The Next Tech Bubble -
Lessons from the Dot-com Crisis for Today's Investors

Benedikt Glatzl

A dissertation submitted to the University of Dublin
in partial fulfilment of the requirements for the degree of
MSc in Management of Information Systems

7th of September 2016

Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics.

Signed:

Benedikt Glatzl

7th of September 2016

Permission to lend and/or copy

I agree that the School of Computer Science and Statistics, Trinity College may lend or copy this dissertation upon request.

Signed:

Benedikt Glatzl

7th of September 2016

Acknowledgements

I would like to thank my supervisor Dr Denise Leahy for guiding me through the research process with empathy and patience and teaching me to never compromise on good academic standards even when faced with tough deadlines.

I also want to thank the twelve individuals who agreed to be interviewed, accommodated my interview requests despite their very busy schedules and were very open when giving insights into the tech investment industry. Their input was vital for this research and I am incredibly grateful for their efforts.

I also want to thank my family for teaching me the value of academic achievement, my university classmates for creating a cooperative, friendly and fun learning environment and my friends and co-workers for giving me the time and space I needed for finishing this dissertation.

Last, but not least, my special thanks go to Nicole, who supported me throughout the ups and downs of the past years with love, understanding and great humour. Without her I would not have managed to get where I am today.

Abstract

In recent years, investments in technology start-ups experienced a steep rise in number and volume with the valuation of some tech companies rising above 1 billion USD within just a few years from their founding. The high sums being poured into the tech market and the quick rise of tech companies' valuations are reminiscent of the dot-com crisis of the late 1990s where the market for internet-based ventures showed a similarly stellar increase in volume, but eventually deflated causing a global recession. However, it is unclear if investors are behaving in a way that would once again lead to a tech bubble or if their strategies have improved and adapted to the new situation.

The purpose of this research is to understand factors institutional and private tech investors take into consideration in the process of evaluating and deciding on a potential investment in the tech sector and how these compare to investment factors during the dot-com bubble time period. It also aims to deepen the understanding on how such behaviours could indicate the build-up of a tech investment bubble in the current situation.

For the purpose of this study twelve individuals from eight countries working as private or institutional investors were interviewed. Key themes identified in the interviews were further developed and contrasted with findings from previous research on the dot-com bubble time period.

This study shows that some aspects of today's tech investment strategies improved (e.g. focus on validating business models, improved strategies for acquiring market knowledge) while some mistakes from the dot-com era are being repeated (e.g. focus on revenue development rather than profitability, unclear exit goals). Furthermore, the study identifies indicators for a generally overvalued tech market like high pressure to invest and irrational valuations of so-called unicorn companies.

Keywords: management, venture capital, entrepreneurship, tech start-ups, technology investment, dot-com bubble, financial crisis

Table of Contents

Table of Figures

List of Tables

Abbreviations

B2B	Business to Business
bn	billion
CAC	Cost of Acquisition
CV	Curriculum Vitae
DCF	Discounted Cash Flow
EU	European Union
ICT	Information and Communications Technology
IPO	Initial Public Offering
IS	Information Systems
IT	Information Technology
KPI	Key Performance Indicator
LTV	Lifetime Value
NASDAQ	National Association of Securities Dealers Automated Quotations
P/E	Price to Earnings Ratio
P/S	Price to Sales Ratio
R&D	Research and Development
US	United States
USD	United States Dollar(s)
VC	Venture Capitalist

Chapter 1: Introduction

1.1 Research Context & Background

When access to the World Wide Web started spreading amongst the general population in the late 1990s, many entrepreneurs saw an opportunity to tap into new markets and create new business models based on this emerging base technology. The financial market actors soon noticed the potential of such companies and as public excitement about the possibilities of the internet grew, so did investment volumes. When the internet-based company “Yahoo!” made its initial public offering (IPO) in April 1996, the price of its stock rose from $13 to $33 within a single day, more than doubling the worth of the company on the financial markets (Press, 2016). Many other young tech companies would soon follow and with each new tech investment round and IPO, the financial market volume would increase. However, a few years later in March 2000, within only a month, the NASDAQ would lose nearly a trillion dollars and in the consecutive months many of the formerly celebrated tech companies would go bankrupt and take large sums of invested money with them (Geier, 2015).

This time period was later named the “dot-com crisis” and had a profound impact on the tech industry and tech investors for many years. In the aftermath of the tech bubble burst, investments into tech companies plummeted (Howcroft, 2001) and the “irrational exuberance” of the dot-com era (Shiller, 2005) was replaced by a general weariness and caution towards the promises of new technologies and suspicion towards the financial long-term viability of start-ups in the tech area. It took years for the tech industry and the financial markets to recover (Ning et. al., 2014). However, memories of the dot-com bubble build up and eventual implosion resurfaced in recent years as tech investments both took up speed and increased in volume once again (see Mims, 2016). Also, as a rising number of only recently founded companies crossed the one billion US dollar valuation line in shorter and shorter time business models are again being scrutinized and judged to be unclear or even questionable (see Lashinsky, 2015). Economists started drawing parallels between the current financial tech markets and the situation in the late 1990s and are calling for increased caution (Curwen, 2016). Tech investors are being examined more carefully for the fear that history might repeat itself and another crisis might be in the making. Hence, the question arose, if investors learned anything from the mistakes that were done during the dot-com era or if they might unintentionally be steering the tech market towards yet another bubble.

Much research has been done on mistakes unsuccessful tech investors made in their evaluations of tech start-ups during the dot-com bubble time period, how these could have been avoided and how tech start-up valuation & investment strategies could be improved. Fields of improvement included the evaluation of financial development (Schwartz and Moon, 2000), the product of the IT start-up (Romanova et. al., 2012) and soft factors like the capabilities of the founder team (Hudson and Evans, 2005) and the way investors build and maintain assumptions about all of these factors (DaSilva and Trkman, 2013). However, only little and incidental research was carried out on how the situation in recent years compares to the dot-com crisis and there is only little research tech investors and tech entrepreneurs can turn to when trying to improve their strategies for evaluating tech companies (Valliere and Peterson, 2004).

1.2 Research Question

The purpose of this research is to deepen the understanding of tech start-up investment strategies of professional investors and if and how they adapted their evaluation models and investment strategies to the lessons from the dot-com crisis period (1997-2001). While research on the subject has been mainly limited to quantitative analyses of market movements and individual valuations and makes little or no reference and comparison to the dot-com bubble time period, this dissertation aims to examine the decision models of investors and factors being taken into account for tech start-up investments in the current financial market and to compare them directly to what was identified as relevant in this field by researchers examining the dot-com crisis. Recommendations on the factors that led to the dot-com crisis and considerations that could have prevented investment decisions with a negative outcome before and during the crisis will be directly related to the findings of this study and conclusions drawn accordingly.

The primary research question of this study is:
Parallels and differences to the dot-com bubble - are there indications of investor behaviour leading to another tech market crash?

The corresponding sub-questions are:

1) In which aspects do tech start-up investors follow lessons and recommendations from the research on the dot-com crisis in their investment strategies in 2016?
2) Which mistakes done during the dot-com bubble period are tech start-up investors repeating in 2016?
3) Are there indications that the behaviours of investors could steer the tech investment market towards another financial crash?

1.3 Importance & Relevance

This research is relevant to a number of groups within the tech community and financial industry. Founders and executives of young tech companies should be able to use this research to deepen their understanding of priorities of investors and how those evolved since the dot-com crisis and use this for improving their efforts to raise investments for their companies. Investors in the tech industry will find this research useful for examining their own investment strategies, checking for mistakes in assumptions and evaluations and improving their investment models and processes for increased return and lower risk. Furthermore, financial analysts and economists can use the insights of this research to gain impulses for their own analysis of the current situation on the financial markets specifically in regards to tech companies and improve the quality of their own research.

1.4 Scope of the Study

This study investigates current venture capital investment strategies in the tech industry from a holistic perspective taking into consideration hard quantifiable and soft qualitative factors in regards to evaluated start-ups and the attitudes and mindsets of the investors themselves and compares them to factors identified as relevant for successful or failed investments in the aftermath of the dot-com crisis. In order to achieve this, interviews were conducted with 12 individuals working in institutional venture capital funds or as angel investors. According to Ibrahim and Rogers (2008), angel investors are

> "*wealthy individuals who personally finance the same high-risk, high-growth start-ups as venture capitalists but at an earlier stage*." (Ibrahim and Rogers 2008)

The participants were selected to ensure a variety in geographic focus, investment volumes and stages of investments. The outcomes were then compared to the findings on investment strategies during the dot-com bubble period and conclusions drawn based on this comparison.

1.5 Roadmap of subsequent Chapters

Chapter 1 provides context and background information on the research, presents the research questions and its relevance

Chapter 2 gives an overview of the literature relevant to the research and positions the research question in the context of the literature

Chapter 3 explains considered methodologies, justifies the choice of using interviews to gather data and outlines the steps taken to answer the research question

Chapter 4 describes the process of analysing the gathered data and presents the findings drawn from it

Chapter 5 closes the research by presenting conclusions, limitations and future research opportunities

Chapter 2: Literature Review

2.1 Introduction

In this chapter, relevant literature on technology venture valuation during the dot-com bubble period (which is usually placed in the timeframe of 1997 to 2001) and thereafter is reviewed. First, the context is established on what a financial bubble and specifically the dot-com bubble is and how the basic mechanism underlying stock pricing, and hence bubble building works. Once this context is examined, a summary of literature covering the most important models and factors that were identified as underlying the mechanisms of the dot-com bubble is given:

- The financial factors used for evaluating tech start-ups during the dot-com bubble time period
- Non-Financial factors that were factored into the evaluation of tech start-ups during dot-com bubble time period
- Other factors that contributed to a misevaluation of start-ups by venture capital investors

After that, a brief overview is given on how tech start-up valuation has changed since the dot-com crisis. Finally, conclusions and research suggestions pointed out will be summarized to provide a basis for the following chapter.

2.2 Context

2.2.1 Stock Market Bubbles

Eatwell et. al. (1987) states that a stock market bubble is characterized by a rapid increase in asset (in this case that means stock) pricing; an initial price hike creates expectations towards further increasing prices, which leads to speculative investors entering the investment market for an asset, who are more interested in trade profits rather than the capacity of a company to be actually sustainable. This means that in such a situation the price increase is a deviation from the real earnings potential of a company (Leone and Medeiros, 2015) and this deviation additionally fuelled by investors looking to “ride” the bubble, i.e. recognizing the bubble and trying to generate profit for themselves by selling these stocks at an even higher price (Zeng, 2016). Rosser (2000) specifies further what would be factors that could be considered valid for an evaluation of the real earnings potential and thus asset pricing, as this would help identify when a rapid

sustained increase in stock prices can be considered a deviation and hence a bubble building. He did this by linking it to “market fundamentals” - factors that can be used to determine a realistic stock price. He comes to the conclusion that one can talk about a bubble in situations where pricing of an asset is not corresponding to its market fundamentals for a prolonged time and where this is unrelated to random events and shocks.

2.2.2 Pricing of Stocks

The underlying mechanism of the stock markets and the building of a stock market bubble is the pricing of stocks. Siegel (2003), in his study of price bubbles, notes that the two essential factors for arriving at a stock price are the expectations about the level of future cash flows and the time-frame in which these cash flows can be realized. This approach constitutes the “Discounted Cash Flow” (DCF) method, which calculates the value of an asset today by calculating (discounting) what future cash flows would be worth today. Siegel pinpoints the fundamental principle of any pricing decision to setting the expectations right based on “reasonable” assumptions and notes that exactly this is the fundamental challenge of any financial evaluation as “reasonable” could mean many different things depending on the model that is applied for the evaluation. Furthermore, he states that even though investment decisions can be considered rational given the expectations and the assumptions used to calculate the price of a stock, these assumptions might still be simply plain wrong.

2.2.3 The dot-com Bubble

In the centre of the dot-com bubble were publicly traded internet-based companies that experienced a rapid inflation and deflation in valuation between 1997 and 2001 (Valliere & Peterson, 2004). The name is derived from the domain ending “.com”, which the newly established Internet businesses most commonly used for their websites at that time. Shiller (2005) comments that the spread of the internet as a new base technology amongst consumers promised the creation of and access to new markets for companies and it was widely assumed that the internet was ushering in a new technological era in business and society. He notes that this thinking created a general sense of euphoria about this new era with supposedly unprecedented growth opportunities and an atmosphere of relative carelessness amongst investors, whose investment behaviour

became more risk-taking in nature as a consequence of the positive outlook on growth opportunities.

Due to the dot-com bubble and the massive amounts of investments in this market, stock markets around the world would experience rapid increases in their total value and then crash when the bubble deflated. Figure 2.1 shows a graph of the development of the NASDAQ index at the time and illustrates the rapid price increase starting in the second half of 1998 and the peak on March 10th in the year 2000 with the NASDAQ Composite index closing at its peak at 5048 points - a level it would not reach again until April 2014 (Google Finance, 2016).

FIGURE 2.1 - NASDAQ index values from October 1998 till May 2002 (Google Finance, 2016)

During the peak time of the tech stock market rally (between 1996-2000), the stock prices of information technology providers increased by more than 35 times compared to the value they had before the start of the rally (Hendershott, 2014). While Hendershott relies on numerical multipliers to illustrate the magnitude of the bubble, Siegel (2003) uses the “Street.com” internet index, which was composed of 20 large active internet stocks, to

show the development of the bubble even more drastically (see figure 2.2).

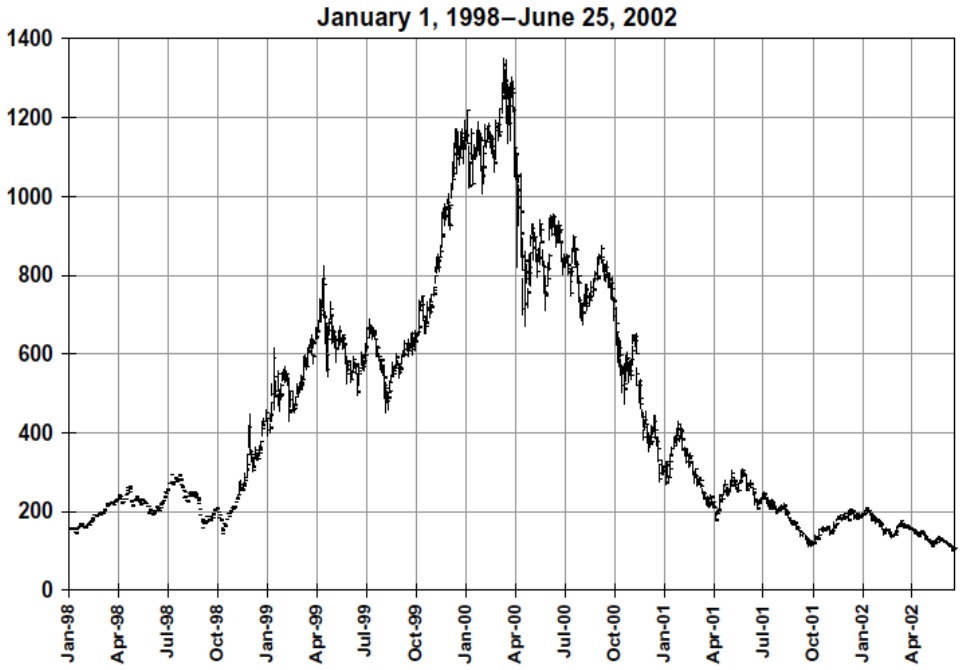

FIGURE 2.2 - Street.com Index values 1998 till 2002 (Siegel, 2003)

Siegel (2003) also states that the unusually high prices of stocks at the time could, given the large potential of new technologies, have in fact been justified and seemingly overvalued companies still could have had the potential to generate corresponding cash flows some time in the future. However, Siegel notes, as the real future cash flows can only be known after such a massive price increase occurred, according to him it is impossible to know right away during a price rally, if it is truly justified or if a bubble is building. Partially confirming Siegel's value justification hypothesis, a later analysis by Hendershott (2014) of the overall value that was invested and created due to the investments in internet companies from the year 1997 to 2000 showed that overall there was positive value created by dot-com companies. He notes that 21 billion US dollars were invested by private and public investors in that timeframe leading to a liquid value of 38.7 billion US dollars towards the end of 2001. He concludes that the increase in stock prices was therefore not entirely irrational, but still overall a rather inefficient allocation of investments.

