MASTER THESIS

VALUE OF INNOVATION IN THE FINANCIAL MARKET

Roel Bruins

MSc Business Administration

Digital Business & Analytics

Examination committee

Prof. Dr. J.R.O. Osterrieder

Prof. Dr. M.R. Machado

04-03-2023

UNIVERSITY OF TWENTE.

Acknowledgements

This master thesis is written for the final stage of my Master of Science education in Business administration with the specialization of Digital Business & Analytics at the University of Twente. Before displaying the full research that I have performed I would like to thank the people who supported me during the writing process of this master thesis.

First of all I would like to thank Prof. Dr. Osterrieder for helping me start with the research process and guiding me along the way. The feedback that I received was helpful and at times necessary to steer my research in the right direction. Secondly I would like to thank Prof. Dr. Machado for his enthusiasm and extensive feedback in a later stage of the research. Through his feedback I was able to refine my arguments and improve the quality of my work. Thirdly I would like to thank my previous educators from the faculty of Business administration. Through them I had the right knowledge, perspective and tools necessary to perform this research. Last but not least I would like to thank my family for providing me with the support necessary to be able to focus on my education.

Roel Bruins

March 4, 2023

Abstract

The importance of innovation has been a well-established factor in the development of the financial sector. With accessibility to the financial market becoming more and more widespread, through advancement in the field of financial intermediation, almost the whole world has access to the international financial market. What the value of innovations is for the development of economies is a well-studied subject. This paper aims to provide an overview of the changes that the value of innovation has undergone in the last thirty years. By creating this overview the paper bridges a gap in the knowledge of the general shift in the valuation of innovations. A literature review on the value of innovation from the last thirty years was conducted to create this overview.

By creating the overview it was found that there is a consensus in the literature that the value of innovation is measured in the changes that it brings to the stock value of a company. Many inventions were made for the financial market brought more prosperity, there have however also been innovations that caused problems in the system. Negative innovations played a large role in the dot-com crash and the financial crisis. Before these two events there was more freedom for financial innovations to be developed. After these two events the value of innovations was still linked to stock returns, however the effects on culture and society started to play a larger role as well, and as a result, there was a growing call for more regulations. The implication of these developments in the field of innovations are that companies can no longer solely focus on stock returns and that the financial market as a whole should look towards changes in the system to create the proper checks and balances.

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1. Introduction

Innovation is often seen as one of the most important factors of the business process. It is the key driver to further a business and make it future proof. Organisations that innovate often enjoy more enhanced profitability in subsequent years (Lerner, 2006). One of the most famous early adaptors of this idea was Joseph Schumpeter who already coined the idea in the early 20th century, as mentioned by Zakaria & Iacopetta (2016). The idea that innovation is good for the economy is therefore nothing new. As time and environment change markets the process of innovation is subject to change as well. Therefore it is necessary to take a look at how the value of innovation has changed over the years.

The view that innovation is one of the most important factors in a business process is also applicable in the financial sector (Vermeulen, 2004). This is not just the case on business level but on macro level as well. Many stories can be told about companies that above everything else wanted to protect their funds for Research and Development (R&D) so that they could still innovate and help the company overcome hard times. One famous example of not wanting to cut R&D costs to be able to overcome hard times is from Apple in the early 2000's. When the dot-com crash happened many companies in the tech sector were facing financial difficulties. Instead of reducing the costs of R&D the leadership of Apple, with Steve Jobs as CEO, decided to significantly increase the expenditure on R&D. Through this increase in R&D funding, Apple was able to overcome their difficulties and book some of their biggest successes with the introduction of iTunes, the iPhone and the app store in subsequent years (Soferman, 2020). An example of the importance of R&D on macro level would be what happened to the British economy in the fall of 2022. With pressure on the economy the government needed to make decisions about how best to handle these difficult times. With cuts in R&D funds the British government could have bridged gaps on the short term, however British businesses and universities advised the government to not touch the innovation budgets (Bethan Staton, 2022). With the cuts in R&D funds the British economy could face lower growth in coming years. According to Matt Griffith (as seen in Bethan Staton, 2022) "it was penny-wise pound-foolish" to create uncertainty about future investments in R&D from the British government.

It is clear that R&D budgets are important, however how much value the financial sector puts on the innovation of their business is not clear. Furthermore the valuation of innovation are subject to change. With the rise of new technologies such as card payments, online banking, mobile banking and risk management techniques, the market has been subject to many changes in the past thirty years. There is no sign of technological advances slowing down, so many more innovation are to be expected (Summerfield, 2021).

1.1. Background information

Before exploring how the financial market values innovation it is important to outline what is the financial market. In the literature multiple definitions what the financial market is can be found. Heffernan (1990) describes it as being a broad term that encompasses securities industry, building societies, major clearing banks and the insurance industry. Boot & Thaktor (1997) describe the financial market as a system to facilitate the transfer of resources from savers to those who need funds. In this latter description the two major players for facilitating the transfer of resources are banks and the capital market, which is the market for bond trading. In a more recent study conducted by Awonatezuaka et al., (2022), the financial market is described as an

intermediary for capital. From these three definitions it becomes clear that the financial market is a system that enables the transaction of capital.

In the past couple decades technological advancements have been paramount in changing the way the financial sector operates. With the rise of the Internet, managing financial affairs on the customer side has become more online. Since the mid 1990's customers have moved to a more self-servicing environment. In the beginning of this innovation not all banks offered this service and there was some scepticism towards the adoption of Internet financing (Pikkarainen et al., 2004). Nowadays it is almost impossible to imagine a world in which finances are not linked to the Internet. Most people use a card or even their phone to make payments. All these transactions work via the Internet. What was first a target for scepticism has now become one of the most common practices.

Just like the rise of having finances handled online there have been new changes to the financial market. In recent years a wide array of developments have taken place in the financial sector with innovations in the payment systems for digital currencies, blockchain-assisted smart contract, credit markets and peer to peer lending (Arefjes et al., 2020) as well as the rise of mobile banking (Shaikh & Karjaluoto, 2015). What these changes will bring us in the future is unclear. However it is clear that the financial market is long from stopping to innovate. It is very reasonable to assume that such a vital part of our civilisation will never stop to innovative. Most of the business infrastructure of financial institutes had to change to accommodate digital management of financial affairs (Sardana & Singhania, 2018). The rapid development of new technologies has warranted an equal swift innovation process. The European Commission (EC) uses the term digital finance to indicate the impact of new technologies on the financial services industry. According to the EC these technologies consist of a variety of products that have changed the way that financial services are provided. The examples of changes in fintech in recent years are numerous, the EC includes Artificial intelligence, social networks, machine learning, mobile applications, distributed ledger technology, cloud computing and big data analytics as innovations that have changed the market in recent years. To make sure that the European Union stays competitive the EC created a digital finance strategy (Directorate-General for Financial Stability, Financial Services and Capital Markets Union, 2022). With many changes happening in the financial market and involvement from the EC to steer these changes it will be interesting to see in coming years how new technologies will be accommodated in the financial market.

1.2. Research question

Even though there is a vast literature on the valuation of innovation in the financial sector, an overview of the changes in valuation of innovation is missing. This paper aims to bridge this gap in knowledge by providing an overview of the value that the financial markets puts on innovation over thirty years. The main research question for this paper is therefore: How has the value of innovation changed over the last thirty years? To answer this question the following three sub questions will be used.

1) What is the value of innovation?
2) What are the important innovations in the last thirty years in financial market?
3) What are the views on innovation in the last thirty years?

