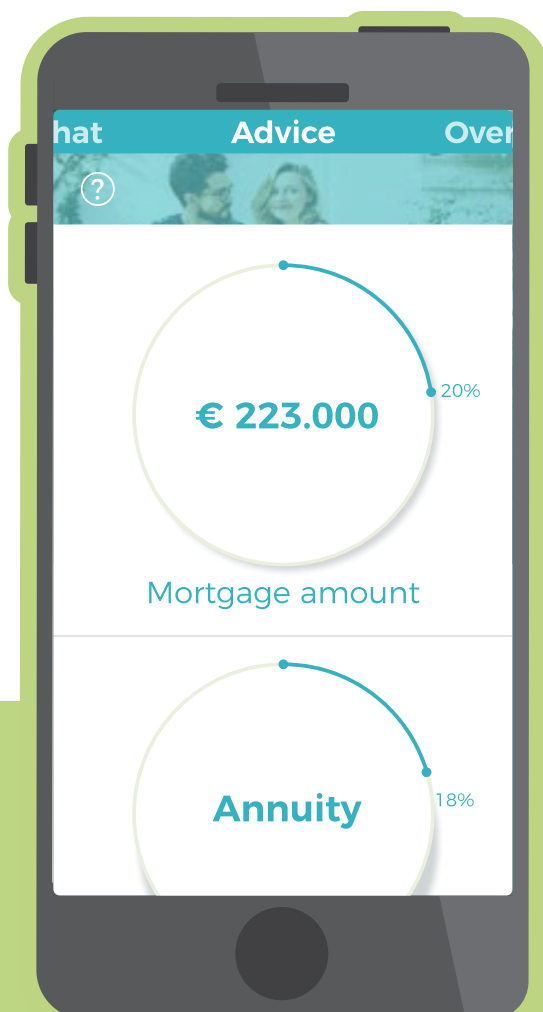# The implementation of Chatbots and Robo-advice in the mortgage market.

Say FINN

Master Thesis
Strategic Product Design
Dennis Boesser

Supervisors TU Delft
Prof. dr. Schoormans, J.P.L
Keller, A.I.

June 2017

hat **Advice** Over

€ 223.000

20%

Mortgage amount

Annuity

18%

Master Thesis

The implementation of Chatbots and Robo-advice in the mortgage market.

Written by
Dennis Boesser (4153146)

To obtain the degree Master of Science
Within the program of Strategic Product Design
At the faculty of Industrial Design Engineering
At Delft University of Technology, The Netherlands

In cooperation with
Yellowtail
Gooimeer 6-01
1411 DD Naarden
+31 (0)35 524 8900
info@yellowtail.nl

Supervisors
Prof. dr. Schoormans, J.P.L (TU Delft)
Keller, A.I. (TU Delft)
Reinders, F. (Yellowtail)
Rogulic, D. (Yellowtail)

June 22th, 2017

Preface

The following report describes the process followed to design a new way of applying for a mortgage. The current process with the use of an adviser proved to be outdated and too expensive for many buyers. One of the newest innovations is the execution only mortgage. It enables consumers to apply for a mortgage without the support of an adviser. The name already commits that it only executes a mortgage, advice is not allowed. Every decision has to come from the users themselves. It turned out that only a extremely small percentage of the first-time buyers dares to apply this way. In financially situations with such a high amount of money involved, consumers become insecure.

This report is divided into two sections. The first section describes the context of the Dutch mortgage market. It includes a quantitative and qualitative user research to map the needs of the consumers. The second part translates these needs into a new concept.

Executive summary

This Master's thesis at the Delft University of Technology is executed in collaboration with Fintech company Yellowtail.

The assignment was to design a new mortgage application process. The current consumer journey proved to be outdated and a shocking mismatch with the new generation of first-time buyers. Especially the high costs and the obligation to consult an adviser made the process almost a burden to buy a house. Before any designs were made, the context is explored.

The chosen approach consisted of a quantitative and qualitative study. The former revealed the lack of financial knowledge, especially of debts. It also showed the insecurity of consumers and a wrong perception of what the advisers do. Many first-time buyers often consult family and friends but these groups did not seem to be the most reliable regarding their knowledge.

In the qualitative study, 5 participants were interviewed who just bought their first house, two of them through an execution only channel. Based on these interviews, the current mortgage application journey is made. Based on the transcripts, 8 codes were identified and placed onto this journey map. The codes were used as needs of the consumer. It exposed which emotions had an effect in which stage of the process. From the qualitative study, two persona's were created. Together they determine the target group of this project. The design brief in combination with a new journey map showed what had to be designed in the second part of the report.

Firstly, a model is made transforming user input into a mortgage advice recommending the best mortgage amount, fixed interest rate and amortization type. Different variables which have an effect on the three advice points are analysed. The model consisted of multiple calculations and boundary conditions. It is an invisible model for the consumer, only the output is shown to them.

Secondly, the front end of the system is created in the interaction design chapter. Several ideas were created and tested with consumers in a small user test. Creating overview proved to be more difficult than expected. Also many consumers still had the need of an adviser. Although this might change within a few years with the rapidly evolving artificial intelligence technology, the concept in this report starts with a small role for the adviser. This person will check the application and guide the consumer to the notary.

Lastly, a chatbot conversation is written. It is presented as an addition to the interaction design. Literature explained several steps to create a convenient and trustworthy chatbot. A small user study is conducted to determine the best tone of voice. The three elements: the model, the interaction design and the chatbot together form the final design. For technical reasons and limited time they are presented independently.

The reports ends with a view on the future and the role of the advisers.

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Part 1

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1. Assignment

1.1. Topic

This graduation project is about robo-advice in the mortgage market. The offer of mortgage products is drastically reduced the last years. In fact, only two types of mortgages are common for first-time buyers: linear and annuity. There are only a few options available for consumers but still they are forced to consult an adviser which costs can run up to three thousand euros. Chatbots seem to be a promising future technology, especially in combination with robo-advice. This report will investigate the opportunities of both technologies in order to design a new mortgage application process.

1.2. Problem

Buying a house is probably the most important decision in someone's life. From financial perspective it can also be a huge risk when the consumer is not informed correctly or mistakes are made during the process of getting a mortgage. Mistakes are not rare, considering the amount of paperwork required in this process. For this reason, Yellowtail is developing "Fintech" solutions in the mortgage, retirement and capital domain. One of their innovations is an application which allows consumers to complete all the paperwork within a few minutes. However, for personal advice the consumer is still redirected to the existing consultants. Yellowtail is highly interested in robo-advice and chatbots capable of providing advice to consumers.

Chatbots can be useful for many purposes such as: shopping, ordering food and navigation. But are consumers willing to chat with a robot about huge financial decisions? What is the best way to implement a chatbot in the financial services for Yellowtail?

1.3. Scope

Robo-advice in the mortgage market is still pretty novel. At the moment of writing this chapter only a few experiments are happening, for example the ABN Amro hypotheken chatbot and Habito (ABN Amro, 2017 & Habito, 2017). Small steps have to be made in the beginning. If a concept proofs to add value for simple cases, it can then be expanded with more functionality in the future. For that reason, there is chosen to focus on first-time buyers. These buyers do not have to sell their own house first, which adds many variables in the system. Besides, this way all mortgage constructions from before 2008 are neglected. These mortgage products are known for their complexity and are not available anymore for first time-buyers. Furthermore, the decision is made to design for childless parents or single buyers (chapter 6 Target group). Not only because it removes a small piece of complexity, but also because it adds a variable to the project: The desire to have children. This is very common with a young couple after buying their first house. An overview can be seen in figure 1.
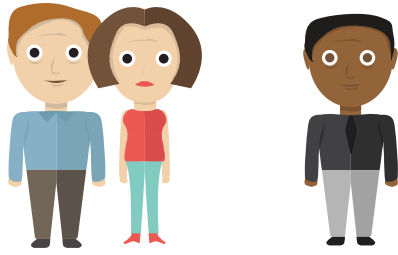
	👫	🧑
Dutch nationality	✓	✓
First-time buyers	✓	✓
Fixed contract	✓	✓
Children	✗	✗
Divorced	✗	✗

figure 1. *An overview of this project's scope.*

Part 1

context

2. Context

2.1. Housing market

From a political perspective, the housing market has always been an interesting topic. Over the past few years, many regulations are removed, added or reinvented. The financial crisis had a huge impact on the housing market and the housing supply experienced some big fluctuations.

But, these changes are perplexing from a consumer perspective. It is not the product itself which makes the mortgage application a complex process, it is the financial hassle around the product. In this chapter, the most important changes in the market are briefly explained including the effect on the housing market. After

that, the social situation is described including social trends. Lastly, upcoming technologies which might have an impact on the current housing market are analysed.

Overstressed market

The offer of houses is limited at the moment, at least if you are looking for a residence near the cities. Especially in Amsterdam the market overstressed (figure 2). One of the explanations is the increase of single households (FD, 2016), moving towards the big cities. House prices are rising rapidly and buyers are forced to bid on a residence without even visiting the location.
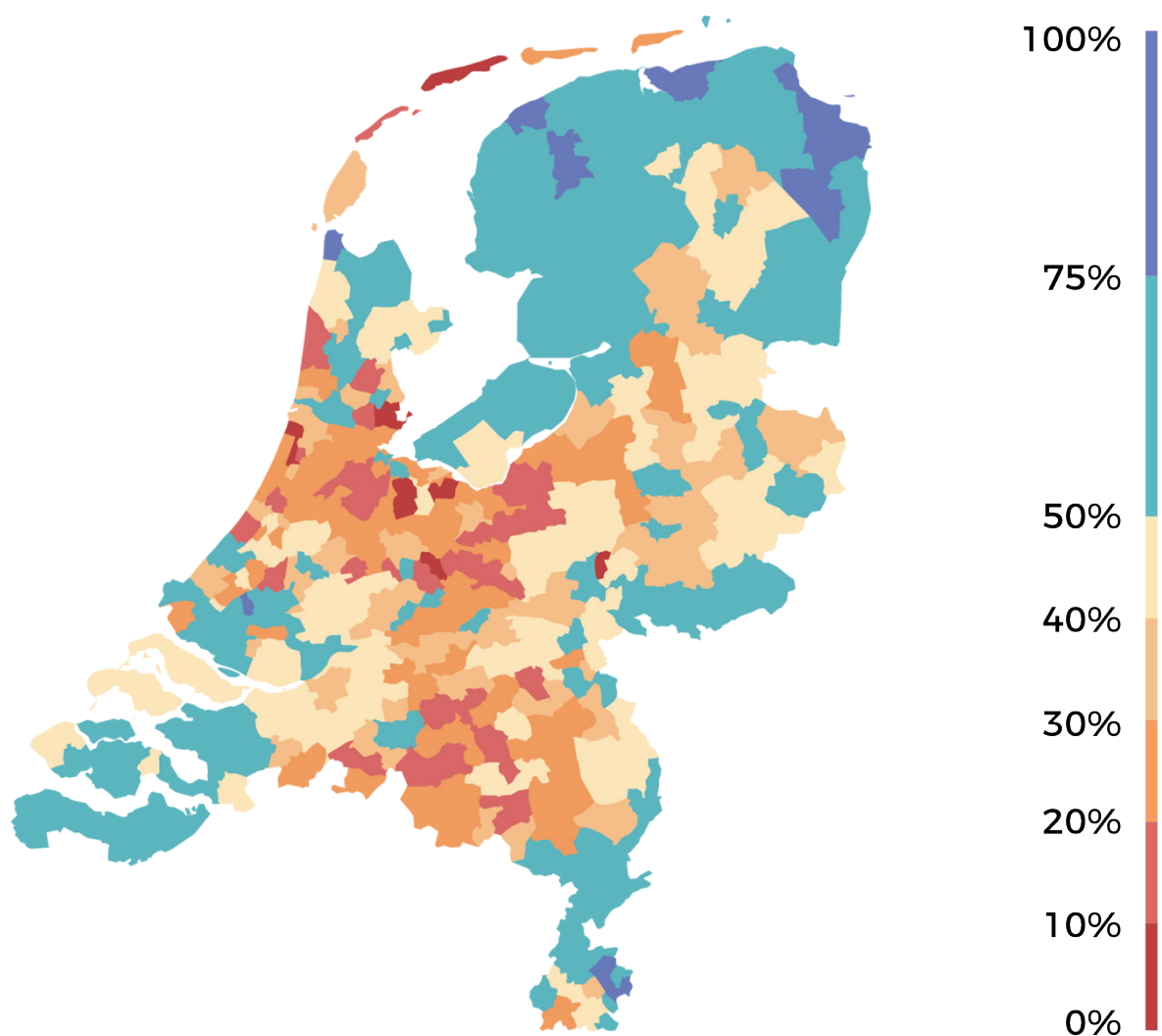
figure 2. *Percentage of houses sold last year for less than € 200.000 (Lab.NOS, 2017).*

Mortgage interest rate (10 years fixed)
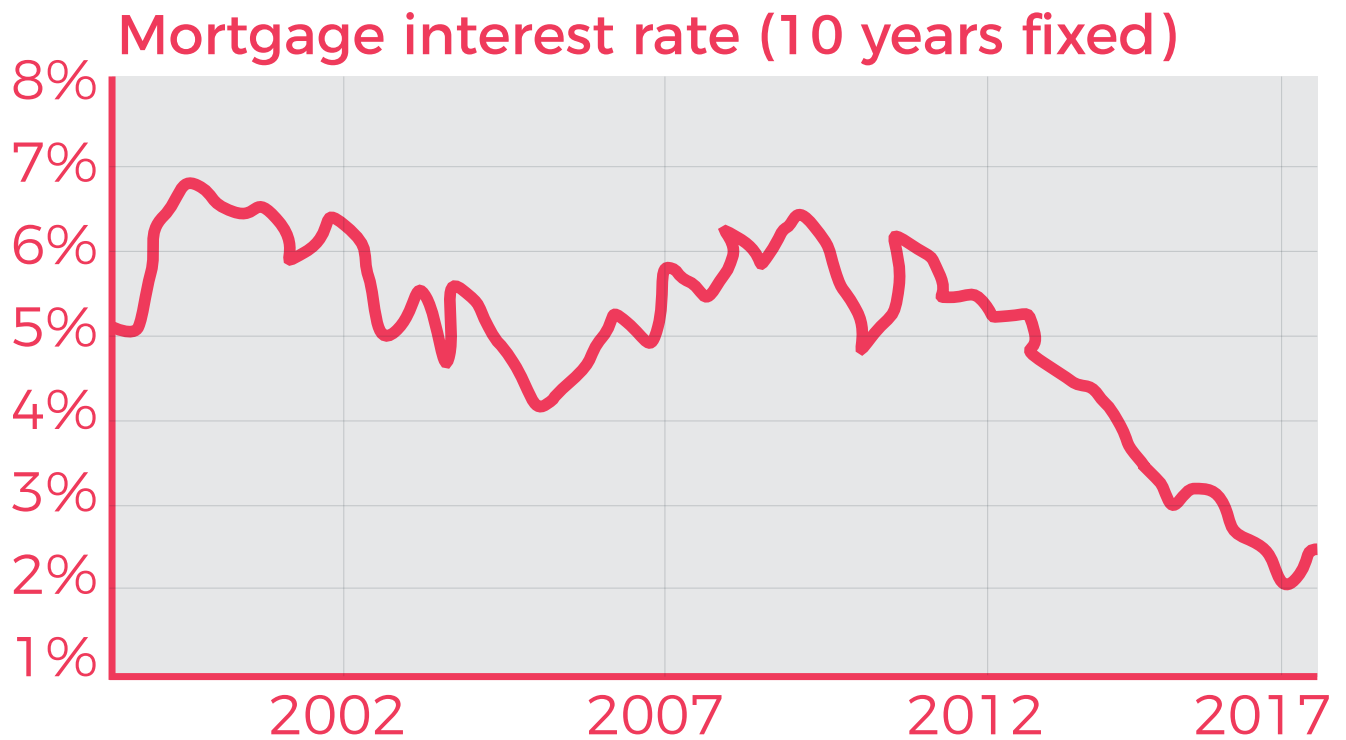
figure 3. *A timeline of the interest rate of mortgages, clearly showing a negative slope. (Adapted from: NN, 2017).*

Fixed interest rate period (2017)
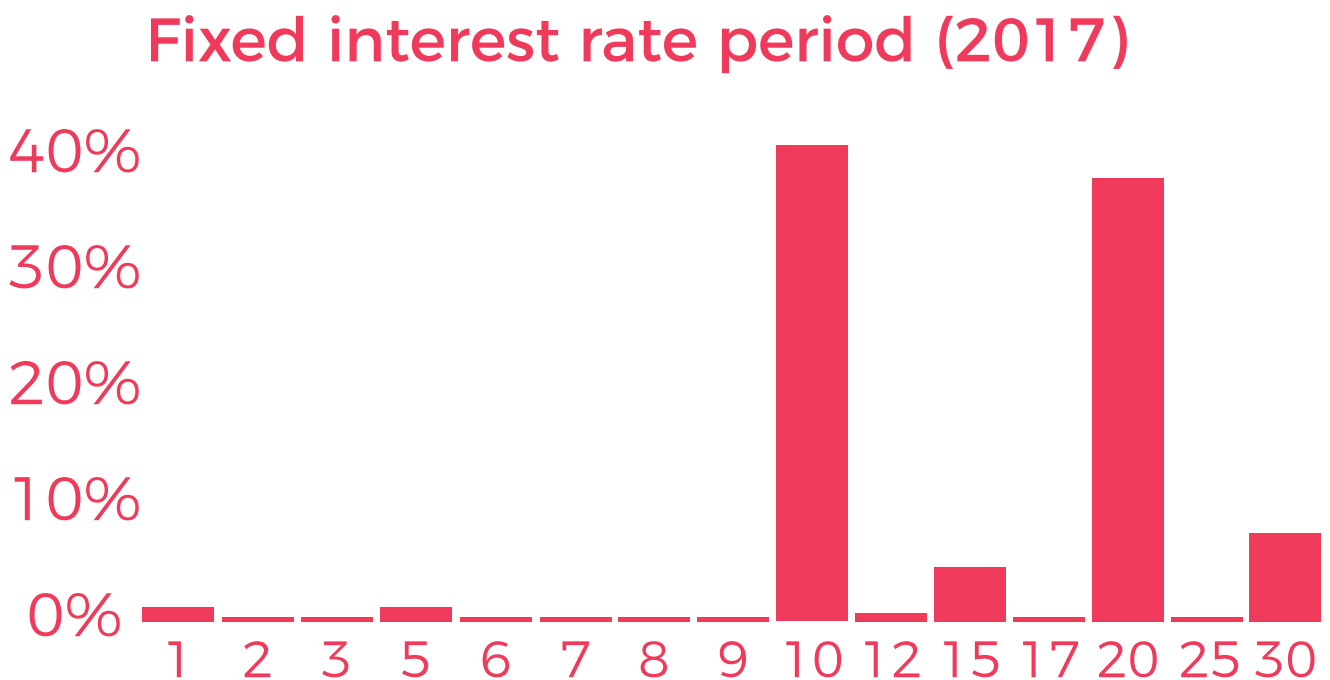
figure 4. *The graph shows most of the buyers (not only first-time buyers) choose a 10 or 20 years fixed interest rate period. (Adapted from: HDN, 2017).*

Low interest rate

In 2017 the mortgage interest rate reached one of the lowest points in history (figure 3). For consumers, this means lower costs for the mortgage. Furthermore, many first-time buyers choose a fixed interest rate period of at least 10 years since they expect the interest rate will not drop to a lower value anymore (figure 4).

Interest deduction

In 1970, to stimulate the housing market, the government decided to subsidize the buyers. By deducting the paid interest from the income, consumers pay less taxes. However, the housing market is not in a bad position anymore, on the contrary, as described earlier the market is even overstressed in some parts of the country. For that reason the deduction is being reduced by a half percent annually. Abolishing this law is recurring theme in political discussions. Many consumers chose an interest only in the past to make optimum use of the interest deduction. However, these consumer did not pay any mortgage resulting in a large debt after 30 years. This way, only two options are available nowadays: annuity amortization and linear amortization. Both are described in more detail in the next part.

Shortage of fundings

With the low interest rate, more people are able to buy a house resulting in a possible shortage of fundings (Kuik, 2016). This means the mortgage brokers have to attract foreign funders, however these funders have difficulties with the high loan-to-value rate of the Dutch Market. For them, the risk is too high when consumers can borrow more than a hundred percent of the value of their residence. The fact that Dutch buyers have one of the lowest rate of default does not change this preconception unfortunately.

Commission ban

One of the biggest changes in the market is the "commission ban" from 2013. Before this day advisers were allowed to receive a fee from the funder. This led to unfair situations for the consumers because advisers just simply recommended the mortgages which resulted in the highest bonus for them. The costs of the adviser was hidden in the total mortgage costs.

Luckily this is forbidden now. There is no financial benefit for the advisers to choose a mortgage funder over another, resulting in an unbiased advice. Nonetheless, advisers are now required to ask a fee directly from the consumer which revealed the extremely high cost.

Partly because of the high cost of the advisers, alternatives are popping up rapidly. "Execution only" (EO) allows consumers to arrange the mortgage themselves with a significant lower price. This is one of the most recent innovations in the mortgage market.

National mortgage warranty (NHG)

If a couple decided to divorce, or one of the partners is fired for example, the Dutch NHG makes sure the debt is more or less insured. Consumers pay a fee of one percent of the total mortgage amount in order to receive this warranty. There are some restrictions: NHG is only possible with mortgages below 245.000 euro. Furthermore, part of the total amount should be insured with a life insurance (Eigenhuis, 2017).

Mortgage credit directive (MCD)

In order to compare mortgages internationally, some European guidelines are made. The MCD for example describes how banks and funders should send their clients an interest offer. Transparency is also a big topic in the guidelines. Mortgage brokers are now obliged to have a transparent fine calculation when consumers want to pay an extra amortization. There are some more changes regarding the property value and NHG but the overall conclusion is that mortgage brokers should take more responsibility, become more transparent and fit to the European guidelines (Eigenhuis, 2017).

Mortgage providers

The amount of providers has increased significantly the last few years. This means more choice for the consumers. However, more choice is not always better. The extreme high offer of mortgage providers makes it harder for decide. Luckily services such as Independer present the best provider for users based on their preferences (Independer, 2017). One of

the pitfalls of these services is that people only look at the lowest interest rate because this automatically means lower monthly payments. What consumers often forget is the conditions of each provider. For example, one provider allows the buyer to bring the mortgage along when moving to another house, other providers charge high fees.

2.2. Mortgage principle

The basis of a mortgage is not difficult: You buy a house with the money you lend from a mortgage broker. To compensate the broker for offering such a generous duty, you pay him some interest each year. However, there are some small things to consider in order to get the best deal. As a buyer, you have the option to choose your the mortgage broker yourself. Each broker has their own interest rate and disclaimer. The latter can include an interest free repayment. Moreover, consumers are able to

or

Alone   Together

Mortgage amount €..................

Annuity **or** Linear

Fixed interest rate period .....

Own money €..................

Refurbishment €..................

NHG **or** not

figure 5. *A simplified overview of the options first-time buyers have when applying for a mortgage.*

fix their interest for a certain amount of years, this way they will have a guaranteed permanent monthly costs. It also possible to finance only part of the house and complement the remaining costs with private money. In reality there are a few more possibilities but regarding the scope of first-time buyers, some rules and options do not apply. Figure 5 shows a simplified overview of the available options for first-time buyers.

Lastly, consumers can decide how they want to pay back the loan. There are only three mortgage products sold to first-time buyers nowadays: The linear, annuity and interest only mortgage. The last one still exist but the amount of buyers is nihill. The reason for this is quite obvious considering the "interest deduction" rule: As long as the mortgage pays off the debt in the end (linear or annuity), the borrower is entitled to receive some money back from the interest paid. This rule does not apply to interest only mortgages and makes this product less favourable. It falls outside of the project scope.
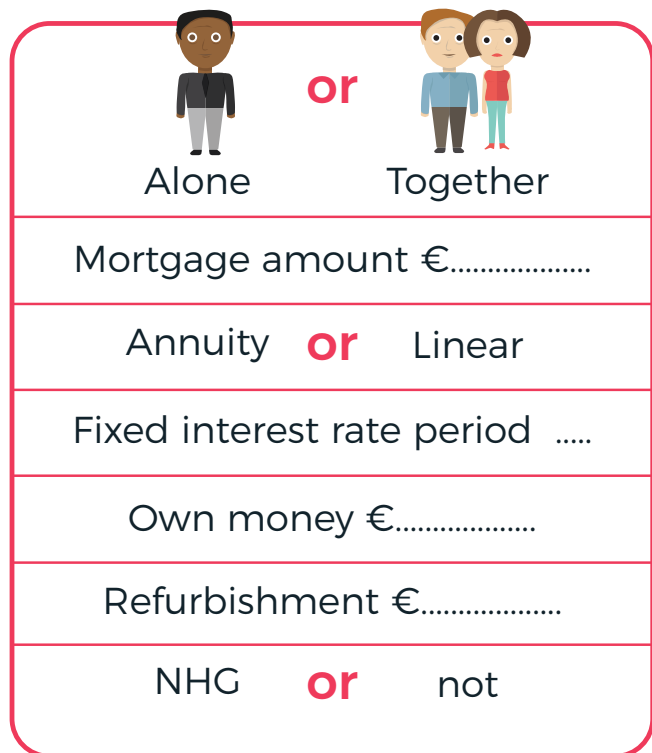
Linear amortization
With this type of amortization, a set amount is repaid each month. Since the total debt decreases each month, the interest, a fixed percentage of the total debt, will also decline slowly. This results in a lower monthly cost over time. However, the costs in the beginning are significantly higher than at the annuity mortgage.

Annuity amortization
in contrast to the linear payment, annuity entails a fixed monthly payment. Costs are built up from interest and repayment again but the balance is much different. In the beginning, consumers almost only pay interest. Over the years this amount will decrease and the actual repayment will increase. Paying a lot of interest also means a high cost deduction. In this case, borrowers pay less in the beginning. Most first-time buyers will experience an increase in salary during their career. For that reason this type of amortization is by far the most chosen product.

2.3. Applying for a mortgage

The mortgage product used to be extremely complex. Applying for a mortgage without adviser was nearly impossible. The highly educated consultant not only gives advice but also guides to client through the whole process. It can be considered as the intermediary of client and bank. As mentioned before, the product offer has decreased drastically and the mortgage types became much easier to understand. Still 97% of the consumers consults an adviser (GFK, 2015). The other 3% feels confident enough to do it alone without any professional help (EO). Through a online website the consumers can fill in their data and a tool calculates the maximum mortgage amount. This amount depends on the income and house value.

There are some approved calculations to determine the maximum mortgage amount. Roughly said, by multiplying the yearly income before taxes with 4.5, the maximum mortgage amount is determined. This is called the Loan to Income (LTI). For example an income of 40.000 euros will result in a mortgage amount of 180.000 euros. However if the house value is less than the LTI, the maximum mortgage amount has a maximum of 101% of the house value. If a house costs 160.000 euros, the same person from the previous example can only borrow 161.600 euros (101% of 160.000).

On the other hand, if the maximum mortgage amount based on the income is 180.000 euros and the house costs 200.000 euros. The buyer can only borrow 180.000 euros, meaning he or she has to find other ways to gain the remaining 20.000 euros. Now the Loan to Value (LTV) rule applies. In short: the lowest value of LTI or LTV is chosen.

Important to know is that the execution only user do not receive any advice. Only information is provided. Although there is some small overlap between these two terms, the difference lies in the personal aspect. Explaining a concept is providing information, telling the client which concept might fit their situation the best is giving advice.

2.4. Conclusion

The mortgage market is complex domain. Not only did many rules change, there are also many rules added to the system. Partly due to the low interest rate the current market is overstressed. There are more people looking for a new home than available houses. However, the mortgage product itself is much easier to understand than a few years ago. The complex mortgage structures are abolished. This is the right moment to introduce a new way of applying for a mortgage. A customer journey which totally fits the new generation of first-time buyers.

