



## How does digitalization impact investment activities?

*-Information retrieval, processing and decision making*

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Master's Thesis in Governance of Digitalization

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Abstract for Master's thesis

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<p>Abstract:</p> <p>Both digitalization and globalization are changing the finance industry and the way people handle their finances. Digital services, social media interaction and information online are the new normal in several aspects of life, also in investing activities. The way people retrieve investment information, process it, and make decisions might affect in many ways to individuals' economic status. Previous research has found that growing number of investors utilize more resources online than traditional bank's personal investment advice. This study indicates the most-used channels Finnish investors use to find investment news and advice in the digital age.</p> <p>The research was executed by using quantitative research method by conducting an online survey to Finnish investors over the age of 18. The sample size of the research was 374. The results of this study indicate that there are variety of digital platforms that investors use for both to seek for investment advice and to share experiences with other investors. However, internet and digital services also create several threats for investors. Financial literacy is one of the key concepts in this research and the importance of it is enormous. Concrete and practical recommendations are made at the end of the research to ensure that saving and investing would be possible for everyone, not just for individuals with university degree in finance.</p>
<p>Keywords:</p> <p>Digitalization, globalization, investing, fintech, financial literacy, crypto, artificial intelligence, non-fungible token</p>
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**LIST OF ACRONYMS**

<b>IT</b>	Information technology
<b>AI</b>	Artificial intelligence
<b>NFT</b>	Non-fungible token
<b>ETF</b>	Exchange traded fund
<b>ML</b>	Machine learning

## 1 INTRODUCTION

Digital technologies have developed more rapidly than any other innovation, reaching around half of the developing world's population in only two decades. (United Nations, 2022) Today, paying bills, ordering a taxi, and even buying an apartment can be done in digital form as long as one has access to the internet. Flexible and varied relationships are formed between people and their diverse identities in the online world. The different forms of participation and digital orders will become more important every day, which will continually influence the value creation process in many companies. Digitalization is changing the social and economic lives of humans, as well as the way individuals interact with each other. Nearly every social and occupational transaction now occurs through modern information technologies and at the same time, transaction costs are decreasing.

Digitalization, globalization, climate change, internet, social media, and artificial intelligence are destroying traditional economic structures. The growth of traditional trade and industrial companies has decreased and at the same time new businesses and business models have been created. Successful investors adapt to the world's changes by leaving the regressive industries and seek new growth possibilities for funds in the constantly changing world. (Saario S. 2021)

The topic of this thesis is the impact of digitalization in private investor's investment activities. Digitalization has had an effect on almost everything in the world, including investing activities. Especially the IT-industry and other forerunners of digitalization have raised the stock rate faster than ever before. Both consumers and companies are interested in digitalization and in the opportunities it brings. The purpose of this thesis is to examine the impact digitalization has brought to investment activities during the recent years, expose the portion of digital currencies and other investment products in Finnish investors' portfolios and to determine the main channels investors use to gain knowledge about the industry in the digital age. The thesis also includes portion of information retrieval, concentrating on how people should adapt to information overload on the internet.

The possibilities are endless in the digital world. In the future, investors will follow increasingly a company's desire to invest money and resources in digital development. In Finland, some might think there has been an unwillingness and even aversion to invest money in the development of new digital services in their early stages. In the end, nobody can really afford to leave the opportunities the internet brings unexploited. Therefore, those interested in investing and especially receiving economic independence through investing activities should be critical towards the information online and avoid relying on other investors when making important investment decisions and taking action. Digitalization brings both advantages and disadvantages to investment activities and therefore it is extremely important that private investors try to utilize the benefits of digitalization and simultaneously avoid the pitfalls of the digital world.

### 1.1 Structure of the thesis

This thesis will start by defining the research questions, which are its foundation. A comprehensive literature review and quantitative research are conducted in order to receive answers to the research questions. Chapter 2 (Theoretical background) is the comprehensive literature review, where all the concepts are explained with the help of literature, scholarly reviewed articles, and previous research. After the literature review, the research methods are identified and justified, and the structure of the digital survey is explained. The thesis continues to the research results and ultimately provides future recommendations and trends among the digital investing industry. The thesis will end with conclusions to summarize the whole research and findings.



## 1.2 Research questions

As mentioned above, the aim of this thesis is to measure the information retrieval, processing and decision making of Finnish investors in the digital age. The research seeks answers to questions that define the impact of digitalization in Finnish investors' investment activities during the recent years. The determination of research questions helps the researcher to seek relevant information and concentrate on the wanted outcome. In other words, research questions prevent the researcher from getting lost in the irrelevant topics. The aim of this thesis is to answer four research questions. The research questions are reviewed and answered later in the report, after the survey data have been analyzed. The research questions are the following:

RQ1. How do investors seek and analyze investing information in the digital age?

RQ2. What advantages and disadvantages has digitalization brought to investors?

RQ3. What is the portion of artificial intelligence, crypto currencies, and non-fungible tokens in Finnish investors' portfolios?

## 1.3 Motivation for the thesis

Recent years of uptrend in stock market combined with the new era of openness to discuss about investment activities both in person and in digital form, has increased the amount of investors significantly. During this time, people can hear and read about investing almost anywhere, from hairdresser to uber rides. Both digitalization and globalization has made investing easier than before and almost everyone owns a mobile device nowadays. The number of opportunities mobile devices, online banking service and new applications bring to the humanity is enormous. Digitalization is a megatrend that affects everyone whether they want it or not. The aim is to find the best possible ways to utilize digitalization in both investing education and in investing activities in general.

In a market economy, prices for services and goods varies. Inflation occurs if there is a significant increase in the price of services and goods, meaning that one can buy less for 1€ today than one could yesterday. In other words, inflation reduces the value of currency over time. (Website of EU, 2022) When measuring inflation, all goods, and services that households consume such as electricity, food, petrol, clothing, insurance and rented housing are taken into account. Low, stable, and predictable inflation is good for the economy, the ideal inflation rate is approximately 2 percent over the medium term. However, according to the EU statistical office Eurostat, Finnish consumer prices rose 5.6 percent from the year before in March. (Eurostat 2022) When considering the high inflation situation, the importance of investing becomes even more important. Consumers lose money annually due to inflation, if they save money to regular bank accounts without any annual interest. However, there are people who are not aware of the consequences of inflation and therefore, investing, and financial literacy should be taught in school.

Internal motivation comes from the desire to learn the investment behavior, find the potential digital opportunities online and ultimately help the financial education process in Finland. Approximately three years ago, I started an internship in Finnish bank. Around the same time, I started to listen several podcasts concentrating on investing and the podcasts encouraged me to start investing. Currently I check the financial markets daily, and my aim is to constantly educate myself about the industry. It can be reading investing books, listening to podcasts, following digital newspapers such as Kauppalehti, or participating on online discussion forums focused on investing. Nearly all investment activities can be done online. Digitalization has brought numerous digital channels where to create knowledge and discuss about the common interests in a digital environment, from the comfort of one's own couch.

Furthermore, the external motivation for this thesis comes from the university. Åbo Akademi University has provided me a safe and supportive learning environment for the past years, and this thesis concludes the two-year project. Studies in the master's degree program in governance of digitalization has provided me information on the meaning and impacts of digitalization generally and for my master's thesis I wanted to combine the learnings from the university with the interests in my personal life. It is essential to investigate how enabling information and communication technologies are used and what effects they have on the investment activities among Finnish private investors. The topic is very current and important for both private investors and the financial institutions who provide investment information to

consumers. Also, educational institutions such as high schools and universities can benefit from this research by recognizing what opportunities digitalization can bring to teaching methods.

The purpose of this thesis is to provide meaningful insights on the new information gathering channels due to digitalization and both advantages and disadvantages the digitalization has brought to investing activities. Future research possibilities and service proposals for the industry are provided at the end of this research.

#### 1.4 Research methods

Quantitative research is the method used in this research. To receive the best outcome of the time and resources invested in quantitative investigations, it is important to understand what quantitative research is and what types of questions it can answer. Basically, quantitative research concentrates on data that can be measured, it is usually effective at answering the “what” or “how” questions on a situation. Questions are relatively direct, and often include phrases such as “what percentage?”, “what proportion?” and “how many?”. (Goertzen, 2017)

Quantitative research allows researchers to learn more about the demographics of a population, measure how many people use a product or service, document trends, study attitudes and behaviors or explain what is known circumstantial. Measurements like counts, percentages, proportions, and relationships provide proof for the variables listed above. Quantitative research aims to be objective, and findings can be evaluated using statistical analysis. It represents complex problems through multiple variables and the results of the study can be summarized or compared.

Findings from quantitative research reveal behaviors and trends. However, it does not provide insights into why people feel, think, or act in certain ways. Quantitative research underlines trends across data sets or research groups, but not the emotion behind observed behaviors. To fulfill these information gaps, qualitative studies like interviews and open-ended survey questions are effective. In addition to quantitative data in the form of a digital survey, the research will provide small portion of qualitative data in form of two open-ended questions in the end of the survey.

Advantages of quantitative research are that findings can be generalized to a specific population, data sets are large, and findings are representative of a population and standardized approaches allow the study to be repeated over time. Main limitations in quantitative research are that specific demographic groups, particularly vulnerable or disadvantaged groups may be difficult to reach, and studies can require data collection over long periods of time and for that reason is very time consuming for the researcher. (Goertzen 2017)

## 2 THEORETICAL BACKGROUND

This chapter will introduce key concepts which create the foundation of the study, as well as identify both current and previous research on the topic. The theoretical background of the research consists of the definition of digitalization, the history and dimensions of digitalization, and the impact of digitalization in the economy and business. At the end of this chapter, globalization and fintech companies are also explained since they have a significant role in digitalization in the finance industry.

Below (Figure 1.), is the theoretical framework for this research. Digitalization is the main topic in this research, and it has made both online banking and globalization possible. Online banking enables investors to buy and sell shares and funds from mobile devices without a visit to the bank. Online banking also provides all the data from the stock market in real time and therefore it is very transparent for investors. Globalization enables Finnish citizens to create bank accounts and customer relationships abroad with the use of internet. Investors can invest in stock markets all over the world and also, they have the opportunity to invest and familiarize themselves with new investment products, such as crypto currencies.

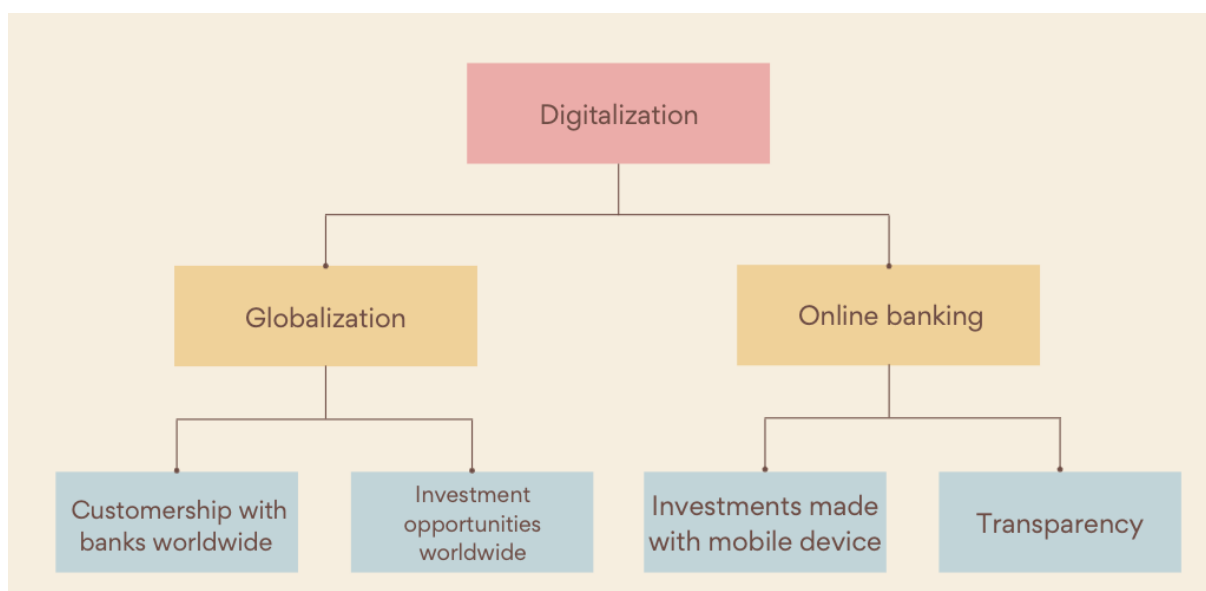


Figure 1. Theoretical framework.

## 2.1 Definition of Digitalization

Digitalization is a term which has been widely used in recent years, but it has no official definition. It is often described through practical examples, but there is no clear definition of the meaning behind it. Obvious examples of digitalization are:

Book → E-book

Department store → Online store

Printed media → Internet's news section

Audio disc → Music streaming services

Digitalization takes place when products, services or processes are reformed to a digital form either partly or fully. In the media, one can read articles about the impact of online stores affecting on the traditional retail stores, new technological miracles, new industrial internet opportunities or the changes in societal structures, all caused by the digitalization. Digitalization is often seen in the form of websites, online stores, digital services, or mobile applications. Digitalization creates new business models, products, services, and processes which will often be beneficial for both the company and the customer. (Koskela & Ilmarinen 2020)

Gray and Rumpe (2015) define digitalization as different technologies integrating all the sectors in everyday life that can be digitized. The impact of digitalization can be seen everywhere, both in private life and in all sectors of the economy. The enormous growth and popularity of social media and also the usage of electronic prescriptions are all enabled by digitalization. (Gray & Rumpe 2015) Another definition of digitalization can be found in Gartner's IT glossary: "Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business." (Gartner 2021)

Verkkokauppa.com, Amazon, Netflix, Spotify, Uber, Facebook, Airbnb, Google and Zalando are all examples of companies founded after the start of digitalization. (Koskela & Ilmarinen 2020) All these companies were established during the digital age, and they have all confidently challenged the traditional companies with new digital business models. An interesting fact about these digital companies is that their business models differ from traditional ones. The

world's largest hotel chain, Airbnb, owns no hotels and the world's largest taxi company, Uber, possesses no cars of their own. Technology companies have transformed many industries and captured markets from traditional companies.

In addition to new companies with digital products or services, business processes of traditional companies are also being digitalized. For example, banks today have an online banking service where customers can complete mortgage applications in electronic form and there is no need for the traditional paper form anymore. These new automatic and electronic systems make the process more efficient for both the company and the customer. (Koskela & Ilmarinen 2020)

The figure below (Figure 2.) demonstrates the number of internet users worldwide from the year of 2005 to the year of 2021. The figure illustrates that increase of active internet users yearly due to easy access to computers, modernization of countries around the world and the increased number of smartphones. Internet is the most used in online banking services, health services such as OmaKanta, and in the governmental applications. (Website of Statista, 2022)

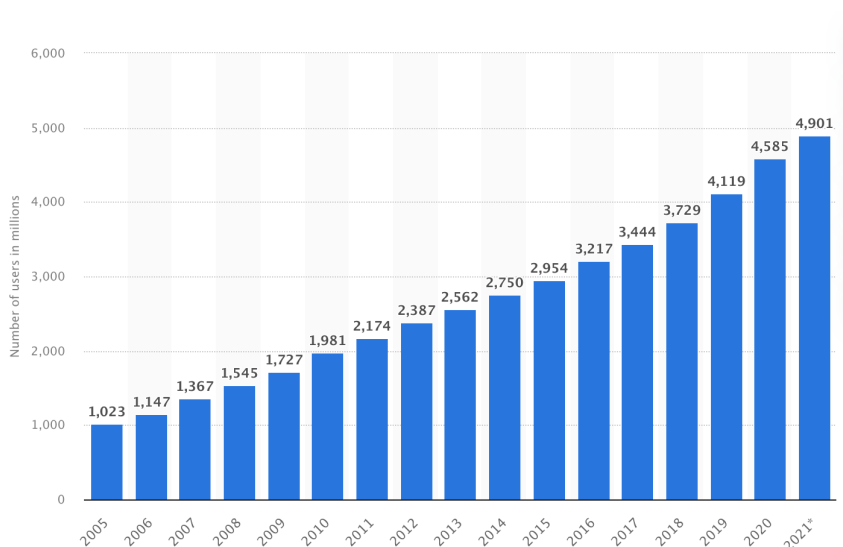


Figure 2. Number of internet users worldwide from 2005 to 2021. (Statista 2022)

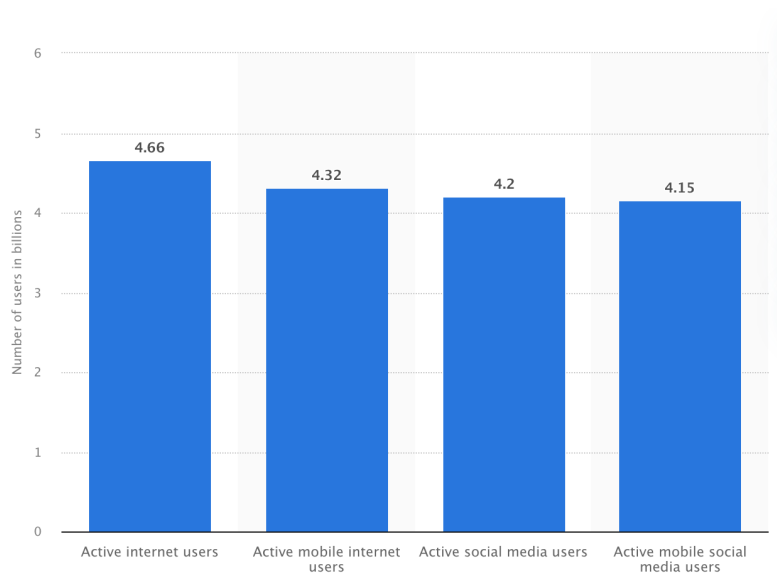


Figure 3. Number of active internet users in 2022. (Statista 2022)

