

Designing a mobile application interface to support mid-career professionals in creating better financial futures

by

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Abstract

South Africans borrow more and save less than other nations (Discovery Bank, 2018). One reason is a lack of financial knowledge. If a mobile application could guide individuals to modify their financial habits slightly by spending less and saving more, they could dramatically improve their financial future.

When designing visualisation systems such as a mobile application interface, users' qualitative design feedback and quantitative usability evaluation are both important and complementary. The benefit of usability feedback in software development is undisputed. The importance of qualitative design feedback from users however, seems to be controversial in Science. Gathering users' qualitative design feedback, ahead of usability evaluation, can have a substantial impact on downstream development costs.

The researcher used design as a tool for thinking (imagining new possibilities) and communicating (sharing ideas). The purpose was to clarify ways in which a mobile application interface could support users in making better financial decisions and creating better financial futures for themselves and consequently for society.

A user centred design (UCD) approach was followed, emphasising design before development, with a strong focus on user involvement in all three phases, namely requirements gathering, design and evaluation. A primary client archetype for mid-career professionals was developed, split into two personas, Alan and Zoe, based on personality and self-rated motivational attributes which were used in an unconventional way to inspire two parallel, diverse designs.

In early design stages, before an idea is well formed, producing multiple contrasting designs in parallel and qualitative design feedback from users is beneficial to establishing utility (solving the right problem), tapping into users' domain knowledge, improving the quality of the design and reducing fixation on one idea. Once the concept has been socialised and evolved sufficiently with users' input, converging on one final design and testing usability (solving the problem in the right way) become more important.

This research offers two refinements of the UCD process guidelines for the benefit of researchers and practitioners.

Key Words

Design; visual design; interaction design; visualisation systems; mobile application interface; user-centred design (UCD); user-centred design process; utility; usability; persona; parallel design; prototype; human computer interaction (HCI); financial planning decisions; financial habits

Declaration

I, the undersigned, Audrey Pentz, hereby declare that the thesis submitted for the degree of Masters in Science in Data Science, at the University of Cape Town, is my own original work and has not been previously submitted to any other institution of higher education. I know the meaning of plagiarism and declare that all of the work in the document, save for that which is properly acknowledged, is my own work.

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Chapter 1: Background to the Research

1.1. Introduction

In this chapter the researcher introduces the problem that people borrow and spend too much and save too little; states the research question to explore how designing a mobile application can help; explains the approach using UCD; outlines the scope and limitations of the research and its contribution and impact. It ends with a chapter outline of how the thesis is organised.

South Africans borrow more and save less than other nations (Discovery Bank, 2018). If individuals could modify their financial habits slightly, they could dramatically improve their financial futures and reduce the risk of not being able to meet their financial obligations.

People make irrational financial decisions due to a lack of financial awareness and education and behavioural biases, leading to lower savings and investment rates and an under provision for unforeseen life events and retirement. Five financial behaviours explain 80% of credit default risk and why people do not have sufficient retirement savings. These are: spending more than they earn, not saving regularly, not being insured for adverse events, not paying off property debt and not investing in the long term.

There are many factors that determine the financial needs of individuals. One factor is whether their earnings amount and frequency pattern is regular or irregular as this determines the degree of planning possible, such as drawing up a budget. Another factor is their family situation, whether they are the sole or a joint provider and the number of dependants that rely on the income, as this impacts on the type of risks they are all exposed to regarding loss of income. Phase of life also plays an important role in determining the individual's immediate and future needs. An individual's financial needs and goals also change over time according to their life-stage and financial prosperity. An individual could have needs that span multiple life stages, so the life stage segregation is not linear and not only dependent on the individual's age and income.

For example, when starting out in life, the individual's main priority is to save and should be to: 1) live within their means (spend less than they earn); 2) track their spending against a budget (know where it's going); and 3) save towards some personal goals such as creating an emergency fund for unforeseen events, saving for a holiday or a wedding or a deposit on a car or home. Once the individual's life becomes more complicated (which includes marriage, children, elderly parents, loans or investments, for example) or there is the possibility of excess income to invest, financial planning and advice becomes increasingly important and complex.

Therefore, financial planning problems are often complex to solve, with many moving parts to consider. Added to the complexity of the task are human factors, such as confronting fears about money and establishing a trusting relationship with a financial planning expert.

Financial Advisors are graduate-level professionals that offer financial advice to individuals and businesses, spanning budgeting, tax, investments, insurance and estate-planning domains. They use their domain knowledge to tailor their advice to an individual's specific financial needs. Since advisors have a finite amount of time available to spend with clients, they rationally prioritise individuals that will earn them more commission (*cherry pick* based on value), leaving the affluent to high-income client largely under-served. This behaviour has earned them a poor reputation in the industry for not

having their client's best interests at heart and a lack of trust from more financially astute individuals (Cull, 2009).

Technology advancements have paved the way to new operating models such as self-service through Robo-Advisors, where a chatbot guides one to select the most appropriate investment, customised to your specific needs (at least for individuals with less sophisticated needs). One study found that robo-advisors will probably augment, not replace, human advisors in the future given the emotions that go with financial investment and the need for empathy (Coombs & Redman, 2018).

Mobile devices have become ubiquitous in society. For a mobile application to be useful, it should demonstrate both utility and usability. Utility is the extent to which it provides the features the user needs. Usability is the extent to which it is easy and pleasant to use those features. In the scientific community, there has been an evolution in software engineering to include usability testing as a primary measure of success but even with the most usable features, if the software does not provide the features a user needs, they will not use it more than once.

Mobile application development is expensive. Mobile Application (App) building company, *Fueled*, estimates the cost of a minimum viable product (MVP) at between \$100,000 and \$150,000 (Saurabh Kumar, 2019). For a start up, they estimate seed capital at between \$250,000 and \$500,000 to operate the company for the first six months and a further \$500,000 to \$1,000,000 for the following twelve months. Therefore, getting the App development right first time is crucial to manage costs.

All six of the main banks in South Africa have a mobile banking App (namely, ABSA, Capitec, FNB, Investec, Nedbank and Standard Bank). The focus of the build to date has mainly been on automating existing processes and enabling clients to self-serve instead of having to go to a branch or call their private banker. Automating existing processes adds speed and therefore efficiency. Enabling clients to self-serve through the App, decreases the long-term cost to the bank in the form of reduced staff and branches needed. Both could increase the convenience to clients, enhancing the client experience and making it more pleasurable to do banking.

Mobile application development has the unique characteristic of minimal screen size which amplifies the need to prioritise which features are built. It is very important to ensure that the prioritisation of potential features is done from the end-user's point of view (to ensure utility) and not based on development time or cost or other factors that are not important to end-users. Designing tangible representations for the user to consider, is a possible solution to help clarify user requirements expressed, further develop ideas, and rank each feature's importance to the user in completing their tasks and accomplishing their goals.

1.2. Aims and Research Question

The aim of this research is to design a relevant and useful mobile application interface prototype that supports people in making better financial decisions. They should be able to access information about their financial position and be guided to borrow and spend less and to save more, through promoting financial awareness and education. The application should help them to imagine possibilities for how they could improve their financial futures by making it easy to form new and good financial habits.

A successful design is one that supports complex daily financial planning decisions and shifts the control and accountability from expert professional advisors to users, by coaching them on how to improve their financial planning decisions.

The main focus of mobile application development to date has been on its usability to its audience. Whilst this is very important, if the utility (building the right features) has not been established when development work starts, rework is inevitable and can have a substantial impact on already high costs. By confirming utility through design, ahead of development, this rework can be reduced or avoided completely along with the associated costs.

The primary research question is:

In what ways can a mobile application support mid-career professionals to create better financial futures?

The sub question of the research is:

In what ways can the use of diverse parallel designs benefit design studies?

1.3. Approach

The researcher positions this research as a visual design study which adopts a UCD approach. The emphasis is more on visual design than on interaction design for usability, but both are intertwined and this is evidenced in the literature review. The research also explores and critiques the design of eight existing mobile applications available globally, for their strengths and opportunities for improvement.

The UCD process advocates that end users and domain experts are included throughout the requirements gathering, design and evaluation phases (Interaction Design Foundation, 2019). As part of data collection, the user sample includes six mid-career professionals and two financial planning experts that are work colleagues at one of the six main South African banks (selected using convenience sampling).

Personas are generally used to assist designers to empathise with life-like user attributes in order to make design decisions. Instead of creating one persona for mid-career professionals for the purpose of making design decisions, the researcher used personas in an unconventional way. The primary persona for the mid-career professional was assigned the income profile, financial needs and financial literacy attributes of users to make the financial planning solutions realistic. The primary persona was then split into two sub-personas, to amplify the personality and behavioural aspects of two different types of users within the same mid-career professional persona. The two sub-personas were used in an unconventional way to inspire two diverse design solutions. Design A was created for the first persona named Alan and Design Z for the second persona named Zoe. A summary follows and there is a more detailed discussion in Chapter 3.

Persona Alan is conservative, methodical, organised and practical. Alan is highly motivated by price and his goals are to pay for his children's education, to enjoy family holidays and to retire comfortably. His main frustrations with his bank are that he is not getting the proactive service and advice he is paying for and that his time is limited, and his finances appear fragmented and require considerable and regular effort on his part to analyse his financial situation and make appropriate changes.

In contrast, Persona Zoe is energetic, modern, social and caring. She is less motivated by price and more motivated by choice, novelty and her impact on society and the environment. Her goals are to make a difference in the world, to keep fit and healthy, to keep learning new things and to save enough to enjoy her retirement.

The personas are presented in summary infographic form in Figure 1 below:

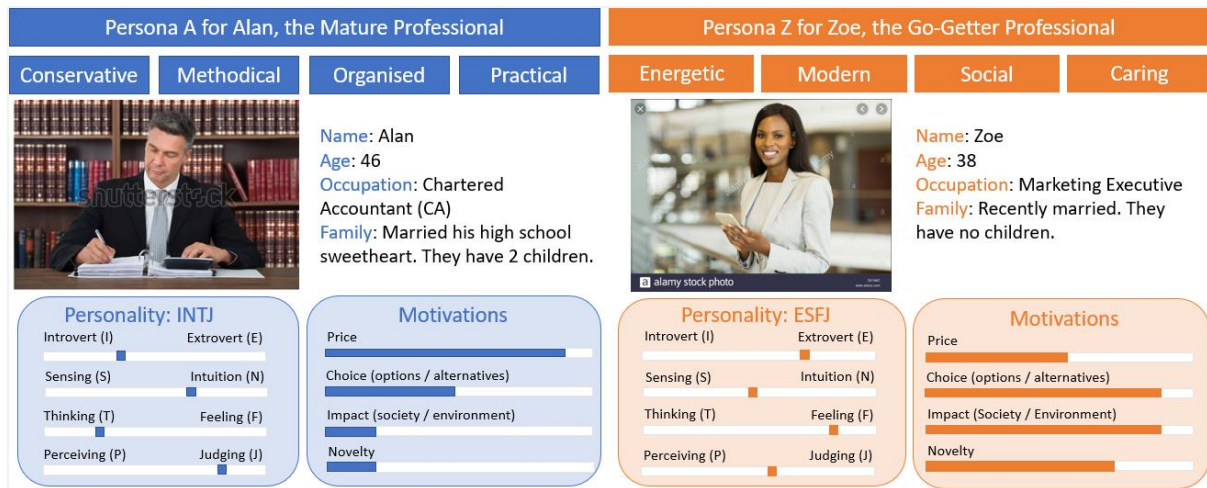


Figure 1: Summarised Personas to inspire diverse designs

Next, themes were matched from three sources: existing mobile applications, financial planning experts' opinions on best practice and user feedback to prioritise three main sections of work to focus on in this research. Creating user stories is a technique which falls within the Agile Methodology of software development that expresses a summary of a chunk of work from the users' perspective. Here user stories were used for the primary purpose of separating the three chunks of work, namely 1) Overview; 2) Spending and Saving; and 3) Retirement but they may represent sets of user stories, depending on the size of the development team and the speed at which they can develop.

The design process incorporates two design iterations, namely an initial and final design. Each of the designs contains three sections, one for each user story. The focus of the initial design was to communicate and clarify the concepts to the users and explore the ideas and alternatives with them. Both prototypes are low fidelity digital prototypes with no functionality but with rich designs and affordances (visual cues such as visual representations of icons and buttons) as to how they might function.

To get from initial to final design, there was one evaluation round with users. The evaluation follows the user-inquiry method using a semi-structured interview with each of six users and two financial planning experts. Whilst the initial designs are detailed, this method is justified by the low fidelity nature of the designs, from an interaction perspective. The focus of the evaluation was three-fold: first to test the ideas and concept presented and whether users thought it would be useful and whether they thought they would use it (utility); second to test whether users thought they could access the information or achieve their goals effectively and efficiently and to pick up any potential imagined usability problems with the designs; and thirdly to evaluate which design users preferred and their reasons for their choices.

1.4. Scope and Limitations

Included in the scope is clarity on which concepts these users say they find useful and which designs they prefer. A detailed final design was recommended but it was not a functioning interactive prototype. The implication is that whilst interaction design principles are incorporated in the design to help users imagine how it might work, measures such as formal usability testing using experts and quantitative testing are beyond the scope of the study. The evaluation is predominantly qualitative. The next step would be for a financial institution to build a functioning prototype and conduct formal quantitative usability testing.

The scope is limited to people with a particular financial profile that are likely to have similar financial goals and needs. The financial profile chosen was that of professional people employed by a corporate who are mid-career and earn a monthly salary. It excludes entrepreneurs who are likely to be self-employed and have variable earnings as these people would have different income profiles and financial needs. It excludes people that are in the early stages of their career as these people would have different financial needs and priorities. It excludes people who are poor or do not work or do not get involved in managing the household finances, as a basic level of financial literacy is assumed for this persona. Different financial needs, priorities and degrees of financial literacy may require a different design. The intention is not to exclude people with valid financial needs but to reduce the financial planning scope and complexity for the purposes of this study. The scope could be expanded by a researcher or financial institution that wishes to build the mobile application interface.

Specific product selections are deliberately excluded from the designs to ensure that the focus remains on the users and their needs and not on the myriad financial products available on the market. The recommended product selections should be added in the interactive prototyping phase, which would follow.

The user sample of six mid-career professionals and two financial planning experts was selected using convenience sampling from work colleagues at one of the six main South African banks. A limitation of this research is that the users were all known to the researcher prior to the study and it is possible that users may have answered differently had they been interviewed by someone not known to them.

1.5. Contribution and Impact

The contribution to researchers is in the refinement of two user-centred design (UCD) process guidelines: firstly, to incorporate multiple parallel designs into the initial low fidelity prototyping phase instead of only one design; and, secondly, in the unconventional use of personas to inspire these diverse designs.

The impact of this visualisation system on the financial planning and wealth management industries if built, is in the transfer of knowledge and accountability for decision making from the professional advisors to individuals. By enabling individuals to easily track the long-term outcomes of their financial decisions made today, they are better equipped to improve their financial futures. If they are better equipped, they can gain the confidence needed to move towards reduced human assistance and self-service.

Advisory businesses could also improve the information gathering process. Collecting income and expenditure and balance sheet information is standard practice for all new clients and using automation to aggregate this information for them would speed up the decision-making process for the advisor when preparing recommendations to clients.

The benefit to financial planning and wealth management firms, is to be able to segment their service offering by freeing up expensive, highly skilled people resources to shift to an oversight role for these currently under-serviced individuals and to focus on more complex cases. This enables growth in the mid-career professional segment through increased capacity at lower long-term cost. Secondly, the visualisation system is a selling point to attract new young, up-and-coming professional clients. The benefit to society is less of a burden on the state and extended family.

1.6. Organisation of the thesis

The thesis is organised as follows:

Chapter 1 was background on the problem of people borrowing and spending too much and saving too little and the positioning of a mobile application interface to solve the problem using a UCD approach.

Chapter 2 is the Literature Review which compares design studies and usability studies; highlights two successful case studies using UCD for mobile application interface design and development; and evaluates eight applications relevant to digital banking and financial planning.

Chapter 3 is the Design Methodology which explains and justifies the use of a slightly modified UCD process and other methods chosen for this study, and how they led to the initial and final designs produced.

Chapter 4 introduces and explains the initial designs. The initial designs are the first design output of applying the Design Methodology in Chapter 3.

Chapter 5 is Results and deals with the evaluation of the initial design based on users' feedback and ends with a final design as a second output of the Design Methodology in Chapter 3.

Chapter 6 is a Discussion and Reflection which answers the research question and sub question and reflects on lessons learnt from applying the iterative UCD process.

Chapter 7 offers a short Conclusion to end the research report.

1.7. Conclusion to Chapter 1 and Introduction to Chapter 2

In Chapter 1, the scene was set to describe the problem that people borrow and spend too much and save too little and that by moderating their financial habits slightly, they could dramatically improve their financial futures. The research question and sub question were stated, and a successful solution was described as a design of a mobile application interface that supports complex daily financial planning decisions and coaches users on how to improve their financial decisions. Scope and limitations were outlined and contribution and impact discussed.

Chapter 2 which follows, is a review of the literature useful to this study. It covers the similarities and differences between design studies and usability studies and why both are important and complementary. It presents two case studies for successful mobile application development and compares eight financial planning mobile interfaces, through a design lens.

Chapter 2: Literature Review and Financial Planning Mobile Applications

2.1. Introduction

In this chapter, the factors that result in poor financial outcomes for people are explored, followed by what constitutes a design study and how it complements usability research and why both are important. This study is positioned as a design study, with usability evaluation out of scope for the study but to follow if the design is to be commercialised. Then two successful case studies for designing and building new mobile application interfaces using UCD are examined for their strengths and learnings. Next, visualisation design principles and usability design principles are covered briefly as these were applied in generating the designs. The chapter goes on to analyse the current landscape of personal financial planning applications available, through a visual design lens, for ideas to build on in this study (augmented with users' feedback throughout).

2.2. Factors that result in poor financial outcomes for people

South Africans borrow more and save less than other nations (Discovery Bank, 2018). If individuals could modify their financial habits slightly, they could dramatically improve their financial futures and reduce the risk of not being able to meet their financial obligations.

People make irrational financial decisions due to a lack of financial awareness or education and behavioural biases, leading to lower savings and investment rates and an under-provision for unforeseen life events and retirement. Five financial behaviours explain 80% of credit default risk and why people do not have sufficient retirement savings (Discovery Bank, 2018). These are: spending more than we earn, not saving regularly, not being insured for adverse events, not paying off property debt and not investing in the long term.

Financial planning is the process of managing financial resources to achieve life goals (FPI, 2020) (CFP Board, 2020). It 'takes into account the client's personality, financial status and the socio-economic and legal environments and leads to the adoption of strategies and use of financial tools that are expected to aid in achieving the client's financial goals' (Warschauer, 2002).

The financial planning process comprises six steps: 1) Establish and define the client-planner relationship (immediate needs, services offered, commission structure); 2) Gather client data (income, expenses, assets, liabilities, risk tolerance) and identify client goals (short, medium and long term); 3) Analyse data and identify financial issues (high debt exposure, inadequate life cover, expenses exceed income, etc.); 4) Develop and prepare a financial plan (recommendations); 5) Implement the financial plan (including guidance and coaching); 6) Monitor and review the financial plan at least annually (in line with economic and lifestyle changes) (FPI, 2020).

The current landscape of financial tools available is fragmented and can be broadly classified into tools for digital banking; tools to manage budgeting and spending activities; tools for robo-advice resulting in an investment product; and various calculators such as for debt repayment or retirement calculations.

Some people prefer to rely on their family or friends or to solve their financial problems on their own, to seeking advice from professional advisors like financial planners (Kimiyağhalam, Mansori, & Safa,

2016). A study showed that the factors that directly affect help-seeking behaviour in individuals include *financial stress, financial knowledge, financial self-efficacy, confidence, personality traits* and *financial risk tolerance* (Kimiyağhalam, Mansori, & Safa, 2016). Demographic factors play a moderating role. This justifies the need for financial tools to support these activities by making it easy and pleasurable for people to self-serve.

Some individual's preference for self-directed financial advice; the fragmented nature of available tools, particularly in the South African market; and the ubiquity of mobile devices, provides the opportunity to design a mobile application to create an integrated mobile user experience.

2.3. Design Studies and Usability Studies

In this section, the purpose of design is explained, and design studies are compared with usability studies, including an outline of their similarities and differences in definition, process and their various methods. This is an important distinction because this study is positioned as a design study, with usability evaluation out of scope in this study, but to follow if the design is commercialised.

The field of Human Computer Interaction (HCI) 'manages innovation to ensure that human values and human priorities are advanced, and not diminished, through new technology' (Interaction Design Foundation, 2019, p. 45). The focus is on advancing people.

The user-centred design (UCD) framework pioneered by Donald Norman's research laboratory at the University of California in San Diego (which evolved into ISO 9241-210:2019) advocates that great design is based on observed human tasks and needs (human centricity); understanding people's thoughts and behaviours (cognitive empathy) and understanding people's emotions (emotional empathy) (MadPow, 2019). Personal financial information can evoke emotional responses in people, which may appear to have little to do with design but are nevertheless important considerations to understand in terms of their impact on users' feedback.

The Interaction Design Foundation (IDF) encyclopaedia provides five characteristics of interaction design (Interaction Design Foundation, 2019, pp. 9-15). First, design involves changing situations by shaping and deploying artefacts. Design involves 'shaping digital things for people's use', as opposed to making or building that which gives an engineering perspective. Second, design is about 'exploring possible futures'. Design is about 'initiating change and transformation'. The focus of design 'is not on that which exists but on that which could be'. Third, design entails 'framing the problem in parallel with creating possible solutions'. Design is an iterative process. Fourth, design involves 'thinking through sketching, prototypes and other tangible representations'. Design is a 'tool for thinking and communicating possibilities'. Fifth, design 'addresses instrumental, technical, aesthetical and ethical aspects throughout'.

This perspective on design has consequences for how research is conducted and how designs are evaluated. The field of design research has less of an academic and scientific heritage than the field of human computer interaction (HCI) (Interaction Design Foundation, 2019, p. 16). The researcher argues that there is merit in weaving the two disciplines together to strengthen their combined output.

2.3.1. Terminology Used in the Field

There are two main types of study in creating a visualisation system (including interfaces): a design study and a usability study. A design study entails following a design process and reflecting on lessons learnt. A usability study entails following a design process and proving usability of the output.

A *design study* is defined as an initiative in which researchers study a problem faced by domain experts; design a visual system that assists in solving that problem; validates the design; and reflects upon lessons learnt, in order to refine design guidelines (Sedlmair, Meyer, & Munzner, 2012). Whilst the process delivers a solution and validates that the solution is useful to the users, the focus is on reflecting on lessons learnt and continual refinement of best practice guidelines (learning).

Human-centred design (HCD) is defined by the International Organization for Standardization (ISO) in ISO 9241-210:2019 (The International Organization for Standardization, 2019) as ‘an approach to interactive systems development that aims to make systems *usable* and *useful* by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques’. HCD is used interchangeably with *user-centred design (UCD)* and was changed to include all stakeholders as users, not only the end-user of the system. The focus is on scientifically proving usability.

Both utility and usability are important. Utility is the extent to which it provides the features the user needs. Usability is the extent to which it is easy and pleasant to use these features. Typical usability goals include effectiveness, efficiency, error tolerance (safety), learnability, memorability, and satisfaction (engaging). Usefulness includes both utility and usability (Interaction Design Foundation, 2019). Design studies validate for usefulness to the users. Usability studies concentrate on confirming that the design is usable, sometimes at the expense of utility (Greenberg & Buxton, 2008).

Usability criteria define specific objectives to assess the usability of a product in terms of how it helps to improve (or not to improve) a user’s performance of their task and is often measured in units of time to complete a task and error rates. These criteria are easier to measure quantitatively and a range of usability inspection methods (UIMs) and usability evaluation methods (UEMs) are available but one cannot ignore qualitative aspects of the user experience (UX) such as utility and satisfaction.

This study is positioned as a design study and uses a slightly modified UCD process (often used in usability studies). A primary focus is on validating usefulness to users (from design studies), ahead of usability. However, usefulness includes utility (right features) and usability, which comes through in the feedback from users.

2.3.2. Designing for User Experience (and not only for usability)

Don Norman described *user experience (UX)* as incorporating ‘all aspects of the end users’ interaction with the company, its services and its products’ (Norman & Nielsen, 2019). The ISO definition highlights that UX ‘includes the user’s emotions, beliefs, preferences, perceptions, comfort, behaviours and accomplishments that occur before, during and after use’ (The International Organization for Standardization, 2019). UX goals are often expressed as desirable and undesirable emotions and tend to be qualitative.

Morville describes six additional factors over and above usability that should be considered when designing user experiences. The product must also be useful, findable, credible, desirable, accessible and valuable, if UX goals are considered and not only usability goals (Interaction Design Foundation, 2019).