2.2.4 Framework for the Literature Review

The next chapters the research on the root causes of the dot-com is examined and an overview of the most important findings given. The structure of these chapters is loosely oriented towards the one introduced by Khanin et. al. (2008). In the analysis of the literature on venture capitalists' decision criteria, Kahnin et. al. found that researchers before, during and after the dot-com bubble have differing opinions about which are the most prevalent criteria for investors. They conclude that researchers are split between those that argue that soft criteria like the capabilities of the management team are most important and others that argue that measurable financial and non-financial company performance indicators matter the most. However they did not specifically analyse literature on the dot-com bubble times, hence in the following sections, the research on this time period is analysed using their framework.

2.3 Financial Performance Indicators considered in Investment Decisions

In the centre of all efforts to evaluate potential investments are the financial Performance indicators as they are most closely tied to the expected future value and cash flows of a company. This is confirmed by Gavious & Schwartz (2011) in an analysis of investors' adherence to classical accounting principles before, during and after the dot-com bubble. It is furthermore pointed out that traditionally earnings and the value of assets according to bookkeeping are used to evaluate a company's future earnings potential. The research also found that such assets are not easy to evaluate for most start-up firms in the tech sector, as they are often intangible. Additionally, these companies are often at an early stage when seeking investors, so there are little revenue and usually negative earnings. The research notes that this makes it hard to give a valuation to these companies when trying to apply generally accepted accounting principles used for evaluating old economy businesses. The analysis shows that while investors did adhere to classical accounting principles and valuations of companies before the dot-com bubble correlated with book value and current earnings, they departed from them during the bubble period.

Ofek and Richardson (2002) mentions that some investors tried to make the "earnings" indicator and hence the discounted cash flow (DCF) method usable by assuming profit margins of comparable "old economy" companies as a proxy of the margins a mature IT company might achieve. However for the prices during the dot-com bubble years to be justified, this would mean such investors expected earnings growth of 40.6% each year for

10 years to achieve the target stock price / earning ratio that those prices implied. Ofek and Richardson suggests using earnings of comparable old economy companies as a good reality check for investments, but notes that investors did seem to accept the implied stellar growth rates anyway and went ahead with investing even when the bubble was already building. It is further elaborated on the expectations of investors and found that investors of software companies expected costs to rise only by a negligible amount when scaling the business (due to the assumption of low distribution and low additional product development costs). Ofek and Richardson state that investors expected that once an IT company entered profitability, the profit margins would increase further still rather than get smaller, which at the time outside of the tech investment market was a very unorthodox assumption and as a matter of fact did turn out to be wrong for most internet companies in the end.

While the Price to Earnings (P/E) ratio is the classical measure of assessing the validity of stock prices, Schwartz and Moon (2000) argue that it is not adequate for stocks of young tech companies. They encompass this criticism in a more sophisticated model based on real-options theory for evaluating a potential investment in the tech sector and come to the conclusion that while this is giving a more accurate picture of a company's worth, it introduces additional uncertainty in the necessary estimates of revenue changes and the growth rate of revenues. Because of this uncertainty, parameters in their new model require the ability to build an informed opinion in order to be estimated properly. They consider this part of the modelling process as vital and the most important one of the analysis process. They state that it requires ample knowledge of the particular business that is evaluated and the industry it is operating in, as the companies have little historic data, which could be used as a basis for estimations.

Brunnermeier and Nagel (2004) on the other hand showed that while many investors tried to figure out if prices were justified using the classical indicators like Price to Earnings ratios, sophisticated investors like hedge funds concentrated on an investment strategy of evaluating Price to Sales (P/S) ratios and growth rates in the prices over the trailing 12 months period. Griffin et. al. (2011) confirm this and adds that an unusually high Price to Sales ratio seems to be a better indicator for a bubble building than high price to earnings ratios.

2.4 Non-financial Factors considered for Investment Decisions

2.4.1 Product & Business Model

DaSilva and Trkman (2013) examines the use of the word “business model” and found that it only started being used frequently in both general and scientific literature during the dot-com bubble times. The paper states that because the new, upcoming technologies brought up new ways of capturing financial value, new start-ups tried to convey this by explaining new and different ways to make money in their business plans. According to DaSilve and Trkman, it encompassed key assumptions about the market and the (potential) customers. However, investors latched onto the proposed business models too quickly. DaSilva and Trkman also mentions that the main problems at the time were that assumptions the business models were based on were flawed and that there was often a fundamental misunderstanding about the difference between value creation (what users get out of a service) and value capture (how the service is monetized). It is furthermore shown that these flawed assumptions did lead to the demise of start-ups on a fundamental basis and that businesses that only pitched how they create value and not how to monetize this value failed when it became necessary to turn into a sustainable business.

The importance of understanding the business model of a tech startup is underlined by Romanova et. al. (2012), who shows that a major mistake of investors during the dot-com bubble was to assign valuations to start-ups without getting to know how the companies were intending to generate profits and without understanding the product portfolio and how viable the products actually were. It is also mentioned that ignorance and sloppy behaviour of the investors was one of the main reasons for inflated valuations of the stocks of the dot-com companies.

2.4.2 Technological Setup

While most young tech ventures do not have a high level of research and development expenditures, for those that do there is a positive correlation in the increase in the value of the company and the spending on research and development for new products/services (Gollotto and Sungsoo, 2004). However, Gollotto and Sungsoo note that this insight is only of limited value for venture capitalists, as tech ventures in their early stages rarely have a dedicated R&D unit or designated R&D expenditures beyond regular product development.

Based on an examination of start-up failure rates, Cusumano (2013) recommends that investors should put greater focus on examining the flexibility of start-ups in their technological approaches. He goes on stating that many technology-driven start-ups spend too many resources on refining their technology, but that most companies rarely become successful with their first or even second or third attempt at creating a viable business. Hence investors need to evaluate if and how easily the technology created in a tech venture can be repurposed for another product use cases and if (in the case of written code) it is bound to a specific hardware platform or to other software the technological setup is aiming at.

2.4.3 Growth Performance Indicators

Golloto and Sungsoo (2004) mentions that the discounted cash flow method used by most investors during the dot-com time had a major weakness in the form of a strong reliance on the guesses and estimated values of the analysts being incorporated in the valuation process as fact. Even though such estimations included seemingly regular factors like potential growth rate, discount rates, price/earnings multiple and similar measurements, these growth rates were based on estimates of the number of visitors on the website pages in a specified period of time, average order size per visit and the frequency of orders from each visit, which in retrospect only provided limited insight into the actual financial potential of the companies (Gollotto and Sungsoo, 2004). Some companies at the time managed to convince the financial community to give them high valuations with even less viable indicators like free users on their page, the number of total internet users or the amount of bandwidth required to generate a sale (Corr, 2006). The frequent usage of ‘web traffic’ as an indicator for future demand in the methodology of evaluating internet companies during the dot-com bubble period, in the end, turned out to be wrong as website visitors did not turn to customers at the anticipated rate. Kettel (2002) provides an explanation of why such indicators were used anyway for valuations. He states that there was no suitable technique for making realistic projections of future cash flows, which is why many investments were done without a sound rational basis based on other unfamiliar indicators.

Because of the variety of and uncertainty about engagement indicators, as a simple check for general viability of the growth projections of a start-up Cusumano (2013) recommends to closely examine proposed milestones and their fit with the funds available to the company. He states that business plans outlining high financial investment requirements and a plan requiring years of operation before revenue is generated are an indicator for

increased risk of failure as many things can go wrong in such a time-frame. Threats he mentions are established firms counterattacking, new competitors entering the scene, changing government regulations or technologies becoming outdated again.

2.4.4 Market & Competition

The fact that the nature of competition in the digital economy is fundamentally different from the "old economy" competition, is summarized by Van Gorp and Honnefelder (2015). They state that

> "*The competitive process is characterised by competition for the market, rather than competition in the market. While the market is characterised by scale economies and network effects and has the tendency to tip, the market is also contestable. The contestability follows from entry strategies that are typically based on product and business case innovations, having the effect of radically changing the definitions of markets. This threat drives all digital companies, small and large, to prepare for the unexpected through constant innovation in all possible areas: new techniques, new products, new sales channels, new customers etc. including new combinations of the items mentioned before.*"
> (Van Gorp and Honnefelder 2015, p. 161)

It seemed that investors and analysts did not understand the nature of this new competition, which is emphasized by Higson and Briginshaw (2000), who analyses how valuations if tech start-ups were performed and specifically how competition factored into the analytical models at the time. They point out that due to the novelty of the market, making statements about the (future) competition of a company operating in it are largely guesswork and that in making such assumptions, analysts examining dot-com companies often implicitly assumed the competitive environment to be favourable and with margins like in the old economy or better. Furthermore, financial analysts assumed that customers would be more loyal to an online business than the offline business they switched over from and with this completely disregarded the fact that switching from one online company (like a retail platform) to another would be much easier than the switch from offline to online. Even if competitors could attain great market margins, this would attract new competitors to the market, which would decrease margins of a company and force it to spend more resources on developing products and marketing instruments further. Higson and Briginshaw (2000) concludes that investors operating in the new economy based

valuations on a superficial understanding of the mechanisms of competition in the new economy and recommend to develop much deeper knowledge of how those worked.

2.5 Other Factors that impacted Investment Decisions

2.5.1 Investors Expertise

Singh et. al. (2015) point out that investors lacking tech knowledge (i.e. not having worked in a technology related field or received formal education in it) have a higher chance of mis-assessing tech ventures and are biased for or against IT venture investments depending on past successes or failures in the field. Interestingly, another of their findings is that in-depth domain knowledge of a certain technology led to mis-assessments too due to overconfidence and explain this with the tendency of experts to not scrutinize their own opinions. They hence recommend that investors should aim to build technology knowledge, but only moderately in order not to fall into the trap of expert overconfidence.

Chang et. al. (2016) confirms that an increasing number of investors lacking domain knowledge appears to be a common pattern in the build up of technology-driven market bubbles. They also mention that this pattern is so strong across past technology-driven market bubbles, that the number of investors investing into a rising sector they have no or little knowledge about could be used as an indicator of an inflating bubble. Furthermore, they point out that these investors in the past seemed to not have understood the cost structure and limitations of new technological developments, which was a major factor in their mis-assessment of the actual value of assets. One of the central conclusions of Gavious & Schwartz (2011) from their analysis of the importance of accounting principles in tech venture evaluation is that, while this expertise was often missing amongst investors in the dot-com bubble period, in the aftermath they did go through an adaptation process and improved their valuation models over time. According to Gavious & Schwartz this might also explain why there are so many conflicting theories on tech venture investor behaviour as those theories depend on what time period is examined.

2.5.2 Investment Paradigms & psychological Factors

When examining stock pricing during the dot-com bubble, Ofek (2002) found that the one main pattern amongst all tech start-up investors at the time was an extremely optimistic view on and trust in IT companies' potential even when confronted with strong adverse information. This optimism was so pervasive that even while a company changing its

name did have no or little impact on its stock price in times before the dot-com bubble, companies changing their names to a term related to the internet or IT (such as appending ".com" to their the name) in the late 1990ies caused an average stock price increase of 53% in the days following the announcement of such a change, even if a company had only little activity with or in the IT sector (Cooper et. al., 2001).

This optimism also made investors less careful in their due diligence. Gavious and Schwartz (2010) finds that based on the premise that more dot-com firms would be able to repeat the success of companies like yahoo.com, evaluations during the dot-com times were carried out without gaining insights into the business model and service/product offers of the companies as long as they resembled companies that had proven to be a stock market success. This is further illustrated by Higson and Briginshaw's (2000) finding that during the late 1990ies many businesses built tech features or products with the sole purpose to increase their valuation even though those features or products did not fit into their business strategy or add any substantial real value.

Already in 1998 Mills notes that effective valuation is difficult for technology start-ups as there is an unquantifiable lead time which can happen before the company starts generating profits for the investors. Investors prevalently used valuation indicators of revenue, profits and assets, which unfortunately had limited use for examining dot-com companies.

An additional interesting point on investment paradigms is made by Chang et. al (2016): Because of the mistakes made during the dot-com bubble in regards to the timing of investments and when it might be reasonable to divest, he suggests that investment objectives and a clearly outlined exit strategy for the investment should form the basis of evaluation for even minor investment opportunities. In the situations described above, again due to a lack of domain familiarity, few investors understood when to exit from their investments. Chang et. al. notes that with proper objectives in place, investors might have withdrawn from many of their investments earlier.

2.6 Developments since the Dot-com Crisis

Khanin et. al. (2008) analyses existing literature on criteria investment firms apply, getting back to the earliest dissertations in the field dating from the 1970s all the way to 2008. At that time, the dot-com crisis was a part of history and its effects processed. The outcome of the analysis sees several fields of criteria VCs count on post dot-com crisis:

- Top Management Team
- Market and growth
- Product quality in terms of its competitiveness
- Risk of the project
- Return on investment
- Exit options
- Quality of the deal
- Strategy of the new firm
- Customers and their potential behaviour
- Competition scenario

Morris and Alam (2012) examine the relation between traditional financial and accounting information and market valuation before, during and after the bubble. They confirm previous research results that the relation between traditional accounting information and market value was declining before the bubble, leading to the bubble itself. They find that after the bubble the trend reversed and traditional financial evaluation instruments became more important again. This is supported by Ning et. al. (2014), who finds that the Venture Capital industry became more careful in its investment strategies. They observe that investment rounds became smaller and are focussed on later stages in the development of young companies than they were before the dot-com crisis, likely due to more available data on the company and less risk in later stages.

2.7 Summary

The stock market bubble built up starting from 1997 and was characterized by a rapid increase in the market cap of internet-based companies with both institutional and private investors pouring money into the market due to the widespread belief that the internet would bring unprecedented growth and market opportunities. When investors realized

around the year 2000 that many of the tech companies were unsustainable and would not be able to deliver the high future cash flows promised to the market, rapid decrease of market caps set in and the bubble burst.

As most tech companies raising money only had little historic data on their performance and almost none generated profit, the classical investment evaluation method - the discounted cash flow - was not usable to get to a meaningful valuation. Hence, investors relied on other indicators like the price to sales ratio, revenue growth numbers or - in later stages of the bubble - on product engagement and growth performance indicators like the number of website visitors or the number of total internet users, many of which turned out to be insufficient as a basis for investment decisions. Besides examining these quantitative factors, tech investors also tried to get a deeper understanding of a business by analysing qualitative factors like the business model or technological setup of the evaluated start-ups. These qualitative analyses, however, were often superficial and biased due to many investors' lack of education and experience in the tech sector. Also contributing to over-valuations was a general optimism that led to lacklustre due diligence when analysing start-ups.

After the dot-com crash, investors returned to more conservative views on investments in the tech sector and developed evaluation models including a more diverse set criteria and more cautionary financial evaluation processes.

2.8 Open Questions

According to more recent research, there are still several open questions in regards to investor behaviour. Elnathan et. al. (2010) states that while there is some research on the valuation of publicly traded companies, there is only little research literature available on the valuation of private companies by financial experts. They explain this with the general difficulty of accessing documentation for valuations.

While Hsu et. al (2014) finds that there are significant differences in the decision criteria for investments between venture capital funds and angel investors, they recommend future research on how these two groups put weight differently on factors when making an investment decision.

Wang and Wang (2013), after analysing the connection of VC investments and overvaluation, pose the question if VCs actually drew lessons from the experiences during the dot-com bubble and altered their behaviours based on that.

Furthermore, Valliere and Peterson (2004) points out that there is only little research on how investors perceive data and take decisions during a bubble.

2.9 Positioning the Research Question

The research question, if the current tech market is steering towards a new bubble, became prominent again in the media (see Vardi 2016, Mims 2016, Cohan 2016, Mahmood 2015). Also, financial analysts and economists started warning of an impending bubble burst in recent years (see Nathan 2015). Nevertheless, only little scientific research can be found on comparing the current situation with the one during the dot-com bubble. Authors like Curwen (2015) briefly touch on the subject, but restrict it to short, purely macroeconomic market analysis.

