THE ADOPTION OF FINANCIAL HEALTH APPLICATIONS IN THE UNITED STATES

Understanding consumers' behavioral intention to adopt financial health applications

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1 Introduction

Financial health is a state wherein a person's day-to-day financial system functions well and increases the likelihood of financial resilience and opportunity (Gutman, Garon, Hogarth, Schneider, 2015). Financial health, just like physical health, is necessary for a person to have a successful and productive life. The United States of America, which is one of the most successful economies of all times shows a worrisome low level of financial health among its population. According to the Financial Health Networks' National Study (2019), fewer than one in three Americans - 29% - are financially healthy and the vast majority (71%) is financially stressed (Brockland, Garon, Dunn, Wilsion and Celik, 2019). This means that the most consumers in the US does not have the day-to-day financial systems they need to be resilient and thrive. Most Americans either spend their money unsustainably, lack savings, carry too much debt, lack insurance, do not plan financially ahead or face a combination of these issues.

Like physical health, financial health is not a one-time goal that can be achieved once and then be ignored. It requires consistent behavior and must be cultivated over time (Gutman et al., 2015). Financial health can be improved through the use of financial tools that can help consumers make better financial decisions, have better control over their money, and plan into the future. Leveraging technology, smart design, and insights from behavioral economics and financial literacy, products and services can help consumers manage their financial lives more easily, conveniently, and affordably (Gutman et al., 2015). These products and services especially include so called "FinTech" applications which have emerged numerously in recent years. FinTech – which is short for financial technology – enables technology and innovative business models to deliver more efficient, more convenient and more accessible financial services. Many of these FinTech firms focus on consumer financial health as part of their mission, providing financial tools and applications with the purpose to increase a user's financial health. Along the different dimensions of financial health – spending, saving, borrowing and planning – lots of different mobile applications are available on the US market. Many apps try to help consumers to spend their money more sustainably, increase their savings, lower or manage their debt, get suitable an

affordable insurance or plan financially into the future. This paper will call applications whose value proposition focuses on financial health "Financial Health Applications" (FHA). Since the problem of low financial health is evident this paper investigates whether people with low financial health would actually adopt solutions which could potentially help them to alleviate their situation. Hence, purpose of this research is to explain relevant factors for the adoption of FHA, especially whether low financial health is motivating consumers to adopt and use applications, which could potentially help them to live a more sustainable financial life.

1.1 Research question

For FHA to be able to make a difference and increase financial health one could argue that in the first place, people with low financial health need to adopt FHA. Therefore, the focus of this paper is to understand the adoption intention of US consumers to use FHA. My research focuses on the following research question:

"Is low financial health increasing the likelihood to adopt Financial Health Applications and which other factors are relevant for the adoption?"

The initial question is, whether people who need FHA most would actually use them. Hence this thesis investigates whether financial health is a relevant factor for the adoption of FHA. Besides financial health, other factors are explored, testing whether they are increasing or decreasing the likelihood for adoption.

1.2 Motivation and purpose

As I studied a semester abroad at UC Berkeley (California) in Spring 2020, I experienced the financial health situation in the US at first hand. While living in the United States, I became aware of the social inequalities in society and the financial struggles of many people around me. Since my semester focused on studies regarding FinTech and entrepreneurship I was part of a startup project regarding consumer loans and the accessibility of affordable credit.

During my studies and especially the market research for the project I talked to diverse people in my surroundings who described me their financial situation and how they use services and products to manage their finances. I recognized the diversity and high number of FinTech companies in the US market. These companies continuously launch new products and applications, all focused on making financial services more useful, affordable and efficient, especially for those consumers who struggle with their finances. I was wondering if many of those consumers actually end up using these applications, helping them to enhance their financial health. Therefore, the purpose of my study is to find out whether financially stressed people (people with low financial health) are more likely to adopt Financial Health Applications and also to understand which other factors make consumers willing or hesitant to use Financial Health Apps available on the market. My goal is to analyze the adoption of Financial Health Applications, asking whether these have any chance to solve financial consumer pain points sustainably and at scale. Purpose of my research is to derive clear market insights which will be the basis for actionable recommendations on how to increase the adoption of FHA. This is will be useful for any FinTech company focusing on financial health improvement as a value proposition. My research method and model will be an example for how to conduct entrepreneurial market research in a scientific way. Mixing methods, I will show an iterative model that can be flexibly extended and altered, usable for any adoption study. Like this, I am able to suggest further research and make recommendations on how to use this method in an efficient manner.

1.3　Scope

Geographically, this study focuses solely on the US market for two reasons. First, the issue of low financial health is salient in the US and has attracted high attention of the public and private sector. Institutions like the Consumer Financial Protection Bureau or the Financial Health Network are public or semi-public institutions investigating this phenomenon, constantly working on research and policies to improve the consumer financial health situation in the US. Since the Financial Health Network has developed a framework to measure financial health I can build on their method and compare my findings to their research in the US. Second, the US is by far the largest market for FinTech and is definitely a

leader in terms of FinTech innovation. The amount of investment into FinTech in the US is the highest in the world and lots of successful Financial Health Applications are located in the US, providing evidence for a large market need.

Further, the scope of this thesis is quite broad investigating the adoption of Financial Health Applications in general, there is no focus on a specific product or product category. The scope could have been narrowed down to a more detailed examination of a specific sub-category, though the goal is to provide a macro-perspective on the subject as a whole.

1.4   Contribution to previous literature

My research contributes to the literature regarding the adoption of (financial) technology, building on fundamental models such as the Technology Acceptance Model (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003). To the extent of my knowledge, this paper is the first one to incorporate financial health as a factor investigating the adoption of FinTech applications. Further my method and model provide an example how to integrate different methods into an iterative study, developing a scientific framework for market research and technology adoption studies.

1.5   Outline of the thesis

The structure of this thesis consists of nine chapters. After this first introductive chapter, chapter 2 will explore the topic of financial health, define the term and the way it is measured, and describe the current financial health situation in the US in detail. The third chapter will elaborate on the topic "FinTech", define the term, give an overview of the US market, describe the evolution of FinTech and lastly give an overview of different Financial Health Applications, available in the US market. Chapter four focuses on the review of relevant literature on technology adoption and especially the adoption of financial technology. The fifth chapter describes my research model and the hypotheses to be tested. The model is based on the analysis of the first part of my research, to be described later on. The methodology of my research is described in chapter six, elaborating on my research philosophy, my research approach, the research design and techniques used. Chapter 7 is the analysis chapter where I will present the results of the different parts of my research, whereas the first part is the basis for the model already described in chapter 5. This chapter will describe how I built my research model and the hypotheses to be tested as well as the results of my quantitative study. Chapter eight will comprehend the findings and discuss the outcome of my research, giving a concrete answer to the research question while also suggesting further research. Finally, in chapter nine I draw the final conclusions of my research.

1 Introduction	2 Financial Health	3 FinTech and Financial Health Applications
4 Literature review	5 Model and hypotheses	6 Methodology
7 Analysis and results	8 Discussion	9 Conclusion
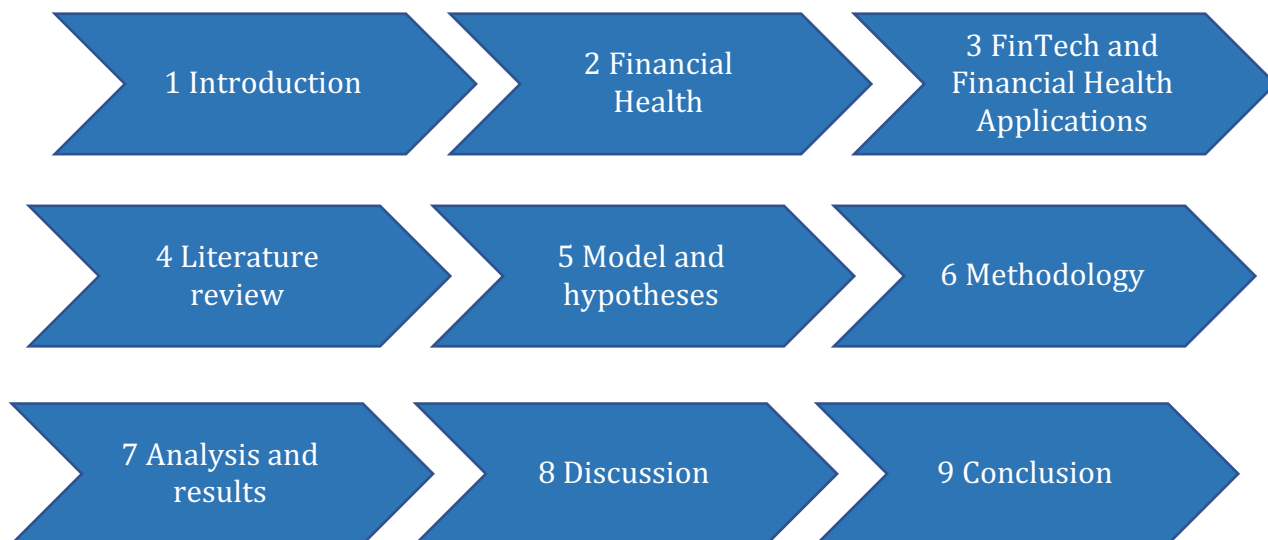
2 Financial Health

2.1   Definition and measurement of financial health

Many researchers have investigated the phenomena of financial well-being and financial stress. The terms used to define constructs describing one's financial condition are various, including perceived economic well-being (Walson & Fitzsimmons, 1993), financial satisfaction (Joo & Grable, 2004), personal financial wellness (Joo & Garman, 1998), perceived income adequacy (Danes & Rettig, 1993), financial stress (Bailey, Woodiel, Turner, & Young, 1998; Freeman, Carlson, & Sperry, 1993; Kim & Garman, 2003), financial strain (Aldana & Liljenquist, 1998), economic strain (Mills, Grasmick, Morgan and Wenk 1992), and economic distress (Voydanoff, 1984). While some have approached the construct from a positive point of view using terms such as well-being (Walson & Fitzsimmons, 1993; Zagorsky and Lupica, 2008), and satisfaction (Joo & Grable, 2004 ; Kim, 1999), others have examined it using negative terminology: strain (Aldana & Liljenquist, 1998), stress (Bailey et al, 1998.; Freeman et al., 1993; Prawitz, Kim & Garman, 2006), and distress (Voydanoff 1984). Additionally, researchers have attached different meanings and definitions to the terms.

Zagorsky and Lupica (2008) define financial well-being for a household when its income and assets are sufficient to maintain an adequate standard of living (p. 284). This standard of living includes minimally decent shelter, medical care, food, clothing, education, childcare and education (p. 284). On the other hand, Walson and Fitzsimmons (1993) found that subjective judgments such as satisfaction with resources and with level of living were important predictors of perceived economic well-being. Prawitz, Kim and Garman (2006) define financial stress as a reaction such as mental or physical discomfort, to stress about one's state of financial well-being. Hence, financial stress is the subjective perception about one's capacity to manage economic resources such as income and savings to pay bills, pay back debt, and afford the needs but also wants in life. Prawitz et al. (2006) see financial stress therefore as a subjective phenomenon, caused by the perception of an individual on its financial state.

In fact, it is an important consideration whether to define individual financial well-being as a subjective or objective condition. Two people with the same objective state of finances regarding their income and spending might feel differently stressed about it. The individual's perception about the degree to which its income can meet his or her financial demands of life, has been defined in the literature as perceived income adequacy (Danes & Rettig, 1993). Perception about income adequacy is shaped by the extent to which disposable income is available for one's needs and wants. Financial stress is hence not only caused by the objective financial situation of a person but also by the amount a person perceives as needed and wanted, causing a feeling of income adequacy.

The Consumer Financial Protection Bureau of the United States investigated financial well-being in a report in 2015. Based on about 60 hours of open ended interviews with numerous individuals the CFPB suggests a definition of financial well-being as a state wherein a person a) has control over its day-to-day and month-to-month finances, b) has the capacity to absorb a financial shock, c) is on track to meet its financial goals and d) have the financial freedom to make the choices that allow one to enjoy life (CFBP, 2015). The CFPB's definition of financial well-being has time-frame dimensions. While a) and d) regard mainly the present, b) and c) pertain securing the future.

	Present	Future
Security	Control over your day-to-day, month-to-month finances	Capacity to absorb a financial shock
Freedom of choice	Financial freedom to make choices to enjoy life	On track to meet your financial goals

Table 1: Dimensions of Financial Health
Source: CFPB, 2015

For me as a researcher the question arises how I should define and measure financial well-being or financial stress of consumers while many different definitions and measures can be found in literature. In my search for a valid and reliable instrument to measure financial well-

being of consumers in the US I encountered the Financial Health Network (FHN). The Financial Health Network is a nonprofit financial services consultancy headquartered in Chicago and is the leading authority in financial health in the United States. One major resource the FHN provides is the Financial Health Pulse which is a survey conducted for the first time in 2018 and was repeated in 2019. Asking more than 5000 American consumers the FHN developed a framework to measure and understand the financial health of American consumers. The framework aims to consider the totality of an individual's financial life.

The FHN defines financial health as the situation when *your daily financial systems allow you to be resilient and pursue opportunities over time* (Gutman, Garon, Hogarth, Schneider, 2015).

Financial health has four components: Spend, Save, Borrow and Plan.

Figure 1: Components of Financial Health
Source: Parker, Castillo, Garon and Levy (2016)

"Spend" comprises whether an individual spends less than its income and can pay bills when they are due. "Save" is about an individual having enough liquid savings to be resilient in case there is an unexpected financial downfall and also sufficient long-term savings to build a reliable safety net for the future. "Borrow" includes whether a person has a sustainable and manageable load of debt, while maintaining a good credit score, giving that person access to

affordable credit. Lastly, "Plan" involves having appropriate insurance and the ahead planning for future expenses.

According the FHN an individual is financially health if they

1. Spend less than their income
2. Pay bills on time
3. Have sufficient liquid savings
4. Have sufficient long-term savings
5. Have manageable debt
6. Have a prime credit score
7. Have appropriate insurance
8. Plan ahead financially

Hence the FHN network describes financial health through the dimensions of A) Spending – indicator 1 and 2, B) Saving – indicator 3 and 4 , C) Borrowing – indicator 5 and 6 and D) Planning – indicator 7 and 8. Like the definition of the CFPB this framework touches upon factors regarding the present (spending and borrowing) and factors regarding the financial future (saving and planning).

Since this framework provides a reliable, valid and measurable definition of financial health I decided to adopt the definition of financial health and the framework of the FHN to measure financial health in my thesis. In this thesis I further define "financial stress" as the opposite of financial health, hence financially stressed consumers are consumers with a low financial health according the definition of the FHN. The questionnaire of the FHN does ask concrete questions which make the measure objectifiable but are also answered by each individual based on his or her subjective perception of themselves. For example, the FH pulse asks concrete questions like *"How long could you and your household afford to cover expenses, if you had to live on only the money you have readily available?"* or *"How confident are you that your household is currently doing what is needed to meet your longer-term goals?".*

Choosing out of different answer possibilities, each respondent can give an answer according to his or her subjective perception of his or her household. Each answer possibility will give the respondents between 0 and 100 points for their financial health score. The answers to the eight questions are averaged with equal weight. An individual with an average score of 80 - 100 is financially healthy. These individuals are spending, saving, borrowing and planning their finances in a way, that allows them to be resilient and pursue opportunities over time. People scoring below 80 are financially coping, these individuals are struggling with some, but not necessarily all, aspects of their financial life. Respondents with a score below 35 are financially vulnerable – these people have strong financial stress and struggle with all, or nearly all, aspects of their financial life. The full questionnaire and the assigned points per answer can be found in the Appendix (Appendix 2).
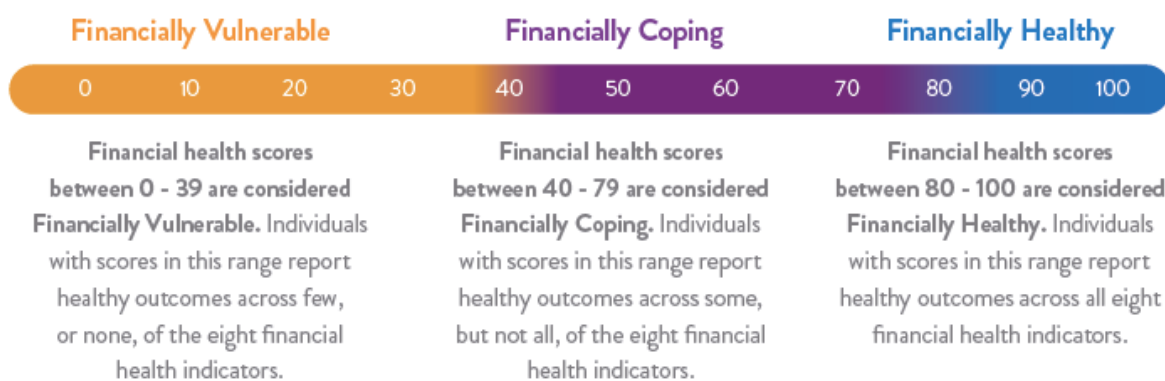
Figure 2: Interpretation of Financial Health Scores
Source: FinHealth Score Toolkit, Financial Health Network (2019)

The provided framework and questionnaire align with previous research focusing on the subjective perception of a person to measure financial well-being. By adopting the framework of the FHN as a measure I can rely on a proven methodology and make my own findings comparable to existing nationwide data from 2018 and 2019. Therefore, I am confident to adopt this questionnaire as it is given from the FHN, measuring the construct of financial health in a holistic and adequate way.

2.2   The current situation

The people of the United States struggle financially. According to the Financial Health Network only about 29% of the American Consumers are financially healthy, meaning these people are spending, saving, borrowing, and planning in a way that allows them to be resilient and pursue opportunities over time (Brockland, Garon, Dunn, Wilson and Celik 2019). Most people in the US are financially coping (54%), these people struggle with some but not all aspects of their financial life. 43 million people (17% of the US population) is financially vulnerable – they struggle with all or nearly all aspects of their financial lives.

17%
Financially Vulnerable

43 million people
These individuals are struggling with all, or nearly all, aspects of their financial lives.

54%
Financially Coping

135 million people
These individuals are struggling with some, but not necessarily all, aspects of their financial lives.

29%
Financially Healthy

73 million people
These individuals are spending, saving, borrowing, and planning in a way that will allow them to be resilient and pursue opportunities over time.

Figure 3: Financial Health Status (National Averages 2019)
Source: Financial Health Pulse 2019 (Brockland et al., 2019)

For too many Americans, personal finances are a source of anxiety and stress. According to the 2018 National Financial Capability Study (FINRA Investor Education Foundation, 2019), more than half (53%) agree that thinking about their finances makes them anxious, and 44% feel that discussing their finances is stressful, with respondents ages 18-34 reporting the highest levels of stress (63%) and anxiety (55%). Looking at gender, single women are more likely than their male counterparts to feel anxious or stressed about their finances. 61% percent of single women feel anxious thinking about their finances compared to 52% of single men. Similarly, 52% of single women feel stressed discussing their finances compared to 42% of single men.

Financial stress has many dimensions and reasons. One important factor is that most people in the US live little financial leeway. The majority of American workers lives from paycheck to paycheck (American Payroll Association, 2019). The annual survey of the American Payroll Association asked respondents how difficult it would be to meet their current financial obligations if their paychecks were delayed for a week. Approximately 28,893 respondents (74%) said they would find it either somewhat or very difficult to meet their financial obligations. Living this tight is also due to the fact that most Americans have no or nearly no savings. According to a recent survey, almost half of the Americans (45%) have 0$ in a savings account. Another 24% has less than $1000 (Huddleston, 2019).
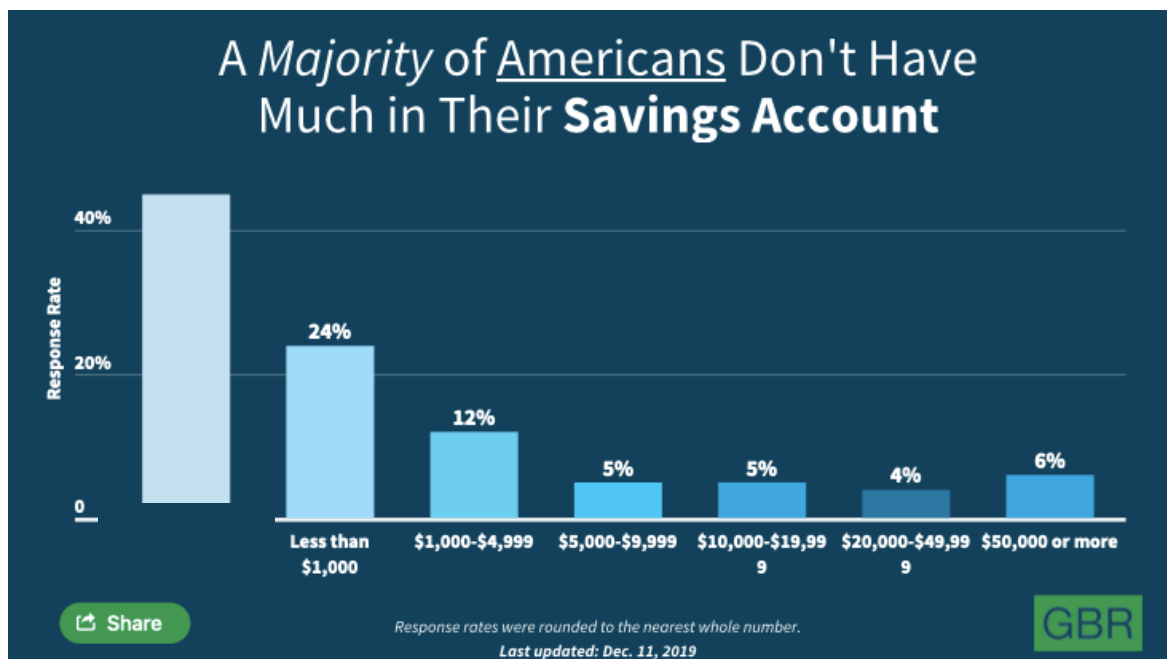
Figure 4: Savings of American consumers in 2019
Source: Huddleston, 2019

This situation of living from paycheck to paycheck and nearly no savings makes American consumers extremely vulnerable to financial shocks. According to the Federal Reserve report on the Economic Well-Being of U.S. Households in 2019 about 37% of the American people cannot cover an unexpected payment of $400 by using cash, savings or a credit card paid off with the next statement (Canilang, Duchan, Kreiss, Larrimore, Merry, Troland and Zabek, 2020). Fortunately, this problem has been enhancing over the past couple of years,

while in 2013 only 50% of the Americans were able to cover $400. The survey of the Federal Reserve also asked about the alternatives of those who cannot cover this unexpected payment. Most responded their alternative would be also a credit card, but they would have to pay it off over time.

When credit is the best way out of a financial shortage it is important to mention that credit and credit cards are not available for all Americans. Credit card access depends highly on a person's FICO score, which is the credit score most companies, banks and credit card issuers in the US use to assess the risk of lending money to consumers. On average the US population had a credit score of 703 in 2019, which is an all-time high (Stolba, 2019). Credit scores have indeed been enhancing over the last years, as the average grew from 689 in 2010. Though looking deeper into the numbers there is a clear bias disadvantaging the younger population.
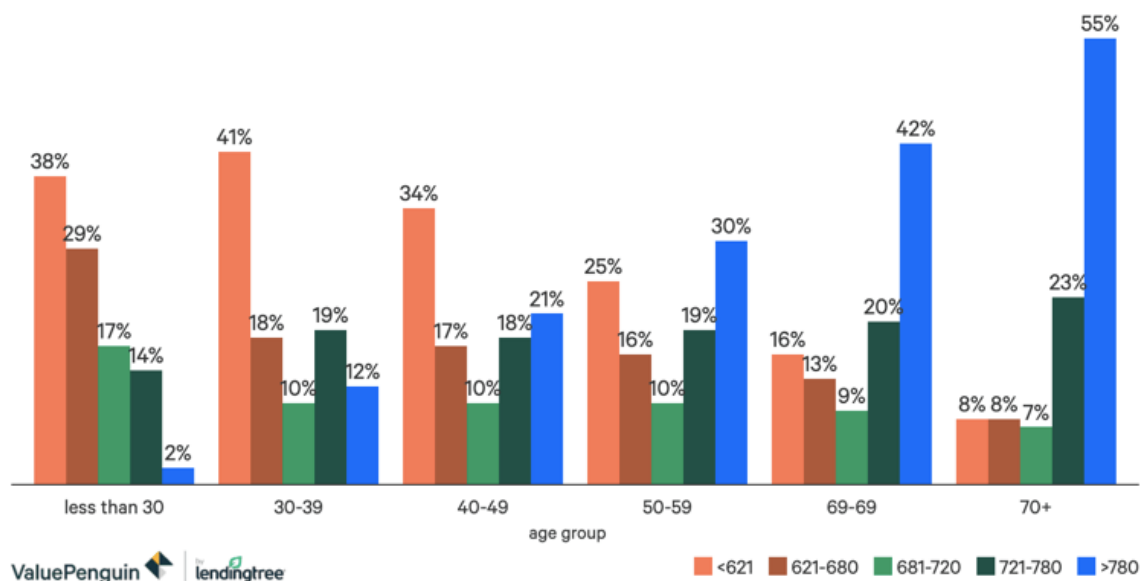
Figure 5: Credit score distribution by age
Source: Resendiz, 2020

About 40% of the people who are younger than 40 years have a credit score of under 621, which makes them hardly eligible for any credit (Resendiz, 2020). Since the FICO score measures primarily credit history (past history of credit repayment) especially young people, who simply cannot show this history, tend to have a subprime score. Following the

2009 CARD Act, it became significantly harder for young adults between 18 and 21 to open new credit card accounts. As a result, many young adults do not start building up a credit file which is the requirement to enhance the FICO score. This delay impacts until later in their life — driving the averages down (Resendiz, 2020).

