with the post-its in order to create more valuable use cases. They tried to find ways to put a post-it in all of the three red boxes, to both enhance the accessibility and convenience as the experience.

JTBD could be more central

The Job to be done is the base of the canvas and each question has a relates back to this. Participants suggested that it could be even stronger when this JTBD is positioned apart from the green framing phase, giving it a more prominent and dominant place.

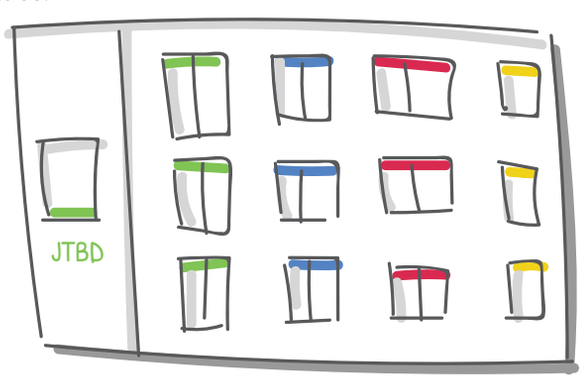


Fig. 42 - JTBD more central on the VUI canvas

Multiple canvasses enhance comparison

When filling in multiple canvases you start to see what is and isn't a good application for a VUI use case. The comparison helps to clarify this overall image of the added value of a VUI.

Questions lack on the canvas

The questions that should be asked in order to answer the elements of the canvas are now written on the cards. It takes extra time to shift away from the canvas and search for the specific cards that belongs to this element. It would be nice if the questions would also be printed in the placeholder boxes, in order to reduce switching between the two different tools.

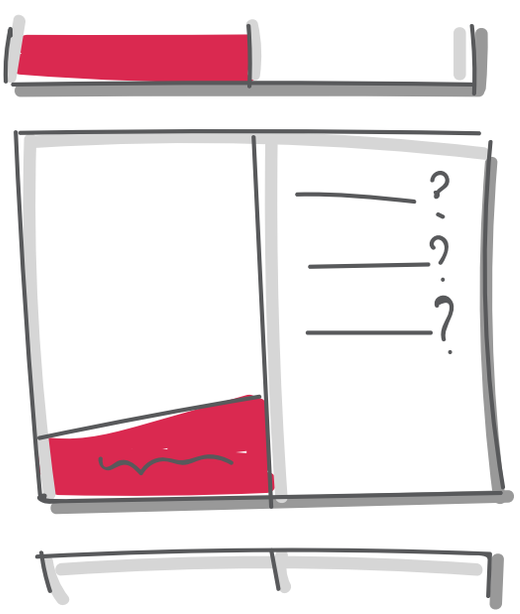


Fig. 43 - Adding questions to blanks in VUI canvas

Card deck barely used

The card decks were barely used by the participants. This was a result of the facilitator explaining the questions and giving examples by head. The participants did not feel the need to look up things for themselves.
On the other hand, there are too many cards to rapidly and easily go through when you are searching for a specific one. Therefor, it is suggested that the cards could be attached to a ring, to keep the elements within their own group. The card deck would work more like a inspiration set as an addition to the canvas.

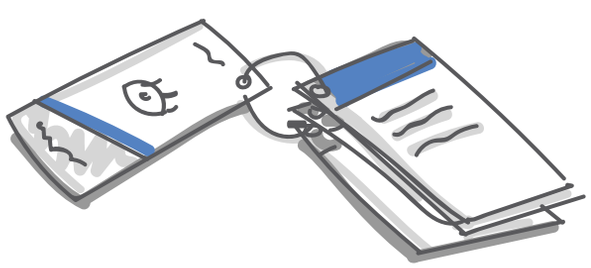


Fig. 44 - Idea: Card deck attached to a ring

Cards interesting for providing depth

The information written on the cards does help the participants to get to a deeper level of understanding VUI value. The questions on the back show a close relation to the canvas, where the grey cards help them to answer the three red user value parts of the canvas.