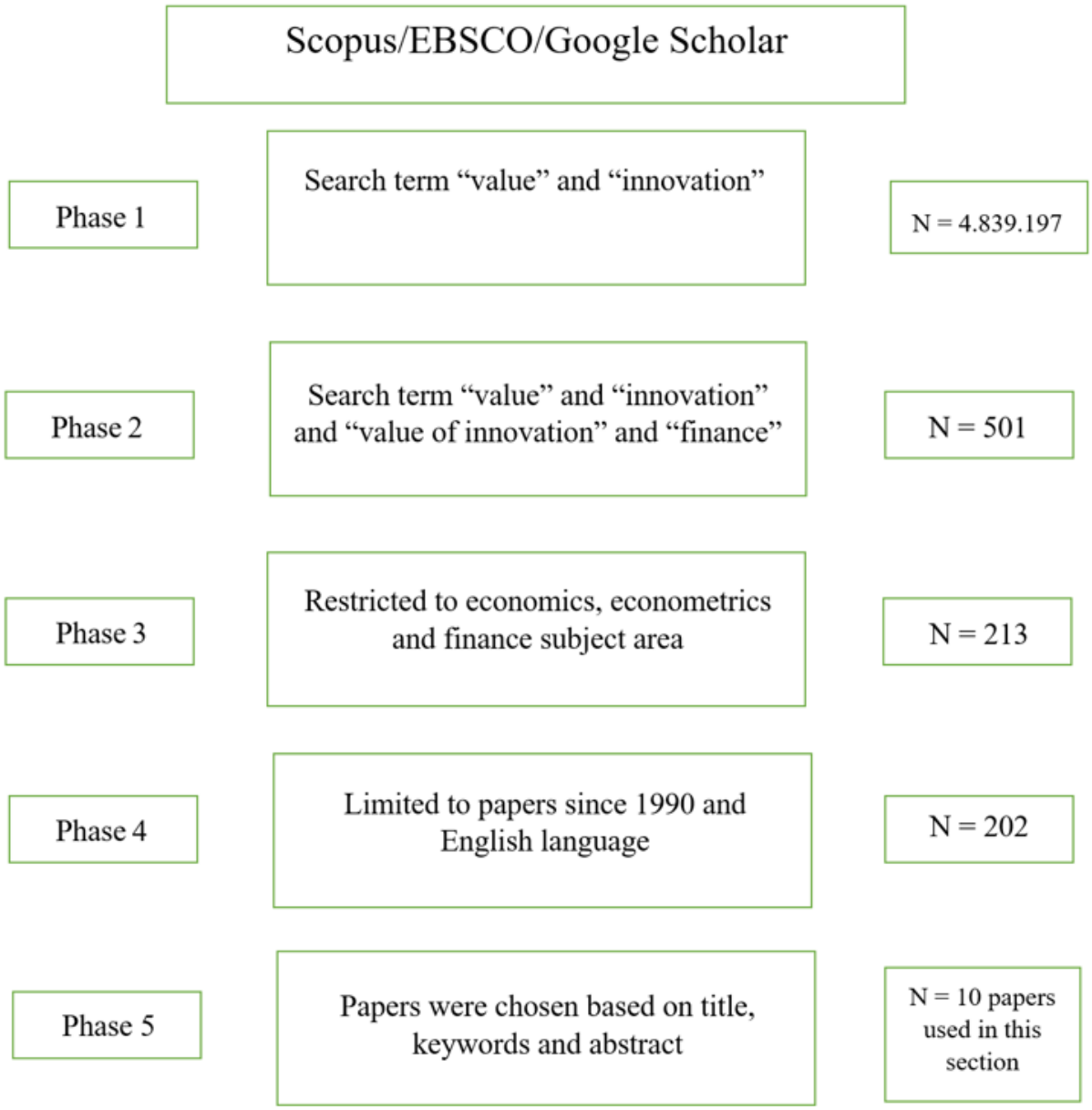
The relevancy of this research is that it provides stakeholders in the financial market an overview of changes that have happened and will most likely happen to their market.

2. Methodology

For this systematic literature review the databases of Scopus, EBSCO and Google Scholar were selected to analyse literature on the value of innovation which were published in the field of finance. The first database that was used, is that of Scopus, through which a vast amount of financial papers can be found that cover financial innovations. Besides papers, Scopus offers access to relevant book chapters and journals that could be used for this research. The second database that was used is that of EBSCO, through which specific literature on economics was readily available. With the advanced search options for economic literature the database provided access to a great amount of relevant literature. The last database that was used is Google Scholar. The database provides access to papers, journals and book chapters. The quality of the literature does however vary a bit more than on the two other databases, therefore it was important to control for quality. The papers found via Google Scholar have therefore been checked more thoroughly on quality via the amount of citations that the literature has.

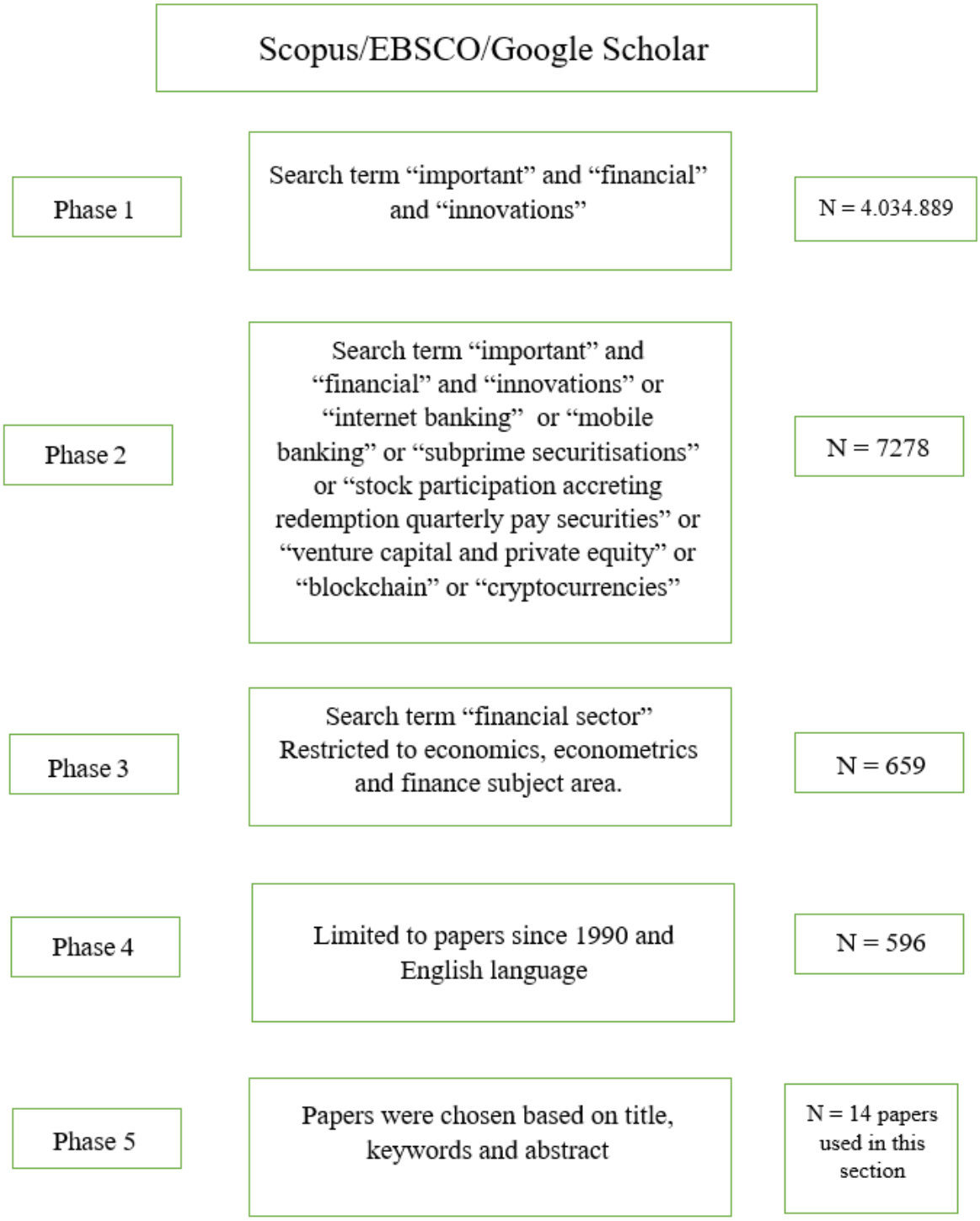
Since this paper consists of three parts, multiple different queries were used. For selecting the literature used in the first part of this paper, which looks at the definition of the value of innovation, the main search terms "value" and "innovation" were used. This resulted in a combined search result of 4.839.197 sources over the three databases. To get the most relevant sources, the results were further filtered by adding the search terms "value of innovation" and "Finance", which resulted in 501 sources. These results were further filtered for the correct subject area of economics, econometrics and finance, which resulted in 213 sources. These sources were further filtered to fit this paper by only selecting the English sources published since 1990. This resulted in a search result of 202 sources over the three databases. These 202 sources were then manually filtered based on title, keywords and abstract to find the most relevant sources for this paper, which came down to ten papers for section one. An overview of this process can be found in figure 1.

Figure 1, Literature selection process section one



For selecting the literature used in the second part of this paper, which looks at important innovations from the last thirty years, a combination of the main search terms "important", "financial" and "innovations" were used. This resulted in a combined search result of 4.034.889 sources over the three databases. Based on initial findings in preliminary research the search terms "internet banking" or "mobile banking" or "subprime securitisations" or "stock participation accreting redemption quarterly pay securities" or "venture capital and private equity" or "blockchain" or "cryptocurrencies" were added, which resulted in 7278 sources. To further specify the field for the innovations relevant for this research the search term "financial sector" was added, as well as restricting the search to economics, econometrics and finance subject area, which resulted in 659 sources. These findings were further limited to sources published in English since 1990, which resulted in 596 sources. From these sources fourteen papers were then manually selected to be used in this research based on title, keywords and abstract. An overview of this process can be found in figure 2.