There is one last resort for people who do not receive any credit from a traditional financial institution: Pay day lending. Pay day loans are a common practice in the US, wherein borrowers take on a short-term loan, to be repaid with the next paycheck. 12 million Americans take payday loans annually. These payday loans amount on average $375, cost about 400% annual interest and last on average about 18 days (Pew Charitable Trust, 2012). 69 percent use payday loans to cover a recurring expense, such as utilities, credit card bills, rent or mortgage payments, or food (Pew Charitable Trust, 2012). Payday loans are extremely expensive and often put people only into more trouble but since they do not require a credit check they are often the only way to access credit for people with low credit scores.

While some people struggle to access affordable credit, the debt amount for those who have access has been continuously growing. In 2020 the US consumer credit hit an all-time high of $14.3 trillion (Federal Reserve Bank of New York, 2020).
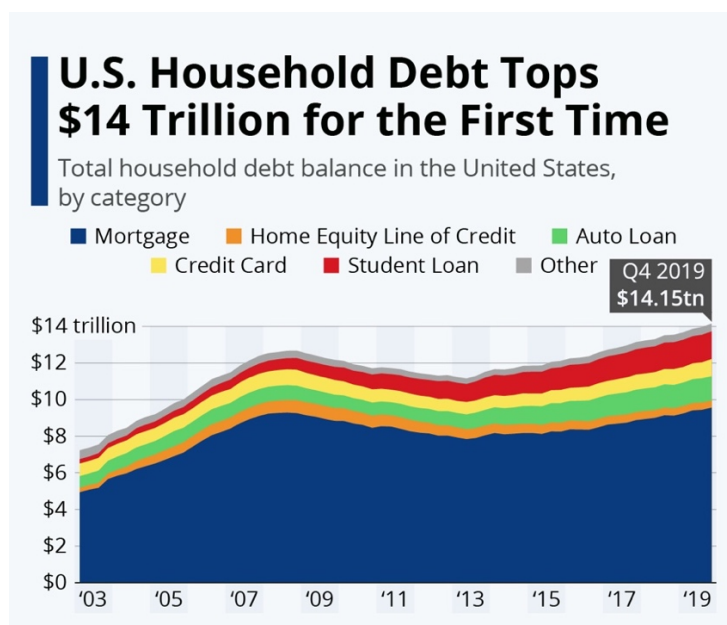
Figure 6: US household debt balance by category

Source: Statista, Richter (2020)

More than 189 million Americans have credit cards, on average at least four credit cards per credit card holder. On average, each household with a credit card carries $8,398 in credit card debt (Fay, 2019). According to the Financial Health Pulse 29.5% of the Americans have more debt than is manageable for them (Brockland et al., 2019). While mortgage debt grew back to pre-crisis levels, student debt has also reached a new maximum with $1.6 trillion. This is mostly because people have barely paid back their debt in the recent years (Kaur, 2020). Student debt was the fastest growing type of household debt in the US in the last decade, and it's now the second largest household debt category after home mortgages (Shenn, Kornfeld and Karnovitz, 2020).

Regarding the last dimension of financial health – planning – about 60% of the US consumers agree with the statement "my household plans financially ahead", 40% do not agree (Brockland et al, 2019). According to a survey by CNBC and Acorns Invest (CNBC, 2019) 75% of the Americans manage their finances on their own, without help from a professional or online service, only 17% have a financial advisor. For most people, lacking the know-how to handle their own finances comes at a high cost. According to the National Financial Educators Council (2019), Americans said money mistakes cost them $1,279, on average, last year alone. Since debt and also living expenses are on rise the importance of setting financial goals (and sticking to them) has never been greater, though most people are not spending enough time on it (Dickler, 2019).

Also, the retirement of many Americans is quite critical. Most families in the US, even the ones who are close to retirement, have little or no retirement savings. Nearly half of the families have no retirement savings, making the median value low for all age groups, ranging from $1000 for families in their mid 30s to $21,000 for families approaching retirement in 2016 (Morrissey, 2019). There is also a huge gap between rich and poor. While the median working-age family had only $7,800 saved in 2016, the 90th percentile family had $320,000 and the top 1% of families had $1,663,000 or more (Morrissey, 2019).
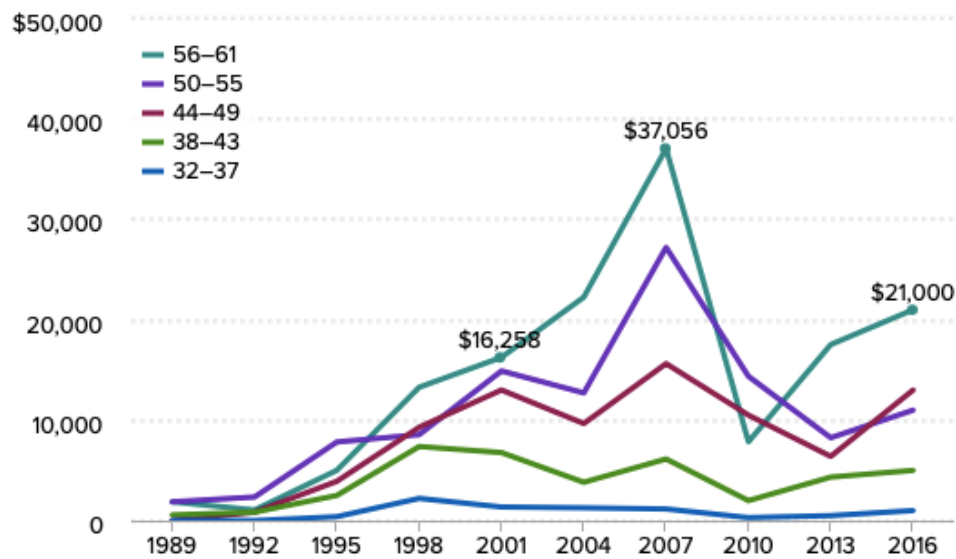
Figure 7: Median retirement account savings of families by age, 1989-2016 (2016 dollars)

Source: Economic Policy Institute, Morrissey (2019)

Regarding insurance about 37.8% of the American consumers are not confident that their insurance policies will cover them in an emergency, 4% have no insurance at all (Brockland et al., 2019). This correlates with the lack of resilience against unexpected payments. In 2018, an estimated 30.4 million people didn't' have any health insurance up from a low of 28.6 million in 2016 (Gunja and Collins, 2019). Uninsured working age-adults were disproportionately low income, Latino and under 35 years old. Nearly half of them may have been eligible for subsidized insurance but two-thirds (67%) had not gone to the marketplace to examine their coverage options. Of those 36% said they didn't think they could afford health insurance (Gunja and Collins, 2019).

All of this data draws a critical picture about the financial health of the consumers in the United States. While the United States is one of the most successful economies worldwide, many consumers on the bottom-line struggle financially, making the society very vulnerable to financial shocks.

2.3   2020 and the crisis of COVID-19

Through the outbreak of COVID-19 and the following lockdown of the economy, millions of Americans lost their jobs. In April 2020 the unemployment rate in the US jumped to 14.7% which is the highest rate since the Great Depression (Long and Van Dam, 2020). 20.5 million

people abruptly lost their jobs, which is roughly double what the nation experienced during the financial crisis 2007-2009. Given the fact that most Americans live from paycheck to paycheck, have little to no savings and many people lack the ability to cope with a financial shock this crisis has pushed millions of households over the edge. How badly this crisis will affect the economical stand of the American consumers and the whole economy in general is yet not clear. Long term effects will only reveal themselves in the future. Since this thesis was written during the pandemic it is not definable how far the results of my research are impacted by the crisis.

3 FinTech and Financial Health Applications

Financial health is a macroeconomic problem. One could argue that this problem can therefore only be solved at the policy level with tools such as a minimum wage, labor policies, state health insurance, basic income etc. Though, the financial services industry is tapping into the potential of solving (or at least alleviating) this problem. Many FinTech (short for financial technology) companies have gained traction in the past years. A flurry of for-profit business claiming to be focused on Financial Health have emerged. The following chapter will highlight this new industry and some of its most promising businesses.

3.1   Definition

Financial technology (Fintech) is a term short for "financial technology" and describes new technology that seeks to improve and automate the use and delivery of financial services (Kagan, 2020). Gulamhuseinwala, Bull and Lewis (2015) define FinTech as firms that are combining innovative business models and technology to enable, enhance and disrupt financial services. In simple terms, FinTech is technology enabled financial services.

3.2   The market of FinTech

The global fintech market was valued at about $127.66 billion in 2018 and is expected to grow to $309.98 billion at an annual growth rate of 24.8% through 2022 (Business Research

Company, 2019). In 2019, 24 FinTech companies reached the "Unicorn" status, having a valuation above $1 billion (Singh, 2020), 12 of them in the US alone.

The US set a new record for fintech funding in 2019, with $59.8 billion in investment compared to $58 billion in 2018 (KPMG International, 2020). The US has a share of 44% of the global investment in FinTech which hit $135.7 billion in 2019. Figure 8 displays the total investment into FinTech in the US between 2014 and 2019

Total investment activity (VC, PE and M&A) in fintech in the US
2014–Q4 2019
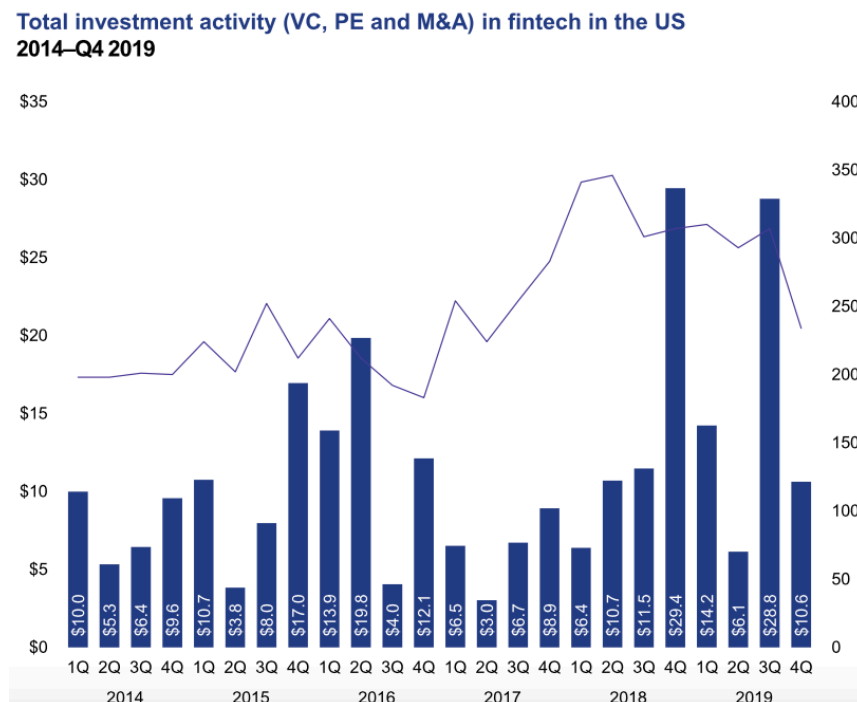
Figure 8: Total investment activity in FinTech in the US
Source: Pulse of FinTech H2 2019, KPMG International (2020)

3.3   The evolution of FinTech

According to Arner, Baberis and Ross (2015) the evolution of FinTech can be divided into three eras:

FinTech 1.0 describes the era of the first financial globalization. It started with technologies such as the telegraph as well as railroads and steamships that allowed for the first-time rapid transmission of financial information across borders. Key event was in 1866 when the first transatlantic cable was laid, connecting London and New York City.

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FinTech 2.0 is defined as the period between 1967 and 2008 and marks the shift from analog to digital. It was the launch of the first handheld calculator and the first ATM installed by Barclays bank that marked the beginning of the modern period of fintech in 1967. Digital Stock Exchange in the early 1970s and the establishment of SWIFT (Society For Worldwide Interbank Financial Telecommunications) shaped financial services significantly. The 1980s saw the rise of bank mainframe computers and the first online banking, which flourished in 1990s through Internet and e-commerce business models.

FinTech 3.0 (the current era) started with the global financial crisis in 2008. Arner et al. (2015) see the crisis as a turning point that has catalyzed the growth of the FinTech era 3.0. Fintech 3.0 is about startups – these startups emerged due to the distrust of the traditional banking system among the general public and the deteriorated public perceptions of banks as powerful organizations. New innovative FinTech companies and business models disrupted the status quo of financial services while the revolution of smartphones accelerated the mass-market penetration of FinTech. In the current era, many FinTech startups pursue a revolutionary mission to make financial services more transparent, more affordable and more useful for the people. Innovative products focus on creating real value for their customers, solving their day-to-day problems and giving them a product that makes their financial lives easier to manage, they strive to enhance consumers' financial health. Since consumer financial services often have been inefficient, inaccessible and not value maximizing for lots of American consumers, many FinTech startups focus on different aspects of financial health, developing services and products which should help consumers in their best interest. These apps whose value proposition is focused on increasing users' financial health, will be called "Financial Health Applications" (FHA) in this thesis.

3.4   Financial Health Applications

While the FinTech ecosystem comprises many different categories such as payments, lending, crowd funding, insurance, digital banking, asset management, financial infrastructure etc. the focus of this paper lays on B2C (business to consumer) fintech

services, especially 'financial health applications' (FHA). According to my definition of financial health (see 2.1) I will define FHA as applications which help consumers

A. to spend less money and organize a budget
B. to save more money
C. to invest money
D. to borrow money more easily or cheaply
E. to enhance their credit score
F. to manage their debt
G. to get better insurance and manage it more easily
H. to plan financially into the future

These applications include the dimensions of personal finance, spending, budgeting, investment, lending, credit scoring, debt management, insurance, financial advisory and financial planning.

Table 2 contains an overview with examples of some of the most successful and popular US FinTech companies in the space of financial health, categorized by functionalities:

Table 2: Financial Health Applications overview

App	FHA Category								No. of Users	Business Model	Valuation
	A	B	C	D	E	F	G	H			
Intuit mint	x				x				13m	Free	$170m (Acquired in 2009)
YNAB.	x	x						x	Not public	$84/year	Not public
digit		x							400k	$2.99/ month	$500m

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Company								Users	Pricing	Valuation
chime	x	x						8m	Free	$5.8bn
acorns		x	x					4.5m	$1/month	$860m
robinhood			x					13m	Free / $5 per month (RH gold)	$8.3bn
personal CAPITAL			x				x	1.7m	Free	$825m (Acquired in 2020)
Petal	x			x				50k	13-24% APR	Not public
earnin				x				1m+	Voluntary tip per cash out	Not public
credit karma					x	x		100m	Free	$7.1bn (Acquired in 2020)
earnup						x		Not public	Free	Not public
Lemonade							x	300k+	20% of insurance premium	$2bn
oscar							x	420k	Depends on insurance	$3.2 bn
SoFi	x	x	x	x	x	x		7.5m	Free	$4.3bn

More details and elaborations for this overview can be found in the appendix (Appendix 3).

There are hundreds of FHA in the US and new companies enter the market continuously. FinTech has shaped the face of financial services as it is continuing to grow, changing the landscape of the industry. Some companies already show at lot of success in the market and have enormous funding and valuations. These FinTech companies focus on positive financial outcomes for consumers – financial health – they transform product design, product marketing and the value proposition towards their customers, creating great product-market-fit. All of them try to reach relevant customers who will adopt and use their solutions, ultimately helping them to improve their financial health. For FHA to be able to have an impact on the current financial health situation of the consumers in the US, consumers need to adopt and use these applications. This is where my research question arose. Would financially stressed consumers actually adopt these apps? And which factors are relevant for consumers to adopt or not adopt FHA? Since I research in the field of technology adoption, I investigated previous research regarding the acceptance and adoption of technology, especially financial services technology.

4 Literature review

4.1 Fundamental theories of technology adoption

There are several fundamental theories regarding technology adoption. One highly used reference is the "Theory of reasoned action" (Fishbein and Ajzen, 1977), a famous model in the field of prediction or explanation of personal behavior.
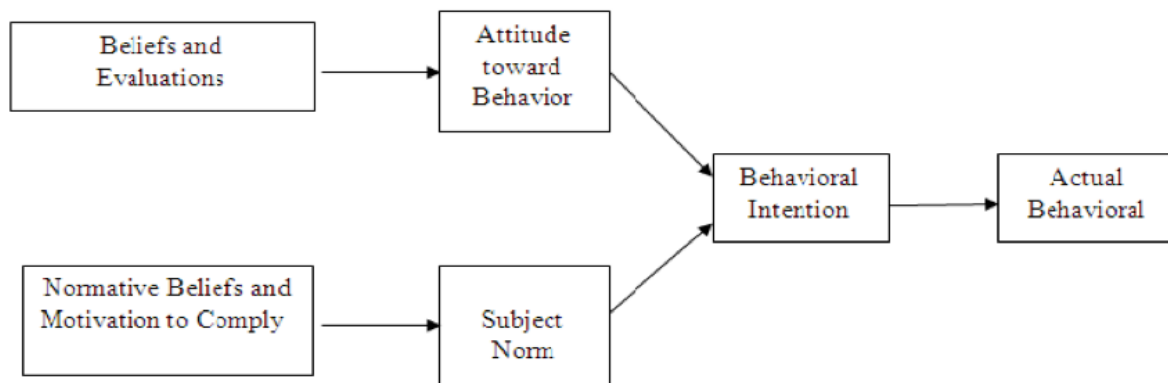
Figure 9: Theory of reasoned action
Source: Fisbhein and Ajzen, 1977

Drawn from psychology the TRA is one of the most fundamental theories of human behavior. The Attitude toward behavior is "an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (Fishbein and Ajzen, 1977, p.216). The Subjective Norm is "the person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein and Ajzen, 1977, p.302). Both influence the behavioral intention of an individual, which ultimately leads to actual behavior.

The Technology Acceptance Model (TAM) (Davis, 1989) explores such a relationship between attitude and behavioral intention and is built upon the TRA. The TAM assumes that the key determinant of behavioral intentions depends on a person's beliefs about their own ability to use a piece of technology (perceived ease of use) and their subjective evaluation of the usefulness of that technology (perceived usefulness) (Davis, 1989).
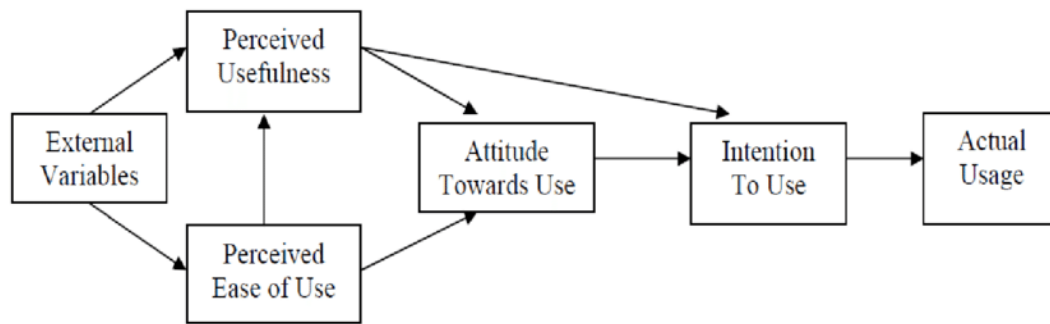
Figure 10: Technology Acceptance Model

Source: Davis, 1989

Perceived usefulness is reflecting a person's belief in that the use of the technology will help to improve performance. Perceived ease of use is a person's belief that using the technology will be free of effort (Davis, 1989, p. 320). Davis (1989) theorized that even if a potential user would believe that a given technology is useful, they may think that the performance benefits of usage are outweighed by the effort of using the technology.

The TAM was further extended by Venkatesh and Davis (2000), who developed the extended TAM (TAM 2).
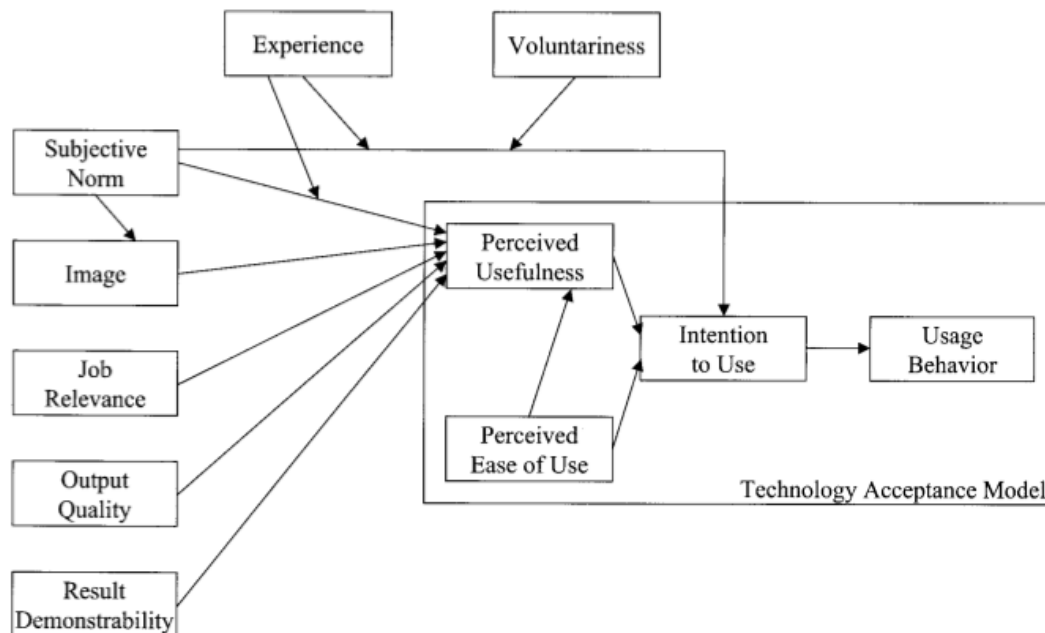
Figure 11: Extended Technology Acceptance Model (TAM2)

Source: Venkatesh and Davis, 2000

Additional to the original TAM, they modeled different other variables to influence the constructs within the TAM. Voluntariness of use, previous experience with the technology, subjective norm (consistent with the TRA), image, job relevance, output quality and result demonstrability were added to the original model, further enriching its meaningfulness.

Venkatesh, Morris, Davis and Davis (2003) reviewed eight different user acceptance theories and prominent models (including the TRA and the TAM) to formulate a unified model – the unified theory of acceptance and use of technology (UTAUT). The UTAUT aims to explain user intentions to use an information system and subsequent usage behavior, combining different models and theories in the space. The theory holds that there are four key constructs: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions. Further four moderators were modeled to influence the key relationships, 1) Gender, 2) Age, 3) Experience and 4) Voluntariness of use.
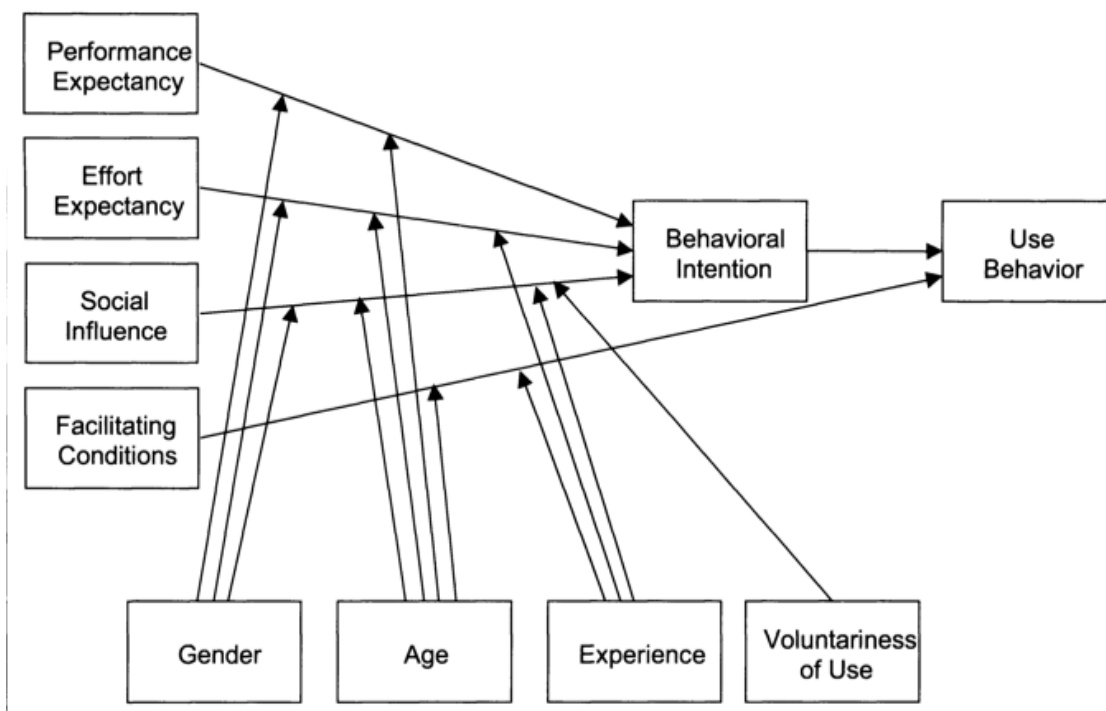
Figure 12: Unified theory of acceptance and use of technology
Source: Venkatesh et al., 2003

Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance. Effort expectancy is the

degree of ease associated with the use of the system which is related to the previous experience with the system (Venkatesh et al., 2003), Social influence is the degree to which an individual perceives that important others believe he or she should use the system, facilitating conditions are the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system. Subsequent validation by Venkatesh et al. (2003) of UTAUT in a longitudinal study found it to account for 70% of the variance in Behavioral Intention to Use (BI) and about 50% in actual use (Venkatesh et al., 2003).