Hassenzahl provides a conceptual model for designing for (user) experiences with 3 levels: *the what*, *the how* and *the why* (Hassenzahl, 2010). *The what* is concerned with the functionality of a product (the product-oriented perspective). This relates to a person's do-goals (pragmatic qualities) (Hassenzahl & Roto, 2007). *The how* makes functionality accessible in an aesthetically pleasing way (the experience-oriented perspective). An aesthetically beautiful, particularly novel, or stimulating display of interaction might classify the product as *experiential*. This relates to a person's motor-goals. *The why* relates to a person's be-goals (hedonic qualities) (Hassenzahl & Roto, 2007). People do things for underlying reasons and to satisfy psychological needs, for example being related, being influential, being competent and being autonomous are ways people may want to be (qualitative measures). Be-goals include relatedness, meaning, stimulation, competence, security, popularity. Technology-mediated positive experiences revealed the salient sources of pleasure as stimulation, relatedness, competence, and popularity (Hassenzahl, 2010).

When assessing the appeal of software, a user can be in one of two usage modes, goal mode or activity mode. In goal mode, the goal drives the users' activities, users are focused on completing the task and being efficient and the software is a means to an end. The study found that in goal mode, both hedonic (qualitative) and pragmatic factors (such as usability, utility, effectiveness, efficiency) played a role in assessing software appeal (Hassenzahl, Kekez, & Burmester, 2002). In activity mode, the activity is more important, the goal is defined during the activity and may change so efficiency and effectiveness are less important. For users in activity mode, appeal was determined only by hedonic factors (qualitative) (Hassenzahl, Kekez, & Burmester, 2002).

When it comes to spending, experiential purchases (where the primary purpose is to acquire a life experience) make people happier than material purchases (tangible objects) of the same value (Gilovich & Bowen, 2003). The reason offered by another study (Carter & Gilovich, 2010) is that evaluation of experiences is less comparative and has less impact on satisfaction than that of material purchases. With material purchases, participants tended to maximise (versus satisfy with experiential purchases); deliberated more about unchosen alternatives and satisfaction was undermined more by comparisons to other available options or the same option at a different price.

In the foreword to the 2005 edition of his book, Gerhard Schulze (2005, p IX) describes five shifting priorities of the emergent experience society as 1) deceleration rather than acceleration; 2) less instead rather than more; 3) uniqueness in place of standardisation; 4) concentration in place of diversion; and 5) making instead of consuming. This assumes their basic needs of food, clothing and shelter are provided for (Inglehart 1997; Maslow 1954).

This has implications for designing for (user) experiences. Designing for user experience includes all three levels and starts with the why through a deep understanding of and empathy with users in their environment. This is what distinguishes technology-driven innovation from human-driven innovation. An experience is a story told through the software and the experience is what is owned after use. The software is only of interest if crucial in creating the experience (Hassenzahl, 2010). Hedonic factors (subjective) are important to users in assessing the appeal of software in both goal and activity usage modes and therefore cannot be ignored. This research uses predominantly qualitative methods to gather users' feedback.

2.3.3. The Design Process

Four frameworks for conducting design and usability studies are examined and grouped into two which are compared below: 1) HCD/UCD; 2a) *Design Studies Methodology* (Sedlmair, Meyer, & Munzner, 2012); 2b) *Double Diamond of Design* (developed by the British Design Council in 2005); 2c) *Design Thinking* framework (taught at universities around the world including Stanford's Institute for Design (d.school), Harvard and MIT and used by practitioners at companies such as Apple and Google).

There are six requirements that a process must meet to be considered an HCD (UCD) process (The International Organization for Standardization, 2019). First, the design must be based on an explicit understanding of the users, their tasks and their environments (context of use). Second, users must be involved throughout the design and development. Third, the design is directed and improved by user-centred evaluation. Fourth, the design process is not linear but iterative and previous steps often have to be revisited. Fifth, the design should address the entire user experience. Lastly, the design team must include multidisciplinary skills and perspectives (which is beyond the scope of this thesis).

The design study process has an explicit focus on visualisation problems however the methodology is useful for broader types of problems as well such as designing mobile software. It is also user-centred in that domain experts are the source of information for clarifying the problem and tasks and evaluating the designs for their usefulness in solving the problem. An iterative process is also required. The two main ways in which the design study methodology is different from a usability study methodology is in its requirement to generate multiple alternatives to choose from and in reflecting on the merits of the process at the end of the study.

The requirement to generate multiple designs is also emphasised by the *Double Diamond of Design* and *Design Thinking* methodologies. The *Double Diamond* refers to thinking that must diverge and then converge again twice through the process, first when considering the problem, and second when considering the solution. In the first diamond, design is framed as problem exploration so the benefit in spending time with divergent thinking is in creating alternatives by exploring the design-space before committing to a direction or a solution. In *Design Thinking*, the *Ideate* phase is about creating as many ideas as possible to choose from. When converging, design decisions will involve trade-offs and should be informed by users or based on a deep understanding of the users and their tasks and goals (Sharp, Rogers, & Preece, 2019).

The *Design Thinking* framework is also user-centred and participatory because users are involved in generating many ideas and co-creating solutions. There is also an emphasis on doing (such as with designs and prototypes) and learning (multiple iterations). It is most suitable to innovation work.

The ISO standard for HCD merely requires the identification of users and their context of use and consideration of UX, but there is more involved than identifying and focussing on users and their needs, which they may or may not be able to articulate or imagine, especially in the case of innovation work. Insight into the problem is required and co-creation is an advantage.

The design study process describes four main phases as 1) Analysis, 2) Design, 3) Validation and 4) Reflection (Sedlmair, Meyer, & Munzner, 2012). The UCD process describes three main phases as 1) Establishing User Requirements, 2) Rapid Prototyping and 3) Usability Evaluation (Interaction Design Foundation, 2019). Although this study is positioned as a Design Study (DS), a slightly modified UCD process is used to conduct the research. Each of the phases are compared next and application to this study summarised afterwards.

Phase 1: Analysis Phase (DS) and Establishing User Requirements (UCD)

It is important for designers to consider 1) who is going to use the product, 2) how they are going to use it and 3) where they are going to use it (Sharp, Rogers, & Preece, 2019). This involves considering what people are better and worse at doing; how they can be supported by technology, in the way they currently do things; how to improve the quality of their experiences (UX); listening to what they say they want; and involving them in the design process (Sharp, Rogers, & Preece, 2019).

The Analysis Phase of a design study is about problem characterisation and abstraction. The objective is to move along the two dimensions of task clarity (from fuzzy to crisp) and information location (from the domain expert's head to digital format), to reach a shared understanding of the problem and what is required (Sedlmair, Meyer, & Munzner, 2012). This is done through iterative interactions with and observations of domain experts.

Establishing User Requirements is the first phase in UCD. The method advocates creating a deep empathy with users. One of the methods employed is the use of Personas. Personas do not describe specific people but they are based on a synthesis of important features of real users that describes the audience of the design (Sharp, Rogers, & Preece, 2019). They are generated from data collection and are therefore realistic and not idealised (Sharp, Rogers, & Preece, 2019). They are described in detail and include aspects like a photograph, name, age, behaviour, attitudes, activities and environment. Personas are traditionally used to bring the requirements to life and to keep users' needs at the top of designers' minds. Successful personas assist in making design decisions and remind designers that real users will use the product (Sharp, Rogers, & Preece, 2019).

Creating *user stories* is a technique within the Agile Methodology of software development (O'hEocha & Conboy, 2010), that expresses a summary of a chunk of work from the users' perspective. They are usually written as a sentence in the form 'As a <role>, I want <behaviour> so that <benefit>' (Sharp, Rogers, & Preece, 2019). The size of the chunk of work is usually aligned to what can be accomplished by the development team in a two-week sprint (which depends on the size and experience of the team).

The method for interacting with users at this phase is typically through questionnaires, interviews and observation. Questionnaires can contain a mix of closed questions with predefined responses and open questions with free text qualitative responses. They are beneficial for getting answers to specific questions from a large number of geographically dispersed people. Semi-structured interviews also use a mix of closed and open questions and the benefits are greatest with a smaller number of participants and in the researcher's ability to probe participants on their responses to gain additional information or to clarify misunderstandings immediately (Sharp, Rogers, & Preece, 2019). There is also less effort on the users' part to speak rather than type or write their responses.

Therefore, there is merit in spending time on problem definition, the use of user stories to chunk the work, the use of personas to assist designers in making design decisions and an iterative approach that promotes shared learning. Questionnaires, interviews and observation are appropriate for data collection in this phase. This study uses semi-structured interviews to elicit user requirements, user stories to prioritise three chunks for work, personas to make design decisions and adopts an iterative approach.

Phase 2: Design Phase and Rapid Prototyping

In the design phase, researchers should strive to have a broad consideration space of possible solutions (consideration of the set of valid visual encodings, interaction mechanisms and data abstractions) (Sedlmair, Meyer, & Munzner, 2012). This should then be reduced to a narrow proposal space using the design principles and guidelines. The proposals are then discussed with domain experts in the form of paper mock-ups, sketches or low-level prototypes. The domain expert feedback assists in making the final selection. The goal is to satisfy (good solution) rather than to optimise (best solution) as design decisions involve trade-offs.

In usability studies, rapid prototyping involves iterations of design from low fidelity, such as a paper prototype, to high fidelity such as a clickable mock-up. Typically, only one design is considered, initially as a sketch or low fidelity prototype and then detail added and the idea refined with increasing fidelity. The advantage of this approach is that sketches and low fidelity prototypes require less effort and are therefore more easily discarded. The disadvantage of having only one is that it is demotivating to discard (Greenberg & Buxton, 2008).

There is evidence that parallel prototyping leads to better design outcomes, more divergence between the designs produced, and increased self-efficacy (designers' belief in their ability to perform design tasks) (Greenberg & Buxton, 2008). It also supports generative thinking (reduces fixation); encourages comparison of ideas; promotes investing in the creative process over investing in a particular idea; and viewing critique as an opportunity for improvement, not as catastrophic criticism when there is only one option available (Greenberg & Buxton, 2008).

Assessing usability too early on can be harmful to the design process in at least three situations: 1) where novel interface designs do not conform to interface norms; 2) when radical innovation exposes many issues with immature technology; and 3) when academic prototypes are assessed on their scientific worthiness without consideration of their adoption and use in everyday life (utility) (Greenberg & Buxton, 2008). Furthermore, usability tests may fail to consider how cultures adopt technology over time (Greenberg & Buxton, 2008).

Therefore, there is evidence to support the consideration of multiple designs in early prototype phases and delaying usability evaluation until the idea is adequately formed and utility confirmed. Iteration and user involvement are mandatory. This study includes two parallel, initial designs, instead of one, which is the norm in UCD. The initial designs are the first design output of the UCD process and are low fidelity in nature. The final designs are the second design output of the UCD process. Whilst the initial designs are refined to produce the final designs, the focus of this study is on visual design and not usability design, so the final designs are rich from a visual design perspective but still low fidelity from an interaction design perspective (and not a clickable prototype).

Phase 3: Validation Phase and Usability Evaluation Methods (UEMs)

In a design study, validation is the process of confirming that the design is useful to the domain experts in performing their tasks. This is often done using design interviews and workshops which gather qualitative feedback. The goal is transferability, not reproducibility, which means that the measure of

success is that the researcher created something useful by following the process (which is reproducible), not that another researcher would create the same design (which is unlikely).

A common mistake in design studies, is to focus either too much or too little on usability (Sedlmair, Meyer, & Munzner, 2012). The researcher argues that usability becomes increasingly important as the fidelity of the design increases but is present throughout the design process.

Usability studies typically use one of many usability evaluation methods (UEMs). There are three broad types of UEM's namely, inquiry methods, usability inspection methods (UIMs) and usability testing. Inquiry methods are qualitative such as interviews, workshops, contextual inquiries, think-aloud evaluation, focus groups and online discussion forums. They are generally used in early evaluation of low fidelity (paper) prototypes. UIMs include cognitive walkthroughs, heuristic evaluation and other types of expert reviews, with various degrees of user involvement. Usability testing typically includes generating summarised quantitative metrics such as success rate, time on task and error rate (Følstad, 2017). UIMs and usability testing are predominantly quantitative but can result in qualitative design feedback as well. These methods are typically used on high fidelity prototypes once interaction is available.

Users generate two types of data during usability evaluation, interaction data and design feedback. Interaction data which relates to the actual use of the system tends to be more quantitative and is undisputed in usability evaluation. Design feedback on the other hand, including users' reflections on experiential issues, suitability to their context of use, usability problems and design suggestions, tends to be more qualitative. A review of 31 research papers found users' design feedback to be qualitatively different from interaction data because domain experts provide a different perspective and therefore a suitable complement (Følstad, 2017). Users' design feedback was found to hold acceptable validity (generalisation beyond the evaluation setting) but thoroughness varied widely (proportion of all usability problems identified). To counter issues of thoroughness, more users should be included. Most importantly, users' design feedback may have substantial impact on downstream development and could significantly increase cost if not considered early on.

A study showed that usability testing with fifteen users would reveal all usability problems but that the maximum benefit/cost ratio occurs at five users (Nielson & Landauer, 1993). Five users will uncover about 85% of all usability problems and thereafter every subsequent user will produce predominantly redundant information (issues already discovered by the first five users). After iteration and redesign, a second round of usability testing would uncover 13% of the remaining 15% of all usability problems. This supports the need for multiple iteration and user-feedback rounds.

The researcher argues that gathering design feedback as part of usability evaluation is too late in the process to be useful to designers. Design feedback should be gathered early on and as an explicit part of user validation of usefulness. For example, if it is only at this point in the process that designers discover that the (only) visualisation system they have created does not offer utility to users (the right features), the designer would need to scrap the work done and start with a new paper prototype. At this point in the process it is highly demotivating to the designer to do so, given the wasted effort.

In summary, validation and evaluation should be more focused on design feedback in early evaluation and on usability evaluation in later evaluation in the iterative cycle from low to high fidelity. Participation of five to fifteen users is appropriate to uncover eighty-five to one hundred percent of usability problems, depending on the available budget. In this study, six end-users and two financial planning expert users are recruited, making eight in total. User evaluation uses the inquiry method,

predominantly semi-structured interviews with the eight users to elicit design feedback, given the low fidelity nature of the initial designs (from an interaction point of view).

Phase 4: Reflection Phase

The outcome of design is a product that supports users in completing their tasks and accomplishing their goals in a useful, effective, usable and pleasurable way (Sharp, Rogers, & Preece, 2019).

Reflection is part of design studies but not usability studies. The purpose of reflection is to critically evaluate which parts of the process worked well and which parts were less effective or failed. The purpose is to offer guidance on how to refine design guidelines for future work to promote continuous improvement. Positioned as a Design Study, this is included in Chapter 6 on Discussion and Reflection.

2.4. Two Successful Case Studies for Mobile Interface Design using UCD

Genimap Navigator and *ImagePlus* are two successful case studies conducted by *Digia* to design new mobile interfaces, by following slightly different UCD processes (Kangas et. al., 2005). *Genimap Navigator* is navigation software for the Nokia mobile device and *ImagePlus* allows images to be edited on a mobile device. Both were new to the market at the time and were successfully launched and adopted. Both had time and cost constraints.

Genimap Navigator did not involve end-users in initial requirements gathering and went straight to designing a prototype which was tested with co-workers. A pilot with end-users revealed that the mobile context of use was not supported, which was the main reason why end-users considered the software not useful. For example, the users wanted to find the nearest taxi station, but the software was designed to find the address of the taxi owner's home or office. A lab test was conducted post the launch of the product and several problems were identified but it was too late to make changes.

ImagePlus did involve end-users in initial requirements gathering using the contextual inquiry (CI) method (observing users in their natural setting). A PowerPoint-like paper prototype was developed to test with users (low quality as compared with a Photoshop-like quality), in parallel with documenting functional and user-interface (UI) specifications. The specifications were used by the Project Manager to estimate implementation time per feature and to prioritise features into what could be delivered in six months (a predefined constraint). A UI prototype was never developed and consequently usability testing not done. Instead, software development began, using an incremental approach to release features one by one. There were many change requests due to usability problems and a lack of engineering resources, which caused a three-month delay to launch. The numerous change requests caused delays because of the length of time it takes to change code (versus the relative ease of adding and removing features from paper and UI prototypes), which resulted in frustration for the team.

There were four learnings from the study. First, end-users should be included in the initial requirements gathering, especially to establish their context of use. Whilst *ImagePlus* did not have a specific mobile context of use, *Genimap* discovered too late that the features that were built were not useful to the end-users. Second, paper-prototyping is useful because it is easy to add and remove

features. It is sufficient for verifying usability for known types of interactions such as stylus movements. Usability testing on a UI prototype is more appropriate if the interaction type is new to the users or more sophisticated in nature. Third, computer-demos are useful for testing visual UI design. They are faster and require less effort than coding. The main advantage is to identify usability problems earlier (before implementation) and reduce the number of change requests and resulting time and cost of development. Fourth, when working within a tight a budget, it is tempting to reduce usability testing in favour of development costs, however, even conducting small usability tests with six to eight end-users, can help to identify many usability problems earlier on.

In this study, users are included in all phases; there is not a specific mobile context of use to consider; and PowerPoint-like prototypes are used throughout (computer-demo).

2.5. Visualisation Design Principles

The purpose of a visualisation system is to facilitate rapid processing of information correctly for the specified tasks. The goals are effectiveness, correctness, accuracy and truth. Therefore, it is important to first focus on function and then on aesthetics, but both are important in creating an engaging UX. The concept of *form follows function* was established as a principle in late 19th century and early 20th century architecture and states that a building or object's shape should be related to its intended function or purpose (Wikipedia, 2020). Schneiderman offers the mantra: 'overview first, zoom and filter, then details on demand' (Schneiderman, 1996, p. 336), which refers to the order in which users' wish to receive information and interact with a visualisation system. Designing to reduce cognitive load is also an important consideration in visualisation design because humans are better at recognition than recall (Nielsen Norman Group, 2020). Minimalist representations when designing icons as an example, promotes *recognition over recall*.

Gestalt Principles (Interaction Design Foundation, 2020), from the field of cognitive science describe how humans perceive and interpret what they see. The eye sees chaos and the brain interprets order, simplicity and meaning. These principles are used in design to focus users' attention, reduce cognitive load, assist with learnability and memorability and create an engaging user experience. They are described below.

The first set of *Gestalt Principles* described relate to how the mind groups and separates objects. *Similarity* is our tendency to group similar objects together such as those with the same colour, size, shape, pattern, texture and orientation (known as visual channels) and to separate them from different objects. *Proximity* refers to grouping objects close together and separating objects further apart such as with the use of white space. *Common Region* refers to the grouping of objects in the same closed region such as within a larger shape boundary. *Connectedness* makes us group objects linked by other objects.

The second set of *Gestalt Principles* described relate to how the mind creates meaning from objects. *Closure* or *Reification* is when the mind fills in the gaps between elements to perceive the whole shape or image. *Prägnanz* is when the mind simplifies complex or ambiguous images into simple ones. The use of *mental models* is an example of how this principle is used to reduce cognitive load (processing in memory). By creating balance and order in designs, we can enhance the user experience.

The use of *gist* in visual design relates to subtle visual cues which set the scene and create context for the user almost instantaneously and are a powerful form of visual communication (Ware, 2010).

In summary, effective design of a visualisation system should observe the best practice guidelines of *form follows function*, *overview first*, *zoom and filter*, *then details on demand* and *Gestalt Principles* for visual perception and cognition. These principles will be used to critique eight financial planning tools in section 2.8 and will be applied in the design activities discussed at length in Chapter 4 and 5.

2.6. Usability Design Principles

There are five principles to design for usability: visibility, feedback, constraints, consistency and affordance and each are described next (Sharp, Rogers, & Preece, 2019).

In order to promote learnability and memorability, which are the users' ability to figure out how to use a visualisation system without help or guidance when seeing it for the first time and then remembering how to use it on subsequent visits, interactive objects must be *visible*. If a user can see a button or icon, they are more likely to try it. *Visibility* also promotes *recognition over recall* (memory) which reduces users' cognitive load. For a sequence of actions, they should be organised into groups with a start and end and users should be shown their progression along the set of steps.

Feedback is the response of the system to an action by the user to confirm that something has happened, for example, a change in an icon or display. Appropriate feedback within a reasonable time keeps the user informed and gives them confidence to continue. Feedback should be given in an expected and familiar way.

Constraints guide a user to take correct actions and avoid incorrect actions. This is done by using user language (not system language) and ensuring there is a logical flow. Mistakes are inevitable so supporting undo and redo actions is also important. Easily understood error messages and confirmation before deletion are good examples.

Consistency should be applied to the design template. Words, icons and symbols should have the same meaning when displayed in more than one place. This makes them easier to learn and remember.

Affordance refers to visual cues that suggest an object's likely function such as three horizontal stripes or three dots in a vertical line, to indicate an overlay menu. The design should be aesthetically pleasing and minimalist. Irrelevant information should be removed because it competes with relevant information, for the users' attention. This is particularly pertinent for mobile design where the screen space is limited.

A further consideration for designing for usability on a mobile application interface is that not every interaction a user has with a mobile interface will be similar. They may vary in intensity and duration (Nadav & Braiterman, 2007). The mobile application must fit into the users' lives and not constantly distract them. The idea is to support and augment, not replace their daily activities. The researcher argues that whilst understanding users' context of use and designing for that context of use is important, users often have multiple devices and demand seamless experiences across their devices. Designing for mobile first forces a minimalist approach and radical trade-offs to be made early on because of the limited screen size.

In summary, effective design of an interactive system for usability, should observe five principles: *visibility*, *feedback*, *constraints*, *consistency* and *affordance*. Approaching design with a mobile-first strategy can help to prioritise functionality, promote minimalism and a seamless UX across devices.

These principles will be used to critique eight financial planning tools in section 2.8 which follows and will be applied in the design activities discussed at length in Chapter 4 and 5.

2.7. Review of research on the design and use of financial management mobile tools

A review was done on 43 research articles related to mobile phones and financial services in developing countries from 2000-2008 (Duncombe & Boateng, 2009). Research articles were framed along two axes incorporating both social factors (financial services preferences and behaviours) and technical factors (mobile phone technology potential). One axis is socio-economic and defines whether the research is conducted at a micro level (individual user); meso level (intermediary providing the service) or macro level (regulatory and policy maker enablers). The second axis is temporal and divided into four categories: assessment of financial needs of users (in this case the poor); application design and development; adoption (usage) and impact.

The focus of research effort was found to be on application design and to a lesser extent adoption but a research gap was identified in assessing user needs and impact. Key findings relating to this thesis are outlined next.

Mobile financial services (MFS) were predominantly commercially driven by the mobile phone industry as a value-added service to expand market share and increase revenue (business models not social models). The extension of banking services through agents such as the post office and the branchless banking model were developed from a maximum distribution at minimum cost perspective (again commercial). There is a lack of research on the financial needs of the end users (in this case the poor) and the cultural aspects of adoption. This thesis is academic (before commercial) and focuses on end users (micro level) and their financial needs (in this case the financial needs of mid-career professionals).

The focus of research was on the technological capability of mobile phones (technical not social). The review of research covers the years 2000 – 2009 and the technology capability refers to SMS technology using SIM-based menus over GSM networks. The iOS App Store was launched towards the end of this period, in July 2008, so much of the research reviewed predates the prevalence of Smart Phones and Apps available a decade later (www.theverge.com, 2020). The cost of smart phones and connectivity (data or wi-fi) has also reduced in the last decade making these technologies more accessible. A study in the UK shows that in 2016, 40% of people made use of mobile apps for spending, budgeting and payments and this number has increased to 70% in 2018 (Clawson, 2018). Millennials, born in the 1980's and 1990's, lead the way at 89% and age 55 upwards lag at about 50%. The increasing trend indicates that money management app usage has extended beyond early adopters.

A characteristic of successful MFS is their simplicity. MFS are framed as a low-cost delivery channel for financial information, services and transactions and therefore were targeted at the poor or financially excluded sectors of society with the backdrop of successful mobile penetration in this market. The need for simplicity could therefore be driven by the financial literacy and financial needs of this market coupled with the technological capability available at the time.

Adoption was found to be lower than expected and confined to more affluent users with higher levels of education and technological sophistication. Utility and social context were found to be more important than technical design considerations in determining usage with South Africa's WIZZIT. Another study confirms this finding and recommends a promotional strategy that focuses on the

emotional aspects of convenience in addition to the practical aspects of usefulness (Lee, Park, Chung, & Blakeney, 2012).