The figure above (Figure 3) shows that the amount of active mobile internet users is increased to almost the same as active internet users in 2021. That is explained with the increased number of smartphones and electronic tablets. The easy access to smartphones and other mobile devices has given the opportunity to use the internet more conveniently and more often. Digitalization and the internet use has led to several different online activities one of them being social networking, where people use platforms such as Facebook to communicate and interact with each other. In 2021, there were over 2.9 billion monthly active Facebook users, which is well over half of internet users worldwide. Connecting with friends and family, online shopping and entertainment and expressing different emotions are the most popular reasons for internet usage. The amount of active social media users is close to the amount of active internet users which also tells about current networking community society. (Website of Statista 2022)



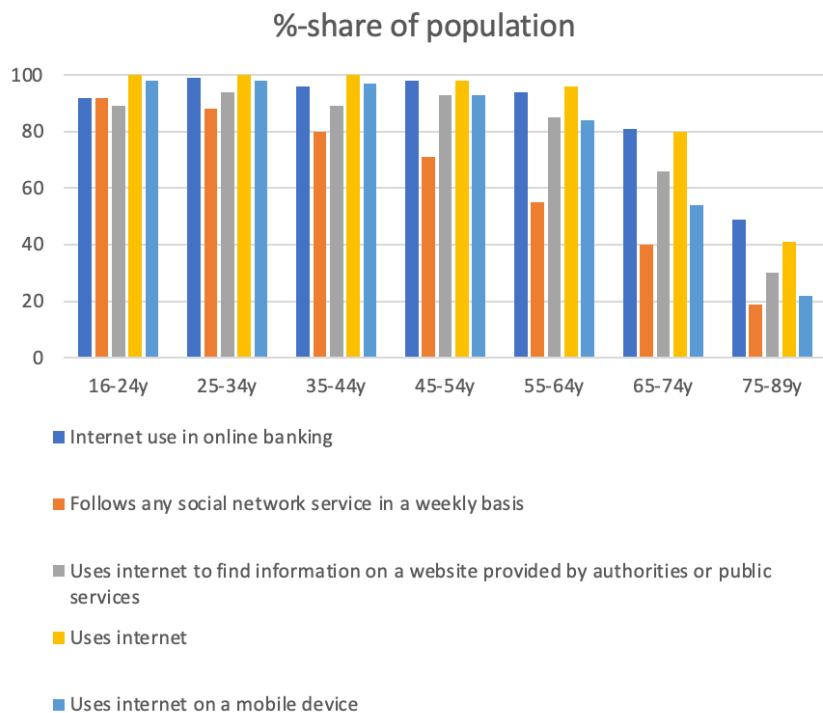


Figure 4. Internet use in Finland by age groups in 2021. (Tilastokeskus 2022, Väestön tieto- ja viestitekniikan käyttö)

Internet services has become a standard practice in everyday life both in households and in workplaces. Nearly everyone in Finland, from the young to the middle-age population, uses the internet and the online banking services (Figure 3). However, it is only in the youngest age group (16-24yrs) where almost everyone uses the internet on a mobile device or follows at least one social network service. The improvement in the ability to use digital services and the affordability of digital alternatives are changing the number of internet usage for older generations as well.

## 2.2 History of digitalization

For thousands of years, the evolution of humanity had been slow until the first Industrial Revolution in the late 1700s. That was the first time the innovations from technology changed the society and the humanity took a major step forward concerning knowledge, population growth, and in the social evolution. Mechanical engineering, chemistry and refinement of metal developed and made it possible to invent new procedures such as producing energy with a steam machine, mass production and transferring people and goods using public transportation. Many scientists believe that digitalization and the internet are the most important factors for technology development since the invention of the steam machine by James Watt in the 1760s which led to the Industrial Revolution. (Brynjolfsson & MacAfee, Pohjola 2014)

The ongoing digitalization can often be compared to the Industrial Revolution in the 1700s with having a transformational effect on society. The change can be described as a revolution when it crosses all the dimensions of human activity by effects on society, culture, and the economy in a significant way. (Kranzberg & Pursell 1967) Computers, smart phones and other digital inventions have the same effect on the human mind as the steam machine had for the man's physical power: it strengthens and expands mental capabilities, and it allows humans to see and understand the environment and the new possibilities around it in a way that has not been seen before. (Brynjolfsson & McAfee 2014, 7.)

Discussions about 'e-businesses' and the 'new economy' that will revolutionize everything started in late the 1990's and in the beginning of the 20th century. Simultaneously, it was the first time when mobile internet and online stores were visioned and tested. Apple changed the markets dramatically in the 20th century when its' user-friendly smart phones found their ways into consumer's pockets. Google permanently renew companies' marketing strategies with their new search engine technology, and the meaning of digital marketing increased rapidly. Still to this day Facebook and Google has managed to maintain their market lead with the portion of annual global marketing budget for both companies is almost one fifth from all the world's companies. (Gerdt & Eskelinen, 2018) The tech bubble that occurred in the late 1990s was a clear drawback for the economy worldwide and it slowed down the digitalization. However, now in the 21<sup>st</sup> century, almost all the innovations visioned in 1990s, has come true. (Koskela & Ilmarinen 2020)

In Finland, the first generation of digitalization happened in the 1990s when the first websites were published. After the websites, the portals arrived, and portals guided the customers into the websites. At the same time portals turned into medias of which became platforms for advertising. One of the commonly known portals in Finland was Sonera Plaza. Simultaneously begun the development for search services and engines. Wwww.fi was the first Finnish search engine that enabled free search. Soon after the first launch of search engines, there were already online stores from new companies and from the existing companies. During this time every tenth household had a mobile phone, and in the late 1990s, the amount of internet connections went up to 60-70% per year. (Koironen, Räsänen & Södegård 2016) However, during this generation nobody really knew the digitalization term yet, people were only talking about e-businesses and the possibilities what to achieve with digital alternatives. (Koskela & Ilmarinen 2020) From the picture below you can see the milestones in the internet age.

Deutsche bank executed research on the topic in 2014, the milestones in the internet age can be seen from the figure below. The main outcome of the research was that there is a need for a new understanding of data and its added value to financial services. This requires adaptation to digitalization strategies. For example, new IT systems will be embedded in existing IT architectures and companies will be able to act on trends and predictions more quickly by enabling the analysis and forecasting of the behavioral patterns of customers, competitors, and business partners. Within the banking sectors, there are opportunities and expertise to innovate something new such as Facebook and Google have invented. However, banks must improve the environment to make room for new innovations in banking sector. Digital structural change is a complex phenomenon with different kind of taxing challenges, it is not exclusively a technological sensation. (Ullman O, 2014)

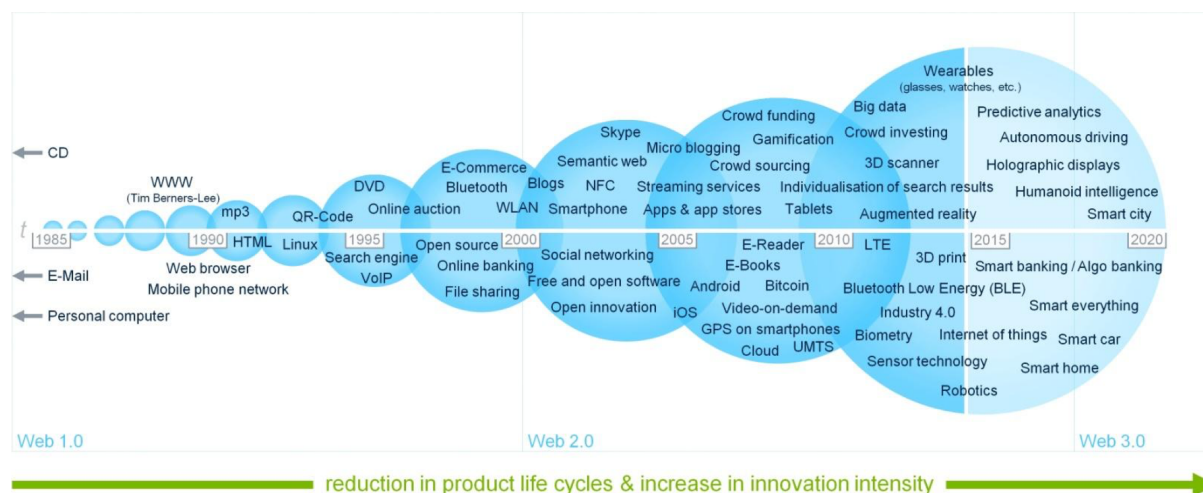


Figure 5. Milestones in the internet age. (Ullmann O, Deutsche Bank Research 2014)

In the 21<sup>st</sup> century in Finland, the digitality, online stores, mobile internet and other factors had a major impact on the operations in all industries. Firstly, the global competition increased rapidly, and the Finnish companies started to compete with foreign ones. The new competitors dominated the traditional markets by providing better services and products than the consumers had been used to. The term digitalization was introduced and taken into use.

The latest breakthroughs in digitalization have been self-driving cars, sensors to follow people's wellbeing especially among senior citizens, and robots which can displace traditional employees in factories. Also, smart homes and basically smart everything are the new trend in the 21<sup>st</sup> century. The important factors in the current stage of digitalization are the increase of intelligence in devices and the ability to communicate with other smart devices as well as the development of automation and robotics.

### 2.3 Digitalization in the finance industry

New technologies are changing the way banks produce and provide financial services. The digitalization in finance brings both benefits and drawbacks to the industry. The first cash machines, electronic debit and credit cards and banking services over the phone were established in the 1980-1990s. In 1996, Finnish bank Osuuspankki launched the first online banking service in Europe, and surprisingly it was the second online banking service in the whole world. (Website of Osuuspankki 2021) In the 2010s, the digitalization and globalization dramatically changed the customer behavior, and until this day, the change has continued in the finance industry and the whole operating environment around it. In 2016, a service called MobilePay was launched, and it allowed people to transfer money by only using the receiver's phone number. The payment is transferred the same day regardless of the bank the customers use. In 2017, the next innovation called Apple Pay, was introduced to the markets and it allowed consumers to have the debit- or credit card to their mobile phone. With both MobilePay and Apple Pay consumers can now pay their groceries by only showing a smart phone or even a smart watch at the cashier. The figure below illustrates the major milestones of the products and services established during digitalization in finance industry.

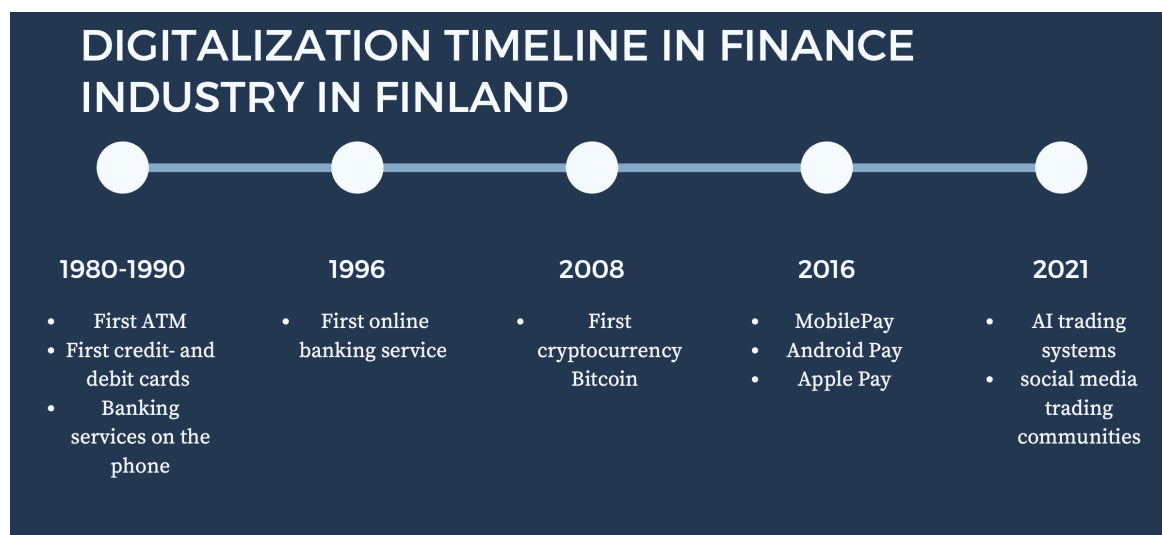


Figure 6. Digitalization timeline in finance industry in Finland. (Source: Author of the thesis)

The online banking service allows banks to receive customers globally, and the competition is high among different banks. The online bank is open 24 hours a day for 365 days a year. Meaning that the bank is always open, and people can check the balance of their account, pay bills, transfer money, and manage their investments whenever they want to and from wherever.

Stocks all over the world can be bought with a few clicks compared to the time before online banking, when shares could be purchased or sold only by walking or calling to the stock market in Helsinki.

Clearly digitalization has brought plenty of flexibility and opportunities for the finance industry, but also it has created severe threats. The number of cyber criminals has increased due to digitalization, and it has increased the amount of account hackings in the finance industry. The criminality is moving on the same direction as the consumers and operations, which is online. For this reason, high-quality cyber security operations are mandatory for both the traditional operators, but also for the new corporations and for consumers. Companies must hire highly educated cyber security staff, take care of their up-to-date knowledge with regular education sessions, and ensure all systems and applications are always updated. Consumers have the responsibility of using antivirus applications and updating the mobile devices and applications regularly. In addition to cyber security threats, online banking credentials have created the threat for misuse and exploitation of elderly and other individuals who are unable to manage their own finances. The confiding senior citizen can be easily defrauded with online banking IDs by a credible neighbor, relative or even a spouse.

According to Tilastokeskus, nearly every third Finn owned listed shares or mutual funds in 2020. Approximately 1.7 million persons owned listed shares, mutual funds, or both in Finland in 2020. The amount correlates to around 31% of the housing population in Finland. The number of investors grew by 107 600 from the year before, while from 2014 to 2019 the number of investors grew by in average of 42 400 persons per year. The explanation to the significant increase in the number of investors is the introduction of equity savings accounts, in Finnish '*Osakesäästötili*'.

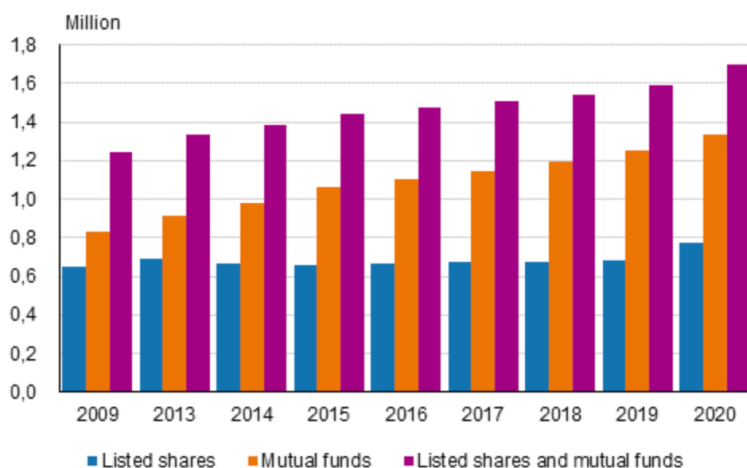


Figure 7. Number of people owning listed shares, mutual funds, or both. (Website of Tila-stokeskus 2022)

The idea behind equity savings account is that one can buy and sell shares without having to pay the tax for single sales when the money stays in the equity savings account. Also, dividends and interests are not taxed in that point when they arrive to the account. The owner of the account pays taxes of the revenues in the equity savings account when taking money out to another account. There is a deposit limit of 50 000 euros to the account and it does not matter whether a person places the amount there at once or in smaller portions. The idea behind is that investors can sell shares or receive dividends and invest it again without paying any taxes of the revenue in the meantime. The tax advantage of equity savings account is so great that the number of equity savings accounts are limited with only one account per person. A fine will be charged if one has opened more than one equity saving accounts. (Website of Vero 2022)

In the future the best will perform certain companies, that can combine people digital applications, effective operations, and global mindset when responding to customers' needs. Individual banks can succeed in the competition by growing the productivity of the work by utilizing digital technologies. In succeeding to do so it will maintain the viability of the business, maintain workplaces, and promote employees' well-being at work. In finance industry, there are three key ways to perform well in the competition. The first is to constantly develop and design the existing and new services. It doesn't need to be huge improvements; often big ideas form accidentally when fixing the small problems. Second way is to improve personnel's abilities, knowledge, and operations. The competence needs to meet with being able to serve customers in digital form with giving the same value to the customer than in traditional form. Expertise

and trust are the traditional competitive advantages in finance industry. The importance of these qualities' highlights when the amount of information increases due to the digital channels. The information that banks provides needs to be processed in the most valuable and reliable form possible. It is a challenge to find operation ways to compete the banks employees' expertise with fixed 9-5 working hours to the internet that is open all the time. There is a need for flexible working hours and hybrid work environments. (Pohjola M. 2015)

## 2.4 Fintech – The digital evolution in the financial sector

Fintech, or financial technology, has transformed financial services through innovative technologies, products, and business models. As discussed before, financial innovation is being supported by specific technological advances, such as smart phone applications, internet, artificial intelligence, and distributed ledger technology. (Allen et al. 2021) These new technologies affect to the way traditional bank produce and provide financial services, as well as bringing new fintech companies and other big tech competitors to the production and generation of financial services. Fintech competes against traditional financial banking methods and old institutions with new technology-thinking services and products.