4.2 Research on the adoption of financial technology

The goal of this thesis is to investigate whether low financial health increases the likelihood of an individual to adopt FHA which other factors are relevant for this adoption. Many researchers have built upon the different models of technology adoption to model specific models for the adoption of financial technology. The following section will review different papers regarding the adoption of FinTech, online and mobile banking as these are relevant references for my own study investigating the adoption of Financial Health Applications - which is a specific subcategory of FinTech.

Lee (2009) investigated the factors influencing the adoption of internet banking and adapted the Technology Acceptance Model (Davis, 1989) with the constructs of 'perceived benefit' and 'perceived risk'. The purpose of his study was to investigate whether perceived risk and benefit significantly impact customers' behavioral intention to adopt online banking. Both perceived risk and benefit were multi-dimensional constructs and part of Lee's structural equation modeling (SEM) approach, where PU (perceived usefulness), PEOU (perceived ease of use), perceived benefit and five risk factors (performance risk, time risk, financial risk and security risk) were the variables modeled to influence the intention to adopt online banking. While PU and PEOU were confirmed as strong indicators for a positive attitude towards online banking, perceived benefit was identified as the most important positive factor for the intention to use online banking. All the risk factors were confirmed as negative factors towards the intention to adopt online banking.

This implication algins with the findings of Featherman and Fuller (2003). They extended the TAM to include a perceived usage risk as a main effect and also tested whether perceived risk moderated several of TAM's relationships. They found that higher levels of perceived risk deflated the ease of user's effect.

Hu, Ding, Li, Chen and Yang (2019) also extended the TAM, they developed the technology acceptance model (TAM) that incorporates user innovativeness, government support, brand image, and perceived risk as determinants of trust to investigate how users adopt Fintech services. Brand image, government support, and user innovation were found to have significantly positive impacts on the adoption of Fintech services. These impacts were direct but had also indirect impacts on trust in FinTech services, while trust had a positive effect on the adoption of FinTech Services. Like Featherman and Fuller (2003) they found that perceived risk can affect users' trust of Fintech services.

Other researchers have investigated the adoption of financial technology using the UTAUT. Tun-Pin, Keng-Soon, Yen-San, Pui-Yee, Hong-Leong and Shwu-Shing (2019) used the TAM and UTAUT to investigate FinTech adoption in Malaysia. They confirmed that all constructs perceived ease of use, perceived usefulness, social influence, personal innovativeness, security concerns, perceived enjoyment and demographic profile affect the intention to adopt FinTech in Malaysia. They also proved significant differences according to gender and age, whereas males and younger people show a higher intention to adopt FinTech in Malaysia (Tun-Pin et al, 2019). Oliveira, Faria, Thomas and Popovic (2014) used the UTAUT to investigate the adoption of mobile banking in Portugal. They confirmed performance expectancy relevant for the behavioral intention and facilitating conditions as relevant for the adoption of mobile banking, though effort expectancy and social influence did not show a significant influence. They did not confirm moderating effects of gender or age.

Some researchers did not directly employ the TAM or UTAUT but build their own models, related the fundamental theories of technology adoption. Polasik and Wisniewski (2009) made an empirical analysis of internet banking adoption in Poland. They investigated if and how much perceived security, experience with the internet, online banking marketing exposure, use of other banking products, the type of internet connection used, and several demographic factors influenced the internet banking adoption. They argued that a high level

of perceived security in online services is necessary to foster further acceptance of online banking. Polasik and Wisniewski further connected the factor of 'experience with the internet' to the 'perceived ease of use' factor of the TAM, as they reasoned that a proficiency in using the internet will make online banking less complex and easier to use. In this sense they argued that technical skills and previous experience are indeed relevant. They found that customers who are familiar with other electronic distribution channels, such as mobile banking or payment cards, show greater tendency to open an internet account. Conclusion was the more technology-savvy customers are, the higher the probability of them conducting banking operations via the internet. In particular, the usage of internet for shopping or work, the duration of use, and number of years of education were important predictors of the adoption. The factor of online marketing exposure was taken into consideration as they argued that consumers need to be aware of a solution and its benefits in order to adopt it. In that sense Polasik and Wisniewski emphasized the importance of customer awareness and marketing as a powerful instrument to influence adoption. Sathye (1999) also identified the lack of awareness as a main hindering factor for consumers to migrate to online banking in Australia. Simarly, Polatoglu and Ekin (2001) argued that marketing effort in Turkey had a positive influence on e-banking acceptance.

Lee and Lee (2001) investigated the consumer adoption of internet banking. They theorized that the higher the need of a person is to use banking services and the more a person has adopted eCommerce and is comfortable with online transactions, the likelier that person would be to adopt internet banking. Therefore, they modeled the constructs of 'use of banking services' and 'internet purchase behavior' as the factors influencing the likelihood to adopt internet banking. The rationale of their paper was to test whether the adoption of internet banking is need-based and/ or skill-based. Need-based was tested through the construct of 'use of banking services' the measure for the need for banking services. Here they asked consumers how often they visit a branch, call the bank or use an ATM. The results indicated that consumers that have a high need for banking services are more likely to adopt internet banking, therefore the adoption of internet banking was proven to be need-based. Conclusion was that the adoption of internet banking is primarily motivated by needs for more convenience in banking. Lee and Lee (2001) also concluded that the adoption of internet banking is skill-based, as consumers who were experienced in online shopping and

online transactions were more likely to adopt internet banking. Fitting to the research of Lee (2009) they concluded that more experience with online transaction is likely to reduce consumers' perceived risk to adopt internet banking. The overall conclusion stated that the adoption of internet banking is both, need-based and skill-based.

Ryu (2018) investigated the factors which make users in Korea willing or hesitant to adopt FinTech. Like Lee (2009), Ryu (2018) investigated the constructs of perceived benefit and perceived risk as the influences on FinTech adoption intention. Ryu's findings revealed that the perceived benefit and risk significantly influenced the Fintech adoption intention. The perceived benefits of Fintech were classified into three different aspects: 1) economic benefit; 2) convenience, and 3) transaction process. His study investigated four types of risks as perceived risks of Fintech: 1) financial, 2) legal, 3) security, and 4) operational risks. Ryu showed that perceived benefit had a significant positive effect on Fintech service adoption intention (beta=0.543; $p<0.01$) and perceived risk was negatively related to Fintech the adoption intention (beta=0.-233; $p<0.01$). Therefore, he proved that perceived benefit positively affects, and perceived risk negatively influences the respondents' willingness to adopt Fintech service. Ryu found that perceived benefit is a more influential factor than perceived risk on Fintech adoption. That implies that customers are mainly willing to adopt Fintech, but some factors hinder their adoption. He concluded that controlling the risks of FinTech is as important as enhancing its benefits.

There have been numerous studies regarding the adoption of financial technology, studies have investigated the adoption of online and mobile banking or FinTech services and differ regarding timing and geography. Based on this literature review I can draw a fundament for developing my own theory and methodology, investigating financial health and other factors in regard to the adoption of financial health applications.

5 Model and Hypotheses

The Technology Acceptance model and the Unified Theory of Acceptance and Use of Technology are fundamental to a diversity of research investigating the adoption of different technologies and innovations. Seldom, scholars use the consumers' point of view to identify

factors which affect behavioral intention to use a new technology, most research is based on past research and applies the TAM or extended models, testing whether these models are applicable to a certain context (Legirs, Ingam and Collerette, 2003). The model for my research builds upon the underlying theories of the TAM and the UTAUT, though instead of relying on defined factors within these models, I used qualitative research to identify relevant constructs for the adoption of FHA. My research uses mixed methods: Firstly, semi-structured interviews in a qualitative phase to explore relevant factors and secondly a quantitative survey to explain the relationships between the identified factors and FHA adoption, analyzing the path coefficients in my proposed model and testing the constructed hypotheses through a structured equation model (SEM). Instead of using a predefined model, I asked consumers which factors they consider to be relevant for them to adopt or not adopt FHA. The model for my research is supported by the TAM/UTAUT and relevant literature but mostly based on the qualitative part of my research, were I derived relevant factors through consumer interviews. Section 7.1 elaborates on the results of this qualitative research, while section 7.2 will explain in detail how I chose the constructs and measurement items for my model. Like the UTAUT my model will test for the moderating effect of demographic factors. These factors will include gender, age and income. For complexity reasons I did not incorporate constructs such as 'Subjective Norm' or 'Social Influence', meaning that I did not account for the perception of an individual whether other people important to the individual would encourage or discourage the use of FHA. My primary focus was on 'Financial Stress', investigating its influence on other constructs in the model and on the intention to adopt FHA.

The model consists of two parts: The structural / inner model and the measurement/ outer model. The structural model includes seven constructs: 'Awareness', 'Perceived usefulness', 'Mobile skills', 'Perceived security risk', 'Financial Stress', 'Adoption intention' and 'Actual Use'. While 'Financial Stress' and 'Actual Use' are single item constructs the other five constructs are latent reflective constructs, which are measured by several reflective indicators. The indicators reflect the latent construct, the latent constructs cause the indicators (Freeze and Raschke, 2007). The indicators which reflect one construct are expected to be correlated (see 6.5.2.2 *convergent validity*).
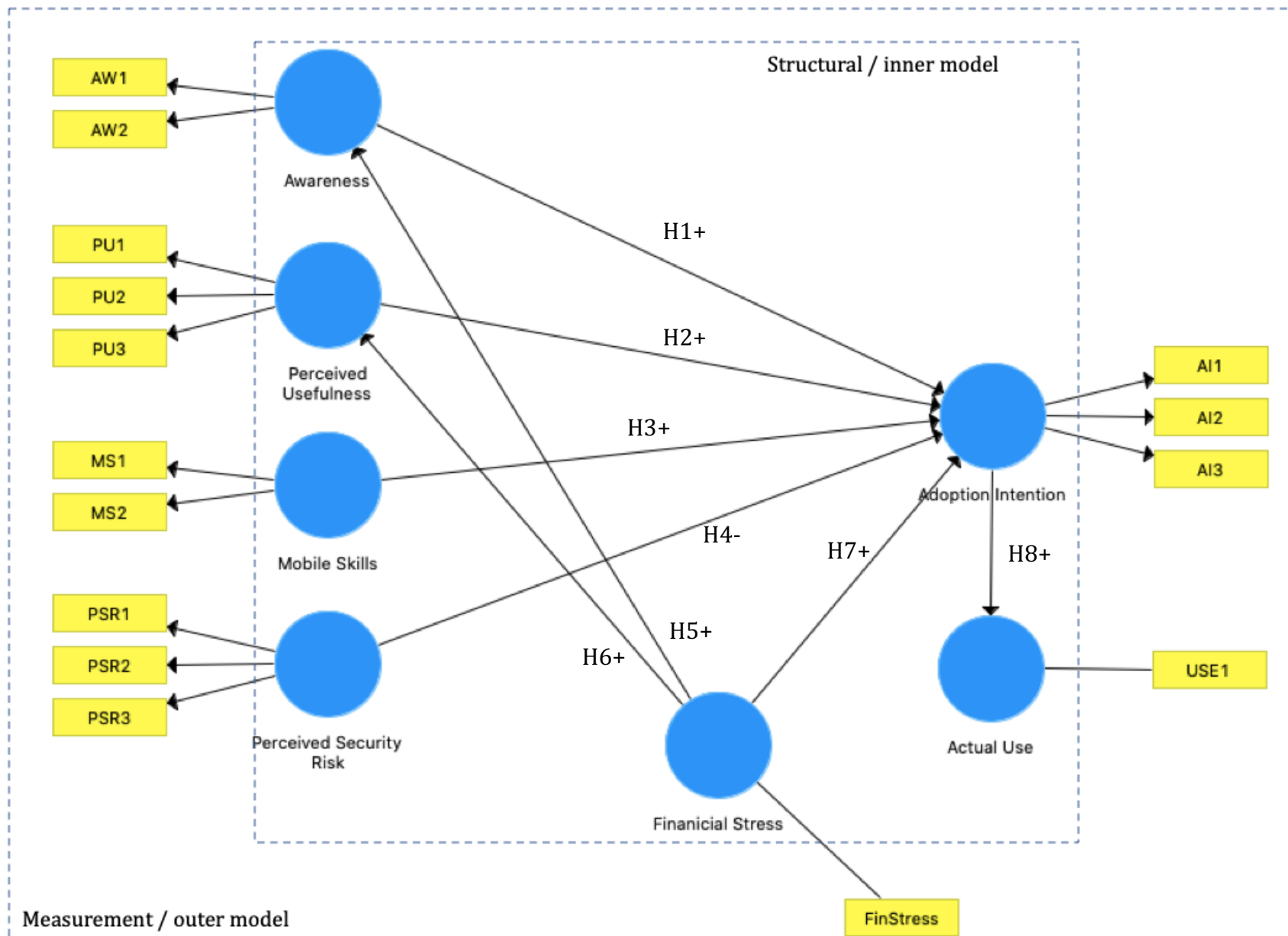
Figure 13: Research model

The latent constructs 'Awareness', 'Perceived usefulness', 'Mobile skills', and 'Perceived security risk' are exogenous variables while 'Adoption Intention' is the endogenous variable of the model. All of these constructs stem from the qualitative part of my research (see section 7.1). Additionally, 'Financial Stress' is another exogenous variable which is modeled to influence 'Awareness' and 'Perceived usefulness' but also 'Adoption Intention' directly. Lastly, 'Actual Use' is a binary variable (yes = 1, no = 0) which will measure if respondents currently use any FHA. Each of the constructs is reflected by one, two or three indicators, measuring the construct. What these indicators are and why I chose to include them are elaborated in section 7.1 – 7.2. The model tests the relationships between the exogenous variables and the endogenous variable to see if the modeled latent constructs are relevant for consumers' intention to adopt FHA. Further the external factor of 'Financial Stress' will measure how financial stress has an impact on the adoption of FHA, testing its influence on the constructs in the model. Goal is to maximize the explained variance of 'Adoption Intention'.

According to this model I propose the following hypotheses to be tested:

H1: Awareness has a positive influence on adoption intention

For an individual to consider adopting a technology or innovation, he or she needs to be aware of its existence so that the technology can be part of the choice portfolio of that person. I reason that people who are not aware of FHAs' existence and functionalities are less likely to intend to adopt them, since they are unable to consider them without this knowledge. Hence 'Awareness' should have positive influence on the adoption intention of FHA. This reasoning stems from qualitative research (see 7.1) and is further supported through Polasik and Wisniewski (2009), Sathye (1999) Polatoglu and Ekin (2001).

H2: Perceived usefulness has a positive influence on adoption intention

This construct is part of the original TAM of Davis (1989) and has been proven in many different papers to be a crucial part of the adoption intention of financial technology (Jahangir and Begum, 2008; Lee, 2009; Al-Sharafi, Arshah, Herzallah, Alajmi, 2017; Raza,

Umer, Shah, 2017) . I reason that the more an individual will perceive FHA as useful, the likelier he or she is to adopt FHA.

H3: Mobile skills have a positive influence on adoption intention

This construct draws the logic that relevant mobile skills are positively influencing the intention to adopt FHA since skills how to use mobile apps and previous experience with mobile finance should make it easier for consumers to use FHA. I reason that people who are used to mobile applications and mobile transactions perceive FHA as easier to use and are more likely to adopt them. While I extracted this factor during my qualitative research, it does relate to 'Perceived ease of use' of the original TAM (Davis, 1989) as well as the 'Effort expectancy' of the UTAUT (Vekantesh et al., 2003). Further, it is aligned with the skill-based argument of Lee (2009).

H4: Perceived security risk has a negative influence on adoption intention

I reason that people who think that their personal and financial data would not be safe with FHA won't trust FHA and are less likely to adopt them. While I identified this factor in my qualitative research (see 7.1) also Ryu (2018) supports this reasoning as he confirmed security risk as the most critical risk factor influencing the adoption of FinTech.

Regarding the factor of 'Financial stress' I draw the following hypotheses:

H5: Financial stress has a positive influence on awareness

H6: Financial stress has a positive influence on perceived usefulness

H7: Financial stress has a positive influence on adoption intention

I reason that financial stress should be positively related to 'Awareness' as well as 'Perceived usefulness' since people who are actually in need of FHA should on the one hand pay more attention to these applications and be more aware of their existence and on the other hand perceive these also as more useful as they do have a higher need which these applications

could fulfill. Lastly, I model a positive influence of financial stress on the adoption intention to see if there is a direct effect.

I do not hypothesize an effect on 'mobile skills' or 'perceived security risk' as these factors should be rather unrelated to 'financial stress'.

For the last variable 'Actual Use' I will measure the influence of 'Adoption Intention' testing the following hypothesis:

H8: Adoption intention has a positive influence on actual use.

Since my model primarily measures the intention to adopt and not the actual adoption this hypothesis will test how strong the intention to adopt leads to actual use. According to the theory of planned behavior (Fishbein and Ajzen, 1977) intention does not directly translate into actual behavior. H8 will test if the adoption intention of people has a significant positive relation to their actual use, hence measure whether intention is a strong indicator for actual behavior.

All of these hypotheses will be tested with the moderating variables of age, gender and income as these demographic factors are likely to influence the key relationships of my model.

6 Methodology

The following section presents the overall methodological approach in this study. The research method, the philosophy of science, the approach to theory development, the research strategy, the time-horizon, techniques and procedures used, are specific to each research, while each method has its own benefits and consequences (Amaratunga, Baldry, Sarshar, Newton, 2002). There is no superior philosophy, approach, design or collection of research (Tsoukas & Knudsen, 2003). Conducting research, a researcher must be aware of the own assumptions he or she has, consciously or unconsciously (Burrell and Morgan, 1979). As I approached this thesis with an active and informed philosophical choice, I a) questioned my own research assumptions and beliefs and b) familiarized myself with the different existing research philosophies within business and management.
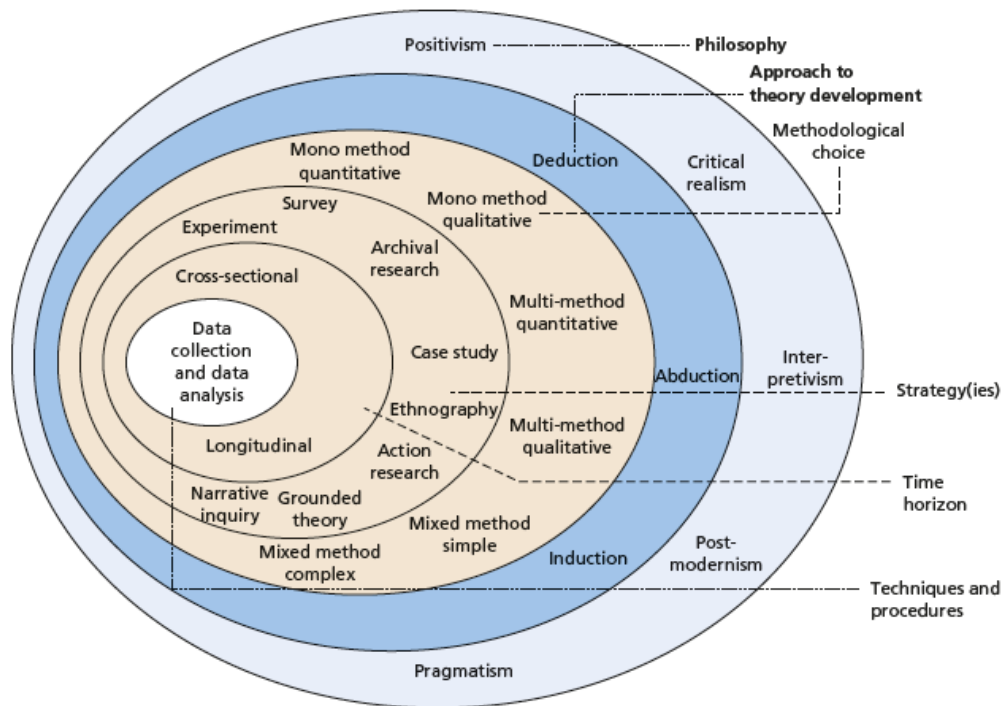
Figure 14: Research Onion

Source: Saunders, Lewis, Thornhill., 2016

In the following section I elaborate the reflexive approach of the development of my research philosophy and design.

6.1 Research philosophy

The term research philosophy refers to a system of beliefs and assumptions about the development of knowledge (Saunders, Lewis, Thornhill, 2016). At every stage of research, researchers make assumptions. These include epistemological assumptions, ontological assumptions and axiological assumptions.

Epistemological assumptions regard the way how human knowledge is acquired, what is considered to be legitimate knowledge, and how knowledge is communicated to others (Saunders et al, 2016). Ontology are assumptions related to the nature of reality. They determine what the researcher sees as real, whether there is one true, external reality or multiple realities exist, socially constructed in subjective context. Axiology refers to values, ethics, and perception, and how these influence the research (Saunders et al, 2016).

6.1.1 Objectivism vs Subjectivism

With these three types of assumptions research philosophies are scattered along a multidimensional set of continua (Niglas, 2010) between two opposing extremes – subjectivism and objectivism.

Objectivism

Ontologically, objectivism embraces realism, which, in its most extreme form, considers social entities to be like physical entities of the natural world - they exist independently of how we think of them, label them, or even of our awareness of them (Saunders et al., 2016). The social world is made up of solid and relatively unchanging 'things', including major social structures into which individuals are born (Burrell and Morgan, 1979). Epistemologically, objectivists want to discover the one single truth about the social world, by analyzing observable, measurable facts, from which law-like generalizations can be drawn (Burrell and Morgan, 1979.). Axiologically, objective researchers keep their research free from any values or beliefs which would bias their findings.

Subjectivism

Subjectivism incorporates assumptions of the arts and humanities, claiming that social reality is made from the perceptions and actions of social actors (Saunders et al., 2016). Ontologically, subjectivism embraces nominalism. Nominalism considers that the structure and order of social phenomena are created by us as researchers and by other social actors through use of language, conceptual categories, perceptions and consequent actions (Saunders et al., 2016). There is no one true reality to the social world since each person experiences and perceives reality in a subjective way. Therefore, there are multiple subjective realities since reality is not the same for everyone (Burrell and Morgan, 1979). Epistemologically, subjectivists are interested in different opinions and narratives that can help to explain the different social realities of different social actors. Axiologically, subjectivists cannot detach themselves from their own values since their subjective reality influences their research.

6.1.2   Choice of research philosophy

After careful reflection of my own beliefs, assumptions and the goal of my thesis I decided for a *pragmatic philosophy*. Pragmatism originated in the late nineteenth /early twentieth century USA in the work of philosophers Charles Pierce, William James and John Dewey. It strives to reconcile both objectivism and subjectivism, facts and values, accurate and rigorous knowledge and different contextualized experiences (Saunders et al., 2016). This philosophy is particularly interesting in management science due to its focus on the practical implications of knowledge on reality (Bailly and Comino, 2017).

Fitting to the goal of my thesis to generate clear market insights actionable knowledge about the adoption of FHA I decided to work within this philosophy.

Ontology

Reality matters to pragmatists as practical effects of ideas. Pragmatism can be described as "the doctrine that reality possesses practical character" (Dewey 1931, p. 31). For a pragmatist, the world is a set of practical actions that are born from thinking. Thinking and doing are two sides of the same coin. Action requires thinking, and "thinking is a mental

activity: it is a doing" (Peters, 2007 p. 356). My ontological assumptions of this thesis fit to this view. Since my thesis investigates the consumer adoption of Financial Health Apps, I argue that the reality of adoption or non-adoption is the consequence of ideas, actions and reality of different stakeholders involved. The circumstances of consumers, their characteristics and needs but also the business model, the value proposition and marketing strategy of the FinTech companies are part of the reality of FHA adoption. As reality is a flux of processes, experiences and practices, knowledge about the reality will result in actions which are able to influence the reality (Dewey, 1929). In this sense, the market insights created with this paper should derive actionable knowledge on how to increase the adoption of FHA in the US.