This small study can give an indication of what factors investors are taking into consideration for their investment decisions in 2016 by comparing the answers in the interviews with what was pointed out to be prevalent investment behaviours during the dot-com bubble time. It will contribute to deepening the understanding of developments in the venture capital industry and provide an exploratory indication of how these developments might be a factor in the potential build up of a tech market bubble.

Chapter 3: Research Methodologies

3.1 Introduction

This chapter explains the methodologies and strategies that were used for the purpose of this research. It explains what different kinds of methods and strategies were examined, the reasoning behind the ones chosen and what limitations those have. After that, this chapter explains how the research was carried out and the type of data that was collected.

3.2 Research Objective

This research is an exploratory study with the aim to examine how the strategies of investors in tech start-ups have changed in 2016 in comparison to the strategies applied by investors during the dot-com bubble time in the late 1990ies.
The primary research question to be answered is
Parallels and differences to the dot-com bubble - are there indications of investor behaviour leading to another tech market crash?

The corresponding sub-questions are:

1) In which aspects do tech start-up investors follow lessons and recommendations from the research on the dot-com crisis in their investment strategies in 2016?
2) Which mistakes done during the dot-com bubble period are tech start-up investors repeating in 2016?
3) Is the tech investment market steering towards another financial crash?

3.3 Research Philosophy

According to Saunders et. al. (2009) the first choice a researcher should take, is one about the philosophy they want to follow in their research. He mentions that despite the fact that there are different formalized philosophical paradigms, a research question hardly ever fits into only a single one. The research topic of this dissertation indeed could be approached by various angles and there is a variety of research papers on the topic with a variety of philosophies underlying them as illustrated in the literature review. As a framework for deciding on the research approach, Saunders (2009) also points out four underlying philosophies: Positivism, Realism, Interpretivism & Pragmatism. These will be

briefly elaborated on in the following paragraphs and a decision about a philosophy explained.

3.3.1 Positivism

Positivism in research is associated with the mindset and approach of a natural scientist trying to achieve the most objective insights possible. This implies the attempt to create observable, measurable research and the test of clearly defined hypotheses. This approach is most commonly (but not exclusively) associated with quantitative research methods (Saunders, 2009). Orlikowski et. al. (1991) notes that this is the predominant research paradigm in IS research and that they believe this dominance of positivist research has provided only a limited view on information systems topics. They hence encourage the use of a greater diversity of philosophical and methodical approaches in the field.

As this thesis is touching an area where IS research and accounting research (the research of financial reporting) overlap, it is important to note the similarities in the approaches in the two fields. Chua (2011) emphasizes that there is a similar pre-eminence of positivist approaches in accounting research and similarly recommends the choice of research philosophies other than positivism for gaining new insights into the financial field. Because of the lack of other research approaches and the focus of the research question also on less quantifiable aspects of decision-making, positivism was not chosen as the underlying philosophy for this research.

3.3.2 Realism

While realism also assumes the existence of an objective reality and tries to delve into a research topic using either qualitative or quantitative methods, according to Saunders (2009) it also assumes that the researcher has a tendency towards being biased based on their enculturation and socialization. This is, as Mingers et. al. (2013) states, because realism considers knowledge to be always influenced by its respective historical and individual context.

This philosophical approach was considered for this research, but rejected, as financial investment strategies are based on the (ultimately artificial) construct of the monetary system and stock market systems, which are largely based on mathematics paired with psychological factors.

3.3.3 Interpretivism

Interpretivism puts great emphasis on the social actors in the chosen research field and hence requires an in-depth interpretation of the collected data based on and examined in parallel with the meanings we give to these roles. Walsham (2006) points out the distinction into “outside” and “involved” researcher in interpretive studies. An outside researcher is not directly involved in the field and can as such give a less biased view on the gathered data. An inside researcher, on the other hand, is involved personally with the research subject at hand and in the extreme form of the approach even consciously trying to influence the outcomes of the research subject. He notes that the inside researcher might get so acquainted with the perspectives of the people she encounters in the field that the advantage of having a fresh view on the situations studied might be lost. Because of this danger, an outside stance was chosen for this research.

Chen & Hirschheim (2004) analyses if IS research has diversified since Orlikowski et. al. (1991) points out the dominance of positivist research methods and came to the conclusion that despite the increase in research carried out under interpretivist paradigms, it is still far from being a widely used research philosophy in IS.

The subject of this dissertation is the decision models of individual actors and organizations, however, there are also quantitative aspects to be considered, so interpretivism was not chosen as the research philosophy.

3.3.4 Pragmatism

Opposed to the rather strict classifications of the above philosophies, Saunders (2009) explains the approach of pragmatism as one that considers a variety of methods to be used and mixed with each other in order to gather the most suitable data, rather than sticking dogmatically to one way of approaching research.

As pointed out in previous chapters, there is a great variety of theories about the reasons for a tech market bubble forming many of which are rooted in a positivist and quantitative approach. There are, however, also some research papers related to the topic that are rooted in the interpretivist philosophy.

As this dissertation deals with the topic of how people perceive and understand the world and take decisions and these decisions are based largely on quantitative models and have quantifiable outcomes, it is required for the researcher to gain a direct insight into the

thinking processes both from a quantitative and qualitative perspective in order to answer the research question. Because of this, pragmatism was chosen as a research philosophy and the answers to the interviews will be both analysed quantitatively and interpreted qualitatively.

3.4 Research Strategy

As the literature review chapter shows, most research in the field has been done based on secondary research with mainly quantitative approaches analysing financial decision models and financial market data. This research focuses on gathering primary data in order to expand the body of knowledge beyond ex-post market data analysis. For this purpose, a variety of primary research methods were considered that are briefly explained here.

3.4.1 Survey

Pinsonneault and Kraemer (1993) describes surveys as a quantitative method for the purpose of gathering data on the population a researcher is studying. Data is gathered from a subset of this population and used to generate descriptive findings that are generalized to the entire studied population. Saunders (2009) points out that surveys need to be standardized and emphasizes the importance of having a representative sample. Surveys, as Pinsonneault and Kraemer (1993) mentions, are not suitable for studying a phenomenon that needs comprehension of the context of the time the phenomenon occurs or occurred. Bell (1996) also states that surveys are prone to biases as it is possible to not get enough responses or responses of bad quality.

As the individuals in the financial investment industry are considered protective of their strategies due to the large sums of money at stake and surveys are less likely to yield a response due to a lack of legitimation through personal endorsement (Sieber 1973), this method was not chosen for this research.

3.4.2 Case Study

Pinsonneault and Kraemer (1993) also comments on the value of case studies and describe them as useful when trying to understand how a phenomenon will develop in an authentic setting. They also mention that case studies are best used when a researcher is aspiring to understand the impact a context might have on the subject of her study. Yin

(2003) describes a case study as a research strategy that focuses on a specific phenomenon that is examined in a real life context with the use of a variety of observation and analysis sources. He emphasizes the importance a context has for the respective phenomena and that such a context distorts the results of the controlled “laboratory” conditions of many other methods. Yin also highlights that case studies pose the danger of creating a bias in the investigation, hence this method was not chosen for this research to enable a broader, exploratory view on the topic and prevent a bias in interpretation.

3.4.3 Interview

Saunders (2009) explains 3 types of interviews generally used in research:

- Structured - with a set of standardised questions
- Unstructured - an informal conversation in which participants speak completely freely
- Semi-Structured - with some standardised questions and overarching themes that guide the conversation and for which questions can be taken out or added if it fits the context

For the purpose of this research, semi-structured interviews were chosen as this approach helps probing answers further and to identify deeper patterns and meanings of what is initially said. Additionally, to the variety of investment approaches in the tech investment industry, data is expected to provide broad results and the interview method will allow a deeper probe into potential root causes of opinions and behaviours, which would be difficult using surveys or other quantitative analysis methods.

Silverman (2007) points out that the way the interviewer interacts with the interviewed person impacts the collected data. Therefore, special precaution was taken during the interview to avoid influencing interviewees too much. This was also considered in analysing the interviews.

3.6 Research Process

3.6.1 Research Targets

The target group for the study were individuals working in private or public institutional Venture Capital Funds where they are decisively involved in investment decisions in early stage tech companies or so-called “angel investors” in the technology field.
The aim was to interview at least 10 individuals.

TABLE 3.1 - Comparison of institutional investors and angel investors (based on Ibrahim and Rogers, 2008)

	Institutional Venture Capital Investors	**Angel Investors**
Affiliation	Private investment banks or funds Governmental investment funds	Individual (no affiliation)
Type of funds invested	Funds of other people	Own funds of angel investor
Stage of investments	Expanding companies, companies preparing for IPO or private sale	Early stage, usually the first year of a start-up’s existence
Typical Background	Financial analyst	Ex-Entrepreneur
Involvement in startup	Board seat	Hands-on support
Investment sums	Typically between $2 million and $10 million, but can surpass this	Typically between $100.000 and $1 million, up to $2 million

3.6.2 Research Design

For the purpose of this research, a questionnaire was created that was used as a baseline for the interviews. As the semi-structured interview approach was chosen, not all questions were asked in the same form to all participants. However, all interviewees were always asked to answer the most important exploratory questions.

The questionnaire is based on the findings of the literature review and aimed at checking if the various factors pointed out in previous research as relevant to either the creation of

the dot-com crisis or relevant factors for successful tech start-up investments are considered in current investment strategies. Additionally to open questions about why and how certain factors are considered in investment strategies, a number of closed questions are asked in which participants are requested to answer on a rating scale, for example about the importance of a certain factor or topic. This is done in order to additionally gain data that would allow more direct comparison of the answers of the interview participants.

The questions are grouped to cover specific themes identified in the literature review as relevant for investment decisions:

- Financial factors considered
- Non-Financial factors considered
- Factors that are not part of a decision-making model, but influence decisions indirectly

Additionally, demographic questions are asked for added context.

As most of the interview participants were located in different countries than the researcher, only 2 interviews were carried out in person. The remaining interviews were carried out via Skype or phone.

3.6.3 Data Collection and Analysis

Walsham (2006) points out the difficulty qualitative research has in getting access to suitable organizations and persons. As large sums of money are involved in the financial industry and investment strategies are an important factor in staying competitive, for this research there were some initial difficulties in acquiring suitable interview partners. After obtaining personal endorsements from venture capital investors in order to establish trust with potential interview participants, interview participants were acquired quickly to carry out the research. Given the global nature of the topic, attention was given to have diversity in countries and specific roles the interviewed investors represent. Overall 12 interviews were carried out.

Given the number of questions and depth of answers on more complex topics, the originally estimated interview length of 30-45 minutes was not sufficient and interviews almost always took nearly an hour or, where this was not possible, could only cover a smaller selection of questions. The interviewed investors were generally very helpful,

open and friendly, but most of them - especially representatives of larger institutional funds - emphasized the importance of keeping their identity anonymous. Hence, no personally identifiable information are included in this dissertation and quotes are given anonymously.

TABLE 3.2 - Overview of Study Participants

Type of investor	**Regional Focus**	**Date of interview**
Institutional	Eastern Europe	02.08.2016
Angel	USA	03.08.2016
Angel	Western Europe	03.08.2016
Institutional	Western Europe	05.08.2016
Institutional	USA & Europe	06.08.2016
Institutional	Western Europe	07.08.2016
Institutional	Western Europe	08.08.2016
Institutional	Europe	12.08.2016
Institutional	Global	15.08.2016
Angel	Western Europe	16.08.2016
Institutional	Global	17.08.2016
Angel	South-East Asia	17.08.2016

The interview analysis is carried out following the data organization process and principles described in Crabtree and Miller (1999, p127 - 138). Both the template approach of using pre-defined categories that have relevance to the research hypothesis and the editing method of reducing texts to summaries to show a clearer interpretive truth were used in the qualitative analysis. The quasi-statistical method of turning textual data into quantitative data that is also described by Crabtree and Miller (1999) is also used to add context the findings produced with the aforementioned analysis methods.

Chapter 4: Findings

4.1 How the Research was conducted and analysed

The Interviews were conducted via Skype or phone and recorded using recording software after getting consent by the participants for the recording. Additionally, the interviewer took notes during the interview. The recordings were transcribed by the researcher directly after the interview and reviewed together with the respective notes afterwards. Results were noted down in a general interview analysis chart and mind map. Since the questions were already grouped according to general themes pointed out in the research (knowledge of investors, financial factors for an investment decision, non-financial factors for an investment decision & learning processes), this provided the initial grouping of answers.

After all interviews were concluded, the answers were reviewed again and the larger themes modified accordingly to accommodate for the newly gained insights. As a result of that, the additional theme of “Current hype and potential bubble” was added as it was a prevalent theme in the interviews and the point “Founder Team” expanded as a separate section as it was emphasized so strongly across all interviews. As patterns amongst the interview answers became more evident at this stage, they were reduced to thematically relevant statements and regrouped according to sub-themes related to the larger pre-defined themes. Additionally, answers were quantitatively analysed in regards to the inclusion of factors into investment decisions and mentions of new factors and arguments and this analysis put into tables that are added in this chapter to provide a context where necessary.
The interviews were then reviewed a third time and quotes directly related to the various themes extracted and attached to them to allow for tracing back argumentations and findings to the actual interviews.

The process of developing the themes was iterative and required several regroupings of the findings. As in the course of the analysis it became evident that angel investors and institutional investors consistently differed in certain key areas and opinions, the findings are split up according to that categorization where appropriate.

4.2 Overview on Participants

Investor Type & Investment Volumes

As outlined in chapter 3, the targets of the research were individuals playing an important role in tech start-up investment decisions. 8 out of the 12 interviewees are institutional investors and 4 angel investors with individual investment volumes ranging from 3500 USD on the lower bound to 56 mio USD on the upper bound. Typically angel investors in the sample have on average both lower investment volumes and fewer investments than institutional investors.

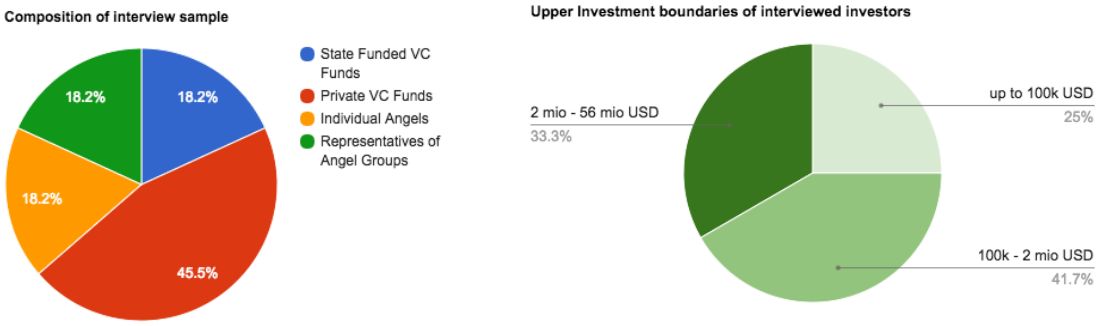

FIGURE 4.1: Organisational Setup & Investment Volumes

Geographic Focus

The geographic focus of investments is typically regionally oriented. The main reason stated for this was that the networks of investors both for experts needed for an evaluation and in the start-up scene are stronger in their respective countries and regions. This plays an especially strong role for Angel investors who lack the infrastructure of established institutional investors. Additionally, the two interviewed investment managers of state-funded venture capital funds have the explicit mandate to fund only companies with operations tied to their respective countries.

4.3 Findings on relevant Investor Knowledge

One of the recommendations in the research on the dot-com crisis is that tech investors should generally have in-depth knowledge and experience in the tech industry to enable them to carry out more sound due diligence. Interview participants were hence asked to evaluate the importance of relevant expertise and how they would assess their own level

of knowledge. Additionally, they were asked on their educational and professional background to assess how much this might aid them in evaluating tech start-ups.