(Lee, Park, Chung, & Blakeney, 2012) found that the focus of research was on customer satisfaction of MFS and sought to explain why MFS was expanding relatively slower than Internet financial services in general. The study found that usage intention of MFS is driven by perceived usefulness and perceived ease of use. Perceived usefulness is when a customer perceives a service will improve performance, increase productivity or enhance effectiveness. Ease of use is how readily a customer can use the MFS. Monetary value of MFS (including time value) was found to drive perceived usefulness which drives usage intention. Connectivity was found to drive perceived ease of use (availability anytime is convenient) which drives usage intention. Personal innovativeness (willingness to try something new and learn) was found to drive perceived ease of use which drives usage intention. Absorptive capacity (prior knowledge, knowledge internalization ability and knowledge utilisation ability) was found to drive usage intention. Task-technology fit (how appropriate it is for the job to be done) was found to drive usage intention. Service value was found to be more important to customers than technical characteristics of the MFS.

The Open Banking regulations that came into effect in the UK in January 2018 promote the free flow of data between financial institutions using APIs encouraging financial technology innovation. An Application Programming Interface or API is a computing interface which defines interactions between multiple software intermediaries. The premise of the regulation is that the data is owned by the client and the client may share it with other service providers to provide value added services such as financial consolidation across multiple financial service providers and financial advice built off this consolidated view. Crealogix found that 35% of customers want to see an overview of their finances (Clawson, 2018).

Millennials were found to have more debt on average than their Baby Boomer parents but have also started saving more and earlier (CB Insights, 2019). Three trends in money management tools have been observed to cater for their unique money management attitudes: firstly, they prefer online to in-person; secondly, they prefer big tech (Google, Apple, Amazon) to big bank and thirdly, they believe and are open to alternatives to banks which could emerge in the next five years. Millennials born in the early 1980's may already form part of the mid-career professional user studied in this thesis or may be close to meeting the requirements.

This thesis deals with the assessment of the financial needs of the user (in this case the mid-career professional) and the micro level (individual users), partially filling a research gap identified. The technology potential of mobile phones is no longer limited to SMS technology which has been replaced by Smart phones with Apps coupled with faster, cheaper connectivity. Important factors in usage intention (leading to adoption) include perceived usefulness and perceived ease of use. Service value is more important than technical characteristics. There is a strong case for mobile financial planning and management given the rising usage. Leading the adoption are Millennials and many Millennials are likely to fit into the financial profile defined in this thesis already or soon.

2.8. Review of financial planning mobile applications on the market

Personal finance mobile applications on the market currently offer one or more of five categories of functionality, namely, aggregation; digital banking; budgeting; robo-advice including retirement fund management; and retirement planning calculators.

Aggregation applications allow the user to give permission to pull their financial data from other financial service providers to see a consolidated view of their financial situation. Digital banking applications offer spending and savings options and usually include budgeting functionality but there are also many stand-alone budgeting applications. Robo-advisory applications digitally guide a user into a suitable investment product given their timeframe, risk tolerance and liquidity requirements and may or may not include retirement funds as investment vehicles. Robo-advisory applications tend to offer more sophisticated investment vehicles such as funds (unit trusts managed by a fund manager) and exchange traded funds (ETFs track a market index), compared with the savings options under digital banking (fixed deposits, notice deposits and money market products).

Next, screens from eight mobile application interfaces are analysed from a visual and interaction design perspective. The purpose is to compare their strengths and weaknesses and inspire design ideas. These are: *22seven* (22seven, 2019) (the only App included which is available on the South African market), *Wealthfront* (Wealthfront, 2019), *Monzo* (Monzo, 2019), *Revolut* (Revolut, 2019), *Mint* (Mint, 2019), *Acorns* (Acorns, 2019), *moneyfarm* (moneyfarm, 2019) and *Retirement Planner*. Screens from the eight Apps are grouped into categories of functionality for 1) Viewing an Overview; 2) Managing Spend against a Budget; 3) Saving towards a Goal including Retirement; and 4) Retirement Planning Calculator. A discussion of each follows.

2.8.1. Viewing an Overview

Screens from *22seven*, *Wealthfront*, *Monzo* and *Mint* are shown in Figure 2.

22seven offers aggregation. Many middle to upper-income people are multi-banked and multi-invested so the concept of aggregation provides a consolidated view of their financial situation. There is an overview of *what you have*, *what you owe* and *your net worth*, which is calculated as the difference. *Wealthfront* only provide *net worth* but they do so for today and a projected value at retirement. These are all presented as numbers which take time to process and compare cognitively and could be improved with appropriate visual encodings.

22seven displays each account balance that has been linked and these are further grouped into categories; for example, the Bank category can be expanded to show the Nedbank and Standard Bank accounts. The *Gestalt principles* of *proximity* and *common region* are used to show their relatedness. The visual circles to the left are visually separated from the words and numbers and vertically aligned which aids searching by rapidly casting the eye up and down using *recognition over recall*. The pictures are conventional choices, but the colours do not add meaning to the icons. The icons could be improved by using minimalist simple lines and uniform colour or colour that serves a purpose in the design. The bank logos assist with *recognition over recall*. The pictures used by *Monzo* are unconventional choices and the reduced size of the photo-like images makes it difficult for a person to decode rapidly using *recognition over recall*. The icons used by *Wealthfront* for 'My Joint Account' and 'Sam's IRA account' are all the same so they serve no purpose at all and should be removed or replaced. *22seven* also uses a floating turquoise plus sign (principle of *visibility*) to indicate to the user that they can add additional accounts with other service providers.

Mint has no icons but uses the colour green for positive balances and the colour black for negative balances. *22seven* uses black for positive and red for negative balances. Both are using the *Gestalt principle of similarity* to separate these visually.

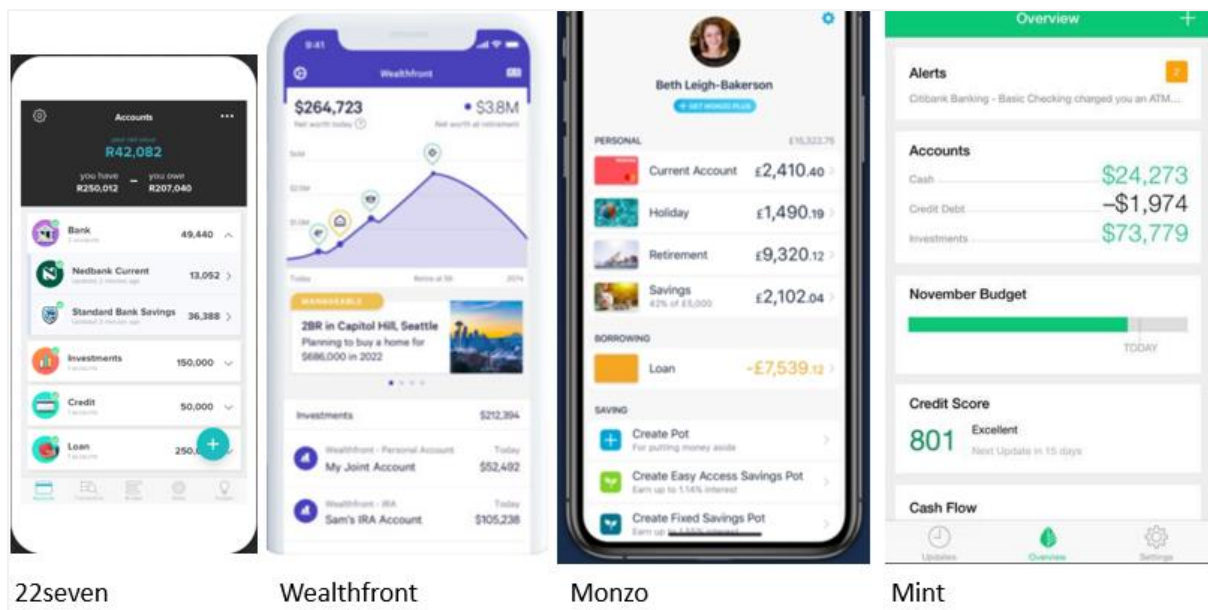


Figure 2: Mobile Apps to view an Overview of Accounts

The purple hill visual on the *Wealthfront* screen is a depiction of finances over time. It starts from today, reaches a peak at retirement age which can be read off the axis as age 59 and ends in the year 2074. Along the hill are location pins with icons such as the home with the yellow outline. The simplicity of the icons using minimal dark outlines on white creates an overview of life events at a glance using *recognition over recall*. The outline colour uses *Gestalt similarity* to categorise the goals into green for comfortable and yellow for manageable. Below the visual is additional information on each goal and the dots underneath use *affordance* (visual cues) to show there are more if one scrolls to the right. The slightly larger yellow location pin outline also shows that the user is currently viewing the home goal.

The bottom navigation band that can be seen on *22seven* and *Mint* with grey icons and a coloured active icon give the user feedback about which section of the App they are in. The subtle muted colours make them fade into the background until needed.

2.8.2. Managing Spend against a Budget

Screens from *22seven*, *Revolut* and *Monzo* are shown in Figure 3.

22seven shows the amount left to spend in green at the top left. The position on the screen indicates that it is the most important information since many people read from top to bottom and left to right. However, its relatively small size does not echo this view. *Monzo* provides the same information displayed in a ring which immediately draws the users' attention because of its large size relative to other objects. The ring is partially shaded to indicate part-to-whole progress and colour indicating green for on track, mustard for a warning and red for attention needed immediately. There are better ways to display part-to-whole relationships than the ring or *doughnut* if the objective is accuracy. For example, it is relatively easy to judge that the green is showing about 75% and the red is showing

about 25% but this is harder for in-between values such as the mustard, users are required to quickly calculate what number lies between 25% and 50% to come up with approximately 37.5%.

Revolut provides a number at the top for *This Month*, presumably actual spend rather than what's left to spend. *22seven* displays the monthly budget as a dark bar and *Spent This Month* underneath it which is a better way to display a part-to-whole relationship to indicate spending is approximately half of budget. How good or bad this is may be difficult to judge without information on how many days are left in the month but users would generally know this, even if not precisely. The rounded edges may also distort users' perception of the end values, making them seem less than they are.

The number of days to go on *Monzo* and the projected end of month spend on *Revolut* provide additional information. The partially displayed, greyed out numbers on *Revolut* and *Monzo* are a use of *visibility* and *affordance* to show the user they can navigate to other months of interest by scrolling sideways. This is also a clever use of Schneiderman's mantra pertaining to *details on demand*.

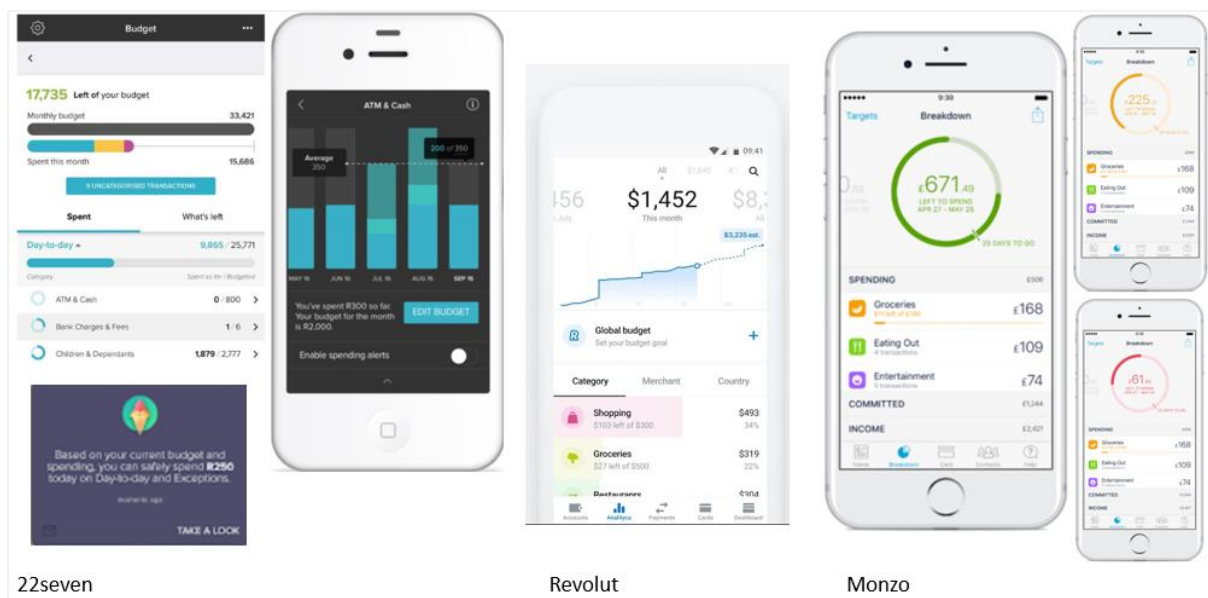


Figure 3: Mobile Apps to view Spending against Budget

22seven breaks down spend into four categories and each are assigned a different colour on the bar graph and underneath. Blue is for *Day-to-Day Spend*. Yellow is for *Recurring Spend*. Orange is for *Exceptions*. Magenta is for *Investments, Savings and Debt Repayments*. Green is for *Income*. Each category provides an overview with a toggle between what has been spent and what is left to spend, observing Schneiderman's mantra, which can expand with details per category of spend. *Monzo* and *Revolut* display the amount spent and amount left to spend without any interaction required by the user which follows the principle of visibility for important information. On *Revolut*, the shaded region behind the category acts as a subtle bar graph indicating the part-to-whole relationship well. There is also a percentage of total spend under the amount spent which provides additional detail and this is smaller and a muted grey colour to indicate that it is less important but available for scrutiny. Similarly, the partially filled bar underneath *Groceries* displays the part-to-whole relationship well. In contrast, the partially filled ring or doughnut of *22seven* is less effective in providing accurate visual information to the user.

22seven also provides an aggregated trend of the last five months on a particular category of spend, for example, *Groceries*. Users can edit their budget here (initial default values are shown as the average of the last three months). Users can split one transaction into multiple, for example, when paying bills at a food retailer one can split bills from groceries.

Additional information about spending habits are provided as *nudges*. One example is provided in Figure 3. *Nudges* come in the form of a daily news-feed-like display on the landing screen of the App (default screen when opening the App) and include all nudges such as security alerts for *suspicious transactions* which then need to be confirmed or flagged. However, these can be unnerving when alerts are received for normal transactions (which happens occasionally).

Revolut and *Monzo* offer automatic spending categorisation and analysis. There is a feature to photograph a receipt and attach it to the spending. The user can move money to sub accounts to manage more easily (called *Pots, Spaces, Pockets* or *Envelopes*). Bill allocations are automatically moved when due or an alert is sent. *Pots* can be topped up automatically. Bill-splitting allows users to keep track of who owes what, for example, holiday with friends, nights out, household bills with flatmates. The South African version called *KIN* was launched in 2019.

22seven advocates that most spending is automatically categorised. However, users are required to change the status from the *unseen* default to *seen* by either confirming (right swipe) or changing the category (left swipe) for every transaction. This allows aggregation by category and analysis of trends by category. However, the app does not learn categories of repeated transactions over time which means the user needs to repeat the allocation task multiple times which may become tiresome and annoying.

On 22seven, labelling of transfers from one account to another is not done which means that if a user transfers money from their home loan to their current account and then to a current account with another bank in order to pay off a credit card with that bank, they would need to categorise three transactions in the App, exacerbating the pain to the user. The App requires a lot of user attention, especially in the beginning. The default state of the App is to have no PIN to log on which seems to contradict their promise of military-grade security by the third party, Yodlee.

Nedbank launched the aggregation concept as a web-based interface for no additional charge to their client base in 2012 and called it *My Financial Life*, however it was decommissioned in December 2019 due to lack of use. This demonstrates that even if the concept is useful to users, if the system is not usable, users will not return.

2.8.3. Saving towards a Goal

Screens from 22seven and *Wealthfront* are shown in Figure 4.

The general flow for saving towards a goal requires four steps: 1) select the type of goal, 2) enter the amount and by when it is required, 3) indicate how you wish to fund the goal 4) select the product. Once the goal is created, the user can monitor progress towards the goal. Once the goal is reached, it terminates.

22seven provides a visually attractive list of goals that uses user-friendly language such as 'get a new ride' (as opposed to bank-speak like 'vehicle and asset finance'). The flow is logical. Users are guided through four steps shown by the blue (done) and grey (not yet done) bars under the header panel.

Whilst the icon pictures are pretty, they could be simpler and the colours have no meaning (*form follows function*) so merely add noise.

When saving towards a goal, only Old Mutual products can be selected (22seven was bought by Old Mutual) which is limiting to users and in direct contrast to existing information being aggregated across many different financial service providers, not only Old Mutual.

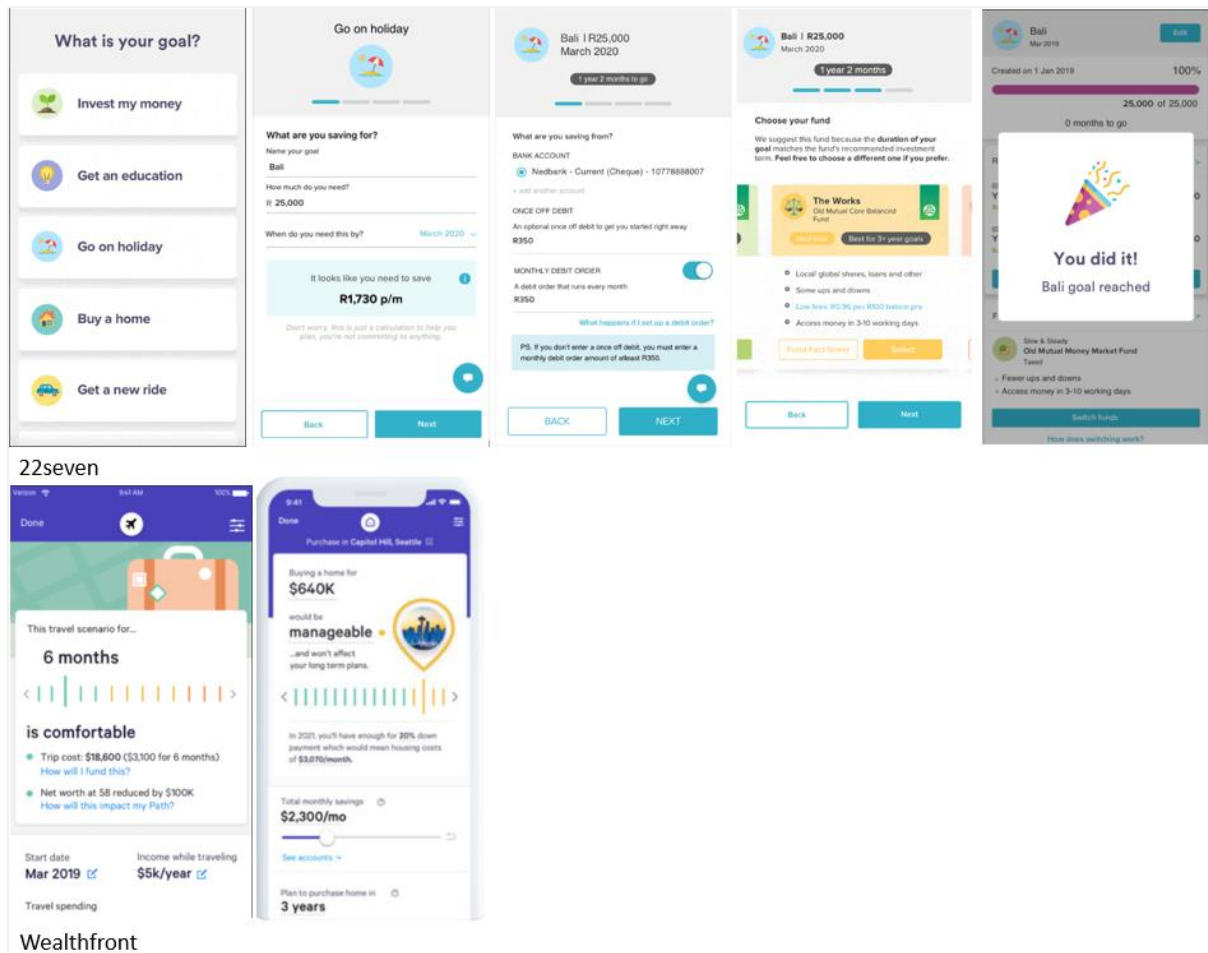


Figure 4: Mobile Apps to view Saving towards a Goal

Users need to decide between *Slow and Steady* (green), *The Works* (yellow), *Globe Trotter* (pink) and *Local Giants* (the same pink). The only information a user is given to decide is the fund name (not helpful to a user), its risk category from *Low* to *Medium* to *High*, its bumpiness from *fewer ups and downs* to *some ups and downs* to *more ups and downs* and the term from *0-3 years*, *3+ years* and *5+ years*. And the fee is given in bright blue text from 58c per R100 balance per annum for green to 96c for yellow or pink to 91c for the other pink. The two pink, high risk options are practically identical other than the 5c per R100 price difference and global versus local shares. Whist 22seven have tried to make the user experience simple, it may be very difficult for a typical user to make a selection based on this information. The colours from green to yellow to pink also do not aid the selection process, for example, why would any user choose red which means danger?

Wealthfront offers an assessment of the users' ability to reach their goal (green for *comfortable* and yellow for *manageable*) on a linear scale shown as an interesting visual of many equal length vertical lines with the relevant line longer. This uses *Gestalt's similarity* to help us rapidly separate the longer line visually. Another interesting feature is the calculated impact of this goal ('net worth at age 58 reduced by \$100k') and a teaser to find out more ('How will this impact my Path?').

Monzo and *Revolut* allow users to set up their own savings triggers (*IFTTT* stands for 'if this, then that'), for example, 'when it rains, add a fiver to my holiday fund'; 'when my team scores, add cash to my celebratory fund'; and 'if I order from Deliveroo, charge me a fast-food tax'.

2.8.4. Retirement Planning Calculators

Screens from *moneyfarm*, *Wealthfront*, *Retirement Planner* and *Acorns* are shown in Figure 5.

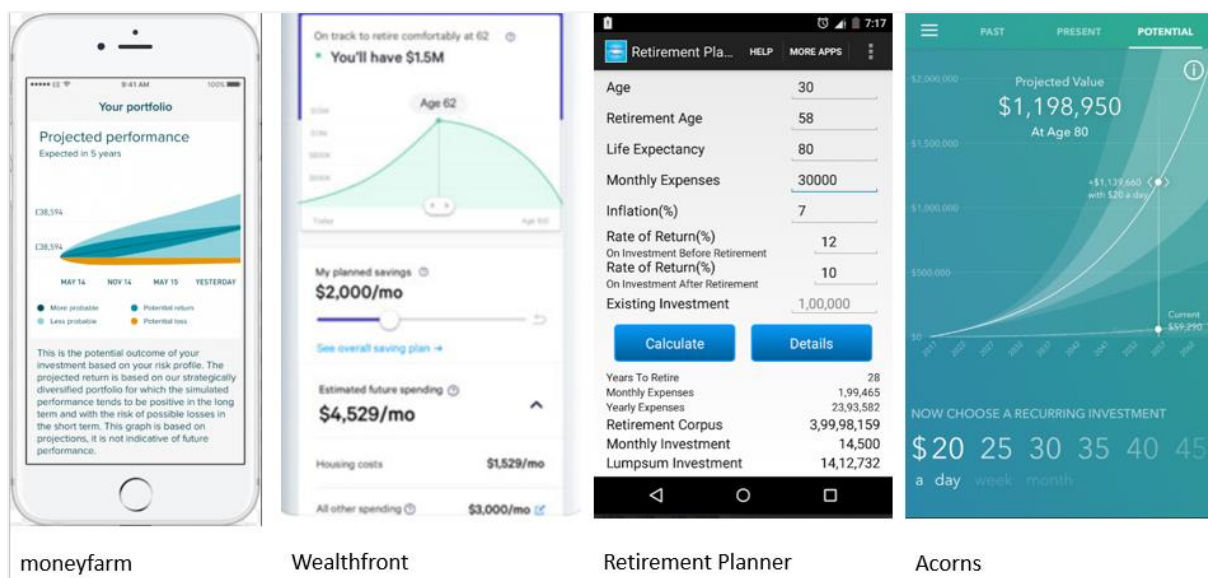


Figure 5: Mobile Apps for Retirement Planning Calculations

Retirement Planner offers traditional retirement calculator functionality in an aesthetically dull display which demands a lot of reading and very little visual encoding to aid rapid visual processing. *moneyfarm* and *Acorns* provide rich graphs which not only give estimated investment growth but also a band of confidence in the estimate. *Wealthfront* and *Acorns* add age to the visuals which immediately makes it personal, relevant and interesting for the user. The slider to move to different points along the timeline entices the user to explore their financial situation further.

Acorns allows a lot of customisation including choice of investment amount and frequency, and a toggle between past, present and potential, all visible to the user. The principle of *visibility* is prominent as all the options are immediately available and do not require any user interaction such as selecting from a drop-down list. It also uses *affordance* by giving visual cues to guide the user what to do next.