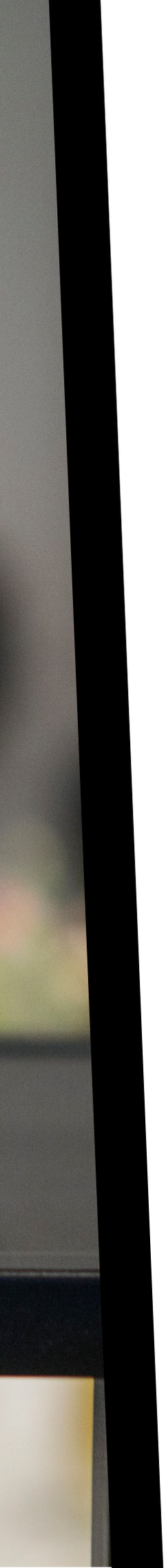
Conclusion

The workshop was positively experienced and acknowledged by both Valsplat as the participants from KPN. They were able to, in a cooperative manner, come up with new VUI use cases.

The shape of the canvas and the card deck could be optimized in order to minimize the information overload. The canvas should be the center point of the workshop, being able to use it as a stand alone product. The card deck should work as an lose inspiration tool, to provide extra depth into the subject.
These changes enable the client to fill in of the canvasses in a more substantive way and to reproduce the workshop by themselves.

With these changes, the workshop is enables clients to come up with VUI use cases. Valsplat should therefor continue to facilitate this set-up for other clients. ■


TIME
WELL
SPENT



7 Conclusion & Discussion

This final chapter summarizes the conclusion of this thesis by answering the research questions. Limitations to the research and project are mentioned as well as recommendations for further development, future research and Valsplat.

In this chapter:

7.1 Conclusion and recommendations

"This chapter concludes the research performed by addressing the research question and giving recommendations for Valsplat, Designers and the Industry. "

The purpose of this project was to understand how designers at Valsplat should approach VUI projects and empower them to create meaningful voice assistant interactions. A more human centered design approach, humanVUI, has been developed to support designers in the research- and creation steps towards a VUI.

Insights from the industry, experts and field of design were integrated and synthesized towards this new design approach and shaped the humanVUI toolkit. The foundation for this design approach is explained in chapter 4. The toolkit that supports the execution of this design process is highlighted in chapter 5.

Addressing the research question

The research question that guided the investigation in this thesis is:

How can designers create meaningful voice assistant interactions?

To be able to answer this research question, it was divided into four subsections that each assign a specific part of the research that has been performed.

1. What is known about voice assistants?
The literature study showed that, although the technology already exists for a longer period of time, there is little known about both the use and design of voice assistants. The design process mainly focuses on the development of the technology, leaving out the user needs that it could address.

2. What does the VUI process look like?
To fill the knowledge gaps from the literature study, interviews with people from the field are performed. It shows that people from the Netherlands still need to accustom to this new way of interaction. Similarly, designers miss out on a VUI specific approach since VUI design is a relatively new profession. This makes them focus on the development of the VUI itself instead of create something based on human needs.

3. What role does a designer fulfill in this process of creating meaningful interactions?
The insights from the first two chapters showed the need for a more human centered VUI design approach, taking the current state of the technology into account. This resulted into humanVUI, a process to enhance Valsplat designers to define viable and human centered VUI use cases.

4. Which tools help designers to develop these interactions/gather those insights?
To enhance the execution of this human centered design approach, a VUI use case canvas and a card deck have been created. The validation of these tools through a VUI use case workshop for KPN showed the ability of both Valsplat as participants from KPN to come up with new human centered VUI use cases. Therefor, the following conclusion can be drawn:

HumanVUI supports designers to create meaningful voice interactions, by incorporating a human centered design approach over the full execution of the VUI design process. The toolkit, consisting of a VUI use case canvas and a 54 piece card deck, empower designers to create and validate VUI use Cases. It puts the human central in relation to the VUI solution space.

Concluding, the results of the research performed form the basis of a human centered VUI design approach that enables Valsplat to discover, design and evaluate voice interactions.

Recommendations

The recommendations are separated into three different perspectives, stating their specific key recommendations and take-aways from this project.