Epistemology

The pragmatist's interest in what works and how and why it works (or doesn't) translates into a notion of knowledge that is antifoundational: one that is directed towards problem solving using the data and understandings available at the time (Kelemen and Rumens, 2008). Knowledge is valued for enabling actions to be carried out successfully. This thesis aims to investigate whether consumers in with low financial health would actually adopt available solutions and to identify critical factors which could be addressed to enhance the adoption of financial health apps. The purpose of knowledge is to "gain the understanding necessary to deal with the problems as they arise" rather than to "uncover the antecedently real" (Dewey, 1988; vol. 4, p. 14).

For a pragmatist, the most important determinant of his or her research design and strategy would be the research problem (research question) that he or she would try to address. Research starts with a problem and aims to contribute practical solutions that inform future practice (Saunders et al., 2016).

The problem with which my thesis started is the low level of consumer financial health in the US and the question whether these people with low financial health adopt the available solutions, aiming to help to enhance their financial health. Knowledge about the reality of the adoption is useful since my research will derive insights for actions to influence the adoption of financial health apps.

Axiology

According to Saunders et al. (2016) pragmatic research is object to the researcher values that drive the reflexive process of inquiry, which is initiated by doubt and a sense that something is wrong or out of place, and which re-creates belief when the problem has been resolved (Elkjaer and Simpson, 2011). As pragmatists are more interested in practical outcomes than abstract distinctions, their research may have considerable variation in terms of how 'objectivist' or 'subjectivist' it turns out to be (Elkjaer and Simpson, 2011). The research for this thesis did initiate through my own beliefs and doubts. Observing and investigating the financial health problems in the United States I wondered whether the FHA solutions which are available at the market are accepted by consumers and adopted by those people who need these innovative services. Only then FHA can make a difference for the consumer financial health in the US – which so many financial health companies claim to be their mission. Understanding this problem setting is the central motivation and the initiation of my research.

6.2   Approach to theory development

There are three main approaches to theory development: deduction, induction and abduction. With deduction, a theory and hypotheses are first developed, and a research strategy is designed to test the hypotheses. With induction, data is first collected, and a theory is developed as a result of the data analysis. Abduction, in effect combines deduction and induction (Suddaby, 2006), as it does not move form theory to data (deduction) or from data to theory (induction) but back and forth (Saunders et al., 2016). The research in this paper is partially deductive since the focus is on a priori developed model and its hypotheses to be tested. The model is based on previous literature but also on exploratory qualitative research prelude (see 7.1 and 7.2), which helped to develop the model and hypotheses. Hence the first part of my research can be classified as inductive, building theory out of collected data. Since I combine both (deductive and inductive) I classify my research as abductive.

6.3   Mixed methods and pragmatism

Fitting to my pragmatic research philosophy I chose to work with a mixed methodology. Pragmatism offers a very specific view of knowledge, one claiming that the only way to acquire knowledge is by combining action and reflection (Biesta, 2010). In a pragmatic philosophy, knowledge is about the relationships between actions and consequences (Biesta, 2010). A major contribution of Deweyan pragmatism is that it is dismantling the persistent dualism of subjectivism and objectivism. Dewey offers a different perspective that there is neither an objective world "out there" nor only subjective knowledge in our minds, the differentiation between subjectivism and objectivism loses its meaning (Dewey, 1929). Deweyan pragmatism characterizes the universe as a "moving whole of interacting parts" (Dewey, 1929, p. 290–291), hence knowledge is only possible through connecting with these connections and not through only observation. There is no alleged hierarky between different knowledges. Different knowledges are the result of different ways we engage with the world (Biesta, 2010). This is very important for the field of mixed methods as it also imposes no hierarchies between different approaches but rather supports the philosophy that different approaches generate different outcomes, different connections between actions and consequences (Biesta, 2010). Tashakkori and Teddlie (1998) suggest that "the paradigm of pragmatism can be employed as the philosophical underpinning for using mixed methods and mixed models" (p. 167). Pragmatists recognize that there are multiple ways of interpreting the world and undertaking research, no single point of view can ever give the whole picture of reality and there might be many different realities (Saunders et al, 2016). Pragmatism as a philosophy allows for the mix and integration of different paradigms and methods. The reason for using a mixed method design was initiation (Saunders et al., 2016), I had initial use of a qualitative method to define the factors relevant for the sequential quantitative research. It helped to formulate the questionnaire items (see 7.2). Further, I used mixed methods for triangulation, in order to combine data to ascertain the findings from one method with the findings of another (Saunders et al., 2016).

6.4   Research design

Lee (1991) suggested a framework to integrate positivistic and interpretive research, in which different research paradigms coexist in order to facilitate an iterative development of integrated understanding. I apply Lee's framework to my pragmatic research philosophy, allowing for the integration and mixing of different methods and paradigms. According to Lee, the first level of understanding is *subjective understanding*, which consists of the common-sense and everyday meaning of reality; the second level of understanding is *interpretive understanding*, which consists of the researcher's systematic interpretation of the first-level meaning; and the third level is *positivist understanding*, which tests the researcher's propositions in a manner similar to the way propositions are tested in the natural science (Lee, 1991). According to Lee's framework (1991) I developed the following research design, a sequential mixed methods design with a qualitative phase informing a dominant quantitative study (qual → QUAN).
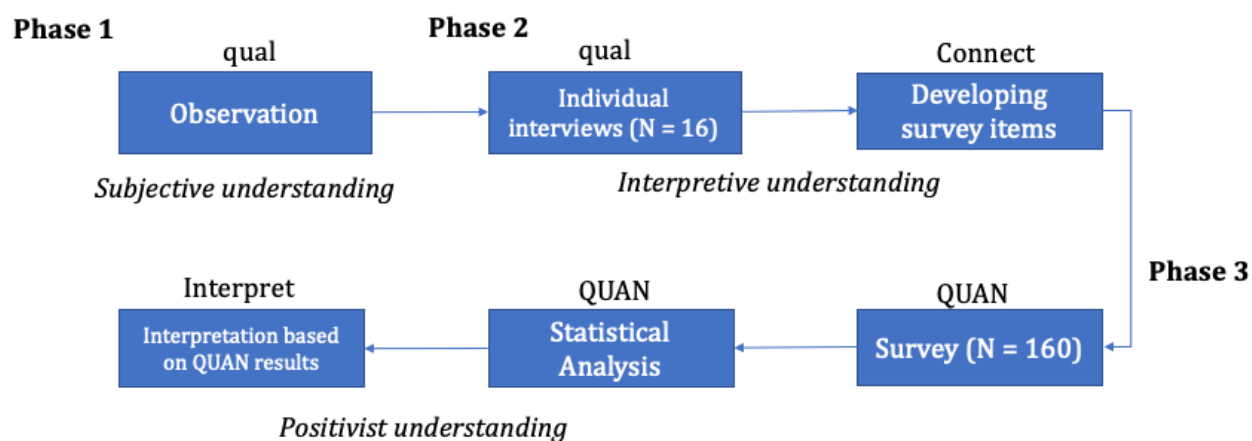
Figure 15: Research design and sequence of phases

Phase 1 is my phase of observation, observing the phenomenon of financial stress and FHA adoption in the United States and my subjective understanding of it. Phase 2 contains semi-structured interviews with N = 16 individuals and connect to Phase 3 through interpretive understanding, as it is basis for the development of the questionnaire items in Phase 3. Phase 3 is the dominant phase of my research, containing a survey with N = 160 respondents, the

statistical analysis of the gathered data and lastly the interpretation of the quantitative results, creating knowledge to answer the research question and suggest further research.

6.4.1   Phase 1: Observation

Phase 1 is about my own subjective understanding and observation of my environment and the problem I chose to investigate. I chose to write about the financial health problems and FHA adoption in the US in particular because I studied at UC Berkeley in the Spring Semester 2020. Having moved to the US I observed the high social inequality, high financial pressure among different parts of the society and also a very broad market of fintech solutions, aiming to resolve financial consumer pain points. An entrepreneurship project regarding consumer credit with the Sutardja Center for Technology and Entrepreneurship further increased my exposure to the financial struggles of the American people. During the customer discovery process of the project I talked to other fellow students who had to handle their student debt or tried to get a credit card but also to people in front of a cash checking store, who were completely unbanked (did not have a bank account at all) or needed a payday loan to pay for their rent. Investigating the financial struggles of US consumers, I encountered the Financial Health Network and its annual Financial Health Pulse survey, investigating the national financial health in the US. I came to realize that only 29% of the consumers in the United States are categorized as financially healthy, while the majority faces problems with their finances. My classes at Haas UC Berkeley and discussion with other fellow students further exposed me to this topic and the different FinTech companies working in this space. Other students showed me the FinTech applications they use in their daily life. Observing the deployment and the acceptance of the financial health applications constituted the first part of my research and is also the origin of my research motivation and research question.

6.4.2   Phase 2. Qualitative Interviewing

6.4.2.1 Method

Phase 1 determined my RQ and financial stress as the first variable to investigate in regard to FHA adoption. For building more insights which factors are inhibiting or promoting the adoption of FHA among consumers I conducted interviews with 16 people in the US.

Conducting interviews first had three advantages. First, qualitative interviews provide a general view of financial health apps as they are perceived by consumers. I needed that picture to know which factors and constructs to incorporate into my study. Second, the qualitative data helped me to design the questionnaire for the subsequent quantitative data collection. Finally, the interviews helped me to avoid my own bias and beliefs, not only asking about the factors I believed to be relevant, but the factors consumers told me about. My semi-structured interview was more a guideline for the conversation, not a rigid protocol. Since the purpose was to explore relevant factors, I asked very open questions. My research in this regard was very flexible and rather spontaneous conversations with other students or people I approached in my environment. Due to this nature of conversation I did not record or code the interviews. As I wanted to have a very casual interview environment, without any pressure on the respondent, I did not record our talk but took notes to safe the information I gathered.

Given the early and exploratory stage of my research this was a flexible and pragmatic approach. Further, this type of open-ended inquiry allowed me to collect responses in a natural and free manner (Kvale, 1996; Rubin and Rubin, 2011). After I explained to the respondents how I define financial health apps and gave relevant examples we discussed their adoption of these applications. The questions which guided my talks were:

- *Do you use any financial health applications?*
- *If yes, why?*
- *If no, why not?*

These questions were not targeted or designed with any specific detail. They simply asked if people use FHA and why or why not, trying to extract factors relevant for the adoption of FHA. The interviews were rather short, about 10 min per person.

6.4.2.2 Data collection

The sample I had for this phase was a quite small and random sample (N = 16). Further my sample was a convenience sample since I talked to people in my near

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surroundings in Berkeley California. I chose to make a random convenient sample since it was suitable to the resources and time given. My research was entirely exploratory, for which I was not going to specifically target any particular sample.

Most people I talked to (10 of 16) were other UC Berkeley students in the age of 19-26. Four respondents were middle aged (age 35-59) and two were above 60 years old. Nine were male, seven were female. I approached them in my environment in Berkeley/Oakland, California. Figure 16 displays the distribution of the sample according to age and gender.

Age distribution

Gender distribution
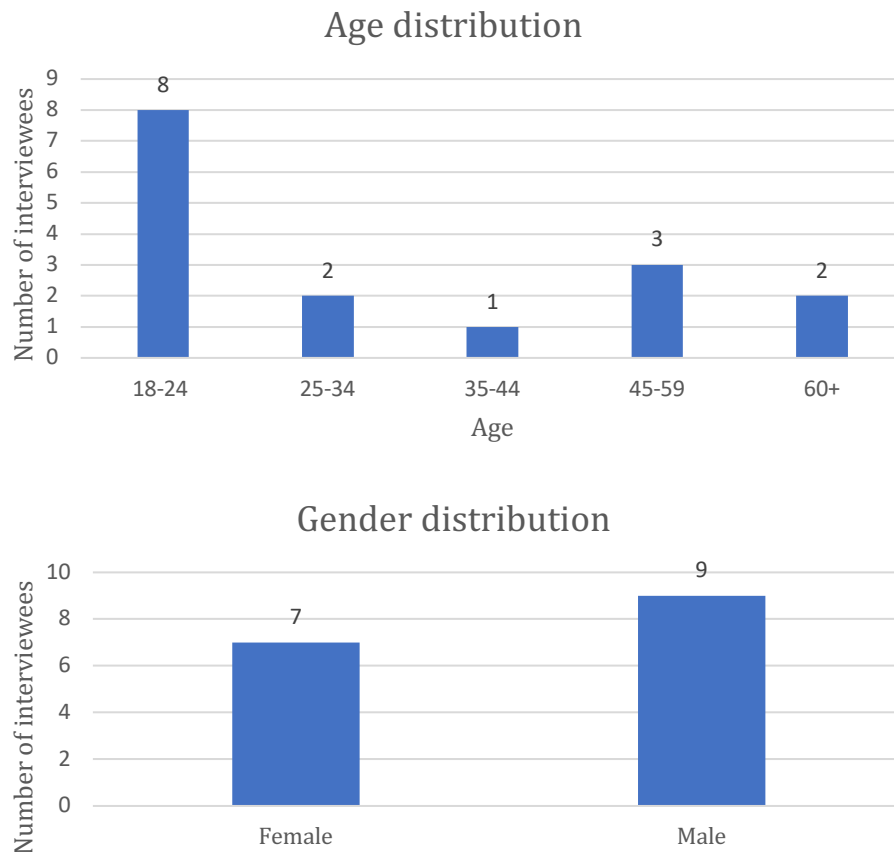
Figure 16: Demographics of the sample in phase 2

6.4.2.3 Analysis technique

Since I did not record the interviews there was no possibility to code the exact response of my interviewees. For each interview I had made notes where I listed key words mentioned when the interviewees talked about their reasons why they had adopted or not adopted FHA. When I identified a relevant factor, I checked back with the respondents whether I had understood them correctly and they would confirm the factor as relevant. After I had

collected the interviews with 16 people, I made an overview of my notes and identified whether several interviewees had mentioned factors which were the same or could be summarized to a common construct. Like this I derived constructs relevant for the adoption of FHA. Since the reliability of the very small and random sample was quite low, I investigated previous literature regarding the adoption of financial technologies to confirm whether similar constructs have been proven to be relevant by other researchers. After having confirmed my identified constructs with other literature I built my model to be tested in Phase 3. The analysis and results of the qualitative Phase 2 can be found in section 7.1.

6.4.3   Phase 3: Quantitative model

6.4.3.1 Method

For developing my model and the survey, I reflected my findings from Phase 1 and Phase 2 as well a previous literature regarding (financial) technology adoption. Comparing my findings with different sources in the literature I connected my insights to create a model and questionnaire (detailed description in section 7.2). To measure the model and to test the hypotheses I had drawn (see section 5) I decided to use Partial Least Square Structured Equation Modeling (PLS-SEM), using the software SmartPLS 3.0.

For a long time, covariance-based structural equation modeling (CB-SEM) was the dominant method for analyzing complex interrelationships between latent constructs and observed variables. Since its introduction by Karl Jöreskog in 1973, CB-SEM has received considerable interest among empirical researchers in all social science disciplines (Hair, Hult, Ringle and Sarstedt, 2016). There were many more articles published in social science that used CB-SEM instead of partial least squares structural equation modeling (PLS-SEM) until about 2010 (Hair et al., 2019). Recently, the number of articles using PLS-SEM has increased significantly relative to CB-SEM (Hair et al., 2016). PLS-SEM has become widely applied in different social science disciplines, including organizational management (Sosik, Kahai, Piovoso, 2009), international management (Richter, Carrion, Roldan, Ringle, 2015), human resource management (Ringle, Sarstedt, Mitchell, Gudergan, 2019), management information systems (Ringle, Sarstedt, Straub, 2012), operations management (Peng and Lai,

2012), marketing management (Hair, Sarstedt, Ringle, 2012b), strategic management (Hair, Sarstedt, Pieper, Ringle, 2012a), hospitality management (Ali, Rasoolimanesh, Sarstedt, Ringle, Ryu, 2018) and supply chain management (Kaufmann and Gaeckler, 2015). PLS path modeling is the predominant estimator for structural equation models in the field of information systems (IS) (Marcoulides and Saunders, 2006). Figure 17 displays the exponential growth of the use of PLS-SEM in a variety of disciplines as it summarizes the studies on PLS-SEM use in the top journals of marketing and strategic management disciplines, as well as MIS Quarterly, which is one of the most prominent journals in management information systems research.
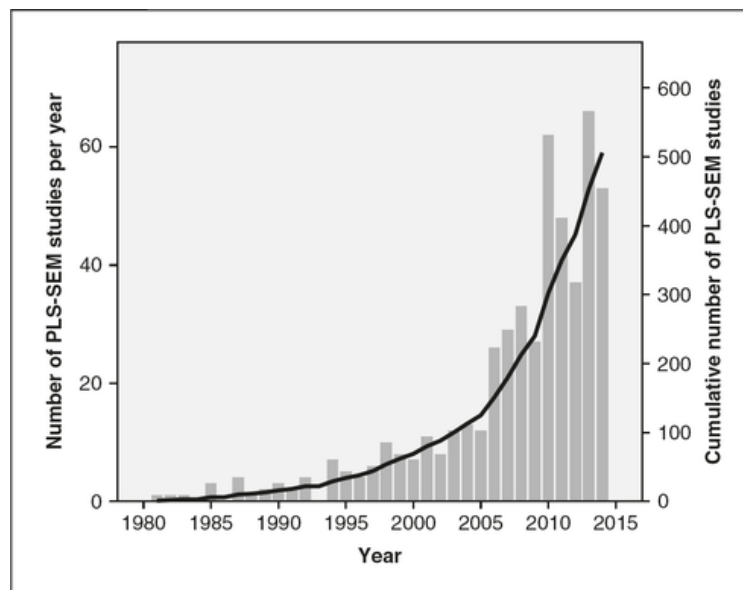
Figure 17: Number of PLS-SEM Studies in Marketing, Strategic Management, and MIS Quarterly
Source: Hair et al, 2016

When researchers choose between PLS-SEM and CB-SEM Hair, Ringle and Sarstedt (2011, p. 144) recommend the following:

- "If the goal is predicting key target constructs or identifying key 'driver' constructs, select PLS-SEM.
- If the goal is theory testing, theory confirmation, or comparison of alternative theories, select CB-SEM.

- If the research is exploratory or an extension of an existing structural theory, select PLS-SEM."

CB-SEM focuses on model fit and explanation, hence CB-SEM aims at theory testing, whether the model fits the data (Hair et al, 2016). It is not useable to compute any latent variable scores and there is no indication whether a certain model predicts an outcome variable. The goal of CB-SEM is theory testing, theory confirmation, or the comparison of alternative theories. It estimates model parameters so that the discrepancy between the estimated and the sample covariance matrices is minimized. Hence the objective is to reproduce the theoretical covariance matrix without focusing on the explained variance (Hair et al, 2016). This is different with PLS – it is a composite based SEM and the PLS algorithm follows a prediction-oriented approach. The estimation procedure for PLS-SEM is an ordinary least squares (OLS) regression-based method rather than the maximum likelihood (ML) estimation procedure for CB-SEM. PLS-SEM uses available data to estimate the path relationships in the model with the objective of minimizing the residual variance of the endogenous variable, it estimates coefficients that maximize the R^2 value of the target endogenous construct (Hair et al., 2016). For this reason, PLS-SEM is regarded a variance-based approach to SEM. Fitting to the argument of Hair et al., (2011), the goal of my model is to predict a key target construct (adoption intention) and to verify the modeled constructs as key driver constructs. Further my model is exploratory, I do not test or try to confirm a given theory. The goal of my model is to predict and to maximally explain the endogenous variable 'Adoption Intention', analyzing whether the proposed constructs in my model can predict adoption intention sufficiently. My focus is not to confirm an established theory but rather to explore a new theory and to maximize its predictive power, hence I chose to employ PLS-SEM and not CB-SEM.

6.4.3.1 Data collection

Before actually collecting data, I made sure to fulfill statistical conditions defining the minimum sample size for my study. For the minimum sample size in a PLS-SEM many researchers have referred to the 10 times rule (Barclay, Higgins and Thompson, 1995) which indicates the sample size should be equal to the larger of

1. 10 times the largest number of formative indicators used to measure a single construct, or

2. 10 times the largest number of structural paths directed at a particular construct in the structural model.

Since I have no formative constructs in my model, I consider the largest number of paths directed at a particular construct (which is in this case 'Adoption Intention'), which is five. According to this rule of thumb my minimum sample size would be 50. Though, PLS-SEM requires researchers to consider the sample size against the background of the model and data characteristics (Hair, Ringle and Sarstedt, 2011). Cohen (1992) provided a more differentiated rule of thumb, provided that the measurement model has an acceptable quality in terms of outer loadings (should be above the common threshold of 0.7).

Maximum Number of Arrows Pointing at a Construct	Significance Level											
	1%				5%				10%			
	Minimum R^2				Minimum R^2				Minimum R^2			
	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75
2	158	75	47	38	110	52	33	26	88	41	26	21
3	176	84	53	42	124	59	38	30	100	48	30	25
4	191	91	58	46	137	65	42	33	111	53	34	27
5	205	98	62	50	147	70	45	36	120	58	37	30
6	217	103	66	53	157	75	48	39	128	62	40	32
7	228	109	69	56	166	80	51	41	136	66	42	35
8	238	114	73	59	174	84	54	44	143	69	45	37
9	247	119	76	62	181	88	57	46	150	73	47	39
10	256	123	79	64	189	91	59	48	156	76	49	41

Table 3: Sample size recommendation in PLS-SEM for a statistical power of 80%

Source: Cohen, 1992

Since the number of independent variables in my structural model is five and I will employ a significance level of 5% the minimum sample size for my model is 70 to achieve a statistical power of 80% and a minimum R^2 of 0.25. R^2 values of 0.2 are considered high in disciplines such as consumer behavior (Hair et al., 2016).

For collecting the data, I had two different strategies. On the one hand I used my own network to reach American consumers and sent out the link to my survey in different social media such as LinkedIn and Facebook. Like this I could reach 39 respondents who all completed the survey. For making sure only Americans would answer the survey I had all respondents indicate their state in the US before taking the questionnaire.

Since my private reach was limited, I also used the audience panel of Survey Monkey. Survey Monkey (SM) is an online tool to create surveys, collect data and get access to a market research panel. I had used Survey Monkey to create my survey, and when I realized that my private network would be not sufficient to gain enough responses, I decided to make use of the audience panel offered by SM. SM guarantees trustworthy results as they make use of volunteer survey participants. In the US, they recruit survey takers from the millions of people who complete SurveyMonkey questionnaires every month. In this way Survey Monkey was extremely useful to reach people in the US. Further, the tool allows for census distribution, hence the responses collected display a distribution of age and gender which is aligned with the overall population of the US. Survey monkey audience offers five types of demographic data: gender, age, household income, type of device used to take the survey, and the US census region of every survey respondent, demographic data I can use to see the effect of factors such as age, gender or income. With Survey Monkey audience I collected additional 121 responses, increasing my total data sample to N =160 which is well above my minimum sample size. Further, since most of the responses was from the SM audience, the sample is fairly distributed along the census regarding age and gender. Since all respondents completed the survey and there was no outlier response (e.g. every question answered with strongly agree) I did not filter any of the 160 responses out. The probability that anyone from my private network was also a respondent from the Survey Monkey Panel is extremely low, therefore there is no risk of a double response. Figure 18 displays the demographic distribution of my sample according to age, gender and income.
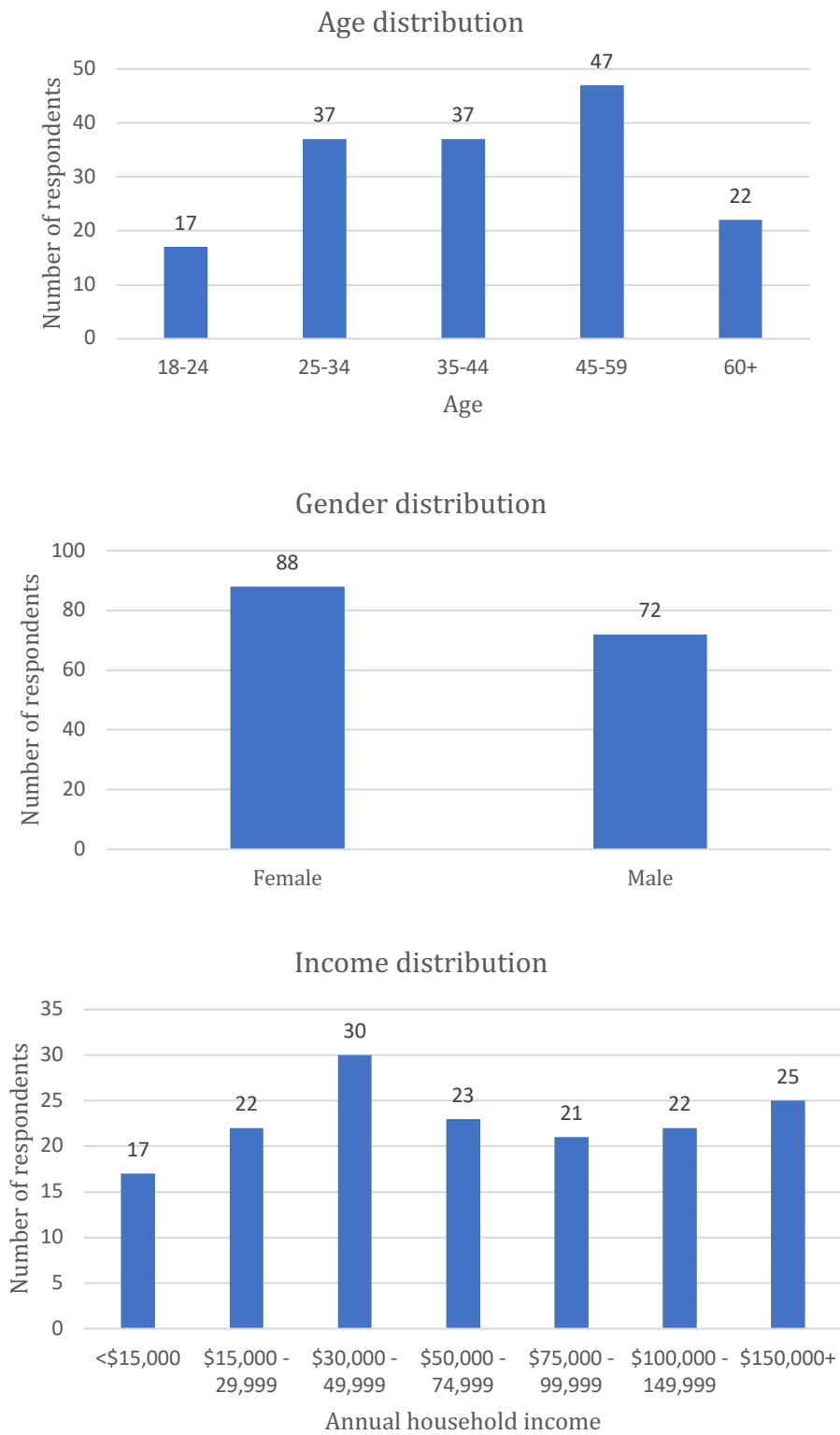
Figure 18: Demographics of the sample in phase 3

6.4.3.2 Analysis technique

To analyze the data collected with the survey I will employ the software SmartPLS 3.0. This software is a popular tool for PLS-SEM and according to Joe Hair "a milestone in latent variable modeling." (Hair, 2014).