2.9. Conclusion to Chapter 2 and Introduction to Chapter 3

In this chapter, design studies and usability studies were compared. The use of user stories was highlighted as a means to chunk the work and personas were explained as a means to bring the requirements to life and assist designers in making design decisions. Evidence was presented to support producing multiple parallel, diverse designs to improve the quality of the designs and avoid early fixation and demotivation when user-feedback is especially critical. Multiple iterations of increasing fidelity with user feedback in-between balances the action of designing with learning. Semi-structured interviews are appropriate for few users when probing the answers to open questions is important.

The researcher emphasized the importance of qualitative design feedback as a complement to and ahead of quantitative usability testing in evaluation because of the downstream impact on development of not first establishing utility (building the right features). Situations are given of when usability testing ahead of establishing utility can be harmful. User inquiry methods such as interviews are appropriate for low fidelity prototypes (from an interaction perspective).

Chapter 3 covers which of these methods were used to conduct the research. Six users and two experts were recruited using convenience sampling. Semi-structured interviews were conducted with the six users to gather requirements and overlay them with generic good advice from financial planning experts. The primary mid-career professional persona was defined and split by personality and motivational attributes into two diverse personas, one for Alan, the mature professional and one for Zoe, the go-getter professional. The two personas were used to make design decisions and in an unconventional way to inspire two parallel, diverse, initial designs (digital paper prototypes). The user inquiry method combined with semi-structured interview questions were used to gather feedback on the initial designs. The user-feedback was used to refine the initial designs into final designs.

Chapter 3: Design Methodology

3.1. Introduction

A slightly modified user centred design (UCD) process was followed to conduct the research. UCD has three main phases: establishing user requirements, rapid prototyping and usability evaluation. In the user requirements phase, personas are used in an unconventional way to inspire parallel, diverse designs. In the rapid prototyping phase, there are two design iterations with a user-evaluation iteration in-between. Two diverse, parallel, initial, low fidelity designs are produced, instead of one. There is an increase in the richness of the designs but not the interactive fidelity of the prototype in the final design iteration. In the user-evaluation phase, we focus on qualitative design feedback and not quantitative usability testing, given the low interaction of the prototype. The slightly modified UCD process is described in detail in its three phases below.

3.2. Phase 1: Discovering and Defining User Requirements

In order to answer the primary research question ‘In what ways can a mobile application support mid-career professionals in creating better financial futures?’, the researcher first needed to clarify what financial information would be useful to users in promoting better financial decisions (to borrow and spend less and save more).

Below is an explanation of how users were recruited for the study using convenience sampling, the nature of the semi-structured interviews conducted, how the primary client archetype was formed and split into two personas on personality and self-rated motivational attributes and how expert knowledge and user priorities were used to chunk the work into three user stories, each with a scenario of use. The output of Phase 1 of the process was enough information to produce two diverse, parallel, initial designs.

3.2.1. Selection of Users and Experts

The financial profile chosen was professional people employed by a corporate who are mid-career and earn a monthly salary. These people are likely to have a similar financial profile, similar financial literacy and similar financial goals and needs. Financial Planning is a broad field of knowledge and these factors narrow the scope of relevant financial planning solutions that would need to be catered for in the design and hence help to focus the study. An entrepreneur with their own business for example would have an irregular income stream and different financial needs (including financial planning for their business) from someone who earns a regular monthly salary (who most likely only requires personal financial planning). People in the early stages of their career would have different financial needs and priorities (such as funding a wedding or buying a first home) from people in mid-career (who have likely had a loan for many years and may be considering buying a second home with tax implications or starting an investment portfolio). People that do not work or manage their finances may have a different level of financial literacy as well as different financial needs which may introduce

additional complexity into design. The intention is not to exclude people with valid financial needs but to reduce the financial planning scope and complexity for the purposes of this study.

To get around asking people for their personal financial information, the sample users were chosen from colleagues the researcher already had a working relationship with, at one of the six South African banks, using convenience sampling. Although the researcher had no prior knowledge of their personal financial situation, their financial profile could be deduced from the position they hold at the bank. This was done to take advantage of an existing level of trust and to avoid having to ask how much they earn. General (not specific) questions were asked about their financial situation. This was done to get a thorough understanding of the users without invading their financial privacy. The focus was on their goals and needs and tasks they perform, not on the actual numbers. This is also why observation was not a relevant method for this study.

Eight users were selected, six not in a financial planning career and two currently working with financial planning domain knowledge on a daily basis. An additional two users were chosen for an initial pilot of the designs (neither in a financial planning career). All but one are currently employed by one of the five main South African banks, in senior management to early executive positions and from different departments in the bank. The users all hold a tertiary qualification from a mix of fields including Engineering, Information Technology (IT), Accounting, Economics, Marketing and Law.

The users were chosen across demographic backgrounds such as race, gender and age, to incorporate a diversity of views. Table 1 shows the demographic distribution of the users with the two pilot users shown in parenthesis (these are not included in the average ages):

Table 1: User Demographics

	Black	Coloured	Indian	White	Total	Average Age
Male	1	2	(1)	1 (1)	4 (6)	42
Female			1	3	4	45
Average Age	39	44	40	44	43	

Five of the users are married, four with dependents and three are unmarried with no dependents. Five of the users reside in Cape Town and three in Johannesburg. Financial planning experts confirmed that this demographic and geographic profile is similar to the profile of mid-career professionals they recruit as clients and therefore appropriate for the study (in the South African context).

3.2.2. Semi-Structured Interviews with Users

The researcher obtained ethics clearance by following the UCT process (approval code **FSREC 003 - 2020**). Each participant signed the informed consent form, included in Appendix 1.

Financial planning covers a broad range of topics such as consolidating and managing debt, managing spending against a budget, saving towards a goal for example to fund children’s education, a holiday or the deposit on a home or vehicle, retirement planning, short term and life insurance, tax planning and estate planning. In order to clarify which of these topics are most important to users, a mix of a few closed and mostly open questions from each of these topics was compiled. Additional questions

about their current financial relationships, financial tools and financial habits were included to uncover areas of frustration and unmet needs. The full set of questions can be found in Appendix 2.

A semi-structured interview was conducted with each of the six users without a financial planning background. The questions could have been sent out as a questionnaire, but a semi-structured interview was chosen instead to build rapport with the users and to take advantage of the ability to probe for more information and to clarify statements made by the user and questions misunderstood by the user. Building rapport with the users is an important step in getting detailed feedback on the designs later on in the process. This method also seemed more suitable given that a lot of the questions were open and demanded qualitative answers as users were asked to describe and explain which is easier for users to say than to type out. Having to type out answers may have resulted in users giving shortened answers or no response which would have reduced the quality of the feedback.

The two users with a financial planning background were excluded from these questions because they are considered experts in their field and would not represent users with typical goals, needs and requirements given their domain knowledge.

Five of the six interviews were recorded. Four were face to face and two were done by Skype because the users reside in Johannesburg (the third user that resides in Johannesburg was interviewed face to face in Cape Town whilst visiting). Five of the interviews lasted 20-30 minutes and one lasted 45 minutes. All were transcribed and available on request.

The semi-structured interviews were used to identify common financial planning themes and develop personas to assist in developing parallel, diverse designs. The common financial planning themes are summarised as design goals in the infographic in Figure 6 below. Users want an easy and effortless experience that helps them to improve their financial well-being and avoid financial disaster. They want to be able to view their overall financial status and trends over time, to add goals and to understand the impact of their daily financial planning decisions on these goals.

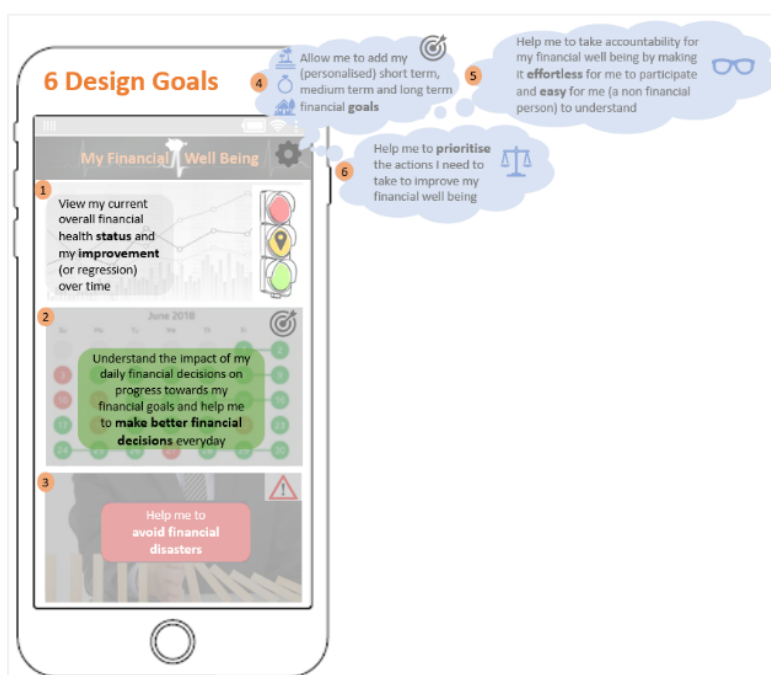


Figure 6: Financial Planning design goals

3.2.3. Development of Personas

Personas are not real people but they are based on aggregated attributes from real users. The purpose of developing personas is to assist the designer in making design decisions (Sharp, Rogers, & Preece, 2019). A primary persona was developed to capture the financial profile of users that would likely have similar financial needs and require similar financial planning solutions. Then, the primary persona was split into two on personality and motivations attributes and used in an unconventional way to inspire diverse parallel designs.

A primary client archetype was developed with input from financial planning experts to describe the financial profile of the mid-career professional. Typically, they are employed by a large corporate and earn a fixed amount as a salary every month. They contribute towards retirement monthly, often through the corporate's *Group Scheme*. They usually own their home and car and may be repaying monthly instalments on each loan. They may have an investment property or share portfolio which will supplement retirement savings. They usually have an emergency fund equivalent to up to three times their monthly income for unforeseen large expenses. They often have a budget outlining planned expenditure each month which is reviewed regularly and adjusted occasionally. They are sometimes able to meet all expenses in the month that they occur, but occasionally exceed the budget for the month and are comfortable to use credit card debt to cover the additional spending. They usually try to pay the full amount owing on their credit cards every month to avoid interest charges but occasionally these charges are unavoidable for a few months whilst recovering from the unexpected expenditure. They are sometimes able to save money towards a goal but find it difficult to do every month because there always seem to be unexpected expenses.

The personality and motivations attributes were collected as a self-rated questionnaire, containing a free online personality assessment and four questions about motivations (see Appendix 3). The dimensions output by the free online personality assessment came in the form of four letters, E or I for Extrovert or Introvert; S or N for *Sensing* or *Intuition*; T or F for *Thinking* or *Feeling*; J or P for *Judging* or *Perceiving*. Users U1 and U2 were primarily used to form the personality of Alan. Users U2 and U4 were blended to form the personality of Zoe. U6 did not complete the questionnaire. Users were asked to score the four dimensions: *price*, *choice*, *impact on society and the environment* and *novelty* on their importance in making purchasing decisions. The self-assessment was on a Likert scale from 0 (least important) to 10 (most important). Scores from U1, U3 and U5 were used for Alan and scores from U2 and U4 were used for Zoe.

The two personas include a Mature Professional and a Go-Getter Professional and detailed infographics are included as Figure 7 and Figure 8. The goals and frustrations were summarised from the semi-structured interviews with users. The personality and motivations sections were modelled from the questionnaire. The background was inspired by knowing some of the users over many years and not from questions per se, and added to enrich the profiles. The pictures came from the Internet and demographics were made up to be appropriate to the study.

Persona Alan is conservative, methodical, organised and practical. His goals are to pay for his children's education, to enjoy family holidays and to retire comfortably. His main frustrations with his bank are that he is not getting the proactive service and advice he is paying for and that his time is limited, and his finances appear fragmented and require considerable and regular effort on his part to analyse his financial situation and make appropriate changes.

Alan is highly motivated by price and less so by choice. His impact on society and the environment are not really important to him in making purchasing decisions, nor is novelty. He is not tech-savvy and is afraid to try new technology as he is not very trusting and is very worried about security and especially phishing. He would rather let others try things out and report back favourably before he feels brave enough. He has a competitive nature, so he likes to compare himself to his peers, but he keeps this to himself because he is embarrassed about it. He is a slight introvert; makes decisions using carefully considered logic; and his colleagues think he is intelligent, reliable and diligent.

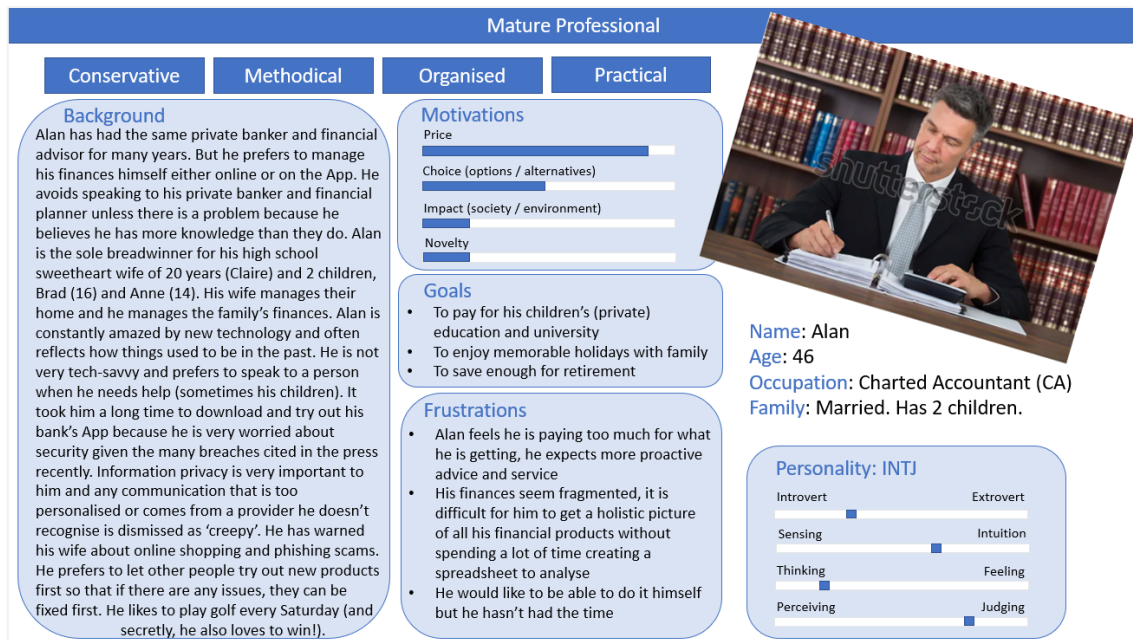


Figure 7: Persona A for Alan, the Mature Professional



Figure 8: Persona Z for Zoe, the Go-Getter Professional

In contrast, Persona Zoe is energetic, modern, social and caring. She is less motivated by price and more motivated by choice, novelty and her impact on society and the environment. Her goals are to make a difference in the world, to keep fit and healthy, to keep learning new things and to save enough to enjoy her retirement. She makes decisions based on emotions and how she feels about a situation.

She loves technology and how it can help her with her busy schedule and social life. She values new experiences and would rely on online reviews by the public to make decisions. She works hard and plays hard and her busy schedule means she doesn't have time to think about finances. She feels frustrated by all the banking Apps she has tried. She knows it is possible to use her personal data to customise her choices and make them more relevant to her. She feels her bank should know her better by now and should use her data and mobile technology to help her to make smart choices. At the moment, it is all far too complicated, and she doesn't have the time to figure it all out.

3.2.4. Personal financial planning assessment

The researcher completed a postgraduate diploma in financial planning in 2012 and qualified as a Certified Financial Planner (CFP) so is qualified to give financial advice but has never practiced. This may be a domain knowledge advantage which may need to be filled should the research be repeated or extended in future.

The researcher contacted a financial planner to undergo a complete financial planning assessment and recommendation of our own personal financial situation. This was done to deeply empathise with the users interviewed and view the problem from their perspective.

In the first meeting with the financial planner, there were questions about current assets and liabilities and current income and expenditure. Then a formal record of income and expenditure was requested. This entailed downloading transactional banking statements from three different banks for the last six months, combining the transactions by date, categorising the transactions into debt repayments, exceptions or unexpected spend and regular monthly spend. Regular monthly spend was further categorised into Restaurants, Groceries, Rates and Water, Electricity, etc. This took approximately six hours to complete.

The researcher also enrolled in the 22seven financial planning aggregation application to analyse the functionality and how common tasks could be made easier for users.

3.2.5. Financial information to inform the designs

The researcher's personal financial information was used as a starting point but modified with the help of a financial planner towards the financial profile of a typical mid-career professional. The main objective was for the users to be able to identify with the financial situation presented to them in the designs as an alternative to providing them with their own financial information.

3.2.6. Generic good advice from financial planning experts

A financial planner assisted the researcher to come up with items of generic good advice for mid-career professionals. Eight categories were identified as follows:

Financial position - Know your financial position at any time.

Spending - Spend less than you earn. Make a budget and stick to it. Reduce high and unnecessary spending. Adjust your lifestyle if necessary.

Saving and Investing - Save as much as you can. Redirect the savings into a separate account. Make saving part of your monthly budget. Make use of the tax-free savings vehicle for saving. Invest your savings regularly and take a long term view. Diversify your investments.

Emergency Fund – Have access to 3x your monthly income in a highly liquid account (cash) in case of emergency.

Debt Financing – Do not pay more than 35% of your monthly income towards debt. Pay down your most expensive debt first. Pay down your property debt faster than required.

Tax Planning – Keeping debt on a second property for rental can assist in lowering your overall tax obligation.

Retirement Planning – Contribute up to 27.5% of your pensionable income towards retirement. Have a retirement savings coverage ratio of at least 70%.

Estate Planning (succession) - Know the cost of dying and make provision for your family by doing an Estate Plan and having a valid Will. Do the calculation 'a breadwinner of age x and income y should have Life Cover of z' to check that you have adequate cover.

3.2.7. Themes and User Stories

The semi structured questionnaires were used to identify common themes at a higher level of abstraction and were linked to the generic good financial advice from above. Eight themes were identified as follows:

My time is limited – I am comfortable to manage my own finances but my time is limited so I need it to be quick, easy and intuitive. I want to be able to ask for help immediately if I get stuck.

Enable me to do it myself – I like to do my banking and finances online myself. I do not talk to my private banker unless there is a problem like fraud on my account. I dread having to visit a branch.

Help me to make smart financial choices – Help me make smart financial choices by using my data and being more proactive. Help me to avoid making mistakes.

Trust – I do not trust my financial planner because I don't think they have my best interests at heart. I check what they say against other experts or ask other people.

Consolidation and aggregation - I would love it if someone could consolidate all my financial information into one ecosystem. Include all my assets and liabilities, all my banking, all my investments including my properties, my shares, my unit trusts and my retirement savings.

Exercise, sports, shopping, travel – I like Apps that track my exercise, give me sports scores, enable online shopping, assist with travel arrangements, facilitate online learning.

Security is important – Security is very important to me. The institution must be reputable.

Retirement – I need help saving for retirement. I am not sure if I am saving enough. I am worried about investment performance because it is lower than I expected.

Three functional mappings were identified (the ‘what’ features should be built). ‘Financial position’ from generic financial advice was mapped to ‘Consolidation and aggregation’ expressed by users. ‘Spending’ and ‘Saving and Investment’ from generic financial advice were both mapped to ‘Smart financial choices’. ‘Retirement’ and ‘retirement planning’ were the third match.

This is summarised in Table 2 below:

Table 2: Mapping of Generic Financial Planning Advice and User Themes and Priorities

User Story	Generic Financial Planning Advice	User Themes and Priorities
Overview	<i>Financial position</i> - Know your financial position at any time.	<i>Consolidation and aggregation</i> - I would love it if someone could consolidate all my financial information into one ecosystem. Include all my assets and liabilities, all my banking, all my investments including my properties, my shares, my unit trusts and my retirement savings.
Spending	<p><i>Spending</i> - Spend less than you earn. Make a budget and stick to it. Reduce high and unnecessary spending. Adjust your lifestyle if necessary.</p> <p><i>Saving and Investing</i> - Save as much as you can. Redirect the savings into a separate account. Make saving part of your monthly budget. Make use of the tax-free savings vehicle for saving. Invest your savings regularly and take a long-term view. Diversify your investments.</p>	<i>Help me to make smart financial choices</i> – Help me make smart financial choices by using my data and being more proactive. Help me to avoid making mistakes.
Retirement	<i>Retirement Planning</i> – Contribute up to 27.5% of your pensionable income towards retirement. Have a retirement savings coverage ratio of at least 70%.	<i>Retirement</i> – I need help saving for retirement. I am not sure if I am saving enough. I am worried about investment performance because it is lower than I expected.

The mapping informed *what* should be designed and helped to reduce scope to the most important areas to focus on (from the users’ perspective, overlaid with generic financial planning advice). This was used to define three sets of user stories to focus on in this research: 1) Overview; 2) Spending and Saving; and 3) Retirement.

Overview: As a user, I would like to see a summary of my balance sheet, comprising all my assets and all my liabilities from all the financial institutions I have an account with so that I can understand whether I am better off or worse off than I was previously.

Spending and Saving: As a user, I would like to assess whether I can afford to buy an item based on my income, my expenses and my budget or what adjustments I need to make to be able to afford it. As a user, I would like to save towards a specific goal, track my progress towards that goal and make adjustments to get back on track so that I can ensure that I meet the goal I have set for myself.

Retirement: As a user, I would like to assess my current retirement position to understand whether or not I have saved enough for retirement. As a user, I would like to explore scenarios that impact my retirement position to assist me to make smart adjustments now to avoid financial disaster at retirement.

3.2.8. Development of Scenarios of Use

The user stories were further detailed into specific tasks the user may want to perform within a specific context of use and are described next.

Overview Scenario: You want to know your current overall financial status. You are interested in your assets, liabilities and net worth. You are interested in whether it has improved or declined over time. You need to isolate the main category ie. assets or liabilities, that contributed to the improvement or decline over time.

Spending and Saving Scenario: You need an outfit for a function you have been invited to attend in three months' time. None of the outfits you own are suitable. It is five days away from payday and you have already exceeded your budget for the month. You have found an outfit you really love for R949 on www.superbalist.com but you are uncertain whether you should spend such a large amount on one item of clothing given your current financial situation. You need to assess whether you can afford to buy the dress given your spending against budget or what changes you may need to make. You need to decide which item to buy based on price and possibly other factors. You need to work out how much to save to be able to buy the dress in three months' time. You need to assess whether you are on track to meet your goal. You need to decide how to pay for the dress and what the impact is on total cost.

Retirement Scenario: In retirement planning, you are considered to have planned to save enough toward retirement when your money is likely to run out within five years or less than your life expectancy. You need to be able to assess whether or not you have saved enough for retirement. Should you find that you have not saved enough for retirement, you need to be able to make adjustments and view the impact of those adjustments on your retirement savings. Examples of adjustments you could make include any single selection or combination of the following: 1) to postpone your retirement date; 2) to save more towards retirement on a regular basis (monthly contribution); 3) to decrease your expenses after retirement (income required to cover those expenses); 4) to increase the return on your retirement savings.

3.3. Phase 2: Developing Designs through Iteration and Rapid Prototyping

The user requirements and particularly the personas and scenarios of use for each of the three user stories (Overview; Spending and Saving; Retirement) from phase 1 are an input into creating the designs in phase 2 (they inform *what* features should be included). The personas of Alan and Zoe from

phase 1 were used to produce two diverse, parallel, low fidelity initial designs, instead of one which is the norm (they inform the *how*).

Then qualitative user feedback was sought on the initial designs. The user feedback was used to refine the initial designs into final designs. The final design has increased richness of the visual design elements but is not a high-fidelity prototype from an interaction perspective. There were two design iterations, an initial design and a final design, with one user feedback iteration in between.

3.3.1. Initial Design

The purpose of the initial designs was to convey the concepts to the users and explore alternatives with them. They are (digital) paper prototypes compiled in Microsoft PowerPoint, with no functionality but with affordances (visual cues) as to how they might function. Even as initial paper prototypes, the designs are relatively rich from a visual design perspective. But they are low fidelity from an interaction (usability) perspective.

Two initial designs were created in parallel. Personas were used to inspire the designs and make design decisions. One initial design was created for Alan, the mature professional persona (Design A) and one initial design was created for Zoe, the go-getter professional persona (Design Z). Their diverse personality and motivation attributes resulted in diverse designs.

Each of the initial designs contains three sections for the three user stories 1) Overview, 2) Spending and Saving and 3) Retirement.