Fintechs are new form of banks which offer the same kind of services than the traditional banks, for example payment services, investment advising and financial consulting. The difference to traditional banks is that they are not regulated to follow the same rules used by the central banks to secure the banking system, and this causes risks for consumers as well as the banking industry itself. The Fintechs use cheap and convenient ways to interact and consult customers and this causes problems with the confidentiality and cyber security. This problem affects both traditional banks and fintech companies in a way that they can cause online thefts, money laundering and many other crimes to the consumers if they do not pay attention to the protection of data of their clients. This is a significant problem for traditional banks, since they do not have a monopoly on digital technologies, and they can be displaced by fintech companies at any time. The Fintechs are more flexible having less operational costs since banks have fixed expenses on physical offices, salaries of employees etc. (Murshudli, Loguinov 2019)



The new competitors are not reinventing the banking industry. However, they do know how to utilize modern data analysis methods and numerous personal data sets to individualize certain financial services digitally in a way that the outcome is better for internet-savvy customers in particular. Some Fintechs try to predict what their potential customer wants and send them personalized offers on it. These offers are often 100% digital services such as payment solutions or any kind of banking products. Moreover, they integrate their sales and advisory channels so that the customer can no longer tell difference between online and offline. This means that traditional banks have the risk of losing significance in the market of standardized and local services in the future because these are passed along to the end of the value creation process, and banks now only perform the transactions in isolation – without the possibilities of contacting customer in the other phases, like in origination phase.

Fintech start-ups are usually digital natives who want to change banking with functionalities, simplicity, big data, accessibility, agility, cloud computing, personalization, and convenience. The aim of Fintech companies is not only to improve the financial consumer experience but also to change the way people pay, transfer money, lend, borrow, and even invest. For example, a very popular company PayPal is one of the world's first and most valuable fintech companies by utilizing emerging technologies and it reshaped and basically created digital payment services with mobile transfers and payments. Another examples of Fintech companies are Patreon and Robinhood. Patreon is one of the first fintech crowdfunding platform created to help artists to receive funding. Robinhood is a mobile stock trading app that reshaped and eased investing accessibility with quick access to trading and it offers commission-free investing.

Fintech should not be confused with regular digital banking services. The differences between Fintech start-ups and digital banking are that fintech's core premise is to improve the customer experience on the financial industry by delivering trust, personalization, transparency, and simplicity to consumers with increased technological efficiency. Digital banking aims to provide faster and improved customer experience, but it is integrated with legacy banking who traditionally focuses more on security, trust, capitalization, and customer indifference. Fintech utilizes technologies such as artificial intelligence, automation, machine learning, cloud computing, blockchain, and robot-advising to reshape the regular functions provided by the regular bank. (Puntillo P, 2021)

## 2.5 Globalization

Globalization is a social, economic, cultural, political, and also a legal phenomenon. Globalization means the spread of products, information, technology, and jobs across national borders and cultures. In economic terms, it refers to the interdependence of nations around the world justified to free trade. Globalizations refers to those processes whereby geographically distant events and decisions impact local activities and life in general. A second definition of globalization is based on Clark and Norris, “Globalization describes the process of creating networks of connections among actors at intra- or multi-continental distances, mediated through a variety of flows including people, information and ideas, capital, and goods. Globalization is a process that erodes national boundaries, integrates national economies, cultures, technologies, and governance, and produces complex relations of mutual interdependence.” (Clark & Norris, 2000)

The way globalization influences our daily lives is a complicated issue. Globalization progressed rapidly for years, and it was difficult to believe it would be seen as a negative issue. However, in 2018, US president Donald Trump re-introduced tariffs and started tariff wars. Trump kept his election campaign promises and did what many people did not believe a Republican president would do, namely, introduce protectionist policies. Trump also alarmed his Western allies at the G7 and NATO summits, raising the question of whether new political alliances are ever to be established. During that time, the citizens of the United Kingdom voted to leave the European Union. The United Kingdom and the European Union negotiated a withdrawal agreement called Brexit. It can be said that a new era of globalization started in 2018. (Cygli & Haelg & Potrafke, 2019)

To measure the consequences and causes of globalization in detail, there is a need for a tool to measure globalization. Single indicators, such as trade as a percentage of GDP are usually used as a measure of globalization. However, globalization is a versatile concept that encompasses much more than openness in trade and capital flows. It includes governments working together to prevent political problems and citizens from different countries communicating with each other and exchanging information and ideas. Indicators such as the KOF Globalization Index are relevant since they allow combining different variables, measuring different aspects of globalization in one index. A country’s ranking in the globalization index is defined by the countries position in the three aspects of globalization: the economy (60 percent), social dimensions (20 percent) and politics (20 percent). The economy aspect uses indicators for cross-border ties in

the areas of trade in services and goods and also wages and capital flows. The transaction metrics include capital controls and transaction restrictions. The political aspect takes under account the number of international treaties or membership in international organizations. The social dimension uses indicators for cultural presence and personal contacts among other indicators.

The KOF Globalization Index, introduced by Dreher in 2006, and updated version in 2008, measures economic, social, and political dimensions of globalization. Globalization has been on the rise since the 1970s, particularly after the end of the Cold War it begun to arise. (Cygli & Haelg & Potrafke, 2019) From the index we can see which countries benefits most from globalization.

As can be seen from the figure below, Finland's globalization index in 2019 was 87.68 and whole world's index was 61.59. (KOF Swiss Economic Institute) According to German research institution Bertelsmann Stiftung, Finland is one of the leading countries that has had economic value due to globalization. In 1990 – 2016, Finland has received economic benefit from globalization 36 664 euros per citizen, according to the German research. Before Finland there are only Switzerland and Japan, whereas Switzerland has gained almost 50 000 euros in economic benefit. The Bertelsmann Stiftung research was conducted with 42 different countries, which GDP equates 90 percent of the whole world's GDP. (Kokkonen Y, Yle 2018)

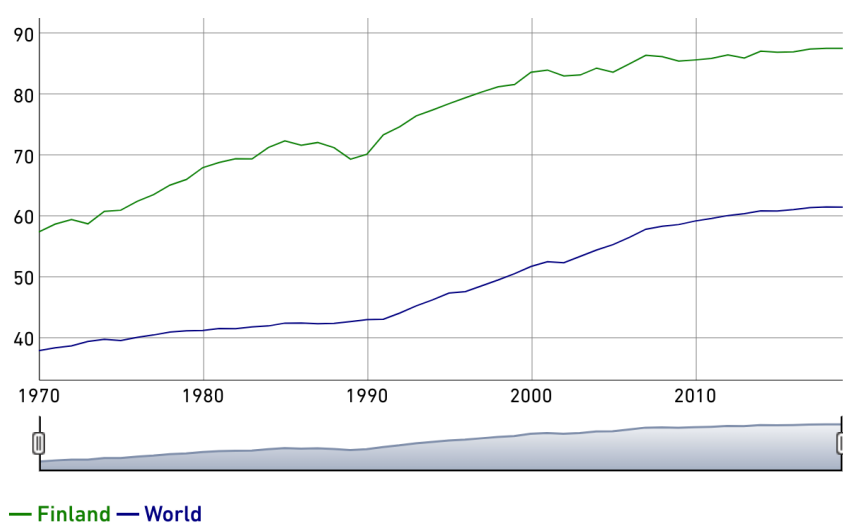


Figure 8. KOF Globalization index Finland compared to rest of the world. (Source: KOF Swiss Economic Institute 2022)

From the next figure can be seen the comparison with Finland's globalization index to Switzerland's, the difference in 2019 is 2.77 units. Switzerland is the 'globalization champion' since no other country achieved the highest globalization index points from 1990 to 2019.

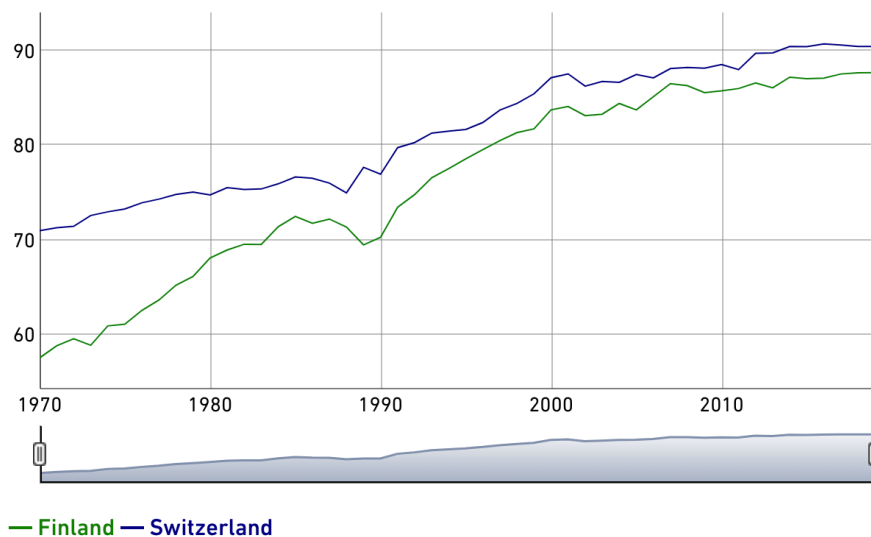


Figure 9. KOF Globalization index Finland compared to Switzerland. (Source: KOF Swiss Economic Institute 2022)

Globalization has made it possible to Finnish citizens to not only work outside Finland but also create bank accounts abroad and invest to foreign companies. According to the website of EU, EU citizens can open a bank account in any other EU country they wish for. Banks cannot deny opening an account for the reason being that the customer lives in another EU country. The rights that EU citizens have for banking services include cash deposit, cash withdrawals, money transfers, debit/credit card and online banking services. Only reason bank can deny opening the account is money laundering and terrorism threat. (Website of European Union, 2022)

Due to globalization and digitalization, Finnish investors can easily buy a share from Apple or a share of Samsung from one click. However, there is always a currency risk and cost of currency exchange when buying or selling a share that is in other currency. Also, the costs for commission can be higher on the shares listed to foreign stock market and the taxation is different from the domestic shares.

For investor, it is important to know the companies and their investments, and also the globalization possibilities and threats they might have. For example, a famous Finnish publicly traded company Fortum has a long history of over 60 years of producing energy in Russia and they have over 7000 employee and 12 power plants in Russia. (Website of Fortum) However, in February 2022 when Russia invaded Ukraine and the whole Europe turned against Russia, Fortum had to stop all the new investments to Russia and reduce the operations there. The value of Fortum share has suffered due to the Russia risk and the company has lost trust among investors. Fortum has totally over 5.5 milliard invested to Russia and due to the world's situation right now, they will have very difficult times ahead for the next years.

### 3 NEW DIGITAL INVESTMENT PRODUCTS

When it comes to investing, many still rely on the traditional ways of investing. In order to change the status quo, it requires time, effort and most importantly a legitimate solution for a problem. With the digital world governing more of our daily lives, investing has become more and more attainable. In this chapter, there will be brief explanations on few of the most popular investment products in the digital age.

#### 3.1 Crypto currencies

Currency is any clearly identifiable object of value that is generally accepted for payment of goods and services. Someone or a group of people using the name ‘Satoshi Nakamoto’ introduced the first crypto currency called Bitcoin in the fall of 2008. The very first crypto currency went live in January 2009. Bitcoin has been considered as the ‘digital gold’. The supply is created through Bitcoin mining which is the process of computers solving complex mathematical algorithms called blockchains. Bitcoin soon triggered the creation of all other digital currencies, collectively referred to as ‘Altcoins’. After the launch of Bitcoin, several ‘Altcoins’ soon followed, including Ethereum, Litecoin, Ripple and more than thousand other coins and token launched over the next decade. Many Altcoins were created to target a specific weakness that Bitcoin has such as transaction speed, energy use or privacy. In April 2013 Bitcoin hits the value of \$100 and later that year in November it hits the value of \$1000. In 2020 a globally known online payment system PayPal announces service to buy, sell and hold crypto. As of late 2020, over 18 million Bitcoin are in circulation. In November 2021 Bitcoin hits the all-time high over \$68,000 on November 2021. (Ashford, K & Schmidt J. 2022)

The advantages of crypto currencies are freedom of payments, meaning no bank holidays, orders, or capital controls. It eliminates the need for third party intermediates in peer-to-peer transactions. Negotiable or lower transaction processing fees than in traditional bank wire transfers, uses blockchain where every single transaction is stored and verified. (Ashford, K & Schmidt J. 2022)

The disadvantages are that it is not yet widely accepted as payment, although this is evolving over the time. Not all currencies last which can lead to total loss of invested money to the particular crypto currency. Crypto currencies are also highly volatile which means the value of the currency is likely to change suddenly and unexpectedly. However, from the picture below we can see new data about Bitcoin and stocks during the Ukrainian war in February 2022. Bitcoin is a highly volatile asset, and it can move many percentages up or down in a day but on 24<sup>th</sup> of February when Russia invades Ukraine, Bitcoin price surprisingly arise in comparison to U.S. dollar a lot more than stocks did during the same time. (Reuters 2022)

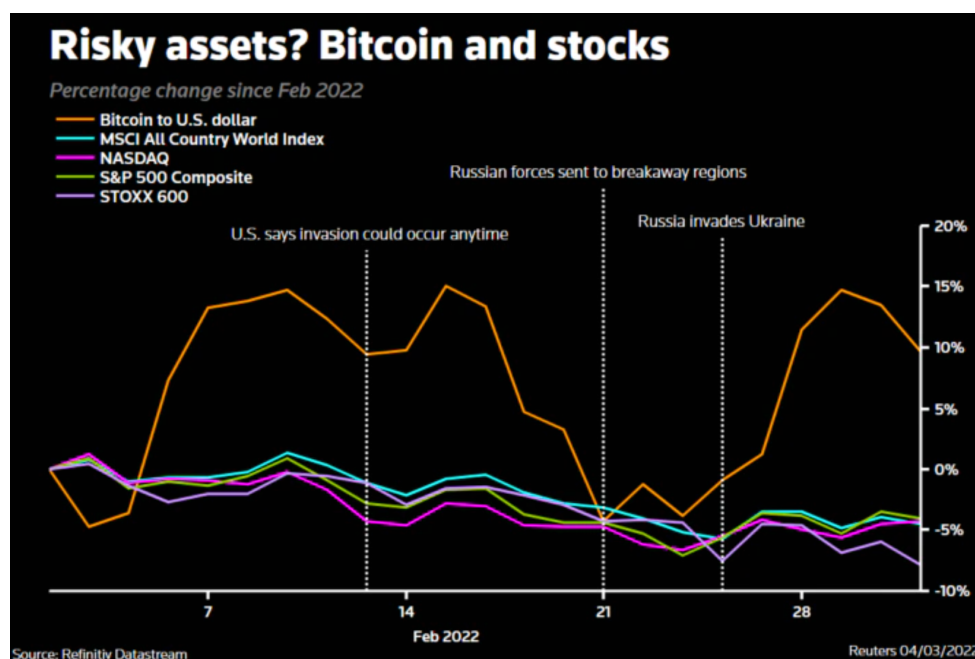


Figure 10. Value of Bitcoin compared to stocks. Source: Reuters 2022.

Crypto experts see bitcoin as ‘digital gold’, a convenient place to store cash during war or disaster. Bitcoin as well as gold, has a limited supply and this might be the reason people seem to rely on it in crisis situations. Bitcoin runs on a global computer network beyond the government reach and therefore it can be seen safer option during crisis than traditional currencies. The picture below illustrates that while the gold has expectedly arisen during the fear of war and after the Russia’s attack, also Bitcoin as a digital gold has had big movements and totally, it has gone up more percentages than traditional gold has during the Ukrainian crisis.