On the one hand I will employ the PLS Algorithm in that software to perform a PLS-SEM and on the other hand use bootstrapping to validate the significance of my findings.

For the PLS Algorithm I use the recommended path weighting approach. This weighting scheme provides the highest R^2 value for endogenous latent variables and is generally applicable for all kinds of PLS path model specifications and estimations (Hair et al., 2016). Using standardized data as an input, the algorithm calculates standardized coefficients between -1 and +1 for every relationship in the structural model and the measurement model. Path coefficients close +1 indicate a strong positive relationship (and vice versa for negative values) (Hair et al., 2016). The closer to 0, the weaker the relationship – coefficients close to 0 are usually statistically not significant.

Bootstrapping is a method to determine whether the identified path coefficients are statistically significant. Since PLS-SEM does not assume the data to be normally distributed, parametric significance tests cannot be applied to test the significance of the results. Instead PLS-SEM relies on a nonparametric bootstrap procedure (Davison and Hinkley, 1997; Efron and Tibshirani, 1986). In bootstrapping, a large number of subsamples are drawn from the original sample with replacement. Replacement means that every time an observation is drawn randomly it is returned to the sampling population before the next observation is drawn. As a rule, 5,000 bootstrap samples are recommended (Hair et al., 2016). Using 5,000 bootstrap samples, 5,000 PLS path models are estimated. The estimates of the coefficients form a bootstrap estimation, which can be viewed as an approximation for the sample distribution. Based on this distribution one can determine the standard error and the standard deviation of the estimated coefficients, hence the t values. If the t value is above 1.96 I can reject the null-hypothesis at a confidence level of 95%, is it above 1.65 I can reject the null-hypothesis at a confidence level of 90%. For testing my model, I employ a bootstrapping with 5,000 subsamples and a minimum confidence level of 90%.

6.5 Critical evaluation of the methodology

My research mixes semi-structured interviews (qualitative, interpretive research) with a survey and statistical analysis (quantitative, positivist research). Both parts need to be assessed according to their reliability and validity.

Reliability *is the "extent to which data collection technique or techniques will yield consistent findings, similar observations would be made, or conclusions reached by other researchers or there is transparency in how sense was made from raw data"* (Saunders et al, 2016).

Validity *is the "extent to which data collection method or methods accurately measure what they were intended to measure"* (Saunders et al., 2016).

6.5.1 Qualitative research (Semi-structured interviews)

6.5.1.1 Reliability:

One issue with reliability in findings derived from semi-structured interviews is that these are not necessarily intended to be repeatable since they reflect the reality at the time they were collected in a situation, which may be subject to change (Saunders et al., 2016). Hence, the findings are bound to the circumstances in which the interviews were conducted. The majority of my respondents were UC Berkeley Students and all respondents were residents in the Berkeley/ Oakland area in California. As I only conducted the interviews once with this group of people I cannot test if responses would have been different in a different environment, at a different time. My sample was a convenience sample since I randomly talked to people I had contact with. Convenience sampling is a form of haphazard sampling and occurs when sample cases are selected without any obvious principles of organization in relation to my research question (Saunders et al., 2016). I selected cases haphazardly only because they were easily available (or most convenient) to obtain, hence my sampling is very prone to bias and many influences were outside my control (Saunders et al., 2016). The sample of 16 people was very small and is biased towards UC Berkeley students in their twenties (10 out of 16). Six more people I interviewed were off campus, four in the age

between 30 and 59 and 2 were above 60 years old. Age, income level, education and other demographic factors are likely external factors influencing the adoption of FHA, though I did not account for these factors due to my very small and random sample. Further, the demographic distribution in the qualitative phase is not aligned with my sample in the quantitative phase. I make no claim that the findings of my qualitative research phase are very reliable or replicable, which is not realistic or feasible with a random convenient sample (Saunders et al., 2016). As I am aware that my findings were prone to bias and not very reliable, I reduced this low level of reliability in my qualitative research by comparing my findings with previous literature investigating the adoption of (financial) technology to verify the factors as relevant to study in this regard. Since all of the constructs could be confirmed with previous literature, I enhanced the degree of reliability. Further I made sure to apply measurement items derived from previous literature regarding (financial) technology adoption (see section 7.2).

6.5.1.2 Validity:

In qualitative research credibility is the parallel criterion to internal validity. Emphasis is placed on ensuring that the representations of the research participants' socially constructed realties actually match what the participants intended (Saunders et al., 2016). During my interviews I tested the identified factors (*awareness, perceived usefulness, mobile skills* and *perceived security risk*) by asking the interviewees if they consider these factors as relevant and if it makes sense to include the factor. Like this I made sure I understood correctly which factors were told to be important. Like Saunders et al. (2016) suggest I checked the data, analysis and interpretations with the participants.

The parallel criterion to external validity is generalizability (or transferability). The findings of my qualitative research are not very generalizable as they are only describing the feedback from 16 people, of who 10 were young students. While I had four middle-aged interviewees and two more senior people my sample did not represent the US population in an objective way. All the interviewees were residents of Berkeley or Oakland, California and I did not further diversify my sample. The identified factors might be very subjective to the people in my sample and I cannot verify how generally applicable these factors would be to

the whole population of the US. Due to the very small sample size and a bias towards students I cannot ensure a large degree of generalizability.

6.5.2 Quantitative research (PLS-SEM)

6.5.2.1 Reliability

Since my model is a reflective measurement model its reliability is assessed by its indicator reliability and internal consistency (Hair et al., 2016). Reflective indicators constitute a representative set of all possible items within the conceptual domain of a construct (Diamantopoulos and Winklhofer, 2001). As a result, reflective items are highly correlated, interchangeable and capable of being left out without changing the meaning of the construct (Hair, Sarstedt, Hopkins, Kuppelwieser, 2014). The reflective indicators are linked to a construct through loadings, which are the bivariate correlations between the indicator and the construct. Indicator reliability is shown if the outer loadings of construct are high, meaning that the associated indicators have much in common, which is captured by the construct (Hair et al., 2016). While all outer loadings should be significant a common rule of thumb is that the outer loadings should be 0.708 or higher. The square of an indicator's outer loading represents how much of the variation in an item is explained by the construct and is described as the variance extracted from the item (Hair et al., 2016). The latent construct should explain a substantial part of each indicator's variance, usually at least 50%. Since 0.708^2 equals 0.5 outer loadings should be at least 0.708. As shown in section 7.3.3, my model fulfills these conditions for indicator reliability.

Internal consistency, which involves the correlation of indicators of one construct with each other, can be measured by composite reliability (CR) when conducting a PLS-SEM (Hair et al., 2016). While internal consistency was traditionally assessed using Cronbach's α (Cronbach and Meehl, 1955), composite reliability provides a better measure of internal consistency reliability for two reasons (Hair et al., 2014). First, unlike Cronbach's α, composite reliability does not assume that all indicator loadings are equal in the population, which aligns with the working principle of the PLS-SEM algorithm prioritizing the indicators based on their individual reliabilities during model estimation. Second, Cronbach's α tends

to underestimate internal consistency reliability since it is sensitive to the number of items in the scale. By using composite reliability, PLS-SEM is able to accommodate different indicator reliabilities (i.e. differences in the indicator loadings), while also avoiding the underestimation associated with Cronbach's α (Hair et al., 2014 p. 111). Composite reliability varies between 0 and 1, with a higher value indicating higher reliability. Constructs indicate internal consistency if their composite reliability (CR) – the shared variance among the observed measurement items of a latent construct - is greater than the recommended threshold of 0.7 (Nunally and Bernstein, 1994). CR should not exceed 0.9 (and definitely not 0.95) since this value would indicate that all the indicator variables are measuring the same phenomenon and are unlikely to be a valid measure of the construct (Hair et al., 2016).

Overall, my model fulfilled these conditions (see section 7.3.3), hence I can conclude that my model shows a sufficient composite reliability.

6.5.2.2 Validity

The validity of a reflective model is measured by its convergent validity and its discriminant validity (Hair et al., 2016).

Convergent validity is the overlap or correlation between two different indicators that have been used to measure the same construct (Saunders et al., 2016). This instrument indicates whether the indicators modeled to be relevant for a latent construct actually measure that construct. It is assessed by inspecting the values and significance of factor loadings and the average variance extracted (AVEs) (Fornell and Larcker, 1981). This criterion is defined as the grand mean value of the squared loadings of the indicators associated with the construct (i.e. the sum of the squared loadings divided by the number of indicators). Hence, the AVE is equivalent to the communality of a construct (Hair et al., 2016). The AVE of each factor should exceed 0.5 (Hair et al., 2006) to suggest that the factors used are representative of each construct and support convergent validity. As shown in section 7.3.3.1 my model fulfilled this condition and does therefore show convergent validity.

Discriminant validity is the absence of overlap (or correlation) between different factors used to measure theoretically distinct constructs. It is the extent to which a construct is truly distinct from other constructs by empirical standards (Hair et al., 2016). It can be

assessed by using the Fornell and Larcker (1981) criterion, in which the square root of the AVE should exceed the shared correlations between each pair of constructs in order to confirm that the constructs are unique. The logic of this method is based on the idea that a construct shares more variance with its associated indicators than with any other construct (Hair et al., 2016). Another method to assess discriminant validity is by examining the cross loadings of the indicators. An indicator's outer loading should be greater than all of its loadings on other constructs. As I show in section 7.3.3.1, my model fulfills the conditions for discriminant validity.

7 Analysis and results

7.1 Qualitative research results

In the qualitative part of my research I interviewed 16 people. Out of 16 people 7 had adopted at least one financial health app. Apps used were Wally (a budget manager tool), Digit (automated savings tool), Chime (digital banking), Earnin (paycheck advance tool), Acorns (investment tool), and Mint (personal finance app). Based on the questioning of 16 people I came up with the following factors relevant for the adoption of FHA:

- *Perceived usefulness*
    - All interviewees who had adopted a financial health application did so since they found the particular service that app provided useful and it added value for them (e.g. keep track of expenses, an easy way to invest, get a better overview over finances, tool to save money etc.).
    - Four interviewees who did not use any financial health application said they do not have a good reason to use them and would not need them
- *Awareness*
    - Four interviewees who did not use any financial health apps said that they did not know much about these apps and what they do
    - Five interviewees who did not use any financial health apps never really thought about the apps or their usefulness
- *Mobile skills*

- Two interviewees who didn't use any financial health apps said they don't use many apps in general or said that too many apps are too complicated for them (this was mentioned by the two respondents above the age of 60)
- *Perceived Security risk*
  - Three interviewees mentioned data security issues, that it is a problem to trust these apps with sensitive financial data.
- Cost
  - Several people mentioned that some apps or their services cost money, hence people would have to have the willingness to pay for the respective service.

I decided not to use the factor 'Cost' since it is a very specific attribute of each FHA. Some FHA are for free, some charge the user a monthly subscription and others cost the user a certain fee per use / transaction. Since the cost of each app is very specific and depends on the respective business model of each FHA, I decided not to investigate this factor since it is more a question of the willingness to pay for each particular app or service. It is not applicable in a more general context, investigating the adoption of any kind of FHA, which is the purpose of my study.

To verify the other factors, I investigated literature about (financial) technology adoption, to find evidence that these factors have been proven to be relevant in this context:

Perceived usefulness: The first identified factor matches 'perceived usefulness' of the original TAM of Davis (1989). People who adopted FHA installed the app(s) since they needed the provided service and perceived it as useful for them. It also aligns with Ryu (2018) who identified 'perceived benefit' as a relevant construct.

Awareness: Adoption is not possible without awareness. This is a basic lesson from the theory of innovation diffusion (Rogers, 2010). Rogers describes the process of innovation diffusion in five steps: awareness, interest, evaluation, trial, and adoption. This theory confirms the factor 'awareness' as an important factor for the adoption of FHA as it is necessary step before the adoption. Authors like Polasik and Wisniewski (2009), Sathye

(1999) or Polatoglu and Ekin (2001) confirmed awareness as relevant factors for the adoption of online banking, which can be related to the adoption of FHA.

Mobile skills: This factor aligns with the logic of Lee and Lee (2001) who confirmed that internet skills are positively influencing the likelihood of consumers to adopt internet banking. Parallel to this, experience with the use of mobile applications can be modeled as a relevant factor for the adoption of mobile financial applications and FHA in particular.

Perceived security risk: This factor fits to the factor of 'security risk' identified by Ryu (2018), concerning the risk of data security and information abuse. Measuring this factor, I will adapt the measurement items from Ryu (2018) who confirmed 'security risk' as one of the most important risk factors relevant for the adoption of FinTech.

Having verified the identified factors with related literature, I can use my insights from Phase 1, Phase 2 and the literature review to build a model for the quantitative analysis of FHA adoption, which is the result of my qualitative research.

7.2   Model construction and survey design

In the following I describe the different constructs and items which build my theoretical model (depicted in section 5) which I will later empirically test through a PLS-SEM.

Construct 1: Awareness

Awareness-knowledge the first step for the adoption process of an innovation (Rogers, 2010). It represents the knowledge of the innovation's existence. This type of knowledge can motivate the individual to learn more about the innovation and, eventually, to adopt it (Sahin, 2006).

To measure the construct 'awareness' I make use of the following measure items, to be rated with a 5-point Likert scale (strongly disagree to strongly agree).

AW1: I have heard of many financial health apps

AW2: I have been exposed to lots of advertisement for financial health apps

AW 1 represents awareness-knowledge (Rogers, 2010). AW2 is derived from Polasik and Wisniewski (2009) who identified marketing exposure as a relevant factor for awareness in their study of the adoption of internet banking.

Construct 2: Perceived usefulness

With the Technology Acceptance Model as a underlying theory to my model I will use the factor 'perceived usefulness' as it has been proven to be relevant in many different research papers (Davis, 1989; Ryu, 2018, Hu et al., 2019). To measure 'perceived usefulness' I make use of three measure items each to be rated with a 5-point Likert scale (strongly disagree to strongly agree).

PU 1: Financial health applications could help me to be financially resilient and stable

PU 2: Financial health applications could help me to have better financial opportunities

PU 3: Overall, I think financial health applications are useful for me

Item 3 is adapted from Hu et al (2019) while Item 1 and 2 are derived from the definition of Financial Health in this paper, as a situation when a person's daily financial systems allow them to be a) financially resilient and b) pursue opportunities over time (see 2.1). In this sense the items 1 and 2 measure how useful a respondent perceives FHA to be able to enhance their financial health.

Construct 3: Mobile skills

The construct 'mobile skills' represents the respondents' skills in using their mobile phones. Since Lee and Lee (2001) proved that relevant online skills are positively influencing the adoption of online banking I draw the analogy for mobile skills being relevant for the adoption of mobile financial health apps. Further this skill perspective aligns with 'perceived ease of use' in the original TAM, as previous skills and experience with mobile applications

should enhance the perceived ease of use. Hence I model 'Mobile Skills' as a proxy for perceived ease of use.

The construct is measured by the following items, to be rated with a 5-point Likert scale (strongly disagree to strongly agree).

> MS1: I use my smartphone all the time and use many different apps in many aspects of my life

> MS2: I like to shop with mobile applications, and I have no problems to make a transaction using my smartphone

MS1 is derived from my subjective understanding in Phase 2 were 'Mobile skills' was identified. This item represents the overall usage of a smartphone and mobile applications, which I theorize to be relevant for the FHA adoption. Further, this factor can be aligned with the so called "how-to-knowledge" which is also part of the innovation diffusion theory of Rogers (2010). How-to-knowledge contains information about how to use an innovation correctly (Sahin, 2006) and reasons that an individual should have a sufficient level of how-to-knowledge to increase the adoption chance of an innovation. Hence the item measures how mobile tech savvy a person is and knows how to use mobile applications in general.

MS2 is derived from Lee and Lee (2001) and Polasik and Wisniewski (2009) who confirmed that relevant skills, prior internet purchase behavior is positively related to consumers' likelihood of adopting internet banking. The rationale here is that consumers with experience purchasing though the internet are more likely to feel comfortable about online financial transactions, and therefore more likely to adopt internet banking. Parallelly, I make the argument that consumers with mobile purchase experience are also more likely to feel comfortable with mobile financial transactions and are therefore more likely to adopt mobile finance applications, including FHA.

Construct 4: Perceived security risk

While mentioned by several interviewees, 'perceived security risk' was confirmed as one of the most important risk factors influencing the adoption of FinTech (Ryu, 2018). To measure this construct, I apply the measure items used by Ryu (2018), also to be rated with a 5-point Likert scale (strongly disagree to strongly agree).

> PSR1: I worry about the abuse of my financial information (e.g. transaction and private information) if I use Financial Health Apps.

> PSR2. My financial information is not secure if I use Financial Health Apps.

> PSR3. I worry that someone can access my financial information if I use Financial Health Apps.

Construct 5: Financial Stress

To answer my research question, I will measure the Financial Health Score (FHS) of each respondent. The lower the FHS the higher the financial stress, since I define financial stress as the opposite of financial health. To measure this variable, I will use the questionnaire of the Financial Health Pulse, making my data comparable to the nation-wide data gathered by the Financial Health Network in 2018 and 2019. It includes the dimensions *spending, saving, borrowing* and *planning* asking the following questions:

(1) Spending
  a. Whether the respondent spends more than his or her income
  b. Whether the respondent can pay his or her bills on time
(2) Saving
  a. How long a respondent's current savings would last without income
  b. How confident the respondent is that he or she is to be able to meet long-term savings goals
(3) Borrowing
  a. How manageable the respondent perceive his or her debt

b. How the respondent would rate his or her credit score

(4) Planning

    a. How confident the respondent is that his or her insurance will help sufficiently in a case of emergency

    b. Whether the respondent plans financially ahead

All of these eight questions are given by the Financial Health Pulse of the Financial Health Network. Each of these items (except 3a), 3b) and 4a)) have five answer possibilities. Question 3a) has four answer possibilities, 3b) and 4a) have six. Each answer possibility gives the respondent between 0 and 100 points, the average from all the questions determine the overall Financial Health Score (FHS). The full questionnaire including the assigned score values can be found in the Appendix (Appendix 2).

To measure Financial Stress (which I define as the opposite of Financial Health) I take the average Financial Health Score of each respondent and deduct it from the maximum value of 100. For instance, a person with perfect Financial Health (FHS = 100) would have a score of 0 for Financial Stress (100-100=0), whereas a person with a low FHS (e.g. FHS = 16) would have a high level of Financial Stress (score = 100 – 16 = 84).

Dependent variable: 'FHA adoption intention'

'FHA adoption intention' is the dependent variable in my model. Based on other literature investigating the adoption of FinTech or mobile applications (Ryu, 2018; Gao, Krogstie and Siau, 2011; Moorthy, K., Suet Ling, Weng Fatt, Mun Yee, Ket Yin, Sin Yee and Kok Wei, 2017), I derived three factors that will measure the variable. 'FHA adoption intention' is measured by the following statements to be rated with a 5-point Likert scale (strongly disagree to strongly agree).

    1) I intend to use financial health apps in the future
    2) I want to learn more about financial health apps
    3) I would recommend financial health apps to my friends and family

<u>Actual Use</u>

Lastly, my questionnaire will ask the respondents if they use any kind of FHA at the moment. This item will be simply answered with 'Yes' or 'No', if 'Yes' respondents are encouraged to name which FHA they use. This variable will be binary and have a score of 1 if the respondent uses an FHA and 0 if not.

Table 4 summarizes the outcome of my qualitative research creating the constructs and measure items for my quantitative model and the survey in Phase 3.

Table 4: Constructs and items overview

Construct / Variable	Indicator	Reference
Awareness	AW1	Rogers (2010)
	AW2	Polasik and Wisniewski (2009)
Perceived usefulness	PU1	Financial Health Network (2018)
	PU2	Financial Health Network (2018)
	PU3	Hu et al. (2019)
Mobile skills	MS1	Rogers (2010)
	MS2	Lee and Lee (2001) /Polasik and Wisniewski (2009)
Perceived security risk	PSR1	Ryu (2018)
	PSR2	Ryu (2018)
	PSR3	Ryu (2018)
Adoption Intention	AI1	Moorthy et al. (2017) / Gao et al. (2011)
	AI2	Moorthy et al. (2017)
	AI3	Moorthy et al. (2017)
Financial Stress	FinStress = 100 - Financial Health Score	Financial Health Network (2019)
Actual Use	Use (Yes/No)	

The full survey with all detailed questions and answer possibilities can be found in the Appendix (Appendix 1).

7.3   Quantitative research results

Having collected data from N=160 respondents I could derive the following insights:

7.3.1   Financial Health

The overall Financial Health Score of my sample is 66 – this is slightly above the national average measured by the Financial Health Pulse in 2019, where the total average was 64 (see figure 19).
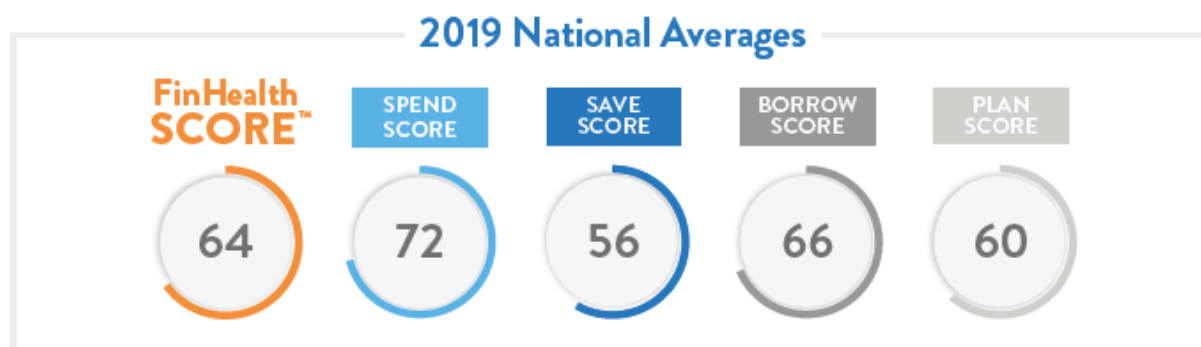
Figure 19: Financial Health Scores (National Averages 2019)

Source: Financial Health Pulse 2019 (Brockland et al., 2019)

For my sample the average Spend Score was 75, Save Score 60, Borrow Score 69 and the Plan Score 61 (see figure 20).
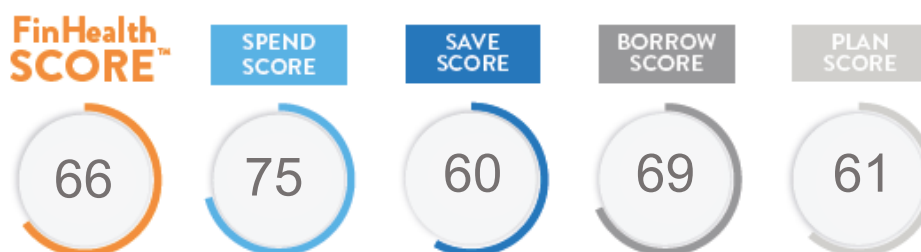
Figure 20: Financial Health Scores averages (Research sample)

My sample of 160 people shows a slightly higher overall financial health compared to the Financial Health Pulse, which questioned more than 5000 people. Though the values are aligned according to the mix of the financial health (sub scores) and are indeed comparable

to the national averages from 2019. Hence, I can conclude that my sample is also representative for the US population.