The designs were first piloted with two users in order to assess whether there were any mistakes, omissions or problems that would cause the user testing to be declared invalid. A few adjustments were made to ready the designs for user testing and evaluation.

The initial designs produced are presented and discussed in Chapter 4.

3.3.2. Final Design

User feedback from the design evaluation of the initial design was used to make adjustments and refine the designs to produce a final design for each of the three scenarios of use defined for each user story.

The final designs produced are presented in Chapter 5, after evaluation.

3.4. Phase 3: Design Evaluation

The purpose of design evaluation is to assess whether the design is useful to the users in completing their tasks and accomplishing their goals (as defined in phase 1 of user requirements). Because of the low-fidelity nature of the initial designs (from an interaction perspective), quantitative usability testing is not appropriate and user inquiry is used to record users' feedback, with a stronger focus on design than on usability.

The focus of the evaluation was three-fold. First to test the ideas and concept presented and whether users thought it was useful and whether they thought they would use it. Second to test whether users thought they could access the information or achieve their goal effectively and efficiently and to pick up any imagined usability problems with the designs. Third to evaluate which design users preferred and their reasons.

An inquiry method was used with the same six users and two financial planning experts. Respondents are labelled U1 to U6 for users and E1 to E2 for experts, in the order that they were interviewed. Users were first read the financial profile of the persona and asked whether they could identify with the primary persona. All 8 confirmed that they could identify with the financial profile as it is similar to their own. The Alan and Zoe personas were not shared with the users.

Users were briefed one scenario of use at a time. They were shown the first design for the first scenario and asked about their first impressions of the design, whether they would find it useful and whether the design was appropriate for the scenario of use explained. Users were encouraged to ask questions about anything that they did not understand or was not clear to them. Users were encouraged to provide feedback and suggestions on the designs presented. Next, they were shown the second design for the first scenario and asked the same questions. After seeing both designs for the first scenario, they were asked which design they prefer and why. They then proceeded to the second scenario followed by the third, each time seeing the same design first.

Four of the eight users were shown Design A first (U1, U3, U5, E1) and the other four were shown Design Z first (U2, U4, U6, E2). Two males and two females saw design A first and two males and two females saw design Z first. The first respondent was shown design A first, the second respondent was shown design Z first, the third respondent was shown design A first, etc. up to eight respondents.

The feedback on the designs from the users was used to form the final designs which are presented in Chapter 5, after evaluation.

3.5. Conclusion to Chapter 3 and Introduction to Chapter 4

In Chapter 3, the Methodology used to conduct this research was explained. A slightly modified UCD process was used, with two design iterations and a user driven evaluation iteration in between. Personas were used to create rich summaries of real user attributes to assist in making design decisions. The personas inspired two parallel diverse initial designs, instead of one which is the norm. Evaluation was qualitative and done using the inquiry method with users, combined with semi-structured interviews.

In Chapter 4 that follows, the initial designs will be presented and the design decisions that were made will be explained. The focus is on communicating the concepts to the users and exploring alternatives with them. There is a stronger focus on visual design principles than on interaction (usability) principles. There are two initial designs, one for Alan and one for Zoe. Each of the initial designs contains three sections for the three user stories and their scenario of use (Overview, Spending and Saving, Retirement).

Chapter 4: Initial Designs

4.1. Introduction

Rapid prototyping is Phase 2 of the iterative UCD process and includes two design iterations, outputting an initial design and a final design, with one user-evaluation iteration in-between. User evaluation falls into Phase 3 and is discussed in Chapter 5. The initial designs are the first design output from following the UCD process. The initial designs were formed through the synergy of three pieces of information: the users' responses in the initial semi-structured interviews; design decisions made with Alan or Zoe in mind; and understanding the existing products on the market, discussed in Chapter 2.

The focus when creating the initial designs was on communicating the concepts to the users (utility or including the right features) and exploring ideas and alternatives with them. The emphasis leans towards visual design principles rather than interaction (usability) principles but there is a blend of both. There are two initial designs, one for Alan and one for Zoe. Each of the initial designs contains three sections for the three prioritised user stories and their scenario of use described (Overview; Spending and Saving; and Retirement).

First the initial designs are positioned by describing the theme and how it relates to persona Alan or Zoe's personality and motivations. Then each of the three user stories is discussed separately. For each user story, first there is a reminder of the user story and scenario of use and a brief explanation of the imagined solution depicted by the design, then the initial design is presented as a figure which is used to discuss the design elements. Within each scenario of use, Design A for Alan is discussed first and Design Z for Zoe thereafter.

4.2. Positioning of the Initial Designs for Alan and Zoe

Design A was done with the persona Alan in mind, the Mature Professional. Alan is conservative, methodical, organised and practical. Therefore, the design is conventional. The theme can be described as grey with muted tones. It consists of rectangular panels of white on a grey background and white and grey are the dominant colours one sees at first glance. The navigation is linear, up or down. Very little interaction is required of the user to see all their information, which suits Alan's reluctance to explore new technology. The 22seven screens were used as a starting point for Alan's design and improvements were added.

On the left of the header panel is the logo or brand of the financial institution backing the application (App). This is a reminder to Alan that the App is safe to use because it is backed by a reputable institution and a registered financial services provider and is not a scam or phishing attempt. This is important to him as expressed in the background section of his persona infographic in Figure 7.

On the right of the header panel is a picture of the relationship manager. This is another reminder to Alan that the App is safe to use. Although not obvious from the design, the relationship manager is intended to be a real photograph of Alan's Private Banker or Financial Planner which he would recognise (or both, side by side). If Alan gets stuck or has any questions about his finances, he can interact with this person directly using the App.

Alan’s primary concern is his family. He wants to make memories with them on holidays and he wants to ensure that they can continue living the lives they are accustomed to should anything happen to him. The header ‘My Financial Health’ was chosen to speak to Alan’s need to feel that his family are secure financially. The pulse in the background is a visual use of gist to represent (financial) health in the same way that one would monitor your pulse if you were exercising to stay healthy. This suits Alan’s methodical profile.

Design Z was done with the persona Zoe in mind, the Go-Getter Professional. Zoe is energetic, modern, social and caring. Therefore, the design is unconventional and vibrant. The theme can be described as ‘modern vintage’, which is a style that has recently come back into fashion. It consists of hexagonal panels of black and slate (very dark grey). The hexagon is an unconventional choice of shape for a mobile App. There is a link to nature in terms of the shapes that form a beehive and the golden colour of honey (using subtle gist). The link to nature ties in with Zoe’s motivation to make a difference in the world and the value she places on her impact on society and the environment. The navigation is non-linear which is also unconventional. Instead of just up and down, the user can also navigate in four additional directions (top-left, top-right, bottom-right, bottom-left). This is in tune with Zoe’s profile of being an extrovert, the high value she places on novelty and choice, her enjoyment of new experiences and her willingness to explore new ideas and technology. The gold lettering gives a sense of something valuable and hints at wealth which is expressed in her aspiration to enjoy her retirement.

Zoe’s primary concern is to make a difference in the world. She has a deep desire to be guided to make smarter financial choices. The text *My Financial Guru* was chosen to represent a link to a higher power or expert to guide her along her financial journey.

The navigation and design templates are shown in Figure 9.

The active hexagon fills most of the screen. The navigation hints around the active hexagon in light grey text, give the user their six navigation options. As the user navigates to another section, say My Retirement above, or My Spending below, the navigation options available around the active hexagon being viewed change as shown in the honeycomb layout in Figure 9. This resulted in the three slightly different templates for the three user stories, also shown in Figure 9.



Figure 9: Initial Design Z: Navigation and Design Templates

In section navigation is displayed at the bottom of the active window using mini-hexagons as breadcrumbs with one filled to indicate it is active. The user could either click on a breadcrumb or use the arrows in the left and right corners of the hexagon to navigate between windows within a section.

As with Design A, on the left of the header panel is the logo or brand of the financial institution backing the App. On the right of the header panel is the relationship manager. This is a reminder to Zoe that she can contact them directly during her busy schedule.

4.3. User Story 1: Overview

4.3.1. The Concept

Table 3 is a reminder of the user story and scenario of use from Chapter 3.

Table 3: Summary of User Story 1 and the Scenario of Use

User Story	Overview
Description	As a user, I would like to see a summary of my balance sheet, comprising all my assets and all my liabilities from all the financial institutions I have an account with so that I can understand whether I am better off or worse off than I was previously.
Scenario of Use	You want to know your current overall financial status. You are interested in your assets, liabilities and net worth. You are interested in whether it has improved or declined over time. You need to isolate the main category ie. assets or liabilities, that contributed to the improvement or decline over time so that you can make better financial decisions and improve.

The primary goal is to give the user a single consolidated view of all their financial information across financial service providers. This is currently difficult for the user to do themselves because of the multiple service providers, multiple formats they receive the information in and differing levels of granularity. It takes considerable and regular effort to perform this task manually. The benefit of doing so (to users) is to get an understanding of their current financial position and changes over time.

It is envisioned that the user would give permission to the service provider who builds the App to ingest their personal financial data from each financial services provider where they hold products (aggregation). The data would be pulled into the App and categorised and aggregated automatically (using advanced machine learning algorithms that learn over time). There would be little user involvement beyond identifying a financial institution where they hold a product and giving permission, the rest would be done automatically using technology on their behalf to make it easy and effortless for users.

4.3.2. Initial Design A for Alan

The initial design A for Alan is presented in Figure 10 below:

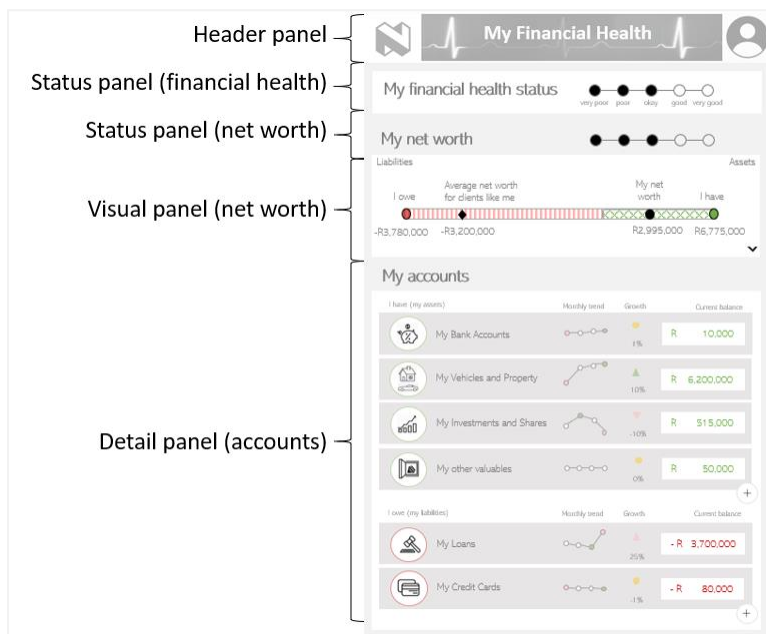


Figure 10: Initial Design A for User Story 1: Overview

Status panel

Two status panels are shown, one for financial health status and one for net worth. A five-point scale is used from very poor on the left to very good on the right and okay in the middle. Each point on the scale has an open circle and the circles are filled in black from left to right to show the user their rating on the scale. The rating compares the user to all other users that are similar to them based on their data (other mid-career professionals enrolled in the App). It serves as validation to the user on how they compare to their peers. In the design, Alan can see that he is 'okay' with respect to his financial health status and his net worth, but there is room for improvement relative to his peers. This is likely to appeal to his competitive nature and serve as a motivation to improve.

Visual panel (net worth)

Alan is an Accountant. He is used to the Accounting convention that debits are on the left and credits are on the right. This mental model was used to depict his Assets and Liabilities as a horizontal bar, starting on the left at the most negative (his total Liabilities) and ending on the right at the most positive (his total Assets). It also follows the convention of increasing numbers running from left to right. The top left and top right of the panel are labelled as such so that the eye can scan along the top to get the Accounting meaning and then down to read off the information. The words 'I owe' on the left were added for people who are less accustomed to the word 'Liabilities' and similarly 'I have' supplements the word 'Assets' for less financially astute users.

In addition to spatial separation (proximity), colour (red, green) and texture (vertical stripes, criss-crosses) are used as visual channels to separate Liabilities from Assets. Muted tones are used to fit in

with the theme but are still bright enough to draw the user's attention. Red for outflow and green for inflow are standard conventions which add meaning. Because the red and green are similar in brightness and saturation, they would be difficult for a colour-blind person to distinguish and would both be seen as brown so the addition of vertical stripes in the red and faint criss-crosses in the green adds another visual channel to separate the information. The start and end are denoted by a filled circle in the same colour.

The net worth which is calculated as assets minus liabilities is shown as a solid black circle. The black is a sharp contrast to the muted tones. It is intended to stand out as the most important piece of information on the visual for people to see, followed closely by total assets and total liabilities. The black diamond for 'Average of clients like me' assists Alan to compare himself to his peers and appeals to his competitive nature.

Details panel (accounts)

The top section of the panel gives categories of assets the user has, and the bottom section of the panel gives categories of liabilities the user has.

On the left of the panel is an icon depicting the category and the edge colour is consistent with the visual panel above, green for assets and red for liabilities. The icons contain a very simple outline of an image on a white background and the images are what one would expect – a piggy bank for bank accounts; a house and car for vehicles and properties; a graph showing growth for investments; a safe containing a diamond for other valuables; a judge's gavel for loans is a reference to the legal transaction when buying a property; cards for credit cards. This is an improvement on the 22seven design which uses more complex images and colours that do not hold meaning.

These icon's visual encodings aid learnability and memorability. There is a description of the category in words to supplement their meaning. The eye would first scan the icons and only if an image wasn't immediately obvious would the user read the text to get the meaning. Over time the icons would be learnt and remembered. The order of the categories would remain the same to aid learning and memorability by position.

The next vertical section gives a very simple trend line. There are four points displayed and one can see from the header that it is a monthly trend. The highest point in the trend is filled in green in the assets section to denote 'best' and red in the liabilities section to denote 'worst'. The reverse applies to the liabilities section where lowest is best and green and highest is worst and red. The other points are white on the grey background. This allows users to quickly pick out the best and worst months in the trend and start to answer the question about which category is responsible for the improvement or decline over time.

The next vertical section gives a shape filled in colour to show growth. A green triangle shows positive growth over the four months, a red upside-down triangle shows negative growth over the four months and a yellow circle shows very little change over the four months. The shapes and colours are conventional and assist the users to process the information rapidly. The text showing the percentage gives the exact amount of growth should the user need more detail. Again, the colours are reversed in the Liabilities section where positive growth is a red triangle and negative growth is a green upside-down triangle. In this way, shape and colour together form different meanings in each section.

The right-hand section shows the amount of the aggregated accounts as a number. The text is coloured green or red, again consistent with the previous section. The floating plus-sign allows the user how to add additional accounts (principle of visibility).

4.3.3. Initial Design Z for Zoe

The initial design A for Alan is presented in Figure 11 below:

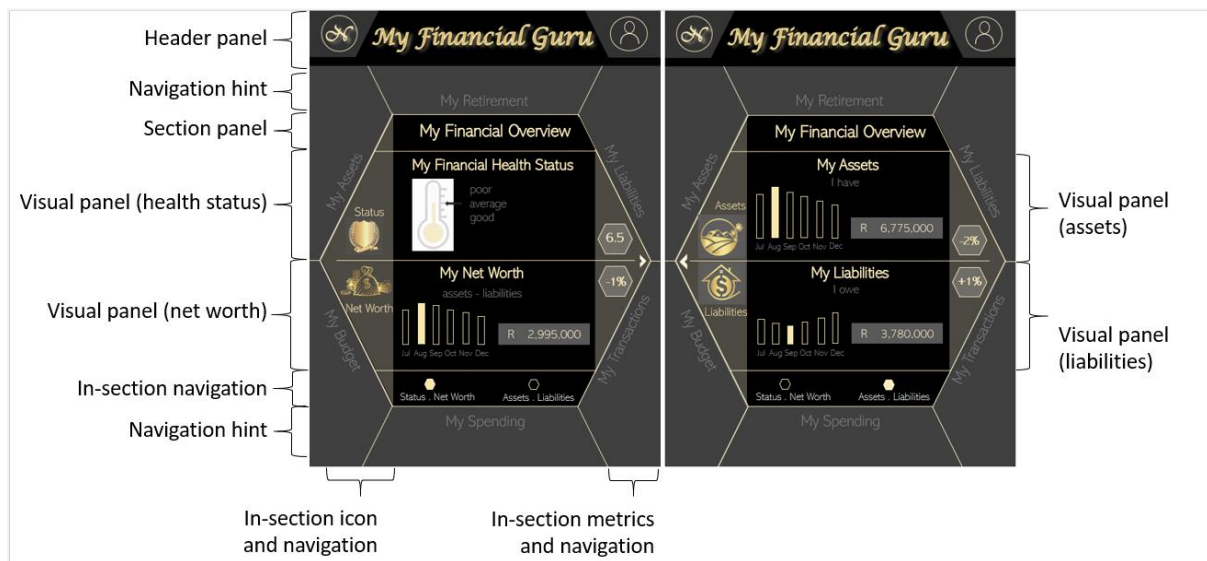


Figure 11: Initial Design Z for User Story 1: Overview

Visual panel

There are four visual panels, for financial health status, net worth, assets and liabilities. This layout is suited to Zoe being constantly on the move and wanting to access the information rapidly on her mobile so smaller amounts of information are revealed at a time and elements are relatively large and spaced out.

For financial health status, a thermometer is used to extend the analogy of health to financial status. A three-point scale is used ranging from poor to average to good. Poor is shown at the highest temperature because high temperatures indicate poor health. The icon chosen for status is a shield which one would normally receive as a prize for a personal achievement with their name engraved. The small hexagon with the number inside is a more exact measurement of financial health status out of 10, which is easily converted to a percentage if required. It compares the user to other users like them based on their financial data (other mid-career professionals enrolled in the App).

For net worth, assets and liabilities, each of the panels has a header with an alternate phrase directly below to add meaning; a trend shown as a bar graph and the current value shown as a large number to the right. The horizontal lines serve to divide the palette in half and the headers label each section. The trend shows the last six months. Empty bars are used except for one filled bar assigned to the best month so that the eye can pick it out rapidly and compare across panels. Assets and Liabilities sections

are stacked above each other for the user to scan rapidly up and down to compare individual months. The numbers are large to facilitate easy retrieval of the information and positioned identically in each panel to aid learnability, memorability and comparability.

The icon chosen for net worth is several money bags. The icon for assets is a house with rolling hills in the foreground to signal wealth. A house was chosen as this is often the largest asset for the professional persona. The icon for liabilities is the shape of a house with a dollar symbol to represent loans on the typically largest asset (also often the largest of the total debt).

The small hexagons with the percentages inside are a more exact measurement of growth in net worth, assets and liabilities respectively. Again, they allow rapid scanning from one panel to another as they are identically placed.

4.4. User Story 2: Spending and Saving

Table 4 is a reminder of the user story and scenario of use from Chapter 3.

Table 4: Summary of User Story 2 and the Scenario of Use

User Story	Spending and Saving
Description	As a user, I would like to assess whether I can afford to buy an item based on my income, my expenses and my budget or what adjustments I need to make to be able to afford it. As a user, I would like to save towards a specific goal, track my progress towards that goal and make adjustments to get back on track so that I can ensure that I meet the goal I have set for myself.
Scenario of Use	You need an outfit for a function you have been invited to attend in 3 months' time. None of the outfits you own are suitable. It is five days away from payday and you have already exceeded your budget for the month. You have found an outfit you really love for R949 on www.superbalist.com, but you are uncertain whether you should spend such a large amount on one item of clothing given your current financial situation. You need to assess whether you can afford to buy the dress given your spending against budget or what changes you may need to make. You need to decide which item to buy based on price and possibly other factors. You need to work out how much to save to be able to buy the dress in three months' time. You need to assess whether you are on track to meet your goal throughout the savings period. You need to decide how to pay for the dress and what the impact of your method of payment is on the total cost.

4.4.1. The Concept

Financial planning experts say that we should reduce high and unnecessary spending; save more and save more regularly. The concept is that the user is guided through a series of steps to make a spending decision with a focus on how to save. The five steps include: 1) Assess whether I can afford the item; 2) Decide which item to buy; 3) Save towards this goal; 4) Review savings progress and make adjustments; and 5) Pay for the item.

Design A for Alan, focusses on the first four steps (excluding pay). The user would need to understand their current spending against their budget and their income to assess whether they can afford the item. Suggestions on how to save would come from analysing spend patterns to give the user ideas on where they could potentially redirect spend to savings by making a short-term sacrifice (like giving up Cappuccinos or Pizzas, for example). The steps align with Alan's conservative, methodical nature.

Design Z for Zoe, focuses on three of the five steps: 2) Decide, 3) Save, 5) Pay. The thinking in the 'Decide' step is that spending decisions would involve assessing more than just appearance and price as in Design A. Additional factors such as impact on the environment (sustainability) or impact on the people producing the product (communities) may influence a person's decision if the prices were not

materially different. The additional information presented, reflect some of Zoe’s motivations including a preference for choice and impact.

The thinking in the ‘Save’ step was taken from Monzo’s IFTTT (if this then that) adding triggers to help users save regularly discussed in Chapter 2 but enhanced to be linked to something Zoe already cares about enough to track regularly such as her own exercise routine or sports following (Wimbledon). Professionals receive a monthly salary and their bills are generally paid monthly. If they have a budget, it is likely to be at a monthly level. Savings may have been built into their budget (again generally at a monthly level). Consequently, they tend to think about their financial picture monthly, at most. It may even be less frequent than monthly, as it is difficult to get a monthly view without considerable effort on the user’s part. So, the researcher needed a way to make users think about and make provision for savings more regularly than monthly, without the hassle of drawing up a spreadsheet.

The concept requires that the user first selects what they value, prefer or find more interesting in both the decide panel and the save panel. Defaults would be set for convenience. In the save panel, if the user were to select ‘My favourite sports team’, they could then select a specific team from a menu of possible sports teams. This is shown in Figure 12 and includes both individual and team sports.

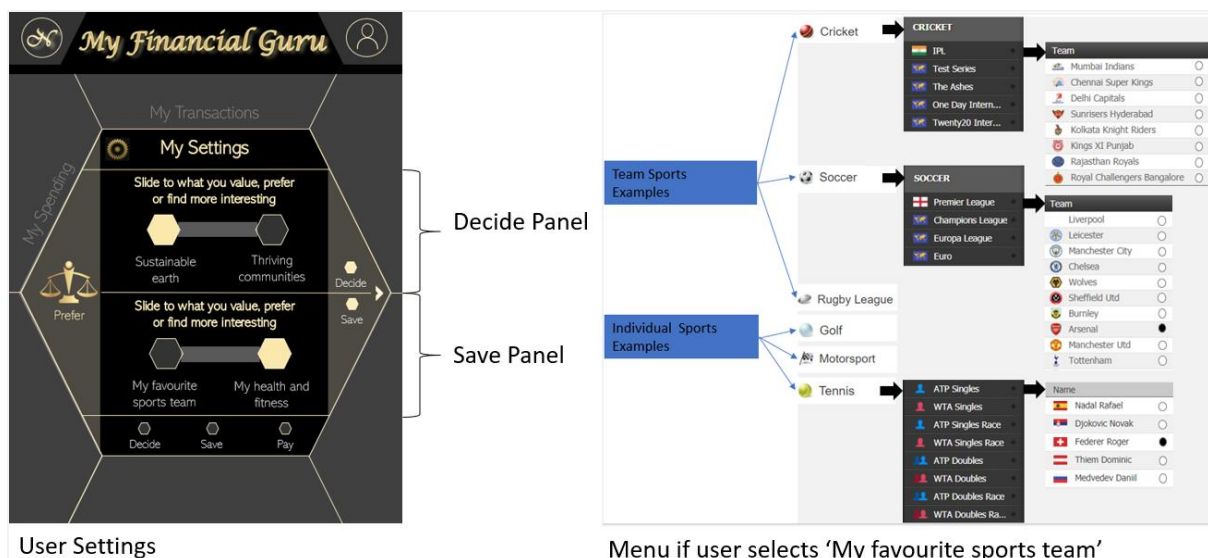


Figure 12: Initial Design Z for User Story 2: Spending and Saving (Settings)

Payment suggestions focus on giving users information about the total cost of credit of their payment decisions. This was highlighted by one user as important information to improve financial literacy and guide people towards better financial outcomes.