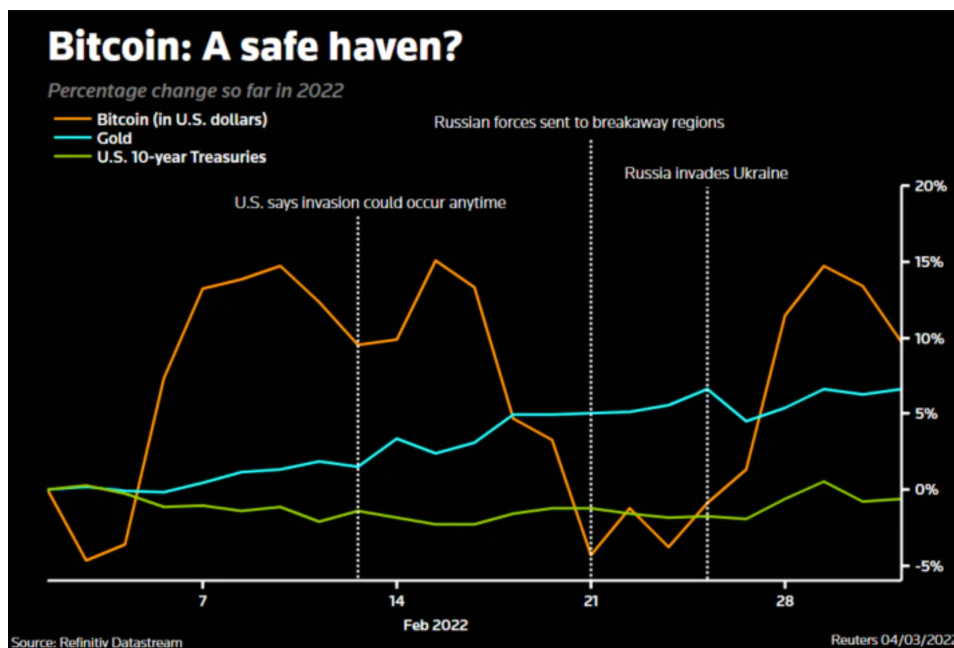


Figure 11. Value of Bitcoin compared to Gold and Treasuries. Source: Reuters 2022.

Cryptocurrencies can be purchased either on peer-to-peer networks or cryptocurrency exchange platforms, such as Binance, Coinbase or Coinmotion. One cryptocurrency marketplace is based in Finland, which is Northcrypto. Northcrypto is a regulated entity registered with the Finnish-Financial Supervisory Authority. The development of Northcrypto is partially funded by the European Regional Development Fund. Northcrypto provides less available currencies than the above-mentioned international competitors, at the moment investors can buy and sell Bitcoin, Ethereum, Litecoin, Chainlink, Aava, Polygon and USDC in Northcrypto's platform. (Website of Northcrypto 2022)

In addition to the ability of using crypto currencies as a payment method, it can be an investment opportunity too. The assets can increase in value while investor holds them without plans of selling them, and that creates an opportunity to utilize also crypto lending. Crypto lending indicates a type of Decentralized Finance that allows investors to lend cryptocurrencies to different lenders. In this form of investing, investors receive interest payments in exchange, also called 'crypto dividends'. The interest rates differ depending on the currency, time, and platform. Even though crypto lending can seem like a simple way to earn passive income, it still includes a high risk of liquidation of assets. (Binance Academy, 2022)



### 3.1.1 Blockchain

Blockchain is distributed, synchronized and immutable digital ledger for recording information. It is appended only since there is no deletion or modification possibility. Blockchain is not maintained or updated by a single authority. It creates chronological chain of blocks and therefore it is named as a blockchain. Each block contains a list of transactions bundled together. Also, other data such as medical records, property agreements can be included in the block. Many blocks participate in updating the ledger and the consensus algorithm is used to achieve agreement on a single data value among distributed systems. Blockchain helps responsible service design by ensuring security, transparency, accountability, and trust. (Blockchain Training Alliance, 2022)

The first block is called a genesis block. Each block is timestamped, and each new block refers to the previous block. With cryptographic hashes and timestamp, a blockchain creates immutable data. Miner nodes bundle the valid transactions into a block and miners need to solve a cryptographic puzzle to find the new block and inform to the other miners in the network. This process is known as ‘proof of work’ and it requires significant computing power. This is the consensus algorithm used in Bitcoin. Each block contains the following information: the reference to the previous block, the proof of work signature (nonce), timestamp and all the transactions included in that block. Blockchain is decentralized by design, meaning it aims to be an open source, permissionless, transparent and operates without any central authority. (Blockchain Training Alliance, 2022)

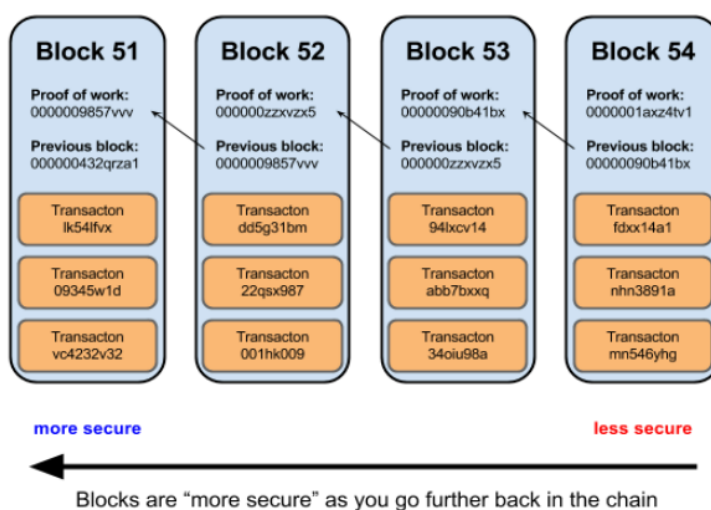


Figure 12. Example of a blockchain. (Blockchain Training Alliance, 2022)

Smart contracts are computer programs that execute predefined actions when certain conditions within the system are met. These contracts provide the language of transactions that allow the ledger state to be modified. They can facilitate the exchange and transfer anything of value, for example shares, money, content, or property. There are no regulatory guidelines on smart contract, ICOs, or even crypto trading. (Blockchain Training Alliance, 2022)

### 3.2 Artificial intelligence

As we live in the middle of the new digital age where digitalization and artificial intelligence have a massive impact on the economic, political, and social aspects of life. It is almost impossible to avoid the media coverage and public discussion concerning artificial intelligence. However, 1500 senior business leaders in the United States were asked about AI in 2017, and only 17% replied they were familiar with it. (Darrell M. & Allen J. 2018)

For some, artificial intelligence is about artificial lifeforms that can surpass human intelligence and for others, almost any kind of data processing technology can be called artificial intelligence. What is this ‘the engine’ of digital evolution called artificial intelligence and what kind of intelligence is behind the term?

One could think since the usage of artificial intelligence is growing rapidly, the phenomenon would be widely known and easily defined. After all, there are clear definitions to all other breakthrough technologies like internet, electricity, and computer processors. However, this is not the case with artificial intelligence. Artificial intelligence is not a single phenomenon or process, it is a large amount of different research problems and the technologies used to solve them. Actually, it could be called as the field of science. There is no simple and universally applicable definition for artificial intelligence that could say whether any computer program or digital service is artificial intelligence or not.

In a general, artificial intelligence can be defined as a field of science, which studies artificial systems and devices, of which activities seem to require intelligence. Gartner’s IT glossary defines artificial intelligence: ‘Artificial intelligence (AI) applies advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate

decisions, and take actions.’ (Gartner Glossary 2022) AI involves using computers to execute tasks that traditionally have required human intelligence. A better way to describe AI other than definitions are to list properties characteristic to AI, such as autonomy and adaptivity. Autonomy refers to the ability to perform tasks in complex environments without constant guidance by the user. Adaptivity indicates the ability to improve performance by learning from experience. (Darrell M. & Allen J. 2018)

The difference between AI and regular programming is that regular programs define all possible scenarios and operate with only particular scenarios. AI teaches a program for a specific task and allows it to improve and explore more on its own. A successful AI system knows what to do when encounters unfamiliar situations. For example, it is impossible for Microsoft Word to improve on its own, but facial recognition software can improve the longer it runs at recognizing faces. (Shroff R, 2019)

Using AI, it requires a large amount of data. AI algorithms are trained by utilizing large datasets to identify patterns, make forecasts and recommend actions, similarly like a human mind would but just faster and better. Still not even the best AI system cannot compete with human brain in some situations. While certain AI is designed to mimic the human brain, today’s AI is only good at quite a narrow range of tasks. AI has the power of applying massive computer power to a narrow set of methods and data. However, human brain can apply medium computing power to relatively wider set of methods and data. To summarize, brains can be applied to almost anything while AI can only specialize in certain issues. (Shroff R, 2019)

Consumers interact with AI daily in both personal and professional lives: task automation, customer support chat bot, self-driving cars, flying drones and delivery robots all require a combination of AI techniques. Searching and planning to find a best possible route from A to B, computer vision to identify possible obstacles, and decision making under uncertainty to deal with the complex and changing environment. Each of these events must work almost flawlessly to avoid accidents. Over time, road safety should improve as the reliability of the systems surpasses human level. Also, the efficiency of logistics chains when transferring goods should improve. Ultimately humans move into supervisory role, observing while machines take care of the human’s work.

Another example of intelligent AI systems can be seen on social media. A great amount of information people see during the day are personalized. The algorithms that determine the content one see are based on artificial intelligence. For example, online advertisements in Facebook, Twitter and Instagram, music recommendations on Spotify, movie recommendations on Netflix and on other streaming services are all personalized by artificial intelligence. Many of the online publishers such as newspapers and search engines such as Google also personalize the content they offer. While the frontpage of the printed version of *The New York Times* or *Helsingin Sanomat* is the same for all readers, the frontpage of the online version can be different for each user. Also, Facebook uses AI to recognize faces, after photo upload it creates a box around the faces in the photo and suggests friends' names to tag. (Shroff R, 2019)

While there have been discussions about mobile payment providers such as MobilePay or Alipay, Alipay is moving on to next level by introducing face-based payments. The customers no longer need to show their phones to the cashier, only their face and the AI system recognizes it and reduces the money from their bank account. Alipay's Dragonfly facial recognition system has expanded to over 300 cities in China. Businesses from supermarkets to bakeries have taken the advantage of the system to hasten customer payments and saving on cashier staff expenses. The facial recognition technology is a key component of the design together with updated POS system design boasts an updated processor and an integrated 3D infrared depth camera to ensure accuracy. According to statistics, the entire process of scanning the face takes less than 10 seconds and users do not have to remember anymore passwords, which reduces the difficulty of use, especially for elderly. The problem during the covid-19 pandemic was the fact that people had to wear mask at the stores, and it made the face scanning and payment situation more difficult. (Shroff R, 2019)

In the investing world, the same phenomenon with AI technologies can be identified. Traditional portfolio manager can be replaced with AI trading bots and funds can be managed with automated orders. Also, investors can invest into companies that utilize artificial intelligence in their operations. For example, a popular Swedish investment bank called Nordnet, offers two artificial intelligence investing products, WisdomTree Artificial Intelligence UCITS ETF or Xtrackers Artificial Intelligence & Big Data UCITS ETF. Both funds are exchange traded funds and ETFs provide the opportunity to track the performance of companies engaged in artificial intelligence and invest in them. (Website of Nordnet 2022)

### 3.3 Non-fungible tokens

NFT stands for non-fungible token. A non-fungible token is built using the same kind of programming as cryptocurrencies Bitcoin and Ethereum, but there the similarity ends. Non-fungible tokens have become more common during the year of 2021 and in the beginning of 2022. From art and music to tacos and concert tickets, these many kinds of digital assets are selling for millions of dollars. There are many opinions about NFTs, and some experts believe NFTs are long-term assets and change investing forever, while others claim they are more like a momentary trend.

An NFT is a digital asset that represents real-world objects such as art, music, entrance tickets and videos. (Forbes 2022) NFTs are bought and sold online using crypto currencies and are generally encoded with the same software as many cryptos, most commonly they use the Ethereum blockchain. NFTs have existed since 2014 but have recently gained notoriety since becoming an increasingly popular way to buy and sell digital artwork. Since November 2017, a staggering \$174 million has been spent on NFTs. (Forbes 2022) NFTs are generally one unique and artists usually produce limited number of objects to sell. “Essentially, NFT’s create digital scarcity”, claims Arry Yu, chair of the Washington Technology Industry Association Cascadia Blockchain Council and managing director of Yellow Umbrella Ventures.

Physical money and cryptocurrencies are ‘fungible’ which means they can be exchanged or traded for one another. They are equal in value; one Euro is always worth another Euro and one Bitcoin is always of equal value to another Bitcoin. NFTs are different, each having a digital signature that shows all the previous owners of the token, making it impossible for it to be exchanged equally.

Blockchain technology and NFTs enable artists a unique opportunity to monetize their artwork. For example, artists no longer need to rent galleries or auction houses to sell their art. Instead, they can sell their artwork directly to a buyer as digital art (NFT), which leads to an increase in the profit share for the artist. In addition, NFTs often include a royalty, meaning that original artists receive a percentage of sales whenever their NFT is sold to a new owner. This feature is attractive as artists usually do not receive royalties after their art is sold at first time.

Many brands have already shown that art is not the only way to make money with NFTs. Charmin and Taco Bell have actioned off themed NFT art to collect funds for charity. Charmin announced it was offering “NFTP” (non-fungible toilet paper), and Taco Bell’s NFT art sold out in minutes with the highest bids of 1.5 WETH (wrapped ether), which was equal to 3 161 euros at the time of writing. An NFT called Nyan cat, a GIF of a cat with a pop-tart body, sold for nearly \$600,000 in February 2021. NBA Top Shot received more than \$500 million in a sale in March 2021. A single LeBron James NFT made from a highlight of him blocking a shot in a Lakers basketball game profited more than \$200,000. (Forbes 2022)

Consumers have long had emotional and aesthetic value to physical goods, e.g., baseball cards, paintings, and they have been willing to pay a large amount of money to receive them. Before NFTs, digital media had not had the same value because it can easily be shared or copied. However, blockchain technology has changed that. NFTs are based on the technology to designate an official copy of a piece of digital media, allowing artists, influencers, companies, and musicians to make money selling digital goods that would otherwise be inexpensive or even free. (The New York Times 2021) NFTs are similar to traditional physical collector’s items, only in digital form. Instead of receiving an actual piece of art to hang the wall, the collector receives a digital file instead. NFTs can have only one owner at a time and the blockchain of NFTs makes it easy to verify the ownership of the token. Popular NFT marketplaces are OpenSea.io, Rarible and Foundation.

Different types of NFT buyers exist in the market; some are collectors and fans who show off their purchases on social media or on screens around their homes. Twitter profile picture is a common place for people to show off their rarest and the most expensive NFTs. Others are trying to receive profits fast by minting (buying) NFTs from the pre-sale and then selling them for a higher price on the secondary market. Many thinks of this as a form of entertainment that includes gambling, investing, sports card collecting and day trading. (The New York Times 2021)

#### 4 INFORMATION RETRIEVAL IN DIGITAL ENVIRONMENTS

Information retrieval is an essential activity and now with all the information packed in internet, it is a necessity in a growing number of human activities. Information retrieval refers to finding information of a text or video that satisfies an information need from within large collections, usually stored in computers. (Dinet J, 2014) Information such as an address, a number, a time slot, or a name are searched daily in various digital environments of constant evolution, e.g., GPS, mobile device, website. Information retrieval exists in many possible scenarios such as web search, e-mail search, searching on laptop, corporate knowledge bases and legal information retrieval. The aim is to retrieve documents or information with relevant data to the user's information need and help user complete a task. Almost all human activities require information retrieval in increasingly digital environment: learning, navigating, communicating, informing, and decision making. Beginning from childhood, most human activities are linked with the ability to search quickly and effectively for relevant information for executing important task: passing an examination, finding a job, investing, voting, or being socially connected. (Dinet J, 2014)

Information retrieval is a compound activity which typically requires writing, reading, memorizing or decision making and as these activities are cognitively complex and corresponding to areas of scientific research on their own. The same query in a search engine on the web gives multiple different results in a few seconds. The process of information retrieval is repeated since the knowledge and behavior of the user are constantly changing at the pace of information returned by the information system. (Dinet J, 2014)

In 1998, the first Google index had approximately 26 million web pages. In 2008, the number of web pages was already a thousand billion. Since then, the number of web pages has no longer been counted and only the number of online sites can be calculated. In 2021 there was 1.88 billion online websites. Figure 13. illustrates the number of online websites as of August 1991 until August 2021. The figure also provides the milestones when internet services such as Yahoo, Google, Facebook, YouTube, and Instagram were established. (Website of Statista 2021)

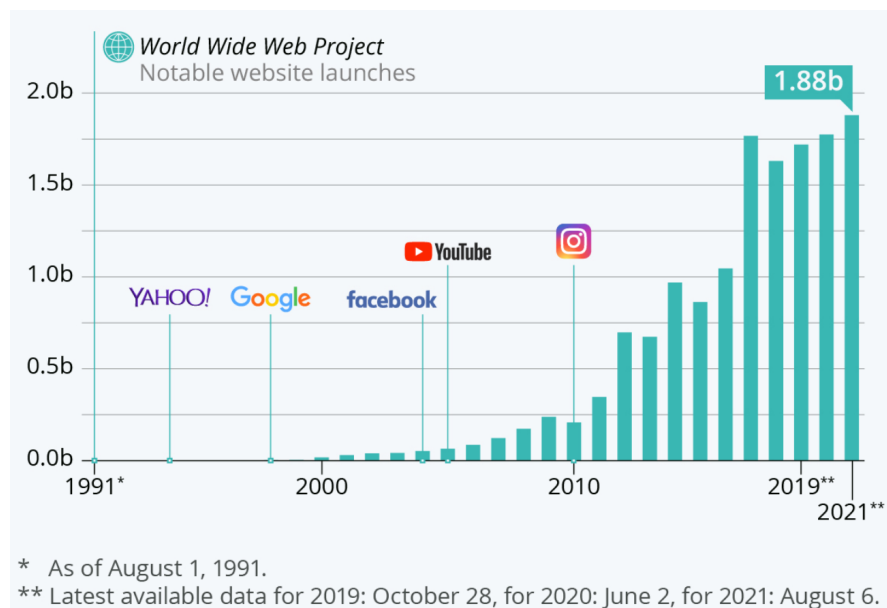


Figure 13. The number of online websites. (Website of Statista 2021)

#### 4.1 Information overload

The term Information overload often occurs while discussing about information retrieval. Information overload was invented by social scientist Bertram Myron Gross, who described it as a phenomenon wherein a system or a person lacks the capability to process a large volume of data. The term is commonly used in computer theory, but it can also be used examining the human capacity to absorb and apply information. (Goyeneche R. 2020)

Information overload happens when human's cognitive abilities are overwhelmed, and it impacts humans in many ways. It can distract from the initial task, and it usually reduces productivity. It restricts our natural thought processes, including logic, creativity, and innovation and also creates action paralysis, trapping us in a research cycle that usually distracts us from making decisions.