4.3.1 Educational and Professional Background of Investors

According to the answers, most institutional investors still have both in education and profession[1] a background in business and more specifically finance. The interviewed angel investors - a role which in this form largely didn't exist during the dot-com bubble period - on the other hand do have experience in the tech industry. All of the participating angel investors with tech industry experience mentioned that they only invest in companies specifically in industries they themselves have professional experience in.

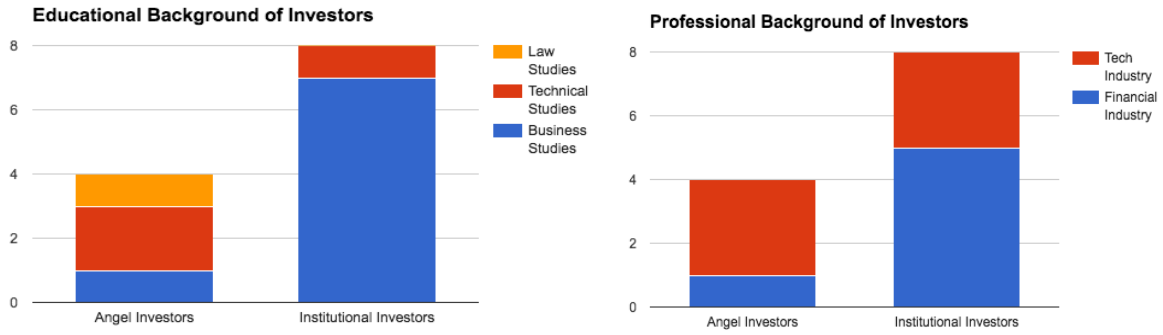

FIGURE 4.2 - Educational & Professional Backgrounds of Interviewed Investors

4.3.2 Market Knowledge

There was a general sense amongst the interviewed investors that market knowledge does play an important role in the investment decision. Two main reasons were stated for this: Firstly, without sufficient knowledge of the market, it would be difficult to verify and challenge assumptions of the financial model and business model a start-up provides. Secondly, once an investment happened, a lack of market knowledge renders an investor unable to give much support in building the company. One of the participants also mentioned that building market knowledge usually leads to establishing market networks and that an improvement in the former would hence make it easier to acquire and bring

[1] "Professional Background" refers to the industry the participant worked in the longest before working in the area of venture capital.

experts into the company. The interviewees, who gave the importance of market knowledge lower ratings, explained that in order to grasp a company well enough, one only needed a general understanding of the market which can be gained rather quickly and that the founders should be the ones to have, digest and present an in-depth market knowledge.

The interviewees consistently evaluated their own market knowledge as good, but not the best possible. When asked to justify this rating, the angel investors brought forward their insight into the industry of their investments. Institutional investors mainly mentioned that they use extensive benchmarking with other companies in the market for understanding the dynamics and that they could always bring in experts to compensate for their own lack of knowledge:

> *“As long as you have trusted advisors who can take a look at things, that is kind of how we operate, when we don't know a lot or we feel we have gaps in our understanding, we bring in people who can kind of help us figure it all out."*

It was also mentioned that being in the business of start-up investment requires constant learning:

> *"Lots of markets are in transformation - if you think you knew a market in the past, it is not necessarily the same in the future"*

4.3.3 Knowledge of Technology Trends

While market knowledge helps understand the specific problem a start-up is trying to address, the interviews showed that the knowledge of larger technological trends might help similarly or even more to make sound investment decisions as participants rated this on average similarly important as market knowledge. Reasons given for high ratings were that it would be hard to evaluate technical capabilities of the team if one does not understand the technology and that knowledge of the tech trends is important to stay ahead of the curve, invest in the future and identify which companies are going to lead those trends. One of the investors pointed out that

> *"If you are not looking in the future, if you don't read analyst reports, if you are not looking what are the next big things, you failed as an investor. Because you invest for the future."*

Two of the participants that rated the importance of tech knowledge with 3 or lower mentioned that it's only important that the founder team is great in regards to the technology rather than the investor, as the founders need to be the ones able to adapt to new trends and developments quickly. Hence they argued that an investor only needs to evaluate the team in this aspect. When asked how they then can understand the skills of the team without sufficient insight into the technology, they mentioned that for this evaluation, too, they could hire external experts.

For rating their own knowledge in technology trends, interestingly some of the lowest ratings came from institutional investors investing the highest sums within the group of interviewees. This could stem from a more cautionary approach of institutional investors and the realization that trends are hard to predict as illustrated by this quote by one of the participants:

> *"In some of these very emerging areas, there is still nobody going to say 'yes, absolutely, this is going to work', because, inherently, nobody knows if it is really going to work."*

Two of the European interview partners pointed out a disadvantage in the technology background of investors in Europe. As one of them stated:

> *"Nobody is a technical person here. That is a general thing in Europe, actually. In the US most VCs were engineers who turned into entrepreneurs who turned into VCs. In Europe, most of the VCs are former investment bankers, real estate fund managers, etc. And that makes a huge difference in how you look at everything."*

A hint that this might be true is that the only interviewed VC representative with experience in the tech industry was based in the US.

TABLE 4.1 - Ratings of the Importance of Knowledge and Knowledge Self-evaluation

	Market Knowledge Importance	Own Market Knowledge	Technology Trend Knowledge Importance	Own Technology Trend Knowledge
Angel Investors	3.50	3.75	4.13	3.625
Institutional Investors	4.38	3.71	4.06	3.5
Total Average	4.08	3.73	4.08	3.55

4.3.4 General Findings on Investor Knowledge

Some participants mentioned that founding start-ups and investing in start-ups has become more trendy in recent years and that this might have a negative impact on the general investment situation due to an increasing number of both entrepreneurs and investors with a lack of experience and knowledge in the tech scene:

> *“You see new funds all the time, or angel investors who don't really know anything about how the investment process works or people who are just kind of dabbling in investing. I think that is where it is - the everyday average Joe investing in internet stocks - that is where you get a lot of not-smart money in the market. There is where I think this can go bad."*

However, it was also pointed out by the majority of interview partners that most young tech companies are - differently from the dot-com bubble period - not traded on the public markets. It was further pointed out that public markets - which contain many small private investors - act much more impulsive, emotional and irrational and have little to none knowledge about markets or technology trends. Without those retail investors in the picture, the interviewees further elaborated, the allocation of investments follows more sound investment principles and due diligence. Additionally, effects of negative developments are also contained within the professional investment space this way.

4.4 Findings on financial Factors taken into Consideration

4.4.1 General Approach

The interview partners confirmed that even though the discounted cash flow (DCF) method is the main method in investment evaluations in the financial industry, it is - as also pointed out in the research - insufficient for start-up investments. While investors during the dot-com bubble times struggled to come to terms with this (as was pointed out in the research), one could argue that investors in 2016 seemed to have accepted and embraced this wholeheartedly. Only the more advanced institutional investors mentioned that they use DCF proxy calculations and simulations and even in those cases, this is only used as supplementary information, not as the main evaluation method. One of these investors even called DCF calculations a mere “sanity check” for their investments.

The majority of interview partners also pointed out that the emphasis in the evaluation is more on financial KPIs relevant for follow-on investments and exits to check the attractiveness for potential acquirers or investors down the line.

4.4.2 Financial Key Performance Indicators

There was a general sense amongst interview participants that any financial KPIs were of very limited use in the early stages they invested in tech companies. It was pointed out that financial KPIs at that point are at best able to indicate consistency and “sanity” of the business model and trends in the development of the company. All investors agreed that this only provided meaningful insights by looking at the KPIs in the context of the entire model and that relying on individual KPIs for investment decisions was not helpful or even misleading. Participants also pointed out that the earlier in the life of a tech start-up a valuation was done, the less helpful financial KPIs were. Nevertheless, as table 4.2 shows, the majority of investors did have a general evaluation approach or model they tried to apply and most of the pointed out factors were considered by more than half of the interviewed investors for their decisions.

TABLE 4.2 - Considered Financial Factors

	Considered	**Yes**	**No**	**No answer**
Financial factors	General Model	8	4	0
	LTV	11	1	0
	Market Opportunity	7	3	2
	Revenue	11	1	0
	Profit	1	9	2
	Competition	5	5	2
	Risk	3	7	2
	Exit Potential	8	2	2

TABLE 4.3 - Newly Mentioned Financial Factors

	Newly mentioned factors	**Mentions**
Financial Factors	Cost / CAC	**6**
	Liquidation preferences	**2**
	Cash burn rate	**3**

4.4.3 Customer Lifetime-Value

One set of questions in the interview was concerned with Customer Lifetime-Value (LTV), as this was recommended in the research as an indicator for evaluating the sustainability of a company. LTV received the highest average importance ranking as a helpful financial measurement across all interviews. However, while it was pointed out that this is the best financial measurement to evaluate if a company can survive and be successful, most interview partners only mentioned they are looking at “repeat use rate” or “stickiness” as illustrated by this statement:

"I want to see customers who are completely locked in with the product"

Participants rating the importance lowly pointed out that in early stages, an analysis should be rather about customer engagement measurement. They stated that those could only be seen as proxies for future LTV development, but that unfortunately engagement and LTV growth are not necessarily correlated with each other in every venture.

4.4.4 Market Opportunity

While the actual financial performance an early stage start-up will have can only be guessed with little certainty, according to the interviewees evaluating a market can be done with more clarity. Hence the majority of investors in the study puts emphasis on this in the evaluation process. However, it was also pointed out that with a flexible product or technology different markets could theoretically be served in many cases, which can reduce the risk of total failure for a start-up. It could be argued though that this thinking about market flexibility can introduce arbitrariness into market estimates.

Participants rating the market opportunity as a less important factor pointed out that markets can change quickly and that the market size (which is usually how the market opportunity is quantified) is less important than the ability of a start-up to capture a portion of the market. These participants also pointed out that they prefer smaller niche markets with the potential to be dominated entirely by the start-up:

> "*It doesn't have to be 'the bigger the better' - it could be a niche market but with potential for growth and domination on that niche market which makes the company very attractive for being sold to a big player later*."

On the other hand, some of the participants who gave the market opportunity a high rating said that they do not want to go for small markets at all. As they are looking for massive exit opportunities, these small markets would not be able to provide those. One participant expressed this way of thinking with:

> *"We are not fishermen, we are whale-hunters."*

This seems to be coming from a fundamental difference in investment philosophy as both "niche market" and "big market" investor groups consisted of both angels and institutional investors and both investors with investment volumes from the lower to the upper bound across the sample.

For assessing the market opportunity, most investors rely on analyst reports and external experts they bring in specifically to assess the market opportunity for a start-up. The ones that try to access not yet developed or existing markets (two out of the 12) also try to evaluate a start-ups offering in the context of macroeconomic trends and similar markets as proxies. Most of the participants also monitoring the moves of large cutting-edge tech companies like Google or Facebook who act both as early market seismographs and market creators.

4.4.5 Lack of historic data on financial KPIs

The research had shown that the lack of data on the performance of young start-ups (as this performance does not exist yet at the time of a seed investment) was a major problem for evaluating dot-com start-ups and that this led to disregarding model evaluation all together in many cases. Most interviewed participants explicitly mentioned that they tried to avoid such behaviour and stated that they demand at least some validation (see table 4.6) of a start-up product or service in the form of first customers. They would not invest at all without proof of such first customers. An in-depth look at data on few first customers is seen as the best way to make up for the lack of larger dataset as it would be the case with established companies:

> *"Even when they are small and have only a dozen customers, and once you study who are these dozen customers, how they are representing the geography, the total field, you can kind of scale it to the whole market"*

Additionally revenue - and especially revenue growth - was seen as a helpful indicator for a validated business model and the potential of a start-up to scale up operations, though some cautioned to always at the same time keeping the cost and cash burn rate in sight (see table 4.3).

The few investors in the interviews that were open for start-ups that are not able to provide any historic data on their company at all emphasized that in such cases they only invest if there is an exceptionally great team with a sound market opportunity:

> "*If they just say 'well, we have absolutely no data because I haven't really done anything yet' but we believe what the technology sounds, their approaches sound, if they got a plan, people seem like they can execute, the market potential is huge*

if it works, ok, let's. You just got to be comfortable with having no data and just be able to recognize talent, and the fundamental soundness of their approach."

This same investor however also complained that the adamant demand for initial customer data led to a “death valley” in the first months of existence of start-ups. This death valley did not exist before and during the dot-com bubble times and has the effect that a lot of great ideas - especially from younger founders - are never being realized.

4.4.6 The Problem of estimating future Profits

All interviewed participants acknowledged that it was not helpful for investment decisions to evaluate potential profits and that forcing a start-up to provide a profit analysis had only very limited value due to the lack of historic data:

"[It is] hard to estimate future revenues, it is always shooting in the dark."

Only one investor mentioned they work with this, but when doing so adjust all assumptions down:

"As a rule of thumb, you can say that everything takes longer and is more expensive than planned"

4.4.7 Competition

Participants said that competition evaluation is usually done as part of the market opportunity assessment and a major part of the analysis is outsourced to the start-up itself which is then scrutinized and cross-checked.

Interviewees were however divided on the importance of competition for an investment decision. Several mentioned that they see competition rather as validation that there actually is a valuable market opportunity. Vice versa - they think that if there is a market, more competition will show up sooner or later anyway. This is contrary to the assumptions of investors during dot-com bubble time period, who assumed that competition would stay static or get more favourable over time (Higson and Briginshaw, 2000).

TABLE 4.4 - Importance of Commonly Pointed out Factors Impacting the Financial Model

	Customer Lifetime-Value	Market Opportunity	Competition
Angel Investors	4.16	3.5	4.33
Institutional Investors	4.58	4.43	4.07
Total	4.44	4.15	4.15

4.4.8 Risk & Exit Scenarios

When asked about how they would evaluate and mitigate the risk of the start-up failing, most participants note that they don't have any specific process for risk evaluation. The main actions in that direction are to minimize the risk of failure with extensive due diligence and protecting themselves with investment protection clauses in the investment contract. The latter was especially important for the interviewed institutional investors that wanted to offset the high risks with high liquidation preferences (see table 4.3). They explained that such liquidation preferences only protect against "bad" cases (selling for a lower value than they had hoped for), but not the worst case of bankruptcy. Generally, amongst participants, the possibility of start-ups failures was seen as unavoidable. None of them talked about how to avoid a total failure of a start-up, but only about making sure a start-up would have the potential for a large exit:

> *"I don't think we are afraid of the risk of failure, specifically, we are afraid of just not growing big enough rather"*

> "*Europe, specifically, where you don't have a lot of role modelling companies growing really big, there is a higher risk of companies staying mediocre. And it is not like a failure, but for us, it is somehow.*"

As such, evaluating potential exit scenarios - by benchmarking the company against other companies in the space that had a successful exit and factoring in assumptions for this specific company or by analysing potential future acquirers - was part of the process for some of the interview participants. Others - especially angel investors - however said that

thinking about an exit from the start was the wrong approach towards an investment and just promoted unsustainable thinking.

4.5 Findings on non-financial Factors taken into Consideration

4.5.1 Product related Key Performance Indicators

When asked about product KPIs, the investors mentioned mainly factors related to repeat usage (daily active use, repeat usage) or “stickiness” (as it was called by the investors) of the product/service (see table 4.6) and conversion towards monetization. Since they invest so early in the development of a company, many of them also analyse the qualitative feedback from customers and examine trends in the aforementioned product data.

The KPIs that were mentioned are very similar to the ones brought up during the dot-com bubble times. However, as one investor commented, since the dot-com time-period the measurement & analysis of such factors has improved significantly and is much more closely tied to evaluating the business model and generating revenues and eventually profit.