3. Technology

Because this project aims at a smart robot solution in the mortgage market, multiple technological trends relevant for this project are described. This way we will not only look at the possibilities of today but also put one foot in the future. Artificial intelligence (AI) is the most important one in this case, mainly because other relevant technological innovations are part of this bigger trend. AI will be explained first, followed by the underlying linked trends.

3.1. Artificial intelligence

Basically, AI is nothing more than a part of computer science. The idea is to create computers which can do intellectual tasks humans normally execute. These systems does not necessarily have to copy human behaviour exactly, as long as it does the task quicker, cheaper or better. Some AI systems have relatively small functionalities. For example Netflix recommends movies and TV shows based on what you have watched earlier (figure 6). It is a computer learning from the consumers' behaviour.

Smart cars on the other hand have much more functionalities and complex algorithms, making them possible to adapt to your driving behaviour. The reason of exposing this difference, is that an AI system does not have to do everything a human can do. Small functionalities like the Netflix example can be a major improvement for user experiences.

When the AI is connected to large databases, certain patterns can be recognised. This is called Machine Learning. The technology is nothing new. In 1959, Samuel already wrote about Machine Learning and highlighted that computers were able to learn without being explicitly programmed (Samuel, 1959). However, in contrast with computer systems from a few years ago, AI is much better at learning from previous activities nowadays. In March 2016, the AI software AlphaGo beat the world champion Go player Lee Sedol which was a huge achievement for the technology (Koch, 2016). A new trend adding even more value to the machine learning innovation is Deep Learning Platforms, in short: "a special type of machine learning consisting
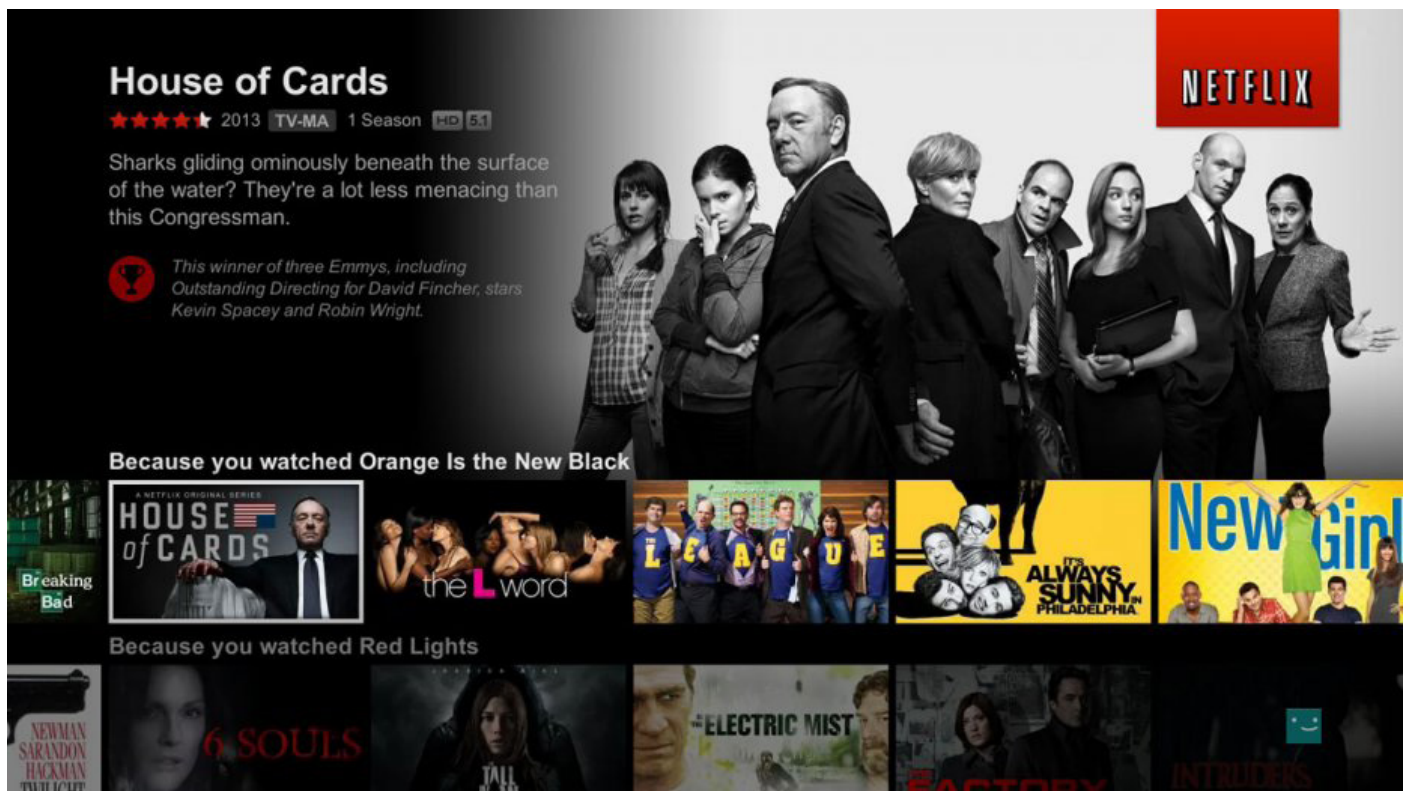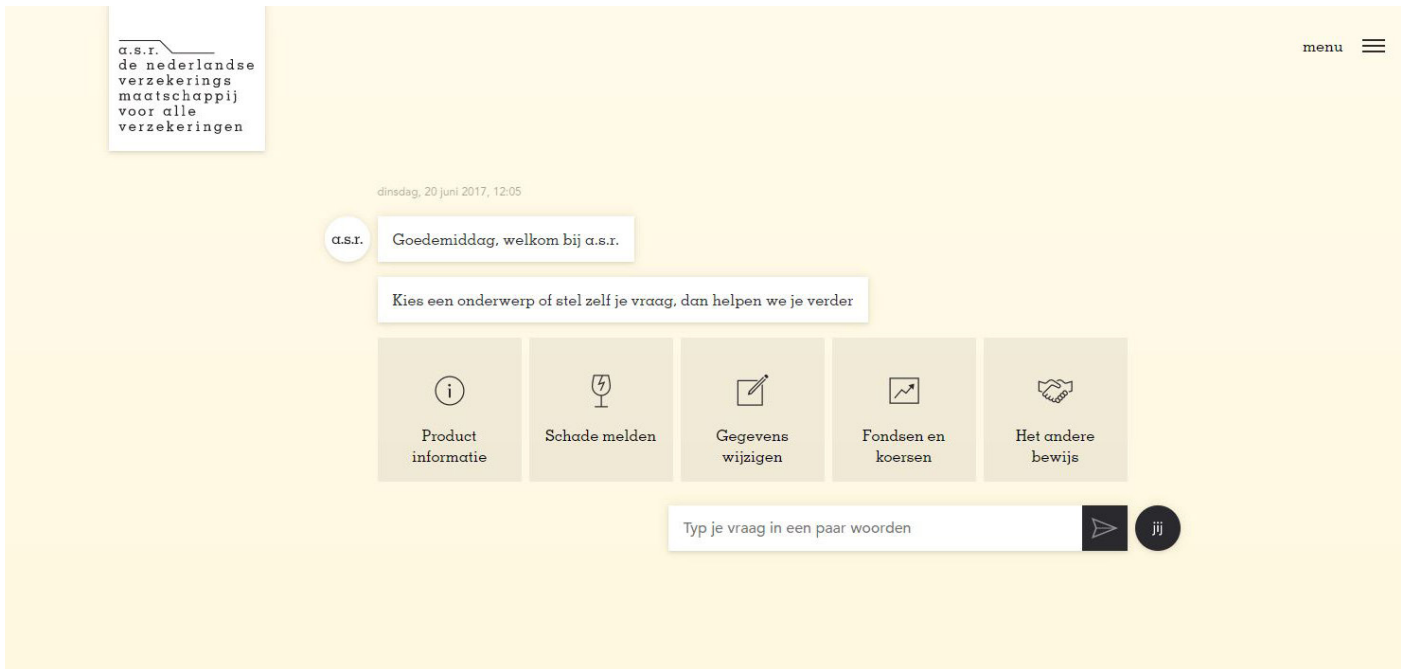

figure 6. *Netflix recommendations ("Because you watched Orange is the New Black"). (N.A., n.d.)*

figure 7. *Dutch insurance company a.s.r. starts a chat dialog on their home screen (ASR, 2017).*

of artificial neural networks with multiple abstraction layers. Currently primarily used in pattern recognition and classification applications supported by very large data sets" (Press, 2017). Weather forecasting is a great example of this: "fluid dynamics are matched with neural networks and other genetic algorithm approaches to detect cyclone activity" (Hemsoth, 2016).

Using the previous described technologies gives the ability to understand users much better. By tracking their behaviour and creating certain patterns, computers can learn from user experiences. It is not surprising that the trend of robo-advice came shortly after. If data and patterns are obtained from the user, this data can be used to give consumers more acumen about their own behaviour. Robo-advice is achieving a lot of attention by big financial institutions and the demand for smart solutions is increasing rapidly (e.g., Schyns 2016; Ludden, Thompson and Mohsin 2015).

Robo-advice is currently much bigger in wealth management than mortgage application. However, the popularity of the latter is increasing recently but a complete solution for mortgage advice by a robot is still not on the Dutch market.
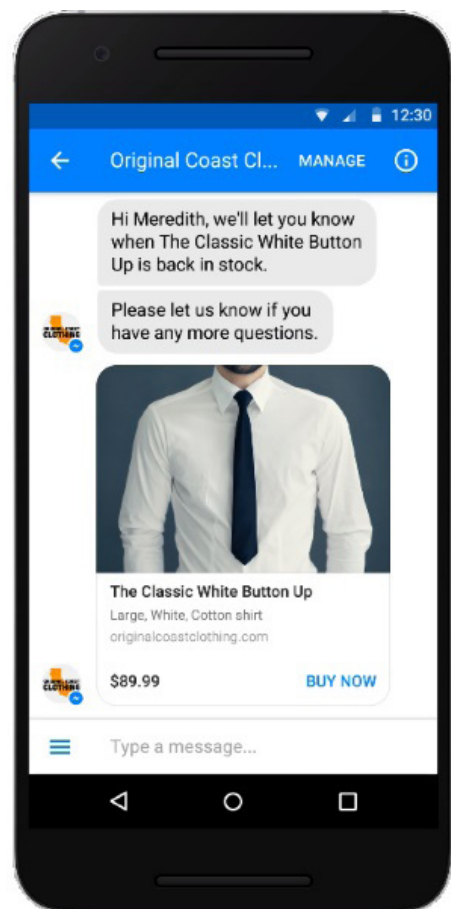
figure 8. *A clothing chatbot (NDTV gadget, 2017).*

18

figure 9. *Amazons' Echos, which is controlled by speech ("Amazons' Echos", n,d).*

The United Kingdom is one step ahead with the first digital mortgage broker Habito (Habito, 2017). Through chatting consumers can arrange the mortgage themselves and even receive some recommendations based on their income for example. This type of communicating with companies is rather new. The Conversational interface is developing in a fast pace and enables consumers to ask their question directly without going through all the menus (figure 7).

In the example of a.s.r., consumers are not talking to a real person but a scripted robot. Chatbots exist for many years already. However, it seems their potential is growing exponentially the last few years. Especially with new platforms such as Facebook Messenger, Kik and Slack. These services are filled with Chatbots helping consumers to find the right clothing items, place to eat or health tracking (figure 8).

Natural Language Processing (NLP) might improve the experience of Chatbots. NLP enables computers to better understand the human language and therefore decrease the frustration when the bot can not figure out what a user means.

One of the latest trends builds on the conversational interface movement is the Audio User Interface (AUI). Amazon Echos is one of the examples of navigating through speech (figure 9).

Whether voice or conversational interfaces will be win the battle of most used communication tool is a difficult questions. One thing is for sure, the traditional graphical interface will have some serious competition.

4. Quantitative research

4.1. Literature study

The Dutch mortgage market has changed significantly over the past years (see chapter 2). In this chapter, the perception of the market from the consumer perspective is described. Firstly, an exploration is made to gain insight in the knowledge of consumers. What do people know about mortgages and debts? How much trust do they have in their own knowledge? Furthermore the used sources for information and satisfaction with advisers are analysed. Finally, it might be relevant to see if consumers are worried about their future regarding their mortgage.

The first question that should be answered, is how are we going to measure someone's knowledge about mortgages? The financial knowledge of consumers is measured many times in the past (e.g., Lusardi, Mitchel & Curto 2010; Huston 2010; Lusardi & Mitchel 2011). Literature often refers to it as financial literacy and it is measured by conducting a small test with a participant. This participant will receive three multiple choice questions about financial situations. The test proved to be an accurate indication of financial knowledge. However, according to van Ooijen and van Rooij (2016), the debt literacy gives a much more accurate estimation of one's mortgage knowledge. Similar to the financial literacy test, the debt literacy test provides three multiple choice questions. To give an example of one of the questions:

"Suppose you take out a EUR 1,000 personal loan from a bank and the interest rate you are charged is 20% per year compounded annually. If you did not pay anything off, at this interest rate, how many years would it take for the amount you owe to double? (i) 2 years, (ii) less than 5 years , (iii) 5 to 10 years, (iv) more than 10 years or (v) do not know." (van Ooijen & van Rooij 2016).

"Less than 5 years" is the correct answer in this case. Although it seems like an obvious question for some, many participants had difficulties answering this question correctly.

The same article concluded that consumers have a low debt literacy, implying that mortgages are complex products. Besides, the younger generation proved to have less confidence in applying for a mortgage themselves. An explanation for this could be the fact that the do not have any experience with mortgages yet. Lusardi (2008), showed the relation between debt literacy and sources used. People with a lower debt literacy tend to consult family and friends much more often (40.7%) than the consumers with a higher debt literacy (17.9%). Considering family and friends are not experts regarding mortgages, this could lead to serious financial troubles.

A research done by the Stichting Erkend Hypotheekadviseur (SEH) in 2011, showed the perception of consumers about advisers. It is striking that most people have no clue about the activities of an adviser. Furthermore, these consumers significantly underestimate the time needed by an adviser for a mortgage application. Consumer think first-time buyers are most time consuming to deal with. In reality these cases are much easier than people moving to their second or even third house. Also the acceptable amount of spending for an adviser is around six hundred euro according to the consumers. In fact, the costs can easily reach up to four thousand euro.

According to the platform Kop-Munt (2016), adviser also acknowledge the lack of understanding consumers have. Half of the advisers admitted to have difficulties explaining their clients a mortgage application is a time consuming activity. Furthermore, almost all advisers agree that this process should be quicker and optimized for a better experience.

Finally, there is evidence that more than 25% of the homeowners consider their mortgage somewhat risky (Ooijen and Rooij 2016). Only one third of the homeowners strongly believe they can pay off their debts no matter the circumstances. These numbers clearly show the insecurity of Dutch consumers regarding their mortgage.

A summary of all results is shown is a Dutch infographic in appendix A. Based on the problems addressed, six challenges are made. Each of them will be described briefly.

The consumers should be better informed about the risks of loans.

Loans are complicated products apparently. There is a problematic lack of financial and debt knowledge and consumer tend to be overconfident about their own knowledge.

The mortgage application process should be more fun for first time buyers.

The young generation is the least confident to apply for a mortgage themselves. Buying a house should be an emotional experience full of joy.

The consumer must know where to find the right information.

Family and friend proved to be an unreliable source of data in some cases. Some consumers should consult the adviser immediately while others might do a internet research first. This is fine as long as the consumers are guided to the right sources.

The consumers should have a better perception of what the advisers does.

Both parties benefit from a clear view on what the adviser can mean for a client. It also explains the needed costs for an advisor better.

The mortgage application process should be much more efficient.

Even the intermediary agrees this process should be improved. It takes too much time resulting in an unpleasant journey for the consumer.

The consumers should be better guided after the application.

Consumers proved to be insecure about their mortgage. They do not know what a possible change in interest or income can mean to their debt payments.

4.2. Conclusion

Literature about the Dutch housing market showed some serious issues. The lack of knowledge about debts in combination with the complex loan products makes this a tricky market. Consumers use many sources of information of which some are unreliable. They have little knowledge about what their adviser can do and what it costs, which is emphasized by the advisers themselves. A significant amount of homeowners are insecure about their future payments. The six challenges will be supplemented or confirmed by the user interviews in the next chapter.
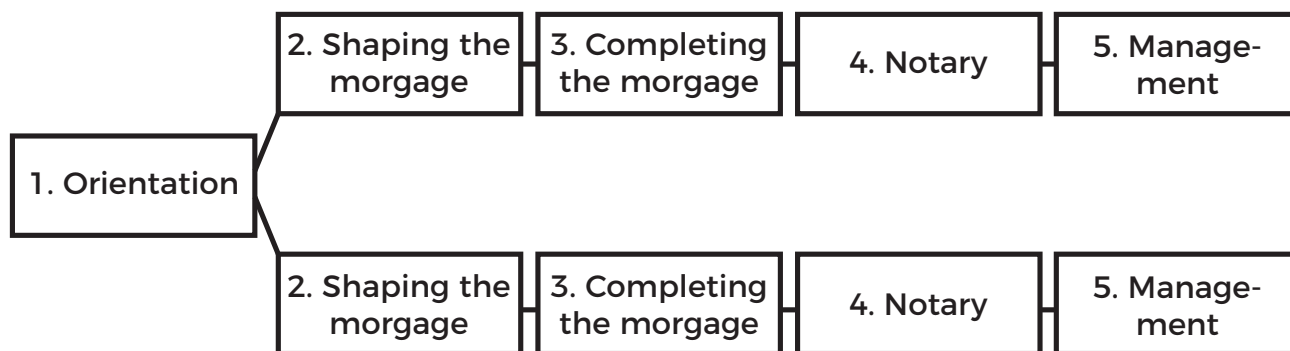
figure 10. *A simplified version of the different steps in the mortgage application process for interview purposes.*

5. Qualitative research

5.1. User study

In order to get a deeper insight into the current user experience in the mortgage market, qualitative interviews were conducted. This research will focus on first-time buyers who recently successfully applied for a mortgage. Consumers who used the traditional method, with the help of an adviser, and consumers setting up the mortgage themselves are both interviewed. Differences between these groups might be relevant. For that reason a standardized open-ended interview is used (Patton, 2002). Having a predefined list of questions makes it more convenient to compare results. However, the questions between both group are slightly different.

The results will be put next to the literature outcomes to create input for the ideation phase.

5.2. Research questions

One of the challenges is to reach a natural flow of conversation. By emerging the interviewee into the context, he or she is better able to explain the experience. Therefore the decision is made to follow the brief steps when applying for a mortgage. This process can be found in the schematic overview of figure 10.

1. Orientation
The orientation usually starts quite early. From the moment someone is dreaming about buying a house, this phase is started. Consumers often roughly estimate how much they can borrow and which type of house they can buy. In this step people decide whether they have enough knowledge to apply for the mortgage themselves, or if the need a professional adviser. Often the latter is chosen.

2. Shaping the mortgage
Designing the construction of the mortgage is probably the most important step. Some choices consumers can make in this process include: defining the duration of the mortgage, the interest rate, fixed or variable rate and the type of mortgage (annuity or linear). The difference between consumers consulting an adviser and consumers without professional advice is that the former receives advice from the consultant and the latter has to decide everything himself. Uncertainty about certain decisions might play a major role in the total experience of this consumer. Therefore the focus of the interview will be on this part.

3. Completing the mortgage
When the consumer has decided the exact details of his mortgage, documents such as the employer's declaration and evaluation report of the new house should be submitted. This can be complex and time consuming process for consumers.

4. Notary
Finally, when the construction of the mortgage is finished, the notary has to approve it. This service is relatively expensive with costs easily running up to a thousand euros. Consumers also have to arrange one or more appointments with the notary themselves.

5. Management
A mortgage is often running for several years. A duration of 30 years is very common. This means that many things can happen in between. For example the house prices can increase or decrease drastically. Interest rates can fluctuate. But also changes in the life of the mortgage applicant can occur. There are many reasons why consumers can have questions or insecurities regarding their mortgage payment. However, because the interviewees just recently bought a house, they do not have much experience in this phase.

The actual questions of the interview (in Dutch) can be found in appendix B.

5.3. Approach

Participants

For the scope of this project, only first time buyers are involved. Because the amount of consumers taking the execution only route is still incredibly small, only 2 interviews were conducted for this target group. The traditional application is much more popular yet which makes it easier to find participants. For this target group 3 interviews were conducted. One the criteria points is that the applicant has successfully applied for a mortgage not more than 3 years ago. Partly because participants might forgot too much details about their mortgage, but also because most of the mortgage types were abolished after 2008.

Procedure

The interviews were planned at the office of Yellowtail, at the participant's workplace or with Skype. In order to make the interview more convenient for the consumers, the conversation was held in Dutch. This means the quotes are translated for the purpose of this report. Small changes in tone of voice or emotion is inevitable.

Data recording

The sound was recorded with permission of the interviewees. Notes were taken to bring up topics again during the interview.

Data processing

For time saving reasons, a slightly different approach of transcribing is used. During the interview, many parts are not transcript worthy. For example the introduction, repetition, indecision, and waffle by the interviewee. Therefore only the in-depth interaction is transcribed. This is called "live coding" (List, 2007) and starts with playing the audio fragment from beginning to end. When an interesting part appears, the researcher then marks the exact time on paper. These marked parts are then transcribed, resulting in a transcript of only in-depth answers.

An example of a Dutch transcript can be found in appendix C.

5.4. Results

Codes are allocated to citations in the transcripts. For example, when a participant mentions that he want his adviser to check if he did everything correctly, this sentence receives the code: Confirmation. This participant is looking for confirmation apparently.

"I do not want to make mistakes, because you are attached to the loan forever. It is nice that my adviser can check everything I do." - Participant E.

A total of eight codes were used: Self research, support, protection, confirmation, flexibility, trust, clarity and overview (figure 11). If a participant likes the way it is going, for example when he or she feels protected against the bank, this code of protection will turn green. But, when a negative experience occurs, for example the lack of protection, the code will turn red.

Self research   **Support**

Protection   **Confirmation**

Flexibility   **Trust**

Clarity   **Overview**

figure 11. *The 8 different codes.*

5.5. Journey map

The schematic overview of the mortgage appliance is already shown earlier in figure 10. Yet, creating the journey map is an iterative process and it is expanded with rich content after the interviews (figure 12). This map explains the steps in much more detail than the schematic overview. Furthermore, it contains all the codes subtracted from the transcripts.

Plotting these positive and negative codes on the journey map creates an overview of what the consumer really needs at a certain moment in the process and whether this need is fulfilled already in the current progress.

The results of the interviews will be explained according to the order of this journey map. After that, other insights apart from the journey will be discussed.

Orientation

The orientation phase is, after the dreaming phase, most probably the longest period for consumers in the total process. According to the GFK Market research institution, this can take up to 6 months for 82% of the first-time buyers (GFK, 2015). During this period, people don't need much help from a professional. They want to explore on their own. However some help is appreciated in the form of calculating tools.

"I've visited many websites like Hypotheekaanbod and Eyeopen to determine the height of the mortgage loan according to my salary. I also knew some guys who explained to me that I have to sign up for newsletters from brokers. Because they will propose residents which are not on Funda yet. So that's what I did, I signed up for ten newsletters but in the end I found my house at Funda."
- Participant C

One other participant explained he immediately approached his adviser to calculate his maximum loan amount. Due to a lack of self-confidence this person felt the need to search for assistance immediately.

Searching residence

Searching for a residence is most often the fun part of the journey. Funda is used by all participants.

"I've checked Fundag every morning. Every time I woke up I refreshed the page." - Participant D

The experience with brokers is rather negative, participant E stated that these brokers cannot be trusted at all.

With or without adviser

At a certain point, consumers have to decide whether they want an adviser or not. Some mortgage lenders insist their clients to use an adviser. The two execution only consumer from the interview both consciously chose to apply for the mortgage without any professional help. One of other interviewees did not even know it was possible to do it on your own. This is very common, many consumers are not even aware that they have a choice. Overall the adviser is considered as trustworthy, helpful, protective and in control.

"It feels good that someone you can trust stands up for your interests." - Participant D

The consumers who arranged their mortgage without any help believe it is basic to apply for a mortgage. They do not see the point of paying an adviser to do stuff they can also do themselves. According to them, everything can be found on the internet.

"I don't have any children or complex situation. Why would I pay someone if I can also do a research myself" - Participant C

Obtain information

One of the surprises is that apparently consumers consult discussion websites like the forum Tweakers. People can easily ask the public and discuss their personal situation online. The difference with informational websites like the bank, is that a forum contains some form of humanity. Real people discuss about a real problem instead of a one-way traffic of information.

In general, the participants are fairly satisfied with their adviser. They felt they were taken seriously and supported. The advisers really showed interest and tried to think along with the customer. Furthermore, consumers admitted it was nice to relinquish tasks to their intermediary.

Shaping the mortgage
When shaping the mortgage, these execution only clients experienced some insecurity whether their knowledge was sufficient enough. It is mandatory for execution only consumers to pass a debt test. This test varies a bit for each mortgage lender. According to one participant the test was fairly difficult.

Determining factors like: Interest period, choice of mortgage lender and mortgage variant (linear, annuity) proved to be not so difficult. According to the EO consumers, the is only a limited amount of options. Other interviewees agreed and admitted this process was not tensive at all. As described in the housing market chapter, many rules are removed nowadays, making the process less complicated.

"Actually it is not that scary regarding choices. There are not many options." - Participant A

Still, the EO consumers were not completely confident about making choices, they were afraid of making mistakes and missing some crucial information.

"Ok, now I am really going to sign at BijBouwe, am I missing something?" - Participant B

Sharing documents
One of the most tedious tasks turned out to be the document sharing part. In this phase consumers have to deliver many documents like a paycheck, employers statement, property valuation and identification. It appeared that consumers have no clue at all which documents are approved and which one still needs to be handed in. Sending sensitive information by mail to the adviser felt unpleasant.

"There was no cybersecurity. It felt a bit weird." - Participant A

Some interviewees admitted they experienced time pressure and had no overview during this process. In contrast, EO clients did not face this problem because they could easily see which document was handed in, checked and approved in a secure environment. A synopsis the adviser was not able to provide.

Passing notary
Lastly, consumers visit the notary. The actual visitation and approval of the mortgage was not so exciting according to the participants. However, overview regarding costs and progress was again lacking. One participant had to call the notary to check if every document was approved because he felt like the mortgage was slipping through his fingers. His initial notary appeared to quit his job after the first meeting without him being noticed.