The time people spend on media is constantly increasing, the average time spent on media in the United States has increased by one hour per day since 2011. In 2019, the average time spent on the media was 12.5 hours per day, which is over half of the entire day. (Goyeneche R. 2020) Media provide both relevant and irrelevant information to people. The reason for the increase in daily media time is the increasing number of smart devices in the developing world's population.

From a cognitive viewpoint, the issue is that most of us cannot effectively multitask. According to studies, 98% of the population are not able to concentrate on more than one thing at a time. Our attempts to process the persistent barrage of information is forcing us to do exactly that. However, it unfortunately damages other pursuits. The fact is that nowadays there is too much information available. Mobile devices, computers, radio, television, and print media provide data and statistics to people nonstop. Ultimately, it takes too much time to effectively determine which information is reliable and useful and which is not. The problem with the internet and information is that there is no simple methodology to separate the wheat from the chaff. (Goyeneche R. 2020)

People often feel obligated to consume all the information they are receiving, and the information overload effects directly to the personal well-being. Managing large amounts of data not only impacts the cognitive processes, it also can increase the production of cortisol and adrenaline which can lead to symptoms such as headaches, irritability, and nausea.

In investing perspective, information overload occurs most-often in a time of crisis, e.g., during the covid-19 pandemic and now during the Ukrainian war. Media create headlines and stories about topics that interest people. Usually political, economic and health related news interests a large portion of the population. Second information overload situation occurs often to new investors who seek for investment advice from the internet. By typing “achieving your financial goals” into a search engine such as google, over 100 million results are found in less than a second. Many financial services or financial advice providers attract consumers with a large amount of information, insisting that would be all one need to achieve financial independence.

## 4.2 Financial literacy

Financial literacy refers to the understanding of different financial components and skills such as investing, budgeting, borrowing, insuring, taxation, and other personal financial management skills. United States Treasury's Financial Literacy and Education Commission defines financial literacy as "The ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial wellbeing". The absence of such skills is defined as being financially illiterate. Lack of financial knowledge can be seen as difficulties in major financial decision-making situations such as opening the right bank accounts, planning for retirement, and paying off debts from loans or credit cards. According to the Financial Literacy and Education Commission, financial literacy consists of five key components: earn, spend, save, and invest, borrow, and protect. (U.S. Department of the Treasury, 2008)

The Bank of Finland wants to increase the opportunities for citizens by providing the toolset to manage their own finances better. Everyone in Finland should know how to spend rationally and have the abilities to manage the financial risks in their everyday lives.

In February 2020, The Bank of Finland, the Ministry of Justice and other key authorities initiated a coordination of activities to promote financial literacy for Finland's national strategy. The national strategy for financial literacy has taken under consideration the starting level of Finn's financial literacy, the conditions appearing in the markets and the occurring societal situation. The mission behind the strategy is to teach people understand the importance of personal finances and to give recommendations on how to handle finances in an ethical and sustainable way. Improving the financial literacy of citizens will generate wellbeing for all sectors in the national economy. For individuals, it can result on improving ability to conduct better financial decisions and avoid poor ones. Digital services can be used to reach large number of people efficiently and affordably. In practice, financial literacy is promoted through training, visits, meetings, events, guides, tools, games, and websites arranged for different target groups. The vision for Finns' financial literacy is to become the best in the world by 2030 and the vision considers the different aspects of private finances, everyday spending, financial planning, purchasing, borrowing, saving, investing, and insuring, and the skillsets required in them. (The Bank of Finland, 2021)

### 4.3 Bounded awareness

The phenomenon called bounded awareness occurs when cognitive blinders prevent a person from seeing, seeking, using, or sharing relevant, easily accessible, and readily perceivable information during the decision-making process. Most individuals are not aware of the specific ways where their awareness is limited. Failure to recognize those limitations can have severe consequences. (Bazerman H. & Chugh D., 2006)

Bounded awareness differs from information overload, and it does not indicate one having to make decisions with too much information in too little time. Even when the information is provided and the person is given sufficient time to make decisions, most individuals still fail to bring the right information into their conscious awareness at the right time. Bounded awareness can occur at any point in the decision-making process. First, individuals may fail to see or seek out key information needed to make a good decision. Second, they may fail to use the information that they see because they are not aware of its applicability. Finally, individuals may fail to share information with others, which leads to bounding the organization's awareness. (Bazerman H. & Chugh D., 2006)

In terms of decision making, one advantage of groups is that group can possess more information than any individual. This advantage occurs in situations where individuals have unique information that is not provided by other members of the group. However, this advantage is limited by the amount of distinctive information shared in one group. Actually, numerous studies show that groups tend to focus much more on shared information than on distinctive or unshared information, in consequence reducing the advantage of the group over the individual as a final decision maker. (Stasser and Titus, 1985)

## 5 EXECUTION OF THE RESEARCH

The goal of the research is to examine the impacts of digitalization on the behaviour, activities and decision making of Finnish investors in digital age. Collecting feedback is relatively easy, however asking the right questions and knowing what and whose feedback to listen to is the challenge. Asking simple questions off topic will often lead to the wrong conclusions. That's why a good survey should ask more concrete questions about how the investors see digitalization in his or her investment activities and what are the interesting factors around it.

### 5.1 Previous research

Several theses on digitalization and investment behavior have been carried out in previous years, as well as studies by other financial institutions. In this thesis, I use as reference material Saimaa University of Applied sciences student Valtteri Saikko's thesis concentrating on the investment behavior of the youth and its changes. The thesis and research were conducted in 2019, quantitative research method was used to collect data and the sample size for the research was 133. (Saikko V. 2019)

The results of the research indicated that the most-popular form of investing are funds and direct shares. Only 5% of the respondents owned crypto currencies. In questions concerning investment information seeking, the results were very similar with this research. Respondents mainly seek investment information from family and friends (73%) and from the internet (72%). 53% of the respondents seek investment information from school and 50% utilize banks and financial service providers for investment advice. Smaller percentage of the respondents (31%) read newspapers and literacy about the topic. The most popular channels on the internet for investment advice were the websites of financial authorities such as banks and financial institutions (70%), other channels were investment blogs, investment podcasts, YouTube, and digital newspapers (33-43%) of the respondents. (Saikko V. 2019) The results are very similar with the current research except the age range of the respondents in the current study is wider and the number of crypto investors has increased during the past three years.

Second example of similar quantitative research conducted in 2017, “*The effect of digitalization on the fund investor’s investment activities*”. The research is conducted by Sanna Aarnio, business student from Jyväskylä University of Applied Sciences. The sample size in Aarnio’s research was 261 and the research was conducted in collaboration with OP Keski-Suomi. The respondents in this research were relatively older, most of the respondents (48%) were 46-65 years old. The thesis examined the utilization of digital channels in investors’ decision making. 52% of the respondents claimed they somehow utilize bank’s online banking service before making investment decisions, 33% used other internet resources to make investment decisions and only 18% of the respondents used the possibility of a web conference to discuss about the investment activities with investment advisor. (Aarnio S. 2017) Again, the results indicate similarities with the research results of this thesis.

## 5.2 Survey

The thesis utilizes Google Forms to collect primary data. Google Forms is a free survey administration software, and it provides a template which can be used independently or together for the purpose of obtaining user information. This application works in Google Drive cloud storage along with other applications such as Google Sheets, Google Slides and Google Docs. The template is easy to use and understand, and it is available in many languages. It also provides the possibility to analyze and summarize survey results with charts and graphs. This software was chosen for the survey since it is easy to use, globally known and reliable for both the user and creator.

The survey was intended for Finnish investors over the age of 18. The survey conducted of 20 questions, where 18 were multiple choice questions and two were open-ended questions. By dividing questions into both multiple choice and open-ended questions, it allowed the research to include small portion of qualitative data together with larger amount of quantitative data. There were two demographic questions, age, and gender. The rest of the questions were determined based on the research questions and the desired outcome of the research. The body of the survey included the following topics: reasons behind investment activities, history in investing, channels where to seek for investment news, safety of the online banking, benefits and harms of digitalization and future trends for the topic.

### 5.3 Research population and sample

Research population refers to the entire group for whom the results of the study will apply. The sample is the group of individuals who participate to the study, in other words sample is a subset of population. Researchers can either measure the entire population or take a sample. The survey was distributed in three different Facebook groups concentrating on investing. The groups are called Sijoituskerho (109.4k members), Osakesijoittaminen (53.1k members) and Vauras Nainen (75.8k members) where each group have a mutual interest on investing, and the groups have daily conversations about the topic. The groups were determined in order to reach as many Finnish investors as possible and most importantly investors in all ages and backgrounds. For the reliability of the research, the importance of receiving answers from a diverse population is high. As the quantitative research design was chosen, the sampling size needed to be large in order to receive reliable results for the research. The response time for the survey was one week, from 28 February 2022 until 6 March 2022.

The sampling of the research consisted of the Finnish investors in three investment groups in Facebook. Since it was clear that the data collection is a difficult process, it was important milestone in the thesis process to find the right target groups to distribute the survey. The survey was distributed by using self-selection sampling method, meaning everyone from the population can be chosen to be a part of the study. A total of 374 answers were received from the survey which makes the sample size 374.

### 5.4 Reliability and validity

Reliability measures the consistency of research findings and whether the used methods would produce the same results on another occasion. The purpose of the research is to obtain the most truthful and reliable information as possible. If a researcher can collect data, repeat the procedure, and receive consistent results each time, the research is considered reliable. In thesis process, it is often impossible to repeat the study multiple times and therefore better way to measure the reliability is to compare the results with similar research. For example, if medicine research, conducted by different doctors, over a fixed period of time on the same patients, produces the same results, the research is considered scientifically reliable, since the

results are consistent. The importance of considering the reliability and validity of the research is high.

The data collection of the thesis is a questionnaire. The questionnaire should be carefully designed, and the questions should be formulated in a way that is easy to understand and clear for the respondent. The frame of the questionnaire is based on the theoretical basis of the research, meaning the existing theory must be well known before conducting the survey. Testing the survey is also important when preparing research. The survey should be tested before the data collection phase, in order to remove the possible errors and modify the questions if required. It is impossible to change an incorrect survey if the material has already been collected. In that case, the research would have to be started from scratch.

In this survey, multiple-choice questions are used to collect answers from respondents. The survey was first tested with a small sample size, then modified and sent to the large population. The anonymous survey design prevents the research from subject bias. As the sampling size of this research was quite large (374), the results can be considered reliable. Reliability is also supported by the fact that the results had similarities with previous research. Reliability can be measured also by repeating the study.

Validity is usually harder to achieve than reliability, but it is even more important. The purpose of this thesis was to use quantitative data to indicate how digitalization has affected investors' information seeking, decision-making and investment actions during past 20 years. The collected data answers to the research questions determined in the beginning of the research and therefore, can be said that the research is valid. The research was executed using good scientific manners and the data collection process has been openly reported in the thesis. These manners also support the validity and reliability of this research.

## 6 RESULTS OF THE RESEARCH

In this chapter, the results of the survey will be published. The questions and answers are in Finnish but explained through in English. With regard to investing, people still feel investing is only for a certain niche of people. However, as we can see from the survey results, investing is becoming more and more attainable on the younger generation. Digitalization has enabled improved solutions and services for the finance industry. Before, those who were interested in investing, needed to book a time to open an investment account at the bank and talk with a financial advisor about it at their office. Now there are fewer limitations for the individuals to take the first step, start investing and build an investment portfolio to achieve financial independence. Digitalization has brought a new age of transparency to investing activities, and it has made the accessibility to markets a lot easier when investing in discretionary and non-discretionary services.

In addition to transparency and efficiency in investment activities due to digitalization, technology has enabled investments solutions like fractional shares. Fractional share is a portion of an equity stock that is less than one full share and it allow investors to trade high-value stocks with small amount of money. According to Forbes, “Fractional shares are relatively new development in investing – only a few years ago it was almost impossible to buy less than single shares of stocks and ETFs.” (Website of Forbes)

In conclusion, technology has enabled a situation where there are less traditional limitations to accessing, reading, and discussing about financial products and publicly traded companies. The internet and numerous online investing platforms such as Nordnet, Robinhood, and eToro, allows anyone who wants to invest may now do so, from the comfortability of one’s own home. Nearly all traditional banks have their own online banking applications and the beginning for investment activities has never been this easy. However, the great number of available services and information online can be experienced distressing among new and unexperienced investors.



## 6.1 Demographics & background on investing

The survey was conducted for investors over the age of 18. Preferably, investors who have years of experience on investing and might have insights about the impact digitalization has brought to the investment activities. The aim of the survey was to attract both male and female investors to participate the research, in order to gain perspective from both genders.

### 1. Ikäsi? (vuosia)

374 responses

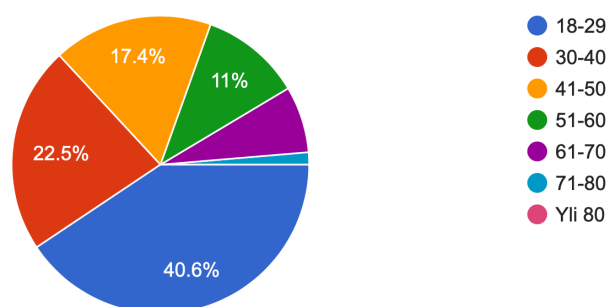


Figure 14. Age dividend of the respondents of the survey.

Majority of the respondents (40.6%) were 18-29 years old. 22.5% of the respondents were 30-40 years old, and 17.4% were 41-50 years old investors. 51-60 years old represented 11% of the respondents and 7.2% were 61-70 years old. The rest of the respondents (1.3%) were 71-80 years old investors. There were no replies from investors over 80 years of age.

## 2. Sukupuoli?

374 responses

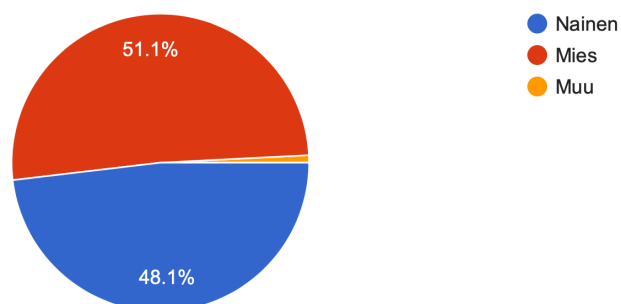


Figure 15. Gender dividend of the respondents of the survey.