TABLE 4.5 - Considered Non-Financial Factors

	Considered Factors	**Yes**	**No**	**No answer**
Non-Financial factors	R&D	1	5	6
	Engagement KPIs generally	12	0	0
	Business Model	12	0	0

TABLE 4.6 - Newly Mentioned Considered Non-Financial Factors

	Newly mentioned Factors	**Mentions**
Non-Financial Factors	Initial validation	5
	User Feedback	3
	Stickiness	6

4.5.2 Business Model

While they alluded to it throughout the interview, the interview participants only occasionally used the word “business model”. When asked directly about it, everyone agreed that understanding the business model was important. As one investor stated:

> *“The earlier an investment, the more important to understand this as an investor yourself and having a hypothesis on how this will play out on the market”*

However, the understanding of how a business model should be evaluated differed substantially between investors. All of the interviewed angel investors referred to the importance of the question “would I use it myself?”, while none of the institutional investors referred to such a rather subjective factor. Instead, they emphasized the importance of evaluating not only the use case for customers, but if a business model actually made economic sense:

> *“Some businesses are great businesses, but they are not good investments. Because they are too expensive to build or can't grow big enough or have other dynamics that prevent them from exiting at some point.”*

4.6 Findings on the Founder Team

4.6.1 Importance of a good Founder Team for a Tech-Company

The importance of the founder team was on average rated the highest by all interviewees and many of them emphasized that from all the discussed factors throughout the interview this one was the most essential for their investment decisions. The strong emphasis on the founder team was explained by the fact that the founders were the central actors in the development of the start-up. They needed to be the ones to figure out how to adapt a product to changing market conditions, failing product hypotheses or other situations that required a strategy change. Also, it was mentioned that the founders were vital for attracting and motivating talent to work in the company. One of the investors summarized this view in the following way:

> "*If the management is strong, even if they don't have the right product yet, they are manoeuvrable enough, devoted enough and hard working enough, they can find*

the way why the product is not right yet, and they can update to the needs of the customer. They can change, they can adapt and can just really go and get it."

Another interviewee also pointed out that a great team is even more important the younger the company is, as in that stage there are even more unknowns that require creativity, talent and perseverance to be tackled.

However, one of the participants rated the importance of the team rather lowly and explained that

"It's important, but we might add value here ourselves. If there is quality missing in the team, we might be able to add this from our own resources. We can add a person into the team ourselves with the quality they are lacking."

4.6.2 Sought out Qualities of a Founder Team of a Tech Start-up

There were a number of qualities mentioned that investors look for in a founder team. Besides tech skills (see table 4.7) the most often mentioned factors were positive team dynamics, industry experience and the ability to adapt, be flexible and coachable (see table 4.8). The very high requirements of investors in regards to founders skills and devotion to the company was emphasized strongly by investors:

"We are looking for people that don't have a plan B, this is what they are doing, and if we don't get involved they are going to figure out another way to raise the money to move it forward"

"If somebody gives you money, and you are like "yeah, we just need money, we can give you updates but we don't want to work with you", that is for me a red flag as well"

Interestingly though one of the institutional investors also mentioned that

"they shouldn't be too experienced, so they should be hungry, in a way, and flexible".

It could be argued that this investor sees a trade-off between experience and the required dynamic mindset.

TABLE 4.7 - Considered Factors in regards to the Founder Team

	Considered Factors	**Yes**	**No**	**No answer**	**Av. importance rating (1-5)**
Founder Team	Generally	12	0	0	4.88
	Tech Skills	8	2	2	4.125
	Networks	1	8	3	2.75

Curiously, tech skills were not mentioned at all by any of the participants, so a follow-up question was asked about this. In regards to the importance of such skills, the interviewees were split: some expressed the opinion that good tech people could just be bought in or attracted due to the leadership of the existing team. The majority, however, said that the person responsible for technology in the founder team should be very strong. An investigation into this phenomenon would be valuable for further research.

TABLE 4.8 - Newly Mentioned Considered Factors in regards to the Founder Team

	Newly mentioned factors	**Mentions**
Founder Team	Team dynamics	7
	Industry Experience	8
	Flexibility / Coachability	5

4.6.3 Networks

The existing networks of a founder team were generally rated as not important and it was pointed out that investors can just bring in their own networks, which they saw as one of the main benefits of having an investor in a company. Two people rated networks highly: one person (working in the B2B field) mentioned that in B2B networks are significantly more important as this is how founders can get access to potential customers, another said that this helped understand the market better. The latter however recommended caution in regards to good networkers:

"*It would be negative, if they are only networking and going to every event, giving speeches and bragging about their business, although they should be focussing on the product and revenues and KPIs*"

4.6.4 Evaluating the Founder Team

Evaluating the founder team was called by a participant one of the most difficult and important responsibilities for an investor as there is no way to properly measure or quantify it:

“Team is the most important, but also most difficult factors to size up for an investment",

"Team is hard to nail down with quantitative measuring, so that's where this [intuition] comes in the most."

As so many “soft factors” need to be evaluated, most investors in this study put a strong emphasis on both a thorough background check and a close personal examination of the founder team in personal conversations, question and answer sessions and observations of the founders in various contexts. However, the approaches vary as illustrated by these quotes from three different investors:

“There are objective factors, of course, like the résumé, the recommendations [...]. But the rest is really subjective, we usually go to the office, we spend some time there with other people, not just the founders, we see how is the mood, even how does the kitchen looks like, very simple things. Are they consistent with what they say about themselves? Also, we look at the dynamics between the founders themselves, how they approach each other, do they have equal number of shares.”

“I usually sit with all of them together and then I want to talk to the senior team and send the founders out, and then I let the senior team talk about the founders. When they talk something different, there is something wrong. If they are telling the same, it is a good team.”

> *“Also the history of the company, the way the investment material is prepared are all symptoms of how the team is set up.”*

Getting a personal impression is so important for investors that they invest significant time into it themselves:

> *"I don't mind doing big trips to meet people in person and get a feel from them."*

Approaches & principled pointed out were:

- Asking senior team about the founders and about company
- Looking at CV - experiences, industry, successes
- External recommendations
- Psychological evaluation (only one answered this)
- Feeling of trust
- Understanding that the founders do not have a “plan B”
- Personal liking
- Feeling you want to be part of that team

As this there is so much emphasis put on the founder team and evaluations are done with a strongly subjective note, one investor is calling for caution in this regard and points out that investors can also be blinded by excellent presentation and marketing skills of founders:

> *“There are people who are really good at raising, but those people are not necessarily the ones who can build great companies. Those are the ones that I think that can get VCs in a frenzy, and get this crazy competition going where the valuations are going up and up.”*

4.6.5 Founder Team Missing in the Research on the Dot-com Bubble

None of the scientific papers focussing on the dot-com bubble that were reviewed for the purpose of this dissertation mentioned the importance of founders. This is in stark contrast to the findings of several papers on venture capital investment strategies in general (Hudson and Evans, 2005 , McMillan et. al., 1985), according to which the founding team quality is an important criterion for investors. One could argue that the strong emphasis on quantitative analysis in both the field of IS research and financial research has led many researchers to miss this point in their analysis.

4.7 Findings on Decision-making & Learning Processes of Investors

4.7.1 The Role of Intuition in Investment Decisions

While decisions in an investment context are put on a sound analytical basis, throughout the interviews many of the participants mentioned that in venture capital investment there are certain points, where intuition does play a role inevitably:

> "*Given the uncertainty, there is always a large portion of gut feel and belief in there. That's something that gets better over time, with pattern recognition.*"

When asked further at which points and in what ways intuition plays a role in their own investment decisions, one participant pointed out that it does help enhance less clear decisions:

> *"It's not just about falling in love with the venture. You look at the fundamentals of course. Intuition enhances your decisions then and turns a less clear "no" or "yes" into a clear one."*

This was confirmed by others and it was stated in several of the interviews that ultimately an investment decision is an “educated guess” that should however always be based on the best data basis one can get.

Every single investor mentioned that intuition played the largest role when evaluating founders and several made it quite clear that this was a make or break factor:

> *"There is definitely an intuition element, especially when it comes to how well you connect with the founders"*

> *"Team is hard to nail down with quantitative measuring, so that's where this come in the most"*

It was also mentioned several times that intuition also played a role when it came to the market, technology trends and if the business model could work:

> *"Gut feeling comes all the time, especially on evaluating people, the market, future exits, it's very intuition-based, do you feel like these people can deliver or not, that this product will have a good market, positioned or not, do you think other players will jump into the market and then it will be too crowded or not."*

4.7.2 Avoiding Errors during the Valuation Process

As the research pointed out that the dot-com bubble was also caused by not making sure the fundamental assumptions of an investment decision are sound, the participants were asked how they made sure that a valuation would be sound.

Angel investors and representatives of smaller venture capital funds stated that they mainly relied on questioning the founder team about the underlying assumptions of the models they present and on doing a general consistency check when re-tracing all the parameters of the business model:

> *"If we can understand all the assumptions or the hypothesis is a closed one, I sleep well."*

The representatives of larger institutional funds all mentioned that they would try to prevent erroneous decisions by (again) bringing in external experts and having a check of all investment decisions by investment committees with several experienced investors looking over them.

One of the smaller institutional investors also mentioned that additionally to all the above, they would also do a quick check on simple, human components:

> *"In the process, we quickly find things which are not so number-driven also. If you think you have a market in the US, and you are not willing to move there, it is impossible to have US customers from Europe, you have to be there. Those are discussions where we help founders to get their expectations right. It's not just about the market."*

4.7.3 Valuations Turning out to be Wrong

When asked about how they deal with a situation where their valuation turned out to be wrong afterwards and the company ran into problems, the general opinion was that the founder team had to deal with it. However the interview participants were split about their own role, some said they should get involved in such a case, others that they should not meddle with the affairs of the founder team.

None of the interviewees mentioned anything about adjusting their own models, examining their way of thinking or similar learning processes.

4.7.4 General Learning Processes

As none of the investors mentioned how they learn from their investment experiences, this was explicitly asked about towards the end of the interview.

TABLE 4.9 - Methods for Improving Decision Making & Learning

	Method	**Mentions**
Decision making & Learning of investors	Involving Experts	**6**
	"More eyes" principle	**5**
	Experiences	**4**
	Knowledge Mgt (databases)	**3**

A number of participants simply stated that they believed that gathering experience in investment over time would enhance their general decision-making capabilities. Some mentioned that they tried to improve their investment capabilities by reading relevant literature or exchanging knowledge with other investors or experts and by always having more people looking over investment decisions ("more eyes principle"). Only three mentioned a more structured knowledge management approach towards this. Two participants mentioned that they keep track of investment valuations and trends in databases that they regularly checked and maintained and one mentioned that the VC she was working in has a "*yearly strategic evaluation and planning session*".

4.8 Findings on Market Bubble & Market Hype

4.8.1 Opinions about other Investors

Interestingly, opinions about other investors, in general, were not very positive. Most of the participants mentioned that they had the feeling no proper due diligence was performed by many investors and that a majority just followed trends and other investors' valuations without performing their own due diligence process.

TABLE 4.10 - Answers on the Question "Do most investors fail in valuations?"

Question	Yes / Probably	No	No clear answer
Do most tech investors fail in valuations?	7	4	1

This opinion was expressed several times, but for a variety of reasons:

> *"Most of the investors don't have a really close look at the profitability, unfortunately"*

> *“With VCs, I do think that a lot of it comes down to 'oh, it is Virtual Reality or it is Augmented Reality, let's take a look at this, we got to have some bets in this area', I think people can get a little bit lazy there."*

> *"In Europe, what happens, is that there is a lot of EU and state money, it is ‘cheap’ money. And therefore, they have no limitation to spend it, they just spend it. They don't necessarily take a close enough look, and they are not necessarily good owners or managers of that money."*

> *“That's a lot of emotional money going on, people want to be investors in a start-up and support the team, and the technology, and it's not only about the yields, so it's not only financial return, but it's social gratification."*

On the other hand, it was also mentioned that different from the above-mentioned institutional investors, angel investors

> *“are almost too cautious, they do try to make it all about data, and they are almost too conservative."*

One of the root causes of investment failures identified was that investors did not evaluate start-ups according to their ability to generate profit:

> *“most don't even care about generating profit, just about exiting”.*

4.8.2 Hype & Bubble

Opinions on potentially being in a bubble at the time of the interview were split. The participants had a differentiated view, but most thought that valuations on the tech start-up market were generally too high:

> *“Do I believe there is a lot of money being invested at valuations that are not justified and numbers and actual facts - but just by people just hoping to chase a good exit - yes I do. Does this mean there is a bubble and this bubble is about to burst - that is hard to predict.”*

> *"I would say we are absolutely in a hype again, even if McKinsey and others are trying to tell you differently. That is reflected in the quality of deals in the market and valuations they get. That is reflected with very visible consumer media picking the topic up. And that is reflected by very light business models getting funded where you say 'I don't get it really'."*

TABLE 4.11 - Answers to the Question "Is there a tech investment bubble right now?"

Question	**Yes / Probably**	**No**	**No clear answer**
Is there a tech investment bubble right now?	8	3	1

Most of the investors attributed the over-valuations less to hype, but rather to high liquidity in the investment market due to the low-interest politics of central banks around the world and few alternative investment opportunities:

> *"Interest rate was close to zero for many years, and the created a huge liquidity. Investors put great money into major funds and these major funds just bombard the funding into the market."*

> *“There is a lot of capital that needs to be deployed within the economy and there are also public markets that drive up valuation levels.”*

“It's a hype combined with a lack of proper investment alternatives in the market, and that creates a different investment decision environment.”

When asked whether there was a “hype” on the market, some interviewees mentioned that there is actually a stronger hype for founding start-ups rather than for investing in them

"*There is a hype where start-ups and technology ventures are becoming mainstream, and this goes into the media, and goes into corporates, and corporates want to participate in the whole thing, and the young people want to have an easy lifestyle, like winning the lottery, where you don't have to work a lot and you can win a huge sum.*"

“*[People are] believing the hype and are having a rock star mentality, which I think... the celebration of entrepreneurship is great, but to turn that into the only decent alternative of life for people is wrong - because you need employees, you need people that support other people's projects.*”

TABLE 4.12 - Parallels to the dot-com bubble

		Mentions
Parallels	High liquidity on market	8
	General (Media) Hype around tech	5
	Hype around tech entrepreneurship	5
	No proper due diligence	2
	Unclear/unsustainable business models	2

There were, however, several arguments on how the current situation is different from the dot-com period. One investor argued against such opinions and states that while he believes there is some overvaluation on the tech start-up market, generally speaking, there is no market bubble right now:

"There are more customers, there are more well-educated entrepreneurs. The technological trend is clearly pointing in this direction that this is a growth sector for the decades to come."

It was also pointed out that the fact that there are far less publicly traded tech companies than at the dot-com bubble times shows that the market is a lot more controlled and less volatile than during the dot-com bubble. Furthermore, the market is currently mostly tackled by investors with more knowledge, caution and experience. It was additionally pointed out that a lot of the growth projections for companies during the dot-com period were based on the assumption that the internet would experience a much faster and more widespread adoption. Several interviewees said that they believed that now internet adoption reached levels where there is a consumer base around which massive internet businesses can sustainably be built.

TABLE 4.13 - Differences to the dot-com bubble

		Mentions
Differences	Fewer publicly traded young tech companies	4
	Improved consumer base	4
	Investors more sophisticated / knowledgeable	4
	Investors more cautious	3
	More substantial business models	2

4.8.3 Valuations of Unicorn Companies

Generally, amongst the interview partners, there was a sense that at least some of the “unicorn” companies (companies valued at more than 1 billion USD) are highly overvalued.

TABLE 4.14 - Answers on the Question "Are current unicorn companies overvalued?"