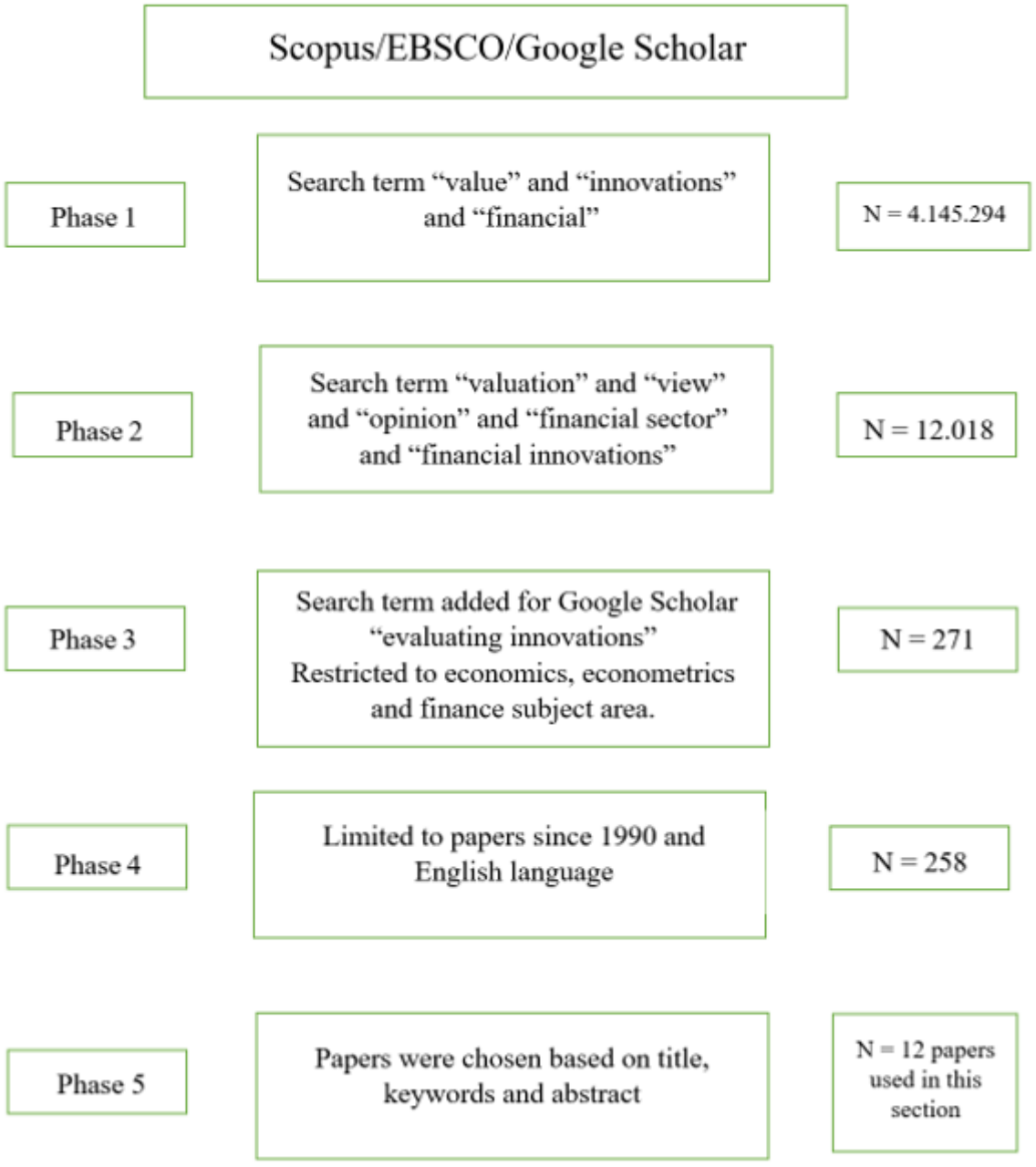
Figure 2, Literature selection process section two



For the third part of this paper, which looks at views on financial innovation over the last thirty years, a combination of the main search terms "value", "innovation" and "financial" were used. This resulted in a combined search result of 4.145294 sources over the three databases. To get the most relevant sources the search terms "valuation" and "view" and "opinion" and "financial sector" and "financial innovations" were added, which resulted in 12.018 sources. Since the Google Scholar database still offered a large quantity of sources, the search term "evaluating innovations" was added for the search on this database. Furthermore the economics, econometric and finance subject area was added to the search in all three databases. These changes in the search query resulted in 271 sources. These findings

were further limited to sources published in English since 1990, which resulted in 258 sources. From these sources twelve papers were manually selected to be used in this research based on title, keywords and abstract. An overview of this process can be found in figure 3.

Figure 3, Literature selection process section three



Besides the literature studied via the databases mentioned above, regular Google searches were performed to find news articles in financial papers. These news articles were used to provide examples of specific claims made in this paper. Only financial papers were used to illustrate the different ideas.

3. Results

To answer the research question we will first explore the concept of value of innovation via an overview of what the literature means with the term value of innovation. With this overview a clear definition will be created to be used in this paper. Secondly an overview will be created of the most important innovations have taken place in the last thirty years. This overview is created to demonstrate that the value of innovation has had some important innovation that influenced it. Lastly we will look at the views on the value of innovation in that same period.

3.1. What is the value of innovation

To be able to make an overview of how the value of innovation has changed in the last thirty years it is first important to get an idea of what is meant with "the value of innovations" in literature, therefore an overview is created. Based on the various definitions of the term "value of innovation" a selection is made about which definition will be used for this paper. Through this selection an answer to the research question "What is the value of innovation?"

Blundell et al., (1999), defines the value of innovation based on the effect that the innovation has on the market value of a firm. The value of innovation is therefore linked to the change in the valuation on the stock market for the firm. Blundell et al., (1999) argues that firms with a larger market share are more likely to be innovative. This corresponds to already established ideas that higher market share companies tend to gain more from innovations than lower market share companies. The paper mentions two alternative interpretations of the results. The first alternative interpretation is that larger firms, often synonymous with higher market share, tend to produce innovations that are intrinsically of higher quality than innovations produced by smaller firms. One thing to note with this statement is that smaller firms tend to be the creators of the more radical innovations. This is however a smaller portion of the innovations. The second alternative interpretation is that firms with a greater market share often have a larger marketing team at their disposal to advance the sales of innovations. This alternative interpretation is however met with critique from Blundell et al., (1999) since a larger company does not necessarily mean that they control a larger market size. The data used in the research did not allow controlling for this potential interpretation, further studies on this topic were therefore recommended.

According to Chesbrough & Rosenbloom (2002) the value of an innovation remains latent until it is commercialized. Not every invention can immediately be implemented in the existing business model of a firm. In some cases the business model will not accommodate the use of the invention or the opportunity in the market. In that case the technology managers of the firms should create the right business model to fully capture the value of the innovation. When the potential of an innovation is not fully captured, it will provide the firm with a reduced value return. If this happens often it can lead to the withdrawal of the company's intention to create technologies all together.

Chesbrough & Rosenbloom (2002) define the value of innovation in multiple ways. They provide a different definition for the firm, shareholders and customers. The value of innovation for the firm and shareholders are focussed on the financial effect that the innovation has on the assets of the firm. For the firm there is still the aspect of the influence that the innovation has on the business process, however this is mostly important for cost and time saving. The definition for shareholders is purely financial, based on returns of the innovation. The value of

an innovation for a customer, in this case a new technology that is brought to the market, can be valued by the customer in two ways according to Chesbrough & Rosenbloom (2002). The first way a customer can value an innovation is judging the technology on its ability to reduce the cost of a solution to an existing problem. The second manner in which a customer can judge a new technology is its ability to create new possibilities and solutions.

Creating value with an innovation is necessary for a firm, however it is not sufficient to just create value as the firm also needs to address how it appropriates some of that value for itself (Chesbrough & Rosenbloom, 2002). The way that the company can appropriate value from its innovation involves third parties. Chesbrough & Rosenbloom (2002) describe that both the vertical value chain and the value network play a role in the appropriation of value. The third parties can supply the goods necessary for the value creation and appropriation and on the demand side effect the consumers to increase the value of the innovation.

According to Sherry & Teece (2003) the value of innovation should be split into two different concepts. The first concept is that the value of the innovation itself should be evaluated. What the value of the technical breakthrough for a firm is should in that case be the factor to take into consideration. The second concept of valuation of innovation is the value of the intellectual property rights associated with the innovation. The reason why this distinction is important according to Sherry & Teece (2003) is that an innovation that creates value for an organisation may not be patentable. By acquiring a patent on an invention the value of it can be made significantly greater.

The way that Sherry & Teece (2003) look towards the value of an innovation is the fee that an organisation can receive for the use of their innovation by other firms. This fee can be received in the form of compensation for the use of their patented innovation. The value of the innovation, in this case the patented concept that is used by the authors, is the "reasonable royalty". The reasonable royalty is different from the actual negotiated royalty that is paid for the use of the patented invention. The reason why this is different is that in the actual negotiated royalty it is often the case that a discount is provided to deal with uncertainty about the validity of the patent. Furthermore in case of an infringement case where the party that uses the patented innovation does not pay for the use of it Sherry & Teece (2003) suggest that there should be a premium on the fee that is normally demanded for the use of their innovation. With this premium infringers are to be deterred from playing a heads or tails game in which they can just gamble on paying the fee or not without any repercussions.

In a final note Sherry & Teece (2003) mention that the value of innovation is a complex subject and that a distinction should be made between private value and social value. The two concepts from Sherry & Teece (2003) are about the private value of an innovation, which means the complete value of the innovation for the firm. This is often just a fraction of what the innovation is worth in social value, which is all the value that is derived from the innovation.