In my sample of 160 people, 32% were financially healthy (FHS above 80), 51% were financially coping (FHS between 40 and 80) and 16% were financially vulnerable (FHS below 40).

Figure 21: Financial Health Status (Research Sample)

Again, this picture of financial health inside my sample is slightly higher but comparable to the national averages from 2019 (17% vulnerable, 54% coping and 29% healthy).

Comparing gender, the following scores appear:

Gender	Total	Spend	Save	Borrow	Plan
Female	64	75	57	67	58
Male	69	76	64	72	64

Table 5: Financial Health Scores according to gender

According to my data, male respondents show a better financial health in each sub-category as well as in the total Financial Health Score. This aligns again with the national data of the Financial Health Pulse (2019) who found women to be less financially health than men.

Accounting for age the following average scores arose from my sample:

#	Age	TOTAL	SPEND	SAVE	BORROW	PLAN
1	18-24	70	82	67	66	65
2	25-34	63	68	58	68	59
3	35-44	66	76	61	67	69
4	45-59	61	74	49	66	55
5	60+	81	87	80	84	75

Table 6: Financial Health Scores according to Age

Accounting for income the following average scores arose from my sample:

#	Income	TOTAL	SPEND	SAVE	BORROW	PLAN
1	Below $15,000	58	62	46	67	55
2	$15,000-29,999	51	61	36	56	49
3	$30,000-$49,999	57	74	47	61	46
4	$50,000-74,999	72	84	71	69	66
5	$75,000-99,999	63	71	57	65	58
6	$100,000-149,999	76	80	73	82	69
7	$150,000+	86	91	89	84	82

Table 7: Financial Health Scores according to Income

My findings can be compared to the national averages from the Financial Health Pulse (2019):

Average 2019 FinHealth Scores™ and Sub-Scores

		FINHEALTH SCORE™	SPEND SCORE	SAVE SCORE	BORROW SCORE	PLAN SCORE
Age	18-25	60	72	52	58	56
	26-35	60	68	51	61	58
	36-49	60	69	51	61	58
	50-64	64	74	56	68	59
	65 and over	75	79	71	79	69
Household Income	Less than $30,000	51	63	43	52	46
	$30,000 - $59,999	60	69	51	62	56
	$60,000 - $99,999	69	76	62	73	66
	$100,000 or more	77	83	72	79	76

Table 8: Financial Health Scores – National Averages

Source: Financial Health Pulse 2019 (Brockland et al., 2019)

While the national averages from 2019 (see table 8) showed an increase in financial health with higher income and a high age, my sample deviates from this trend. Since the Financial Health Pulse has not the same age and income categories as my data it is not directly comparable. Interestingly, my sample showed that the lowest income group and the youngest age group show higher financial health than the groups with a middle income or older age. The lowest financial health was detected in the age group of 45-59 years old and the income group of $15,000 – $29,999. Like the Financial Health Pulse my data confirmed the highest income and the oldest age group as the financially healthiest.

Combining the demographic factors of age and income the following pictures arises:
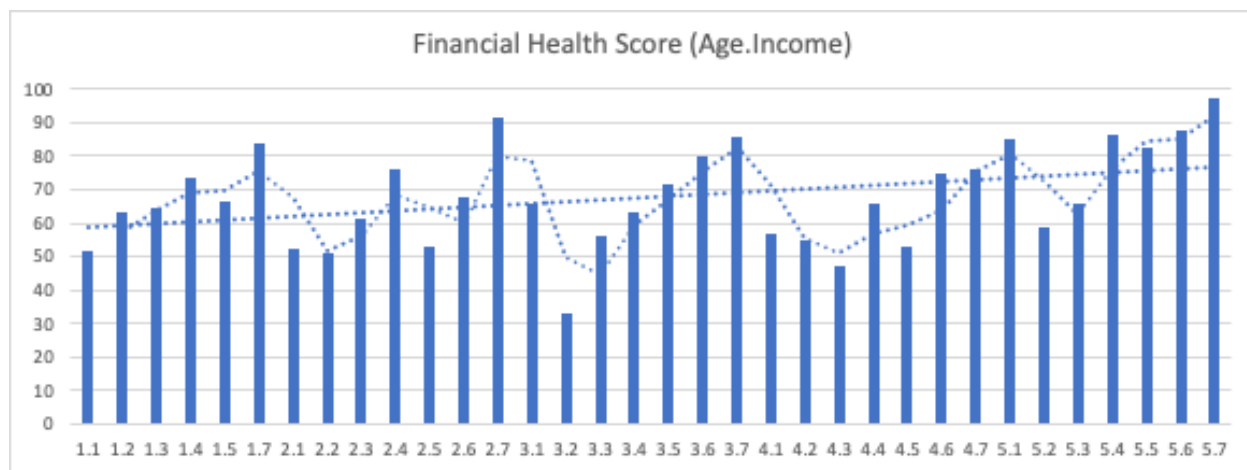
Figure 22: Financial Health Score per Age and Income

Figure 22 describes the FHS of each age/income group. There are five age categories and seven income levels which in combination result in 35 categories from 1.1 to 5.7. For example, 1.1 is the group with the youngest age (18-24) and the lowest income (below $15,000) and 3.6 is the group with the age 35-44 years and the annual income of $100,000-149,999. 1.6 is missing since no respondent was in age category 1 (18-24) and income level 6 ($100,000-149,000). The lowest financial health score was detected in the group 3.2, people in the age group of 35-44 and the income of $15,000-29,999. This group of people scored on average 33 which is a status of financial vulnerability. Group 5.7 scored highest (age 60 + and income $150,000+) with an average of 98, meaning this group is on average

almost perfectly financially healthy. Generally, I can confirm the trend of higher financial health with increased age and increased income. An important finding is though, that people with extremely low income (below $15,000) show a higher financial health than people with higher incomes ($15,000-49,999). This is true for every age group except the youngest group (age 18-24). Age group 4 (45-59) had the lowest and age group 1 (18-24) had the second highest financial health which is also a deviation from the trend.

7.3.2 Adoption of FHA

Regarding the question whether the respondent currently uses any FHA the following results were collected:
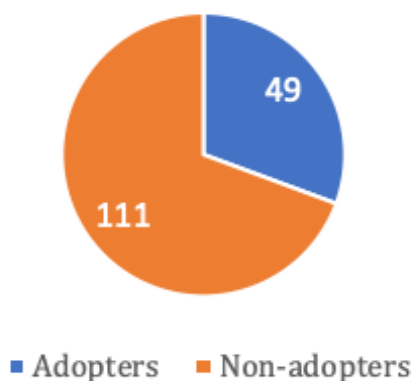
Figure 23: Adopter and Non-adopters of FHA

Out of 160 respondents, 49 indicated that they use one or several FHA, 111 did not use any FHA. The respondents who use FHA used the following applications:

Table 9: FHA apps used

App	Count
Acorns	8
Charlie	1
Chime	1
Credit Karma	14

Fidelity	1
Digit	2
Every dollar	4
HoneyDue	1
Jassby	1
Mint	12
Personal Capital	3
Quicken	1
Robinhood	6
Stash	1
Wally	1
YNAD	1

Most users only used 1 app (40 out 49), while some respondents used 2,3 or even 4 apps at a time. Generally, I found that about 30% of my sample was an FHA-adopter, with most people using one app. The most used app was Credit Karma (14 users), followed by Mint (12 users). Next most used were the investment apps Acorns (8 users) and Robinhood (6 users). The average financial health of FHA-Adopters was 66 – therefore they are on par with the average of the overall group. 30 were male, 19 were female.

7.3.3 PLS-SEM analysis

Running the PLS-Algorithm with SmartPLS 3.0 the following loadings and path coefficients appear:
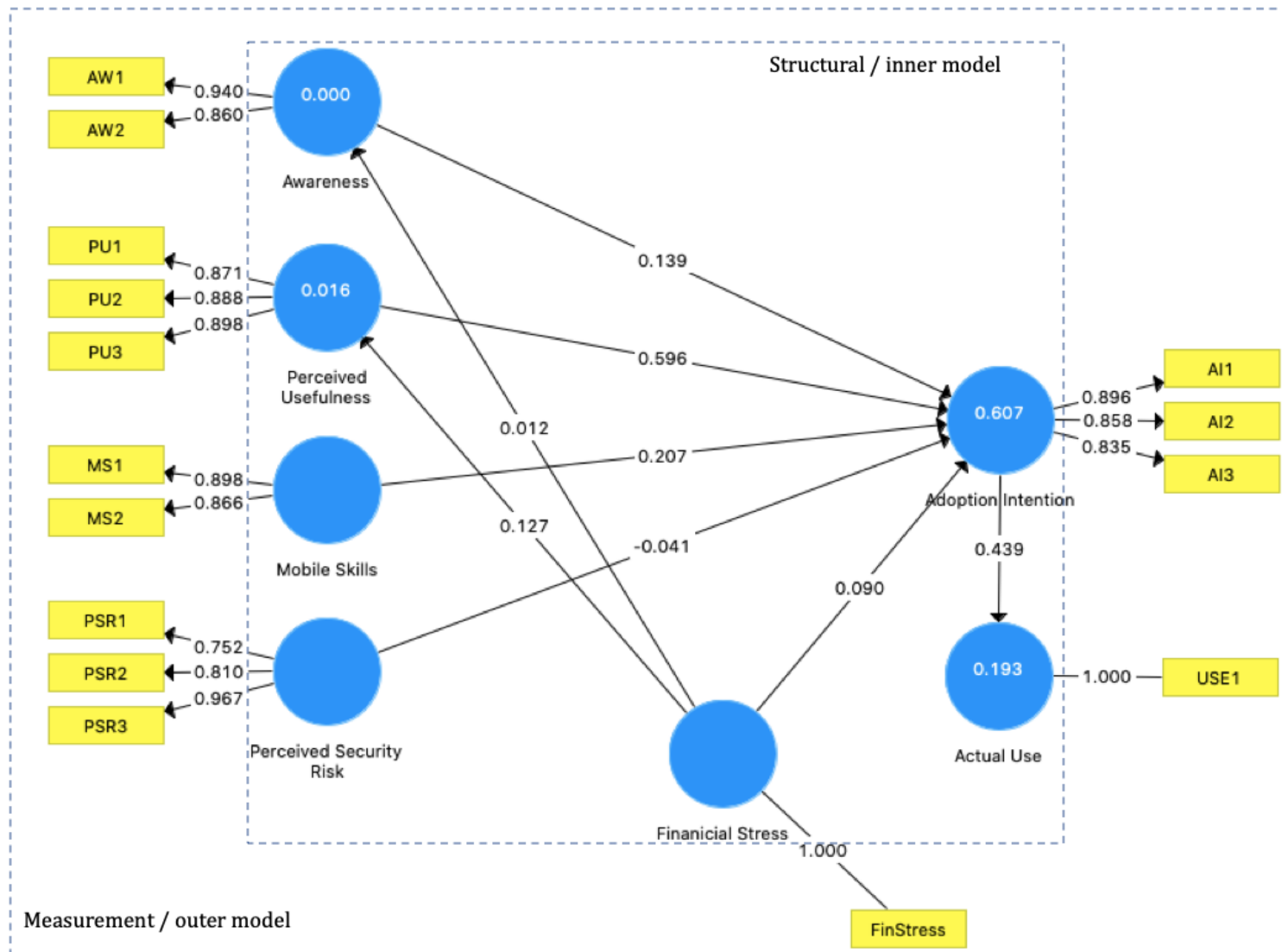
Figure 24: PLS-SEM algorithm results (SmartPLS 3.0)

7.3.3.1 Measurement / outer model

As depicted in Table 10 all outer loadings show a higher value than 0.708, hence my measurement model has a sufficient quality (Cohen, 1992). The bootstrapping showed the following results for the outer loadings of the measurement model:

	Original Sample (O)	Sample Mean (M)	STDEV	T Statistics	P Values
AI1 <- AI	0.896***	0.896	0.02	44.945	0
AI2 <- AI	0.858***	0.857	0.023	36.78	0
AI3 <- A)	0.835***	0.834	0.035	24.112	0
AW1 <- AW	0.94***	0.94	0.019	49.602	0
AW2 <- AW	0.86***	0.854	0.055	15.773	0
FinStress <- FS	1	1	0		
MS1 <- MS	0.898***	0.9	0.026	34.438	0
MS2 <- MS	0.866***	0.86	0.051	17.098	0
PSR1 <- PSR	0.752***	0.711	0.264	2.849	0.004
PSR2 <- PSR	0.81***	0.754	0.246	3.294	0.001
PSR3 <- PSR	0.967***	0.795	0.301	3.213	0.001
PU1 <- PU	0.871***	0.87	0.038	22.86	0
PU2 <- PU	0.888***	0.887	0.027	32.9	0
PU3 <- PU	0.898***	0.897	0.022	41.675	0
USE1 <- AU	1	1	0		

Table 10: Bootstrapping results of the measurement model

The original sample column describes the outer loadings of my original sample (N=160). All outer loadings were significant on a 99% confidence level.

Construct reliability and validity

Assessing for construct reliability and validity my model shows the following results:

	Composite Reliability	Average Variance Extracted (AVE)
Actual Use	1	1
Adoption Intention	0.898	0.745
Awareness	0.896	0.811
Finanicial Stress	1	1
Mobile Skills	0.876	0.779
Perceived Security Risk	0.883	0.719
Perceived Usefulness	0.916	0.784

Table 11: Composite Reliability and AVE

Since 'Actual Use' and 'Financial Stress' were single item measures the CR and AVE were naturally equal to 1. Looking at the CR, all constructs exceed 0.7. Perceived Usefulness exceeds 0.9 which makes it slightly critical. Having a CR above 0.9 could mean that the measurement indicators were redundant, measuring all the same phenomenon and therefore being not reliable indicators for the construct (Nunally and Bernstein, 1994). It could be that the questions for measuring perceived usefulness were too similar. Overall though I can confirm that my model shows a high degree of reliability. Looking at the AVE all values exceed 0.5 and therefore indicate convergent validity.

The Fornell-Larcker Criterion shows the following:

Fornell-Larcker Criterion	AU	AI	AW	FS	MS	PSR	PU
Actual Use	1						
Adoption Intention	0.439	0.863					
Awareness	0.268	0.38	0.901				
Finanicial Stress	-0.044	0.185	0.012	1			
Mobile Skills	0.172	0.454	0.095	0.096	0.883		
Perceived Security Risk	-0.182	-0.113	0.035	0.058	-0.192	0.848	
Perceived Usefulness	0.279	0.737	0.372	0.127	0.366	-0.071	0.885

Table 12: Fornell-Larcker Criterion

I can confirm that the square root of the AVE exceeds the shared correlations between each pair of constructs, hence the constructs are unique. The constructs share more variance with their associated indicators than with any other construct (Hair et al., 2016). The square root of the AVE of 'Actual Use' and 'Financial Stress' was naturally 1, since they are single item constructs.

The cross loadings of the indicators show the following picture:

Cross loadings	AU	AI	AW	FS	MS	PSR	PU
AI1	0.434	0.896	0.353	0.109	0.433	-0.104	0.662
AI2	0.306	0.858	0.234	0.26	0.462	-0.054	0.607
AI3	0.391	0.835	0.392	0.118	0.283	-0.133	0.638
AW1	0.246	0.398	0.94	0.018	0.152	0.024	0.391
AW2	0.24	0.266	0.86	0.001	-0.011	0.044	0.258
FinStress	-0.044	0.185	0.012	1	0.096	0.058	0.127
MS1	0.18	0.425	0.112	0.1	0.898	-0.11	0.353
MS2	0.12	0.374	0.052	0.068	0.866	-0.236	0.29
PSR1	-0.11	-0.033	0.041	0.082	-0.012	0.752	0.055
PSR2	-0.091	-0.032	0.064	0.07	-0.085	0.81	0.029
PSR3	-0.196	-0.136	0.022	0.041	-0.234	0.967	-0.116
PU1	0.227	0.608	0.294	0.112	0.355	-0.102	0.871
PU2	0.187	0.626	0.261	0.059	0.277	-0.033	0.888
PU3	0.315	0.715	0.419	0.16	0.338	-0.055	0.898
USE1	1	0.439	0.268	-0.044	0.172	-0.182	0.279

Table 13: Cross loadings

Also, the cross loadings show that all indicators' loadings on the associated construct are greater than all of its loadings on other constructs. Both the Fornell-Larcker -Criterion as well as the cross loadings confirm discriminant validity for my model.

Overall, the reliability and validity of my reflective measurement model can be summarized like the following:

Latent Variable	Indicators	Loadings	Indicator Reliability	CR	AVE	Discriminant Validity?
Actual Use	USE1	1	1	1	1	-
Adoption Intention	AI1	0.896	0.803	0.898	0.745	Yes
	AI2	0.858	0.736			
	AI3	0.835	0.697			
Awareness	AW1	0.940	0.884	0.896	0.811	Yes
	AW2	0.860	0.740			
Financial Stress	FinStress	1	1.000	1	1	-
Mobile Skills	MS1	0.898	0.806	0.876	0.779	Yes
	MS2	0.866	0.750			
Perceived Security Risk	PSR1	0.752	0.566	0.883	0.719	Yes
	PSR2	0.810	0.656			
	PSR3	0.967	0.935			
Perceived Usefulness	PU1	0.871	0.759	0.916	0.784	Yes
	PU2	0.888	0.789			
	PU3	0.898	0.806			

Table 14: Summary of model reliability and validity

All outer loadings exceed 0.708, hence my measurement model shows acceptable quality (Cohen,1992). The indicator reliability (measured as the square of the loading) exceeds 0.5 for every indicator (more than 50% of the indicators variance is explained by the latent construct). The CR exceeds 0.7 for each construct, indicating reliability, and the AVE exceeds 0.5, indicating convergent validity for each construct. Further the Fornell-Larcker-Criterion and the cross loadings of all indicators confirmed discriminant validity for each construct. The constructs 'Actual Use' and 'Financial Stress' did not influence the reliability and validity of my measurement model since they were single-item measures. I can conclude that my measurement model fulfills the conditions of composite reliability, indicator reliability, convergent validity as well as discriminant validity.

7.3.3.2 Structural / inner model

Having confirmed sufficient reliability and validity of my model I can start assessing the results of the coefficients between the latent variables, interpreting the outcome of my PLS-SEM to test the previously defined hypotheses.

Path coefficients

The PLS-algorithm and the bootstrapping computed the following results for the structural model:

	Path coefficient	t-statistics	P Values
AI -> AU	0.439***	8.231	0
AW -> AI	0.139**	2.423	0.015
FS -> AI	0.09*	1.74	0.082
FS -> AW	0.012	0.153	0.879
FS -> PU	0.127	1.58	0.114
MS -> AI	0.207***	2.93	0.003
PSR -> AI	-0.041	0.733	0.464
PU -> AI	0.596***	8.764	0

*** p < 0.01 ** p<0.05, *p<0.1

Table 15: Structural model path coefficients

According to the bootstrap, the influence of 'Financial Stress' on 'Awareness' as well as the influence on 'Perceived Usefulness' are statistically not significant. Also, the path coefficient

from 'Perceived Security Risk' on 'Adoption Intention' shows a t value of only 0.733 and is not significant. The path coefficient between 'Financial Stress' on 'Adoption Intention' is only significant on the 10% confidence level since the t-statistics exceeds 1.65 but not 1.96. Since the coefficient is very close to zero, I can conclude that there is no significant relationship between 'Financial Stress' and 'Adoption Intention'. The path coefficient from 'Awareness' to 'Adoption Intention' was significant on the 95% level, the path coefficients from 'Perceived Usefulness' to Adoption Intention', from 'Mobile Skills' to 'Adoption Intention' and from 'Adoption Intention' to 'Actual Use' were significant on the 99% level.

<u>Collinearity</u>

Since the endogenous variable 'Adoption Intention' is a formative construct (arrows are pointing towards the construct), the inner model is a formative measurement model, where the other latent constructs are formative indicators for 'Adoption Intention'. While reflective indicators are interchangeable, high correlations are not expected between indicators in a formative measurement model (Hair et al., 2016). High correlations between two formative indicators (collinearity) can be problematic, methodologically and interpretationally (Hair et al., 2016). High levels of collinearity affect the results of analyses in two ways. On the one hand, collinearity boosts the standard errors, on the other hand collinearity can result in the weights (loadings) being incorrectly estimated (Hair et al., 2016). To assess collinearity, researchers have to calculate the tolerance (TOL) and the variance inflation factor (VIF), which is 1/TOL. The square root of the VIF is the degree to which the standard error has been increased due to the presence of collinearity. VIF values of 5 or higher indicate a problem, these levels indicate that 80% or more of an indicator's variance is accounted for by the remaining formative indicators associated with the same construct (Hair et al., 2016). The formative measurement model of 'Adoption Intention' showed the following VIF-values.

VIF	Adoption Intention
Awareness	1.169
Finanicial Stress	1.027
Mobile Skills	1.199
Perceived Security Risk	1.049
Perceived Usefulness	1.347

Table 16: Variance Inflation Factor

Hence formative indicators of 'Adoption intention' do not show a too high level of collinearity and there is no issue with the model.

<u>Hypotheses tests</u>

With an adequate measurement model and a suitably low level of collinearity, all proposed hypotheses were tested with the PLS.

Based on the results of the PLS-SEM I can conclude on my hypotheses:

H1: Awareness has a positive influence on adoption intention

'Awareness' has a significant positive influence on 'Adoption Intention' (β = 0.139, $p < 0.05$). Thus, H1 was supported.

H2: Perceived usefulness has a positive influence on adoption intention

'Perceived usefulness' has a significant positive influence on 'Adoption Intention' (β = 0.596, $p < 0.01$). Thus, H2 was supported.

H3: Mobile skills have a positive influence on adoption intention

'Mobile Skills' has a significant positive influence on 'Adoption Intention' (β = 0.207, $p < 0.01$). Thus, H3 was supported.

H4: Perceived security risk has a negative influence on adoption intention

'Perceived Security Risk' had a slightly negative, but statistically insignificant influence on 'Adoption Intention' (β = - 0.041, $p = 0.464$). Thus, H4 was not supported.

H5: Financial stress has a positive influence on awareness

The influence of 'Financial Stress' on 'Awareness' was close to 0 statistically not significant (β = 0.012, $p = 0.879$). Thus, H5 was not supported.

H6: Financial stress has a positive influence on perceived usefulness

'Financial Stress' had a positive influence on 'Perceived Usefulness', though the path coefficient was not sufficiently statistically significant (β = 0.127, p = 0.114). Thus, H6 was not supported.

H7: Financial stress has a positive influence on adoption intention

'Financial stress' had a weak positive influence on 'Adoption intention', which was significant only on a 10% confidence level (β = 0.09, p < 0.1). Thus, H7 is not sufficiently supported.

H8: Adoption intention has a positive influence on actual use.

'Adoption intention' had a positive influence on 'Actual Use', which was significant on a 99% confidence level (β = 0.493, p < 0.01). Thus, H8 is supported.

<u>Predictive power</u>

Overall, the proposed model accounted for 60.7 percent (R^2 = 0.607) of the variance in the FHA Adoption intention. In general, the predictive accuracy of my model to predict 'Adoption Intention' is quite substantial. The R^2 of the actual behavior measure 'Actual Use' is 0.193, which is not very high. The R^2 of 'Awareness' is 0, meaning that 'Financial Stress' does not explain any variance in this variable. The R^2 of 'Perceived Usefulness' is also very low (0.016), which means that 'Financial Stress' does also not explain a meaningful amount of the variance in that variable. Accordingly, the path coefficients from 'Financial Stress' to 'Awareness' and 'Perceived usefulness' were insignificant.

7.3.3.3 Demographical analysis

Before discussing the final outcome of my analysis and the implications on my research question it is of interest to analyze differences according to gender, age and income. To model these categorial moderator effects I divided my original sample (N = 160) into different subsamples according to these demographic factors. Like this I will detect potential heterogeneities, whether certain groups of respondents exhibit significant differences in

their model relationships. Understanding group-specific effects will facilitate to obtain further differentiated findings (Hair et al., 2016).

The first subsamples were divided according to gender. Hence, I had a male sample (N = 72) and a female sample (N = 88). For simplicity reasons, I did not divide into the five age and seven income categories. I also ensured that the divided samples would not become too small. Regarding age I divided the sample in two groups. Group "Gen Z and Millennial" (N=91) which was in the age up until 44 years old, and "Gen X +" (N=69) for the respondents above the age of 45. Regarding income I formed two subsamples: Sample "Low Income" = Income from below $15,000 to $74,999 (N= 92), Sample "High Income" = Income from $75,000 above (N = 68).

In total I created 6 subsamples, with each I ran the PLS Algorithm/Bootstrapping again to detect any differences.