4.4.2. Initial Design A for Alan

The initial design A for Alan is presented in Figure 13 below:

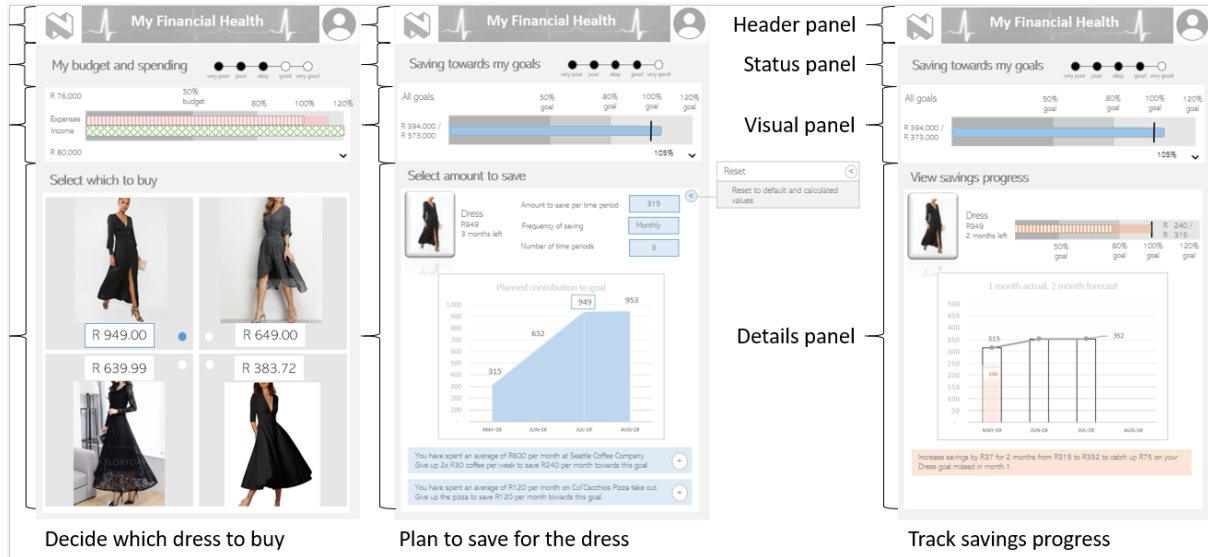


Figure 13: Initial Design A for User Story 2: Spending and Saving

Deciding which dress to buy

The header section has the same five-point scale as the status and net worth sections which tells the user how they are managing their spending relative to their budget and their income.

The visual panel gives the user information about their expenses relative to their budget and income for the month. The expenses bar is in red with vertical stripes which is consistent with Liabilities from the Overview section and uses colour and texture visual channels to separate the expenses information from the income information. Income is shown in green with faint criss-crosses, also consistent with assets in the Overview section. The solid red area at the end of the striped area is the forecast expenses between today and the end of the month which the scenario of use tells us is five days. The two bars are superimposed on a grey scale showing expenses as percentage of budget (this is an improvement over the 22seven design). By placing the expenses and income bars next to each other, one can also see actual and forecast expenses relative to income. For an exact number, these are placed in the top left and bottom left area of the visual panel above and below the respective label that applies. The user must use this information to assess whether they can afford to buy the dress at this point in the month or not.

Assuming the user can afford to buy the dress, the only other information supplied to select the dress is what it looks like and its price. The thinking behind this is that it matches the persona for Alan who is very price sensitive and places a moderate value on having many choices. The user is given an option of four dresses and their prices. To decide which dress to buy, the user would inspect each dress in turn, deciding which they like the most. In contrast, the user would want to compare prices to one another, so these are placed nearest each other so that the eye does not need to travel far. The selection circles are in each of the adjacent corners. This allows the user to start with a broad arc of

the eye to inspect the dresses, then flick between prices in a smaller oval motion and finally make the selection near the centre of the images. Once this outside-in pattern is learnt, the user should become more efficient at this motion.

Planning to save for the dress

The visual panel gives the user information about their savings towards all goals combined. The pale blue colour means that the user is on track to meet their combined goals.

The details panel reminds the user of the dress they have selected with a small image and the user is required to input the amount, frequency and number of time periods to save for. Below the inputs is a graphical projection of the savings over the term showing that the user will meet their goal if they stick to the amount to be saved per time period. Below the graph are two suggestions (or 'nudges') of how the user may save by giving up Cappuccinos and Pizza take out. The pale blue colour has been used to show the user where their input is required.

Track savings progress

As time moves on, the user is able to view their savings progress against their planned progress. There is a small picture of the dress to remind the user which goal they are viewing. The horizontal bar shows the user that they have saved less than 80% of the planned saving. The colour has turned from pale blue to pale orange to show that the user is not on track to meet their goal. The details panel shows the actual savings against the planned savings and the increase needed over the next two months to reach the goal. This information is also displayed in text below the graph in the form of 'nudges'.

4.4.3. Initial Design Z for Zoe

The initial design Z for Zoe is presented in Figure 14 which follow on the next page.

Deciding which dress to buy

The picture of the dress takes up the most space on the canvass because it is the first information the user is interested in. The first dress is the default selection and is displayed on the left corner panel with its price as a reminder and for comparison. A description of the retailer and the price is positioned above the large dress image. On the right the user is given additional information about the product they wish to purchase, based on their selection in settings. Users can navigate between dresses and note the differences in the look of the product on the left as well as the additional product information they are most interested in on the right. They can also change their selection by clicking on the 'Switch to this dress' button. In the bottom right corner, the user is reminded of their selection in settings. They can change their selection by touching the settings icon above the selected dress in the left corner panel.



Decide which dress to buy
Preference: Sustainable Earth



Decide which dress to buy
Preference: Thriving Communities



Plan to save for the dress
Preference: my health and fitness

Plan to save for the dress
Preference: my favourite sports team

Pay for the dress

Figure 14: Initial Design Z for User Story 2: Spending and Saving (decide which dress to buy)

Saving for the dress

Depending on their preference or interest selected, the user is shown three triggers for saving towards their goal, two positive and one negative. The thinking is that some people respond better to positive feedback and some people respond better to negative feedback and others may enjoy both. Each of the triggers comes with defaults and the user can customise the triggers. Once set up, it is envisaged that the gym visits data, the steps per day data and the sports team wins, loses and scores data will be automatically tracked for the user and no further manual input is required of them. By making the association between something the user thinks about already and their savings, the intention is that users become more aware of saving regularly and are given a facility to do so easily.

The chosen icon is a piggy bank with a hand adding a coin in the same golden style, again an obvious choice to represent savings and easily recognised and remembered.

Paying for the dress

The user is given four options, two of them not recommended. Each option gives the user information about the total cost of credit when choosing that method of payment. The objective is to drive awareness of the total cost of credit and guide better financial outcomes for people.

The chosen icon is a wad of cash in the same gold style, again an obvious choice to represent payment and easily recognised and remembered.

4.5. User Story 3: Retirement

Table 5 is a reminder of the user story and scenario of use from Chapter 3.

Table 5: Summary of User Story 3 and the Scenario of Use

User Story	Retirement
Description	As a user, I would like to assess my current retirement position to understand whether or not I have saved enough for retirement. As a user, I would like to explore scenarios that impact my retirement position to assist me to make smart adjustments now to avoid financial disaster at retirement.
Scenario of Use	In retirement planning, you are considered to have planned to save enough toward retirement when your money is likely to run out within five years or less than your life expectancy. You need to be able to assess whether or not you have saved enough for retirement. Should you find that you have not saved enough for retirement, you need to be able to make adjustments and view the impact of those adjustments on your retirement savings. Examples of adjustments you could make include any single selection or combination of the following: 1) to postpone your retirement date; 2) to save more towards retirement on a regular basis (monthly contribution); 3) to decrease your expenses after retirement (income required to cover those expenses); 4) to increase the return on your retirement savings.

4.6.1. The Concept

The key question which users cannot answer definitively is *do I have enough?*. Taking this a step further, the concept is that if I can see that I do not have enough saved for retirement, users want to know what they can do about it now, to improve their long-term financial outcome. Users are were given a set of variables that they can adjust to view the impact on their retirement savings to assist them to answer the question *do I have enough?* and *if I make this adjustment, do I have enough now?*.

Both Design A for Alan and Design Z for Zoe, allow users to explore their current retirement planning projection as well as hypothetical retirement planning scenarios (not to be confused with scenarios of use). Three retirement planning scenarios are shown in the initial designs.

Retirement Planning Scenario 1 shows a change in retirement age from sixty to sixty-five. The number of years between running out of funds and likely death has decreased from nine to four.

Retirement Planning Scenario 2 shows retirement age set back to sixty and an increase in monthly contribution from R11,500 to R15,500. The number of years between running out of funds and likely death has decreased from nine to five.

Retirement Planning Scenario 3 shows a change in retirement age from sixty to sixty-five *and* an increase in monthly contribution from R11,500 to R15,500. The number of years between running out of funds and likely death has decreased from nine to one.

The setting panel has a breakdown of the assets (investments) that make up the retirement savings values and some assumptions about the amount and frequency of contribution and the growth rates per asset. It is envisaged that this data would be pulled in from the service providers when the user gives permission. The growth rates would be actuals based on the full period of available data. An advanced user could adjust the growth rates for each investment (in practice this would be done by adjusting the asset allocation within the fund or portfolio, such as moving cash to equities which generally offer higher risk and higher return). The user can also change the amount invested or the frequency of the investment (M for monthly, Y for yearly and O for once-off or occasionally). The salary, tax rate and fees would be calculated from the data ingested. The inflation rate would be set by the financial institution and reset occasionally in line with the country's fiscal policy. Because these adjustments are likely to happen less frequently, settings are hidden from the initial landing screen in both designs.

4.6.2. Initial Design A for Alan

The initial design A for Alan is presented in Figure 15 which follows on the next page.

The status panel tells the user their current retirement status using the same five-point scale.

The adjustables panel has three parameters with default values set to actual values read in from the data. The user can make changes to the three pale blue boxes and observe the effect of those changes on the Whale Graph. On the right is a guideline on what is recommended by the experts. The user can reset the values should they adjust them and want to go back to the original state. This is explained by a pop-up overlay text box on hovering over the reset icon (guide users to take the right action).

The visual panel with the whale graph shows the user their projected retirement savings up to retirement and how those savings are depleted after retirement in green. The point at which the green area graph crosses the x-axis is the point at which funds run out. Thereafter, until the calculated life expectancy, funds are negative and shown as the red tale of the whale. The number in the circle represents the number of years between running out of funds and calculated life expectancy. The aim is for the user to adjust the parameters in pale blue until the number in the circle is less than five years and preferably less than one year. This is explained in the information box which would pop up on hovering over the icon.



Figure 15: Initial Design A for User Story 3: Retirement

The details panel gives a breakdown of the various assets and funds that make up the retirement savings. The same icon is used for the share portfolio as was used for investments from the overview section. The other icons are all intuitive and in keeping with the same style of minimalism and simplicity. Growth rates are stated as a band of rates over and above the inflation rate (set in the setting panel) and can be adjusted if desired.

Retirement Planning Scenarios are created by changing the variables shaded pale blue. The bright blue outline on a box represents the variable that was changed. The number of years between running out of funds and likely death is shown as a number in a circle from red (indicating immediate attention required) to yellow (a less serious warning) to green (on track to retire with peace of mind).

4.6.3. Initial Design Z for Zoe

The initial design Z for Zoe is presented in Figure 16 which follows on the next page.

Current retirement position

The in-section icon is a mature tree symbolising a mature life for the retirement section, in the same golden style. At the bottom of the panel is a settings icon to navigate to assumptions and advanced settings.

In the adjustables panel, there are hexagons which contain parameters with default values set to actual values read in from the data. The user can make changes to these values and observe the effect

of those changes on the coloured hexagon at the bottom of the panel. On the right is a guideline on what is recommended by the experts to guide the user to make sensible choices. The number in the red hexagon represents the number of years between running out of funds and calculated life expectancy. The aim is for the user to adjust the parameters until the number in the hexagon is less than five years. The red colour in the hexagon shows that the user is on a trajectory of under-saving for their retirement based on their current position because the number is greater than five.

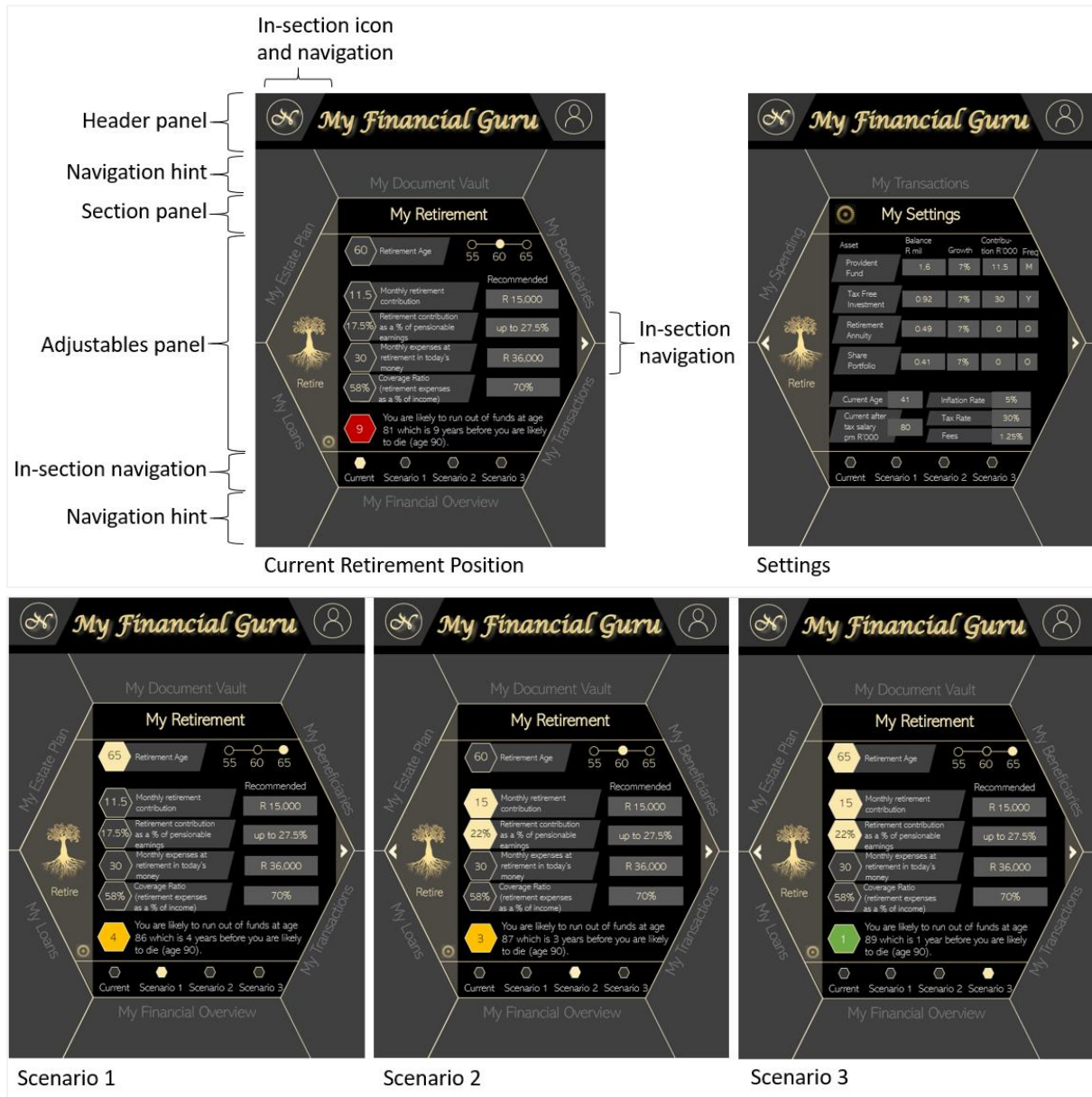


Figure 16: Initial Design Z for User Story 3: Retirement

Retirement Planning Scenarios are created by changing the variables in the small hexagons. A small hexagon shaded in gold represents the variable that was changed. The number of years between running out of funds and likely death is shown as a number in a small hexagon near the bottom, from

red (indicating immediate attention required) to yellow (a less serious warning) to green (on track to retire with peace of mind).

4.6. Conclusion to Chapter 4 and Introduction to Chapter 5

In Chapter 4, the two diverse, parallel, initial designs were presented, one for persona Alan and one for persona Zoe for each of the three user stories and their scenario of use (Overview; Spending and Saving; and Retirement) and design decisions were explained. There was a stronger focus on visual design principles than on interaction (usability) principles but elements of both came through.

In Chapter 5 that follows, user-evaluation of the initial designs is discussed, and final designs are presented. The purpose of design evaluation is to assess whether the design is useful to the users in completing their tasks and accomplishing their goals (as defined in phase 1 of user requirements). User-evaluation is Phase 3 of the UCD process. The focus of the evaluation was three-fold: first, to test the ideas and concept presented and whether users thought it was useful and whether they thought they would use it (establishing utility); second, to test whether users thought they could access the information or achieve their goals effectively and efficiently and to pick up any imagined usability problems with the designs; and third, to evaluate which design users preferred and their reasons.

Chapter 5: Results – Evaluation of Initial Designs and Final Designs

5.1. Introduction

Evaluation is phase 3 of the iterative UCD process. This chapter consists of two parts, user evaluation of the initial designs and presentation of the final designs, incorporating the user feedback. The final designs were formed in response to the users' feedback in the second round of semi-structured interviews, using the inquiry method to collect qualitative user feedback on the designs. The final designs are the second and final design output from following the UCD process.

5.2. Evaluation of Initial Designs

The primary purpose of design evaluation is for users to validate that the design is useful in completing their tasks and accomplishing their goals (as defined in phase 1 of user requirements). The focus is on visual design and the extent to which the right features have been included in the designs (utility). During this process, imagined usability concerns may also emerge from users even though there is no interaction functionality.

The focus of the evaluation was three-fold: first, to test whether users thought they could access the information or achieve their goal effectively and efficiently and to pick up any imagined *usability* concerns with the designs and correct these in the final design; second, to test the ideas and *concepts* presented and whether users thought they were useful and whether they thought they would use the App if it were built; third, to evaluate which design users *preferred* and their reasons.

First, the salient parts of the initial designs A for Alan and Z for Zoe will be presented side by side in a figure as a reminder and each of the three areas of focus for evaluation will be discussed individually (Concept; Usability; User Preference). Respondents are labelled U1 to U6 for users and E1 to E2 for experts, in the order that they were interviewed.

5.2.1. User Story 1: Overview

Designs side by side

The initial designs A for Alan and Z for Zoe are presented side by side in Figure 17 which follows on the next page.

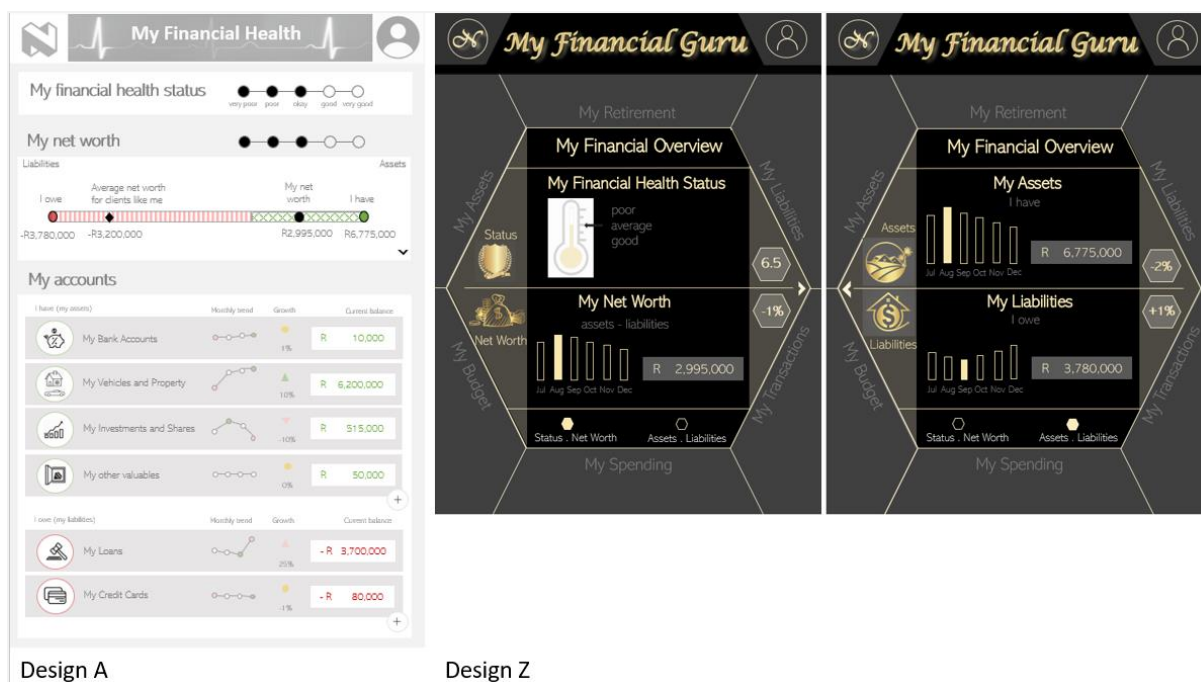


Figure 17: Initial Designs for User Story 1: Overview

Evaluation Focus 1: Concept Presented

All respondents said they would find the concept of viewing their summarised assets and liabilities and trends over time very useful if the data were ingested and aggregated automatically.

Initially, the scenario of use was defined as giving users an understanding of their current financial position and changes over time. During evaluation, additional scenarios of use were discovered, including 1) to submit as supporting documentation when applying for a loan; 2) to provide a professional financial planner with a view of their current balance sheet; and 3) to submit their balance sheet to their accountant to complete their provisional tax return twice per year.

All respondents said they enjoyed the detail displayed in the design A accounts panel. Respondents U1 and U3 noted that it would be adequate to replace their manual spreadsheets but that they would need to be able to download the information into another application such as a spreadsheet and save it to their computer for record keeping purposes.

Respondent U6 and E1 said that they would like the flexibility to select the time period (calendar year, last month and backwards a year) and granularity on the x-axis (days, weeks, months, years). Respondent U2 wants to download the information to send to their Accountant to prepare their provisional tax return and therefore it would be useful to be able to select a tax year (Mar to Feb).

Overall, the concept is sound and worth pursuing further.

Financial Health Status

Respondent U1 asked what the status 'okay' was relative to. The words used to describe the financial health status on both designs (very poor, poor) were described as 'not great' and 'demoralising' by Respondents U4 and U6. They explained that if a person was not where they wanted to be financially (which could be different for each person), they would be feeling fear and shame. To get a person over this hurdle, they would need to be encouraged that it's okay to know your financial health status, it's better to know and using charged words will make them feel worse. A person could be earning over a million rand per annum but spending more than they earn and be labelled as 'very poor' for example. Respondent U6 noted that the status takes up more real estate in design Z and it's the first piece of information a user would see without the additional information to create the context of what informs the status (which is provided in design A). Only Respondent U4 was able to see that the 6.5 in the hexagon in design Z is the metric associated with status as it is situated too far away and under a shaded section creating visual separation. Respondent U2 said that the font on design A was too small to read.

The thermometer metaphor in design Z was described as confusing by Respondent U1 because 'good' is not at the top which is what is expected.

Net Worth, Assets and Liabilities

Every respondent noted that the values were easier to read off design Z than design A. The graphic on design A was described as too complicated because it holds too much information and is not shown in a way they are used to. It would be difficult to figure it out initially and difficult to remember when revisiting the App (learnability, memorability). The information for 'average net worth for clients like me' was seen as something that could be added after seeing their own information by Respondent U4, even though they liked the ability to compare themselves to other people. Respondent U1 asked what 'like me' means.

Every respondent preferred the line trend in design A to the bar trend in design Z and found it easier to read. They liked the simplicity and the green and red fill colours to show best and worst. Respondent U3 noted that the overall Assets and Liabilities trend was missing from design A and would be useful. Respondent U6 was the only one able to recognize that the solid bar on design Z represented the best month, others thought it was the month to focus on or the month that had been selected and related to the number being displayed. Only Respondent U4 was able to understand that the metric in the hexagon on design Z related to that section, again because of the shading creating visual separation.

Every respondent liked to see the account level detail provided in design A. Respondent U3 assumed design Z would offer the same drilldown capability as design A when touching the navigational hints displayed surrounding the active hexagon which was an interesting leap from what was presented (note that this respondent was shown design A first). Respondent E1 pointed out that the word 'accounts' was not relevant for property values or items held in a safe which is a valid observation.

Evaluation Focus 3: User Preference

Both experts preferred design A. 4 of the 6 users preferred design A (U3, U4, U5, U6), Respondent U1 and U2 preferred design Z.

It was pointed out that the 'heartbeat' on the header of design A means life or death (alluding to a heart attack) and finances should not be life or death. It's also another thing for the user to decode and does not provide any useful information. One of the pilot respondents described the heartbeat as 'tacky'. Respondent U4 described design A as 'calming', the icons as 'more modern and contextual' and said 'I feel like there is analytics supporting me'.