"...Until i called and asked: is this still going in the right direction?" - Participant C

Almost all participants were surprised about the cost of the notary, apparently this is not communicated sufficiently by the adviser or website.
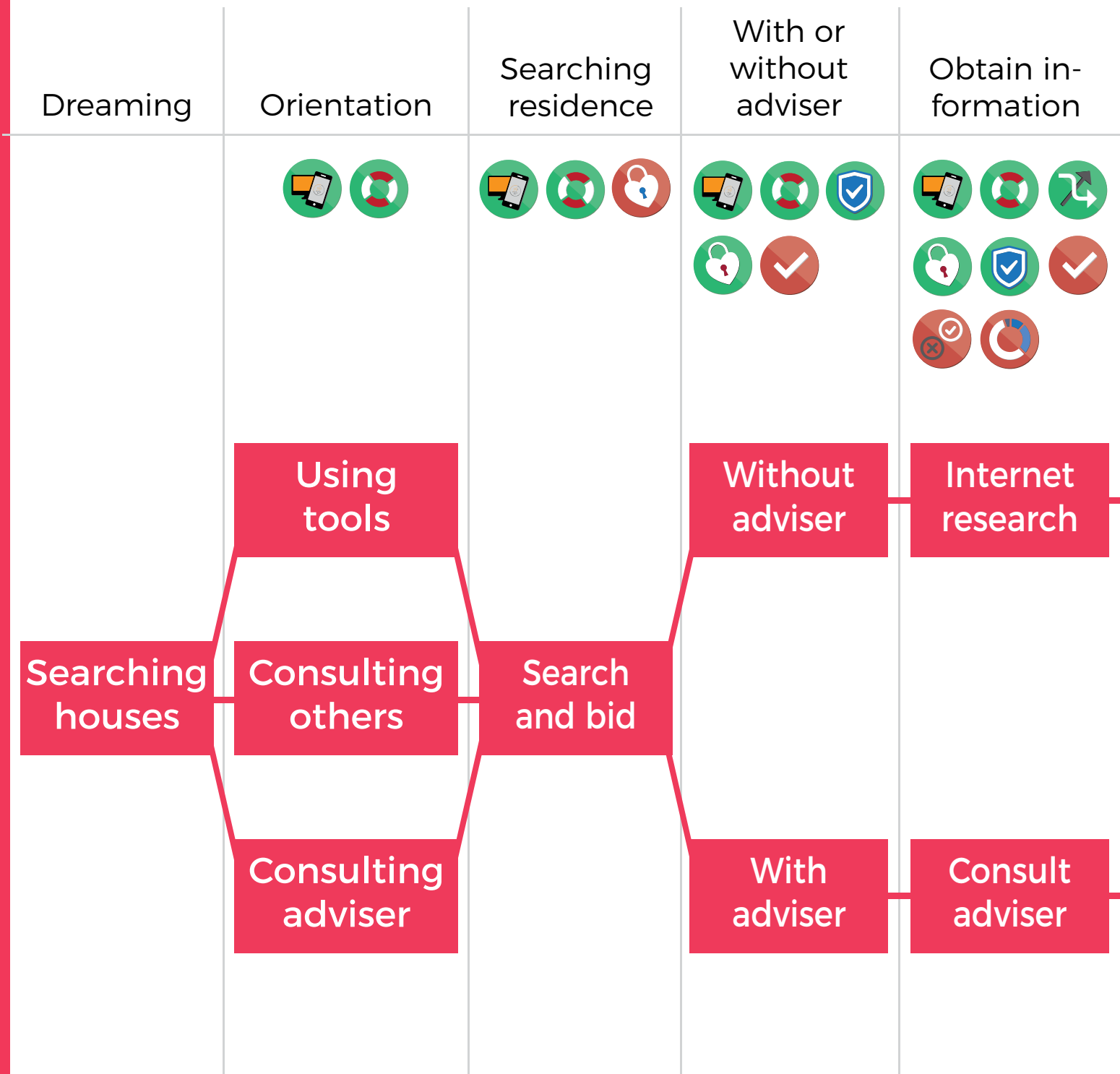
Paying
In the end, most interviewees described their mortgage as just a monthly payment. A few were concerned about a possible decrease in house prices. The first payment appears to be higher than the expected mortgage. Because the mortgage lender frequently adds the costs of the life insurance to the first month, the total costs are significantly higher once only. Both EO and consumers with adviser were not aware of this.

Other results
Apart from the journeymap, consumers prefer to consult someone who is familiar with their process and thinks along. Some kind of humanity is favoured during the first meeting. Also one client mentioned it felt strange to enter such a big commitment with the bank, without meeting a real person from this organisation. Furthermore, there was a strong demand for a checklist or roadmap.
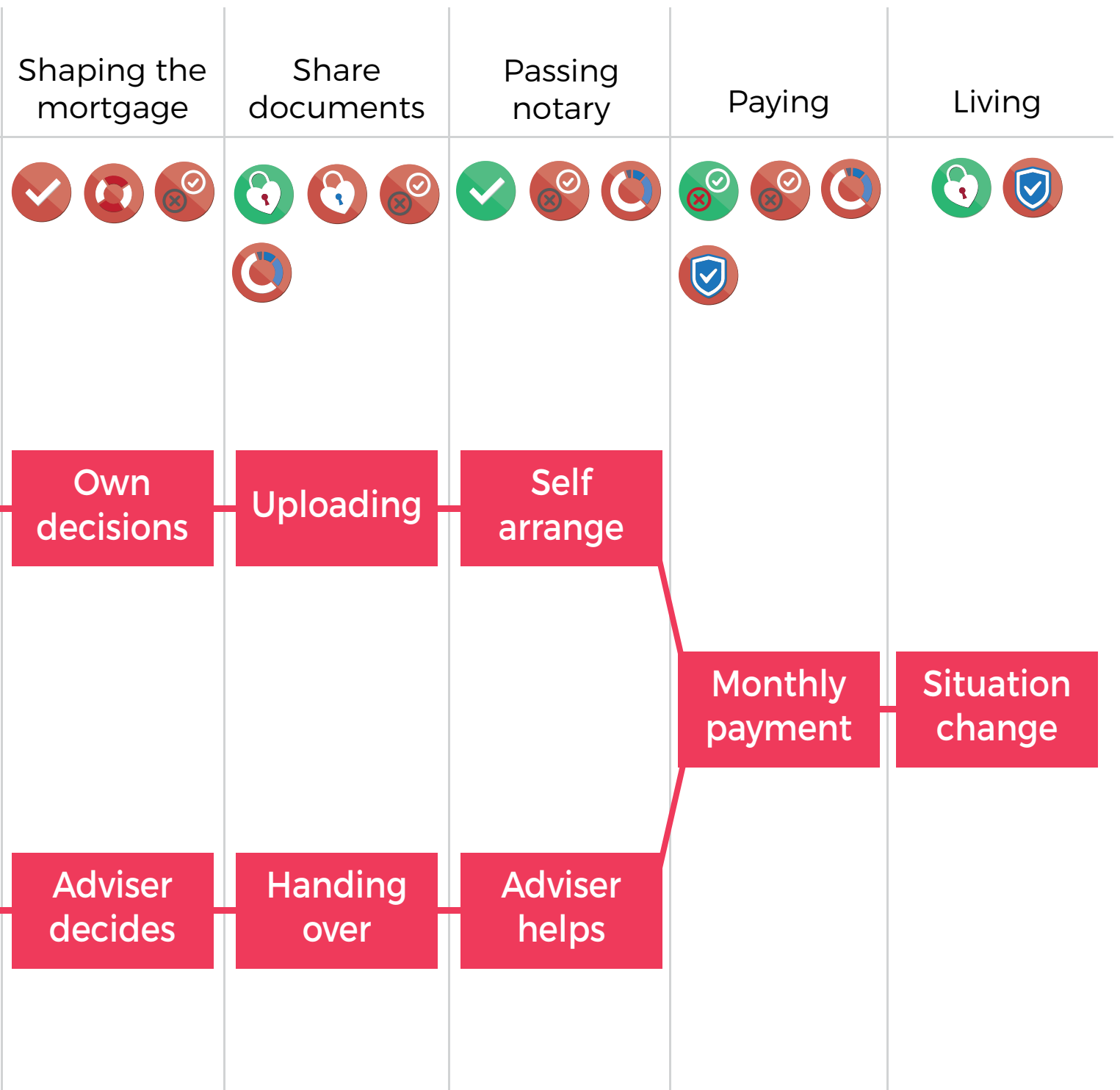
The needs of the consumers during the r

Dreaming	Orientation	Searching residence	With or without adviser	Obtain in-formation

Searching houses

Using tools

Consulting others

Consulting adviser

Search and bid

Without adviser

With adviser

Internet research

Consult adviser

mortgage application

Shaping the mortgage	Share documents	Passing notary	Paying	Living

Own decisions	Uploading	Self arrange		
			Monthly payment	Situation change
Adviser decides	Handing over	Adviser helps		

figure 12. *The journey map with codes plotted.*

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5.6. Conclusion

The journey map summarises the results of the qualitative research. It shows the needs of the consumers at different moments in the journey. There is a reason for not splitting the codes in the two paths (with and without adviser) in the journey map (figure 12). The most important differences between these groups are already discussed. Furthermore, all codes are important for the ideation phase. For example, when a need like protection is lacking in the traditional path (without adviser), consumers will probably have the same need for EO. Another example is when consumers like that their adviser is flexible, this need of flexibility will very likely also be present in the EO path. Another important reason is that when the codes are divided, the comparison is not valid since both groups have a different amount of participants.

Insecurity proved to be a significant barrier during the whole process. Although the mortgage options are limited nowadays, participants have difficulties making decisions. There is always that fear of not making the best choice, especially with participants who chose to do everything by themselves. Having a cloud environment to share documents is a huge benefit from the EO process compared to the traditional path, mainly for overview reasons. When consumers do not know at which step they are in the process, and even de process in unclear, they feel lost and insecure.

The insights from the qualitative research will be used to create personas. The eight codes will give guidelines which needs should be fulfilled during the ideation phase.

6. Target group

It appeared, not unexpectedly, that every consumer is different. According to one of the interviews, the adviser was the most important player in the mortgage process. The interviewee could not have done it without the adviser he claims. People like this will probably the last group to adopt robo-advice. Other interviewee acknowledge the importance of their adviser but seem much more open to innovative products. Consumers who followed the execution only path showed the most interest in a new mortgage process. However, this last group showed some serious doubt during the application. Especially the last two groups would benefit of robo-advice the most in the short-term.

6.1. Personas

Based on the participants from the interview, two fictive households are created. There are big differences between both households regarding future goals, personality and financial knowledge. Both households are relatively young (around their thirties) and are used to digital products such as smartphones and tablets. They both fit the scope of the project and together include a wide variety of needs.

Reason of buying a house
There are multiple reasons for a young person to buy a house. He or she may feels the need of having an own garden or garage for example. Or a couple needs a place of their own. According to the interviews in chapter 5, many participants said renting was simply too expensive, forcing them to buy something. They needed a new place for one of the aforementioned reasons and calculated the difference between renting and buying. Since buying results in a property and renting does not, they applied for a mortgage.

Household 1
The first household consist of one single male. Carlos has a good-paying job and likes to buy a small apartment near his work. As mentioned before, renting was too expensive for him. Figure 13 shows all the details of Carlos.

Carlos Koopmans

Age 27
Status Single
Children None

"My apartment in Amsterdam is getting too expensive."
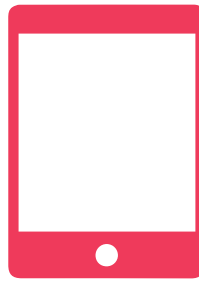
- Carlos

He likes...

- City trips with friends
- Two vacations a year

Frustrations...

- Unorganised websites
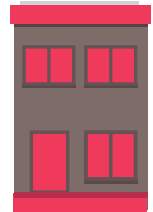- Sending many emails
- Traffic jam

Tablet   Smartphone   Smartwatch

Looking for...

What Apartment
Where Amstelveen
Budget € 180.000

Clever
Rational thinker
Introvert
Proactive

Education

Business Administration

Job

Associate transaction services
Income € 39.000 a year

Goals...

- Making promotion
- Improving own talent

Debt literacy

High (3/3)

figure 13. *Persona Carlos.*

Ramon & Anna Wagenaar
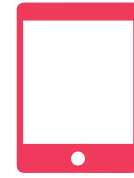
Desktop PC | Tablet | Smartphone

Looking for...

What	House
Where	Zwolle
Budget	€ 210.000
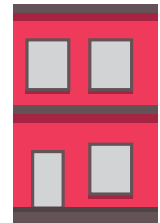
Ramon 27	Anna 31
Intuitive and practical	Patient and organized

Low (1/3)	**Debt literacy**	Low (0/3)
Vocational Education	**Education**	Art college
Security employee	**Job**	Music teacher
€ 23.500 a year	**Income**	€ 20.500 a year

Goals...

Becoming a dad

Becoming a mom

He likes...
- Formula 1
- His vegetable garden

She likes...
- Playing the piano
- Teaching others

Frustrations...
- Political decisions in favor of the elite
- Financial administration
- Not trusting the bank and other big financial institutions
- Wasting money
- Complicated buying experiences

figure 14. *Persona Ramon and Anna.*

Household 2a

The second household is a couple. Ramon and Anna are looking for a first-time buyers house. Ramon will most probably take the initiative in the mortgage process. Having a small family is one the most important goals of this couple (figure 14).

These two households together represent the target group of the project.

6.2. Conclusion

The idea of the personas is to create two households which will represent as many first-time buyers in the Dutch housing market as possible. They are based on real consumers from the interview and both households are significantly different. If an idea or concept fits both personas, the assumptions is made it will fit the target group. Confirmation will later be given through user testing in chapter 10.5.

7. Design brief

The housing market has changed significantly after the crisis. From an abundance of empty residences it has transformed into a overstressed market. Especially in cities like Amsterdam where people are pushed so hard that the often do not even have the chance to visit the house before buying it. The mortgage process is a slow journey of insecurity and indistinctness including time pressure.

This is supported by the literature which proved consumer have a lack of debt knowledge and trust in their own capabilities. Applying for a mortgage feels like a mandatory barrier for buying a house instead of a meaningful experience.

Several interesting technologies (chapter 3) have proved to add value for financial problems. For example in the asset management market where robots are able to make recommendations based on the input it receives. In this project, a solution should be found by applying promising technology to a very stiff market.

7.1. Design goal

Over the years the mortgage application process has not changed much. Some improvements are made such as Ockto (chapter 8.1) application and the execution only mortgages but in the end the main proces (figure 12) still remains the same. By only fixing current problems the new experience will be a collection of small solutions. The main goal of this project is to create a total new experience for consumers with supporting technology.

There are six main goals which directly derived from the literature research, the order is not important in this case.

1. The consumers should be better informed about the risks of loans.

2. The mortgage application process should be more fun for first time buyers.

3. The consumer must know where to find the right information.

4. The consumers should have a better perception of what the advisers does.

5. The mortgage application process should be much more efficient.

6. The consumers should be better guided after the application.

These goals are fairly broad and not realistic to achieve within the time span of this project. The three most important goals are: goal 1,2 and 5. For that reason, this project will only on these topics which are translated into a challenge.

7.2. Challenge

First-time buyers should be able to successfully apply for a mortgage without the help of an adviser. In contrast to execution only, the consumer must receive personal advice and decrease the amount of doubt during the process.

7.3. Preconditions

8 preconditios are defined:

Self research
Interviews showed the need of looking things up on the internet. This is what the new generation Y and Z does all the time. Knowledge is not only having the information you need, but mostly knowing where to find it.

Support
At some point, support from a professional is preferred. That does not necessarily mean a human being like an mortgage adviser. It could also be a computer making calculations

Flexibility
Information on the internet is available all day, an adviser is not. Consumers should be able the ask a question whenever they want, even if they are laying in bed during the night.

Trust
People not having trust in financial institutions, especially banks, is very common after the crisis. A good relationship with the user should strengthen the trust.

Protection
According to the interviews, many consumers are uncertain about their decisions. They are afraid of making mistakes resulting in big consequences. A form of protection is desirable.

Confirmation
Although the new generation is expert in searching information, there is no one who can check their findings. Many consumers only consult an adviser to check their own research.

Clarity
Mortgage products are complex, people have a serious lack of financial knowledge. The provided information and advice should be as clear as possible.

Overview
The current mortgage application process includes many moment in which the consumer is lost. Having an overview of the progress at all times is needed.

These preconditions are important on a different level. For instance "clarity" might be expected during the whole consumer journey. In contrast, "trust" might play a bigger role in the starting phase to build a relationship with the user. In the next chapter, a new journey will be presented. When plotting these preconditions on a timeline of the new journey (chapter 8.4), the eight preconditions will make more sense.

8. New customer journey

The goal of this chapter is to explore the opportunities of robo-advice in the mortgage market. Firstly, the application Ockto is explained. This software product is used explicitly in the ideation phase and therefore deserves some explanation. After that, the new consumer experience is explained with a new journey map, solving the issues from existing journey (figure 12).

8.1. Ockto

Instead of printing documents such as an employer's declaration, a payslip or pension data, consumers can use the Ockto application for Android and IOS (figure 15). This software program enables consumers to login with their Dutch personal number (Digid). Ockto automatically retrieves all needed data from official sources such as MijnOverheid and MijnPensioenOverzicht. It eliminates the use of hardcopy documents. The disadvantage is that some data is not (yet) available in the official data sources. For example the student loan is not included in these sources yet, but this might change in the future. The Dutch government acknowledged the potential of digital data and is making steps to digitalize even more personal consumer data.

8.2. Reason for a new journey

As mentioned before, the idea is to create a total new experience and journey for the consumer. Mainly because the current process is considered as unclear and unpleasurable (see chapter 5.5). It exists for many years already and it did not improve the experience of consumers. In contrast, applying for mortgage is harder today than 20 years ago. Mainly because the required paperwork which slows down the process enormously. Luckily new solutions arise such as the Ockto app which allows consumers to retrieve information from certified sources such as the government.

Besides the Ockto application, more companies are investing in smart solutions to reach the

figure 15. *A screen of the Ockto app.*

consumers in an earlier stage. For example the company Brickler (figure 16) allows people to swipe houses in order to find their dream house, similar to dating application Tinder (Brickler, 2017). Moreover, the user can fill in their financial situation and house preferences to find a mortgage broker. However, there is no personal advice included.

The example of Brickler shows the potential of engaging with customers in an earlier stage but a complete solution for house searching, mortgage advice and applying for a mortgage does not exist yet.
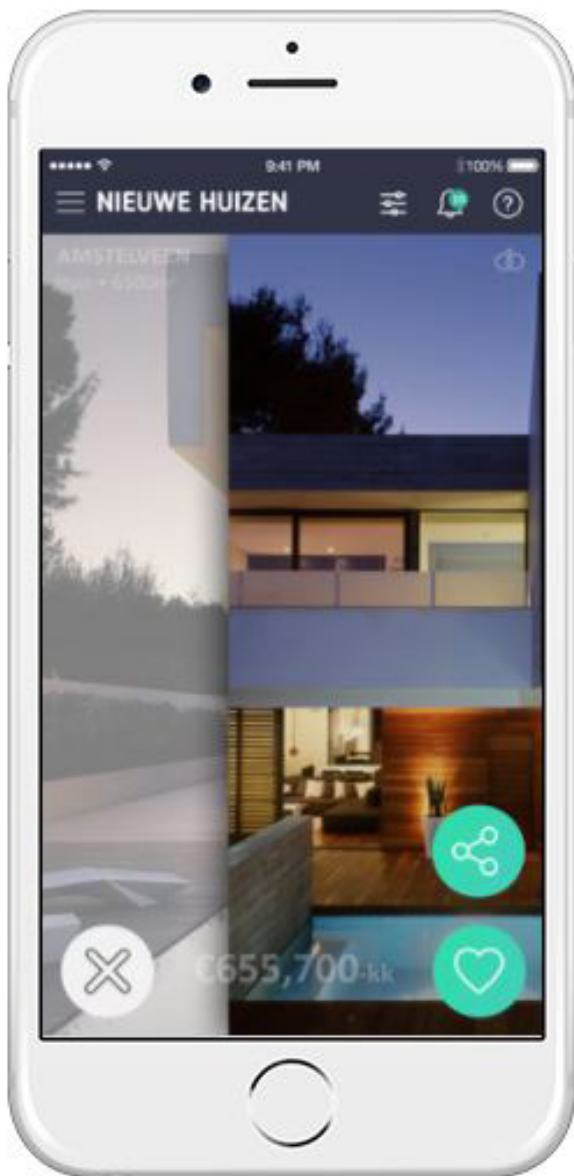
figure 16. *The swiping method of Brickler (Banken.nl, 2017).*

8.3. Explanation of the journey map

The main idea of the new journey from figure 18, is that the user retrieves as much data from Ockto as possible. He or she states whether the property is bought alone or with a partner and if the house is already found. Then some input from the buyer(s) is needed to determine a fitting mortgage amount, fixed interest rate period and amortization type. This can either be accepted, ignored or refused. The last option will bring the user back to the input loop. The other two options will guide the user to the data step. Some information cannot be retrieved from certified sources (yet). The system will ask for these documents and checks whether the information is sufficient. This process is similar to the "Share documents" phase from the execution only path in the current journey (figure 12). Interviewees admitted this was a comfortable and easy step in the process.

Situation
The starting point of the journey is a dashboard. Users login and immediately start selecting options. This phase decides which additional questions the chatbot should ask.

Mortgage amount indication
The calculations behind the mortgage amount is explained later in chapter 9.2. In this journey, the LTI is calculated first. If users are still looking for a house this maximum mortgage amount will tell them which house prices are achievable. If the house is already found, the LTV applies.

Buying with a partner
The first part of the journey is done together (or by one of the two partners). Ockto retrieves source data and the system calculates the maximum mortgage amount based on the two income combined. After the couple have filled in whether they found a house already or not, they move on to the input loop. A chatbot will ask questions to both of them separately. At certain points the system can check important information with the partner. For example: "your partner told me there is no money left at the end of the month, is that true?"

Some input is combined, for example the "financial position". Other things like the "risk willingness" is determined by the partner with the most initiative.

Input loop

The input loop consist of 5 steps which will be explained in the model subchapter. It allows the users to request the advice at any time. Also when some input is still missing but this will result in an imprecise advice. If for example only half of the input is given and the users asks whether he or she should choose a linear or annuity amortization, the system will recommend one of these two options. However, it will also recommend to provide some more information in order to make a more solid advice.

If the input phase is complete, both partners have to decide whether they accept the advice or not.

8.4. Preconditions

The aforementioned preconditions (chapter 7.3) play an important role in the new journey map. The map is divided in six phases. Figure 17 shows where each of the eight preconditions is located. Some factors only play a smart role in the journey. Others might be important during the whole journey. This overview might help to focus on certain preconditions in the ideation phase.

Dashboard	Situation	Chatting	Advice	Adviser chat	Management
		Self research			
			Support		
		Flexibility			
Trust					
				Protection	
			Confirmation		
Clarity					
Overview					

figure 17. *An overview of the preconditions on the journey steps.*

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START
Dashboard

Hi Carlo

Situation user

OCKTO

Mortgage amount indication

Residence

The model

Debt literacy

Future

Financial position

Risk willing- ness

Request Advice

person A

person B

Recommended Mortgage amount

Recommend Fixed interest period

Recommended
Future plan

Manage-ment plan

Notary

Non-digital data

Mortgage broker

Recommended
Amortization type

Accept

No

No

Yes

Yes

Conflict

Yes

Not approved
Consult adviser

figure 18. *The new journey map to a mortgage.*
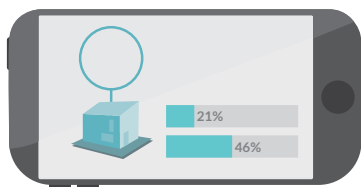
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Part 2

Design

The new journey is supported by three main elements: The advice model, the visual design of the concept and the interaction with the chatbot. Each element is described from beginning to final concept (figure 19).

Making three concepts of each element would result in too many concepts in total. It would not be time efficient to elaborate on each concept. The decision is made to create only one concept for the model (chapter 9), one for the interaction design (chapter 10) which is tested and improved and 3 "tone-of-voices" for the chatbot (chapter 11).
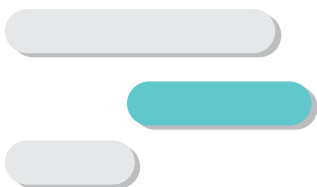

The model
Calculates advice based on the input

Interaction Design
Guides users through system

The Chatbot
Enables users to give input

figure 19. *All three elements.*

9. Model

One of the goals of this project is to create a model which can determine personal advice for first-time buyers. The aim is to start with a small model which can be expanded easily. Based on input from the user, the model should calculate 3 main advice points: The mortgage amount, fixed interest rate period and amortization type (figure 18).

9.1. Input

Based the qualitative study and two interviews with mortgage advisers, the most important input from the user is determined. The following subjects proved to be important when setting up an advice: The financial position, the financial knowledge, the future and risk willingness. Each of them will be described. After that, a scheme is presented which shows how these subject influence the 4 main advice points.

Financial position
The maximum mortgage amount is calculated on income before taxes. But if two people have the same income, it does not mean they have an equal amount of money to spend. What is left to spend depends on the actual expenses of this person. What financial advisers do, they ask their client which hobbies he or she has. Whether they go on a holiday each year and what kind of trips they have planned in the future. Perhaps they go out for dinner each week. A dog might have bigger costs than a cat. All these factors are considered when consulting an adviser.

Asking all these questions to the user might become too much. It will be an endless list of questions with the chance of missing a big expenditure which was not included in the list. For that reason, a different approach is used. Literature has discussed a method to determine the financial position of a person or household. The consumer financial protection bureau (CFPB) has created a questionnaire, consisting of 10 questions, which can easily answered on a likert scale (CFPB, 2015). The article also contains an abbreviated version of the questionnaire. Only 5 questions are needed in this case. Because

the decision is made to start small, the shorter version is used (appendix D).

Debt literacy

The quantitative research in chapter 4 revealed the lack of financial knowledge of consumers. Moreover, the debt literacy was even lower. Only three questions are needed to predict the debt literacy of a person (Appendix E). However, one might argue that this knowledge is not relevant when the consumer receives advice. The adviser, in this case a robot, is the expert. Why should the user understand everything as good as the expert? One of the options was to leave this subject out of the model but it might be relevant when the system should provide information. For example when a consumer has a really low debt literacy, it will provide more information than a person with a high debt literacy. The weight factor of this variable could be decreased in the future if necessary

Future

This subject predicts the future plans of the user. At this point, only 3 topics are discussed: The wish to have children, the wish to work less in the future, and an expected income increase. According to both mortgage advisers, these three topics are the most important when defining the future. All three questions can only be answered by yes or no.

This subject can easily be expanded with more topics if they proved to be relevant.

Risk willingness

The risk someone is willing to take plays a major role in the mortgage application process. Especially considering the unpredictable interest rate. No one knows which fixed interest rate period is the best option because there is no prove how the interest rate will develop in the future. The only thing people can do is to decide how much risk they are willing to take. A good adviser talks about this subject with the client. Figlo is an advisory software which helps advisers to process the input from the clients (Figlo, 2017). It shows graphs and predicts future scenarios in order to support the advice. This software has a build-in questionnaire determining the risk

willingness of a person. Two of the five questions appeared to be quite similar to the financial position questions. A combination is made from both questionnaires to determine the risk willingness.

9.2. The link between subjects

It is important to know which subject influences which advice point. Again based on the interviews with advisers and literature describing the advice considerations of mortgage adviser in general (AFM, n.d.-a, n.d.-b, n.d.-c, n.d.-d), three different schemes are made (figure 20, figure 22 & figure 23).

Mortgage amount

Either the LTI or the LTV is used as the starting point. This value is the maximum mortgage amount. The subjects: Financial position, risk willingness, debt literacy and future can only decrease this value. The model can be described as:

LTI/LTV * FACTOR (financial position) * FACTOR (Risk willingness) * FACTOR (debt literacy) * FACTOR (future) = Mortgage amount

This is also explained in figure 20. The factor is determined by the answers of the user. If a person achieved to score maximum points on a subject, that factor is 1. This means this subject has no effect on the mortgage amount or better said, it does not decrease this value. The lowest score results in a factor of 0.9. If a user scores the lowest factor on each of the four subjects, the total factor would be: 0.9*0.9*0.9*0.9=0.66. A total factor lower than this 0.66 is not realistic, for that reason the factor has a value between 0.9 and 1. It could turn out that in a later stage the factor weight is not perfect. Perhaps the subject financial position has a higher impact than debt literacy in this case. In this model, such changes can easily be made since the model is quite flexible. The earlier described Deep Learning (chapter 3) could improve this model significantly in the future.