Gender

Differentiating for gender the following results occurred:

Female (N=88)	Path coefficient	T Statistics	P Values
Adoption Intention -> Actual Use	0.403***	5.41	0
Awareness -> Adoption Intention	0.133**	1.831	0.067
Finanicial Stress -> Adoption Intention	0.126*	1.855	0.064
Finanicial Stress -> Awareness	0.004	0.038	0.969
Finanicial Stress -> Perceived Usefulness	0.23**	2.17	0.03
Mobile Skills -> Adoption Intention	0.154	1.594	0.111
Perceived Security Risk -> Adoption Intention	-0.122	1.573	0.116
Perceived Usefulness -> Adoption Intention	0.624***	7.962	0

*** p < 0.01 ** p<0.05, *p<0.1

Table 17: Results female subsample

Male (N=72)	Path coefficent	T Statistics	P Values
Adoption Intention -> Actual Use	0.457***	5.782	0
Awareness -> Adoption Intention	0.167**	2.003	0.045
Finanical Stress -> Adoption Intention	0.069	0.862	0.389
Finanical Stress -> Awareness	0.04	0.344	0.731
Finanical Stress -> Perceived Usefulness	0.006	0.049	0.961
Mobile Skills -> Adoption Intention	0.274***	2.784	0.005
Perceived Security Risk -> Adoption Intention	0.009	0.101	0.92
Perceived Usefulness -> Adoption Intention	0.531***	4.715	0

*** p < 0.01 ** p<0.05, *p<0.1

Table 18: Results male subsample

Looking at gender as a demographic variable, interesting differences appear. For both female and male, there is a significant relationship between 'Adoption Intention' and 'Actual Use'. Like in the full sample, I can confirm a strong positive relationship between the intention and actual behavior. For both female and male, awareness is a relevant factor for 'Adoption Intention', while this relationship was slightly stronger for male respondents (0.167 vs 0.133). 'Perceived Usefulness' had a very strong and significant influence on 'Adoption Intention' for both genders, though this relationship seems to be even more relevant for female respondents (0.624 vs 0.531). Interestingly, only for females there is a significant relationship between 'Financial Stress' and 'Adoption Intention' and between 'Financial Stress' and 'Perceived Usefulness'. While for the males both paths were insignificant, for females 'Financial Stress' is a relevant factor directly for the adoption intention of FHA and indirectly through the perceived usefulness of FHA. While my overall sample data rejected H6 and H7, the female sample supports these hypotheses. Another interesting difference was detected regarding the influence of 'Mobile Skills'. While for the female sample the path was not significant, for the male sample a highly significant path coefficient was detected between 'Mobile Skills' and 'Adoption Intention' (β=0.274, p < 0.01). H4 was supported in the overall sample (β = 0.207, p < 0.01), but there is evidence that this path was supported highly through male respondents.

When both subsamples showed a significant but different path coefficient for a certain path it is important to test whether this difference is actually significant.

Keil, Saarine, Tan, Tuuainen, Wassenaar, Wei (2000) proposed a parametric approach to PLS-SEM multigroup analysis (PLS-MGA). Researchers must calculate a two-independent-samples t test, which requires to specify several parameters:

1. The number of observations of the two groups to be compared ($n^{(1)}$ and $n^{(2)}$)
2. The path coefficients of the two groups ($p^{(1)}$ and $p^{(2)}$)
3. The standard errors of the parameter estimates of both groups ($se(p^{(1)})$ and $se(p^{(2)})$)

These six elements are then used as input to calculate a test statistic whether the difference in the path coefficients is significant. The form of the test statistic depends on whether the variances of the parameter estimates (obtained from bootstrapping) differ significantly (Hair et al, 2016). To check whether this is the case, Levene's test (Sarstedt and Mooi, 2014) is used.

If the standard errors are unequal, the test statistic takes the following form:

$$t = \frac{\left|p^{(1)} - p^{(2)}\right|}{\sqrt{\frac{(n^{(1)} - 1)}{n^{(1)}} \times se(p^{(1)})^2 + \frac{(n^{(2)} - 1)}{n^{(2)^2}} \times se\,(p^{(2)})^2}}$$

If the standard errors are equal, the test statistic is computed as follows:

$$t = \frac{\left|p^{(1)} - p^{(2)}\right|}{\sqrt{\frac{(n^{(1)} - 1)^2}{(n^{(1)} + n^{(2)} - 2)} \times se(p^{(1)})^2 + \frac{(n^{(2)} - 1)}{(n^{(1)} + n^{(2)} - 2)} \times se\,(p^{(2)})^2} \times \sqrt{\frac{1}{n^{(1)}} + \frac{1}{n^{(2)}}}}$$

Comparing the path coefficients between 'Adoption Intention' and 'Actual Use', 'Awareness' and 'Adoption Intention' as well as between 'Perceived usefulness' and 'Adoption Intention' I compute the following results:

	Group 1: Male (n^{(1)}=72)		Group 2: Female n^{(2)}=88		Group 1 vs. Group 2			
Path	$p^{(1)}$	$se(p^{(1)})$	$p^{(2)}$	$se(p^{(2)})$	$\left\vert p^{(1)} - p^{(2)} \right\vert$	T value	Significance level	p Value
AI -> AU	0.457	0.079	0.403	0.074	0.054	0.500	NS	0.618
AW -> AI	0.167	0.083	0.133	0.072	0.034	0.313	NS	0.755
PU -> AI	0.531	0.113	0.624	0.078	0.093	0.682	NS	0.497

Table 19: PLS-MGA (gender)

The differences between female and male for these path coefficients are not significant. Hence the relationships between these constructs do not show a proven difference regarding gender.

Income

Comparing high and low income the following results are computed:

Low income (N=92)	Path coefficient	T Statistics	P Values
Adoption Intention -> Actual Use	0.374***	4.838	0
Awareness -> Adoption Intention	0.145*	1.72	0.086
Finanical Stress -> Adoption Intention	0.129*	1.77	0.077
Finanical Stress -> Awareness	-0.101	0.937	0.349
Finanical Stress -> Perceived Usefulness	0.109	0.922	0.356
Mobile Skills -> Adoption Intention	0.247**	2.423	0.015
Perceived Security Risk -> Adoption Intention	0.035	0.444	0.657
Perceived Usefulness -> Adoption Intention	0.505***	4.67	0

*** p < 0.01 ** p<0.05, *p<0.1

Table 20: Results low income subsample

High income (N=68)	Path coefficient	T Statistics	P Values
Adoption Intention -> Actual Use	0.529***	7.69	0
Awareness -> Adoption Intention	0.182**	2.508	0.012
Finanical Stress -> Adoption Intention	0.048	0.617	0.537
Finanical Stress -> Awareness	0.126	0.943	0.346
Finanical Stress -> Perceived Usefulness	0.157	1.518	0.129
Mobile Skills -> Adoption Intention	0.191	1.599	0.11
Perceived Security Risk -> Adoption Intention	-0.071	0.981	0.327
Perceived Usefulness -> Adoption Intention	0.719***	10.005	0

*** p < 0.01 ** p<0.05, *p<0.1*

Table 21: Results high income subsample

While for high income there was no statistically significant relationship, the low-income group shows a significant relationship between 'Financial Stress' and 'Adoption Intention' (β= 0.120, p < 0.1) as well as between 'Mobile Skills' and 'Adoption Intention' (β= 0.247, p < 0.05). This indicates that H7 and H3 are supported for the low-income group but not for the high-income group.

For both, low and high income, the relationship between 'Adoption Intention' and 'Actual Use', between 'Awareness' and 'Adoption Intention' as well as between 'Perceived Usefulness' and 'Adoption Intention' was proven to be relevant and statistically significant. Thus, H8, H1 and H2 were supported in both groups. Interestingly, all of those paths had a higher coefficient in the high-income group. To test whether these differences were actually significant I employed the PLS-MGA again.

	Group 1: Low-income (n$^{(1)}$=92)		Group 2 : High-income n$^{(2)}$=68		Group 1 vs. Group 2			
	p$^{(1)}$	se(p$^{(1)}$)	p$^{(2)}$	se(p$^{(2)}$)	$\left| p^{(1)} - p^{(2)} \right|$	T value	Significance level	p Value
AI -> AU	0.374	0.077	0.529	0.068	0.155	1.518	NS	0.131
AW-> AI	0.145	0.085	0.182	0.073	0.037	0.332	NS	0.740
PU -> AI	0.505	0.107	0.719	0.073	0.214	1.662	*	0.099

Table 22: PLS-MGA (income)

While the differences of the paths AI->AU and AW->AI were not significant, the difference for the path between 'Perceived Usefulness' and 'Adoption Intention' showed to be significant with a confidence level of 90%. Hence, 'Perceived Usefulness' does indeed show a significantly higher influence on 'Adoption Intention' in the high-income group.

<u>Age</u>

Gen Z and Millenials (N=91)	Path coefficient	T Statistics	P Values
Adoption Intention -> Actual Use	0.433***	5.844	0
Awareness -> Adoption Intention	0.247***	3.068	0.002
Finanical Stress -> Adoption Intention	0.085	1.207	0.228
Finanical Stress -> Awareness	-0.038	0.36	0.719
Finanical Stress -> Perceived Usefulness	-0.04	0.37	0.712
Mobile Skills -> Adoption Intention	0.072	0.665	0.506
Perceived Security Risk -> Adoption Intention	-0.017	0.167	0.867
Perceived Usefulness -> Adoption Intention	0.594***	8.752	0

*** p < 0.01 ** p<0.05, *p<0.1

Table 23: Results subsample "Gen Z and Millennials"

Gen X+ (N=69)	Path coefficient	T Statistics	P Values
Adoption Intention -> Actual Use	0.415***	4.722	0
Awareness -> Adoption Intention	0.047	0.644	0.52
Finanical Stress -> Adoption Intention	0.068	0.922	0.357
Finanical Stress -> Awareness	0.09	0.546	0.585
Finanical Stress -> Perceived Usefulness	0.269**	2.395	0.017
Mobile Skills -> Adoption Intention	0.301***	2.678	0.007
Perceived Security Risk -> Adoption Intention	-0.118	1.435	0.151
Perceived Usefulness -> Adoption Intention	0.575***	4.761	0

*** p < 0.01 ** p<0.05, *p<0.1

Table 24: Results subsample "Gen X+"

Comparing age, I can also derive interesting insights. The group "Gen X+" supports H3 and H6 while the group "Gen Z and Millennials" does not. Hence, I can derive that 'Financial stress' does have a significant positive influence on 'Perceived usefulness' for older respondents but not for younger respondents. Further, 'Mobile Skills' seems to be a relevant factor for 'Adoption Intention' among older respondents, this is not the case for the younger

sample. Therefore, I can derive that the support for H3 in the overall sample was driven from the older-age group. The group "Gen Z and Millennials" does support H1, while the group with the older respondents does not show a significant positive relationship between "Awareness" and "Adoption Intention". I can derive that "Awareness" is a more relevant factor for the younger-age group, and that the support for H1 in the overall sample was driven by younger respondents.

Both age groups supported H8 and H2 while the path coefficients were higher for "Gen Z and Millennials". Whether these differences are significant was tested again using the PLS-MGA.

	Group 1: Gen Z and Mill. ($n^{(1)}$=91)		Group 2 : Gen X+ ($n^{(2)}$=69)		Group 1 vs. Group 2			
	$p^{(1)}$	se($p^{(1)}$)	$p^{(2)}$	se($p^{(2)}$)	$\left\|p^{(1)} - p^{(2)}\right\|$	T value	Significance level	p Value
AI -> AU	0.433	0.077	0.415	0.090	0.018	0.153	NS	0.878
PU -> AI	0.594	0.068	0.575	0.122	0.019	0.137	NS	0.891

Table 25: PLS-MGA (age)

The differences for these path coefficients were not significant.

8 Discussion

The goal of this thesis was to clarify whether low financial health (high financial stress) increases the likelihood of an individual to adopt Financial Health Applications. Further I investigated which other factors increase consumers' intention to adopt FHA.
Before answering the research question, I will discuss the findings of the financial health in my research sample.

8.1 Financial health

To measure financial health, I employed the methodology of the Financial Health Network, using a proven method and making my findings comparable to national data. The overall financial health of my sample was slightly higher but indeed comparable to national averages, displaying a similar pattern within the subs cores of spend, save, borrow and spend. Hence, I can be confident that my measure of financial health was indeed representative and generalizable for the US. Comparing to the national data I could not confirm a definite trend for higher financial health with higher income or higher age. I did find group 5.7 (the highest age and highest income group) as the most financially healthy (average score of 98). Group 3.2 (age 35-44 and income between $15,000 and $29,999) was the group with the lowest financial health, scoring on average only 33, indicating that these people are vulnerable and struggle on average with nearly every aspect of their financial life. My findings align with the Financial Health Pulse, which found that low-income individuals and people in their prime working years show signs of vulnerability (Brockland et al., 2019). Interestingly, in almost all age groups (except the youngest) the subgroups with income level 1 (below $15,000) scored higher than subgroups with income level 2 ($15,000-$29,999). I can derive that people with extremely low income tend to have a higher financial health than people with slightly higher income. I can reason that people with extremely low income spend, save, borrow and plan in a way that is more sustainable than people who have more than the absolute minimum. Overall, the group with income level 2 scored lowest (average total score of 51) compared to a score of 58 in income level group 1. Income level group 1 even scored slightly higher than income group 3 ($30,000-$49,999), which scored on average 57.

Looking at age, the oldest age group scored highest (81), second place was the youngest age group (70). Lowest financial health was within the age group between 45-59, scoring on average only 61. My data indicates that there is no evidence, that people of higher age are necessarily financially healthier. Financial health is not necessarily growing over time, there is no indication that people of higher age are spending, saving, borrowing or planning their financials better than younger people.

Looking at gender I can confirm that women show on average a lower financial health than men. This is not necessarily related with the factors of age or income in the sample as the average income and average age level of both genders was not very different within my sample (see table 26).

Gender	Average income level	Average age level
Male	4.16	3.05
Female	4.03	3.18

Table 26: Average income and age level according to gender

My findings emphasize that financial health is a question of behavior, not necessarily of financial means or age. Analyzing further why certain demographical groups show a different financial health than others will be key to build solutions addressing their needs effectively, helping these individuals to increase their financial health.

8.2 Financial Health's impact on FHA adoption

To answer the primary research question, whether low financial health increases the likelihood of FHA adoption, I refer to H5, H6 and H7. All those hypotheses were not supported in my overall sample. Hence, I can conclude that in general I could not find evidence that low financial health (financial stress) increases the likelihood of an individual to adopt FHA. In my overall sample, I could not prove that 'Financial Stress' has a positive influence on neither 'Awareness', 'Perceived usefulness', nor 'Adoption Intention'. Therefore, there was no proof of a direct or indirect positive effect. Generally, low financial health does neither increase the likelihood of a person to be aware of FHA, to perceive FHA as useful, nor does it increase the likelihood of a person to adopt FHA.

Accounting for demographical factors I could find interesting differentiations according to gender, age and income. Differentiating for gender I found that for female respondents, 'Financial Stress' actually had a substantial and significant positive effect on 'Adoption Intention' ($\beta = 0.126$, $p<0.1$). Further, 'Financial Stress' had a high positive effect

on 'Perceived Usefulness' (β = 0.23, p < 0.05). Since 'Perceived usefulness' had a strong positive effect on 'Adoption Intention' (β = 0.624, p<0.01), the total effect of 'Financial Stress' on 'Adoption Intention' can be computed as follows:

Total effect = direct effect + indirect effect = 0.126 + 0.23*0.624 = 0.270,

whereas the indirect effect is measured by the path from 'Financial Stress' via 'Perceived usefulness' to 'Adoption intention'. For men there was neither a significant effect of 'Financial Stress' on 'Adoption Intention' (β = 0.069, p = 0.389) nor on 'Perceived usefulness' (β =0.006, p = 0.961). Hence my research supports the reasoning that low financial health does increase the likelihood of FHA adoption, but only for women, not for men. This is supported through a direct effect of low financial health on the intention to adopt FHA but also the phenomenon that women with low financial health are likelier to perceive FHA as useful. This is extremely interesting, making women with low financial health a better target for FHA, especially in terms of marketing. Why women show a stronger relationship between low financial health and the intention to adopt FHA is not clear.

Accounting for age, I could also find some differentiation. While neither the higher age group nor the lower age group supported H7 (a direct positive effect of 'Financial Stress' on 'Adoption Intention'), the higher age group did support H6, indicating that there is a significant positive effect of 'Financial Stress' on 'Perceived Usefulness' (β =0.269, p<0.05). Since 'Perceived Usefulness' had a strong positive effect on 'Adoption Intention' (β = 0.575, p < 0.01) I can compute an indirect effect of 'Financial Stress' on 'Adoption Intention' as follows:

Indirect effect = 0.269 * 0.575 = 0.155

Therefore, I can derive that low financial health has a positive influence on the perceived usefulness and therefore indirectly on the intention to adopt FHA for people who are 45 years old or older, while there was no proof for such a relationship for people in the age 18-44 (β = -0.04, p = 0.712) . I can only speculate why this is the case. It might be that people in

young age, see their low financial health not as critical compared to people with higher age. When a person is young, he or she might not have a lot of savings, no prime credit score, possibly high student loans and no detailed financial plans for the future. For a young person this is not as critical, since savings and a prime credit score need to be built over time. People of a higher age might see a state of low financial health as more critical, as low savings, a sub-prime credit score and bad financial planning become a larger worry, the older you get. The higher the worry the higher the perceived usefulness of helpful FHA might be. Since my model did not measure the worry a person has because of his or her financial health I cannot verify this reasoning.

Accounting for income I found a difference for the path coefficient between 'Financial Stress' and 'Adoption Intention'. The low-income group supported H7 (β= 0.120, p < 0.1), while the high-income group did not (β= 0.048, p = 0.537). People with low income have generally a lower financial health (see 7.3.1) and apparently, they are also more likely to adopt FHA because of that.

8.3 Other factors relevant for FHA adoption

The other factors I modeled to be relevant for FHA adoption were a) 'Awareness', b) 'Perceived usefulness', c) 'Mobile Skills' and d) 'Perceived Security Risk'.

Most important factor proved to be 'Perceived usefulness', of which the path coefficient was always substantial and significant, in the overall sample and all demographical subsamples. In the overall sample this path coefficient was by far the strongest (β = 0.596, p < 0.01). For every subsample the coefficient exceeded 0.5, being the strongest positive influence for the intention to adopt FHA for all gender, income and age groups. Within the demographical analysis only income proved to be a differentiating factor for this path. The high-income group showed a very high coefficient, β = 0.719, compared to β = 0.505 in the low-income group. The PLS-MGA proved that the difference of 0.214 was significant with 90% confidence, indicating that there is indeed a stronger relationship between 'Perceived Usefulness' and 'Adoption Intention' for people with an income of $75,000 or higher. This

means that if an individual perceives FHA as useful, the likelihood for that person to adopt FHA is even higher if that person has a high income. Why this is the case cannot be answered at this point. Generally, 'perceived usefulness' was found to be strongest driver for 'Adoption Intention'. Why and when people perceive FHA as useful remains in the dark. Like mentioned before 'Financial Stress' was not confirmed as a significant influence on 'Perceived usefulness' in the overall sample, H6 was only supported in the subsample of females and the subsample of higher age. Overall, the R^2 of 'Perceived Usefulness' was only 0.016, meaning that 'Financial Stress' does not explain a meaningful part of this variables' variance. Investigating the drivers of 'Perceived Usefulness' will be extremely useful for researching FHA adoption, as it will explain more about the motivation of consumers to adopt FHA. While 'Financial Stress' could not be confirmed as a relevant variable, it will be extremely interesting to research when, why and under which circumstances different consumers perceive FHA as useful. These findings will probably imply crucial insights to promote market adoption.

'Awareness' was confirmed as a relevant factor, the overall sample supported H1 ($\beta = 0.139$, $p < 0.05$). I can conclude that the awareness of FHAs' existence and knowledge about their functionalities is a relevant factor for the adoption. Since many FHA are quite new innovations and rather young on the market, market awareness and branding must be a priority for FHA companies. Especially for younger people, 'Awareness' showed to have significant impact on 'Adoption Intention' ($\beta = 0.247$, $p < 0.01$). This means that if a person has heard about FHA and seen a lot of advertisement for them, they are more likely to adopt FHA, though this has only been proven for people in the age 18-44. The age group of 45+ years old did not show a significant relationship ($\beta = 0.047$, $p = 0.52$). Therefore, my research implies that if an FHA company wants to create impact through product and brand awareness, it should focus on channels reaching younger consumers. These channels could be for instance digital social media.

Further, 'Mobile Skills' was identified as a relevant factor for FHA Adoption. The overall sample supported H3, ($\beta = 0.207$, $p < 0.01$). Hence, I can derive that skills regarding

the use of mobile applications and mobile financial transactions are relevant for FHA adoption. People who use their smartphone a lot and are in general used to financial transactions via their phone, are more likely to adopt FHA. This aligns on the one hand with the findings of Lee and Lee (2001) who confirmed a skill-based view on technology adoption and on the other hand with the original TAM (Davis, 1989), whereas 'Mobile Skills' can be related to 'Perceived Ease of Use'. 'Mobile Skills' can be seen as a proxy for the perceived ease use of FHA, since relevant skills and how-to knowledge are relevant for the adoption of a technology (Lee and Lee, 2001; Rogers, 2010), making the use of a technology easier.

The demographic analysis drew a more specific picture in this regard. The path coefficient between 'Mobile Skills' and 'Adoption Intention' was significant for the male group (β = 0.274, $p < 0.01$), for the low-income group (β = 0.247, $p < 0.01$) and for the older age group (β = 0.301, $p < 0.01$). Hence, I can derive, that mobile skills are especially relevant for the adoption of FHA among male people, people with lower income and people above the age of 45. The subsamples of the female respondents, respondents with income above $75,000 and below the age of 45 did not show a significant path coefficient between 'Mobile Skills' and 'Adoption Intention'. Taking a reversed point of view, I can reason that if people have low mobile skills, they are less likely to adopt FHA. This was verified for males, people with low income and people of higher age. While I am unsure of the reasons for the differences between genders and low and high income, I can reason why there is a difference between younger and older respondents. Older respondents might be less "digitally native", strong mobile skills are therefore not necessarily given. Therefore, low mobile skills might be a higher inhibitor for FHA adoption. This reasoning is supported by the fact that 78% and 85% of the young respondents agreed or strongly agreed with the two measurement indicators for the construct 'Mobile Skills'. For the older subsample only 65% agreed or strongly agreed to the statement that they use their smartphone all the time and for many aspects in their lives, and only 63% agreed or strongly agreed with the statement that they are used to mobile shopping and mobile transactions. This reasoning is further supported through my qualitative research. The factor 'Mobile Skills' was only mentioned in the interviews with older people outside campus.

'Perceived Security Risk' was not confirmed as a relevant factor. H4 was neither supported in the overall sample, nor in any of the subsamples. Therefore, I cannot conclude that perceived security risk of FHA has any impact on consumers' intention to adopt FHA. Even though I identified this factor in my qualitative research and also Ryu (2018) identified it as a negative factor for Fintech adoption, my research did not find any evidence that the perception of FHA having high data security risk had any significant impact on the likelihood of adoption. Whether consumers think that FHA are secure in terms of privacy does not seem to matter for their intention to adopt them.

8.4 Intention and actual behavior

H8 was supported, in the overall sample as well as any subsample. With a path coefficient of 0.439 I can support the reasoning that people who intend to adopt FHA are also likely to do so for real. Though 0.439 is still much lower than 1.0, meaning that an intention is not necessarily indicating actual behavior. According to the theory of reasoned action (Fishbein and Ajzen, 1977), intentions are the proximal predictors of behavior and mediate the influence of both the theory's predictors (attitudes and subjective norms) and extraneous variables (e.g., personality) on behavior. "Behavioral intentions are instructions that people give to themselves to behave in certain ways" (Triandis, 1979, p. 203). Sheeran (2002) did a meta-analysis on different meta-analyses of the intention-behavior relationship including research in diverse fields of behavioral studies. Correlations between intention and behavior ranged from 0.4 to 0.82, while the R^2 of behavior ranged from 0.16 to 0.38. Since I found a highly significant coefficient of 0.439 and computed an R^2 of 0.193 for 'Actual Use', my findings are in the range with other studies investigating behavioral intentions and actual behavior.

8.5 Suggestions for further research

Overall, I could not proof that low financial health increases the likelihood of a person to adopt FHA, to be aware of FHA or to perceive FHA as useful. Since FHA should target people with low financial health it is essential to ask why this is not the case. Possibly, FHA companies might not reach financially stressed consumers effectively, many consumers

might not sufficiently understand the benefits FHA could have for them. Further, the missing link between financial health and FHA adoption might be influenced by a lack of financial education, meaning that even if consumers are informed about FHA and their functionalities, but they might not realize their value added. Thoroughly analyzing the financial health situation and demographics of consumers will help FHA companies to effectively target an audience with low financial health. Finding out why people have low financial health, which dimension of financial health is the most problematic and which demographics suffer the most will increase the market knowledge of FHA companies, who can then address consumers in the most effective way. I clearly found that the perception of FHA as being useful is the highest motivating factor for consumers to adopt FHA. Since 'Financial Stress' is not a strong indicator for 'perceived usefulness' this construct remains a black box ($R^2 =$ 0.016). Since it was found to be by far the most important driver for FHA adoption, I suggest to further investigate what the drivers for 'Perceived Usefulness' are. Finding out when and why people would perceive FHA as useful seems to be the most important question derived from my research. I could only find a relationship between 'Financial Stress' and 'Perceived Usefulness' for females and people of higher age. The question is now why there was a significant difference for females and for people of higher age and most importantly, which factors generally contribute to consumers perception of FHA being useful. Explaining more of the variance of 'Perceived Usefulness' should improve the insights about FHA adoption, identifying more drivers of this construct would give FHA companies more concrete information on how to increase the adoption. Since I proposed an iterative methodology with an abductive approach, I suggest continuing this research with a qualitative, inductive study. Diving deeper into 'Perceived Usefulness' as the main driver it will be essential to interview more consumers, why and how they perceive FHA as useful.