The same respondent said about design Z 'Black and gold is a beautiful design interface but it makes it feel very serious. For someone who is not where they want to be financially, it creates a distance for them, it's like walking into a restaurant and suddenly realising you haven't dressed up enough'. Respondent U3 described design Z as 'gamey, not appealing to me personally, but more interesting' and said 'I wouldn't say I don't like it but it would take time to get used to it and work out how to navigate'. Respondent E1 did not like the word 'Guru' because of the spiritual reference which they felt didn't belong with finances and thinks 'guide' would be better. The same respondent also described design Z as 'like driving a gold BMW, flashy and wanting everybody to notice'. In contrast, Respondent U1 said the gold made them feel wealthy and reminded them of a wedding invitation.

5.2.2. User Story 2: Spending

Designs side by side

The initial designs A for Alan and Z for Zoe are presented side by side in Figure 18 which follows on the next page.

Evaluation Focus 1: Concept Presented

The researcher discovered that the scenario of use described as buying a dress was not relevant to the mid-career professional persona. It would be more relevant for someone starting out in the working world or someone with a lower disposable income. This emphasizes how important it is to keep users in the loop throughout, because had it been built, it would have had to be scrapped.

The topic of what is important in making a spending decision came up with all respondents and they all held similar views that the amount for the dress and the differences between the options was too small for it to make a difference to them or as Respondent U4 put it 'to have to think so hard' or as Respondent U3 put it 'to go through so many steps'. The users explained that for larger purchases of R50,000 or more, such as a holiday, vehicle, piece of furniture or renovations, the concept could work. The other factors mentioned in making a purchasing decision included features (vehicle), value for money (holiday), convenience (travel) and reviews (holiday). Respondents U2, U6 and E1 questioned the fulfilment of the order, specifically whether the dress would be available at that price in three months' time.

Respondents U5 and E1 liked the idea of linking sustainability and community values to financial decisions, the rest did not think it would assist them in making a spending decision. Respondent E1

added that it has the potential to cause conflict for people if they know that the more expensive item supports sustainability, but the cheaper item is better for them financially, as an example.

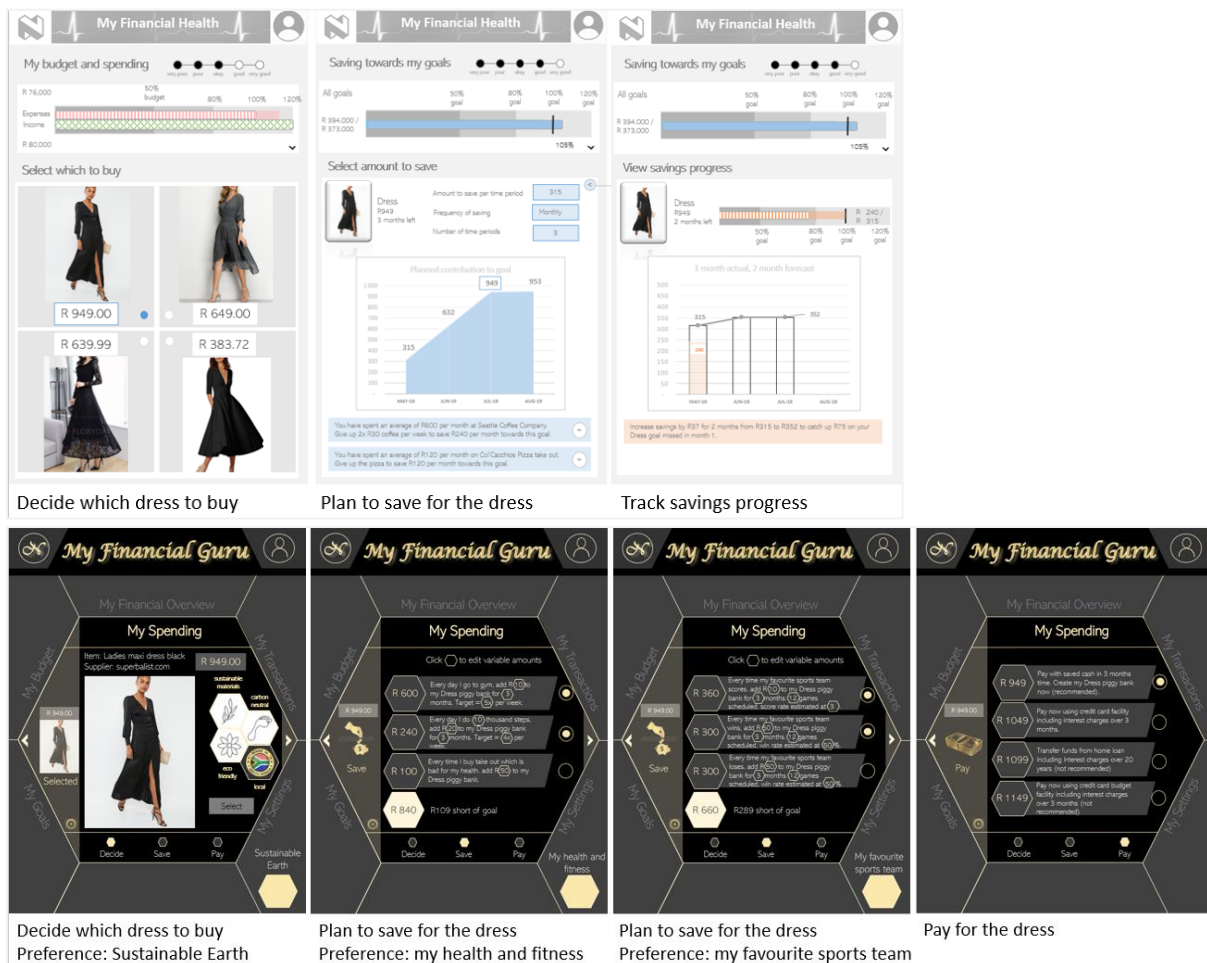


Figure 18: Initial Designs for User Story 2: Spending and Saving

All of the respondents liked the idea of linking savings to exercise or sports results but Respondent U3 remarked that they would not use it because they didn't need help with the discipline of saving but that they could see how it might appeal to other people. The other seven respondents said they would use it and find it useful. Respondent E2 was excited to admit that they could imagine themselves going to gym in the morning and checking to see how much they had saved when they got to the office.

Respondent U3 put it succinctly as 'I've often wondered what they mean by going beyond banking and I've never thought that giving people more options of what to buy is valuable but this has helped me to see that helping people to save or support sustainability in their spending choices could be something valuable'.

All of the respondents liked the ideas of analysing spending patterns to give nudges on how to save (coffee) but Respondent U1 did not like the negative nudge (pizza take out) because of the temptation factor. Respondent U3 noted that there would need to be some sort of contractual mechanism in place (with yourself) for the idea to work such as an alert when approaching the coffee shop or a

notification each week to remind you of your commitment and how much you actually spent on coffee that week. Otherwise it would become a 'read and forget' piece of information.

Respondent E2 noted that often people do not think they earn enough to save and think that the only option is to earn more which is not always easy so they delay saving and this helps to make people aware of what they are spending on coffee because they probably don't know and then helps them to see an option that they may not have considered before. Respondents U5 and E1 noted how the Samsung Health App counts steps automatically and now that they are aware of how many steps they do, they have changed their behaviour to park further away and to take the stairs in order to reach the 6000 steps per day goal and 'get the fireworks' (reference to when the grey bar turns to green to show that the goal was met for the day).

All respondents liked the concept of giving people information about the total cost of their decision. Respondent U1 said they like having recommended and not recommended options and would only choose from those recommended but that 'it feels like a temptation, especially because I know the bank will make more money from the not recommended options'. Respondent E1 concurred that often this information is hidden away from people that are not financially astute. This was an interesting insight which stems from the lack of trust and suspicion with which people engage with financial services products in general. Respondents U1 and U4 said they would prefer that they only see recommended options and U4 pointed out that it is more in line with the purpose of assisting people to make better financial decisions.

Respondent U3 said that it would be very useful to be able to see income and expenditure against a budget in the same way that Assets and Liabilities are split in the Overview section (in order to replace their manual spreadsheets). Respondent U3 noted that although their savings are all in one account, they would like to be able to see it split into the various goals they are saving towards, even if it's only a virtual split, because it is easier to track that way (and that's how it's done in their spreadsheet).

Evaluation Focus 2: Completion of user tasks and achievement of user goals (usability)

Can I afford it and preference settings

Respondent U1 did not notice the graphic showing income and expenditure against budget on design A. Respondent U1 said that they would need to see whether buying this item was part of their luxury budget or necessities budget and Respondent U1 and U2 said it would be more useful to know how much was left to spend than what was actually spent (in that particular category of spend in the case of the Respondent U1). The time period of the income and spend was not clear to Respondent U2. All except Respondent U5 requested a legend to show the meaning of actual and forecast values as it was not clear to them.

Design A uses the colour pale blue to mean different things which is confusing: 1) On track against budget / goal 2) User input goes here 3) Planning mode. Other colours or visual channels should be used to reduce confusion. Design Z has two large sliders and Respondent U1 asked if they needed to select one or the other or whether they could slide it to the middle to represent say 50% Sustainable Earth and 50% Thriving Communities. Respondent U2 noted that they would only want to see what was relevant to their selection, not both (this was implied but not understood).

Saving for the goal and tracking the goal

Respondent U4 noted that they initially didn't know what '315' means and it would be helpful to first select the number of time periods, then the frequency and then the amount could be calculated as '315'. With reference to the graphic, Respondent U4 asked why it is showing four months if the goal is for three months and suggested that the interest should be shown separately or as information about funding alternatives to buying the dress. The same respondent suggested making the graphic smaller and moving the nudges to above the graphic as it is more important information to the user and to add icons to make it easier to understand what it's about and remember the next time (a coffee cup and the words 'Take Out' with a no-entry sign through were suggested). The distinction between blue colours to represent 'on track' and orange to represent 'not on track' was not noticed by any of the respondents. Therefore, this visual encoding is not working and needs attention (rework).

Three respondents mentioned that they would like to see the coffee and pizza nudges when tracking spend against the goal as well as a reminder of what they committed to and whether they had in fact managed to improve their financial behaviour.

Evaluation Focus 3: User Preference

Both experts preferred design A. 4 of the 6 users preferred design A (U3, U4, U5, U6), Respondent U1 and U2 preferred design Z.

5.2.3. User Story 3: Retirement

Designs side by side

The initial designs A for Alan and Z for Zoe are presented side by side in Figure 19 below:

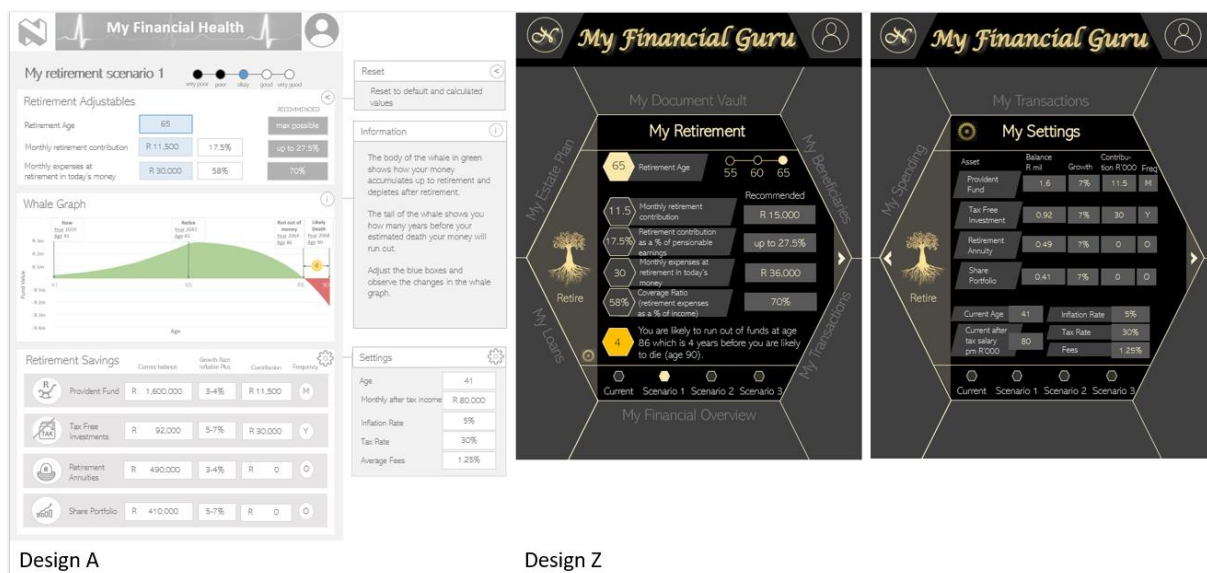


Figure 19: Initial Designs for User Story 2: Spending and Saving

Evaluation Focus 1: Concept Presented

All respondents said they would find the concept of viewing their current retirement position and adjusting variables to assess the impact very useful if the data were ingested and aggregated automatically. They like the concept of being able to perform a *what-if analysis*.

Respondent U3 noted that it is far more robust than their manual spreadsheet which only gives a rough idea of their retirement situation so is a suitable alternative. The same respondent said 'The only thing is, if you are using this through a financial institution, you may be suspicious. I guess that's my whole issue with financial advisors in general, I don't believe they really have your financial best interests at heart. And all the information they give you is geared towards trying to sell you something. Because there are many ways to cut and slice and dice and make these graphs, they are all based on a whole lot of assumptions and you can tweak those assumptions to try to sell people things. It's not to say it's not useful.' Respondent U1 also mentioned wanting to see the projection against the actual performance as time moves on because of a lack of trust in their financial planner.

The designs also sparked a few new ideas from respondents in terms of additional functionality they would find useful. Respondent U1 and U3 said that they would like the ability to save a scenario to view at a later date. The same respondents also said that they would like to view scenarios side by side. Respondent U2 and E2 said they would like the ability to include or exclude certain assets, for example, if a tax free investment is already designated to pay for a child's education and will not contribute to retirement savings. E2 also noted that a user may want to include the income from their second property as an additional retirement income stream as this is a typical investment for mid-career professionals. Respondents U1, U2, E2 expressed discomfort with the ability to adjust growth rates and suggestions were to 1) restrict input to realistic values, for example, maximum of 10%, to prevent user errors; 2) adding terms and conditions of use to prevent law suits against the bank; and 3) having a benchmark set by a reputable institution's research team instead of allowing input. Respondent U3 was confident in changing the growth rates, the other five were not and U2 pointed out that they would need advice on how to change their asset allocation and what growth projection the change would yield. Respondent U6 and E2 said they would like the option to immediately contact a planner should they get stuck or need more information.

Respondent U4 expressed initial confusion 'how do I decide which scenario is best for me?' but later clarified that three is a nice number to choose from, it's not too many that it overwhelms you and it's not too few that you feel restricted and the scenarios speak to different people and their preferences (to work for longer or to save more).

Respondent U1 said it would change how often they viewed the information. They currently look at it quarterly but if it was done automatically, especially in the current poor investment performance environment, they would track it more regularly (monthly).

Respondent U6 said they would like to know the recommended value they should have at retirement compared with their projected value and the gap. But when probed they were not sure how this information could help them adjust their situation now. It is what they are used to seeing from their financial service provider. The same respondent pointed out that it was not clear what they could do with the information, for example, they would like to be able to act on the information immediately such as to top up their existing debit order or contact their financial planner to request a meeting or to issue an instruction.

Evaluation Focus 2: Completion of user tasks and achievement of user goals (usability)

Adjustables and scenarios

On design A, Respondent U3 noted that it is not easy to tell the difference between what can and what can't be adjusted because some adjustables are in the top section and some (such as growth rate) are in the bottom section. And in the bottom panel there is nothing to distinguish current balance which cannot be adjusted from growth rate which can be adjusted. The blue outlines are too subtle to be noticed and Respondent U4 said they thought it was showing it had been clicked on. It is difficult to tell what has changed and it is also difficult to distinguish between scenarios and both are much easier on design Z. On design Z, Respondent U6 noted that it was difficult to tell which fields are editable and Respondent U4 noted that the information in the hexagons and under the recommendations was in a different format, so it is difficult to compare them or even know that they are representing the same thing.

The favourite part of design Z for three of the respondents is the number in the coloured hexagon. They like that it's simple and clear and depicts the key piece of information to focus on. Respondent E2 said 'I love how all that complexity is summarised in one number and there it is, that's all I need to know'. The same information on design A is on the whale graph but respondents agreed that it was too small and got lost in the detail of the graphic.

Whale graph visual

Respondents U1, E1 and E2 love the whale graph. In contrast, Respondent U4 noted that 9 years didn't seem like a lot of time when shown design Z but seeing the massive red dip 'freaks me out and makes me feel anxious'. They initially didn't see the *Now, Retire, Run out of funds* and *Likely Death* annotations because the graph is too complex on first glance. The words *Whale Graph* were described by Respondent 4 as 'means nothing to me'. The same respondent also said that they thought some people would say 'it's too traumatic to figure out so I'm not even going to try'. Respondent U1 did not like the use of the words *Likely Death* and added that it would distract their parent's generation from all other information presented.

Detail / Settings section

Respondents were pleased with this display on both design A and design Z. Respondent U2 noted that they would start by looking at this section because if anything was missing, they wouldn't want to continue. Respondent U6 said it would be nice to see a total value for retirement savings.

Evaluation Focus 3: User Preference

Both experts preferred design A. 4 of the 6 users preferred design A (U2, U3, U5, U6), Respondent U1 and U4 preferred design Z. Interestingly, Respondent U2 and U4 preferred one design for the first two user stories and switched their preference for the third user story (retirement). Respondent U4 switched from design A to design Z and Respondent U2 switched from design Z to design A. Respondent U2 attributed the reason for switching preference to the fact that more detailed information is more appropriate for a more complex financial planning decision such as retirement planning.

Design A was described by users as simple, effective and cleaner. In contrast, Respondent U3 described design Z as ‘haphazard’. Respondent U4 described design Z as ‘simple, easy to understand, everything works perfectly for me’.

Respondents U2, U6 and E1 explained that they like to see all the information on 1 page (referring to design A). With reference to design Z, Respondent E1 said they enjoyed seeing all the other sections that they could navigate to around the active hexagon whilst Respondent U6 described it as ‘too busy’.

5.3. Final Designs

The final designs are presented for each user story and scenario of use. They are predominantly based on Design A for Alan since this is what the majority of users said they preferred. The scenario of use for the Spending and Saving user story was changed from buying a dress to saving towards a holiday, based on user feedback. Two designs are presented for Spending and Saving as the researcher thought it had become too large in scope to depict in one set of screens, which was merit enough to create the split. First, the final design is presented as a figure. Next, each improvement on the initial designs is outlined and explained, starting with the elements that were kept and ending with the improvements and additions.

5.3.1. User Story 1: Overview

The final design for user story 1 is presented in Figure 20 below:

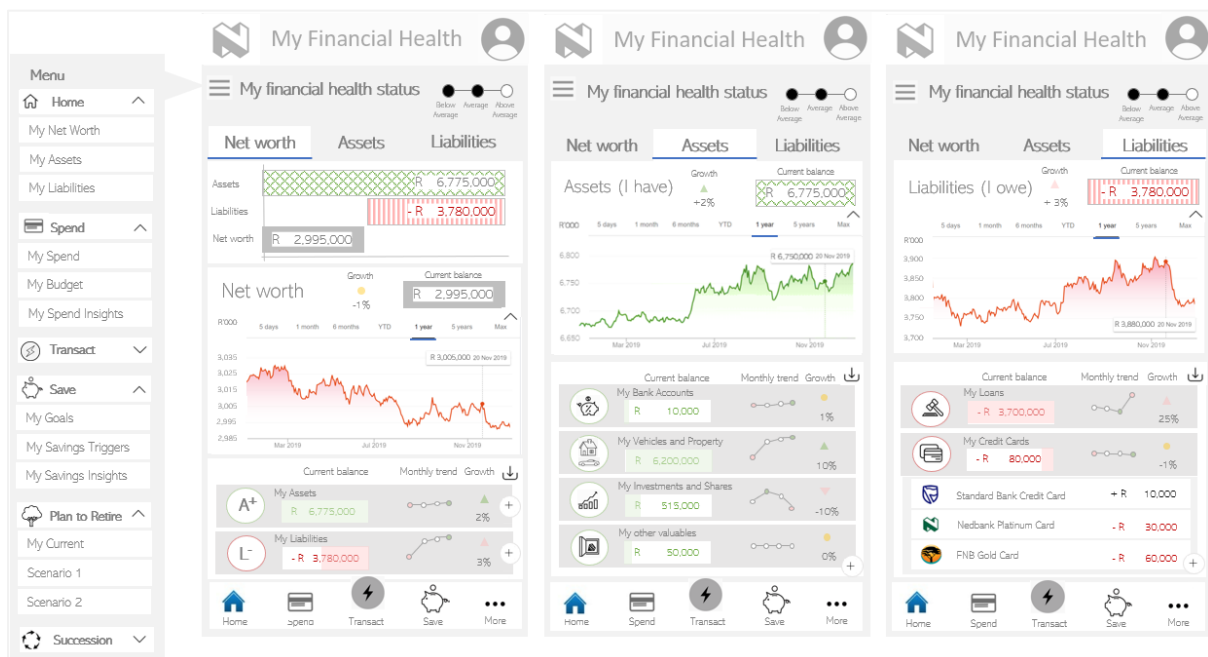


Figure 20: Final Design for User Story 1: Overview

The header panel was kept but the words for financial health status were changed from a five-point scale to a three-point scale with less charged words as descriptions (*below average, average, above average*). The account breakdown was kept because all users liked it. But the screens were split into three sections for *Net Worth, Assets* and *Liabilities*, as indicated by the tabs under the header panel with a bright blue line on white background for the active tab. The width of the account panels was reduced and the description moved to above the large number to condense the view. The numbers are also filled with green from the left or red from the right indicating the values relative size. Asset and Liability totals were added as these were admired in Design Z. Each panel opens up to account level as shown for *My Credit Cards*.

Two new menu panels were added, one activated as a pop-up overlay by touching the three horizontal lines near the top left (called a hamburger menu) and the other at the bottom of the screens. The menu at the bottom of the screens has a *Home* button which is active (bright blue) for the Overview display; *Spend* and *Save* buttons which are two of the users' priorities and used more often; a *More* button to navigate to retirement planning and other less frequently visited places and a *Transact* button. The *Transact* button is an existing feature on the Nedbank and Standard Bank Apps which displays an arc to pay, transfer, buy or invest, as an example. Although existing South African banking Apps were not considered, the researcher thought this would help a financial institution to see how the transition from current to future could take place. The pop-up menu is divided into groups with icons to aid learnability which opens up to the detail of each screen.

The *net worth* graph from the initial design was replaced with a sideways waterfall graph, maintaining the depiction of the *Assets minus Liabilities equals Net Worth* relationship. This is a clearer way to show the relationship than the previous straight line.

The trend graphs were added to offer the flexibility to select a time period. A download button was also added to each screen, which would allow the user to specify the period and file format required. This new functionality was requested by users to enhance usefulness.

5.3.2. User Story 2: Spending and Saving

The final design for user story 2 are presented in Figure 21 and Figure 22 which follow on the next page, and are discussed in turn.

Again, the screen is divided into three sections, this time for insights, spend and budget. The insights screen is the default and offers a summary and overview of ways to reduce spending (*nudges*); *alerts* when spending deviates off budget or the prior three-month-pattern and spending *patterns* that may be of interest to the user (enhancing financial awareness and education; guiding better financial decisions). This offers a convenient way for users to act immediately which was a concern raised by Respondent U6. The *nudges* have a blue circle under the icon to allow the user to opt in to keeping track of items such as cappuccinos and take out, speaking to the contractual mechanism needed as raised by Respondent U3. It is envisioned that these would be tracked on a calendar-type visual which is a common choice for tracking habits such as number of glasses of water per day, calories per day and hours of sleep per day. Each day shows up as green for *habit kept* and red for *habit not kept*. Streaks (number of consecutive green days) are a common metric and tiny numbers next to a coffee cup or pizza slice on each calendar-day, would also work. It is recommended that this is added to the design, perhaps as a separate menu called *Habit Tracker* under *More* and incorporated into *My Insights*.