Greenhalgh & Rogers (2006) define the value of innovation based on the market value of a firm. The market value of the firm is calculated by using the following equation:

$$V = q(A + \gamma K)^{\sigma}$$

In this equation the market value (V) is calculated via the book value of total assets (A), the intangible assets not included in the balance sheet (K), the current market valuation coefficient (q), ratio of shadow values of intangible and tangible assets (γ) and to accommodate for non-constant returns to scale (σ) is added. With the valuation method used by Greenhalgh & Rogers (2006), they create a possibility to measure the value of innovation by using the market value to determine if an innovation creates more market value for the firm.

According to Greenhalgh & Rogers (2006) the value of innovation varies substantially across different sectors. They discuss two possible reasons for the different value of innovations between sectors. The first reason is that the stock market might not have the knowledge required to make an adequate estimation of the likely returns of innovative activities. The knowledge required could differ between firms and sectors which would explain the differences in valuation between sectors. The second reason that Greenhalgh & Rogers (2006) put out there is that the variation in valuation can possibly be explained by the different extents of competitive pressures in a sector. In case there is less competitive pressure, firms would be able to achieve higher profit levels than in sectors where the competitive pressure is high. With higher level of competition they argue that it is more difficult to come to a most beneficial "appropriability", which comes down to the ability to capture the benefits of an innovation for a firm.

Besides the firms' sector influencing the market value, Greenhalgh & Rogers (2006), found that the type of patent that an organisation holds for their innovations influences their market value as well. By just holding national patents, in this research UK patents, the influence on a possible market premium are significant for three of the six researched market sectors, however they are always less of an influence than the European counterpart to the national patent. The researchers thereby concluded that the patents that the companies hold are of great influence on the market premium that they can achieve.

In the paper by Pisano & Teece, (2007), the value of innovation is seen as the economic returns on the innovation. Two factors that play a role in the returns from innovations are the appropriability regime and the industry architecture. The first factor the appropriability regime is the protection that an inventor has for their innovations. This consists of the legal mechanisms in place and the "natural" barriers that exist for others to recreate or imitate their inventions. With a higher appropriability innovators can receive a higher return on their investment. The second factor the industry architecture depicts how the different components in a market interact. Parties in the market that are outside of the firm can have an influence on the return on the innovation for firms.

Acemoglu, (2012), stated that economic growth is one of the most relevant areas of economics. This relates to a practical level as well as a scientific level. On a practical level humanity wants to evolve and create more wealth for its population. On a scientific level economic growth is an interesting subject to investigate because of its importance. According to Acemoglu, (2012), the value of innovation is not specifically mentioned. However innovation is seen as one of the key drivers of economic growth. Through the importance of economic growth mentioned it is a reasonable assumption that innovation is seen as great value for a market. Acemoglu, (2012), stresses the importance of standardizing new technologies to create more value from the

innovation. By standardizing innovations the technology can be used by more workers, which plays a major part in the growth process.

According to Gârleanu et al., (2012), innovations have two effects on the market. The first effect is captured in their "displacement risk factor", this theory looks at the effect that the entering of an innovative firm has on the market equilibrium. In this theory they speak about the bright side and dark side of innovative firms. The bright side is the value that innovations bring to the market, they raise productivity which leads to increased outputs, consumption and wages. However Gârleanu et al., (2012) does not solely speak of value creation through higher outputs from innovations. There is a dark side to bringing new innovations to a market. In this paper they argue that bringing an innovation to the market creates a risk factor through increased competitive pressure, reducing profits and eroding the human capital of older workers. A second effect of innovation is that profits from innovations are mostly captured in the future it is not possible to avoid negative effects from current innovations with the value of future innovations through the financial market Gârleanu et al., (2012).

Loualiche, (2016) do not define the value of a single innovation, however the author looks towards a broader effect that innovative companies can have by entering a market. The value of the new innovations is looked at through a market value perspective. The new players change the status quo of the market. Established companies get displaced by the new competition. How much the new innovation in the market upsets it depends on the monopoly rents that are available in the market. New innovation in markets that are used for large monopolies and low entering costs are the most likely to gain the most value from their innovation.

In the paper by Kogan et al., (2017), two views on the value of innovation are displayed. The first value of innovation that they elaborate on is the private value. In the paper they propose a new measure that is based on the stock market reactions to patents to capture the private value. By examining the stock prices in a short window after the news of the successful application for the patent becomes known they try to filter out contamination of the private value. They further clean the information by filtering the total stock return from the stock price effect over the event window. The second value of innovation that Kogan et al., (2017), elaborates on is the scientific value, which means the advancement of knowledge. This is measured in the amount of citations that an innovation receives in literature.

The two types of value evaluation do not have to coincide. An innovation can create a great sum of private value and still be of virtually no scientific value. The research from Kogan et al., (2017), however shows that there is a positive correlation between the private value of an innovation and the scientific value of an innovation. In case that the private value of an innovation is high it is positively correlated with a higher number of citations in scientific literature.

The research from Kogan et al., (2017), further establishes support for the Schumpeterian hypothesis that innovations enable firms to grow economically. Through this growth there is also support for the idea of creative destruction, in which the new innovation makes the older techniques obsolete and brings forth a shift in allocation of assets in the market (Kogan et al., 2017).

According to Haddad et al., (2022) it is important to measure the impact of an innovation to be able to understand economic growth, firm dynamics and many more questions about economics and finance. The value of innovations is often measured by the reaction of the stock price to the announcement of the innovation. Based on the reaction of the stock price the present value is determined for the innovator and the spillovers for the competitors. The paper by Haddad et al., (2022) challenges this approach because they do not see a correlation between the stock prices and the real outcomes of an innovation. The disconnect is due to intense speculations on the financial market in reaction to an innovation boom.

Haddad et al., (2022) argues that existing literature supports the idea that asset prices always reflect the economic impact of innovation, however does not calculate this for every asset, it just takes the average values of innovations. Haddad et al., (2022) pushes the idea that taking asset prices for valuation of innovations is incorrect, for the relation between the two is altered in times of economic bubbles. Which is defined as years in the industry where there is a rapid increase in stock prices.

The paper by Haddad et al., (2022) indicate two disconnects between the market value and the real value of an innovation that happen during a bubble. The first disconnect is that the inflated changes in stock prices during the first few days after obtaining a patent does not create a realistic view of the increase in cash flows due to the innovation. This effect is even greater in patents that receive many citations, as the relationship between cash flow and citations does not change. The second disconnects that is mentioned by Haddad et al., (2022) is that there is no negative impact of innovations measured in competing firms. In reality there should be a negative effect on the stock price of a competing firm, since their competitor has gained an advantage with the innovation. During economic bubbles these negative effects do not seem to show in the real outcomes. Haddad et al., (2022) proposes a theory for the valuation of innovation, in which the disagreement between investors on the value of companies in an industry is combined with a framework of firm competition.

To answer the sub question “What is the value of innovation?” multiple definition from the literature have been described. The answer on this sub question is that most studies agree on the premise that the value of innovation is the value that the new invention brings the company, measured in changes of stock value. The consensus on this simple to grasp definition of “the value of innovation” makes it a good definition to use for this paper. It is good to note however that there are more ways that an innovation can be valued. Therefore an overview of the value of innovation definition is presented in table 1. With this definition the value that the innovation has on society does not get measured. Neither does the definition fully display the negative effects that the innovation can have for the competition.

Table 1, Overview value of innovation definitions

Study (author + year	*Definition of evaluation of innovation*	*Main variables*	*Financial aspect (yes/no)*	*Any other relevant aspect?*
Blundell et al., (1999)	Effect that innovation has on the market value of a firm	Market value	Yes	
Chesbrough & Rosenbloom (2002)	Two valuations, one based on market value and one on value the new product brings customers	Market value Product value for customers	Yes	
Sherry & Teece (2003)	Two valuations, one based on technical value for the firm and the second on the value of intellectual property rights	Technological value, Intellectual property rights	Yes	
Greenhalgh & Rogers (2006)	Effect that innovation has on the market value of a firm	Market value	Yes	
Pisano & Teece, (2007)	Economic returns on the innovation	Economic return, Appropriability, Industry architecture	Yes	
Acemoglu, (2012)	Economic growth on practical level and scientific level	Wealth creation, Scientific relevance	Yes	
Gârleanu et al., (2012)	Two valuations, effect that innovations have on productivity and effect on competitive pressure	Productivity, Competitive pressure	No	Innovations are not just seen as good as they also have a "dark" side
Loualiche, (2016)	The effect that the innovative companies have on the market equilibrium	Market status	No	Does not valuate a single innovation but looks at the effect on the

				market as a whole
Kogan et al., (2017)	Two valuations, private value through stock price reactions and scientific value of innovation	Stock price, Scientific value	Yes	An innovation can vary in valuation based on the valuation method
Haddad et al., (2022)	Stock return corrected via disagreements between investors on the value of companies combined with a framework of firm competition	Corrected stock return	Yes	Corrected economic return of innovations to withstand economic bubbles
This study	The valuation of innovations based on changes in stock prices	Stock return	Yes	How the value of innovation has changed in the last thirty years

3.2. Important innovations in the last thirty years

In this section the various innovations in the financial market since 1990 will be displayed to answer the sub-question "What are the important innovations in the last thirty years in financial market?" Through this overview an impression on which innovations have been subject to and have influenced the view on innovations will be created. According to Allen, (2012), financial innovations are not always created with the best intentions at heart. They are sometimes created with the goal of making finances more complex so that it can be used to exploit customers. An example of these unnecessary innovation given by the author is overpriced securities with no other redeeming qualities. However, there are also many positive innovations that have helped shape the financial landscape. An example provided by Allen, (2012), would Venture Capital (VC), through which more companies would have access to the required funds.