Question	Yes / Probably	No	No clear answer
Are current unicorn companies overvalued?	8	4	0

The representatives of larger institutional investment funds stated, however, that valuations of many unicorns are misleading as all of these valuations are only on paper and more or less a result of negotiations between the company and its investors:

> *"Not many people really understand in a lot of detail how these valuation levels come together to create a unicorn valuation. All these valuations in a private round - this is all on paper. It doesn't really mean that this is a long-term stable valuation level. There is also an inherent risk in becoming a unicorn. You are applying a high valuation to your company and as long as you are not cash flow positive this can actually be quite hurtful as well."*

Another institutional investor mentioned that in the case of an IPO, most unicorn companies would not be able to achieve the same value on the stock market as they currently have in their latest investment rounds:

> *"If you would translate those evaluations into normal stock lists in companies they would have much lower valuations, as those prices are really financially engineered. These companies might sometimes be "wrongly" prices, but in fact, it's actually a completely different pricing mechanism."*

Generally, the opinions expressed about unicorn companies were rather negative. The following quote expresses a sentiment that many of the interviewees share:

> *“[For] Some of the more hyped cases in the world the day will come when they will be acquired or go public and personally I foresee that sky-high valuations - particularly above 10 billion - will be extremely hard to protect. Many others in the low range of 1 - 5 bn which I think are also just worth a fraction of that."*

It was additionally pointed out that the general hype around unicorns creates wrong and irrational incentives for founders as well:

> *"It misguides entrepreneurs to seek imaginary valuation hurdles. It skews some expectations on the entrepreneurs and creates wrong dynamics in growth rounds. Everyone who is now valued over 1 billion is now under scrutiny."*

However, it was also emphasized that unicorns couldn't be evaluated as a whole, but should be looked at on a case-by-case basis:

> *"Whether a company is valued 1 bn + can be totally justified if it has large potential or is a category-defining business in a large market with a great business model."*

4.8.4 Lessons from the Dot-com Crisis

The lessons the interviewed investors took from the dot-com crisis all revolve around being more careful in investments, asking for at least some substantial proof of the business case and making sure all relevant KPIs ("fundamentals") are substantiated. Only one of the larger interviewed institutional investors mentioned that being more careful can also be a bit short-sighted. He explained that many business models developed in the late 1990s that were not sustainable back then, are in fact viable today and used by successful companies. Hence, besides doing proper due diligence, one should also consider that the timing for a business model needs to be right.

TABLE 4.15 - Lessons from the dot-com crisis

Mentioned Lessons	**Mentions**
More caution / due diligence	6
Require early validation of business case	3
Focus on fundamentals	2
Timing matters	1

4.9 General Findings

4.9.1 Decision-making Factors in Context

While the interviewees generally rated almost all the factors presented as similarly important for investment decisions, a qualitative analysis of the answers (examining people rating something as "*a six on a scale of one to five*" or making statements like "*this is the most important factor*") shows that the general approach of investors seems to be to emphasize two things the most: the founder team and the business model. Further analysis of mentions shows that product engagement KPIs, early revenue and LTV indicators being seen as very important (see tables 4.2 and 4.5), but - as the qualitative analysis of the interview revealed - not always mandatory factors for investment decisions.

While business models were seen as mutable, the team was pointed out as the single most important factor as it was harder to change and could adapt the company's focus if needed. As one investor stated:

> *"With a good team, you will always find a market".*

Vice versa another investor mentioned that a bad or average team could make a company fail despite a great market opportunity and business model.

4.9.2 Case-by-Case Evaluations

Almost half of the interviewed participants pointed out at some point of the interview that many start-up evaluation cases need to be looked at on an individual basis ("*it's a case by case decision*", "*it depends*") and argued that it was impossible to have one single process or model for investment decision-making. Some of the investors mentioned that they have distinct approaches for certain business models and certain market types ("Software as a service" was mentioned by several participants as a business model with a distinct approach to valuation associated with it), but this was not explored further in this research. One institutional investor explicitly referred to the case-by-case assessment towards the end of the interview:

> *"I really want to stress that there is hardly any kind of standardized process; sure there are some standardized KPIs that I really look into - I check any investment opportunity against a set of 10 KPIs - and if they are being met I start doing work, but after that it's a case by case assessment"*

This study did not aim to probe deeper into valuation methods for specific industries or business models. Further research into such areas can yield valuable additional insights.

4.9.3 Reliance of Institutional Investors on Experts and Angel Investors

Generally, representatives of institutional investment funds mentioned a reliance on experts for evaluating many of the factors addressed in this research, like evaluating markets, technologies, business models or the founder team. Additionally, while the interviewed Angel Investors all pointed out that they invest mainly in pre-seed or seed stage funding rounds, some of the institutional investors mentioned that they are often relying on the due diligence done by such angels as a basis for their own analysis. Such an interplay between angel investors in the (pre-)seed round and institutional investors did not exist to such extent in the investment landscape of the late 1990s as it is not mentioned in any of the research on the dot-com bubble.

4.9.4 Involvement of Investors with Founder Team

While institutional investors referred often to the resources, networks and expertise they could bring to a start-up, angel investors frequently referred to their motivation to get involved more strongly in the start-ups:

> *“I have to be convinced with the idea, I have to be convinced that the numbers add up and make sense, so 50/50, and at the end of the day, I really want to work with this start-up, or with the company I am investing, saying that I really want to be there as an adviser, I don't want to be just giving money and then is a fire-and-forget"*

Further hints of wishing to work more closely with the team are the use of phrases like “Chemistry with the founders” or “I want to use the product myself”. One could argue that this indicates a larger emotional component in investment decisions than for institutional investors.

Chapter 5: Conclusions

5.1 Introduction

The aim of this chapter is to give a summary of the research findings, answer the research questions, point out additional notable conclusions and discuss how this research advances the current research in this area. Furthermore towards the end of this chapter the limitations of this research will be outlined and additional areas for research recommended.

5.2 Findings Summary

This dissertation set out to examine the behaviour of tech start-up investors and to compare it to the behaviour of investors during the dot-com bubble period. This was done in order to identify lessons learned, mistakes that are being repeated and understand if in the current situation there are indicators that the tech start-up investment market is steering towards another financial bubble.

5.3 Answering the Research Questions

This research aimed to answer the following questions:

- Which lessons did investors take from the dot-com crisis?
- Which mistakes are investors repeating from the dot-com crisis?
- Are there indications that the behaviours of investors could steer the tech investment market towards financial crash?

In order to gather data on these questions, 12 investors from 8 countries were interviewed to gain an understanding of their current investment strategies and their own view on lessons they learned and on a potential bubble in the market.
For drawing the conclusions both the explicitly stated answers to the questions and answers inferred by comparing decision criteria and stated behaviours with those identified in the research (see appendices A, B and C) are taken into consideration.

Research-Question 1: In which aspects do technology Startup Investors follow Lessons and Recommendations from the Research on the Dot-com Crisis in their Investment Strategies in 2016?

This research shows that there are a number of lessons and improvements investors are applying in their investment strategies compared to investors during the dot-com bubble period.

The key lessons and improvements identified are

- **A more cautious approach**: Even though some hype exists on the market currently, most investors indicated generally bigger caution in their investments and an emphasis on extensive due diligence even when something is considered to be a “sure bet”.
- **Acknowledgement of the limited use of the profit KPI**: Rather than forcing the profits indicator and projections into an evaluation model as it was attempted often during the dot-com bubble period, investors have accepted that earnings are hard to estimate and predict at early stages of a company and rather emphasize different factors for their investment decisions.
- **Validating business models**: while there is (similarly to the dot-com period) a strong emphasis on the business model when evaluating a tech company, contemporary investors are often not satisfied with purely theoretical considerations and demand a validation of the business case a company claims.
- **Linking engagement KPIs to profit**: While during dot-com bubble times investors were satisfied with high engagement rates like website hits and assumed that those will easily translate into profit, investors nowadays are examining engagement KPIs in the context of the entire business model and require special emphasis on factors like stickiness and a clear funnel towards profit.
- **More realism in market expectations**: While expectations towards the performance of tech start-ups are still very high, the underlying fundamental assumptions about the global adoption of the baseline technology (the internet) and the maturity of markets are more realistic now. However, some investors hinted towards "*pockets of irrational investments*" within tech investment. Identifying and examining such areas would be a suitable topic for further research.
- **More realistic expectations towards competition**: While during the dot-com bubble period competition was implicitly assumed to be favourable, during this

research competition was explicitly mentioned as always increasing the more successful a start-up would get. There is the caveat however that increased competition does not seem to play a role in the modelling of an evaluated company's development, which is hinting towards an implicitly assumed favourable development.

- **More experienced and knowledgeable investors**: While institutional investors still generally had a background in business and the financial industry, angel investors tend to have a tech background. Institutional investors rely in some parts on the evaluation and expertise of these angel investors. As angel investors did not exist in this form and quantity, it can be assumed that their emergency generally increased investment decision quality. Where investors find their own knowledge lacking, they regularly commit themselves to an in-depth research and involving outside advisors rather than purely trusting their intuition and limited own expertise.

Research Question 2: Which Mistakes done during the Dot-com Bubble Period are technology Start-up Investors repeating in 2016?

While investors did improve their investment processes in some areas significantly, there are some areas in which they show similarly risky behaviours as investors during the dot-com bubble period.

Potentially risky behaviours identified are:

- **Institutional investors mainly have financial industry background**: While angel investors in this research were shown to have experience and education related to the tech industry, most institutional investors in this research did not. As institutional investors carry out larger venture capital investments, there might still be a risk of lower quality decisions on their side due to a lack of understanding combined with volumes high enough to impact the market significantly. This was similar during the dot-com bubble time period (Briginshaw, 2000).
- **No clear goals for exits**: generally the exit potential of tech start-ups is not taken into consideration by all the interviewed investors and amongst those who do there is often no clear goal at which they would try to exit. This was similar in the dot-com period (Chang et. al., 2016).

- **Favourable implicit assumptions about costs**: While costs, CAC and cash burn rate do play a role in investment decisions, they are seen as secondary to factors like revenue or the quality of the founder team. Also, costs were assumed to increase linearly or even decrease as a company scales up operations. These assumptions appear to be similar to those during the dot-com bubble period (Ofek and Richardson, 2002).
- **Strong initial focus on revenue development**: The strong focus on revenue potential, and a (at least initial) disregard of profits and only considering cost or CAC as supportive KPIs indicates a potential danger of creating valuations with a high inherent price to revenue ratio, which is seen in the research on the dot-com crisis as an indicator for a bubble (Griffin et. al., 2011).
- **Favourable implicit assumptions about competition**: Even though it was explicitly stated that increased competition was seen as inevitable, it was never stated that this assumption was included in the modelling of the company beyond a binary check if a product was easy to copy.

Research-Question 3: Are there indications that the behaviours of investors could steer the tech investment market towards another financial crash?

As every single interviewee commented on the possibility of another tech bubble building in the current situation, this topic was emphasized more strongly than originally anticipated in this dissertation. As pointed out in the literature review on the dot-com crisis, it is impossible to say with certainty during a price hike of assets like tech companies if this is a sign of a bubble (Siegel, 2003). Hence this research can only provide an overview of possible signs that the current situation might be a tech bubble additionally to the potential mistakes pointed out above.

According to this research there are a number of indicators that there might be a tech bubble currently:

- **High Pressure to invest due to High liquidity on the financial markets**: With currently low interest rates and few investment alternatives, there is increased pressure to invest money in tech companies and reach very high payouts while having increased competition with other investors. This leads to higher, and potentially too high, valuations and investments that would not take place with less investment pressure from the financial markets.

- **Investors failing to make good valuations**: The majority of interviewees judged a majority of current valuations and investment decisions on the market as problematic. This distorts and drives up valuations further.
- **Overvaluation of unicorn companies**: Most unicorn companies that appeared in the past years seem to be overvalued and interviewees do not expect most of them to realize these valuations were they to go into the public market. This is likely the largest risk factor in the tech investment market currently as a massive devaluation of these companies might send a strong signal to the venture capital market and financial areas beyond it.
- **Investors believe a tech bubble is building:** While it is difficult to truly pinpoint the build-up of a bubble, the majority of interviewees were concerned that it is currently happening.
- **A stronger focus on softer factors is riskier**: In their hunt for catching great companies as early as possible in their development, investors put in their evaluation increased focus on factors that are not or not easy to quantify, which increases the possibility of irrational, emotional decisions.
- **Case-by-case evaluations introduce systemic risk**: Most investors perform case-by-case evaluations and only few seem to try to create a general set of investment models or principles and challenge existing ones. One could argue that this might make it more difficult to identify moments when the entire tech investment market shifts towards more problematic behaviours. That is because without any pre-defined boundaries in principles or models it might be difficult to identify whether the whole market is moving closer to or crossing these boundaries.

5.4 Summary of Conclusions

Overall tech investors evolved and seem to be better equipped to properly evaluate tech start-ups, put more emphasis on more meaningful factors in their evaluations and are more cautious in their general approaches. There are some potentially risky behaviours similar to ones identified in the dot-com bubble period, but one can argue that they might be offset if not entirely, so at least enough to prevent a complete financial market crash like when the dot-com bubble burst. Especially the fact that the risk is largely contained within the professional investment space decreases the risk of a devastating tech market

crash sending shockwaves to all other financial markets and the global economy in general.

Additionally, while each of the mentioned factors for a building tech bubble might have a negative impact on the financial market situations, they are not necessarily indicators that such a tech bubble is really present. It seems very likely that (in some cases substantial) devaluations and less favourable investment terms for start-ups will manifest in the near future. However, at this point, it seems unlikely that this will lead to a general investor panic and rapid and total withdrawal of funds across the entire venture capital market as there are no viable investment alternatives. Also, business models of many start-ups are set up well enough to survive a prolonged period of time or even generate profits after a cost-cut in case this becomes necessary. The times of accessing limitless money supplies to fuel rapid growth will then, however, be over. If there is a bubble, its deflation can be expected to mainly hit venture capitalists, large tech companies and especially unicorns hard and make it more difficult to acquire funds as a tech start-up in some markets, but the impact on the general public is likely to be a lot less disastrous as the dot-com bubble burst was.

5.5 Relevance of Research Question

The gained insights provide a valuable perspective on investment strategies across the tech market and many starting points for researchers to dig deeper into for evaluating and predicting the development of the financial tech investment market. Furthermore, investors can use these insights to examine, deconstruct and refine their investment strategies and make sure they are not unintentionally driving themselves and the entire market into unsubstantiated over-valuations. Lastly, start-up founders can use the insights of this research for evaluating their start-up from the perspective of investors and for preparations for raising funding for their company.

5.6 Limitations of Research

The conclusions of this research are based on the collection and analysis of interviews carried out for this research. In the process of gathering, analysing, summarizing and codifying the gathered data, certain assumptions and compromises were made that lead to a number of limitations. These limitations are:

5.6.1 Sample Size and Composition

A total of 12 investors were interviewed for this research. As most of them were from Europe and mostly only covered early stage investments rather than the entire investment cycle for tech start-up investments, the conclusions have only limited applicability for the entire tech investment market. This becomes especially evident when observing unicorn investments since those - as pointed out by some of the interviewees - seem to operate under very different investment decision frameworks and principles. Another hint towards this is that the one interviewed late stage investor actually does consider profits and historic data as very important and is applying more classical financial analysis models compared to the rest of the interviewed investors.

5.6.2 Market Differentiation

While the dot-com bubble was all about internet-based companies, nowadays the term “tech company” can be applied to ventures in a number of different markets, some of which seem to exhibit more “bubbly” patterns like less knowledgeable investors, unclear business models, etc. Due to this and the mentioned “case-by-case” decision making amongst the interviewed investors, investment decisions in one market might be less sound than in another even for the same investor.

5.6.3 Broad Research Topic

Since the research questions of this study are very broad, many aspects of investment strategies could only be touched in a general way. While the aim was to identify general investment strategies, it seems that examining strategies for specific markets, business models or technologies could yield more substantial and structured information.

5.6.4 Public vs. Private Companies

A large portion of the research on the dot-com bubble period revolves around publicly traded companies. In the current market situation, there are hardly any publicly traded tech start-ups, so this research focussed on privately funded companies to gain insights into a - at the time of writing - more relevant section of the tech start-up investment market. This does, however, make the direct comparison of behaviours problematic, as the data on investments from the dot-com bubble period includes a larger amount of small, individual investors whereas in the current situation most investors are professionals.

5.7 Recommendations for Future Research

There are a number of future research areas that can be undertaken as a follow up to this dissertation. Firstly, the topic should be examined additionally by doing a quantitative analysis of the market movements with a specific focus on investor behaviours and assumptions, secondly interviews and surveys should be carried out with a much larger sample of participants to get a more representative image of the situation across investor categories and geographies. Besides extending the sample, the focus should also be set more narrow and researches of this kind undertaken to examine specific start-up markets, geographies or technologies. As the importance of the founder team was emphasized so heavily by the investors in this research, it would be valuable to explore both how exactly founders are evaluated and how positive and negative evaluations in this regard compare to the actual later performance of the start-up. Lastly, unicorn companies should be examined and a comparison of valuations, KPIs and financials with those of dot-com bubble companies that went bust carried out in order to identify those companies with the biggest danger of imploding and bringing the market down in the process.