As the figure above shows, the gender dividend for the survey was very even. 51.1% of the respondents were male and 48.1% were female respondents. 0.8% of the respondents claims to be called 'other' in this research. According to Finnish foundation for share promotion (In Finnish: Pörssisäätiö), only 34% of all shareholders in Finland are women. In the media there have been discussions about the increase in number of women investors and women having (in average) more profitable investment portfolios than men during recent years. It is important to seek for equality also in investing world, since women usually still receive smaller salaries and pensions than men. However, women often live longer and for that reason, they spend money for longer time after retirement than men do. Women are often more long-time investors than men, they do not trade with shares as much as men do, which causes transaction fees and eats the profit. Economic education in primary school would most likely increase the number of women investors, according to Pörssisäätiö. (Website of Pörssisäätiö, 2022)

From the figure 16 below, we can see 12 most owned Finnish publicly traded companies by Finnish private investors. The statistics has divided between male and female owners, red color indicates female owners and blue color indicates male owners. Nordea, Nokia and Sampo have most household owners, however the portion of male investors invested in these companies is almost double compared to the number of female investors. Only company, which has more female investors than male investors is Elisa Oyj. (Euroclear 2022)

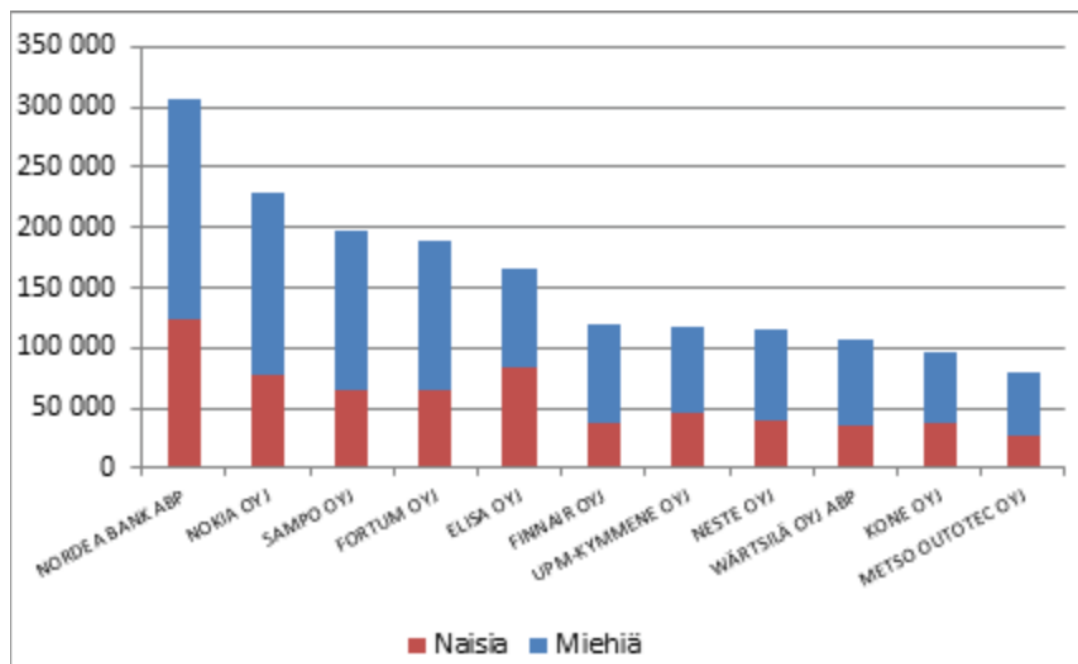


Figure 16. Gender dividend in companies with most of household shareholders. Source: Euroclear 2022

The next figure indicates 12 publicly traded Finnish companies, which are most popular among female investors. The statistics shows the proportion of female investors in relation to all household investors and holdings. Usually, women invest to well-known brands, companies that are familiar to them from retail, or to companies that they understand how it operates and makes profit. Marimekko, Stockmann Oyj, Elisa Oyj and Musti Group are the most popular one's Finnish women investors invest their money into. (Euroclear 2022)

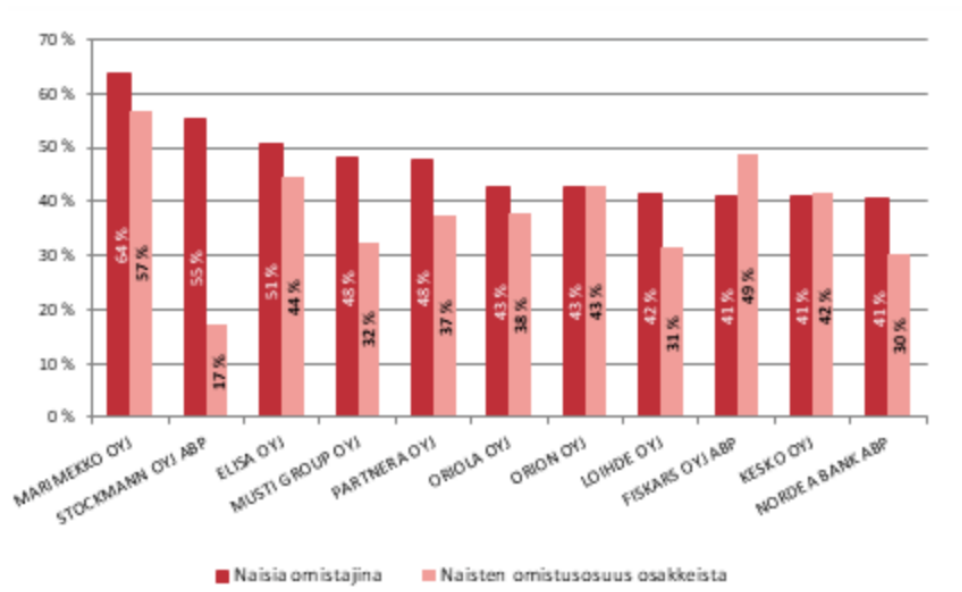


Figure 17. Listed companies with the highest proportion of female investors. (Euroclear 2022)

On the contrary, from the next figure we can see 12 publicly listed Finnish companies, which are most popular among male investors. The statistics shows the proportion of male investors in relation to all household investors and holdings. Traditionally male investors own more technology and game companies, and they tend to own a bigger portion of the company than female investors. (Euroclear 2022)

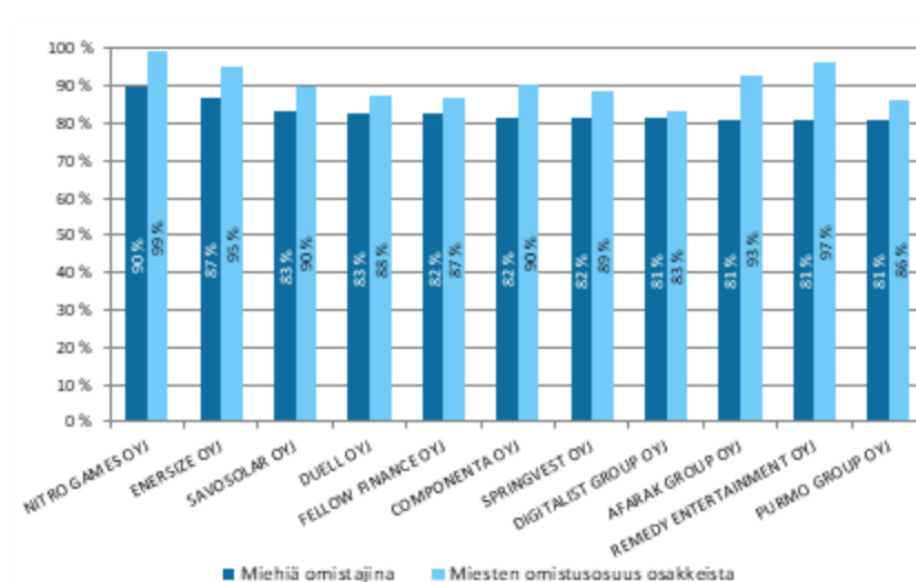


Figure 18. Listed companies with the highest proportion of male investors. (Euroclear 2022)

Third question in the questionnaire after the demographics was concerning the length of the respondents' investing activities. Majority of the respondents (49.5%) responded that they have been investing for 1-5 years. 16.6% of the respondents had been investing for 6-10 years and 13.6% had over 10 years of experience in investing. Luckily, great portion of 14.4% had over 20 years of experience in investing, and this experience can be seen on the quality of the survey answers. Most of the respondents (63.2%) are long time investors with investment horizon being over 20 years, 31.6% answered 5-10 years and only 5.3% of the respondents are short-time investors with only 1-5 years of predicted investment horizon.

Next question was concerning the motivation behind individual's start for investing. There were multiple different answers, and the dividend was extremely wide. The greatest portion of respondents (36.4%) were introduced to investing by family and friends. The next most common answers were studies (11.2%), own bank (10.7%), social media (9.9%) and own workplace and colleagues (9.6%). In addition, heritage, sale of a company, investment literacy and own interest were reasons for starting to invest.

#### 4. Mikä sai sinut aloittamaan sijoitustoiminnan?

374 responses

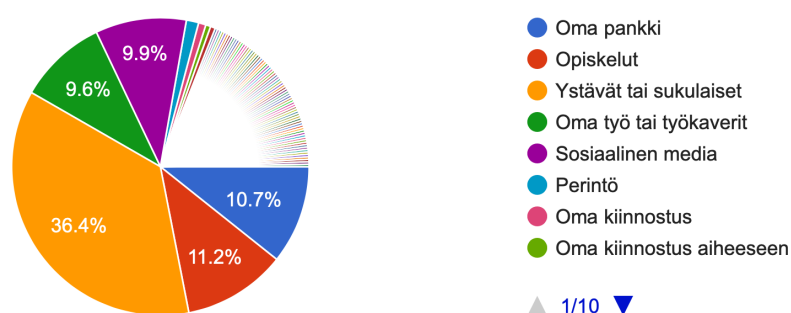


Figure 19. The reason behind the start of investing.

## 6.2 Benefits of digitalization

One of the main questions was about the benefits digitalization has brought to investing activities. Especially for the respondents with over 20 years of experience on investing, what are the factors digitalization has brought to reform the investing activities. 50% of the respondents thought that digitalization has made the investing easier, 48.9% of the respondents did not have experience on investing before online banking. So basically, almost everyone who had longer history on investing, thought digitalization has made the process easier and more transparent.

There was also an open question about the topic for the respondents that had longer experience on investing and felt that digitalization has made investing activities more convenient, total of 167 (45%) respondents answered how digitalization has affected their investment activities. Many of the respondents stated that now after digitalization investing is easy, fast and the access for information is more convenient. Since all company reports and key numbers are on the internet it is easier to familiarize with the company, before digitalization the same information

was only in a paper form. Many replied that before they had to visit the bank to buy or sell shares and all the actions happened in days delay. Now when all investing activities can be done with a mobile device from home, everything in investing has changed. Below one can find direct quotations from the open-ended question's answers.

*“Making orders is really easy and fast. Cheaper than at the time in the office as a personal service. Real-time, global market information available around the clock.”* Female 41-50 yrs.

*“Both the company's reports and key numbers are on the internet, not on paper.”* Male 18-29 yrs.

*“Much more information is readily available than before. It is also easier for investors to exchange ideas on the internet.”* Male 41-50 yrs.

*“It's easy to participate in investment coaching and education from home on computer, especially when you live far away from the city. Without digitalization, I would still only invest in bank funds, and I would not have started to invest in equity and crypto markets”.* Female 41-50 yrs.

*“In many ways. When I started investing in the 80s there was no information other than closing prices in a paper magazine with a day lag, orders were made on paper at the bank and mailed to the stock exchange and shares (if a deal close) came back to the bank vault within a week. Digitalization has changed everything. Now a private investor can search for a huge amount of information, trade in real time digitally and have easy access to foreign markets as well as even more exotic instruments.”* Male 41-50 yrs.

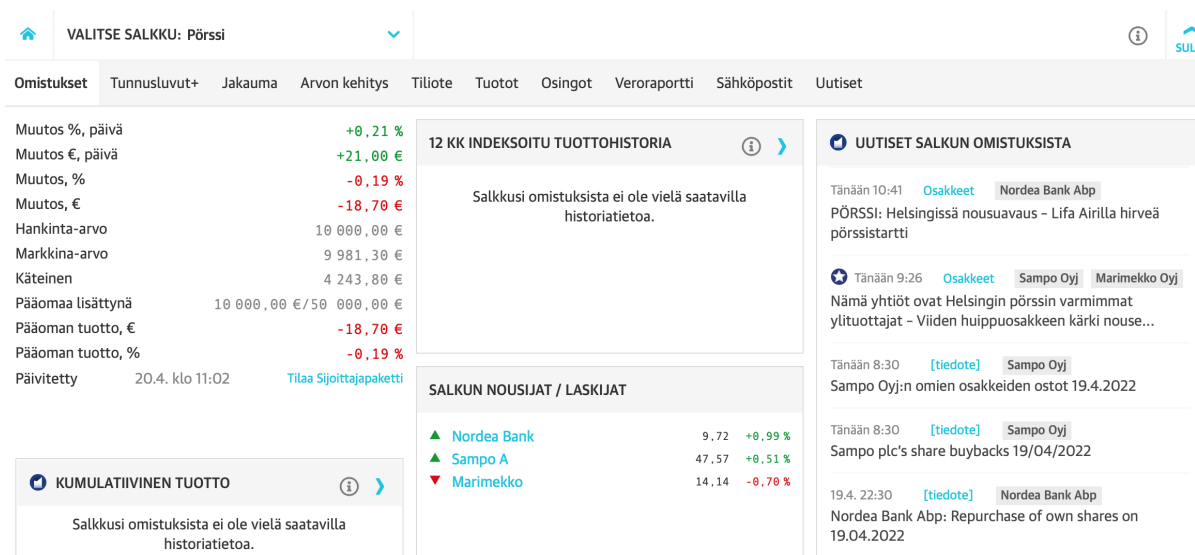
*“I would never have started investing if I had to go to the bank in person to talk about it. It's a horrible thought that someone is sitting on the other side of the table waiting for an answer from me as to which fund to invest in.”* Female 51-60 yrs.

Many of the respondents replied they would not have started investing if they would still have to walk or call to the bank to make orders to buy or sell shares or funds. The start of investing is easy in digital age that the number of investors is higher than ever before. One good point from the survey answers was from a person who lives in the countryside, away from the city center. Digitalization has enabled the investing, education, and information for investors all over Finland. From Iisalmi to Lappeenranta, everyone has the opportunity to start to learn about investing, start investing and discuss about investing online.

Information, education, tools, and calculators concentrated on investing are available on the internet for beginners to learn how to invest. From the survey respondents I received responses about the digital tools and calculators they have used on the internet. For example, Kauppalehti has this free learning tool called 'Oma Salkku' where beginners can use demo money to buy and sell properties such as stocks, funds, apartments, or woods to their investment portfolio. Oma Salkku provides daily updates about the value of investments and therefore beginner can familiarize themselves with market movements before using their own money to invest.

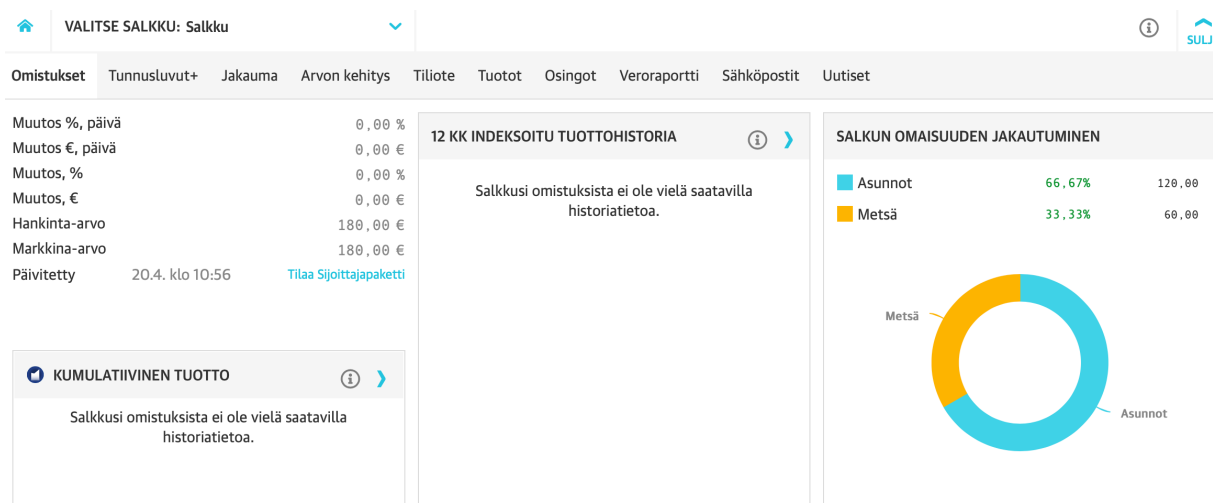
The tool starts by determining the type of the portfolio; revenue portfolio, equity savings account portfolio and basic portfolio. In equity savings account portfolio, user can only own stocks and in the other two portfolios, user can own stocks, funds, apartments, and woods. I created two portfolios to test the tool and the portfolios I chose were equity savings account portfolio and basic portfolio. In equity savings account portfolio, one has limited 50 000€ to spend on shares, which is same maximum amount one can add to the real equity savings account in bank as well. Only downfall in this tool is that it does not provide stocks from foreign markets, only from Nasdaq Helsinki. Second factor I found misleading in the tool is the lack of transaction fees when buying or selling shares. The tool gives the user an opportunity to add the transaction fee manually, however rarely beginning investor is aware of the fees when buying or selling shares. Usually, the transaction fees vary depending on the bank and it can either be a fixed rate or percentage of the amount of the sale. Picture from the tool can be found below.





Picture 1. The equity savings account -portfolio. Website of Kauppalehti 2022

After familiarizing with equity savings account portfolio, it was time to test the basic portfolio. There one can add value of properties, value of shares, and value of woods reportedly owned, and once the information is provided, the tool creates a figure of the values. The values change daily depending on the market situation.



Picture 2. The basic portfolio. Website of Kauppalehti 2022.

Overall, the tool is good for starting investors to demonstrate the bank's investment portfolio. This tool could be used in educational institutions for teachers to demonstrate to students the market movements. Especially the equity savings portfolio is great for beginners who consider opening of such account. The tool provides information about different companies and their key numbers. However, the service is not available as an application, and for educational purposes, an application would be easier to utilize in teaching.

### 6.3 Challenges of digitalization

According to the survey, the challenges of digitalization are highly connected to the information overload part of the internet. Respondents claim digitalization increases emotional investing, information overload, bounded awareness and they often feel the fear of missing out (FOMO) in the discussion forums or investment groups in the internet. Covid-19 and now the current war in Ukraine have affected to the stock market worldwide and newly started investors feel unguided about the risks in investing.