Valsplat

- Show how Valsplat's 'design-by-insight' way of working relates to VUI design by using humanVUI as the approach: Human centered voice design.
- Use the new design process with the sequence of projects to explain clients the complete VUI way of working. This helps to step away from only performing usability tests.
- Offer the use case workshop to more clients to show them how to achieve more human centered results.
- Develop a strong VUI wizard of oz and usability test set-up plan to offer exclusive expertise to clients.
- Explore other ways to extend the humanVUI process and toolkit. For example, incorporate the canvas into design sprints and use the card deck for brainstorms.

Designers

- Gather general knowledge about VUI to be able to consider it in your solution space during design projects.
- Consider acquiring new skills: linguistic, conversational design, or dialogflow programming.
- Get familiar with VUI, by interacting with them yourself.
- Try out the VUI canvas and get inspired by the card deck.

The industry

- Be aware of the voice technology push. Make sure to focus on the benefits that a VUI provides over other technological solutions when addressing a user need.
- Incorporate a more human centered design approach into your VUI projects to make sure the outcomes will add value to the users context. The VUI process and humanVUI tools that followed from this research could help you in doing so.
- Keep following the development of VUI technology to know what your solutions space en-holds.
- Do not think of voice-first as a separate medium, but see voice as one of the multiple ways to interact with technology. The reaction to a voice input should be focused on providing the information in an efficient way, and therefor could be both audible as visual. ■

7.2 Limitations and future research

"This chapter discusses the limitations of the research , the implications of the work performed and recommendations for future research. "

Limitations

Limitations in the literature research

Since VUI technology is relatively new there is little research performed into and known about its applications. Almost no academical papers and just a few books are published regarding the topic. Therefor, the literature study performed in this thesis is mainly based on research publications from the United States and websites with VUI explanations. The three VUI specific design processes evaluated are randomly picked to cover three different design mindsets. This could have led to a less complete overview of all VUI design activities. The literature study could therefor be extended.

Limitations in the exploratory research

The exploratory research was performed by interviewing 14 random pedestrians, five VUI designers and three VUI experts. The bypassing pedestrians were approached at random, making that they do not represent the complete population of the Netherlands. Besides the expert interviews were performed with two people from the same company, Google. This may have led to biased outcomes.

Limitations of the VUI process creation

The amount of data required in to first phases of the design project made it difficult to incorporate other designers into the data analysis. The synthesis was therefor solely performed by the researcher, which could have resulted into biased interpretations. In order to broaden the viability of this analysis, it should be carried out by multiple designers to justify the choices that formed the basis of the VUI design process.

Limitations of the toolkit validation

Due to time restrictions, the toolkit was only validated during one session with a client. This did enable the drawing of general conclusion, but more validations with clients should be executed in order to compare the insights.

(A second session with RTL nieuws, VTBL, Bright and RTL Boulevard was executed the day after handing in this report)

Future research

To conclude, some of the limitations discussed have been translated into topics for future research.

Extent the literature study

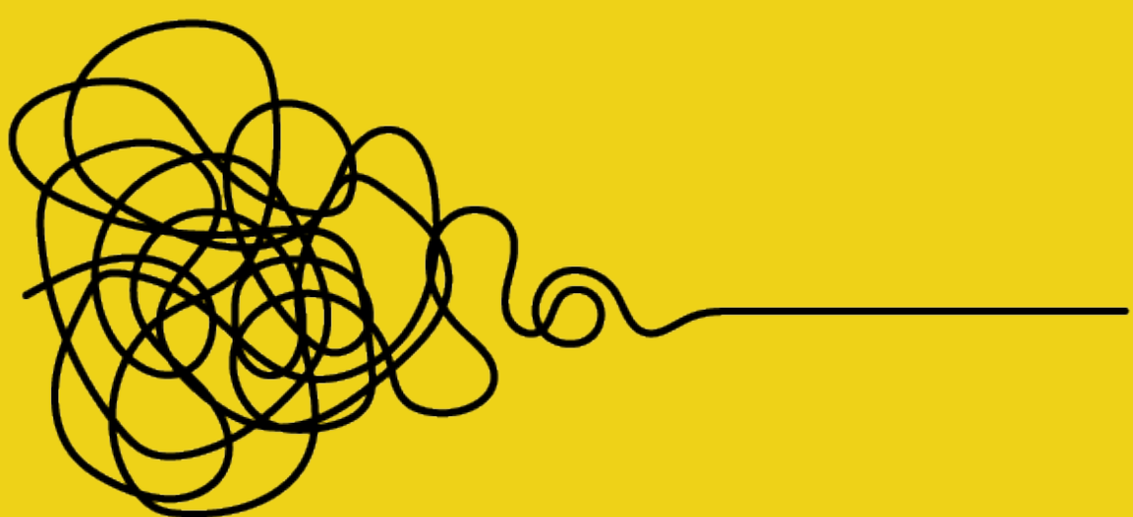
- Create a broader understanding of the state of the art of VUI design.