Variable	Unit	Calculation	Example
Max. mortgage amount	NUMBER	Number	200.000
		X	X
Financial position	FACTOR	Factor	0.94
		X	X
Risk willingness	FACTOR	Factor	0.95
		X	X
Debt literacy	FACTOR	Factor	0.90
		X	X
Future	FACTOR	Factor	0.99
		=	=
Mortgage amount	NUMBER	Number	159.132

figure 20. *Scheme of the mortgage amount.*

Hypotheekrentes

	5 jaar	10 jaar	15 jaar	20 jaar
Acadium Bastion	1.45%	1.74%	2.28%	2.39%
Allianz	1.50%	1.79%	2.14%	2.30%
De Hypotheker	1.45%	1.85%	2.15%	2.30%
Hypotrust	1.44%	1.73%	2.20%	2.35%
ING	1.55%	159%	2.35%	2.45%

figure 21. *The longer the fixed interest rate period, the higher the interest rate. (Adapted from: HDN, 2017a)*

In short, to score the maximum mortgage amount, someone should have a strong financial position, high debt literacy, a positive future from a financial perspective and very willing to take risks.

Fixed interest rate period
The fixed interest rate period depends mostly on the risk willingness. The more risk someone is willing to take, the shorter the fixed interested rate period. In general, a short period is financially more attractive than a long period. Mortgage brokers demand a higher interest for longer interest rate periods as can be seen in figure 21 (HDN, 2017a). The Dutch Hypotheken Data Netwerk (HDN) keeps track of all mortgage data.

The consumer should keep in mind that a short fixed period for the interest rate, for example 5 years or less, means a lower maximum mortgage amount. The government created this law to protect banks from high risk. For that reason,

Variable	Unit	Calculation	Example
Financial position	FACTOR	(-100 x factor)+110)	(-100 x 0.94)+110)
		+	+
Risk willingness	FACTOR	(-100 x factor)+110)	(-100 x 0.95)+110)
		/2	/2
		=	=
Fixed interest rate period	NUMBER	Rounded to 10, 15 or 20	15 (15.5)

figure 22. *Scheme of the fixed interest rate period.*

Variable	Unit	Calculation	Example
Financial position	FACTOR	4.8 x factor - 4,32	4.8 x 0.94 - 4,32
		+	+
Risk willingness	FACTOR	-6 x factor + 6	-6 x 0.95 + 6
		+	+
Future	FACTOR	-1.5 x factor + 1,35	-1.5 x 0.99 + 1,35
		=	=
Amortization type	linear/annuity	Value < 0.5 Annuity	0.357 (Annuity)

figure 23. *Scheme of the amortization type.*

above ten years is the highly preferred by consumers the last year (HDN, 2017b).

In this model (figure 22), the fixed interest rate period varies between 10 and 20 years. The subject financial position is also taken into account. If someone has a very low financial position, it might be better to have a stable future and pick the longest fixed period. Both subjects risk and financial position are combined to determine the optimal period.

Many mortgage brokers have only three options in this case: 10, 15 and 20 years fixed interest. Therefore the exact value is rounded to one of these three numbers.

Amortization type
The variables from figure 23 are almost similar to the previous one. Future is added because a linear amortization might fit better when the future is not so bright from a financial perspective. For example when someone has the desire to work less in the future, an increasing monthly payment does not seem as a good idea. Annuity is chosen as the default, if the value from the equation is above a certain benchmark, the advice will change to linear.

There are a few exceptions which can overrule the previous mentioned equation. When the user states he or she expects an income increase and no decrease in working hours in the future, an annuity amortization is chosen.

Three other rules result in a linear amortization provided that the financial position is low (below a value of 0.95): a decrease in working hours, no income increasement and the wish to have children.

Conflicts
When the user states that he or she likes to take as much risk as possible, that is not a problem unless the financial position is very low. In this model, there is function that checks for these kind of conflicts and returns them in the output. It might be better to consult an adviser when this happens.

0.980	0.967	0.967	0.987
Financial position (high)	Debt literacy (medium)	Future (Medium)	Risk willingness (high)

Mortgage amount	€ 180.709
Own money	€ 19.291
Extra costs	€ 12.000
Total own money	€ 31.291
Fixed int. rate period	10 years
Amortization	Annuity
Conflict	No

figure 24. *An example output of a person with a LTI or LTV of 200,000 euros.*

9.3. Output of the model

Unregarded which input is given by the user, the model will always produce output. If a cell in empty, the model takes the best value in that case. No input results in the default output: maximum mortgage amount, 10 year fixed interest rate period, an annuity amortization and no conflict. Furthermore, it calculates the extra costs which is in most cases 6% of the property value. An example of an output can be seen in figure 24. This person scored relatively high on each variable.

With each piece of input, the output becomes more accurate and reliable.

9.4. Conclusion

Overall the model shows realistic results. As mentioned earlier, it could easily expanded with more variables or input fields if needed. On other benefit is that deep learning (chapter 3) could be applied to this model. The model has made with different weight factors which is a requirement when building a neural network. Algorithms will calculate the best weight factor for each variable.

10. Interaction design

10.1. Ideation

The model from the previous subchapter is what happens below the surface. The consumer will never see this system, he or she will only provide the needed input which is needed by the system to create an advice. It can be seen as the engine of a car. What comes next is the interaction between the user and the engine through a dashboard of the car. In other words: how will the consumer interact with the product in order to keep the engine running?

Several creative session were executed internal with the company Yellowtail (appendix F). Most ideas were created with the "How-to" method. In this method, a group of 4 or 5 people draw as many ideas within 2 minutes on a specific questions such as: How to ask a question? This method results in many small ideas which build on each other in a relatively small amount of time. In this chapter, some highlights during the ideation phase are mentioned.

Receiving input for the model

One of the first How-to's explores different varieties to ask a question. This is needed to fill the model with user data. One of the most obvious solution is a chatbot. This technology is already described in chapter 3 and allows users to chat with a robot. Data from the conversation can be extracted and put into the model. But putting all questions in a chatbot might results in an extremely long conversation. Inspired by one of the drawings to select some questions yourself, the decision is made to have an orientation phase first. This means that users will first answer some yes or no questions in order to eliminate as many options as possible. For example: If someone states he is not retiring within 10 years, the chatbot does not have to start a conversation about this topic.

Answering questions

The required input is mainly provided with the chat. Still, there are many different ways of answering the questions from the chatbot. For example the user can type but also select an option from some predefined answers. The user can draw the answer or use speech. A combination is also possible.

Gain trust

According to the qualitative research, consumers need someone who they can trust. Because of the rather new technology of robo-advice, consumers are slightly reticent about trusting a robot. This will be a big challenge in this project. The qualitative and quantitative research proved the importance of peers during the mortgage application. Based on one of the ideas about a friend who says: "I swear", the idea popped up to provide some proof from other users. For example: "90% of the people with the same income as you also choose an annuity amortization. This way, the user receives some guarantee that his choice is very common.

In the challenges stated in chapter 7.2, one of requirements is that consumers can apply for a mortgage without an adviser. However, many ideas about gaining trust contained an adviser. The interviews from chapter 5 also showed the need of a check by a professional. For that reason, the decision is made to not completely exclude in the adviser in the conceptualization phase.

Advice

One of the brainstorm sessions addressed the topic of giving advice. Talking with an adviser is one of the most obvious ones. But the most interesting one is about providing the right information to the right person. Every piece of advice should be based on the personal situation of the user. Visualising the options makes it much more understandable for consumers. In the end the advice should feel legit, as if it comes from an expert. This experts does not necessarily have to be human.

Making the process more fun

Gamification often helps to make a process more fun. Of of the ideas was about giving rewards. When an user answered half of the questions, the bot could respond with: Congratulations, you have answered 50% of the

questions! These kind of small ideas can improve the journey significantly.

Another simple element which makes the process more enjoyable is doing things together. Partners could for example chat with a chatbot together to increase efficiency and pleasure. This way a new dimension is added since both persons will not only discuss things with the bot but also with each other.

An indirect factor for fun could also be a cheap price. Robo-advice will most probably be cheaper for the consumer than an adviser. This could have a major impact on the satisfaction of the product.

Lastly, the speaking style of the chatbot has a big influence on the total experience of the consumer. If the bot is to firm, it could be experienced as boring. If it makes too much jokes it could irritate the user. A good balance should be found in this case.

10.2. Early test models

Small ideas were tested first (figure 25). These ideas were made within in a few minutes on paper. By making the ideas simple, it was easier to discard them when the did not had much potential. Most of the first ideas were tested internally at the company Yellowtail.

From these sessions, the idea arose to have a "quick selection" phase in the process. By selecting between two or three options, users can easily define their situation. It was highly referred by some of the first users. At this stage it became clear that users do not always want to type everything. Although chatbots are the main topic of this project, it is not always the solution.

Most of the ideas were first drawn with a fineliner and when they showed potential it was later digitized to improve readability. Figure 26 shows both forms.
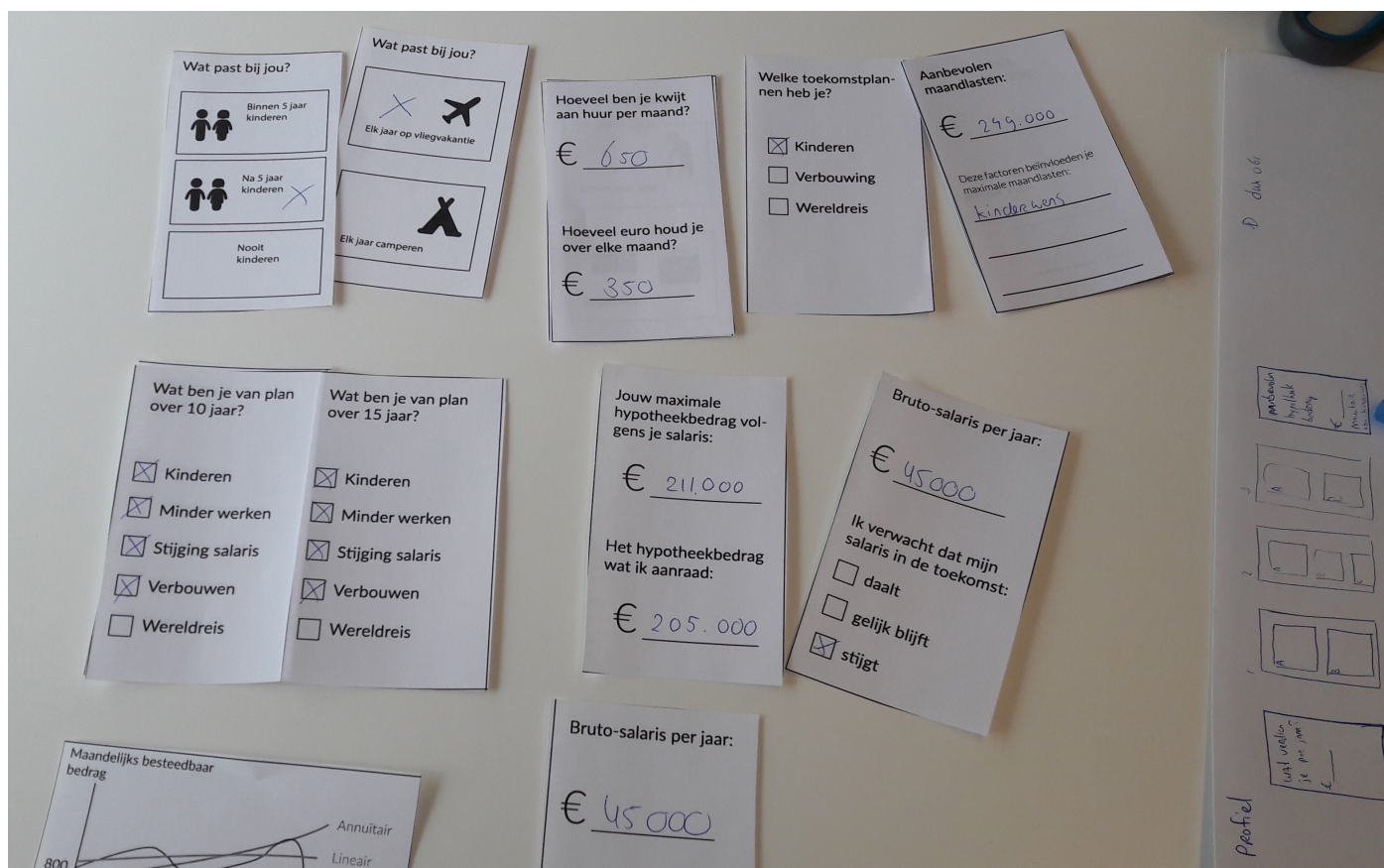
figure 25. *One of the first ideas tested.*
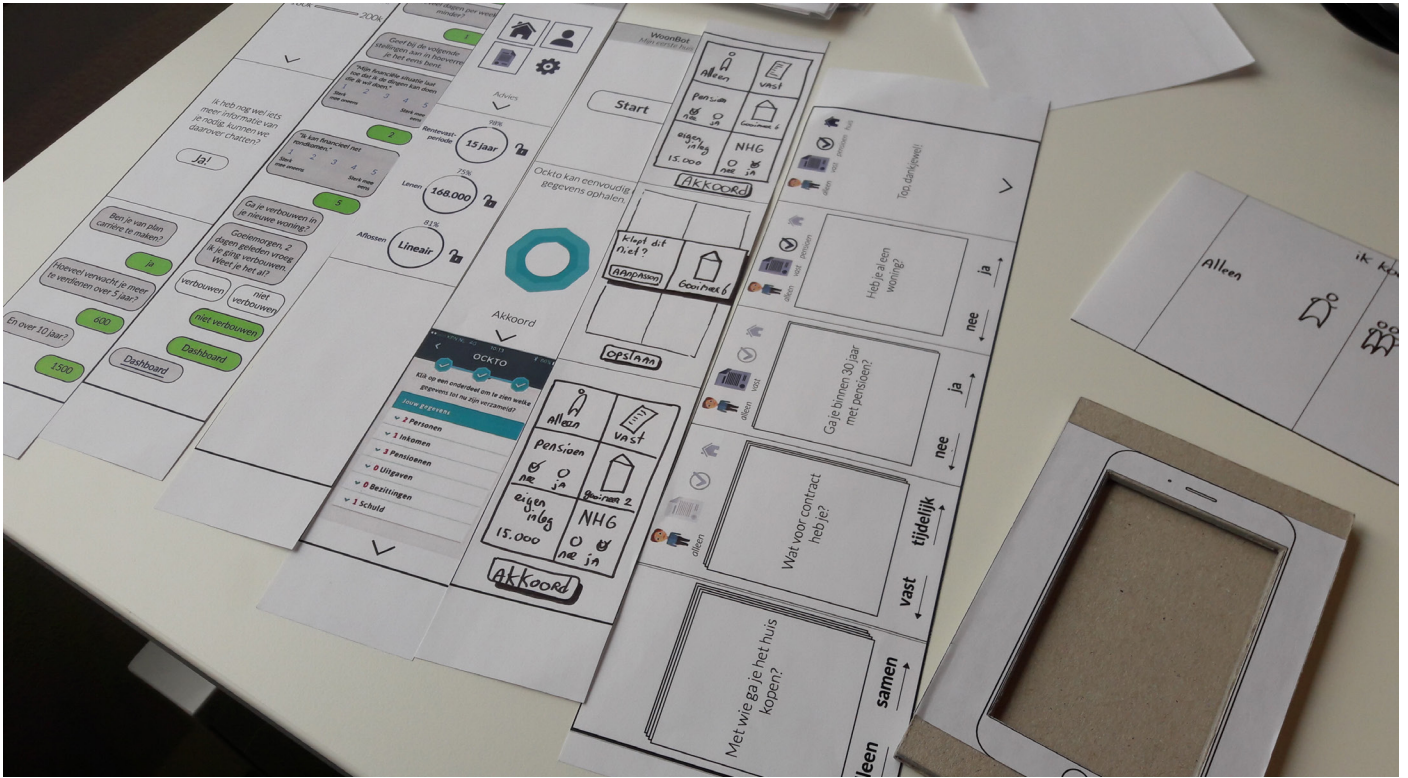
figure 26. *A hand-drawn idea in the middle of digital ideas.*

By making a small cardboard smartphone (figure 27), the ideas could easily be tested. The reason for using a smartphone is that consumers know how to interact with it. Gestures such as swiping and touching are fully accepted in the community nowadays which makes it easier to understand what the idea can do. Long paper strips were used to slide through the cardboard model in two directions.

Many iterations were made and resulted in the final idea of figure 28. All screens from this model can be found in appendix G.

Although this idea seem to work, it is still aesthetically poorly designed. Also some extra explanation or information is lacking on the screens. For instance, what if a user is advised to choose a linear amortization but does not understand what amortization is. Implementing these information screens on this paper prototype did not work well, for that reason it is added later in the aesthetic version.
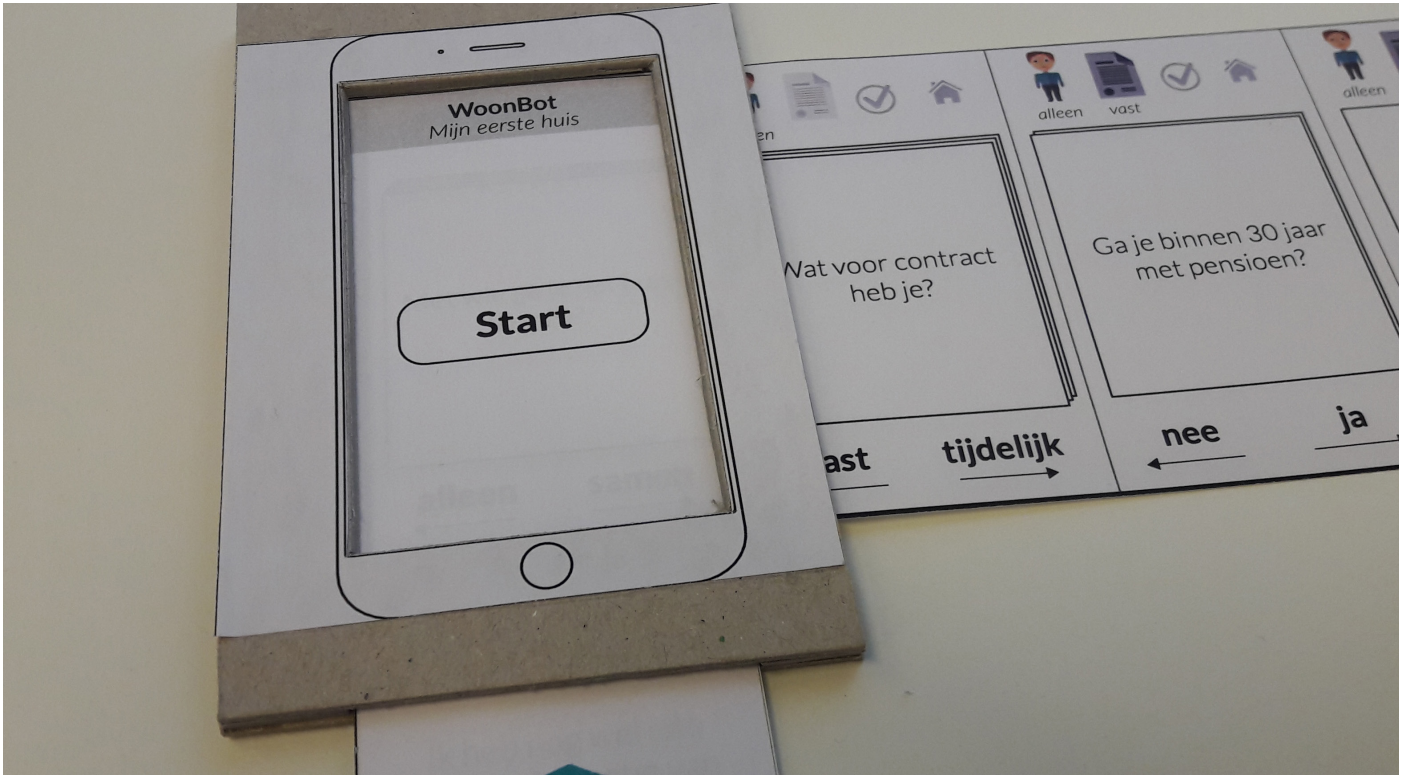
figure 27. *The cardboard smartphones with two available directions to slide idea strips.*

figure 28. *Photo of the final prototype.*

10.3. Concept

At this stage, the design of the prototype is added. Some screens proved to be difficult to understand. For example the flipping buttons from figure 29. The buttons had two sides, clicking on them would turn them around. They are designed differently in the concept. Also much more information screens are added to guide the consumer better through the process. The software tool InVision (invisionapp.com 2017) is used to create a digital prototype which can be easily tested on smartphone or desktop.

Alleen kopen	Vast contract
Geen pensioen <10 jaar	Huurhuis nu
Woning gevonden	Nieuw- bouw

figure 29. *The flipping buttons which were not easy to understand for users.*

First the flow of the concept is described (figure 30). In other words: What is the order of the different elements from the concept? After that, the design is elaborated and finally both the flow and the visual design are tested with an user study.

Flow

Before the order of the elements is presented, the elements are described first. The concept starts with an introduction of what the concept can do for the user. Right after this introduction, 6 questions are asked in the orientation phase to eliminate as much questions for the chatbot as possible. If the user made his choices he will be asked to use Ockto. Based on the income and value of the residence, a first indication of the mortgage amount is presented. Then the users is directly guided to the chat. This chatbot will take the initiative of the conversation and ask a few questions. When the user has completed around 20% of the questions needed for the model (chapter 9), the chatbot suggests to check the "advice page". This page shows which mortgage amount, amortization and fixed interest rate is recommended based on the chat. The user has the option to go back to the chat, apply for a mortgage or scroll right to the "overview page". This page is similar to a page shown earlier in the application which shows the choices from the orientation phase. The last screen is the "document page". It shows which documents are handed in or automatically filled with Ockto. Users can scroll from page to page at any time.

10.4. Design

In this subchapter, the different design elements of the application are explained and supported by images. A total of six elements is treated in random order.

Colours

Buying your first house is something that you will never forget. It could mean the start of a new life. It is filled with joy and hopefully many great future experiences. Therefore the decision is made to use many bright colours. Bunq already showed that if the design is simple, colours can really improve the total experience of the application and even the whole brand itself. Especially Bunq (Bunq 2017) proves that banks can also have a young and fun appearance. Figure 31 shows which colours are used in the concept from this project besides black and white.
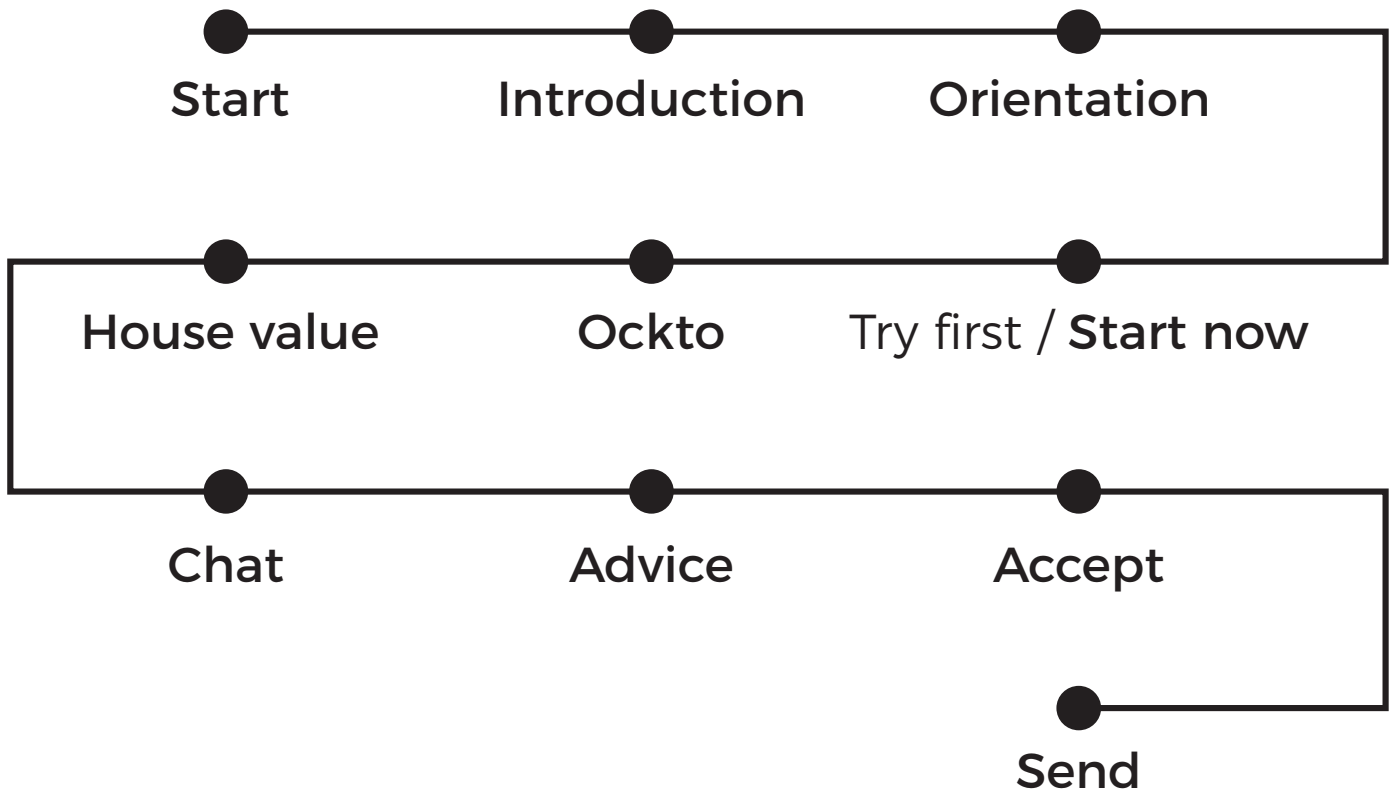
figure 30. *An overview of the flow of the application.*
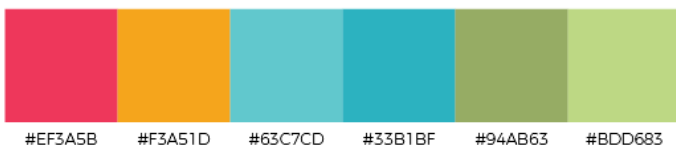
figure 31. *All colours used in the concept.*

Background

Applying for a mortgage can be an exciting process. In order to ease consumers a bit, the background shows a happy couple in a relaxing atmosphere (figure 32). This will most probably also the target group of the product. They are young, happy and do not show any fear. To make the photo less dominant, a green overlay is added. This will also improve readability of the text.

figure 32. *The background of the application.*

Buttons and popups

Most of the buttons and popups have a white background. The buttons have a flat design style which makes them very minimalistic (figure 33). Popups appear in front of the page and have a small shadow around them (figure 34). This suggest that they can appear and disappear with just one touch gesture.
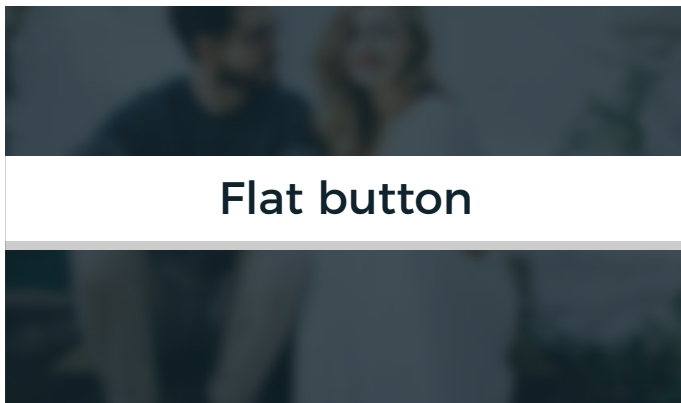
figure 33. *The flat button design.*
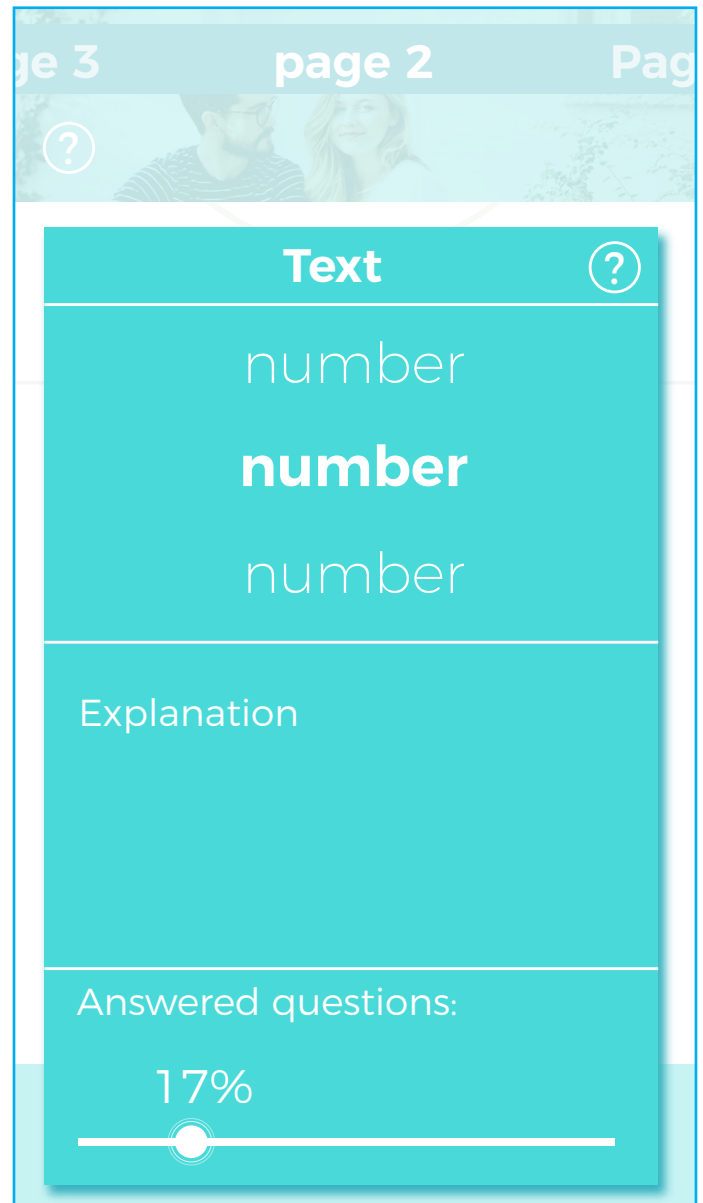
figure 34. *The popup design with a small shadow underneath.*

Swipe dashboard

Similar to the Bunq app, users can navigate through pages by scrolling left or right. This proved to be a convenient way of navigating (figure 35).