The internet is full of information about everything, there is no difference in investment activities. It is hard for beginning investor to determine is the information reliable or not, without any education about it. It would be extremely important, that both upper-comprehensive schools and high schools in Finland would begin to teach about financial literacy and how the investing world works. Pörssisäätiö has introduced new teaching method for upper-comprehensive students called Pörssilähettiläät. Basically, it means Pörssisäätiö has trained group of students interested in investing and the students visit different schools to teach fellow students about economy. It is meant for students age of 15-18 and the education is available for 9<sup>th</sup> graders in Finnish schools. (Website of Pörssisäätiö 2022)

William Bernstein describes in his work *The Delusions of Crowds* with historical examples, how disastrous situations bounded awareness can be seen in different aspects of life. Classical examples of these situations are stock market bubbles and collapses. One respondent introduced one example of the drawback of digitalization being certain investment related Facebook groups that might cause bounded awareness among inexperienced investors. In several different social media platforms can be seen very active users that the group members see as a certain type of authorities. That is a problem when investors with little to no knowledge on investing see someone's actions and words as facts and these actions lead to group members' investment decisions. Similar effect can be seen in the model portfolios in Inderes, that some investors try to copy and simultaneously they forget to do their own investigations on the companies they intend to invest on. In large picture this is the kind of action that historically creates stock market bubbles. In summary, digitalization can lead to decrease in market efficiency when investment decisions are not made with own understanding and consideration, when leaning on too much on other investors' opinions and views. (Bernstein W. 2021)

One issue with investing activities in digital age is concerning the new level of cyber-attacks, viruses, and fraud due to the global shift of economic activity online being further accelerated by the COVID-19 pandemic. The frequency of cyber-attacks varies between countries and the stakes attached to maintaining secure networks are increasing everywhere. This is especially the case in a time of crisis where individuals' ability to work and communicate online have become a necessity for maintaining economic activities. Russia, the United States and Canada faced the most frequent occurrence of web attacks being generated in their borders, while Germany in Europe showed the highest ratio of total attack registered per capita. (OECD G20 Digital Economy Measurement, 2020)

During recent years, the criminality has changed its form and large part of criminals use internet to obtain victims. The pattern in investment scams is usually always the same: first criminals lure investors to invest couple hundreds of euros and in a few days the investment account seems to have grown to over five hundreds or even more. The scam companies' websites usually look completely professional, and the money transfers are convenient and fast. The goal is to have the investor to invest more and usually the criminals are calling directly to the investor to gain more money for the 'well-performed' investment. Phone calls are coming from a number outside of Finland and the conversations are in English. Also, the company's name might remind of some well-known investment company. Investing usually lasts for weeks or even months. When it's time to withdrawal the profits, the ugly truth comes up. All the sudden, the promised money does not move, and the messages and callbacks are left unanswered. Often the explanation can be a technical malfunction on the website which is not over in a matter of days. This is part of international criminality and often the police are unable to catch the people behind it, according to Finanssihallinto. The number of losses varies a lot, the beginning payment is often 250 euros and the biggest losses that have been recorded to the police have been 60 000 euros. (Website of Yle, 2022)

One of the questions in the survey was concerning the investment scams over the internet. 21.1% of the respondents replied they have been asked to take part of an investment scam online and the rest 78.9% have never experienced criminal attempts over the internet. The figure below illustrates the dividend of the answers.

9. Onko sinua ikinä yritetty huijata netissä johonkin tiettyyn sijoitustuotteeseen vedoten?  
374 responses

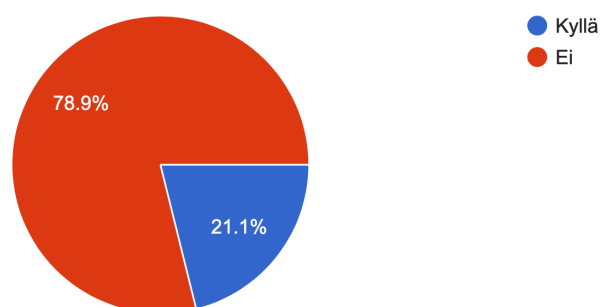


Figure 20. The personal experience with investment scams in the internet.

#### 6.4 Digital platforms for investment news

According to the survey, there are many different digital platforms where investors seek for information and ideas for investment activities. Digital magazines (59.4%), podcasts (47.9%), internet forums such as Reddit and Inderes (8.3%), Youtube (26.2%) and Facebook (51.1%) are the most common digital channels used. 36% of the respondents also follow and listen own bank's investment advice and still a large portion (32%) reads investment information from traditional newspaper and smaller percentage of respondents (under 5 percent) seek information from books and radio.

Top three information sources for investment news/information:

1. Digital magazines
2. Facebook
3. Podcasts

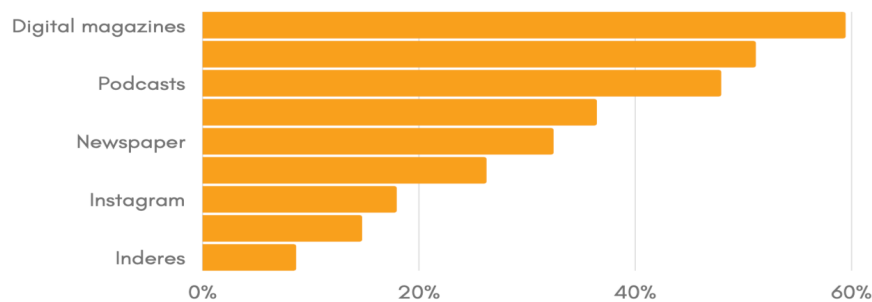


Figure 21. Most-used information sources for investment news/information.

The following question was concerning the information literacy of respondents, more precisely how they ensure if the information online is reliable. 53.2% of the respondents claim to follow only reliable sources and 29.7% told they always check the sources before making any decisions based on the given information. Quite large portion (17.1%) of the respondents answered they do not check the reliability of the sources over the internet.

#### 7. Miten varmistat tiedon oikeellisuuden?

374 responses

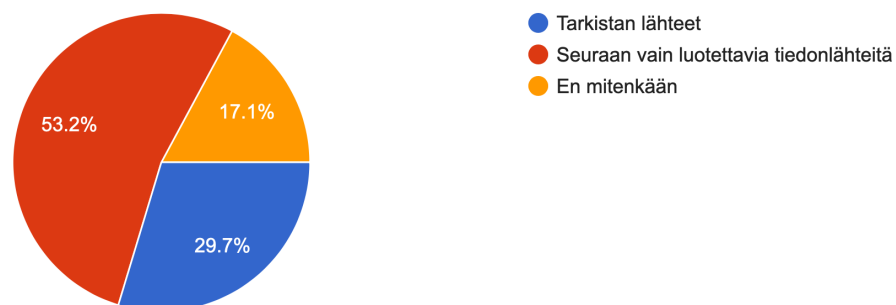


Figure 22. How respondents ensure the reliability behind the sources on internet.

Since social platforms and information over the internet are becoming increasingly common in investment activities, there raises question whether traditional investor advisors are needed in the changing world. The question in the survey was the following: “Do you wish for traditional investor advisor would contact and personally advice in investment decisions?” 67.1% of the respondents answered that they no longer need personal investment advice from a bank employee, they can access to the relevant information elsewhere. However, 20.3% still requires personal investment advice from the bank and 12.6% cannot tell whether they need it or not.

17. Toivoisitko, että pankkivirkailija olisi myös henkilökohtaisesti yhteydessä sijoitusasioihin liittyen?  
374 responses

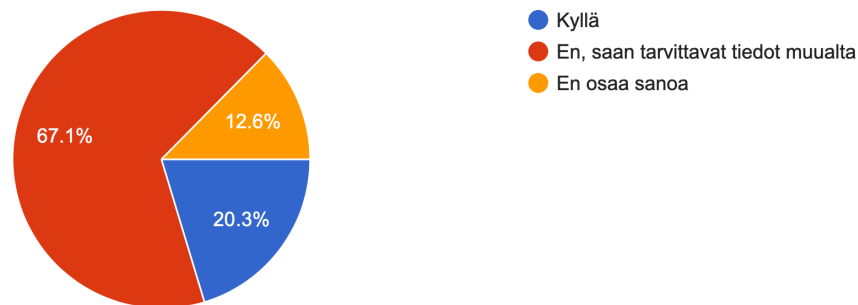


Figure 23. Demand for personal assistance from the investment advisor.

The next figure illustrates the gender dividend on the desire of personal investment advising from the bank's employee. In the figure, red color indicates female investors and blue color reflects the number of male investors. The answers between both genders were almost even, slightly more male respondents (53% male, 47% female) who claims they have no need for bank's investment advising and on the contrary, more females (54% female, 46% male) still require personal contact from the bank concerning investment activities. This might result from the fact that traditionally men have more experience on investing and a large number of female investors have recently started to invest and therefore they might need more help from the professionals. Male respondents voted more on the 'I don't know' option than female respondents.

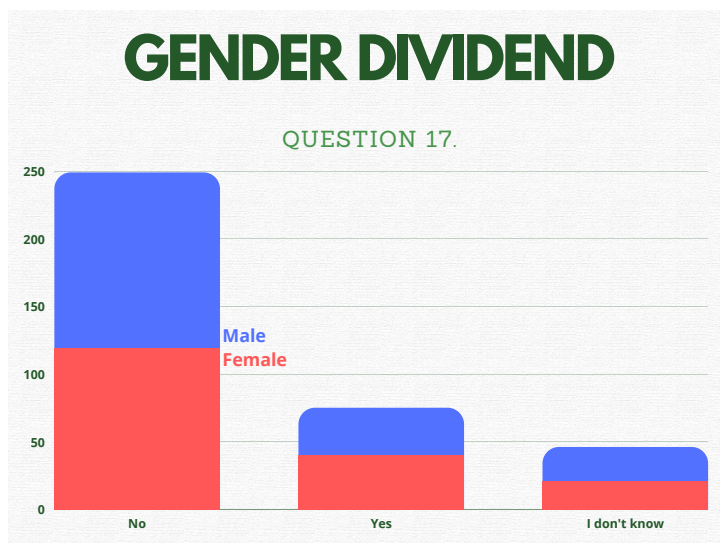


Figure 24. Gender dividend of the responses for the question 17.

## 6.5 Contents of Finnish investors' investment portfolios

The contents of each investors' investment portfolio are personal and all responses to the survey were anonymous. According to the survey answers, the biggest portion of Finnish investors' ownings are funds and shares. Expectedly, almost 90% of the respondents owns shares and funds. The next biggest portion of properties were apartments (37.8%) and ETFs (33.8%).

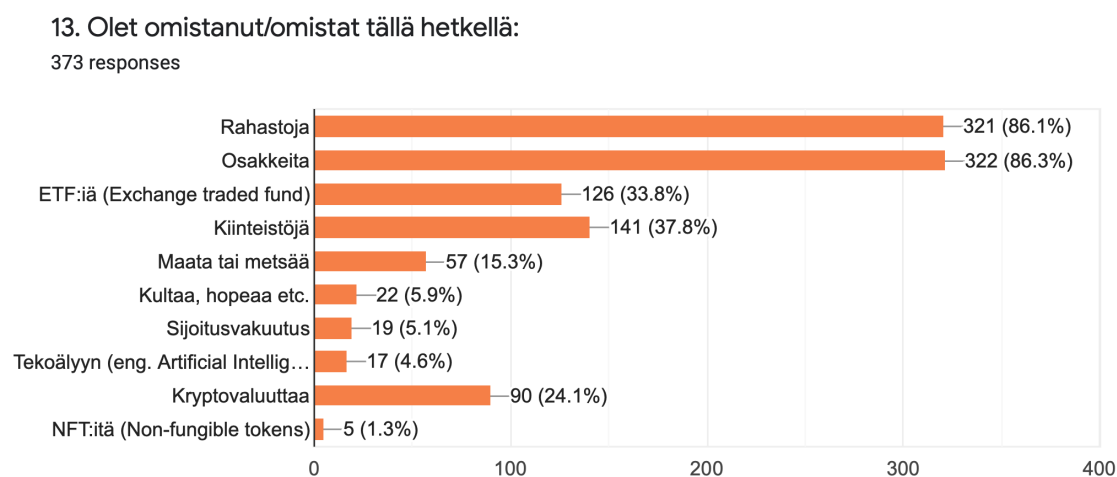


Figure 25. The contents of the respondents' investment portfolios.

The number of investors that either has owned or currently owns any type of crypto currencies were 24.1%. Bitcoin together with other digital currencies are new and interesting ways of investing. Many have read from the media about cases where early investors in crypto have made large profits and therefore want to invest in cryptos as well. The new possibility of loaning cryptos and receiving interest on the crypto investment is making the investment less risky. Since the interests in regular bank accounts have been relatively small for many years now, crypto currencies offer a little passive income to the investment in the form of interests.

Surprisingly the portion of artificial intelligence was only 4.6% from the respondents. Investing directly to companies that utilize artificial intelligence in their operations or investing to funds or ETFs concentrating on artificial intelligence is relatively easy. However, as the research earlier indicated, there are many people that still does not know the meaning behind the term artificial intelligence. Also, the topic is still new and there is not that much historical data behind the artificial intelligence investment products.

As discussed in the theory part, NFTs are still quite new and unpredictable form of investing. According to the survey, only 5 persons out of 374 owned or had own NFTs which make the total percentage of respondents only 1.3%. Compared to cryptos and artificial intelligence investment products, NFTs are the most complicated to buy and the transaction fees can be high. There is also a large number of criminals in the NFT world, and a clueless private investor can easily become a victim by the skilled cyber criminals online.

In the next picture, there is current information about the 15 most owned Finnish public companies from year 2010 to 2022. This statistic is similar to the one already seen in demographics part, but from here can be seen the numbers of increases and decreases from the year before. The number of Fortum's owners decreased with 8258 due to the large investments in Russia. Also, Metso Outotec Oyj and Orion Oyj has lost owners compared to year 2021 but all other 12 companies has accomplished to increase their number of investors.

**Kansanosakkeet 31.3.2022**

<b>1. NORDEA BANK AB</b> 306 335 ▲ 9 687	<b>2. NOKIA OYJ</b> 228 876 ▲ 4 867	<b>3. SAMPO OYJ</b> 197 835 ▲ 12 790	<b>4. FORTUM OYJ</b> 189 375 ▼ -8 258	<b>5. ELISA OYJ</b> 165 920 ▲ 454	<b>6. FINNAIR OYJ</b> 119 504 ▲ 5 005	<b>7. UPM-KYMMENE OYJ</b> 118 535 ▲ 2 627	<b>8. NESTE OYJ</b> 115 447 ▲ 12 676
<b>9. WÄRTSILÄ OYJ AB</b> 106 928 ▲ 6 625	<b>10. KONE OYJ</b> 96 966 ▲ 12 725	<b>11. METSO OUTOTEC OYJ</b> 79 045 ▼ -332	<b>12. OUTOKUMPU OYJ</b> 78 695 ▲ 1 963	<b>13. ORION OYJ</b> 76 205 ▼ -1 189	<b>14. NOKIAN RENKAAT OYJ</b> 65 558 ▲ 12 582	<b>15. KESKO OYJ</b> 65 018 ▲ 4 163	

Nro. Yhtiö	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	31.3.2022
1. NORDEA BANK ABP									220 483	288 251	287 452	296 648	<b>306 335</b>
2. NOKIA OYJ	181 309	217 640	233 563	210 994	202 987	196 549	223 036	232 988	229 435	234 418	235 919	224 009	<b>228 876</b>
3. SAMPO OYJ	78 903	78 227	73 080	73 062	73 834	75 246	81 630	98 435	105 515	116 255	160 462	185 126	<b>197 835</b>
4. FORTUM OYJ	92 271	98 406	114 600	122 463	101 885	127 176	123 224	119 402	115 499	121 834	198 111	197 633	<b>189 375</b>
5. ELISA OYJ	181 309	214 596	203 201	205 553	195 366	184 056	181 320	175 507	170 413	163 098	165 055	165 466	<b>165 920</b>
6. FINNAIR OYJ								15 469	23 516	25 809	83 920	114 499	<b>119 504</b>
7. UPM-KYMMENE OYJ	84 879	89 907	88 045	86 065	81 671	77 543	77 270	81 763	85 896	92 819	105 636	115 908	<b>118 535</b>
8. NESTE OYJ	72 459	73 183	71 618	74 254	67 767	64 233	60 256	58 631	56 731	72 863	90 516	102 771	<b>115 447</b>
9. WÄRTSILÄ OYJ ABP						35 481	35 591	36 287	45 052	71 241	100 877	100 303	<b>106 928</b>
10. KONE OYJ	55 550	54 377	52 639	52 838	48 450	51 781	52 904	56 537	57 997	57 717	68 562	84 241	<b>96 966</b>
11. METSO OUTOTEC OYJ											75 097	79 367	<b>79 045</b>
12. OUTOKUMPU OYJ	37 661	39 510	52 655	60 876	61 528	66 518	55 338	63 282	71 642	73 669	76 665	76 732	<b>78 695</b>
13. ORION OYJ						45 682	45 404	53 479	68 267	62 729	68 524	77 394	<b>76 205</b>
14. NOKIAN RENKAAT OYJ								35 881	39 629	43 256	55 532	52 976	<b>65 558</b>
15. KESKO OYJ						34 750	34 834	37 452	36 168	36 574	52 536	60 855	<b>65 018</b>