3.2.1. Internet banking

In the 1990's banks started enabling customers to deal with their finances via the Internet. The term "Internet banking" is coined to catch this new way of banking activities done through the Internet (Furst et al., 2002). These activities vary from opening an account, transferring funds to managing bills. These services were often offered as an additional service next to the physical banking offices that were already in place. However, with the rise of Internet banking more and more "Internet-only" banks were established. These banks would still offer the ability to withdraw money from ATMs without any further physical locations. In the study conducted by Furst et al., (2002), it was found that Internet banks had better efficiency and higher returns than traditional banks. Even though it was concluded in the research that at the time Internet banking probably had only a small influence on the institutions performance, it was clear that this new way of dealing with finances was about to bring a revolutionary development to the market.

3.2.2. Mobile banking (M-banking)

With the rise of the Internet is was clear that dealing with finances via the Internet would most likely become a well-established phenomenon. The same could be said about the rise of the mobile banking applications in the late 2000's. Through the development of these applications customers could access their finances on their mobile phones. With the potential that the increased accessibility, privacy and saving in time and effort brings, it was no wonder that M-banking had a swift adoption (Akturan & Tezcan, 2012). In the study by Akturan & Tezcan, 2012, it is concluded that the adoption of mobile banking is largely determined by the attitude towards M-banking. This attitude is determined based on the experience that customers have. When the customer have the perception that mobile banking is beneficial for them they will increase the use of it. Two other perspectives that should be focussed on are the social and performance risk of mobile banking. When these risks are deemed too great for the customer, adoption of M-banking will slow down.

3.2.3. Subprime securitisations

Subprime securitisations have been one of the most influential innovations in the last thirty years. Often credited with being the cause of the financial crisis that started in 2007 (Allen, 2012). With Subprime securitisation mortgage originators extended mortgages to previously deemed not creditworthy borrowers. The debts of these mortgages were then bundled and sold

to investors (de Michelis, 2009). Investors were interested in these subprime loans, because of their historic return rates.

The rise and boom of subprime securitisation took place between 2003 and 2005, in which the groundwork was lain for one of the biggest financial crisis in recent history. With the financing of many mortgages that were below standard investors took a risk with their capital. Through re-selling their mortgage contracts many lost sight on what was the risk of these subprime mortgage contracts. As long as the value of properties were going up there was no problem, since the houses could be sold to recover the loan. However, when the housing prices depreciated and people folded on their mortgages without having made substantial payments, there was no way to recover the loan (Jacobs, 2009).

3.2.4. Stock Participation Accreting Redemption Quarterly Pay Securities (SPARQS)

Often new types of securities are issued to improve the position of both the issuer and the buyer. This can be due to a better alignment of the two parties, lower taxes or avoid regulations. Since issuers and buyers would benefit from these things it is assumed that financial innovations are desirable (Allen, 2012). As mentioned before, not all innovations are made with the best intentions at heart. One of the inventions that seems to serve no purpose besides funnelling money from unaware customers towards financial institutions is the introduction of Stock Participation Accreting Redemption Quarterly Pay Securities (SPARQS). SPARQS are medium-term issued notes that will provide payments based on other company's common stock prices (Henderson & Pearson, 2010). According to Henderson & Pearson, (2010), these securities have an abnormal negative return compared to the underlying stock and bonds with the same risk. In a similar study conducted by Bergstresser, (2008), it was found that especially notes issued before 2005 had a negative return. Notes issued between 2005 and 2008 had a premium that would lead to a performance of about zero. Since the securities do not seem to provide any other benefits such as liquidity or tax benefits, it is difficult to rationalise their purchase. Therefore Henderson & Pearson (2010) conclude that SPARQS are only offered with the intent to exploit uninformed customers.

3.2.5. Venture capital and private equity

Venture capital in itself is nothing new, in the late nineteenth and early twentieth century the first forms of venture capital can be found. Wealthy families sought opportunities to increase their wealth by exploring possible high-return investments (Gompers, 1994). Venture capitalists offer new firms the cash that they need to chase their growth potential. Besides the capital needed for growth the venture capitalists sometimes offer their expertise and help guide the new firm so that it can grow (Hopp & Rieder, 2011). This practice is prevalent in the United States than it is in Europe. In Europe the venture capitalists often use a more "hands-off" approach where they let the new business figure its own path out and just supply the finances (Schwienbacher, 2008).

With the success of the tech industry in the 1990's the investments of venture capital and private equity increased dramatically. As nobody wanted to be left out on the next big thing, many investments were placed in start-ups. Most prominent was the investment in companies in silicon valley, where the most innovative tech companies were concentrated. These successful innovative companies helped increase the venture capital that was brought into the market. The

peak of the investment of venture capital was near the end of the 1990's. From there the performances of the investments started to go down which lead to a decreased investment from venture capitalists (Kedrosky, 2009). According to Kedrosky (2009), it is expected that the investments of venture capital will further decrease in the years after 2009.

3.2.6. Blockchain

With the invention of blockchain, a secured digital ledger to keep track of all the transactions with digital currencies was made. The introduction of this innovation coincides with the introduction of the bitcoin. The technology works without the interference of a third party and verifies the integrity of the data with all the network members (Pal et al., 2021). By the decentralised data storage form it becomes a very reliable system to use for the transfer of digital funds. Through Blockchain security in finances could therefore be improved.

3.2.7. Cryptocurrencies

The first cryptocurrency to be launched was the bitcoin, which works on blockchain to create an all-digital currency with its own value that can be used to make online payments. Other cryptocurrencies followed the bitcoin and work with a same peer-to-peer communication infrastructure (Ingolf et al., 2021). As the coins can be broken into smaller pieces it can be almost used like an all-digital substitute of money, with no interference from third parties. There are however also problems with this system. Since it is a very anonymous way of dealing with financial funds it is difficult to trace certain financial transactions back to its source (Bao et al., 2023).

To answer the sub-question "What are the important innovations in the last thirty years in financial market?" an overview was created of important innovations since 1990. The most prominent innovations from the last thirty years were found to be consisting of: Internet banking, M-banking, subprime securitisation, SPARQS, VC and Private equity, Blockchain and cryptocurrencies. These innovation have had major influences on how the market looks towards innovations. Some of these innovations helped the market grow through new mediation options between suppliers and demanders of capital. Other innovations were less beneficial for the market and were mainly used to enrich specific institutes without offering benefits for customers.

3.3. Changes in value of innovation in the last thirty years

To answer the sub-question "What are the views on innovation in the last thirty years?" the views on innovation since 1990 are explored. Two major events happened in the last thirty years that influenced the way that the financial market looks towards the value of innovation. The first major event that had great influence on the value of innovation is the dot-com crash. The dot-com crash demonstrated the impact of financial bubbles on the way that we look at innovations. The second event that had a lot of impact on the views on the value of innovation is the financial crisis of 2007. The financial crisis displayed how far a system can be rotten when innovations are not regulated. With significant crashes of the stock market the dot-com crash of 2000 and the financial crisis of 2007 had significant impact on the stock market and the way that innovations were valued (Chen et al., 2018). In the time after the dot-com crash and the financial crisis, the effects that these two events had on the value of innovation can be felt. Besides the effects brought forward by these two events other changes in the value of innovation are also displayed for this era to create an up to date view of how the financial market looks towards the value of innovation.

Innovation has been credited with having a positive effect on the economy for the longest time. In the article by Johnson & Kwak, (2012), innovation is seen as a basically good process for the economy. Innovation is one of the most powerful forces since it improves living standards and thereby shapes human society. Especially in a free market innovation is one of the most powerful tools to improve living standards, since in this market type innovators are allowed to capture benefits from their contributions to society and are therefore stimulated to make the most profitable contributions to society as possible. By rewarding innovators for their contributions they are more motivated to make the best contributions to society as they can than when the market limits the capturability of the profits.

According to Johnson & Kwak, (2012), technological innovations in the financial sector are synonymous with financial innovations since the technological innovations surely effect the financial sector a great deal, they however do not change the core function of the sector. The core function according to Johnson & Kwak, (2012), is financial intermediation. In this simplified portrayal of the financial sector, Johnson & Kwak, (2012), would call a development an innovation for the financial sector if it enables financial mediation where it was not possible before. Examples of specific financial innovations that are given in the research are: Hedge funds and securitization lowered borrowing costs. These innovations allow customers more access to the financial market, so that they can make more use of the financial mediation. The nature of financial innovation is composited from two factors according to Johnson & Kwak, (2012). The first factor is that the innovation must have a positive effect on financial intermediation. With this positive effect it should further the productive usage of savings where it would otherwise not occur. The second factor is that innovations should make credit more available. However with these type of innovations it is possible that the market is already able to access credit effectively, it is even possible that credit becomes too accessible.