The difference with the concept from this report, is that it also changes colours when swiping through the pages. The main reason for this is that it highlights the differences between functionalities of the pages. Figure 36 shows all Dutch pages and their different colours.
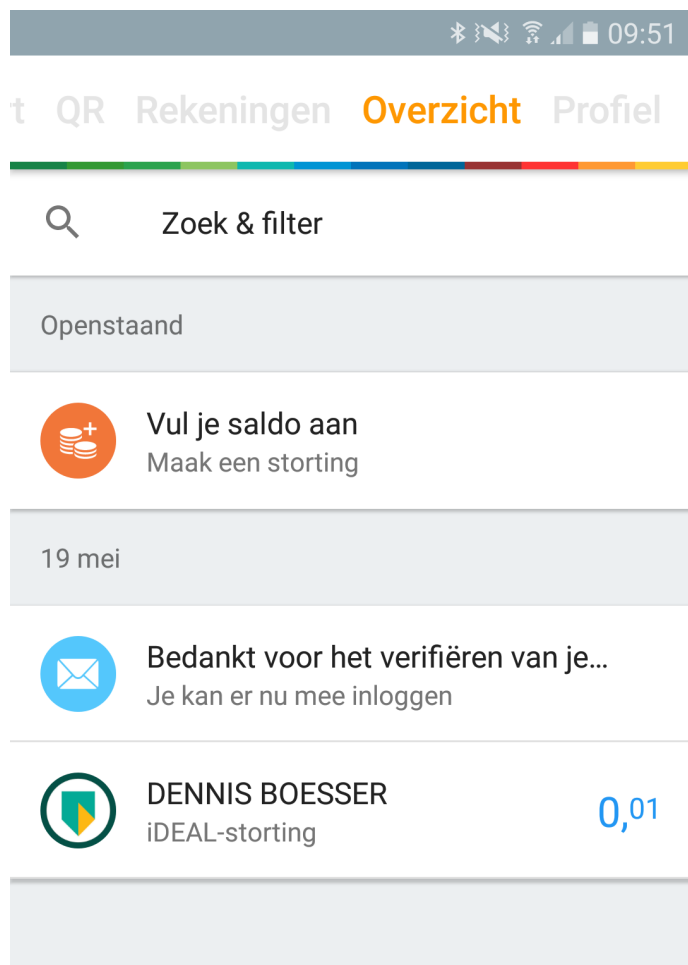
figure 35. *The Bunq app which allows users to scroll left and right (Bunq, 2017).*

figure 36. *All pages next to each other with different colours.*

10.5. User study

To understand how consumers will experience such a product, an user test is conducted. The most important question is whether consumers understand the flow, if they would like it and if they trust the product. The goal is to make one last iteration step before the final concept.

Research questions
Several research questions are made to validate the concept:

Will consumers experience the ability to self research?

Will consumers experience support from the application?

Will consumers experience that the application is flexible?

Will consumers experience trust the concept?

Will consumers experience feel they are protected from financial risk?

Will consumers experience the application gives them confirmation?

Will consumers think the concept is clear?

Will consumers think the concept gives a good overview of the mortgage process?

These 8 questions derived from the preconditions chapter 7.3. As stated in the design brief, a mortgage advice should satisfy all preconditions as good as possible.

Approach
A demo with InVision is made in which the user can click through all screens (partly linear). The different choices such as: buying alone or with a partner are already made for the user in this demo. The only purpose of this demo is to test the research questions.

A few screens of the Dutch demo can be seen in figure 37 and figure 38.

Participants had to click through the demo until
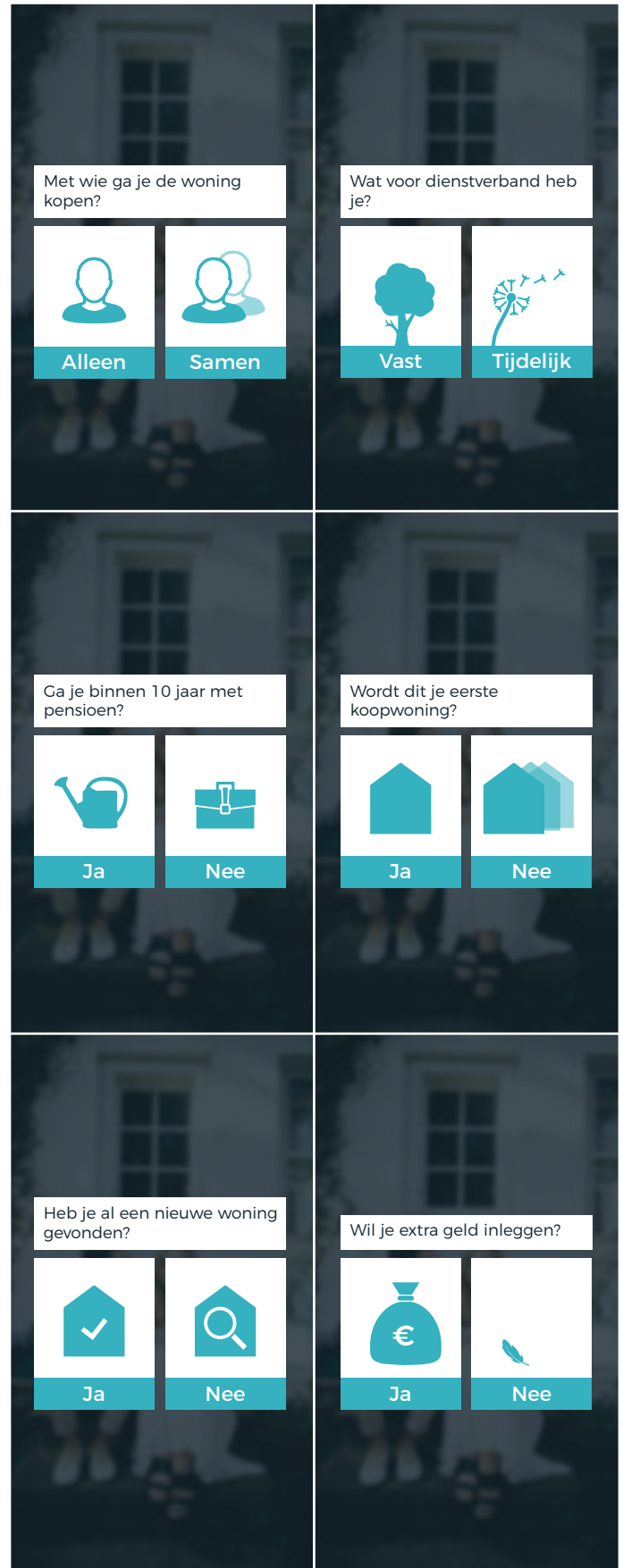
figure 37. *Some screens from the InVision Demo.*

figure 38. *Some screens from the InVision Demo (2).*

they reached the end (the assignment was to apply for a mortgage).

A questionnaire was made to test the research questions. For each research question, two questions are asked. Some of them in "reverse wording". On a 5 points scale, participants could state whether they agreed with the statement or not and to what extent. An example of such a statement is:

"I trust the advice of this application completely".

The possible answers are always:

Completely disagree
Disagree
Neutral
Agree
Completely agree

All questions in Dutch can be found in appendix H.

Results

47 respondents completed the demo and the survey. Comparing the means of the 8 preconditions resulted in figure 39.

Descriptive Statistics

	Mean	Std. Deviation	N
1=male, 2=female	1,13	,337	47
Age	2,96	1,062	47
Education	2,70	,507	47
SR	3,309	,7037	47
SU	3,521	,7369	47
FL	4,404	,7564	47
TR	3,872	,7623	47
PR	3,468	,7619	47
CO	3,723	,5398	47
CL	3,894	,8904	47
OV	3,479	,7868	47

figure 39. *The different means for each precondition (SR=Self research, SU=Support, FL=Flexibility, TR=Trust, PR=Protection, CO=Confirmation, CL=Clarity, OV=Overview.).*

The following results are based on the correlation table in appendix I.

A trending effect is found between age and flexibility (r=0.252, N=47, p=0.088). A simple linear regression was calculated to predict participant's flexibility perception based on their age. A significant regression equation was found (F(1,45)= 3.047, p=0.88), with an R^2 of 0.063. Participant's predicted trust perception is equal to 3.874+0.179(age). The average perceived flexibility increased 0.248 for each increase in age group.

Also a trending effect is found between age and trust (r=0.275, N=47, p=0.061). With a similar regression the following effect was found: The average perceived trust increased 0.197 for each increase in age group.

Furthermore a trending effect between age and overview is supported by the following data: r=0.261, N=47, p=0.076. The average perceived overview decreased 0.193 for each increase in age group.

Lastly, the trending effect between education level and protection was found (r=0.250, N=47, p=0.090. The average perceived protection decreased 0.248 for each increase in education level.

Besides the quantitative data, participant had also the ability to write comments. This rich feedback will be discussed in the conclusion.

10.6. Conclusion

The first results proved that no precondition scored negatively on average (below the neutral score of 3). However, some preconditions score higher than others. The best ones are: flexibility, clarity and trust. Most of the respondents were aged between 20 and 35, this group is used to chatting and smartphone applications in general. Apparently they also trust applications rather fast. This demo was enough to convince them that is was trustworthy. Still, one participant mentioned he was a bit reluctant about the use of DigiD (Dutch identification account) in such an app.

Self research had the lowest mean value (M=3.309). Apparently consumers expect the application to give all the answers. This is in contrast with research findings from the interviews in chapter 5. These interviews shows that consumers do an extended internet research before they do their first mortgage application attempt. A reason for this difference is that most participants were suddenly asked to do this demo and did not have time to do an internet research in advance.

Overview (M=3.479) also scored rather low compared to the other preconditions. Some participants mentioned there was a lack of overview. It was not clear which steps had to be done. They also had the need to make more decisions themselves.

It appeared that older participants tend to feel more flexibility when using the application. This is

remarkable and no explanation is found. However, it is a small trending effect. The same goes for the increase in trust for each higher age group. Again, this results in unexpected at might depend on the sample size of the study.

A more expected result is that older people tend to have more difficulties with overview. The younger generation is used to digital products and might understand the information faster. They also have less troubles with a lack of protection apparently. Older age groups are less easy satisfied with protection according to the results.

Finally, there is still a need of an adviser for many participants. As described earlier, the final concept will include a small role for the mortgage expert. Chapter 13.2 will elaborate more on this decision.

11. The Chatbot

Making a chatbot is not hard. But in this case, when designing a chatbot in high risk financial situation such as the mortgage market there are some things to consider.

Four steps are defined to create the chatbot interaction (Kulawik 2017). First the goals are set. Then the personas from chapter 6 will be used to define the needs of the consumer for this bot. In step 3 the transcript form is created and completed by the actual script in step 4.

11.1. Setting goals

The main goal is to provide input for the advice model in chapter 9. The chat will include several elements:

    Introduction
    Financial position
    Future wishes
    Debt literacy
    Risk willingness
    Advice recommendations
    Pause
    Starting conversation
    Mortgage adviser introduction

The order of these elements may be slightly different in reality. For example the debt literacy questions might be spread across the whole chat. Otherwise the chat would feel like an examination. The advice recommendation will only show when a predefined percentage of the chat is completed.

11.2. Defining the user needs

The personas from chapter 6 will make it easier to understand the target group. Both households are familiar with devices such as a smartphone, tablet or desktop computer. There is a chance this target group already experienced a chatbot in their lives.

According to the qualitative interviews from chapter 5.4, consumers have 8 main values (figure 11). Creating Overview is mostly covered by the application from chapter 10. Protection and confirmation have less priority for the chatbot. Mostly because they play a role later in the journey which falls outside of the scope in this project. It appeared that consumers like to have ability to do some research themselves before they talk to chatbot. But this takes place outside the chat and is therefore also not included in this part. The remaining four values: support, trust, clarity and flexibility are the most important ones.

Support

One of the fictive persons from the persona has a lot of patience, others are practical and probably want to get things done quickly. One of the households is a single intelligent male. This person will most probably do an extended internet research before consulting the chatbot. If the bot then also provides an overload of information, it could frustrate the user. The other household might go in blank, meaning he or she need more information. The chatbot could react to that by asking questions like: "Do you want to know more about his?"

Trust

One of the participants from the interviews had absolutely no trust in banking institutions. One big challenge will be to win the trust of this consumer. The opposite of trust is lying. Many chatbots are not transparent or create wrong expectations. Telling the user at the beginning what the chatbot can do and most importantly what it cannot do is a crucial factor in gaining trust.

Another way of earning the trust of someone is to provide real valuable data. If the system can prove that the answers from the user are used in good way and resulted in a clear conclusion, it builds trust.

Trusting robots is still a sensitive subject. For that reason, many robots are given a name like Alexa or Siri. This trend (Harris 2017) is not without a reason. It suggests that the bot or robot has feelings like humans have. This way designers conceal that in fact, the user is talking to an algorithm.

Clarity

Simplicity can also add a lot of value to the relationship between bot and human. The enormous list of information on an average disclaimer is bad example of simplicity. Having too much text in the chat could make the chat unnecessary complicated. Presenting multiple pre-selected answers immediately shows what kind of answer is expected from the user. Also explaining the order of tasks could help making the process much clearer. The bot could tell the user: "First we will talk about this and later we will discuss the following..."

Flexibility

According to the interviews from chapter 5, consumers not always have much time to arrange their mortgage. The current mortgage process is a slow process. However no one takes a week off to arrange everything. Most of the tasks happen during the working time, in the car or in the evening at home. The chatbot should allow people to start and leave the chat at any time without losing information.

11.3. Transcript form (process tree)

This chatbot might be different than most of the existing bots. These existing bots usually answer the questions of the user. But in this case, it is the bot who asks the questions and the user who gives the answers. It is a linear story with only questions. The user can interrupt the session at any time. However, the next time the bot will pick up the conversation at the same point as where it ended.

The orientation questions from figure 37 can easily eliminate some questions. If a user for example states he does not want any children, the chatbot can skip this subject. A simplified structure of the chat can be seen in figure 40. This structure continues until all questions are treated. After the risk willingness (bottom of the structure in figure 40), the following subjects are asked: debt literacy, less working days, wish to have children, income increasement, some checks about the income for example and a conclusion.
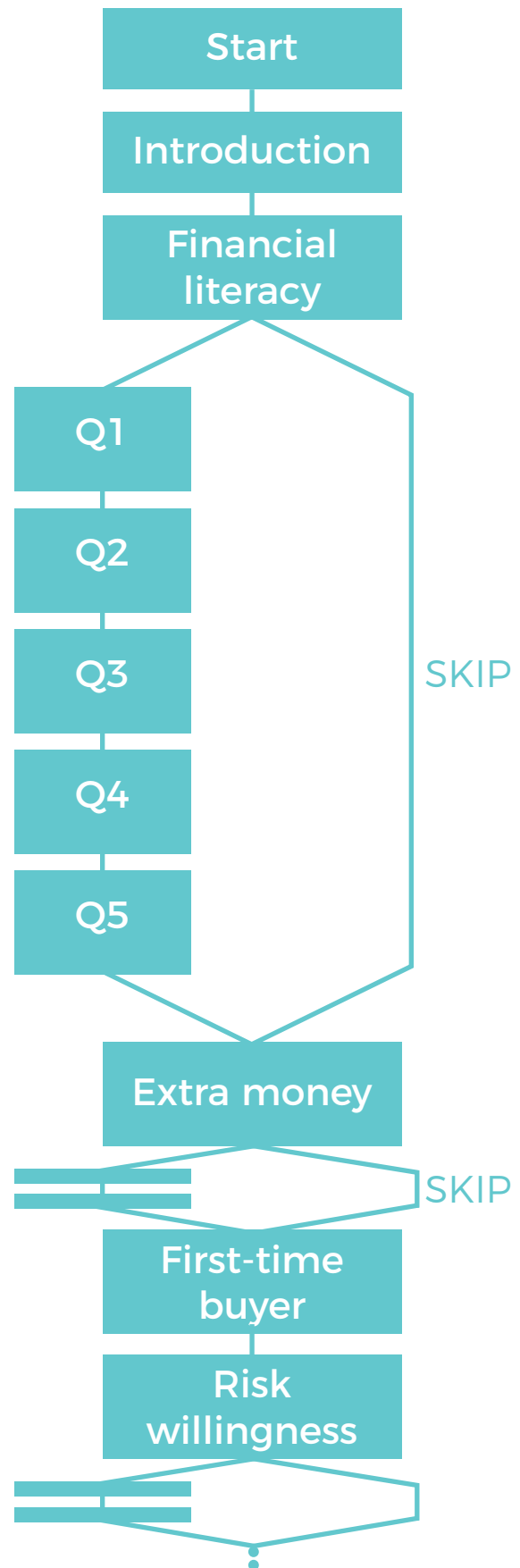
figure 40. *The simplified structure of the chat (partly).*

The main idea of the structure is that users can take a side step if they need to specify for example their income increasement. The bot needs to know how much and when the increasement is expected. When an user has completed 25% of the chat, the bot suggests to visit the advice page. Other percentage of this occurrence are 50%, 75% and 100%.

11.4. The script (path to end goal)

Open-ended versus closed-ended
There are two types of questions: open-ended and closed-ended questions (appendix J). The former enables users to ask anything and the bot replies. This requires a natural language processing technology. That would be an overkill for the end goal. It could also happen that the conversation drifts away from this goal. Therefore the decision is made to have only closed-ended questions. The only exception is when a user can type a number. For instance his salary or working days.

Tone of voice
The framework of "The Four Dimensions of Tone of Voice" (figure 41) developed by the Nielsen Norman Group (NN Group) shows 4 different tones which can influence brand perception (Meyer 2016). This can also be applied to a chatbot.
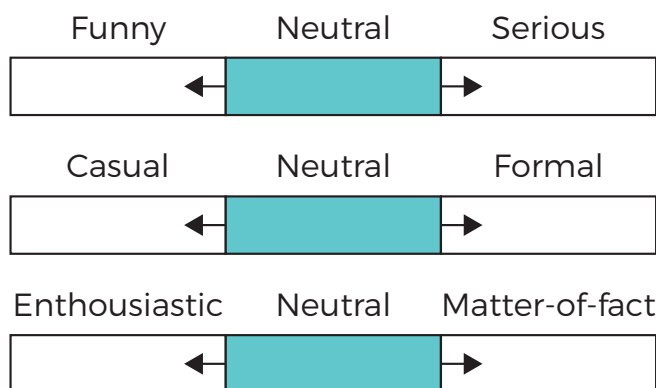
figure 41. *The four dimensions on a 3-point scale with a neutral point in the middle (adapted from NN Group, 2017)*

From the same article, the NN Group did a research for different clients in which they measured the trustworthiness of their product. Multiple versions, varying the different tones, were made to measure the trustworthiness. As a result, they found that tone of voice has a major impact on trustworthiness. But a perfect combination of dimensions does not exist. It highly depends on the use case. To find the best tone of voice for the chatbot in this project, a user test is conducted.

11.5. User study

Three combinations according to the dimensions by the NN Group are made (figure 41). The tone "funny" is not used, the chance that this will have a positive impact on trustworthiness is minimal. This is supported by the research of the NN Group (Meyer 2016). Based on the other conclusions from the research, the three most promising combinations are tested.

1. Serious, formal and matter of fact
2. Casual and enthusiastic
3. Serious and casual

To illustrate the differences between these tone of voices, a sample text is provided. This text will also be used in the experiment.

Research questions
Only one research question is tested in this user study:

Which of the following tone of voice combinations is preferred the most regarding trust?

By presenting a few options the respondent can clarify which tone of voice is trusted the most in this case.

Approach

A sample text is used to test the preferences of the users. In this sample, a bot will introduce itself in the chat. It will address the following subjects:

1 Introduction of the chatbot.
2 What it will do for the user.

The original text is in Dutch, for the purpose of the report it's translated to English.

Serious, formal and matter of fact

"In this chat, several questions are asked to determine the best personal mortgage. If necessary, a professional will support the chat."

"Press start to begin."

Especially since it is written with the "matter of fact" tone. No unnecessary words are written and the chatbot does not introduce itself as something with emotion. This might be useful in high risk financial situations.

Casual and enthusiastic

"Hi! I'm glad you found me. I'm going to help you with finding the best mortgage for you. But before I ask your preference, I will first explain what I can do for you."

"The next few days I will send you some questions to get to know you better. But remember I still have to get used to humans. Luckily there will always be a professional around to support me."

"Let's start!"

In this example, the chatbot starts really enthusiastic. There is emotion involved ("I'm glad you found me.") and words are written in a casual way ("I'm" instead of "I am"). This way it reads like a happy person who can't wait to start ("let's start!").

Serious and casual

"Hello. I will help you to find the best mortgage based on your personal preferences."

"By asking a few questions I will get to know you better. It may happen that I do not fully understand you, but luckily there will always be a professional around to support me."

"Are you ready?"

The last example is much less enthusiastic compared to the previous one. Information is short, clear but not formal. It tells everything the user needs to know without too much emotion.

On a 5 points-scale, participants were asked to what extent they trusted the introduction of the bot. Each participant received all three samples. The mean value of trust of each introduction is compared.

11.6. Results

A total of 47 respondents participated in this small study. According to the results, a serious and casual tone scored the highest mean value of trust (M= 3.77, SD= 0.983). Also a weak correlation is found between age and the first tone of voice (r=0.292, N=47, p=0.047). A simple linear regression was calculated to predict participant's trust perception based on their age. A significant regression equation was found (F(1,45)= 4.187, p=0.47), with an R^2 of 0.085. Participant's predicted trust perception is equal to 2.712+0.248(age). The average trust increased 0.248 for each increase in age group.

Appendix K shows the results in different tables.

11.7. Study conclusion

From this experiment, the conclusion can be made that the Serious and casual tone of voice might fit this concept the best. However, the differences are small. In this concept, the aforementioned tone is used. In reality, the tone of voice might also depend on the company who adopts this concept. Some banks have a more formal tone than others.

The correlation between the first tone and age can be explained by older generation. This group is used to the formal language of companies and might associate this with professionality. Nowadays, most modern companies, even banks, have adopted a more casual way of communicating. For the younger generation this seems normal, a too formal approach could result in suspicion.

11.8. Other insights

There are some things we can learn from existing chatbots. In his article, den Dopper (2017) describes the use of a good intro. What is the purpose of the chatbot? What can it do for the consumer? As can be seen in the sample text of the user study, an introduction is made. It also starts with a suggestion as den Dopper recommends (Dopper 2017).

The goal of the bot is also to include some human aspects. For example, when it constantly repeats the same sentences it feels more like a robot than a human. The same goes for timing. Humans need some time to think before they answer. A small delay can imitate this behaviour. Also using phrases like: "Thank you for your answer" can make the conversation more human (Dopper 2017).

11.9. Script

To illustrate basics of the chatbot, a sample text is made. This sample treats the following subjects:

Introduction	yes
Financial position	partly
Debt literacy	no
Future wishes	partly
Risk willingness	partly
Advice recommendations	partly
Pause	yes
Starting conversation	yes
Mortgage adviser introduction	partly

Not all elements are written because it would be to repetitive in this case. An example of the chat with explanation can be found in figure 42, 43 and 44.

11.10.   Conclusion

Many considerations are made before building the chat story. The main goal was to provide input for the model. Based on the personas and the qualitative study from chapter 5 and 6 the most important preconditions are used. Trust proved to be the most challenging one. For that reason a user study is conducted. It showed the preference for a Serious but casual tone of voice. This is in line with the literature (Meyer 2016).

Some participants complained about the dramatic tone of the chatbot in the sentence: "...there will always be a professional around to support me." It implies that very bad things could happen and that the professional is always watching. This effect was much stronger in the original Dutch text. It changed to a more soft and less dramatic tone.

Hello. I will help you to find the best mortgage based on your personal preferences.

By asking a few questions I will get to know you better. It may happen that I do not fully understand you, but luckily you can always decide to call an expert for support.

Also remember that you can leave this chat anytime you want, the next time we will just pick up the conversation where we left. If you don't want to answer something, just type "skip" and we will move on to the next question.

Are you ready?

Yes	No

Yes

Firstly, I want to make sure you can afford to pay the monthly expenses of a mortgage. Could you tell me to what extent the statements apply to your situation?

Yes	No

Yes

Great, let's start with the first one...

"Because of my money situation, I feel like I will never have the things I want in life."

Completely	Very well	Somewhat	Very little	Not at all

very well

4 more financial position questions are asked here.

Thanks a lot for your answers! But let's keep going.

According to my information you are not going to add some extra money, is that true?

Yes

figure 42. *An example of the chat with explanation.*

Please be aware that every mortgage requires some additional money. Adding a higher amount of extra money results in a lower monthly payment and lower mortgage amount. Do you want to stay with your first choice or insert more extra money?

| No extra money | Insert extra money |

No extra money

Ok, that's fine.

Just to be sure, this will be your first bought house right?

| Yes | No |

Yes

Perfect!

I will now ask you some questions regarding financial risk, please pick one of the answer options.

Can you deal with financial risk?

| I am always looking for the least risk. | I take small risks but avoid big risks. | I accept insecurity and I am well able to live with financial risk. |

I take small risks but avoid big risks.

—— 2 more risk willingness questions are asked here. —— — — — — — — — — —

Thanks again for your replies!

You mentioned earlier that you already found a new house, is that true?

| Yes | No |

! User stops responding because he or she left the chat. — — — — —

figure 43. *An example of the chat with explanation (2)*

Hello Ramon. Yesterday we talked about your new house, could you tell me more about the location?

Type: City, postal code, street, number

SKIP

! User skips this questions for now.