5.8 Closing Remarks

This dissertation set out to explore how tech start-up investor behaviours changed in comparison to the behaviours of investors during the dot-com bubble period. It also explored parallels and differences of the current situation on the tech investment market compared to the investment market during the dot-com bubble period. The results indicate that there are both clear continuities and differences in the behaviours of investors and that investment strategies improved over the past decades since the burst of the dot-com bubble. However, there are still risky behaviours and some indicators that a tech bubble or at least a certain level of overvaluation of tech companies might currently exist on the market.

While investors are aware of the risks of start-up investing, even at too high valuations, the potential payout both for them and society in general are large. When asked about reasons for his risk-friendly start-up investment strategy, one of the interviewees mentioned that the only way to achieve extremely high investment pay-outs at this point was to spread out investments amongst as many promising start-ups as possible despite the high uncertainty this involves. He referred to a quote from the book “The Black Swan” and mentioned that it summarizes the attitude of most venture capitalists:

> *"The strategy for discoverers and entrepreneurs is to rely less on top-down planning and focus on maximum tinkering and recognizing opportunities when they present themselves. So I disagree with the followers of Marx and those of Adam Smith: the reason for free markets work is because they allow people to be lucky, thanks to aggressive trial and error, not by giving rewards or "incentives" for skill. The strategy is, then, to tinker as much as possible and try to collect as many Black Swan opportunities as you can." (Taleb, 2007, p. xxv)*

In the spirit of this quote, one could argue that failing tech investments and even start-up investment bubbles are necessary evils on the path of achieving economic progress.

References

Bell, S., 1996. *Learning with information systems: Learning cycles in information systems development*. New York: Routledge.

Brunnermeier, M. K., & Nagel, S., 2004. *Hedge funds and the technology bubble*. Journal of Finance, 59(5), 2013–2040.

Chang, V., Newman, R., Walters, R. J., & Wills, G. B., 2016. *Review of economic bubbles*. International Journal of Information Management 36(4), 497–506.

Chen, W. & Hirschheim, R., 2004. *A paradigmatic and methodological examination of information systems research from 1991 to 2001*. Information Systems Journal, 14(3), pp.197-235.

Cohan, Peter, 2016. *7 Ways 2016's Tech Bubble Differs From The Dot-Com Disaster*. Forbes.com. [online] Available at http://www.forbes.com/sites/petercohan/2016/02/12/7-ways-2016s-tech-bubble-differs-from-the-dot-com-disaster/#2faead5639b9 [Accessed 24 July 2016].

Cooper, M. J., Dimitrov, O., and Raghavendra Rau, P., 2001. *A Rose.com by Any Other Name*. Journal of Finance ,56 , p. 2371–88.

Corr, T. A., 2006. *Boom, Bust, Boom: Internet Company Valuations - From Netscape to Google*. Financier, 13/14, 66–84..

Crabtree, B.F. and Miller, W.L. eds., 1999. *Doing qualitative research*. Sage Publications. pp. 127-138.

Cusumano, M. a., October 2013. *Evaluating a startup venture*. Communications of the ACM, Vol. 56 Issue 10, p. 26-29.

Eatwell, J., Milgate, M. and Newman, P. (eds), 1987. *The New Palgrave: a Dictionary of Economics.* New York, Stockton, p. 281.

Eli Ofek and Matthew Richardson, 2002. *Valuation and market rationality of internet stock prices*. Oxford Review of Economic Policy, vol. 18(3), pp. 265-287.

Elnathan, D, Gavious, I, & Hauser. S., 2010. *An analysis of private versus public firm valuations and the contribution of financial experts*. International Journal Of Accounting, 45, pp. 387-412.

Gavious Ilanit and Schwartz Dafna, 2010. *Market valuations of start-up ventures around the technology bubble*. International Small Business Journal, vol. 29(4), pp. 399–415.

Geier, Ben, 2016. *Tech Stocks and the 2000 Dotcom Bust: 15 Years of Wall Street Lessons*. Time.com. [online] Available at http://time.com/3741681/2000-dotcom-stock-bust/ [Accessed 31 August 2016].

Gollotto Jamie C. and Sungsoo Kim, 2004. *Market valuation of dot com companies; R&D versus hype*. Managerial Finance, vol. 29(11), pp. 61-72.

Google Finance, [online] Available at www.google.com/finance [Accessed 26 June 2016].

Griffin John M., Jeffrey H. Harris, Tao Shu and Selim Topaloglu, 2011. *Who Drove and Burst the Tech Bubble?*. The Journal Of Finance, vol. LXVI (4), pp. 1251-1290.

Higson, C., & Briginshaw, J., 2000. *Valuing Internet Businesses*. Business Strategy Review, 11(1), 10.

Howcroft, D., 2001. *After the goldrush: Deconstructing the myths of the dot.Com market*. Journal of Information Technology, 16(4), 195–204.

Hsu, D. K., Haynie, J. M., Simmons, S. a, & McKelvie, A., 2014. *What matters, matters differently: a conjoint analysis of the decision policies of angel and venture capital investors*. Venture Capital, 16(1), pp. 1–25.

Hudson, E., & Evans, M., 2005. *A Review of Research into Venture Capitalists' Decision Making: Implications for Entrepreneurs, Venture Capitalists and Researchers*. Journal of Economic and Social Policy, 10(1), Article 3 (1-18).

Ibrahim, D. M., 2008. *The (Not So) Puzzling Behavior of Angel Investors*. Vanderbilt Law Review 61 (5): 1405–1452.

Kettell Brian, 2002. *Valuation of Internet and Technology Stocks.* Butterworth Heinemann.

Khanin, D.; Baum, J.R.; Mahto, R.V., Heller, C., 2008. *Venture Capitalists' Investment Criteria: 40 Years of Research*. Small Business Institute® Research Review, Volume 35, p. 187-192.

Lashinsky, Adam, 2016. *The truth behind Unicorn valuations*. Fortune.com. [online] Available at http://fortune.com/2015/10/22/startup-unicorn-valuation-uber-real-worth/ [Accessed 31 August 2016].

Leone, V., & de Medeiros, O. R., 2015. *Signalling the Dotcom bubble: A multiple changes in persistence approach*. The Quarterly Review of Economics and Finance, 55, p. 77–86.

MacMillan, I. C., Siegel, R. and Subba Narasimha, P. N., 1985. *Criteria used by venture capitalists to evaluate new venture proposals*. Journal of Business Venturing, (1): 119 – 128.

Mahmood, Tallat, 2015. *The Tech Industry Is In Denial, But The Bubble Is About To Burst*. TechCrunch. [online] Available at https://techcrunch.com/2015/06/26/the-tech-industry-is-in-denial-but-the-bubble-is-about-to-burst/ [Accessed 25 July 2016].

Mills R., 1998. *How do you value a start-up company*. Long Range Planning, vol. 31(3), pp. 446-454

Mims, Christopher, 2016. *This Tech Bubble Is Bursting*. Wall Street Journal. [online] Available at http://www.wsj.com/articles/this-tech-bubble-is-bursting-1462161662 [Accessed 25 July 2016]

Mingers, J., Mutch, A., & Willcocks, L., 2013. *Critical Realism in Information Systems Research*. MIS Quarterly, 37(3), 795–802.

Morris, J.J.; Alam, P., 2012. *Value relevance and the dot-com bubble of the 1990s*. The Quarterly Review of Economics and Finance, 52, p. 243–255

Nathan, Allison, 2016. *Robert Shiller: Unlike 1929 This Time Everything - Stocks, Bonds And Housing - Is Overvalued | Zero Hedge*. Zerohedge.com, [online] Available at http://www.zerohedge.com/news/2015-05-29/robert-shiller-unlike-1929-time-everything-stocks-bonds-and-housing-overvalued [Accessed 31 July 2016]

Ning, Y., Wang, W., & Yu, B., 2014. *The driving forces of venture capital investments*. Small Business Economics, 44(2), pp. 315–344

Orlikowski, W. J., Baroudi, J. J., & Orlikowski, W. J. , 1991. *Studying Information Technology in Organizations: Research Approaches and Assumptions*. Business, 2(1), 1–31.

Peter Curwen , 2016. *Double bubble trouble: is history repeating itself again?.* info, Vol. 18 Iss: 1

Pinsonneault, A., & Kraemer, K. L., 1993. *Survey research methodology in management information systems: An assessment*. Journal of Management Information Systems, 10, p. 75-105.

Press, Gil , 2016. *Yahoo IPO And The Birth Of Computer Programming: This Week In Tech History*. Forbes.com. [online] Available at http://www.forbes.com/sites/gilpress/2016/04/11/yahoo-ipo-and-the-birth-of-computer-programming-this-week-in-tech-history/ [Accessed 31 August 2016]

Robert J. Hendershott, 2014. *Net value: wealth creation (and destruction) during the internet boom*. Journal of Corporate Finance, vol. 10, pp. 281– 299)

Romanova Natalie, Marilyn M., Helms Margaret Takeda, 2012. *Valuing internet companies: A more accurate, comprehensive financial model*. Academy of Entrepreneurship Journal, vol. 18 (1), pp. 35-53

Rosser, J. B., Jr., 2000. *From Catastrophe to Chaos: a General Theory of Economic Discontinuities*. Kluwer Academic, 2nd ed.

Saunders, M., Lewis, P. and Thornhill, A. 2009. *Research Methods for Business Students*. Harlow: Pearson Education

Schwartz, E. S., & Moon, M., 2000. *Rational Pricing of Internet Companies*. Financial Analysts Journal.

Shiller, Robert, 2005. *Irrational exuberance*, Second Edition, Princeton: Princeton University Press, pp. 113 - 147

Sieber, S.D., 1973. *The integration of fieldwork and survey methods*. American journal of sociology, pp.1335-1359.

Siegel, J. J., 2003. *What Is an Asset Price Bubble? An Operational Definition*. European Financial Management, 9(1), 11–24.

Silverman, D., 2007. *A Very Short, Fairly Interesting and Reasonably Cheap Book about Qualitative Research*. London: Sage.

Singh, H., Aggarwal, R., & Cojuharenco, I.,2015. *STRIKE A HAPPY MEDIUM: THE EFFECT OF IT KNOWLEDGE ON VENTURE CAPITALISTS' OVERCONFIDENCE IN IT INVESTMENTS*. MIS Quarterly, 39(4), 887–908

Taleb, N.N., 2007. *The black swan: The impact of the highly improbable*. Random house.

Valliere, D., & Peterson, R., 2004. *Inflating the bubble: examining dot-com investor behaviour*. Venture Capital, 6(1), p. 1–22.

Van Gorp, N. & Honnefelder, S., 2015. *Regulation and Competition: Challenges for Competition Policy in the Digitalised Economy*. Communications And Strategies, 99, pp. 149-162

Vardi, M. Y. , 2016. *Are we headed toward another global tech bust?.* Communications of the ACM, 59(4), p. 5.

Walsham, G., 2006. *Doing interpretive research. European Journal of Information Systems*. 15(3), 320–330.

Wang, L., & Wang, S., 2013. *Venture Capital Backing and Overvaluation: Evidence from the High-Tech Bubble*. Financial Review, 48(2), 283–310.

Yin, R.K., 2003. *Case Study Research: Design and Methods.* 3rd edn., Thousand Oaks, CA: Sage

Zeng, Y., 2016. *Institutional investors: Arbitrageurs or rational trend chasers*. International Review of Financial Analysis, 45, p. 240–262.

Appendices

Appendix A: Abridged & Anonymised Full Analysis Participants 1-4

	Participant 1	**Participant 2**	**Participant 3**	**Participant 4**
Context	VC	Angel	Angel	VC
Experience	Financial Industry	Legal & Finance	Tech Industry	Finance
Education	Business Administration	Law	Business Admin & Computer Science	Business Administration
Person & Org	Investment Manager, government-funded VC fund	Super-Angel, Angel Fund	Angel investor very early startups, seed or pre-seed	VC fund / micro-VC
Investment Volumes	100k - 1 mio / round, up to 3 mio total / company Euro	250k - 750 k $	10k - 60k British Pounds	200k - 400k Euro
Geographic Focus	specific European country	North America / Western Europe	Europe Competition in US too high	generally Europe
Industry Focus	Any	Technology	Tech industry	Tech industry
General				
Investment Strategy	Legally restricted to one country High-growth company in tech field Do not fund product development or prototyping, only later when validated/market proven product exists Usually come in as second or third investor Like: Digitalizing a fragmented market; clear markets, clear value proposition	Emphasis on the founder team --> industry experience, understanding of the user, build a platform for this user SAAS: Prefer already existing/launched product No need for many customers, but should have a few	Only passively (wants to get approached) Initial due diligence, then call w. pitch Step 1: Proposition, USP, market, competition Prepared to ask questions, challenge them, test how well-thought through it is Step 2: accounting perspective - burn rate, how to use money, cash flows, KPIs - Revenue, not profit matters Do they want a fitting investor or just money? They need to want to work with the investors	Team, Technology, competitive advantage (as US companies usually faster, but Hungarian ones are cheaper) Able to help the company Market Understanding & Exit options
Parallels to Dot-com times	Very liquid market Could be that valuations might get corrected just the same, but will not impact normal people as much due to companies not going IPO as much	High liquidity, too much money in the market	Lots of money, lots of artificial inflation of company value	N/A
Differences to Dot-com times	Not as many listed companies --> will not impact retail investors, closed loop within investor setting Did not understand the (financial) tech market & did not understand fundamentals of tech companies Back then people thought new era of digital ventures, but only now gone into full swing	Valuations more reasonable, more substantiated Better understanding of products, measurements	1) Less aggressive investments A vision is not enough to raise money Need a prototype for seed funding Need market & traction data for series A funding Majority of dot-com companies wouldn't get funded now 2) Less IPOs dot-com: lots of IPOs, now: very few Reason: less volatile capital generation for the company & investors; if investors tried to cash out at once in an IPO, the stock and potentially the market would crash This way cutting valuations does not cause a chain reaction on the market	Back then companies had no real value, no work to show for the valuation The majority of craze happened in the US market back then, same now
Lessons taken from Dot-com times	Fundamentals are key Business model needs to be proven to monetize (at least on small scale)	N/A	Be less aggressive in investing, demand valid data not just a vision	There is no general bubble, it's more differentiated Valuations should have some connection to fundamentals

	More cautious, middle path			
Know How				
Market Knowledge Importance Rating	5	3	4	4
Market Knowledge Importance Reasoning	Market mechanisms & sales cycles need to be understood Impossible to invest without understanding the market	Need general understanding of the market, but not in depth	Depends on the kind of investor - as an angel it is important, because so early in the company life Series A/B - not so important as already proven market, product-market fit	In some industries you can invest with little knowledge and in some it matters a lot; generally it's important to have it
Own Market Knowledge	4	4	5	4
Market Knowledge explanation	Individual desktop research Network of industry experts (from state) - 200 experts from every industry Database of 1200 pitches Benchmarking different products Learning every day, evolution of fund strategy	3-5 (averaged to 4) Some just average, others much better since being a traveller himself	Was working in the fields he is invested in	
Knowledge of technology/tech trend importance rating	3	5	5	5
Explanation	Technology can come and go, it's all about the market	Due diligence in this is important; if lack of insight, evaluate the technical skills of the lead engineer/CTO no need to understand the code itself	Investing in startups is investment in the future, no short-term gain	"Trend" is the important word VCs need to be ahead of the curve (was a 7, but that was not an option)
Own Knowledge of technology/tech trend rating	4	4.5	4	2.5
Own Knowledge of technology/tech reasoning	Have really good know how	N/A		Nobody technical in the VC; generally European VCs are investment bankers US more engineers turned entrepreneurs turned VC Q: IS THAT A DISADVANTAGE? Yes, not as good in forseeing things if you lack knowledge These are the things that, if you are not in technology, you don't see, simple as it is.
How to assess tech trend	Combination of different methods; not easy to find disruptive new ones if you want to invest early as noboda heard of them yet Invite Startups in very new trend to discuss & assess	No simple answer; intuition	Big companies going after a trend - Google, Facebook, Apple They are good indicators Otherwise industry reports, analyst reports	Industry experts Try to stick to one trend to get network effects
Evaluation Criteria				
General Financial Method or model	Reduce revenue projections, increase cost projections Evaluate market transaction costs & prices Discount planned exit point back to today for equity value Sometimes use Discounted future cash flow method Terms sheet important - liquidation preference or other protective mechanisms --> higher price; payout in tranches --> higher price	No, case by case	General financial setup Cash Flow, burn rate, expense structure Does the budget & forecast make sense? Not just looking at KPIs, but the underlying assumptions	Discounted Cash Flow