3.3.1. Influence of dot-com crash and financial crisis

People with over-access to credit was heavily witnessed in the era before the dot-com crash. With the successes of Internet companies, the financial market tried to capture lightning in a bottle with funding new start-ups that had the potential to make it big in the booming business. With the rise in interest to finance start-ups came new financial innovations to earn money from the influx of funds.

Johnson & Kwak (2012), shows the effects of some of the latest innovations in the financial sector. The securitization of assets is nothing new, however in the 1990's and 2000's innovations were made to facilitate the sales of these securitizations. One of these inventions was the Collateralized Debt Obligation (CDO). This combination of bonds, of which the cash flows were being sold, was a novelty on the market. Through CDO's it was possible to sell loans that would otherwise have been deemed to be too risky, which improved the financial intermediation. The structure got so convoluted that this lead to the problem that companies were given loans that had a great chance of being defaulted, without the investors demanding high returns for the loans.

Another innovation that was made in the 1990's and 2000's is the credit default swap (CDS), which is closely related to the CDO. The CDS is an insurance for a bond or CDO which would have otherwise been deemed too risky to buy. With the insurance investors were more willing to buy these risky bonds, thereby the CDS improved the financial intermediation. The problem with CDS was that they were priced based on historic data with low default rates. Based on these low prices it was for investors interesting to take these CDS's with the CDO. The underestimation of the risks involved in the CDO's meant that suppliers of CDS's were also vulnerable for heavy losses.

A third innovation in the 1990's and early 2000's was Venture Capital (VC). Venture capital in itself is nothing new, wealthy citizens and institutions have been funding companies for a cut of the profit for centuries. However, the popularity of VC sky-rocketed with the innovations brought forward by the rising Internet companies. The excessive access to VC funded the Internet boom and was later also a stakeholder in the dot-com crash. With too much access to capital available even risky undertakings could relatively easy receive the funds that were needed. This, in combination with the more convoluted set-ups that were thought up by the financial market, created a financial environment without the proper checks and balances. Who is exactly to blame for these ultimately toxic innovations, or at least toxic applications of these innovations is not concluded by Johnson & Kwak, (2012). It is however become clear that more regulation was needed for innovations to regulate the risks that innovations can bring.

According to Akinbami, (2010), the lack of regulations on financial innovations before the financial crisis lead to excessive and uncontrolled use of the financial innovations. The lack of regulation of innovations contributed to the financial crisis. The paper notes there is a noticeable shift from predominantly non-interventionism before the financial crisis, to a more interventionist view on the financial market. In the years before the financial crisis the idea was that that the financial market had to be free to create the most efficient system. The idea was that human beings want to maximize their own benefits and would be able to do this to the best of their abilities when there was little interference from the government. A problem with this theory arises when people act without the full knowledge of the situation. It is not always possible and to be expected that individuals make rational decisions about complex financial systems, especially when they do not have all the information. In the financial crisis the risk of the lack of knowledge about complex new innovations became clear. Through complex systems the risks of investing through new innovations were not understood by a large part of investors.

To prevent a future crisis to happen through poor understanding of complex systems, interventionist pleaded for more regulations to be installed by the government or regulators of the market (Akinbami, 2010). With the increase of regulations the main aim of interventionist is that consumers are better protected than they were before the financial crisis. These changes in regulation could hamper the capturability of innovations, since companies are restricted in

their freedom to create the innovations that they want. Whether this is a negative effect or not is up for debate. It does limit the economic growth that could be had through a free market in which every company is pushed to chase the highest profitability to remain competitive. However, because this systems does upset the mismatch between information available for companies and consumers it also manages risks involved in blindly chasing highest profits possible. The regulations play an important role in the protection of the economy, through regulating the new innovations the market has to adapt to trying to maximize their profits within set boundaries. This creates stability of the market, through which it can flourish and remain that way for a longer period of time.

3.3.2. Post financial crisis

According to Johnson & Kwak, (2012), the opinions about innovations have shifted slightly. Before the worldwide financial crisis that started in 2007, the opinions about innovations were more unencumbered since innovations were solely seen as a positive contribution to society. Since some of the financial innovations that were made before the financial crisis played a role in the downfall of the world economy the view changed. Innovations are still seen as a good process that helps society evolve, however it is no longer an unchecked process. New ideas are more thoroughly checked before being implemented. With the right checks and balances in place the risks that new inventions can bring towards the market are significantly reduced. This movement gained traction from the economic crisis of 2007 and has since played a more prominent role in innovation development. By spreading the risk more broadly over the financial system the complete financial system has become more resilient.

In the article by Beck et al., (2016), the mentally shift for innovations is displayed for the period before and after the financial crisis in the early 2000's. The study provides data to illustrate the "bright" and "dark" sides of financial innovation. The "bright" side of innovation is described in this study as innovation that enable growth, quality and variety in the banking service, creates risk sharing in the market, complete the market and innovations that increase the efficiency of the market. With the "dark" side the study investigates the innovation that enabled the unprecedented credit expansion through securities that were perceived as safe but in reality just exploited investors, which lead to the financial crisis.

In the study by Beck et al., (2016), it is concluded that up until this study there has not been a holistic approach for whether innovations in the financial market have a positive contribution or not. In the literature till that point most studies focussed on very specific financial innovations and this resulted in mixed conclusions. Through the holistic approach by Beck et al., (2016), it is concluded that there is support for both the bright and dark sides of innovation. Through financial innovation banks achieve a higher growth rate, with the higher growth rate banks can provide more capital to customers which leads to economic growth. The study also concludes that the risk taking through financial innovation increases the volatility of the profits, which in a financial crisis can lead to heavy losses. With both the upsides and downsides of financial innovation pitched against each other the study concludes that financial innovation does help a country develop more than it hampers it.

The more prominent role of checks and balances does however not stop the crucial role that innovations still play today in enabling economies to develop. In the study conducted by Domeher et al., (2022) it was found that innovation in the financial sector in Sub-Saharan Africa only have a positive effect on the economic development when there is an improvement in the

accessibility of financial services. When more people gain access to the formal financial system, the innovation have a higher potential of effecting the economic development. In order to capture the positive effects of innovation it is therefore important for governments to make financial services accessible to everyone. In the study by Domeher et al., (2022) it is concluded that innovation is still one of the fundamental pillars of the development of the financial sector.

It was already known that the value of an innovation depends on many aspects. Since the time of great turmoil with the dot-com crash and the financial crisis it has become apparent that the value of innovation is also influenced by the nature of the innovation. Not every innovation is worth the same, some innovations benefit a firm in more than one way. With innovation a firm aims to gain certain competencies so that it can reach its performance goals. With the increased performance companies can take on competition in the market (Damanpour et al., 2009). In the study conducted by Damanpout et al., (2009), the relation between the different types of innovations and their effect are researched. The types that the study distinguishes are: Service innovation, technological process innovations and administrative process innovations. Service innovations aim to provide customers with new services or offer the existing services to current clients. Process innovations aim to change the internal organizational processes in order to increase efficiency and effectiveness. Technological process innovation aims to change aspects of the production system or the service operation to enhance the processes. Administrative process innovations aims to innovate the secondary processes in a firm. The way employees are motivated and how they work together, managerial skills, information systems and organizational structure are innovated.

Damanpout et al., (2009), concludes that a combination of different types of innovations help develop a firm. Not only innovations for the product and the production process are important, the organisational processes are also to be updated to reach the best results. In recent years the working culture has become a more prominent subject of discussion. The value of an innovation for a firm has therefore become more influenced by unwritten rules of culture. The value is no longer measured purely by the increase in productivity but also by the secondary impacts of the innovation. The study does not specifically research the financial market, however it can be assumed that these differences in effect of innovations of different types can be generalised to all service industries.

Hai et al., (2022), agrees with other literature that innovation is the key driver of financial growth and long-term development. The paper however notes that for innovators it is not always manageable to capture value from their innovations because of the uncertainty of the innovative processes and the market outcome. The constraints that the innovators has with the development of the innovation, like access to risk capital, play a key role in the process.

Hai et al., (2022), concludes that innovation does not have a linear correlation with the returns of a firm. Innovations are still associated with a higher returns, however this relation would be a nonlinear u-shaped relation. A firm has to overcome the first low level of innovation to reach the stage in which spending more on innovations is actually beneficial to the firm. With the launch of new products first additional costs like marketing and initial launch costs have to be overcome to bring in more profits.

In the pursuit of capturing profits from innovations it is important that companies do not go overboard with the risk taking. In the study conducted by Olalere et al., (2021), it was concluded that financial- and business risk are impactful on the performance of a company. This influence can however be moderated by financial innovations. Banks should still aim to reduce credit related risk. Through a lower risk, banks can limit their vulnerability to a financial crisis. Innovation is seen as a good thing and will often lead to higher returns, however firms should look at the additional risk coming from these innovative processes. Excessive risk-taking can have extreme impacts for a firm (Olalere et al., 2021). To not overextend on the risk taking through investments in financial innovations, there should be an alignment between their risk management policies and the funds for financial innovation.