Lähde: Euroclear Finland/Pörssisäätiö



Figure 26. The 15 most owned shares by Finnish investors. (Pörssisäätiö 2022)



According to the Bank of Finland, the fund capital of Finnish investment funds was 162.7 billion euros, 27 billion higher than the year before. The growth was mainly because of equities held by the investment funds, but the funds also had a great amount of new subscriptions. In 2021, the aggregate investment fund capital increased by 17 billion euros while new subscriptions were 10.3 billion euros. (The Bank of Finland 2022)

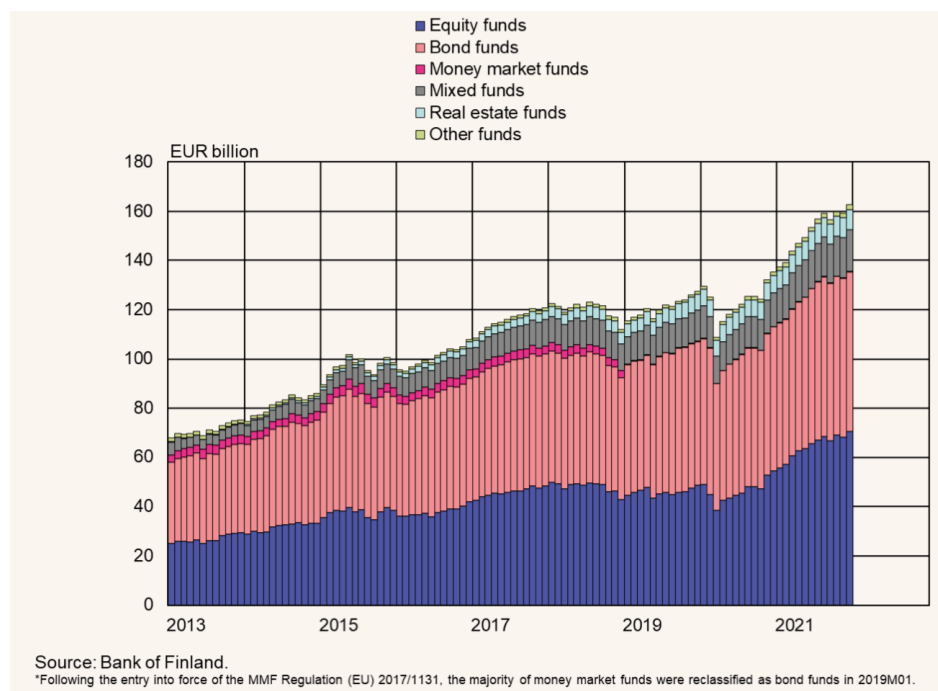


Figure 27. Fund capital investment funds at record high at the end of 2021. (Bank of Finland 2022)

## 6.6 Ideas for discussion

The last question of the online survey was open-ended for the respondent to provide ideas for general discussion about the topic. 53 responded to the final question which was 14% of the whole sampling size. Below you can find a few quotations from respondents' answers.

*“It would be a nice option to see investment portfolios from other investors. That you could see their possessions and how they have evolved during time. Similar to some social media platforms, one would have to show their own portfolio in order to see others.”* Male 18-29 yrs.

*“Personally, I am also familiar with the downsides of digitalization, i.e., in Facebook investment groups, which may cause bounded awareness, especially for inexperienced investors. Many social media platforms see active users who are seen in groups as certain types of authorities. Digitalization can therefore also lead to a decline in market efficiency, as investment decisions are no longer made on the basis of one's own understanding and judgment, but increasingly on the basis of the opinions and views of others.”* Male 18-29 yrs.

*“The different investment platforms are in their own little circles without proper possibilities for comparison.”* Male 71-80 yrs.

*“Ideas for discussion; Bounded awareness caused by social media, especially in the investment decisions of novice investors.”* Male 18-29 yrs.

*“The future of digitalization lies in the visions of newer Fintech companies based on e.g., Blockchain (applications other than crypto), AI / ML, etc.”* Male 41-50 yrs.

*“The "gamblers" of investment activities should somehow be better protected. Based on the forums, there are a lot of ordinary private investors who make very risky speculation with very little information. This has probably always been the case, but with digitalization, it is even more possible for everyone at any time.”* Male 30-40 yrs.

## 7 DISCUSSION

The research findings indicate that Finnish investors appreciate the benefits digitalization has brought to finance industry in the form of online banking and digital investing services. They also have experience on the different tools and platforms online to help with learning new skill-set in the form of saving and investing. However, there are some limitations that the current learning tools have and there is room for improvement. The vision of being the world's top one financial literacy country requires a lot of work and new innovations to spread the knowledge to as many people as possible. The following subchapters answer to the research questions of this thesis.

RQ1. How does investors seek and analyze investing information in the digital age?

RQ2. What advantages and disadvantages has digitalization brought to investors?

RQ3. What is the portion of artificial intelligence, crypto currencies, and non-fungible tokens in Finnish investors' portfolios?

### 7.1 Ways investors seek and analyze investing information in the digital age

Digitalization has enabled the use of internet wherever and whenever. Internet provides platforms and opportunities to share and provide information regardless of the source behind the information. According to the survey results, social media discussion groups have an enormous effect on the investment decision-making process in the digital age. Facebook, Inderes, Discord and Twitter provide platforms for like-minded people to connect and share experiences about investing.

Moreover, the results indicate that the respondents mostly use digital newspapers, Facebook discussion groups and podcasts for investing advice in the digital age. However, Google's search engine is used sometimes when the respondents quickly need to find information that is related to investing. One explanation for this could be that the respondents are unfamiliar with the terms and uneducated about the topic. Another reason could be that both the investing tools and bank's websites are overly complicated for the respondents to use. Investors may

sometimes resist using the material available on reliable sources if it is difficult to understand and use. Moreover, another explanation could be that not enough training in how to handle personal finances and people try to fix the situation by trying to learn the investing skillset fast online. Respondents suggests that financial training should be provided in schools for improving the financial literacy of Finnish citizens. It seems that the lack of education in personal finances can lead to serious circumstances in the digital age.

Furthermore, the result has indicated that the respondents may not always observe the sources of information during the information retrieval process. This shows that respondents may not know how to evaluate the multiple sources over the internet properly. Apparently, the respondents understand the importance of seeking information from reliable sources. Regardless, it seems that both the information and financial literacy are problems for Finnish investors. This may be because of the greater variety of information that is available today, which may create problems for the respondents when managing information on the internet. Therefore, investing education online should be provided from reliable sources in a comprehensive form to increase financial literacy among Finnish citizens.

## 7.2 Advantages and disadvantages digitalization has brought to investors

To summarize the advantages digitalization has brought to investment activities are online banking applications, transparency, efficiency, decrease in transaction costs, easy accessibility to foreign stock market, electronic signatures in real estate deals, online discussions with other investors and education, tools, and calculators available in the internet. Digitalization brings numerous positive elements to investing and the journey of digitalization in the finance industry is still in the beginning.

The disadvantages and downfalls of digitalization are the lack of reliability on the sources over the internet, information overload, bounded awareness, fear of missing out and emotional investing. The lack of financial literacy combined with bounded awareness phenomenon can lead to severe circumstances that can be difficult and long process to fix afterwards. Each individual investor needs to take care of themselves on the internet by constantly update their investment knowledge and learn about new investment possibilities. The number of cyber criminals is increasing daily and therefore carefulness over the internet is more important than ever before.

### 7.3 Portion of artificial intelligence, crypto currencies, and non-fungible tokens in Finnish investors' portfolios

Digitalization has affected investment activities by introducing new type of investment products such as crypto currencies and non-fungible tokens. The demand for traditional alternatives, i.e., gold, woods and investment insurances are decreasing and there is room for new trending products. The most popular investment forms were direct shares, funds, ETFs, and apartments.

The portion of crypto currencies, artificial intelligence and NFTs in the survey participants' portfolios is still quite small, that might be result of Finnish stubbornness against unknown and relatively new investment products. 24.1% of the respondents had experience with crypto currencies, 4.6% had invested in artificial intelligence and only 1.3% had purchased NFTs. The time will show the future with cryptos and NFTs, whether there is just a temporary hype around them or is it actually the new normal in investing.

### 7.4 Gaming of investing activities for educational purposes

As discussed in the previous chapters, the education of investment knowledge is important in digital age. Everyone should be justified to the financial knowledge regardless of the family or background they come from. Not all come from wealthy families who start to invest for their children from a young age or let alone speak about the importance of saving and investing at home. The time is money in the investment world and the earlier people will start to invest the better the profits will be in the future, even with a small starting capital.

The idea for change would be that the economy classes would be added to the curriculum of high schools and preferably even to upper comprehensive schools. Students are keen to learn everything that they found interesting, and as long as the teaching method is entertaining and rewarding it will receive a lot of positive attention. This action would be in the line with Finland's strategy to have the world's best financial literacy by 2030.

To support financial education, a new teaching method could be introduced to beginning investors. Digitalization offers an opportunity to create mobile applications whereas mobile application refers to a type of application software designed to run on a mobile device, such as a smartphone or tablet. The mobile application invented to support financial literacy project in Finland, would concentrate on financial education. One of the questions in the survey was concerning about the usage of potential educational investing application. 67.6% of the respondents claimed that there is a need for an education application as described. 17.6% of the respondents does not see the use for education application concerning on investing and 14.7% of the respondents could not say whether they see the application useful or not. Figure 28 illustrates the question and the dividend of replies.

19. Näetkö käyttöä applikaatiolle, joka olisi demoversio verkkopankin sijoitussalkusta, jossa aloittelijat voisivat harjoitella kurssien seuraamista tekemällä ostoja ja myyntejä 'leikkirahan' avulla?  
374 responses

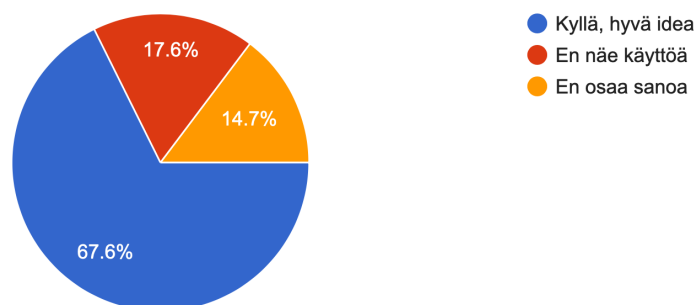


Figure 28. Use for the educational investment application.

In addition, to support the quantitative data, there were multiple comments concerning the educational application for investing in open-ended questions. Here to list a few of them:

*“Such a demo application would be good, it could take into account estimated buying and selling costs, etc. It would certainly inspire many to start investing. Overall, with this occasional little investing hobby, I find many concepts in investing difficult to understand.”* Male 41-50 yrs.

*“The idea in question 19 is great and it will certainly be easy to utilize for example in educational institutions!”* Female 18-29 yrs.

*“Investment could be gamified because it inspires some people. It should be also made easy to donate small amounts of investment to another person without bureaucracy.”* Female 41-50yrs.

As the answers indicate, there is a demand for educational investment application that could be utilized in educational institutions. From the survey answers could be noticed that there are already practice portfolios in Kauppalehti website and investment application called Invested, but neither of these services are used in educational institutions and the services lack on realistic qualities such as transaction fees, foreign markets, and crypto markets.

From the survey data I invented a game which would be a demo investing application with gamified features such as points and scores that help to keep users motivated. The application would be made in collaboration with a traditional Finnish bank, e.g., Osuuspankki, Säästöpankki, Nordea. The idea is to create a demo version to resemble the real version of a customer’s investment portfolio, with the exception that the users would use demo money while investing, and users would receive tips and guidelines in the application. One of the most important factors is to include the amount of transaction fees when buying or selling shares and make the application as realistic as possible.

Various research indicates that a good way to successfully learn is by playing an instrument. Of course, different people learn differently. Some prefer lessons with a teacher, and others prefer learning by themselves, and this can involve digital applications or traditional books. For example, Duolingo is an application launched in 2012 which has become one of the most popular ways to learn a new language and one of the most downloaded education apps in the world.

The approach used in order to attract customers in the early stages of the project to collect feedback is much more in line with what Eric Ries calls the "build-measure-learn cycle", which replaces the traditional (and long) product development path. (Aalto University Starting up course 2022) This process follows three steps:

1. Build a Minimum Viable Product (MVP)
2. Collect feedback on the MVP by exposing it to potential customers
3. Iterate the product based on the feedback (not only verbal feedback, but how they behave, e.g., buying your product)

Initially, the aim is to develop an early version of the product, with sufficient features to begin testing its market potential. The product is then given to customers to test the following: Do people use it? Will they keep using it? Do they spend money on it?

In the gaming industry, one of the most common mechanisms is "loot boxes", or bundles of rewards that contain a variety of random prizes. Ultimately, the result is a commitment to the product, where users are actively waiting for a new reward. The product is designed so that it rewards players with activities that matter to them, ultimately forming an emotional bond. (Aalto University, 2022)



## 7.5 Other service proposals

According to the survey, Finnish investors require more information about the risks in investing during digital age. Information about different forms of investing is available online 24 hours daily and it can be overwhelming to certain type of people. In online discussion forums people praise the well-performed investments but the same ones usually stay silent about the bad ones. Investing is a risky hobby, but it can be very rewarding if the investor knows what to do and minimizes the costs. From the practice portfolio in the demo investing application, beginning investors could see realistic transaction fees and market movements in real time.

Second service idea that came up in the survey results was a website that would compare all different banks and their fees. Especially transaction fees when buying or selling shares is different in every bank and there is a difference whether investor uses a bigger or smaller budget in investing. For other the best solution can be bank with a fixed transaction fee and for another one prefers a bank with a percentage fee. The ideal situation would be that by visiting this one website, an investor would receive an overview of all the financial services providers available and the costs of them.

One very different service proposal came from one of the survey respondents, the idea was to add social media features to investment portfolios. The idea is that investors could choose whether to show their own investment portfolio to other investors and if they decide to do so, they will receive access to see other investors' portfolios. The outcome would be that investors could learn from others by seeing how different investment portfolios have developed and in what time. The implementation of such service in online banking is difficult concerning all the security issues online banking services contains.

## 8 FUTURE RESEARCH

The research findings indicate that the investment behavior is very current and interesting topic for people in all ages. The large sample size indicates that investors are active online, and they are willing to participate studies examining the investment behavior. The research could be renewed annually to indicate how Finnish investors are adapting to digital currencies, non-fungible tokens, artificial intelligence, and machine learning.

In addition to future research suggestion provided, the contrast between Finnish investors' investment behavior to foreign investors' behavior could be an interesting topic and good addition to this research. Finnish investors usually follow the footsteps of foreign investors and therefore digitalization can be seen here later on than for example, in the United States. The number of technology and fintech companies, new digital services, and new digital currencies increase daily and the future research will show the impact of them on individuals' investment activities.

## 9 CONCLUSION

This thesis studied the effects digitalization have created on investing activities. It can be concluded that digitalization does have a large impact on the information retrieval, processing, and decision-making on Finnish investors. Online banking, digital services, fintech companies and online discussion groups have transformed the traditional banking industry and it has brought both advantages and disadvantages for investors. It was interesting to acknowledge all the effects digitalization has brought to investment activities and explore different digital tools provided online to improve own investment knowledge.

The topic is current and important to both investors and financial institutions. Both digitalization and globalization have permanently changed the finance industry and the operational environment around it. Different financial services are already offered by new companies with completely digital platforms. Professionalism and reliability are the traditional competitive advantage that finance industry will always have. In the future the best will perfume the companies, that can combine people, digital platforms, efficient operations, and global business when responding to the need of digital native consumers.

Furthermore, internet provides various tools and resources for individuals to learn about investing without a university degree in finance. Regardless of the age, gender or family background, everyone should have the same possibilities to seek for financial independence. The act of making Finland the world's most financial literate country has started and it concentrates on educating Finnish citizens about personal finances. The idea of an educational investing game application raised during the quantitative research and the finished product could help with increasing financial literacy among Finnish citizens.

Overall, the respondents found digitalization as a positive aspect to investment activities. Information overload and bounded awareness phenomenon can be avoided when confirming the sources over the internet. At this point, the proportion digital investing products among respondents is still relatively small compared to traditional investment funds.

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## SURVEY QUESTIONS

1. Age? (In years)
2. Gender?
3. How long have you invested?
4. What got you started with investing?
5. How long is your investment horizon?
6. From which channels you seek for investment information/advice?
7. How do you make sure the information is reliable?
8. Do you understand the basic investment terms? For example, P/E (Price per Earnings), allocation, bear -market and bull -market
9. Have you ever experienced investment scams over the internet?
10. Do you feel unsafe while using online banking services?
11. Has digitalization made your investment hobby any easier?
12. If you answered yes, how?
13. You have owned or own at the moment:
14. Do you have: domestic bank, foreign bank, or both?
15. How have you geographically diversified your investments?
16. Do you have: book-entry account, equity savings account or both? Or other?
17. Would you like the bank's investment advisor to personal contact you in investment matters?
18. Do you think that the processing time for buying/selling funds or shares in online banking is too long?
19. Do you see use for an application that would be a demo version of an online banking investment portfolio where beginners could practice market movements by executing purchases and sales using demo money?
20. Is there anything else that comes to mind concerning the topic? If you wish, you can provide ideas for discussion related to the effects of digitalization on investment activities.