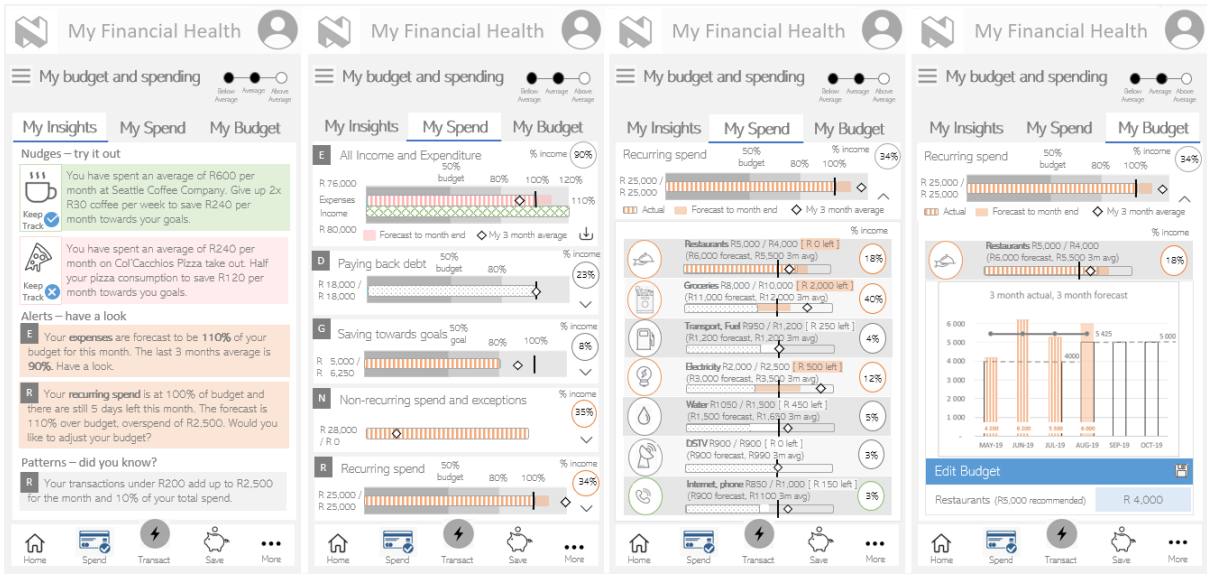


Figure 21: Final Design for User Story 2: Spending

Respondent U3 asked for the functionality to track income and expenses in the same way as assets and liabilities in order to replace their spreadsheet and this is shown in the spend and budget panels. Respondent U1 wanted to be able to assess affordability within their *necessity* and *luxury* categories and this is also provided as *non-recurring* and *recurring* expenditure and the category labels could be customised as required. Respondents also asked to see *what's left* as well as what has been spend, which was included.

When editing a budget, a three-month trend of actual spend and a three-month forecast of spend is provided to assist the decision-making process. The recommended budget based on actual spend over the last three months which gives a realistic trajectory, is listed in text alongside as well. This promotes awareness of financial habits and the effort required to change them.

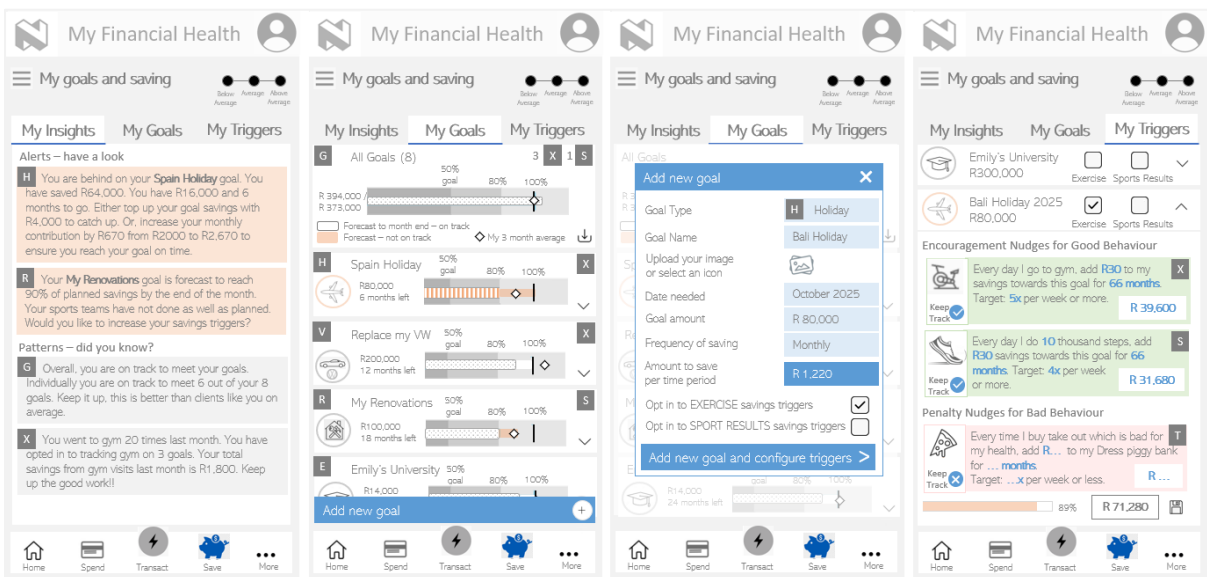


Figure 22: Final Design for User Story 2: Saving

Again, the screen is divided into three sections, for insights, goals and savings triggers. Savings *alerts* and savings *patterns* are shown on the landing screen (My Insights) as this is the most important information to the user, depicting a summary of what to take note of and act on.

Respondent U3 asked that goals be shown together as well as separately and this is done on the My Goals screen, starting with All Goals at the top and then listing each goal separately underneath. Users can add a new goal by clicking on the plus sign in the blue panel and completing the fields in the pop-up window (the background fades, using depth to make the screen more prominent and draw the users' attention).

The last screen, called My Triggers, allows the user to opt in to customisable positive and / or negative triggers for saving regularly, linked to exercise or sports scores (taken from Design Z). In the example displayed, the user can reach 89% of the R80,000 savings goal in five and a half years, just by going to gym five times per week or more and doing 10,000 steps or more at least four times per week. By changing the scenario of use from the dress to a holiday, it is made more relevant to the mid-career professional persona.

It is envisioned that products from any financial services provider would be offered on the mobile application but would be made simple from the users' point of view so that it is easy to decide which option suits them best.

5.3.3. User Story 3: Retirement

The final design is presented in Figure 23 below:

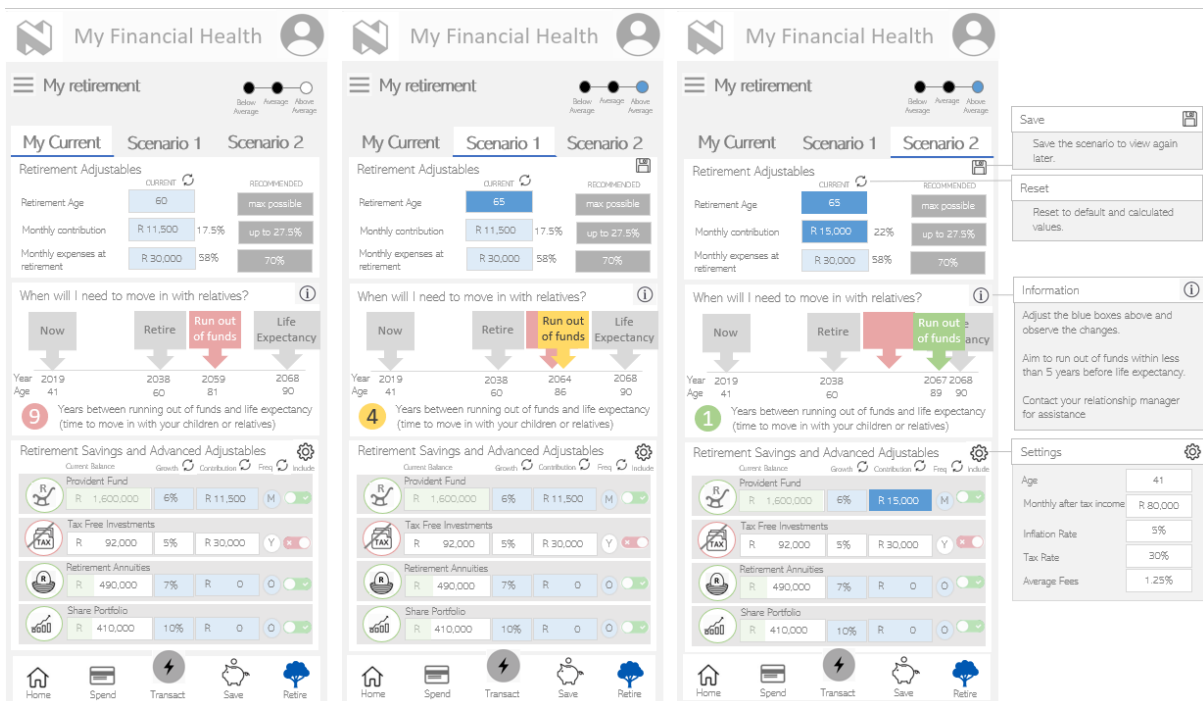


Figure 23: Final Design for User Story 3: Retirement

To navigate to the *Retire* screen, one needs to use the hamburger menu (three horizontal stripes) on the top left. Once there, the *More* button on the bottom panel is temporarily replaced with the retirement planning tree and it is shaded bright blue to show active state.

The *whale graph* from the initial design was replaced by a simple timeline showing the order of *Now*, *Retire*, *Current Retirement Projection*, *Retirement Planning Scenario Projection*, *Run Out of Funds* and *Life Expectancy*. The number in the circle was moved to the bottom and enlarged to make it more visible. Words were softened such as *time to move in with children or relatives* and *Life Expectancy*, rather than *Likely Death*.

The pale blue boxes for input were made more prominent, especially in the lower section, and bright blue was used to indicate changes in variables from current (not only a bright blue outline which was too subtle for users to notice). Refresh icons were added to each heading, should the user lose track and wish to begin again.

Respondent U2 and E2 asked for the option to include or exclude assets from the retirement calculation and this was added and demonstrated in the design with the Tax-Free investment being excluded from the retirement planning calculation. There is a *Save* icon in the top right corner of the retirement planning scenarios however saving is envisaged to be done automatically every few minutes the screen is active.

5.4. Conclusion to Chapter 5 and Introduction to Chapter 6

In Chapter 5, the user-evaluation of the initial designs was discussed and used to form the final designs. User story 2, for Spending and Saving was split into two designs as the requirements grew. A complete set of four designs for a financial planning mobile application were delivered, each with three screens. This is the second and final design output from following the UCD process.

In Chapter 6 which follows, the research question and sub question are answered and there is a summary of all the lessons learnt from applying the slightly modified UCD process described in this study. This is Phase 4 which is the *reflection* section, common in design studies but not usability studies. Two refinements of the UCD process guidelines are offered for the benefit of researchers and practitioners. Conclusions end the research report.

Chapter 6: Discussion and Reflection on the Design Process

In this chapter, the research question and sub question are answered. Next, lessons learnt from applying the slightly modified UCD process described in this study are discussed as a *reflection* of what worked and what could be improved. Two refinements of the UCD process guidelines are offered for the benefit of researchers and practitioners. Conclusions end the research report.

The primary research question is: 'In what ways can a mobile application support mid-career professionals in creating better financial futures?'

Overall, four ways were discovered, in which a mobile application can be useful in supporting mid-career professionals in making better financial decisions that would lead to better financial futures. In contrast, two concepts were removed based on users' feedback that they were not relevant to mid-career professionals.

Firstly, users said they would find it extremely useful to be able to see an overview of their financial situation across all financial service providers and to analyse trends over time. The ability to download the information offers a convenient way to replace their manual spreadsheets and use the information for record keeping, credit applications and to complete their provisional tax returns.

Secondly, users said they would find it useful to be able to access information about their monthly spend against their monthly budget and how much they have left to spend at any time. It would offer a convenient way to replace their manual spreadsheets. Additional information on their spending patterns such as how much they spend on coffee or takeout, would increase their awareness of their spending habits. Nudges on how to improve their spending habits would assist them to modify their behaviour if tracking their habits could happen automatically without input or effort.

Thirdly, users agreed that positive and negative nudges linking their enjoyment of regular exercise or sports results to their savings habits, to increase their frequency of savings, would be beneficial and interesting.

Lastly, users said that an assessment of whether they are on track to retire comfortably and which adjustments would improve their long-term financial situation would be useful in creating awareness, providing ideas on how to improve and contribute towards increased peace of mind.

The first concept that was removed was the buying of a dress, as users decided it was not a relevant scenario. The reasons cited were that the size of the purchase was too small and the price differences between dresses were too small, to make a difference. There were also too many steps and too much to think about for a small and simple purchasing decision. As a concept, the retail purchase also raised logistical concerns such as whether the dress would be available in 3 months' time and how sale fulfilment would work, which distracted users from the core concept. This illustrates how important it is to make the concept relevant to the intended audience and test it with real users. It would have been beneficial to rather ask the users to describe a scenario of use, rather than for the designer to propose the idea relating to the users' expressed priorities. The idea may still hold merit but is just not suited to this particular persona and may be better suited to people with a lower income or earlier stage of life.

The second concept that was removed was the concept of providing additional information about a particular purchase. Overall users said that even if the dress was a relevant type of purchasing decision, such as a holiday, vehicle or property purchase, they would not find the information very

useful in their purchasing decision. Price, features, value for money, trade-offs and long-term financial impact were considered more important than sustainability and community information.

The sub question of the research is: 'In what ways can the use of diverse parallel designs benefit design studies?'

Overall, the user-centred, iterative design process was effective in producing a useful design of a mobile application interface aimed at supporting mid-career professionals in making better financial decisions and in creating better financial futures. Specifically, the strong focus on and involvement of users, the use of personas, the focus on design before development, the two design iterations and exploring two parallel, diverse designs were contributing factors.

Involvement of the users and experts in all three phases of requirements gathering, design and evaluation was effective. Specifically, the pilot users were able to immediately identify errors and omissions that could be fixed prior to conducting formal user evaluation. Users also found it motivating to see the story unfold. They enjoyed having time to digest the ideas presented as it allowed them to build on previous feedback that was only partially formulated in their minds at the time.

In this research, personas were used in an unconventional way, which was useful to the designer in creating two parallel, diverse designs. There was also benefit to users as the final design used elements of both initial designs, based on the users' feedback. Exploring alternatives is an imperative aspect of the design process to cultivate convergent thinking and avoid fixation too early on.

Focusing on design (before development) was beneficial in formulating ideas and clarifying user requirements. It resulted in some ideas being scrapped, costing significantly less at design stage than at development stage. It supports the need to separate design and development processes and to allocate sufficient resources to the design process (time, people, budget) in order to reduce development costs due to rework, downstream in the process. This is particularly relevant when concepts and ideas are new to the users, as the concepts take time to evolve as people build on previous ideas and gain clarity along the way. Our experience indicates that time pressure hinders the creative process somewhat and could reduce the quality of the design results.

The two iterations of the design process with increasing fidelity were beneficial. The low-fidelity nature of the first iteration prototype made it easier to *throw away* the elements of the design that were not useful or not effective (the dress concept and the concept of providing additional information in assisting to make a purchasing decision). Had it been a high-fidelity interactive prototype, it would have been more costly and demotivating to scrap because of the effort wasted.

This is not to say that a high-fidelity interactive prototype should not be built, and usability tested quantitatively. The final designs have evolved enough by the end of this study, to confirm usefulness including utility (the right features) and to begin to develop an interactive prototype with reduced rework and associated costs. The researcher was surprised that more people did not enjoy Design Z for Zoe. The main reason given by users was the unconventional navigation. Because this reason is very specific to the interaction of the prototype, it is recommended that first Design Z is refined to a final design as Design A was in this study and that second, both Design A and Design Z are developed as interactive prototypes. This is supported by the learnings from the two successful case studies discussed in Chapter 2 that only conventional navigation can be tested for usability with low fidelity prototypes and more sophisticated navigation requires an interactive prototype. It is also supported by the study on situations when usability testing can be harmful to the design process when novel interface designs that do not follow interaction conventions are chosen. Usability evaluation of the

two prototypes should be compared throughout. It could even be beneficial to run it as a hackathon-like competition with two teams aiming to win on usability metrics.

Whilst scientific research focusses heavily on usability studies, there is an implicit assumption that the problem is well understood and what is being built provides utility (useful features) to users. Even in the definition of design studies, there is an assumption that the problem is well understood by the users and the first phase of the design process, which is to clarify user requirements, is about transferring knowledge from the domain experts' brain to the design team and ultimately the computer. However, at times, the problem is not well understood, even by the users and domain experts. The exploratory nature of the design process in generating alternatives facilitates a shared learning journey. The researcher found design as a tool for thinking (imagining new possibilities) and communicating (sharing ideas) to be one of the most valuable aspects of the design process. It is what distinguishes design studies from usability studies. It is this part of the process that can lead to innovation. Usability testing and technology are enablers that come later.

When problems are not well defined, design studies are particularly valuable as they place the focus on solving the right problems (utility) whereas usability studies place the focus on solving problems in the right way (effectiveness, efficiency, learnability, memorability). Whilst both are important and intricately connected, design research should precede usability research as they could save substantial costs by clarifying the problem and user requirements and avoiding rework in downstream development. Even when time and budget are constrained resources, re-allocation of the same amount to design activities (ahead of development activities), could still result in the same or even lower overall development time and costs, due to a reduction in rework. Therefore, the researcher would like to see an increase in the allocation of resources (time, people, budget) to design research to increase the focus on utility and complement and strengthen the outcomes of usability research in creating useful and usable technology solutions.

Chapter 7: Conclusions and Future Work

In this research, design was used as a tool for thinking and clarifying ways in which a mobile application interface could support users in making better financial decisions and creating better financial futures for themselves and consequently society. A user centred design (UCD) process was used with a strong focus on user involvement in all three phases of requirements gathering, design and evaluation, which produced a useful design.

Users said they would find the imagined mobile application useful, they enjoyed the ideas presented on how to reduce their spending and improve their savings habits but preferred a more conventional interface with lower learnability and memorability rates.

Using personas to create initial, parallel, diverse designs was a useful and effective extension for the designer to explore the design space and seek alternative solutions.

For practitioners, the recommendation is to increase the allocation of resources (time, people, budget) to design research to increase the focus on utility to complement and strengthen the outcomes of usability research in creating useful and usable technology solutions.

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Appendices

Appendix 1: Informed Consent Form

DEPARTMENT OF COMPUTER SCIENCE		
UNIVERSITY OF CAPE TOWN PRIVATE BAG X3 RONDEBOSCH 7701 SOUTH AFRICA	RESEARCHER: Audrey Pentz TELEPHONE: +27-82-497-2500 E-MAIL: pntaud001@myuct.ac.za URL: https://www.cs.uct.ac.za/	

Informed Voluntary Consent to Participate in Research Study

Project Title: Designing a mobile application interface to support mid-career professionals in creating better financial futures

Invitation to participate, and benefits: You are invited to participate in a research study conducted with mid-career professionals. The study aim is to design a mobile application interface to support mid-career professionals in making better financial decisions. I believe that your experience would be a valuable source of information, and hope that by participating you may gain useful knowledge.

Procedures: During this study, you will be 1) asked to answer general questions about your financial experiences but you will not be asked to reveal any specific financial information such as income, expenses, assets and liabilities 2) shown a mobile application prototype and asked for your opinion and critique.

Recording: We may record audio as part of the study. This will be used only by the researcher to analyse your feedback in more detail afterwards. If you object to this, please indicate below.

Risks: There are no potentially harmful risks related to your participation in this study.

Feedback: You will receive feedback about the results of this research on request.

Disclaimer/Withdrawal: Your participation is completely voluntary; you may refuse to participate, and you may withdraw at any time without having to state a reason and without any prejudice or penalty against you. Should you choose to withdraw, the researcher commits not to use any of the information you have provided without your signed consent. Note that the researcher may also withdraw you from the study at any time.

Confidentiality: All information collected in this study will be kept private in that you will not be identified by name or by affiliation to an institution. Confidentiality and anonymity will be maintained as numeric identifiers will be used.

What signing this form means: By signing this consent form, you agree to participate in this research study. The aim, procedures to be used, as well as the potential risks and benefits of your participation have been explained verbally to you in detail, using this form. Refusal to participate in or withdrawal from this study at any time will have no effect on you in any way. You are free to contact me, to ask questions or request further information, at any time during this research.

I agree to participate in this research (tick one box) Yes No _____ (Initials)
I agree to be audio-recorded Yes No _____ (Initials)

_____ Name of Participant	_____ Signature of Participant	_____ Date
_____ Name of Researcher	_____ Signature of Researcher	_____ Date

Appendix 2: Semi-structured interviews with users

Respondent Profile
Gender
Race
Occupation
Married?
Number of dependents
Do you manage the finances in your household?

General – banking and advisory relationships
Which brands do you have a banking relationship with?
How do you interact with your bank?
Who do you turn to for financial advice?
How long have they been your trusted advisor?
How do you prefer to engage with that person?

Digital Brands and Pain Points
Which are your favourite digital brands that you interact with and why?
Which digital brands do you interact with related to your financial world (banking and investments)?
Which are your favourite and why?
What are your key financial needs?
Do you feel these are being met by these brands?
What are your key pain points when it comes to banking and finances?

Daily Transactional Financial Behaviour
Think of a month in your financial life. Describe the tasks you perform and the tools you use to perform those tasks.
What are your key frustrations with daily tasks you wish could be made easier for you?
What financial information do you like to keep track of regularly (daily, weekly, monthly, yearly)?
Is there any other financial information you would like to keep track of if it was easy to do so?

Spending Habits and Budgeting
Do you have a budget?
If yes, do you or did you find it useful?
If yes, did you ever exceed your budget? If so, how did you respond?
If yes, did you ever spend less than your budget? If so, how did you respond?
If yes, what would help you to stick to your budget?
If no, how do you manage your spending?
If no, how do you prioritise what is more important and less important?
Do you think you could write down your top 10 categories of spending from highest to lowest, from memory?

Saving towards a specific goal
Have you ever saved towards a specific goal?
If yes, how long did you save for?

If yes, where did you keep the money as you were saving?
If yes, did you reach your goal in the time you planned to?
If yes, how did you maintain the discipline needed when saving?
If yes, how do you keep track of how much you have saved and how much you still need to save?
What would make it easier for you to save?
Making use of the R33,000pa tax-free savings allowance is considered good financial behaviour. Do you utilise this vehicle? Why or why not?

Debt and avoiding financial disasters

Have you ever been in a situation where you spent more than you earned in a month?
Have you ever felt uncomfortable about the amount of debt you have?
What would help you to feel more comfortable?
What are the biggest lessons you have learnt about using debt to purchase an asset?
What are the biggest lessons you have learnt about using debt for something other than an asset?
Having 3x your monthly earnings set aside for Emergencies is considered good financial behaviour. Do you have access to 3x your monthly earnings should anything unforeseen happen? If not, what would you do in such a situation?

Financial Habits

What would you consider your best financial habits?
What would you consider your worst financial habits?
What do you think could help you to improve your financial habits?

Retirement Planning

Do you feel that you will have enough saved when you retire?
What would help to give you peace of mind?

Succession (Estate Planning)

Do you have a Will?
Do you feel that your family are adequately provided for in the case of your unexpected death?
What would help to give you peace of mind?

Appendix 3: Personality and motivations questionnaire with users

Section 1: Personality

Please complete the free online test (link below) and let me know which personality type you are? You should be given 4 letters, for example, INTJ, ESFP, etc.

<https://www.16personalities.com/free-personality-test>

Section 2: Motivations

1. On a scale from 0 (not at all important) to 10 (extremely important), how would you rate how important **PRICE** is in making purchasing decisions?

0	1	2	3	4	5	6	7	8	9	10

2. On a scale from 0 (not at all important) to 10 (extremely important), how would you rate how important **CHOICE** is in making purchasing decisions?

Choice is defined as the number of options and alternatives you have to choose from and the freedom you have to personalise or customise your selection.

0	1	2	3	4	5	6	7	8	9	10

3. On a scale from 0 (not at all important) to 10 (extremely important), how would you rate how important **IMPACT** is in making purchasing decisions?

Impact is defined as how your purchasing decision will affect the environment or communities, for example if you strongly support and practice all of the examples below, then choose '10':

- To what extent do you support and practice recycling and car-pooling?
- To what extent would you stop buying items with plastic packaging because only a fraction of plastic is recycled and plastic is getting into the ocean and killing marine life such as turtles and whales?
- To what extent would you stop buying items that are imported in favour of local substitutes that would create jobs locally and stimulate the South African economy (such as fruit imported from Europe and clothes imported from China)?
- To what extent would you boycott buying from and travelling to Norway and Japan because they still support whaling (killing whales for sport)?

0	1	2	3	4	5	6	7	8	9	10

4. On a scale from 0 (not at all important) to 10 (extremely important), how would you rate how important **NOVELTY** is in making purchasing decisions?

Novelty is defined as how willing you are to immediately try new ideas and new things. If Novelty is not important in making purchasing decisions, then you are likely to delay a purchasing decision until other people have made the purchase and given you positive feedback before you are willing to try.

0	1	2	3	4	5	6	7	8	9	10