Ok, that's fine. We will talk about it later.

Are you planning to do a refurbishment?

| Yes | No |

No

Congratulations! You have answered 50% of the questions!

At this moment, it seems that a linear amortization of €172.000 suits you well. But we have to chat more in order make a more precise estimation. Would you like to continue or move to the advice explanation?

| Continue chatting | Go to advice |

Go to advice

A few days later, the user accepted and send his application.

Hello Ramon. My name is Ruud Wilgen and I am a mortgage adviser. I just saw your application, it looks good. I am sure we can make it work. I invite you to my office in The Hague this wednesday at 11am so we can talk about it. Is that ok for you?

Dear Ruud, that sounds great. I will be there!

! This is were the application ends for now.

figure 44. *An example of the chat with explanation (3)*

12. Final design

The are several lessons to be learned from the user study of all three element (the model, the interaction design and the chatbot). A summary of the each element is presented along with possible changes compared to the concept phase. It is important to say, that these elements should be integrated into one system in the end. However, this will not be realised in this project for technical reasons and limited time.

12.1. The model

The model itself (chapter 9) could be expanded easily. For the purpose of this project, it will remain the same as presented in chapter 9. It is an invisible model for the consumers and will only be accessible for developers in reality. The factor based principle is well suited for future machine or deep learnin

g.

To summarise: The model transforms data such as financial literacy, debt literacy, future wishes and risk willingness into factors. The factors have a certain effect on the output: Recommended mortgage amount, fixed interest rate period and amortization type.

Test here

Model

Or copy the link:
https://docs.google.com/spreadsheets/d/1r
hd971l4u57M1618oveTwRU6qtuIIjz050FIIJ
RvE3A/edit?usp=sharing

12.2. Interaction design

The concept shows a lack of overview at some moments. This is solved by changing one screen into an "overview screen" (figure 45).

This screen obliges users to first accept their advice before sending it to the adviser. Also in the final design, more explanation is added regarding the required steps to continue in the progress.

Mobile application or web based
The decision is made to make it a smartphone application instead of a browser app. An mobile application loads faster, feels more protected for the user and could reveal the location of the user. The last benefit might be relevant when the application is expended with a possible "house searching" tool. In this case, users could receive a notifications when they are passing by a house they could afford and meets their other criteria. Furthermore, according to the user tests from chapter 11.5, Facebook Messenger proved to be not trustworthy in such high risk financial situations.

To summarise: the interaction design consists of an application which allows consumers to interact with the chatbot, view their progress, apply for a mortgage and upload their remaining documents.
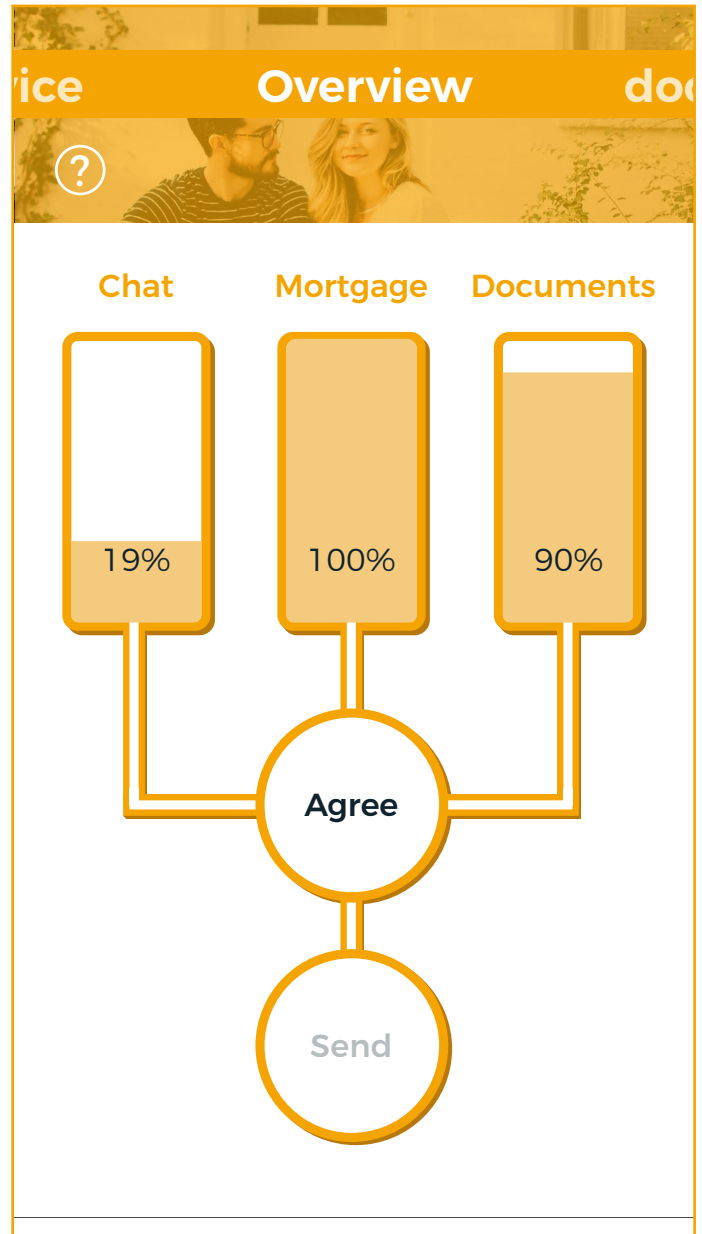
figure 45. *The new overview screen.*

Test here

Demo

Or copy the link:
https://invis.io/
U3C1RJOJH#/237241638_
Screen_0-pdf_1

12.3. Chatbot

The chatbot can be considered as an addition to the application. The tone of voice differs from each institution. A formal bank might prefer a more serious and matter of fact tone. However, in this case the casual and serious tone proved to be the best fit.

The chat enables users to provide input for the model. Natural language processing is avoided at this stage due to complexity. Also when the bot does not understand a questions, which unfortunately happens quite often with the current bots, it could results in a negative attitude towards the bot. In the future, NLP could be added to answer basic questions of the consumer when the technology is more mature. This bot only includes one command: "skip", which enables users to skip a question.

The chatbot is minimalistic in the sense it does not show any images or other visual elements. The two options in this case were: Make the chat do everything (provide information, show the advice, apply for a mortgage and so on) or keep the chat as simple as possible and show visual elements such as graphs in the application. The latter is chosen because it turned out that implementing the whole mortgage progress into a chat was not feasible.

To summarise: Consumers can talk to the chatbot to prove input for the model. The chatbot saves all data which is transformed to an overview for the adviser later in the process (figure 46). Each given input updates the advice of the application. The chatbot is also used to build a relationship with the consumer.

Test here

Model

Or copy the link:
http://philome.la/DennisBoesser/sayfinn

Application
Carlos Koopmans

Personal ❯

House ❯

Chat ⌄

Questions answered
87%

Advice given by bot
€ 192.000
15 years
Annuity
No conflict

Open chat history

Remarks ❯
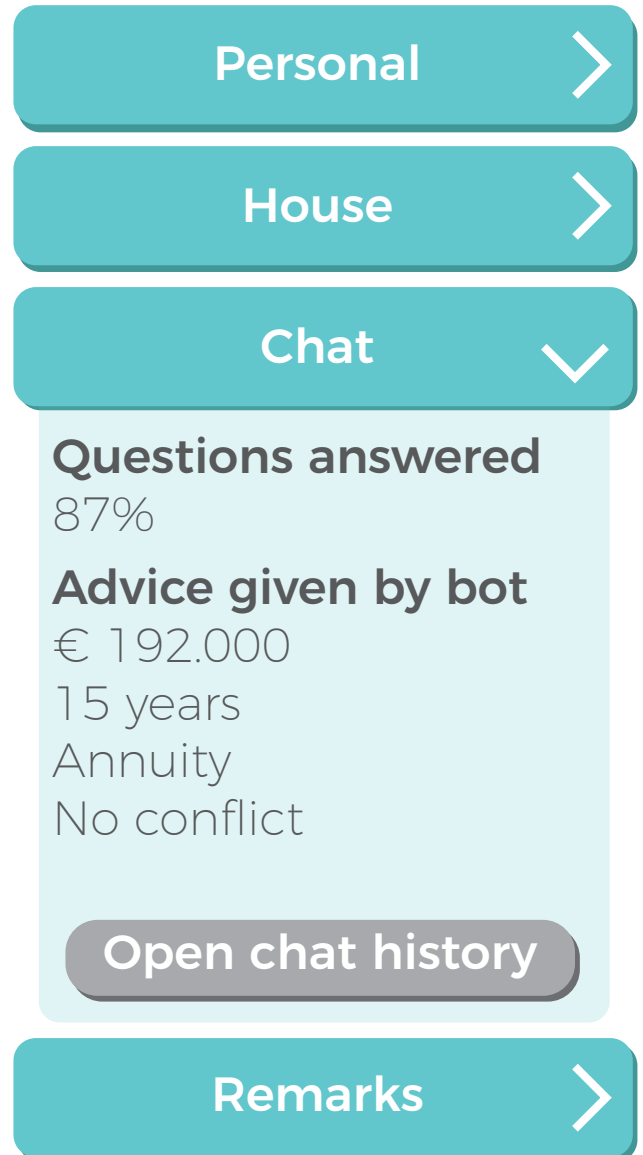
figure 46. *The chat outcome an adviser receives after an application of the consumer.*

12.4. Scenario

A user scenario is made to illustrate the collaboration of all three concepts in figure 47.
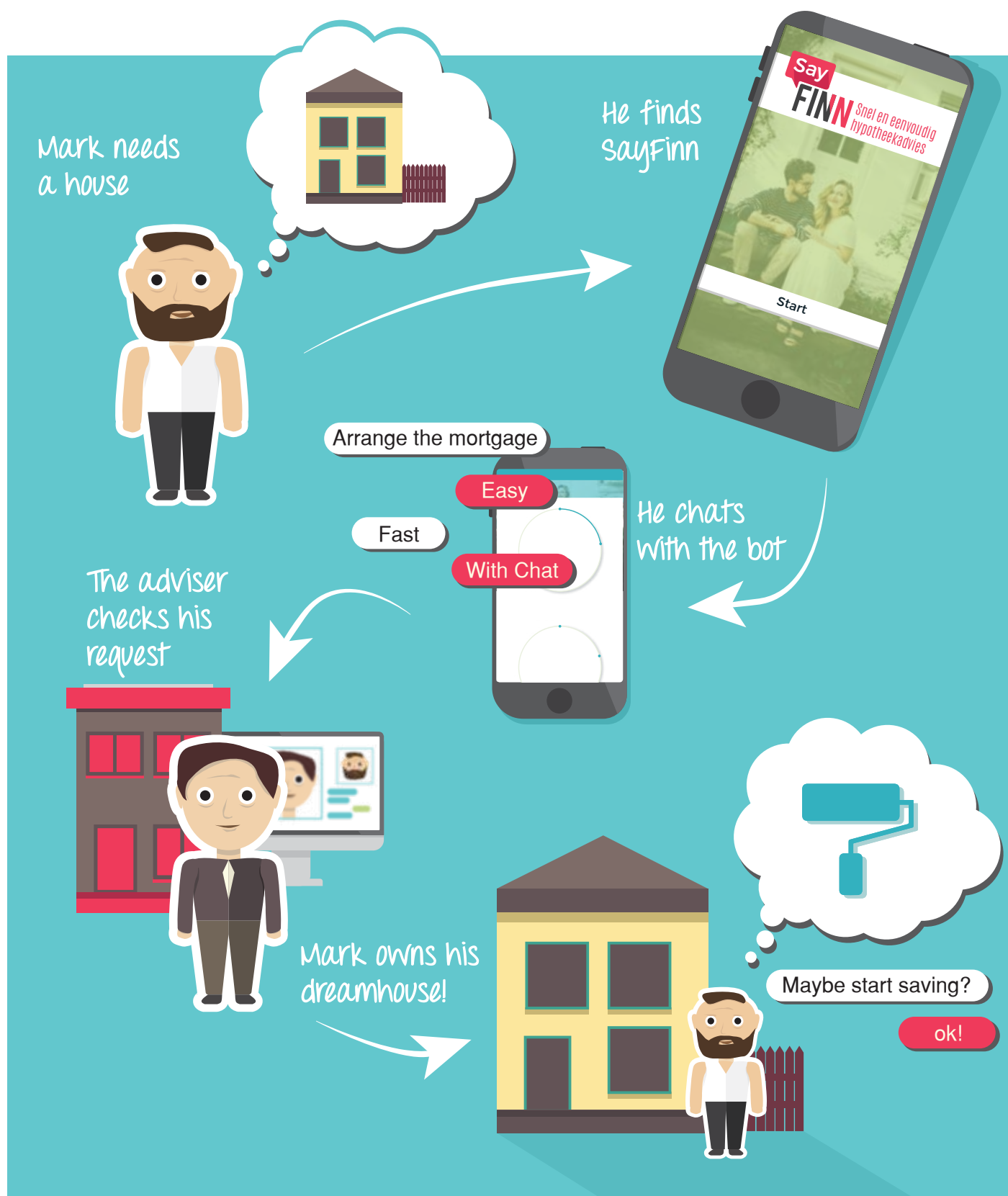
figure 47. *A scenario of the final design.*

13. Implementation

In this chapter, two subjects are discussed: the brand identity of the final design and a brief implementation plan for the future.

13.1. Brand identity

Building on the user test of the tone of voice, the total concept should be more or less serious and casual. Although it depends on the company adopting this concept, a serious and casual image might fit most of the companies.

As described earlier, most of the bots are given names to hide the robotic appearance. However, an article by McGuane questions the need of bot name (McGuane 2017). As a resident language expert on the product design team of the company Inside Intercom, she describes the results of a study done by the company. In this study, they gave their chatbot a name and let it intriduce itself. It appeared that participants hated this bot because of that introduction and name. " It was interrupting them, getting in the way of what they wanted (to talk to a real person), even though its interactions were very lightweight" (McGuane 2017).

In her article she states: "Names and identity lift the tools on the screen to a level above intuition. They make us see the tool in all its virtual glory, and place it in an entirely different context to the person using it — and not always a relationship that person asks for or appreciates" (McGuane 2017).

For that reason, the chatbot in this project will only have a logo. The total concept itself on the other hand, will be named. This name is not visible in the chat and will just be the name of the application.

The name SayFinn is chosen (figure 48). "Fin" represents the streamline of fishes which steers them to their end goal. That is exactly what the final concept does, guiding people to their mortgage in an efficient way. By adding an extra letter "n", a more modern name is created. Finn is even on the list of most popular names for newborns in the Netherlands (SVB 2017). The "Say" is added to make the name more active. It is also a reference to chatting. When pronounced in total it sounds like "savin(g)", exactly what it does: saving money.

Say FINN Snel en eenvoudig hypotheekadvies

figure 48. *The logo of SayFinn.*

A positioning statement is used to describe how this product fits in the market.

SayFinn offers a tool for the future generation of first-time buyers to apply for a mortgage much cheaper and convenient than current solutions.

It does so by using robo-advice and a chatbot to retrieve and process data much faster than a human adviser.

13.2. Future development

Consumers still have difficulties in trusting a robot in the mortgage market. Even though they trust the advice itself, many consumers prefer a check by a professional. For that reason, the final design of this report includes a mortgage adviser in the end who checks all data of the consumer.

When artificial intelligence and deep learning reach a point when consumers no longer resist but acknowledge of the technology, the trustworthiness of robo-advice could have a major boost. Only at this point it is the right time to introduce deep learning to the final design. This will have a major impact on the role of the adviser, which is described next.

Role of the adviser in the future
The initial goal was to create a system which superfluous the adviser. It appeared that consumers are not (yet) ready for that. A positive outcome for financial advisers who are told for years that robo-advice will crush their jobs. It is an ongoing battle between the human advisers and the robo technology. The final design of this project includes an adviser, however with a much smaller role than before. It is inevitable that robo-advice changes the market. The next small part is about me, the author of this report, and my experience as a product designer in the mortgage market.

In may 2017, I had the honour to talk about my findings of this report at the Hypovak2017 Congress (figure 49 and 50). This is the biggest mortgage congress of the Netherlands. Most of the audience worked as a mortgage adviser. At the main stage I talked about the new generation first-time buyers and their expectations of a mortgage application. The story was different than others because for the first time the advisers were told not to fear the robots but collaborate with them.

Link to the presentation: https://www.youtube.com/watch?v=WM7QWenEBR8

Besides, two articles have been written and published by me supporting the presentation.

Link to the first publication: https://www.infinance.nl/e_paper/E-INFINANCE03/index.html?page=20

Link to the second publication: http://www.consultancy.nl/nieuws/14125/hypotheekadviseur-kan-robots-beter-toepassen-dan-mijden

figure 49. *Me presenting at the Hypovak 2017.*
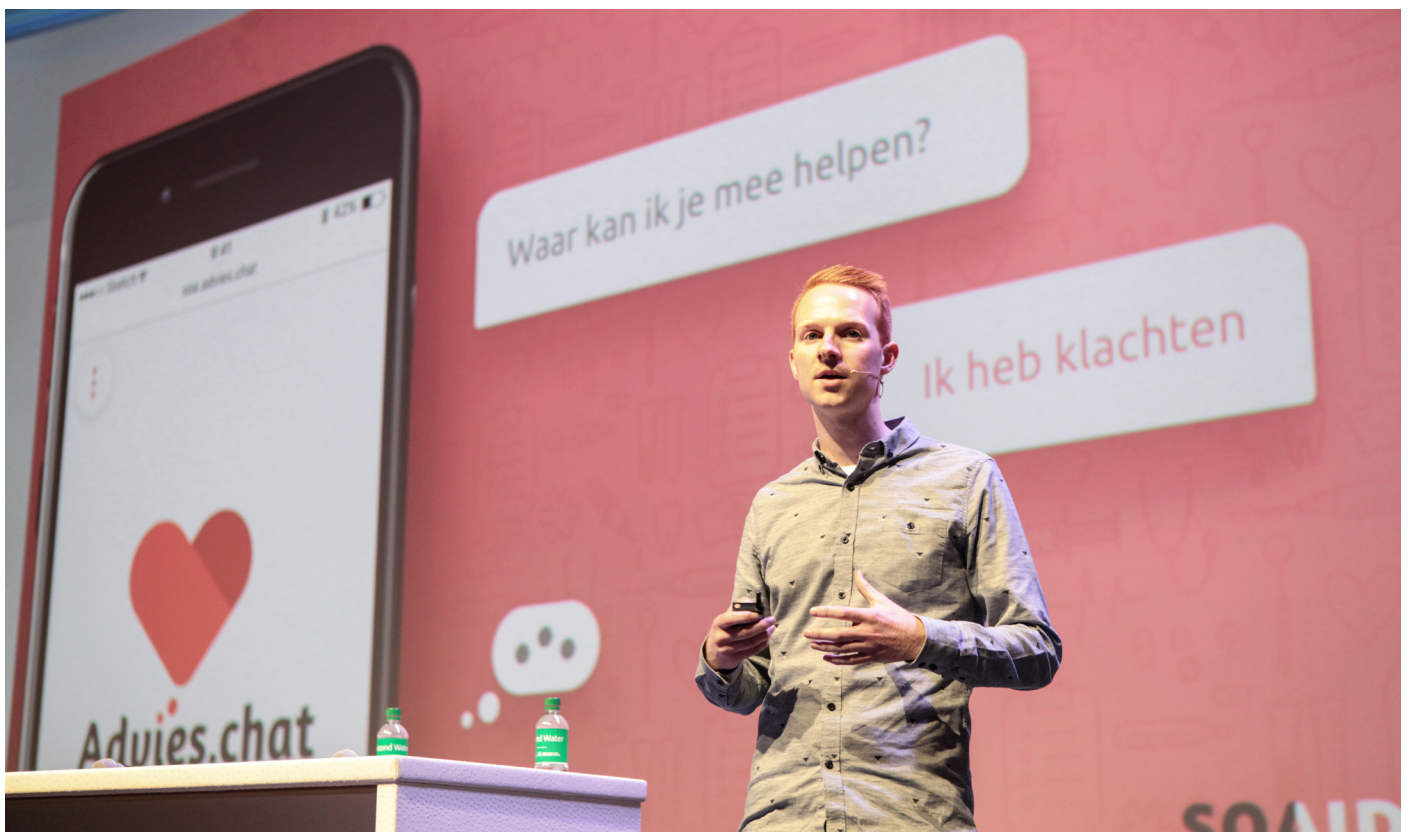
figure 50. *Me presenting at the Hypovak 2017 (2).*

14. Evaluation

14.1. Conclusion

During this project, several insights were gathered regarding first-time buyers. It revealed the insecurity and frustrations experienced by the buyers. It also showed unexpected results. Although the total costs of a mortgage adviser was considered too high in general, it also appeared that the adviser was needed on a emotional level. In contrast to what was stated in the design brief, the decision is made to include the adviser in the journey. However this only temporary. When the deep learning technology is more mature in the financial market and people consider it as a trustworthy technology, the adviser will be redundant. I expect this to happen before 2021.

Besides the needs of the consumer, there is one other reason why the adviser has a small role in the journey. The Dutch AFM (authority financial markets) has made several legislations to protect the consumer from unreliable advice software. To be qualified for robo-advice, the product should meet many requirements. It would slow down the progress of this project too much and become a barrier for the creative session. Therefore the final concept can be applied as an orientation tool and not an advice tool at this moment. The future seems much brighter according to European Parliamentary Cora van Nieuwenhuizen. In her article, she mentions that next year there will be an easing of rules for Fintech companies next year (Klein 2017).

The initial idea was to integrate the model and the chat into one prototype. A Node JS of the model is made, however linking it to the chat proved to be harder than expected. Unfortunately there was not enough time in this project to combine the two. Both elements had to be presented apart from each other in this report.

Initially, the chatbot was the main assignment. However, it turned out that sending visuals in the chat was not the best solution. Images are often cropped or too small. The role of the chatbot decreased during the project. In contrast, the interaction design received a much bigger role.

One thing is for sure, the current mortgage process does not fit the future first-time buyers at all. Fintech companies are ready to change the market, the consumers are ready, the government is working on it but the mortgage advisers show the most resistance. If they keep pushing the technology away from them instead of learning how to use it, their jobs will not be safe for long. Innovative products will hit the market soon, this project shows the potential of it. Hopefully the next few years will include many more innovative products changing this market in a positive way.

14.2. Further research

When applying deep learning to the model, the output will become much more reliable. Instead of linear equations it will then develop into a huge network of variables and hopefully improve the trustworthiness of the advice. Also using the NLP technology allows users to ask questions to the chatbot.

The management part of the journey is not covered in this report. The chatbot could notify users once a year to increase their monthly payment for example. Also the start of the journey, the dreaming phase, could be examined for further research. The chatbot could play a role in searching for a new house.

The amount of variables influencing the advice could be expanded. As mentioned in report, the project is scoped relatively narrow. In reality more variables might play role in the advice.

Little attention has been paid to the interaction between couples when applying for the mortgage together. This still remains an interesting topic but is partly ignored in this report for time limitation reasons. A literature and user study should be conducted to find insights regarding buying decisions of a couple.

Acknowledgements

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Figure 2
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Figure 6
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Design header
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Figure 32
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Appendix A (infographic)

D. Boesser 2017

De hypotheekmarkt vanuit de *Consument*

Financiële kennis kan getoetst worden met een "**Basiskennis**" toets en "**Schuldenkennis**" toets. Beide bestaan uit 3 meerkeuze vragen. De Schuldenkennis toets blijkt het meest geschikt om leningen kennis te toetsen.

De kennis van de consument

23-28 jaar

Jongeren hebben een bijzonder lage financiële basis-kennis (27%).

*2

Percentage dat alle 3 de kennis toets vragen goed heeft beantwoord.

53% Basiskennis

9% Schuldenkennis

*1

42%

42% dacht alle schulden vragen goed te hebben.

*1

Wie heeft meer schuldenkennis, de man of de vrouw?

1.06 **1.47**

Gemiddeld vragen goed

*2

Wie heeft de meeste schuldenkennis op basis van opleiding?

0.84	1.16	1.45	1.83
Basisschool	Mid. school	Bachelor	Master

Gemiddeld vragen goed

*1

Percentage dat hooguit 1 vraag goed heeft in de schuldenkennis toets

Meer dan de helft bevat een zeer lage schuldenkennis.

57%

Schuldenkennis

*1

Risicogehalte hypotheek

Schuldenkennis

Risicogehalte hypotheek

Hoe hoger de schuldenkennis, des te hoger het risicogehalte van de hypotheek.

*1

🔍 Men is overmoedig

🔍 Leningen zijn ingewikkeld

🔍 Men heeft een lage schuldenkennis

🔍 Een hogere schuldenkennis resulteert in een hypotheek met meer risico.

Het vertouwen in eigen kennis

Percentage van de consumenten die overtuigd zijn zonder adviseur een hypotheek af te kunnen sluiten.

Jonger dan 40	40-70	Ouder dan 70
10.3%	**12.8%**	**19.8%**

Hoe ouder hoe meer vertrouwen.

*1

De consumenten die geen adviseur nodig hebben, beschouwen een variabele rente als minst riskant.

Variabele rente

Consumenten zonder adviseur

De variabele rente kan voor ernstige financiële problemen zorgen.

*6

Q   De jongere generatie heeft het minste vertrouwen in zelf een hypotheek afsluiten.

Q   Consumenten onderschatten de mogelijke variabele rente stijging.

Informatiebronnen voor een hypotheek

Het percentage consumenten dat een adviseur als belangrijkste bron van informatie beschouwd.

100%
75%
50% — Adviseur
25%

0   1   2   3
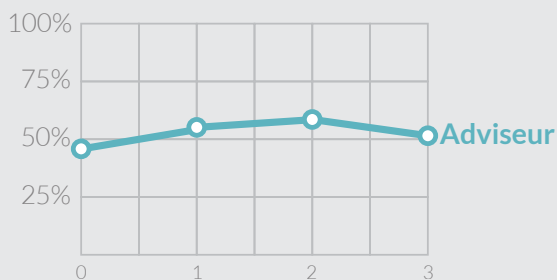
Aantal vragen goed in de schulden toets

Adviseur bij hypotheekaanvraag

Consumenten met een lage schuldenkennis raadplegen niet vaker een adviseur dan consumenten met een hoge schulden kennis.

*1

Overige gebruikte bronnen per schuldenkennis.

40.7%

Lage schuldenkennis
Hoge schuldenkennis

17.9%

12.4%

17.0%

6.3%

2.1%

Vrienden/familie   Internet   Tijdschriften/boeken
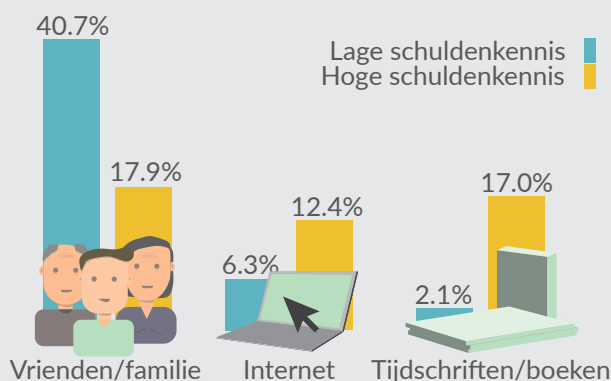
Hypotheek informatie verkrijgen

Consumenten met een lage schuldenkennis raadplegen veel vaker vrienden of familie. Tijdschriften en boeken daarentegen worden nauwelijks gebruikt.

*3

Q   Consumenten met een lage financiële kennis raadplegen veel vaker vrienden of familie.

Q   Advies wordt niet gebruikt door de mensen die daar potentieel de meeste baat bij kunnen hebben.

De consument over de hypotheekadviseur

Aantal uur dat de adviseur in totaal nodig heeft volgens de consument.