In recent years the value of innovation seems to be heavily influenced by the cry for more regulations. Where regulations are there both to benefit the entrepreneur as control them. This new found demand for regulations are however not leading yet to optimal use of regulations. As concluded in Vives, (2011), innovation is often seen as a disrupting factor in the financial market for their effect of helping stakeholders in the market go around regulations. Even though some innovations do have this effect, it should not be the innovations itself that are to blame for these effects. According to Vives, (2011), inadequate regulations are to blame for the disrupting effects that innovations can have on the market. To capture the most economic growth from innovations it is therefore recommended to create a regulatory network that enables innovations to thrive in the globalized financial system, while still maintaining the balance between stakeholder incentives.

The necessity of more regulations is confirmed in the case study conducted by Nazir et al., (2021). The study concludes that financial innovation in China, India and Pakistan does lead to economic growth in both the short and the long run. Through economic recession after the financial crisis in the early twenty-first century it has become apparent that supervision of innovations is necessary to limit the risks. The paper concludes that for the supervision of innovations it is important that the financial system as a whole evolves into a more robust system.

In the paper by Blach, (2020), financial innovation is described as the driving force of the economy. It creates the possibility to improve the social welfare of a society. Just as the previous sources, Blach, (2020) expresses the importance of regulations as well. As described in the paper for an innovation to be able to accomplish a positive return for social welfare, it has to overcome barriers to become successful. The author describes three main barriers: 1. Unclear tax and accounting regulations. 2. Complexity of the innovation. 3. High transaction costs. At least the first and the third barrier described by Blach, (2020), could benefit greatly from clearer regulations.

Another paper from the post financial crisis era that describes the necessity of more regulations is the paper by Johnson & Kwak, (2012). In the article the financial system is seen as overcomplicated for the benefit of receiving more money from customers or leveraging more risk to the customer than that they are aware of. The problem with overcomplication of the financial services are however difficult to overcome according to Johnson & Kwak (2012), since financial services often have influence over the ruling politics. Even when there would be administration that would take action against convoluting financial services, these changes

would most likely be overturned again when the regulation are changed again by a next administration. One solution that is offered in the paper is that the barriers between the financial market and politicians should be increased. This could be achieved through increasing wages of politicians and increasing periods before they would be allowed to work for financial services.

To prevent the next financial crisis from happening Johnson & Kwak, (2012), look towards the risks of concentrating finances in big institutions. They see a great risks in banks that get so big that they will not be able to be saved by governments when they default on their debts. One way of dealing with this problem that they suggest is raising the capital requirements for banks. This is however a topic that economists argue about, since there is no consensus if raising capital requirements hampers the economic growth of a country. The paper by Johnson & Kwak, (2012), concludes with the remark that if financial innovations do not overcome recognized barriers in the financial landscape to further financial intermediation it is to be assumed that their benefits do not outweigh the risks.

To answer the sub-question “What are the views on innovation in the last thirty years?” an overview was created of different views on innovation in the last thirty years. It has become apparent that the views on innovation can be split into two era’s. One before the dot-com crash and the financial crisis of 2007 and an era from after these two events. The effect that the two major events from the last thirty years have had on the views on innovations is that innovations have become more scrutinized. There have been calls for more regulations to make sure that financial innovation do actually benefit the market and are not just created to enrich a select part of the market, while it can have severe consequences for other parts.

4. Conclusion

To answer the main research question of this study "How has the value of innovation changed over the last thirty years?" three sub-questions were created, which were answered in their own sections.

The first sub research questions "What is the value of innovation?" lead to the answer that the consensus about what the value of innovations is, that it is the value that the innovation brings to the company based on the changes in stock value. This definition has largely remained the same over the last thirty years. The second sub-question "What are the important innovations in the last thirty years in financial market?" lead to the answer that there have been multiple innovations that have had a major impact on the financial market. The most prominent innovations from the last thirty years were found to be consisting of: Internet banking, M-banking, subprime securitisation, SPARQS, VC and Private equity, Blockchain and cryptocurrencies. Some of these innovations had a positive influence on the market through offering new financial mediation options. Others were merely a way for a select part of the market to enrich themselves without offering possible benefits for others. The third sub question "What are the views on innovation in the last thirty years?" lead to the answer that there have been multiple ways in which the market looks towards innovations. In the first era innovations were seen as mostly positive because of their contribution towards economic growth. Over time the not just the financial rewards for a specific firm were taken into account and innovations became more scrutinized.

The answers from the sub-questions led to the following answer on the main research question "How has the value of innovation changed over the last thirty years?" Due to two major financial events, the dot-com crash and the financial crisis, the role of innovation in the financial market has been scrutinized. Before the two major financial events innovations were seen as a great way to develop the financial system and enable customers to acquire the funds needed. For a long time financial innovations had the sole aim to provide more access to credit. In a combination with great financial intermediation, credit surplus and innovations in convoluting structures there were two great hits on the financial market with the dot-com crash and the financial crisis. These great hits on the world economy lead to a shift in the way that financial innovations are viewed. In the post financial crisis era, innovations are still largely seen as a positive contribution to the financial market. The market has however become more reluctant to stimulate unregulated innovations. Where the notion that financial innovations are good for economic development are still accepted, the "dark" side of innovations, in the form of convoluted structures that deceive investors, has become the cause of many calls for reform. Besides the request for more regulations to battle the risks of financial innovations, there has also been a culture change. Innovations are no longer judged solely on their stock returns. The benefits of the innovation for the culture in the company and society have become more important. To conclude, the main view on the value of innovation has remained, the value that is captured in the stock returns, innovations have however become subject to more regulations that change the dynamic of profit capturability and the secondary effects on culture and society have become more important.

5. Discussion

This section will start with summarizing the findings of this research paper, followed by a discussion of their implications for the financial sector. The limitations of the research will then be presented and finally a recommendation will be made for future studies.

5.1. Summary

From the researched literature on what the value of innovation is, it is concluded that there are many ways that innovations can be valued. Most literature does however support the idea that the value of innovation is how the introduction of a new invention affects the stock price of a company. This financial view of the value of innovation was therefore used in this paper. In the second section an overview is given of important innovations in the financial market that have been developed in the last thirty years. This overview created an image of the changes that the financial markets had to deal with. From the overview it is clear that innovations come in all shapes and sizes and are not always made with the best intentions at heart. The impact of the innovations were shown in the next section, in which the value of innovations were compared between two time periods. In the time before the financial crisis it is shown that there are fewer regulations for the way innovations can be created. In the period after the two financial crisis there is a call for more regulations on innovations. Besides the regulations also a shift in culture can be seen, where secondary effects of an innovations have become more important than before the crisis.

5.2. Implications

Through the shift of solely financial gain towards a more reserved and balanced position for the value of innovation of being both beneficial for the company as society, it has become clear that companies should look to a broader impact of their innovations than the effects that it has on their stock returns. Besides how companies look towards their innovations, the financial market as a whole should also look towards their process for financial innovations. The call for more regulations is something that has to be a robust change of the system to have an impact on the way that innovations are dealt with. Otherwise short-term benefits will still be prevalent over long-term security.

5.3. Limitations

There are many papers in the financial literature that look into innovations. It is has however proven challenging to shift through the papers that did actually touch on the subject of the value of innovations and not just the innovations itself. In this paper a selection of papers were therefore used that stayed closest to the specific subject of the value of innovation. It is therefore possible that snippets of relevant information could be found in financial papers outside of the researched papers for this research. Another limitation of this study is that it was supposed to be a chronological review split into three different time periods. The different time periods were based on shifts in the views on value of innovation. The events that were found to have an influence on the value of innovation were the dot-com crash and the financial crisis. There is however very little information to be found of the small time frame between the two events. Therefore it was not possible to use this period as a section in the chronological review. Moreover this paper should be used as an indicator of changes in the market. It set out to merely describe the changes in the market. In a larger study research could be performed to measure the changes of the value of innovation.

5.4. Future study

Based on the findings in this paper it is recommended that further studies should be conducted on measurable changes in the value of innovations over the years. Based on that research companies would be able to make a decision on whether it is the right climate to focus more on innovations. Another study that could be interesting to perform as an elaboration on this study is to look at the changes in regulations that were made in the financial landscape to control innovations. If the study would include upcoming changes, businesses could start to change their processes to match the expected regulations.