Further develop the toolkit

- Redesign the canvas and the card deck with the recommendations followed from the workshop performed for KPN (see chapter 6.2)
- Keep on iterating the tools by using them deliberately during client projects

Human centered design approaches

- Discover ways to also apply the human centered design approach within the develop phase of a VUI project.
- Share the humanVUI approach within Valsplat and communicate it outwards. ■



Discovery **Design** **Delivery**

7.3 Personal Reflection

"How I have experienced this half a year lasting roller-coaster."

After six months of hard work, it is time to look back and reflect on my graduation thesis.

In the starting face of this project I already learned that, although I planned out every single detail, things will not turn out the way you imagined. Events that happened beyond my control forced me to find a new chair and company. Fortunately, Gert Pasman and Valsplat offered me the opportunity to restart the graduation based on the intended project brief which I am very grateful of.

I restarted with full enthusiasm and dove into this new world of human computer interaction; voice technology. Becoming an expert on this topic was one of the personal learning objectives, and made me read tons of reports and attend multiple conferences. But I was soon overwhelmed by the continuous updates and shifts in this moving field of design.

Even though I discovered a lot of interesting insights in this research phase, I turned out blind for the results, not being able to connect all the dots.
It turned out to be time for my personal graduation mental breakdown (which is apparently a thing that all graduates undergo in a certain manner).
Valsplat colleagues noticed I wasn't doing oke, and even though I know that empathy is part of your job, it was extremely comforting to feel your compassion and hear your concerns about my well-being.

Anne turned out to be my personal superhero, giving all the mental support needed and more. (In the shape of crying over a good coffee and eating pepernoten) We together made the decision: I should really take a serious break, which forced me to do nothing for a whole month.
This goes against my beliefs and was therefor one of the hardest times ever during both my academic and personal life.

But I wouldn't have learned so much about myself if it wasn't for accepting that sometimes my 'good enough' equals others 'perfection'.
This break provided me with enough strength to pick up graduation again in January. (Setting aside that the boredom was beginning to take its turns ;)

I re-started the project again, this time at my own part-time pace, and as cliche as it sounds: it was a matter of 'Just doing it' and 'Go with the flow.'
As Gert en Femke said during the mid-term meeting, I had made a 180 degrees turn on both a personal as on the project level.

And where Murphys law applied to the beginning of this project, it appeared to have the opposite effect on the final stages of graduation.

I got into contact with Google whom showed their interest into my project and gave me my own Google hub to experiment with.
Valsplat supported me financially to create a slick looking toolkit and gave me the space to better my visualization skills.
Maarten Lenz Fitzgerald proposed to publish my research as a part of the first Dutch VUI book.
My proposal for a VUI workshop was sold as part of a project for KPN online, which I was able to facilitate myself and use as the perfect validation.

But above all, there is only one thing that I am especially grateful of: myself saying: "I am proud of what I have designed."

To all future graduates that read this reflection I would like to share the following insights:
"Graduation is not meant to show how perfect you are at designing. You practice graduation to both encounter and acknowledge your own design skills and pitfalls. And to the perfectionist amongst you: sometimes your 'good enough' equals perfection."

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Human Centered Voice Design

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