14	10	6
Starters	Doorstromers	Oversluiters

Het acceptabele te besteden bedrag in euro's volgens de consument.
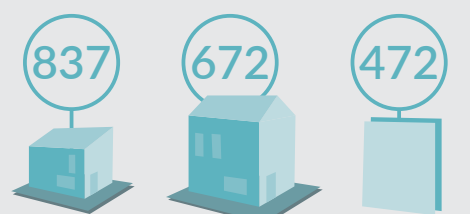
837	672	472
Starters	Doorstromers	Oversluiters

De hypotheekadviseur

In de praktijk blijkt dit aantal uren ver onderschat. Consumenten hebben geen goed beeld van de benodigde uren voor een degelijk hypotheekadvies.

*4

De kosten van een hypotheekadviseur kunnen oplopen tot 4000 euro, ver boven het gemiddelde acceptabele bedrag van de consument. Met name lager opgeleide consumenten vinden een lager bedrag acceptabel.

*4

Percentage van de consumenten dat zijn of haar adviseur zou aanraden aan anderen.

Totaal	Tot 34 jaar
54.1%	65.1%

Maar iets meer dan de helft van de consumenten zou zijn adviseur aanraden. Consumenten onder de 34 jaar zijn over het algemeen meer tevreden met hun adviseur.

*4

Huishoudens die een adviseur hebben ingeschakeld bezitten een hypotheek met meer risico.

Hypotheekadviseur

Een mogelijke verklaring is dat adviseurs een meer complexe hypotheek samenstellen voor de klant dan de consument zelf zou kunnen.

*4

🔍 De consument heeft geen goed beeld van wat de adviseur doet.

🔍 Bijna de helft van alle consumenten zou zijn adviseur niet aanbevelen aan anderen.

De hypotheekadviseur over het proces

Percentage adviseurs dat het eens is met de stelling.

92.2% — De klant heeft niet alle fases volledig in beeld.

50.9% — Het is lastig een klant uit te leggen dat een hypotheekaanvraag veel tijd kost.

96.8% — Het volledige proces van een hypotheek aanvraag moet geoptimaliseerd worden.

Hypotheekadviseur

Het is lastig om de klant een goed beeld te geven van het hypotheekproces. Bovendien benadrukken adviseurs dat een hypotheekaanvraag sneller moet kunnen.

*5

Adviseurs zien de noodzaak om het hypotheekproces te optimaliseren.

De zorgen van de consument

Hoe riskant beschouwd de klant zijn hypotheek?

Totaal niet riskant — 21%

Zo goed als niet riskant — 46%

Enigszins riskant — 27%

Heel riskant — 2%
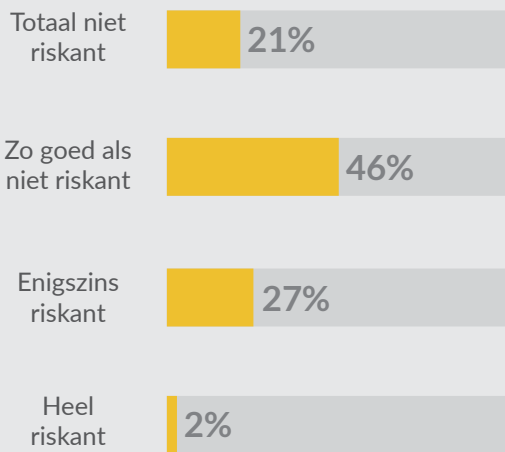
Consumenten over hun hypotheek

Meer dan een kwart van de consumenten vindt zijn of haar hypotheek enigszins riskant. *1

Percentage consumenten die denken zijn hypotheek onder elke omstandigheden kan afbetalen.

31%
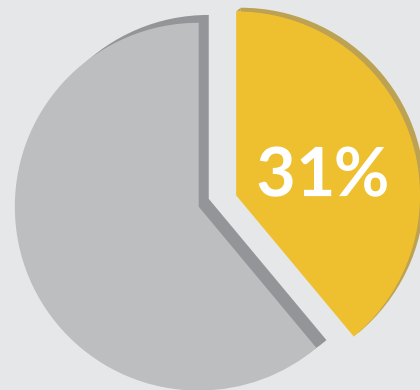
Problemen met afbetalen

Slechts 1 op de 3 consumenten denkt de hypotheek onder alle omstandigheden te kunnen afbetalen. *1

Percentage dat in financiële problemen denkt te komen bij onverwachte veranderingen.

€↓

€↓

Huizenprijsdaling — 26%

Inkomensverandering — 65%

Een kwart van de consumenten denkt in financiële problemen te komen bij een huizenprijsdaling. Twee-derde denkt in financiële problemen te komen bij een abrupte inkomensverandering.

*1
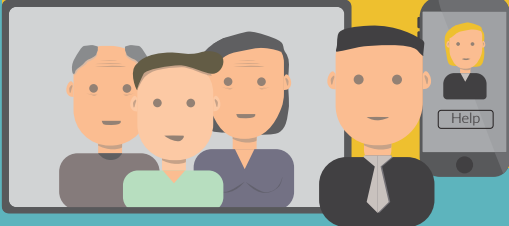
Een aanzienlijk deel van de consumenten maakt zich zorgen over de hypotheek.

Waar liggen kansen?
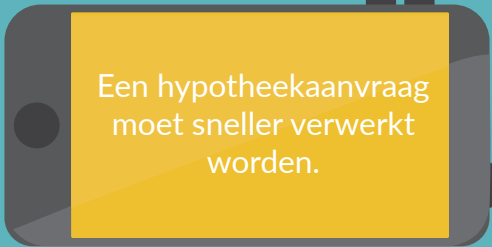
De consument moet beter ingelicht worden over de risico's van lenen.

🔍 Leningen zijn ingewikkeld.
🔍 Men is overmoedig.
🔍 Consumenten onderschatten de mogelijke variabele rente stijging.
🔍 Men heeft een lage schuldenkennis
🔍 Een hogere schuldenkennis resulteert in een hypotheek met meer risico.

De consument moet op de juiste bronnen gewezen worden.

🔍 Consumenten met een lage financiële kennis raadplegen veel vaker vrienden of familie.
🔍 Advies wordt niet gebruikt door de mensen die daar potentieel de meeste baat bij kunnen hebben.

Een hypotheekaanvraag moet sneller verwerkt worden.

🔍 Adviseurs zien de noodzaak om het hypotheekproces te optimaliseren.

Een hypotheek afsluiten moet toegankelijker en leuker worden voor jonge starters.

Coffee

🔍 De jongere generatie heeft het minste vertrouwen in zelf een hypotheek afsluiten.

Men moet beter begrijpen wat een adviseur doet.

🔍 De consument heeft geen goed beeld van wat de adviseur doet.
🔍 Bijna de helft van alle consumenten zou zijn adviseur niet aanbevelen aan anderen.

Consumenten moeten beter begeleid worden na het afsluiten van de hypotheek.

🔍 Een aanzienlijk deel van de consumenten maakt zich zorgen over de hypotheek.

1. Van Ooijen, R., & van Rooij, M. C. (2016). Mortgage risks, debt literacy and financial advice. Journal of Banking & Finance, 72, 201-217.
2. Lusardi, A., Mitchell, O. S., & Curto, V. (2010). Financial literacy among the young. Journal of consumer affairs, 44(2), 358-380.
3. Lusardi, A. (2008). Financial Literacy, presentation to MEA. Dartmouth College and NBR Mannheim.
4. Stichting Erkend Hypotheek adviseur. (2011). Het SEH consumentenonderzoek: Consument niet klaar voor fee-beloning.
   http://www.mijnerkendfinancieeladviseur.nl/nieuwsbrief/13
5. Kop-Munt (2016). Hoe denken klanten over hun adviseur en over het aanvraagtraject?
   http://www.kop-munt.nl/munt/blog/posts/hoe-denken-klanten-over-hun-adviseur-en-over-het-aanvraagtraject/
6. Bucks, B. , Pence, K. , 2008. Do borrowers know their mortgage terms? Journal of Urban Economics 64 (2), 218–233.

Appendix B (interview questions)

Criteria (rood = afgekeurd)
1. Hoelang is het geleden dat u een hypotheek heeft afgesloten?
   minder dan een jaar / tussen de 1 en 3 jaar / langer dan 3 jaar geleden

2. Ik ben een: starter / doorstromer

3. Hoe heeft u de hypotheek afgesloten?
   Bij een adviseur van de bank of hypotheekverstrekker / bij een onafhankelijke adviseur
   (adviesbureau) / zonder adviseur

Introductie
Goedendag, bedankt voor uw komst.
Om mijzelf kort voor te stellen: Ik ben Dennis, afstudeerder bij het financieel dienstverlening bedrijf
Yellowtail. In mijn afstudeeropdracht doe ik onderzoek naar de hypotheekmarkt voor starters. Met dit
gesprek probeer ik inzicht te krijgen in de ervaring van klanten tijdens het gehele hypotheekproces.

Er zijn geen goede of foute antwoorden, alles wat u zegt zal anoniem blijven. Heeft u er bezwaar
tegen als ik het geluid opneem? Dit geluidsfragment zal overgetypt worden en uiteindelijk ook
verwijderd. Wanneer u een vraag niet wilt beantwoorden mag u dit uiteraard gewoon aangeven.

1.   Oriëntatie
Laten we teruggaan naar het begin van het proces, dus nog voor u de hypotheek bent gaan regelen.

1.1 Wat was het eerste moment waardoor u aan een nieuwe woning dacht?
            Welke stappen heeft u vervolgens genomen? Hoeveel tijd zat hiertussen?
                  Oriënteren wat voor hypotheek u kon krijgen?
                        (optioneel) Op welke manier?

1.2 Heeft u in deze beginfase andere personen geraadpleegd?
            (optioneel) Wie waren dat?
            (optioneel) Hoe hebben zij u geholpen?

1.3 Woont u samen?
            (optioneel) wie nam het initiatief?

1.4 Kunt u uw nieuwe woning beschrijven?
            Waar? rijtjeshuis/vrijstaand/appartement, nieuwbouw?

1.5 Wat is de reden dat u voor een adviseur/EO heeft gekozen?
            (adviseur) Zou u uzelf vaardig genoeg verklaren om een hypotheek af te
            sluiten?
            (adviseur) Heeft u ooit overwogen de hypotheek zelf af te sluiten?
            (EO) Waarom heeft u besloten het zelf te doen?

Execution only
2.   Hypotheek vormgeven (EO)
2.1 Waar heeft u uw hypotheek afgesloten?
     Wanneer was dit?

2.2 Had u van tevoren bepaalde eisen of wensen voor uw hypotheek?
     Welke precies?

2.3 Bent u op enig moment verrast door de uitkomsten van de website?
     (hulp) Het maximale hypotheekbedrag, eigen inleg, extra kosten.
     (optioneel) U voelde u zich op dat moment?
          In hoeverre komt uw hypotheek overeen met uw verwachtingen?

2.4 Hoe voelde u zich tijdens het aanvragen van de hypotheek?
     Hoeveel vertrouwen gaf de website u?

2.5 Was het duidelijk waarom bepaalde documenten aangeleverd moesten worden?

2.6 Is er een moment geweest dat u zich niet helemaal zeker voelde bij een beslissing?
     (optioneel) Welk moment is dit geweest?
     (optioneel) Waarom voelde u zich niet zeker?
     (optioneel) Op welke manier heeft u deze onzekerheid opgelost?
     (optioneel) Op welke manier zou een adviseur in de situatie kunnen helpen?
     (hulp) Rentevast periode, annuitair/lineair, looptijd, verzekering,
     maandlasten kunnen betalen?.

2.7 Is uw kennis over hypotheken op enig moment getoetst?
     Hoe ging dat precies?
     Hoe voelde het om zo een test te doen?

2.8 Hoe efficiënt zou u dit gehele proces beschrijven?

3. Afronden hypotheek (EO)

3.1 Op welke manier heeft u uw gegevens gedeeld met de hypotheekverstrekker?
     Hoe is dat gegaan?

3.2 Zijn er op enig moment onduidelijkheden geweest?
     Hoe heeft u dat opgelost?

3.3 Hoe heeft u dit proces van documenten aanleveren ervaren?
     Was het duidelijk waarom dit moest?

4. Notaris (EO)

4.1 Hoe heeft u de notaris gevonden?

4.2 Heeft het gesprek met de notaris voor verrassingen gezorgd?
     (hulp) kosten, afspraak plannen.

4.3 Heeft u andere geraadpleegd?

4.4 Hoe heeft u de periode rondom de notaris ervaren?
     (hulp) onzekerheid.

4.5 Hoe voelde het om uw hypotheek goedgekeurd te hebben?

5. Beheer (EO)

5.1 Hoe denkt u nu over uw hypotheek?
> Kunt u in detail beschrijven wat voor hypotheek u heeft?
> (Lineair/annuïtair, NHG, rente, rentevast etc.)

5.2 Maakt u zich zorgen over uw hypotheek?
> (hulp) Huizenprijsdaling

5.3 Als er de komende tijd onduidelijkheden ontstaan, wie gaat u dan raadplegen?

Welke ervaring kan volgens u verbeterd worden?

Met advies

2. Hypotheek vormgeven (met advies)

2.1 Waar heeft u uw hypotheek afgesloten?
> Wanneer was dit?

2.2 Had u van tevoren bepaalde eisen of wensen voor uw hypotheek?
> Welke precies?

2.3 Hoe heeft u de adviseur gevonden?
> (intermediair) Waarom heeft u gekozen voor deze adviseur?
> (intermediair) Wat voor opties heeft de adviseur u gegeven?
> (intermediair) Hoe bent u daar mee om gegaan?
> (bank) Waarom heeft u gekozen voor deze adviseur?

2.4 Hoe voelde u zich tijdens de gesprekken met de adviseur?
> Hoeveel vertrouwen gaf de adviseur u?
> Hoe zou u de rol van de adviseur in uw proces omschrijven?

2.5 Bent u op enig moment verrast door de beslissingen van de adviseur?
> (hulp) Het maximale hypotheekbedrag, eigen inleg, extra kosten.
> (optioneel) U voelde u zich op dat moment?
> In hoeverre kwam uw hypotheek overeen met uw verwachtingen?

2.6 Welke communicatiemiddelen heeft u gebruikt met de adviseur?

2.7 Wat was uw rol tijdens het vormgeven van de hypotheek?
> In welke mate is deze rolverdeling u bevallen?

2.8 Bij welke keuzes heeft de adviseur u ondersteund?
> Hoe nuttig was deze hulp?
> (hulp) Rentevast periode, annuitair/lineair, looptijd, verzekeringen,maandlasten.

2.9 Is er een moment geweest dat u het niet eens was met de adviseur?
> (optioneel) Waarom was u het niet eens?
> (optioneel) Op welke manier heeft u dit opgelost?

2.10 Was het duidelijk waarom bepaalde documenten aangeleverd moesten worden?

2.11 Is uw kennis over hypotheken op enig moment getoetst?
        Hoe ging dat precies?
        Hoe voelde het om zo een test te doen?

2.12 Hoe efficiënt zou u dit proces beschrijven?

3. Afronden hypotheek (met advies)
3.1 Op welke manier heeft u uw gegevens gedeeld met de hypotheekverstrekker?
        Hoe is dat gegaan?

3.2 Zijn er op enig moment onduidelijkheden geweest?
        Hoe heeft u dat opgelost?

3.3 Hoe heeft u dit proces van documenten aanleveren ervaren?
        Was het duidelijk waarom dit moest?

4. Notaris (met advies)
4.1 Heeft het gesprek met de notaris voor verrassingen gezorgd?
        (hulp) kosten, afspraak plannen.

4.2 Heeft de adviseur u hierbij ondersteund?
        Heeft u andere geraadpleegd?

4.3 Hoe heeft u de periode rondom de notaris ervaren?

4.4 Hoe voelde het om uw hypotheek goedgekeurd te hebben?

5. Beheer (met advies)
5.1 Hoe denkt u nu over uw hypotheek?
        Kunt u in detail beschrijven wat voor hypotheek u heeft?
        (Lineair/annuïtair, NHG, rente, rentevast etc.)

5.2 Maakt u zich zorgen over uw hypotheek?
        (hulp) Huizenprijsdaling

5.3 Als er de komende tijd onduidelijkheden ontstaan, wie gaat u dan raadplegen?

Welke ervaring kan volgens u verbeterd worden?

Afsluiten
Dit was mijn laatste vraag, zijn er bepaalde onderwerpen die we niet behandeld hebben? Het onderzoek is anoniem zoals ik zal zei, mag ik je wel 5 korte vragen stellen zoals je leeftijd?

Appendix C (small sample of transcript)

Heb je zelf op websites gekeken? Ja op funda, op funda heb ik echt iedere ochtend op gekeken als ik wakker werd even de pagina verversen zeg maar.

Hoe ben je erachter gekomen wat je kon lenen? Ik heb gewoon met die man gezeten. Het is in principe zo dat je een tussenpersoon hebt. Die neemt je alles uit handen en kijkt gewoon heel eerlijk wat goed is voor jou, en tot hoe ver moet je gaan. Wat je vaak hebt bij een bank is dat je of een nummer gaat krijgen wat je wil, of dat ze moeilijk gaan doen over sommige dingen. Of dat ze teveel in hun eigen straatje gaan praten met als gevolg dat je een hypotheek hebt afgesloten waar je niks aan hebt. **Was je daar bang voor?** Ja best wel, ja zeker want je weet dat je geen voetbal koopt. En iedereen heeft er verstand van behalve jij. Dan heb je allemaal aktes van verpanding en de akte wordt gepasseerd allemaal woorden. Ik wist bij god niet wat ik moest tekenen. Dan is het heel fijn dat je iemand kan vertrouwen die echt voor jouw belangen opkomt als het ware.

Voor de adviseur moest ik 2000 euro aftikken, ik weet niet of ik dat nog kan terugkrijgen van de belasting? Maar goed, dan kom ik volgend jaar wel achter. Volgens mij kun je dat terugkrijgen. Of weet jij dat? Kan ik dat nog terugkrijgen?

Waarom ben je naar deze persoon gegaan? Ik kende die man. dus ik ben direct naar die man gegaan. Ik wist dat er een risico aan zat om na 3 jaar een huis te gaan kopen samen. Je weet wat er met relaties kan gebeuren, ik heb een hypotheek garantie afgesloten. Dat soort verzekeringen allemaal zeker. Dat je als iets hebt ingebouwd dat je niet met een restschuld komt te zitten.

Mijn vriendin moest aantonen dat ze hier echt woonde, een adres heeft. En daar deden ze ook allemaal moeilijk over. Het was wel lastig. Toen ze erachter kwamen dat ze een buitenlands paspoort had, wij hebben de hypotheek afgesloten bij Aegon, nou ja goed. ze hebben de hele contracten doorgespit. Daar zagen ze dat ze een nul uren contract had. Die wilde ik meenemen in de hypotheek in eerste instantie. Toen moesten ze ook de jaarsalarissen hebben van de afgelopen drie jaar van haar. En dan konden we toch weer wat meer lenen.

Waarom een hypotheek adviseur? Volgens mij was het op het moment dat ik een huis wilde kopen. toen zei een collega tegen mij: ja ik heb mijn hypotheek bij een tussenpersoon afgesloten. die mensen hebben er verstand van, die kunnen je verder helpen. En je ligt alles bij hun neer, hun pakken alles voor je op. Dat neemt echt zoveel uit je handen. Dat vond ik wel wat, dat blijft je dan bezig houden. Dan heb je er uiteindelijk veel minder kopzorgen bij. Dus toen heb ik uiteindelijk ervoor gekozen om dat maar bij een tussenpersoon te doen. En omdat ik wist dat de vader van die vriend van mij dat doet.

Heb je wel eens overwogen om het helemaal zelf te doen? Nou ja ik wist niet dat het geld zou kosten zeg maar. Dat zie je steeds meer bij verkopers. Ik denk dat het best wel te doen is joh, zelf naar de bank toe en dergelijke. Maar achteraf voor mij gezien was dit wel de beste oplossing denk ik. Ook omdat de hypotheekverstrekker behoorlijk achterdochtig was voor mijn gevoel. Omdat mijn vriendin een slowaakse afkomst heeft. **Omdat ze daar moeilijk over deden?** Ja ik weet niet, zo voelde het gewoon. Ze vroegen ook gewoon om een uren garantie zeg maar zwart op wit van haar baas. En dat ze zou regelen dat ze een intentieverklaring zou krijgen. Dat het echt de intentie is dat ze 15 uur per week krijgt ofzo.

Vertrouwen, **angst**, **onzekerheid**, **onprettig**

Appendix D (financial position questions)

CFPB FINANCIAL WELL-BEING SCALE
Questionnaire

NAME OR NUMBER

Part 1: How well does this statement describe you or your situation?

This statement describes me	Completely	Very well	Somewhat	Very little	Not at all
1. Because of my money situation, I feel like I will never have the things I want in life	☐	☐	☐	☐	☐
2. I am just getting by financially	☐	☐	☐	☐	☐
3. I am concerned that the money I have or will save won't last	☐	☐	☐	☐	☐

Part 2: How often does this statement apply to you?

This statement applies to me	Always	Often	Sometimes	Rarely	Never
4. I have money left over at the end of the month	☐	☐	☐	☐	☐
5. My finances control my life	☐	☐	☐	☐	☐

Appendix E (debt literacy questions)

Suppose you take out a EUR 1,000 personal loan from a bank and the interest rate you are charged is 20% per year compounded annually. If you did not pay anything off, at this inter- est rate, how many years would it take for the amount you owe to double? (i) 2 years, **(ii) less than 5 years** , (iii) 5 to 10 years, (iv) more than 10 years or (v) do not know.

Suppose you take out a EUR 3,0 0 0 personal loan from a bank. You repay a minimum amount of EUR 30 each month. At an annual percentage rate (APR) of 12% (or 1% per month), how many years would it take to clear your personalloan debt if you made no additional new charges? (i) less than 5 years, (ii) between 5 and 10 years, (iii) between 10 and 15 years, **(iv) continue to be in debt or** (v) do not know.

You purchase an appliance which costs EUR 1,0 0 0. To pay for this appliance, you are given the following two options: (a) Pay twelve monthly installments of EUR 100 each or (b) borrow at a 20% annual interest rate and pay back EUR 1,200 a year from now. Which is the more advantageous offer? (i) option (a), **(ii) option (b)** , (iii) they are the same or (iv) do not know.

HKJ
iemand beschrijven (1/2)

emoties. & Actief

actief

passief

bijnAAm geven :
tRAilerpArk boy

of

NL   vs   DuiTschud

YOLO

LEEFTIJD
0 ———————— 100

beroep uitbeelden?

vs

mobile active

HOBBY'S

LiNkEDiN
FACEBOOK
TWiTTER

kenns Social geld

Jij bent er
dus zo een:

pArty : vAAk
geld : weinig

geld: $ $ $
kennis: v v v v

omschrijf
jezelf in x
woorden.

ik ben zeg
maar echt
zo iemand...

pRofielen
1 2 3

DIPLOMA
MBO   vs   DIPLOMA
unt

jij bent er zo een:

FOOD

man | vrouw
Leeftijd

zeker
oneker

Facebook

LinkedIN

witter

HKJ
vertrouwen geven

ZWEER HET!

VERLEDEN ? TOEKOMST

TOEN DEDEN WE DIT?

VRIENDEN zeggen het..

doen man

DIPLOMA

mooi pand

T.V.
X heeft nieuwe aanpak;NL (i)

Reviews
(o) echt goed dit!
(:) mooi!

hand schudden.

BEDRIJF X
SINDS 1900

10

Achteraf betalen €€€

DIY
↳ support expert nodig?

een expert heeft het gecheckt

STAPPEN UITLEGGEN

12 mensen in jouw buurt deden hetzelfde

1
2
3
4
5
FINISH

HKJ
Iets aanraden

WAT?

ALLEEN WAT
KAN.

Adviseur
Aan tafel

VW

VOLVO

FERRARI

beste keuze
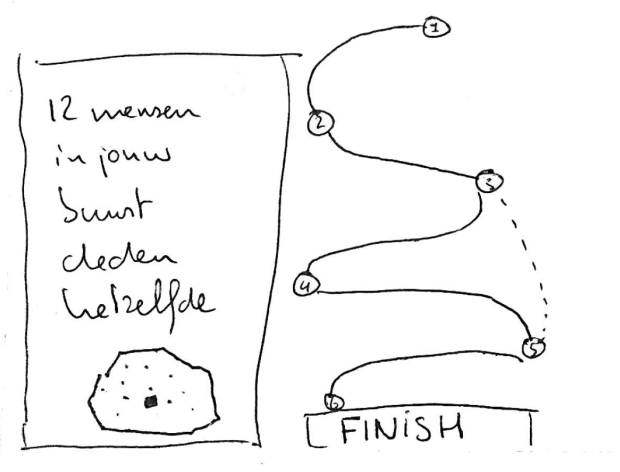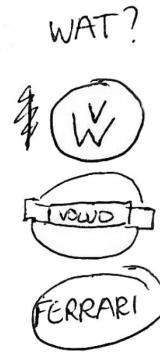
☐ 156 andere mensen kiezen dit
☐ 4 vrienden kiezen dit
☐ goedkoopste

wat wil je echt?
↓
aha, nu snap
ik je echte behoefte!
...

$

Voorbeeld
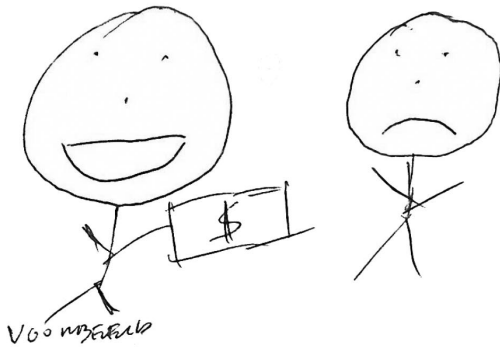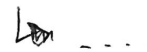
PROBEER HET NU.

1 MAAND PROEF.

tablet/smartph.

GAME
Sociykeuzen kiezen
①
②
③
④

Ziekenhuis

Kantine
Koffie

1 2 3.

VRAAg! bordje

whatsappe

Pensioen
wacht

2 WOORDEN
g LETTERS.

BORDSPEL
KEUZE
KEUZE7
KEUZE

PEERS → 99%
DOET DIT.

Voicemail

UITKOMST.

VRAAG3.

VRAAG2.

VRAAG 1.

| 1 | 2 | 3 | 4 | 5 |

SPEURTOCHT

vraag 1
vraag 2
vraag 3

elke dag een
brief sturen

?

VRAAG 1.

!

?