6. Reference list

Akinbami, F. (2011). Financial services and consumer protection after the crisis. *International Journal of Bank Marketing*, *29*(2), 134–147. https://doi.org/10.1108/02652321111107620

Akturan, U., & Tezcan, N. (2012). Mobile banking adoption of the youth market. *Marketing Intelligence & Planning*, *30*(4), 444–459. https://doi.org/10.1108/02634501211231928

Allen, F. (2012). Trends in Financial Innovation and their Welfare Impact: an Overview. *European Financial Management*, *18*(4), 493–514. https://doi.org/10.1111/j.1468-036X.2012.00658.x

Allen, F., & Santomero, A. M. (1997). The theory of financial intermediation. *Journal of Banking and Finance*, *21*(11–12), 1461–1485. https://doi.org/10.1016/S0378-4266(97)00032-0

Arefjevs, I., Spilbergs, A., Natrins, A., Verdenhofs, A., Mavlutova, I., & Volkova, T. (2020). F*inancial Sector Evolution and Competencies Development in the Context of Information and Communication technologies*. https://doi.org/10.22616/rrd.26.2020.038

Awonatezuaka Achiyaale, R., Ellah Adaletey, J., Ato Forson, J., & Komla Tsorhe, D. (2022). Financial Markets Development and Economic Competitiveness Growth in ECOWAS. *Specialusis Ugdymas*, *1*(43), 282–299. https://sumc.lt/index.php/se/article/view/35

Babutsidze, Z., & Iacopetta, M. (2016). Innovation, growth and financial markets. *Journal of Evolutionary Economics*, *26*(1), 1–24. https://doi.org/10.1007/s00191-016-0448-6

Bao, Q., Li, B., Hu, T., & Sun, X. (2023). A survey of blockchain consensus safety and security: State-of-the-art, challenges, and future work. *Journal of Systems and Software*, *196*, 111555. https://doi.org/10.1016/j.jss.2022.111555

Beck, T., Chen, T., Lin, C., & Song, F. M. (2016). Financial innovation: The bright and the dark sides. *Journal of Banking & Finance*, *72*, 28–51. https://doi.org/10.1016/j.jbankfin.2016.06.012

Bethan Staton. (2022, October 28). *British business and universities demand R&D be spared cuts*. Financial Times. https://www.ft.com/content/8038eac5-69a5-474f-a972-a23da089d1c3

Bergstresser, D. (2008) The retail market for structured notes: Issuance patterns and performance, 1995-2008. *Harvard Business School, Boston MA*, 2008.

Błach, J. (2020). Barriers to Financial Innovation—Corporate Finance Perspective. *Journal of Risk and Financial Management*, *13*(11), 273. https://doi.org/10.3390/jrfm13110273

Blundell, R., Griffith, R., & van Reenen, J. (1999). Market Share, Market Value and Innovation in a Panel of British Manufacturing Firms. *The Review of Economic Studies*, *66*(3), 529–554. https://doi.org/10.1111/1467-937X.00097

Boot, A. W. A., & Thakor, A. v. (1997). Financial System Architecture. *Review of Financial Studies*, *10*(3), 693–733. https://doi.org/10.1093/rfs/10.3.693

Chen, H.-C., Chou, R. K., & Lu, C.-L. (2018). Saving for a rainy day: Evidence from the 2000 dot-com crash and the 2008 credit crisis. *Journal of Corporate Finance*, *48*, 680–699. https://doi.org/10.1016/j.jcorpfin.2017.12.025

Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change*, *11*(3), 529–555. https://doi.org/10.1093/ICC/11.3.529

Damanpour, F., Walker, R. M., & Avellaneda, C. N. (2009). Combinative Effects of Innovation Types and Organizational Performance: A Longitudinal Study of Service Organizations. *Journal of Management Studies*, *46*(4), 650–675. https://doi.org/10.1111/j.1467-6486.2008.00814.x

Domeher, D., Konadu-Yiadom, E., & Aawaar, G. (2022). Financial innovations and economic growth: Does financial inclusion play a mediating role? *Cogent Business & Management*, *9*(1). https://doi.org/10.1080/23311975.2022.2049670

Directorate-General for Financial Stability, Financial Services and Capital Markets Union. (2022). *What is digital finance? https://finance.ec.europa.eu/digital-finance/what-digital-finance_en*

Furst, K., Lang, W. W., & Nolle, D. E. (2002). Internet Banking. *Journal of Financial Services Research*, *22*(1/2), 95–117. https://doi.org/10.1023/A:1016012703620

Gârleanu, N., Kogan, L., & Panageas, S. (2012). *Displacement risk and asset returns $*. https://doi.org/10.1016/j.jfineco.2012.04.002

Gompers, P. A. (1994). *The Rise and Fall of Venture Capital*. *23*(2), 1–26. https://about.jstor.org/terms

Greenhalgh, C., & Rogers, M. (2006). The value of innovation: The interaction of competition, R&D and IP. *Research Policy*, *35*(4), 562–580. https://doi.org/10.1016/j.respol.2006.02.002

Haddad, V., Ho, P., & Loualiche, E. (2022). Bubbles and the value of innovation. *Journal of Financial Economics*, *145*(1), 69–84. https://doi.org/10.1016/j.jfineco.2022.04.006

Hai, B., Yin, X., Xiong, J., & Chen, J. (2022). Could more innovation output bring better financial performance? The role of financial constraints. *Financial Innovation*, *8*(1), 6. https://doi.org/10.1186/s40854-021-00309-2

Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market Value and Patent Citations. *Source: The RAND Journal of Economics*, *36*(1), 16–38.

Heffernan, S. A. (1990). A characteristics definition of financial markets. *Journal of Banking & Finance*, *14*(2–3), 583–609. https://doi.org/10.1016/0378-4266(90)90065-A

Henderson, B. J., & Pearson, N. D. (2011). The dark side of financial innovation: A case study of the pricing of a retail financial product☆. *Journal of Financial Economics*, *100*(2), 227–247. https://doi.org/10.1016/j.jfineco.2010.12.006

Hopp, C., & Rieder, F. (2011). What drives venture capital syndication? *Applied Economics*, *43*(23), 3089–3102. https://doi.org/10.1080/00036840903427257

Jacobs, B. I. (2009). Tumbling Tower of Babel: Subprime Securitization and the Credit Crisis. *Financial Analysts Journal*, *65*(2), 17–30. https://doi.org/10.2469/faj.v65.n2.6

Johnson, S., & Kwak, J. (2012). Is Financial Innovation Good for the Economy? *Innovation Policy and the Economy*, *12*, 1–16. https://doi.org/10.1086/663153

Kedrosky, P. (2009). Right-sizing the US venture capital industry †. *Venture Capital*, *11*(4), 287–293. https://doi.org/10.1080/13691060903190255

Kogan, L., Papanikolaou, D., Seru, A., & Stoffman, N. (2017). Technological Innovation, Resource Allocation, and Growth*. *The Quarterly Journal of Economics*, *132*(2), 665–712. https://doi.org/10.1093/qje/qjw040

Lerner, J. (2006). The new new financial thing: The origins of financial innovations. *Journal of Financial Economics*, *79*(2), 223–255. https://doi.org/10.1016/j.jfineco.2005.01.004

Loualiche, E. (2016). Asset pricing with entry and imperfect competition. *Revise and Resubmit at the Journal of Finance*.

de Michelis, A. (2009). Overcoming the Financial Crisis in the United States. *OECD Economics Department Working Papers*, *669*.

Nazir, M. R., Tan, Y., & Nazir, M. I. (2021). Financial innovation and economic growth: Empirical evidence from China, India and Pakistan. *International Journal of Finance & Economics*, *26*(4), 6036–6059. https://doi.org/10.1002/ijfe.2107

Olalere, O. E., Islam, M. A., Yusoff, W. S., Ariffin, K. H. K., & Kamruzzaman, M. (2021). *The moderating role of financial innovation on financial risks, business risk and firm value nexus: Empirical evidence from Nigeria*. 020108. https://doi.org/10.1063/5.0045082

Pal, A., Tiwari, C. K., & Behl, A. (2021). Blockchain technology in financial services: a comprehensive review of the literature. *Journal of Global Operations and Strategic Sourcing*, *14*(1), 61–80. https://doi.org/10.1108/JGOSS-07-2020-0039

Pikkarainen, T., Pikkarainen, K., Karjaluoto, H., & Pahnila, S. (2004). Consumer acceptance of online banking: An extension of the technology acceptance model. *Internet Research*, *14*(3), 224–235. https://doi.org/10.1108/10662240410542652

Pisano, G. P., & Teece, D. J. (2007). How to Capture Value from Innovation: Shaping Intellectual Property and Industry Architecture. *California Management Review*, *50*(1), 278–296. https://doi.org/10.2307/41166428

Sardana, V., & Singhania, S. (2018). Digital Technology in the Realm of Banking: A Review of Literature. *~ 28 ~ International Journal of Research in Finance and Management*, *1*(2). https://www.researchgate.net/publication/329514279

Schwienbacher, A. (2008). Venture capital investment practices in Europe and the United States. *Financial Markets and Portfolio Management*, *22*(3), 195–217. https://doi.org/10.1007/s11408-008-0080-z

Shaikh, A. A., & Karjaluoto, H. (2015). Mobile banking adoption: A literature review. *Telematics and Informatics*, *32*(1), 129–142. https://doi.org/10.1016/j.tele.2014.05.003

Sherry, E. F., & Teece, D. J. (2004). Royalties, evolving patent rights, and the value of innovation. *Research Policy*, *33*, 179–191. https://doi.org/10.1016/S0048-7333(03)00088-X

Soferman, R. (2020, May 29). *Why You Shouldn't Cut R&D Investments In Times Of Crisis And Recession*. Forbes. https://www.forbes.com/sites/forbestechcouncil/2020/05/29/why-you-shouldnt-cut-rd-investments-in-times-of-crisis-and-recession/?sh=42be9553257f

Summerfield, R. (2021, August). *Innovation in Financial Services.* Financier worldwide. https://www.financierworldwide.com/innovation-in-financial-services

Vermeulen, P. (2004). Managing Product Innovation in Financial Services Firms. *European Management Journal*, *22*(1), 43–50. https://doi.org/10.1016/J.EMJ.2003.11.012

Vives, X. (2011). *"The Financial Industry and the Crisis: The Role of Innovation." In innovation. Perspectives for the 21st Century.* BBVA.