According to my analysis I can recommend not only to measure the financial health status of consumers, but also how much they worry about it. This would increase the knowledge about the subjective financial stress a person feels, which could be relevant for the intention to adopt FHA and the perceived usefulness. One could reason that only if a person with low financial health perceives this situation as problematic and worrisome, he or she should be likelier to adopt FHA or perceive these apps as useful.

Other than that, I suggest generally expanding my research in phase 2 to derive more factors which could be tested to be relevant for the intention to adopt FHA. Asking more people, more diverse people and in more detailed way will probably derive more factors which could be tested with the method I demonstrated in this paper. Focus groups, in-depth interviews and case studies are possible qualitative methods to consider. While I confirmed some several factors to have a positive impact on the likelihood of adoption I could not find or confirm any inhibiting factors for the adoption of FHA. Taking an opposing view, the investigation of inhibitors for adoption could potentially also build more insight, focusing on why people would not like to use any FHA.

Generally, I suggest following a similar methodology like the one I proposed, mixing qualitative studies for factor identification and quantitative studies for factor confirmation. My method could be further leveraged by using a much higher sample size and the collection of more demographical data points, allowing for a very detailed demographical analysis. More demographics such as race, level of education, employment status, relationship status, geography or rural vs city area of residence could be interesting variables to account for. Having a higher sample size and more variables would allow for a more granular picture or financial health and the adoption of FHA.

Another suggestion is to apply my method and model on a concrete application. While my research investigated the adoption of FHA in general, my method could be particularly interesting to investigate the adoption of a concrete product. For example, apps which focus on a particular dimension of financial health could make use of the finanical health subscores. For instance, applications such as *Earnup* and *Credit Karma* could pay special attention to the *Borrow Score*, while applications such as *Digit* and *Mint* should be primarily interested in the *Spend Score* or *Save Score* of consumers. Each of the FHA companies need to clarify why people would like to use their product and especially what kind of people are most likely to adopt their app. FinTech companies could make use of the different theories about technology acceptance and use them for scientific market research, in order to derive insights potentially increasing the adoption of their product.

Lastly, this study merely focused on behavioral intention as the endogenous variable to investigate theory-driven actual behavior in the early adoption stage. Technology adoption is not only about acquiring customers but also the successful conversion and

retention of users. The study of FHA adoption could be further improved by employing additional methods such as field studies or longitudinal analysis to understand more about the actual behavior, not only adoption intention but also actual use and continuance of use.

Following this research, it would be very interesting to investigate how the use of FHA actually impacts the financial health of consumers. Going back to the initial problem of low financial health within the US population I can recommend investigating whether the use of FHA actually increases the financial health of consumers. This emphasizes the importance of stakeholders to efficiently measure financial health and to do so over time. Whether any FHA can actually fulfill its mission and make consumer financial behavior more sustainable, is the final question to be answered. Only then FHA would add any value for the financial health in the United States.

8.6 Managerial implications

Through my findings and discussion, I can derive the following implications for FinTech companies in the FHA space:

1. Focus on the perceived usefulness of your product

Since this factor was by far the most important driver for the adoption of FHA, FinTech companies need to investigate how and why consumers would perceive their product as useful. This implies that the customer value proposition must be derived from thorough consumer and market research. Creating a strong product-market-fit will create a pull from consumers, who will perceive the application as useful for the fulfillment of their needs and hence adopt the solution.

2. Drive market awareness and endeavor marketing

Since many FHA products are quite new and innovative it is essential to communicate to customers effectively, educating about the product's function and branding the app in the market. Especially for young people, awareness was confirmed as a driving factor for FHA

adoption. Hence FHA companies should market especially in channels reaching younger people.

3. Women with low financial health could be a special target group

While low financial health was in general not increasing the likelihood of FHA adoption, it did so for female respondents. FHA companies could therefore especially target women with low financial health as these are more likely to perceive FHA as useful and are also more likely to adopt them. Generally, it would be of interest to investigate why there is apparently a significant difference between females and males.

4. Low mobile skills could be an inhibitor to adopt FHA, especially for older people

This is an implication FHA companies should be aware of. Since older people with low financial health are likelier to perceive FHA as useful but might be less digitally savvy, FHA companies should make their apps as user-friendly and as simple as possible. Generally, the applications should be easy to use for people who are not very used to handling mobile applications and mobile financial transactions.

5. Use an iterative and abductive approach for market research

My research model is a relevant example for FHA companies. I recommend pursuing market research with an iterative and abductive approach. Qualitative research and quantitative research should be combined and repeatedly iterated. This multimethodological triangulation method is necessary for extracting and testing potential variables that will help explain the variances of adoption intention.

6. Measure financial health

FinTech companies should commit to regularly measuring financial health outcomes for their customers. Only by doing so will they know if the solutions they develop to improve

financial health are working. Also, policy makers need to pay attention to the measures of financial health as input for policy design, government and social services. Only if involved stakeholders measure financial health, they will able to see if any of their implemented solutions work and improve financial health. Using a common and standardized method like the framework provided by the Financial Health Network is recommended, making the findings comparable with more research over time.

8.7 Considerations for a broader context

When discussing my findings, it is important to emphasize that my research is solely focused on the US and contains only data from US American citizens. The Financial Health Network, which is an American institution, applies its research only within the US. Though, I can argue that the framework to measure financial health would be applicable in any country. Hence the proposed framework could be tested also in other countries around the world. FHA do not only exist in the US, even though it is a huge market for this kind of FinTech applications. Other developed countries such as the Nordics or Germany would be interesting to investigate, drawing implications on the differences between countries' systems and cultures. Measuring financial health in different countries with the same measurement framework would be extremely interesting since it could derive insights regarding the countries' policies and systems. For example, Denmark is a country where every citizen has state insurance, social benefits are very high, and education is for free. Arguably, financial health should be higher in Denmark compared to the US. It would be very interesting to compare financial health across countries, compare policies and legislations possibly related to consumer financial health. The measurement of financial health across countries could imply important findings for policy makers. Still, financial health is also very much related to an individual's behavior, e.g. whether that person spends less than his or her income or plans financially ahead. Measuring financial health in different countries could also draw implications on different cultures regarding financial behavior in different geographies.

Further, the research question whether financially stressed consumers are likely to adopt FHA could be asked in any country. Financial health can be measured no matter which nation is considered, the proposed model for FHA adoption can be applied in any

geographical context. It is important to mention that the market in the US offers a high number and diversity of FHA while the market for FHA in Europe is less mature. While there are numerous applications in the US, the app stores in countries like Denmark or Germany do not offer the same number of apps in this space. The US was indeed a very interesting market for this research, but I also recommend testing this framework for other geographies. This is especially relevant for FHA products that plan to expand outside the US.

8.8 Limitations

My results and their interpretations are subject to various limitations, which need to be accounted for when considering the method, I developed.

Phase 2 and my qualitative research, which was the basis for my model development had several limitations. Given the fact that I only interviewed 16 people in the environment of UC Berkeley and surroundings the generalizability of my qualitative research is very low. The sample was very small, random and not distributed well enough. Further the interviews were quite spontaneous, which on the one hand gathered feedback in a very free and easy way, on the other hand I did not record or code the responses, making the method inefficient. For the future I can recommend employing in-depth and planned interviews, to find more details and more diverse insights. This study focused on a specific set of identified factors, reflecting the feedback from a small group of people. Future studies may include many other relevant factors for FHA adoption.

On purpose, I did not use 'Cost' as a factor for my model. It is logic, that the associated costs of an FHA have impact on consumers' intention to adopt. Costs and willingness to pay are critical factors, but my study did not account for this dimension at all. Since the costs and business models of particular FHA are so different it was not applicable as a factor for a study of FHA in general. I recommend to account for cost when investigating either a particular type of app or a specific product.

Furthermore, my model did not incorporate any social influences. I did not investigate whether the person's perception that most people who are important to her think she should

or should not adopt FHA influences the intention to adopt FHA. This is contradictory to the UTAUT and the TRA and my research is limited in this regard.

My measure for financial health was derived from the Financial Health Network (Brockman et al., 2019). The method was useful and transferable though it is important to emphasize that this framework is not necessarily universal or the perfect measure. The measure for financial health does not include any kind of measure regarding the self-perception or level of financial worry of a person. I could reason that if a person has low financial health but does not see this as problematic, he or she might not be interested in any services of FHA helping to increase the financial health. This perspective is not considered in my study and possibly limits the explanation between financial health and the intention to adopt FHA.

Another limitation of my study is the sole focus on adoption intention to interpret theory driven actual behavior. Since actual behavior (actual adoption) is the goal of FHA companies, I need to emphasize the difference between these two constructs. The intention will not necessarily make an individual install and use an FHA, hence my research about adoption intention is limited investigating consumer behavior. I recommend investigating direct drivers for adoption and the inhibitors of adoption, promoting or preventing the conversion of a consumer to use and continue to use an FHA. Further, I recommend field studies and longitudinal analysis, for a closer observance of actual consumer behavior.

The measurements of all constructs in this study were collected at the same point in time and via the same self-reported instrument. According to Straub, Limayem and Karahanna-Evaristo (1995), the potential for common methods variance may exist. This means that some of the variance might be attributable to the measurement method rather than to the constructs the measures represent. Since my survey first asked the questions measuring the financial health of a respondent, the awareness of one's financial health situation caused in the moment of answering the survey could have impacted the answers to the following questions, asking about the perceived usefulness and adoption intention. If there is any bias in this regard, I cannot account for it.

Lastly, the findings of my study are only applicable for the United States. Since all my research was focused on consumers and FHA in the US, I cannot verify the transferability of my findings to other markets due to national characteristics. Further, since I particularly

focused on FHA as a special type of FinTech applications, the findings cannot be generalized for FinTech services in general.

9 Conclusion

Based on my discussion I can conclude that generally, low financial health does not increase the likelihood of a person to adopt FHA. In general, financially stressed people are not more likely to adopt FHA, they also do not necessarily perceive them as useful. This is quite disappointing, implying that people with low financial health are not likely to adopt applications which could potentially help them to increase their financial health. Why this is the case cannot be answered by this study. It will require more research about financial health, people's perception of their financial health as well as their perception of FHA. Perceived usefulness proved to be by far the most important driver for FHA adoption. Since it remains unclear why and when consumers would perceive FHA as useful it is recommended to investigate the drivers for this construct. Understanding why and under which circumstances what kind of customers would perceive FHA as useful is the key to drive consumer adoption. Research in this regard could derive decisions and actions to increase the FHA market adoption, potentially helping more people to increase their financial health. Besides the perceived usefulness my research confirmed awareness and relevant mobile skills as a driving factor for FHA adoption. Therefore, I can recommend FHA companies to endeavor marketing to inform and educate consumers about their product as well as to make sure their product is easy to use, especially for people having less experience with mobile applications and mobile financial transactions. Perceived security risk was not confirmed as a relevant factor hence I cannot conclude that this construct has any impact on consumers' intention to adopt FHA. I recommend investigating other inhibitors and risk factors which could potentially explain non-adoption of FHA. For the different variables tested I was able to identify significant differences accounting for demographic variables such as gender, age and income. The larger the total sample and the more demographical data points researchers can collect the more differentiated insights could be derived from my proposed research model. Detailed insights about consumers' financial health and adoption intention could

inform product design, targeted marketing and strategic decisions of FinTech companies in the FHA space.

My model showed a substantial level of predictive power, explaining 60.7% of the variance of the intention to adopt FHA. This is satisfactory, though further research and the incorporation of more variables could further increase the power of the model to explain FHA adoption intention. My model, which integrated qualitative and quantitative study, is a useful tool for FinTech adoption research and is applicable for FinTech companies, providing a tool for scientific market research in business. Based on theories regarding the adoption of technology and a PLS-SEM analysis I provide an example how to conduct market research scientifically, using an iterative, abductive approach. Further explorative and iterative use of the method shown can deepen the understanding of FHA adoption. This is ultimately very useful for FHA companies, who can use this kind of research to derive key drivers for market pull. The market knowledge created will help to effectively design and market FHA, potentially helping more consumers to increase their financial health.

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Appendix

Appendix 1: Survey questionnaire

* 1. Which of the following best describes your household's spending compared to total income over the last 12 months?

○ Spending was much less than income

○ Spending was little less than income

○ Spending was about equal to income

○ Spending was a little more than income

○ Spending was much more than income

* 2. Which of the following statements best describes how your household could pay its bills over the last 12 months?

○ Pay all our bills on time

○ Pay nearly all our bills on time

○ Pay most of our bills on time

○ Pay some of our bills on time

○ Pay very few of our bills on time

* 3. With your current savings, how long could you and your household afford to cover your expenses, without borrowing money or taking it out of your long-term savings (if you have any)?

○ 6 months or more

○ 3-5 months

○ 1-2   months

○ 1-3   weeks

○ Less than 1 week

* 4. Are you confident that your household is able to meet long-term savings goals such as vacation, starting a business, buying a home, saving for education / retirement?

○ Very confident

○ Moderately confident

○ Somewhat confident

○ Slightly confident

○ Not at all confident

* 5. Taking into consideration your household's current debt (mortgage, bank loans, student loans, medical debt, past-due bills, credit card balances carried over from previous months and money you owe other people), how manageable can you describe your debt?

○ I do not have any debt

○ I have a manageable amount of debt

○ I have a bit more debt than is manageable

○ I have far more debt than is manageable

* 6. How would you rate your credit score?

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor
- ○ I don't know

* 7. Taking into consideration all types of insurances you have (health, vehicle, home or rental, life or disability insurance...), how confident are you that those insurances can help you enough in case of emergency?

- ○ Very confident
- ○ Moderately confident
- ○ Somewhat confident
- ○ Slightly confident
- ○ Not at all confident
- ○ No one in my household has insurance

* 8. Can you agree with the following statement: "My household plans ahead financially"

- ○ Strongly agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Strongly disagree

For the following questions please read the definition below and think of apps which come to your mind.

Financial health apps are

- Apps that help you to spend less money and organize a budget
- Apps that help you to save more money
- Apps that help you to invest money
- Apps that help you to borrow money more easily or cheaply
- Apps that help you to enhance your credit score
- Apps that help you to manage your debt
- Apps that help you to get better insurance
- Apps that help you to plan financially into the future

Keeping this in mind, how much can you agree with the following statements?

Financial Health Apps Examples

* 9. Do you use any Financial Health Application? If yes, please name which one(s), if no please skip this question.

_____

* 10. I have heard of many financial health apps

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 11. I have been exposed to lots of advertisement for financial health apps

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 12. Financial health applications could help me to be financially resilient and stable

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 13. Financial health applications could help me to have better financial opportunities

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 14. Overall, I think financial health applications are useful for me

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 15. I use my smartphone all the time and use many different apps in many aspects of my life

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 16. I like to shop with mobile applications and I have no problems to make a transaction using my smartphone

- ◯ Strongly disagree

- ◯ Disagree

- ◯ Neither agree nor disagree

- ◯ Agree

- ◯ Strongly agree

* 17. I worry about the abuse of my financial information (e.g. transaction and private information) if I use Financial Health Apps.

- ◯ Strongly disagree

- ◯ Disagree

- ◯ Neither agree nor disagree

- ◯ Agree

- ◯ Strongly agree

* 18. I worry that someone can access my financial information if I use Financial Health Apps.

- ◯ Strongly disagree

- ◯ Disagree

- ◯ Neither agree nor disagree

- ◯ Agree

- ◯ Strongly agree

* 19. My financial information is not secure if I use Financial Health Apps.

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 20. I intend to use financial health apps in the future

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 21. I want to learn more about financial health apps

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

* 22. I would recommend financial health apps to my friends and family

○ Strongly disagree

○ Disagree

○ Neither agree nor disagree

○ Agree

○ Strongly agree

Appendix 2: Financial Health Measure

SPEND

1 Which of the following statements best describes how your household's total spending compared to total income, over the last 12 months?

100 Spending was much less than income

75 Spending was a little less than income

50 Spending was about equal to income

25 Spending was a little more than income

0 Spending was much more than income

2 Which of the following statements best describes how your household has paid its bills over the last 12 months?

My household has been financially able to:

100 Pay all of our bills on time

60 Pay nearly all of our bills on time

40 Pay most of our bills on time

20 Pay some of our bills on time

0 Pay very few of our bills on time

SAVE

3 At your current level of spending, how long could you and your household afford to cover expenses, if you had to live on only the money you have readily available, without withdrawing money from retirement accounts or borrowing?

100 6 months or more

75 3-5 months

50 1-2 months

25 1-3 weeks

0 Less than 1 week

4 Thinking about your household's longer-term financial goals, such as saving for a vacation, starting a business, buying or paying off a home, saving up for education, putting money away for retirement, or making retirement funds last...

How confident are you that your household is currently doing what is needed to meet your longer-term goals?

100 Very confident

75 Moderately confident

50 Somewhat confident

25 Slightly confident

0 Not at all confident

| | BORROW | | | PLAN | |

BORROW

5 Thinking about all of your household's current debts, including mortgages, bank loans, student loans, money owed to people, medical debt, past-due bills, and credit card balances that are carried over from prior months...

As of today, which of the following statements describes how manageable your household debt is?

- 100 Do not have any debt
- 85 Have a manageable amount of debt
- 40 Have a bit more debt than is manageable
- 0 Have far more debt than is manageable

6 **How would you rate your credit score?**

Your credit score is a number that tells lenders how risky or safe you are as a borrower.

- 100 Excellent
- 80 Very good
- 60 Good
- 40 Fair
- 0 Poor
- 0 I don't know

PLAN

7 Thinking about all of the types of insurance you and others in your household currently might have, including health insurance, vehicle insurance, home or rental insurance, life insurance, and disability insurance...

How confident are you that those insurance policies will provide enough support in case of an emergency?

- 100 Very confident
- 75 Moderately confident
- 50 Somewhat confident
- 25 Slightly confident
- 10 Not at all confident
- 0 No one in my household has has any insurance

8 **To what extent do you agree or disagree with the following statement:**

"My household plans ahead financially."

- 100 Agree strongly
- 65 Agree somewhat
- 35 Neither agree nor disagree
- 15 Disagree somewhat
- 0 Disagree strongly

Source: FinHealth Score Toolkit, Financial Health Network (2019)

Appendix 3: FHA companies detailed overview

1. Mint (Category A, E)

Mint is a personal finance app brining one's finances into one dashboard, allowing for convenient management, transparency and control. Users can create budgets tailored to their spending behavior. It automatically updates and categorizes transactions, creating a picture of spending in real-time. Mint has of now more than 13 million users (Pegoraro, 2020), who can use the app for free. Since 2009 Mint is part of the software company intuit, which bought it for $170 million. Intuit, which is a diversified FinTech provider, is currently valued at $87.2 billion.

2. You need a budget - YNAB (Category A, B, H)

YNAB is a budgeting tool allowing consumers to connect their bank accounts and credit cards. With the tool users can manage their transactions, avoid overspending, keep track of their financial balance and make informed spending decisions based on a set budget, taking all household expenditures into account. Like this YNAB helps consumers to keep control and be able to plan what to spend for what. The YNAB budgeting tool costs $84/year, number of users and valuation of the company is not publicly available.

3. Digit (Category B)

Digit is a savings tool that analyzes users' spending and seamlessly saves the perfect amount each day. Users can set goals for any purpose and keep track of their progress. Digit is aware of a user's financial behavior and situation and suggests the best amount to be saved automatically while preventing account overdrafts. The company claims to have helped its users to save more than $1 billion since its launch in February 2015, which is about $2500 on average for each of their 400,000 users (Martin, 2019). Digit costs $2.99 per month and has a post money valuation range between $100M and $500M since its last funding round of $27,500,000 in September 2019 (Crunchbase, 2020a).

4. Chime (Category B)

Chime is the most successful digital bank in the US. The bank is completely digital, and users get a checking and savings account for free. Chime lets customers who have a steady income overdraft the account without imposing high penalty fees, giving users more financial flexibility. Chime pays higher APR on savings (currently 1%) and the automatic savings tool helps to build up a financial cushion. As of now Chime has opened 8 million accounts (Bloomberg, 2020) and is one of the US FinTech Unicorns valued at $5.8 billion (Son, 2019).

5. Acorns (Category B, C)

Acorns is a micro investing platform, accumulating round ups from spending to invest the "spare change" into portfolios of bonds and stocks, created by Acorns. Like this, users can start investing money automatically and do not have to manage the investments.

Recently Acorns also launched a checking account with a debit card, integrating their savings and investing tool with a proprietary account. Acorns has about 4.5 million users (Rooney, 2019) who pay $1 for the lite or $3 for the all-in-one solution per month. Acorns is valuated at $860 million since its Series E of $105 million in early 2019 (Rooney, 2019a).

6. Robinhood (Category C)

Similar to Acorns Robinhood is an investment platform making investments accessible and transparent for everyone. Users can invest commission for free into stocks and funds with as little as $1. Users can also trade crypto currencies such as Bitcoin or Ethereum. For $5 per month users can upgrade to Robinhood gold, enabling premium features. As of now Robinhood has about 13 million users and is valuated at $8.3 billion (Abdel-Qader, 2020).

7. Personal Capital (C, H)

Personal capital is a digital financial advisor helping consumers to plan for retirement and invest their capital. As of June 2020 the assets under management have reached over $12.5

billion and personal capital has over 1.7 million users (Dogen, 2020). In June 2020 Personal Capital sold itself to Empower Retirement for $825 million (Wilhelm, 2020).

8. Petal (Category D)

Petal is a revolutionary credit card company offering credit cards to people with little to no credit history and hence a low credit score. Instead of using a traditional FICO score, it uses other data and metrics to assess whether or not someone can repay the loans, looking at the entire financial picture of an individual. Hence Petal gives access to affordable credit (between 13-24% APR). Petal has doubled its user base every other month since launching the card in October 2018. Roughly 65% of its 50,000 customers are millennials or Gen Z (Rooney, 2019b). Petal has a total funding of $380.6 million and does not disclose its valuation (Crunchbase, 2020b).

9. Earnin (D)

Earnin is not a loan company but gives people the possibility to access their earned paycheck earlier, hence it is an alternative to expensive payday loans and prevents overdrafts. Users can withdraw up to $100 per day to cover liquidity shortages, while Earnin will receive the money back with the next paycheck. For each advance the customers pay a voluntary tip to the platform (about 10% of the amount by default). The Earnin app has more than 1 million downloads and the company has a total funding of $190 million, valuation non-disclosed (Crunchbase, 2020c).

10. Credit Karma (Category E, F)

Credit Karma gives consumers access to credit scores and other credit information, as well as tools for consumers to improve their rating. Users can access Credit Karma's information for free and as frequently as they want. Hence Credit Karma helps consumers to manage their debt and also improve their credit score by counseling and referring the most suitable credit products. Credit Karma has more than 100 million members in the US, Canada and the UK (Credit Karma, 2019). In February 2020 Intuit announced the acquisition of Credit Karma for $7.1 billion (Lunden, 2020).

11. Earnup (Category F)

Earnup is an app automating and managing loan payments and upcoming bills, it optimizes the debt repayment according to the users' income. Earnup claims to realize financial health improvements for their customers, where 35% pay off debt faster and 26% save on interest.

Earnup manages more than $10 billion of loans on its platform (PRNewswire, 2019). Funding, number of users and valuation of the company are non-disclosed.

12. Lemonade (Category G)

Lemonade is an Insurtech company revolutionizing home and rental insurance. Like in a peer-to-peer business model premiums paid by each customer are pooled. Lemonade has a flat fee of 20% while any insurance claim of anyone in the pool is paid with the pooled premia. The rest of the pool is distributed to a charity of the peers' choice, hence Lemonade does not seek to minimize payouts to maximize profits. Since their launch in 2015, Lemonade has signed up 300,000+ customers (Al-Saad, 2019). The company is also a US unicorn, valued at $2 billion (Rapier, 2020)

13. Oscar (Category G)

Oscar is a technology focused health insurance company promoting the use of telemedicine. Further Oscar's mission is to make health insurance simpler, Oscar's simple plans cover all doctor visits, and preventive care and generic drugs are free. Using analytics, Oscar attempts to find the least expensive and most effective treatments. Oscar has of now 420,000 members (Shieber, 2020) and is valued at $3.2 billion (Truong, 2019).

14. SoFi (Category A, B, D, E, F, G)

SoFi is an app which offers a budget tracker, a checking and savings account, an investment platform, tools to find and manage student, private and home loans as well as a credit score monitor. Like this SoFi is closer to be an all-in-one solution offering consumers different services in one place. The company focuses mostly on young customers and has 7.5 million registered users (Rooney, 2019c). SoFi is another unicorn, valued at $4.3 billion (Wilhelm, 2019).