Speakers

kies er 14
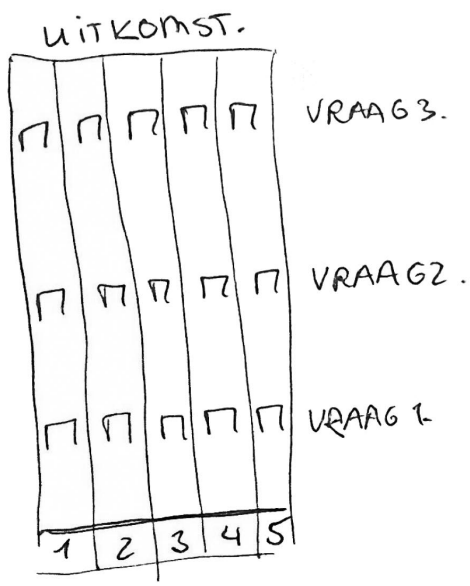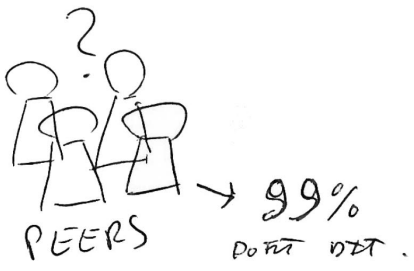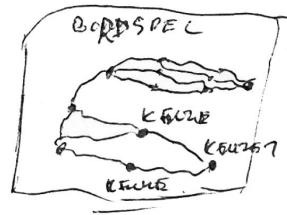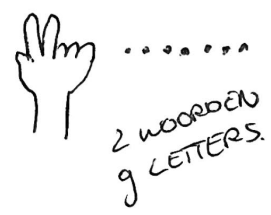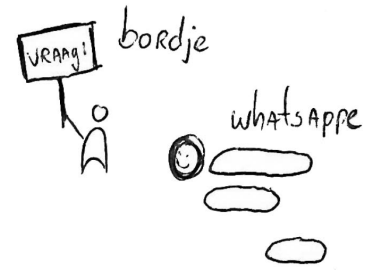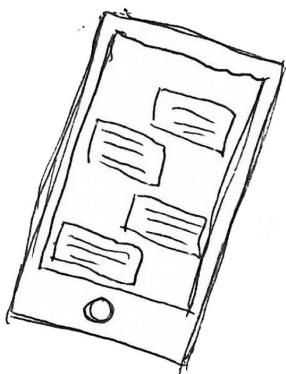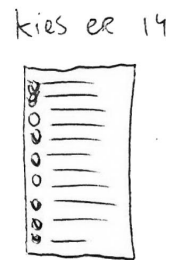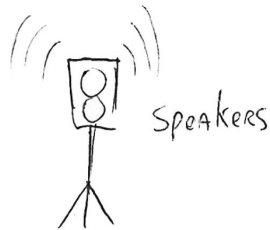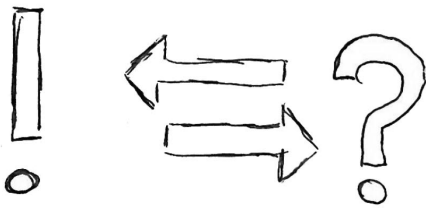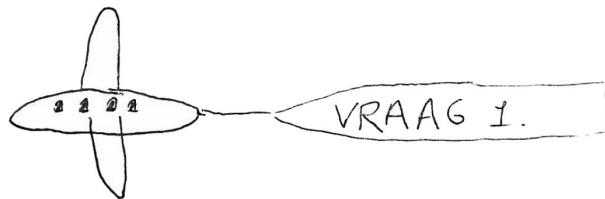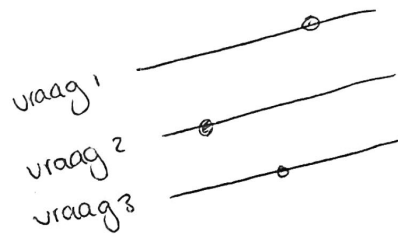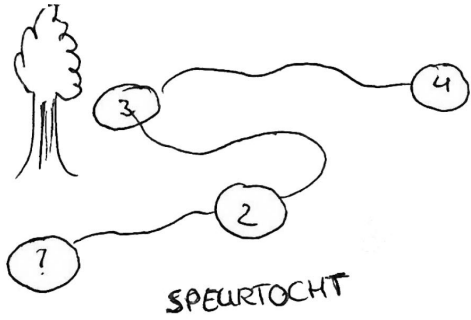
VRAGen
CAdeAu doen

jeey weef een
VRAAg gekregen!

HKJ
waarschuwen

Roepen: kijk uit!

"PAS OP" bord

WARM worden

stroomschok

Rook signaal

ALARM

iemand langssturen

LAMP branden

Rode kleur

Later zien wat er fout kan gaan

lampen in de kamer aan

muziek

HKJ
begrijpen
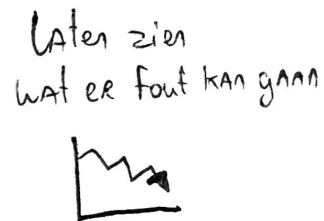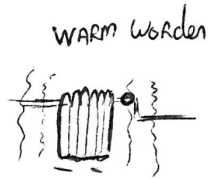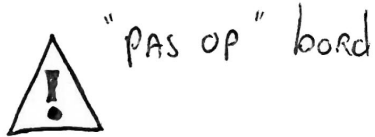
Mee Kijken

Mee gluren

wat doe je?

VRAGen

Het zelf
proberen

workshop

Lezen

College
volgen
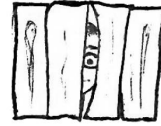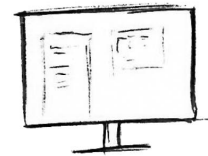
Zelf Research
doen

HKJ
leuker maken
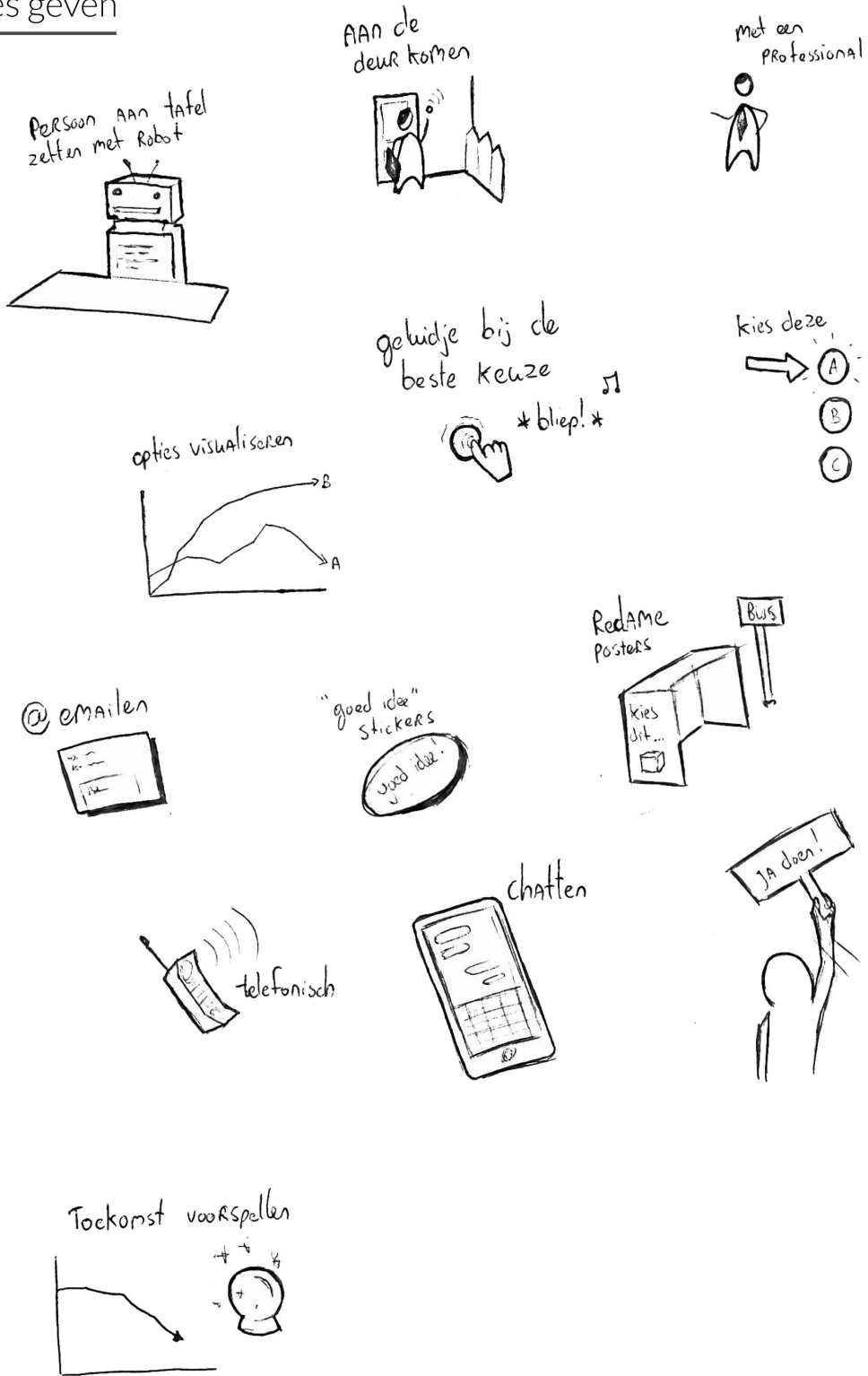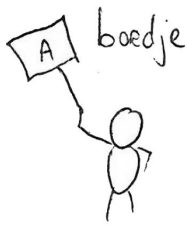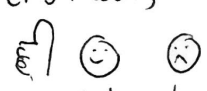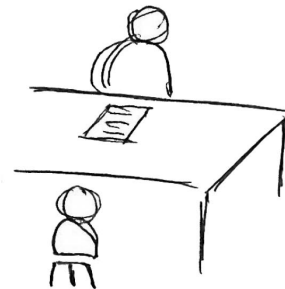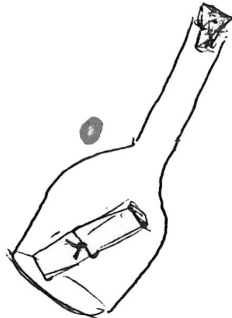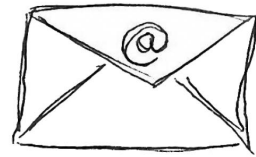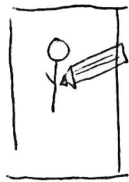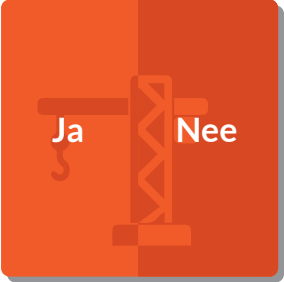
Highscore
1. ~~~
2. ~~
3. ~~

Prijzen winnen

Delen met Anderen

muziek

Samen doen

Ballonnen

Achievements (Gamification)

geld bonus

eten toevoegen

€€€ ↓ goedkoper

HA HA HA
grappen maken

Customization

Brief Sturen (onverwachts)

Persoonlijk maken

Zelf dingen doen

HKJ
advies geven

Persoon aan tafel
zetten met Robot

aan de
deur komen

met een
Professional

opties visualiseren

geluidje bij de
beste keuze

bliep!

kies deze

A

B

C

@ emailen

"goed idee"
stickers

goed idee

Reclame
posters

Bus

kies
dit...

telefonisch

chatten

Ja doen!

Toekomst voorspellen

HKJ
een vraag beantwoorden

2 lettergrepen
1 woord.
↳ fluisteren
Ssst...

schreeuwen A
B

boodje

bla
bla
bla
oké
bedankt

knop drukken

A P C

emoticoons
ok leuk stom

@

Appendix F (final prototype)

> Welkom in de chat! Om je goed advies te kunnen geven, heb ik iets meer informatie van je nodig.

> Je kunt de chat op elk moment verlaten. Wij praten alleen wanneer het jou uitkomt!

> Ben je er klaar voor?

Ja   nee

Ja

Alleen kopen   **Vast contract**

Geen pensioen <10 jaar   **Huurhuis nu**

Woning gevonden   **Nieuw-bouw**

Leenbedrag

212k ⟷ 236k

Je hebt nog niet genoeg vragen beantwoord in de chat voor een goed advies.

✓ Werkgevers-verklaring   ✗ Taxatie-rapport

✓ Identiteits-bewijs   ✓ Offerte

WoonBot
Snel en eenvoudig hypotheekadvies

Wat voor dienst-verband heb je?

Vast — Tijdelijk

Heb je al een woning op het oog?

Ja — Nee

Welkom Jan, ik ga je helpen de juiste keuzes te maken voor je hypotheek. Daarvoor heb ik wel wat informatie nodig van jou.

Laten we eerst eens oriënteren wat je wilt.

Ok!

Ga je binnen 10 jaar met pensioen?

Ja — Nee

Wil je extra geld inleggen?

Ja — Nee

Met wie ga je de woning kopen?

Alleen — Samen

Wordt dit jouw eerste koopwoning?

Ja — Nee

Klopt dit?

Alleen kopen	Vast contract
Geen pensioen <10 jaar	Huurhuis nu
Woning gevonden	extra inleg

Ja!

Nee, wijzig

Wil je een eerst een snelle proefberekening doen om te kijken wat je ongeveer kunt lenen of wil je direct starten met de persoonlijke berekening?

(Proefberekening)

(Persoonlijke berekening)

Om je goed te kunnen helpen heb ik ook wat financiële gegevens van je nodig.

Met Ockto kun je gemakkelijk je gegevens invoeren zoals je inkomen en leningen.

(**Gebruik Ockto**)

Vul handmatig in

Wat is de waarde van je nieuwe woning?

240.000

(**Verder**)

1	2	3	4	5	6	7	8	9	0
-	/	:	;	(	)	$	&	@	"

#+=	.	,	?	!	'	⌫

ABC	space	return

DigiD

Gebruikersnaam

Wachtwoord

(Login)

Op basis van je inkomen en de woningwaarde kun jij het volgende bedrag lenen:

200k ⟷ 240k

Zodra ik meer van jou weet kan ik je een nauwkeuriger bedrag geven.

⌄

●●○○○ KPN NL 4G 10:13 ⚹ 86% 🔋
‹ **OCKTO**
✓ ✓ ✓

Klik op een onderdeel om te zien welke gegevens tot nu zijn verzameld?

Jouw gegevens

⌄ 2 Personen

⌄ 1 Inkomen

⌄ 3 Pensioenen

⌄ 0 Uitgaven

⌄ 0 Bezittingen

⌄ 1 Schuld

⌄

In de chat kunnen wij elkaar beter leren kennen.

Zullen we gelijk starten?

(Ok!)

Naar dashboard

Column 1 (chat)

Ben je van plan carrière te maken?

[Ja]   [nee]

Ja

Hoeveel verwacht je per maand meer te verdienen over 5 jaar?

600

Hoeveel dagen per week werk je?

[1] [2] [3] [4] [5]

5

Hoeveel dagen per week wil je werken over 5 jaar?

[1] [2] [3] [4] [5]

4

Kun je bij de volgende vragen aangeven in hoeverre je het hier mee eens bent?

"Mijn financiële situatie laat toe dat ik de dingen kan doen die ik wil doen."

[Sterk eens] [Eens] [Neutraal] [Oneens] [Sterk oneens]

Eens

"Ik kan financieel net rondkomen."

[Sterk eens] [Eens] [Neutraal] [Oneens] [Sterk oneens]

Sterk oneens

Gefeliciteerd, je hebt 25% van de vragen beantwoord! Wil je jouw voorlopige advies zien of liever doorgaan?

[Advies]   [Doorgaan]

Advies

Column 2

Rentevastperiode

12 ⟵⟶ 18

Je hebt nog niet genoeg vragen beantwoord in de chat voor een goed advies.

⌄

Aflosvorm

Lineair

Je hebt genoeg vragen beantwoord voor dit advies. Wil je deze optie vastzetten?

(Vastzetten)

⌄

Zo zou jouw hypotheek er op dit moment uitzien:

Leningbedrag: **212k-236k**
Maandlasten: **700-800**
Looptijd: **30 jaar**

Rentevast: **12-18 jaar**
Rente: **2.3 %** (o.b.v Munt)

(Verder chatten)

Naar aanbod

Column 3

Zo ziet jouw hypotheek eruit:

Leningbedrag: **230k**
Maandlasten: **780**
Looptijd: **30 jaar**

Rentevast: **15 jaar**
87% van de mensen met een vergelijkbare situatie als jij kiest dezelfde rentevastperiode

Rente: **2.3 %** (o.b.v Munt)

Appendix H (user study questions)

Visueel onderzoek
Email uitnodiging
Beste deelnemer, in dit onderzoek wordt een nieuwe manier van een hypotheek afsluiten getest. Deze demo werkt op een desktop maar het gebruik van een smartphone is aangeraden. In deze demo zijn alle keuzes al gemaakt, het is alleen mogelijk om van scherm naar scherm te gaan.

Het zal ongeveer 10 minuten duren.

Context
Je bent een starter op de woningmarkt. Je hebt al een huis op het oog maar weet nog niet goed welke keuzes je moet maken wat betreft de aflossingsvorm bijvoorbeeld.

Opdracht
Loop zoveel mogelijk schermen door om een compleet beeld te krijgen van de applicatie. Zodra het is gelukt om een fictieve aanvraag voor een hypotheek in te dienen is de demo afgelopen. Deze stap bevindt zich onderaan de adviespagina.

Link naar demo: https://invis.io/U3C1RJOJH#/237241638_Screen_0-pdf_1

Vul de vragenlijst in.

Link naar vragenlijst: https://goo.gl/forms/FSBjyIpe7oaA0VT92

Mocht je vragen hebben dan hoor ik het graag.

Dankjewel voor je deelname!

Met vriendelijke groet,

Dennis Boesser

Vragenlijst
1. Zelf zoeken
2. Hulp
3. Flexibiliteit
4. Vertrouwen
5. Bescherming
6. Bevestiging
7. Duidelijkheid
8. Overzicht

1. Ik heb de instructies van de e-mail gelezen.
2. Ik heb de demo doorlopen.
2. Ik doe deze test op: Smartphone/desktop

1. Ik verwacht dat deze applicatie mij alle informatie gaat geven wat betreft hypotheken.
   Als deze applicatie niet al mijn hypotheek vragen kan beantwoorden ben ik teleurgesteld.
2. De applicatie biedt alle hulp die ik nodig heb.
   Ik heb het gevoel dat ik geholpen ben.
3. Ik zou deze applicatie alleen gebruiken op een vast moment van de dag.
   Ik voel mij vrij deze applicatie te gebruiken wanneer mij het uitkomt.
4. Ik vertrouw het advies van deze applicatie
   Ik heb het gevoel dat er misbruik wordt gemaakt van mijn informatie.
5. Deze applicatie beschermt mij tegen het maken van fouten in het hypotheekproces.
   De applicatie voelt als een veilige omgeving.
6. Ik krijg bevestiging of ik mijn woning kan kopen.
   Uiteindelijk weet ik nog steeds niet hoe mijn hypotheek eruit gaat zien.
7. De informatie in de applicatie is duidelijk.
   Het is niet duidelijk wat de applicatie doet.
8. De applicatie is overzichtelijk.
   Ik weet goed wat er nog moet gebeuren om mijn hypotheek rond te krijgen.

Extra
1. Ik zou het prettig vinden om op deze manier een hypotheek af te sluiten.
2. Ik zou deze manier van een hypotheek afsluiten aanbevelen bij vrienden.
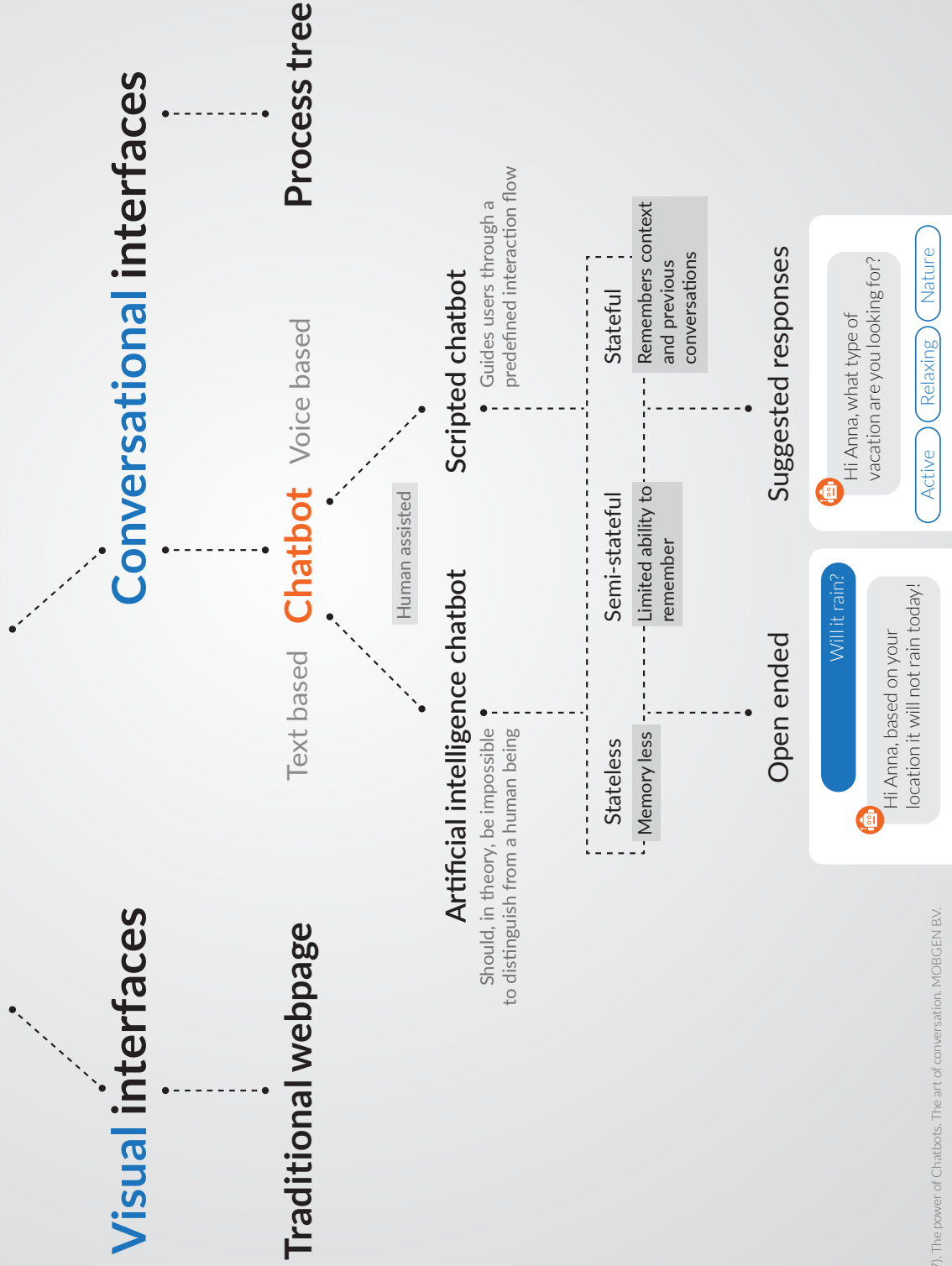
Appendix I (user study correlation table)

Correlations

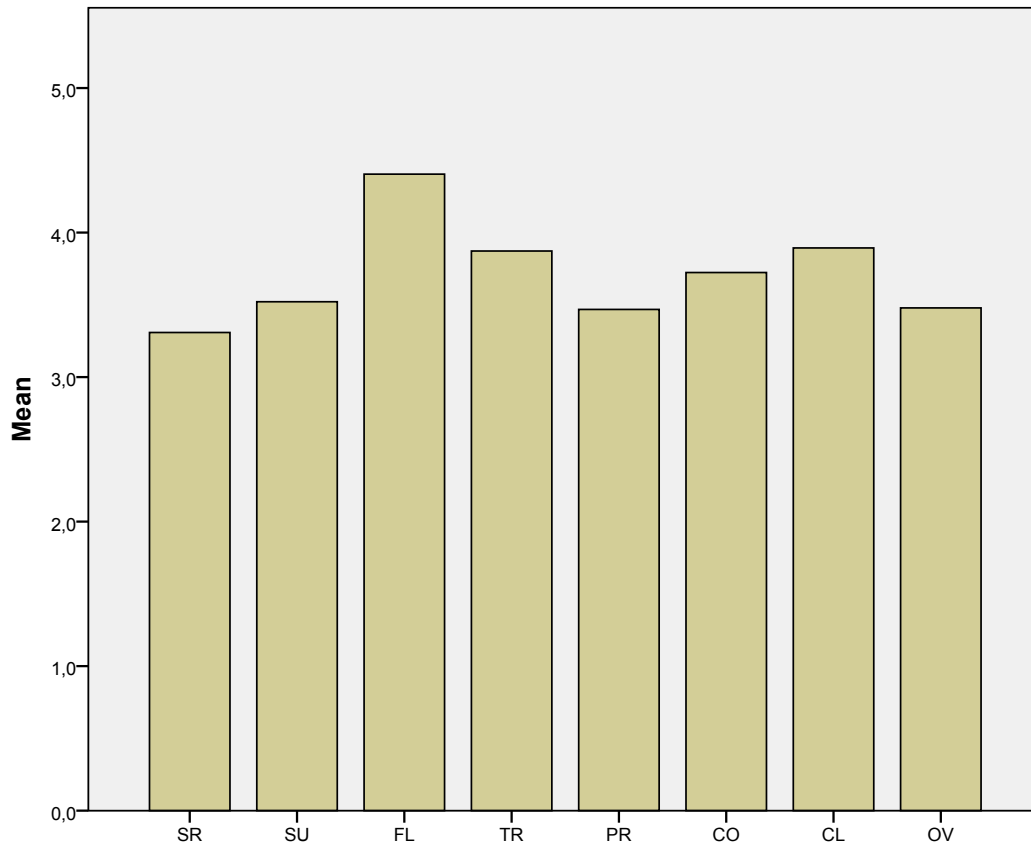|		1=male, 2=female	Age	Education	SR	SU
1=male, 2=female	Pearson Correlation	1	,197	-,027	,151	-,011
	Sig. (2-tailed)		,183	,857	,311	,941
	N	47	47	47	47	47
Age	Pearson Correlation	,197	1	,057	,105	-,040
	Sig. (2-tailed)	,183		,705	,482	,787
	N	47	47	47	47	47
Education	Pearson Correlation	-,027	,057	1	-,194	-,215
	Sig. (2-tailed)	,857	,705		,192	,146
	N	47	47	47	47	47
SR	Pearson Correlation	,151	,105	-,194	1	,574**
	Sig. (2-tailed)	,311	,482	,192		,000
	N	47	47	47	47	47
SU	Pearson Correlation	-,011	-,040	-,215	,574**	1
	Sig. (2-tailed)	,941	,787	,146	,000	
	N	47	47	47	47	47
FL	Pearson Correlation	,134	,252	,207	-,076	-,006
	Sig. (2-tailed)	,369	,088	,162	,611	,968
	N	47	47	47	47	47
TR	Pearson Correlation	-,104	,275	,040	,085	,237
	Sig. (2-tailed)	,485	,061	,789	,569	,109
	N	47	47	47	47	47
PR	Pearson Correlation	,058	-,163	-,250	,404**	,572**
	Sig. (2-tailed)	,696	,274	,090	,005	,000
	N	47	47	47	47	47
CO	Pearson Correlation	-,041	,112	,050	,072	,124
	Sig. (2-tailed)	,786	,455	,739	,630	,405
	N	47	47	47	47	47
CL	Pearson Correlation	-,026	-,005	-,048	,305*	,534**
	Sig. (2-tailed)	,861	,974	,751	,037	,000
	N	47	47	47	47	47
OV	Pearson Correlation	,051	-,261	-,207	,473**	,432**
	Sig. (2-tailed)	,731	,076	,163	,001	,002
	N	47	47	47	47	47

Appendix J (different types of chatbots)

Before a company decides to implement a chatbot in the current customer journey, it should keep in mind that chatbots exist in many different varieties. This overview will hopefully make it easier to decide which type of Chatbot fits the company best. An overlap between elements is very common.

What is a Chatbot?

Visual interfaces

Conversational interfaces

Traditional webpage

Text based **Chatbot** Voice based

Process tree

Human assisted

Artificial intelligence chatbot
Should, in theory, be impossible to distinguish from a human being

Scripted chatbot
Guides users through a predefined interaction flow

Stateless
Memory less

Semi-stateful
Limited ability to remember

Stateful
Remembers context and previous conversations

Open ended

Suggested responses

Will it rain?

Hi Anna, based on your location it will not rain today!

Hi Anna, what type of vacation are you looking for?

Active Relaxing Nature

Appendix K (user study other tables)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
TrustBot1	47	1	5	3,45	,904	-,664	,347
TrustBot2	47	2	5	3,57	,903	-,325	,347
TrustBot3	47	1	5	3,77	,983	-,794	,347
Valid N (listwise)	47						

Descriptive Statistics

	Kurtosis	
	Statistic	Std. Error
TrustBot1	,005	,681
TrustBot2	-,602	,681
TrustBot3	,331	,681
Valid N (listwise)		