Financial KPIs	Depends on business model Market Place: Sales funnel KPIs - traffic, Customer Acquisition costs (CAC), marketing spend for conversion, how big the market is Of course Revenue and IBTA	At least some paying customers	N/A	
How to evaluate business model	Should be profitable on a transaction basis "That's probably the most reliable source of truth. If you're profitable on a monthly basis, by given, I'd say, the business model works."			
Customer Lifetime-Value importance rating	4	5	3.5	5
Customer Lifetime-Value importance reason	First time CAC, recurring buy rate	Analyse customers, see if they are locked in That's why preference for SAAS, high lock in rate	Only assumptions in seed stage later important how it actually worked and IF it actually works, always compare CAC with LTV 2.5 in seed 4 in series A/B	No other way to define revenues
Market Opportunity rating	5	3	5	3
Market Opportunity reasoning			The bigger the market opportunity, the better (Originally rating was 6, but that was not an option)	More looking for narrow niche or company that can become one of the bigger, but not biggest player
How to assess market opportunity	Top down and bottom up research (see above)	Potential for growth and market leadership so the company becomes interesting for an exit or IPO	Reading Analyst reports Checking if big players going in that direction Early markets are good, only small % finished	Desk Research and information from network/experts
Revenue/profit dev dynamic?	Evaluate Sales Plan, assign probabilities Evaluate entire sales pipeline - realistic?	Lots of Q&A w. founders; Intuition & guesswork	In Europe, most look at profitability In Anglo-American area, nobody does; revenue is important, shows people are willing to pay SIDE-TRACK: WHAT ABOUT TWITTER? Very late stage startup, at a stage where they should make profit already; startups should have a strategy of how to make money	Most come with hockey stick scenario Invest in tranches bound to milestones, so the plans need to be realistic If dynamic or not depends on the business model - some need rather a look at number of customers for example
Estimate future demand?	Sometimes qualitative, sometimes quantitative User testing at due diligence For consumer products also engagement KPIs - monthly/daily active, downloads, ...	N/A	Show in small niche that it is working HAS to have customers & market opportunity	Set hypothesis on size of market, competition, etc. based on experience and input from experts
Lack of historic data?	Don't do super early investments, want to see few months of development Don't want a lot of data, but do want SOME data	Analyse first customers (are they representative) and project based on their behaviour & total market size	Need to have a proper model set up; if a founder is unable to do that, he will fail for sure	Experienced founders that inspire confidence And/Or prototype and first customers Sometimes just work with company for a few months before investing in them
Competition rating	5	5	3	3
Competition reasoning	N/A		If there is a trend, there is competition	
How to evaluate competition	If big player like Google working on similar feature, then very important factor (factor in with 5) Otherwise factor it in with a 3 - if enough space left in the market	Test competition himself Q&A w. founders Sometimes 3rd party expert to evaluate	Clearly understand the USP and differentiator	Market maturity, competitors, state of the market generally
Problems with evaluating future earnings?	Everything takes longer and is more expensive than planned Stretch assumptions out, increase cost, plan reserves	Don't focus on earnings initially anyway Market share is more important, profitability will follow However should not rest too long on market share, eventually it has to become profitable	More important to understand the market, as you can predict maximum 18 months Need at least some customer data, otherwise won't invest	Don't care about it in seed and even in series A

Evaluating risk	From investor side: If you can't do it properly, you put protective measures in place like liquidation preference, anti-dillution mechanism, preference shares, voting rights From company side: Reduce costs to buy time to mitigate failure, relaunch product, ...	Due diligence, summary of all factors - founders team, market, competition --> get better intuition	There is always a risk; everything mentioned above also aims at the risk	Risk lies in losing out on alternative investments Risk is in companies staying mediocre
Evaluate exit scenarios?	Benchmark against other exits in the space & match with assumptions in business case - factor those in	Analyse potential acquirers, other exits in the space	Not doing it, too early stage investments Doesn't like founders who aim at exit right away	Benchmark against collection of exits Different scenarios: acquihire, market access, technology Try to categorize where a company could fall into and then optimize towards that exit
Non-Financial Criteria				
General	Single founder --> risk, 3 --> good Transparency in reporting & comms Execution - roadmap, deadlines kept, being realistic, decisive, keeping direction	Paying customers User/Customer Churn Monthly/Daily Active Users Trends in data	Customer / User Acquisition Engagement numbers, DAU	User base, contracts, partnerships founders
R&D Rating	N/A (skipped)	5	2	3
R&D Reasoning	N/A (skipped)		too early	N/A
How factoring R&D in	N/A (skipped)			N/A
Engagement KPIs?		(See above)	see above	Depends on the product, generally number of users and how often they do the core action Check how much growth is fueled by marketing (expenses)
Understanding Product/Service?		Try to use it himself; try to understand the problem it resolves	Would I use it myself? Value proposition and vision needs to be very clearly understood	Basis for competitiveness Not need to understand to the very basics Analysing customer feedback
Understanding Business Model?	Should be profitable on a transaction basis "That's probably the most reliable source of truth. If you're profitable on a monthly basis, by given, I'd say, the business model works."	Key questions: Can it be monetized, how, why would customers pay, would it stick? Thorough evaluation of replicability & competitiveness	Need to understand the market opportunity and how the business model fits, if the funnels make sense	Trial and error - continues after the investment Pivot often in seed stage, so it's ok
Importance of Founder Team?	5	5	5	5
Explain importance		Single most important factor If management is strong, they will figure out how to adapt a product, attract talent etc.	The earlier the stage, the more important	
How evaluate Founder Team?	Experienced, but not too much, so they are still hungry & flexible Should really understand the competition How they function together	Many conversations Understanding of market & competition	Talk with senior team about founders - if they say different things, there is something wrong Experiences generally and in industry	Resume, recommendations, industry experience, successes Really subjective, spend time with them in the office --> Mood, consistency, dynamics WHY DO SHARES MATTER? Motivation, dynamics between them, contribution reflected
Importance of intangible IT assets/capabilities?	5	3	5	5
Why?	N/A	Only need to be good Strong leadership will attract great talent	Tech founder has to be a rock star	Key talent to innovate and disrupt, need superior skills
How evaluate intangible IT assets?	N/A	N/A	Look for scalability, technology stack, reliance on certain technologies	

Importance of networks	4	2	2	4
Why?	So they learn from other founders	It's all about the leader; if CEO is right person tis can be fixed by investors Investors bring the networks in	Comes from investors Main benefit is to get in additional team members	Not that vital, but helps for understanding the industry and tech trends
How evaluate?	Needs to be global	N/A	N/A	
Learning				
Intuition, gut feeling, personal experiences?	For less clear decisions; enhances decisions Should fall in love with the venture 5	Very important - making an educated guess 4-5 Founders, markets, exit	Trust first impression Intuition is important when you have extensive knowledge and experience in the area	Ultimately if there is a strong gut feel for not doing something, follow it Founders team evaluation a lot on gut feel and experiences Technology trends
How to avoid errors?	investment committee, which consists of 5 very experienced investors and entrepreneurs; raises questions and red flags always 2 investors for one investment, then check w. director and risk management Also check w. industry experts lots of eyes looking over it	Try to identify inconsistencies or mismatches in data and models Conversation with founders on assumptions	Looking at big picture; needs to be aligned and make sense	Checked by everyone in the company (6 people)
How adapt evaluation models?	No	No	No	No Standard set of questions and topics Meet the company, ask for one-pager, ask for PG deck & financial plan Then Validation phase - talk to customers, partners, investors, team, experts
What do they do if their valuation is wrong?	Support where possible If nothing helps, try to protect their investments; facilitate an exit	Locked in as an investor Work with management to improve things If management doesn't listen --> difficult	Re-adjust calculations	Conversation; base hypotheses built need to be reevaluated (e.g. market size) Then adjust - train founder? Pivot product? If market is wrong/bad, that's bad, not much you can do
Learning process in place?	Evaluation database Database of term sheets	Experiences lead to new behaviours and change intuition	Repeat the due diligence you started with, adjust on the fly	Review strategies every year in a long session
VC Behaviour				
Do most investors fail to analyse IT startups correctly?	At the moment they take the decision, most are acting rationally and with plausible basis	Many don't due proper due diligence	Everyone makes errors, good VCs just make up for it with their star investments Valuations right now are too high, but coming from private market bubble, big companies way too highly valuated	Yes US --> huge volumes to fill debts, 1 out of 10 sucessful; most successful invest in the trend itself, not just single companies Europe --> state and EU money, cheap money; this drives overvaluation; 38% of funding was public
Hype & Risk of investments being mis-invested?	Yes Most investment opportunities do not give inflation protection & good returns Margins of real estate getting lower as prices rise Hype combined with lack of alternative investment options Also	Yes Lots of liquidity in the market due to low interest rates; funds bombard the market with money Also many former successful people that invest Unicorns start getting scrutinized more now though	N/A	Hype on the startup founding side, it's hip for young people Many investment (programs) financed by state money, just shooting it out there

Closing				
Is there a hype right now?		Yes, bubble	Hype in creating startups Institutional investors really good in selecting an investment	
Unicorns	Special rights venture contracts If would translate those valuations into stock markets, would be much lower Listed vs. non-listed not comparable Not wrongly priced, but differently	Bubble; can't be worth 50 bn if no profit was ever generated Exceptions are those that don't make profit because they invest so much in expansion, like Amazon 60 bn and not IPO yet, you will never make profit as investors as public don't want to pay that price; market won't support this	valuations not justified, too much Intangible products, how to you put worth on an idea (examples: Google, Apple, Uber) Investors expect high return rates some time in the future when the companies start monetizing	If people are willing to pay for it, it's ok; believe many are overvalued, but not all
Hot Topics	N/A	N/A	Freelance / Gig economy AdTech Artificial intelligence	Autonomous driving, Internet of Things, Big data, fin tech

Appendix B: Abridged & Anonymised Full Analysis Participants 5-8

	Participant 5	**Participant 6**	**Participant 7**	**Participant 8**
Context	VC	VC	VC	VC
Experience	Finance	Finance	Tech industry	Finance
Education	Civil Engineering	Business Admin	Business Informatics	Business Admin
Person & Org	Board member of large governmental fund	Seed VC for student startups, early stage investments CFO & investment committee	Was entrepreneur during dot-com bubble Partner at a boutique Startup organization (VC, coaching, acceleration, ...)	Principle Investing fund for all capital stages Growth Equity opportunities (no seed, VC - rather growth equity, later stage)
Investment Volumes	200k - 25 mio Euro	10k-100k $	50k - 150k Euro	20 - 50 mio $
Geographic Focus	A specific European country	US & Europe	European	Europe
Industry Focus	General	No specific focus, tackling big problems	B2B Tech companies	Tech & Internet (B2B more strongly)
General				
Investment Strategy	Find and support most promising early or seed stage teams and companies and help them scale up to reach series A and B where we also co-invest	Young founders, early stage that wouldn't otherwise get funding; this way can get bigger chunk of the company Goal: Get them to the A round, let other investors take it from there Try to be at the pulse of time by investing in youngest founder generation, rather than investing in what media and VCs (which are older) think is hot stuff	Network-driven, based on recommendations from their network (e.g. if other investors want them in for their expertise) Team - serial entrepreneurs Model - scalable Company - Survive independently Investor - Value Add? Industry - B2B Exit - Already see an exit channel	Already clear revenue streams and clear path to profitability in next 4-5 years in high growth environment (disruptive in market or growing market) Clear path means break even on operating profitability level & adjacent business models that show that it can work in steady state after growth slows down Strong Management team, great idea
Parallels to Dot-com times	Excess of unicorns right now early stage companies getting funded where they shouldn't, particularly because of the availability of public money and incentive schemes, and fiscal incentives schemes, and structural funding in Europe, and overhype in the US. when you have very low interest rates, and when investors, institutional investors, are chasing return, there will be a tendency for those investors to allocate capital to higher risk, potentially higher return asset classes, what that means is that you are diverting money from public equities and bonds into alternative investments, such as hedge funds, private equity, real estate, and VC to a certain extent. pressure to deploy that capital starts. So this bubble, in a big way is fueled by that cheap money available and increased allocations marginally to VC	N/A	Consumer media picking up on the topic Unclear business models ("I don't really get it") Value of some companies derived by many indirect factors that don't really tie together well	A lot of funding and pressure to deploy capital --> leads to high valuations and goes into startups that will struggle if there was another funding environment
Differences to Dot-com times	Markets are much bigger &much more mature	Investors pushed companies to go public very early before they were ready Everybody, also normal people, got caught up in the hype and invested in anything that had anything to do with the internet Valuations now are a lot saner; investors became more cautious, not willing to drive up valuations so much		More due diligent nowadays (work with external advisors, high hurdles to get convinced) Focus on survival of company once funding is turned off, is it possible, can it survive on its own
Lessons taken from Dot-com times		Careful not to get caught up in buzz and invest in areas they don't know	The earlier you get customers the better Companies should come from the eco-system, not	Dilligence is important due to the number of startups around

		There are still some "pockets" though where everybody wants to be in early on and valuations are crazy	go into a market they have no idea about	
Know How				
Market Knowledge Importance Rating	5	4	5	4
Market Knowledge Importance Reasoning	Absolutely fundamental Only VCs that can develop quickly deep industry knowledge in the field	Without knowledge you can't help the company also can't make a good judgment call about the actual opportunity In early stage about quality of idea, market size and founder team	Important to evaluate the actual value the business could achieve Also important to help with your network in growing and for exits	Can learn quickly about the market 80/20 rule - can dig really deep into industry in 2 months But need it to actually get a call for an opportunity, for this you need networks Don't need to be absolute expert
Own Market Knowledge		4	3	3.5
Market Knowledge explanation		Software: 5, other things less 3-5 (averaged to 4)	clear focus, but more regional network	3-4
Knowledge of technology/tech trend importance rating	5	4	5	3
Explanation	If you don't understand you are going to miss out on companies that will be leading that trend Intertwined with knowledge of industries		Going in early, need to have an understanding	Can always get an expert in to get an evaluation of the technology
Own Knowledge of technology/tech trend rating		4	4	2.5
Own Knowledge of technology/tech reasoning		Call in trusted advisors Also rely on references of the founders		2-3
How to assess tech trend	Important to be specialized, but keep on reading and listening. We travel a lot, go to events, read as much, learn from others as much as we can. No single place to find all the trends. A lot of information going around. You need to keep on studying. A big part of our work is to keep on studying what is happening in the market.	Call in trusted advisors Also rely on references of the founders	If he himself is able to pitch it, it's a good indicator	Do extra research in some industries, attend conferences, meet experts - even if not evaluating a company at that moment; to build general expertise being able to act fast Other 50% you get an inbound call, get presented opportunity, then you need to do catch up work, research 50/50 - constant work vs. reactive
Evaluation Criteria				
General Financial Method or model	N/A (skipped)	Ask for 5-year model (but more as an exercise) Mainly look at money needed till exit and how their ownership might be affected by that Nobody does Discounted Cash Flow, too early for that	Look at business case and business model The "hard" indicators just to see how attractive for follow on investors	Late investment, so 2-4 years history of company data Analyse the existing business plan and challenge; those companies are pre-profitability we look at top-line potential, assessing this with top-line advisors Profitability --> benchmark with market peers All case by case
Financial KPIs	N/A (skipped)	When later investment, standard stuff: Revenue, customer acquisition But early investment not really	N/A	Revenue, cross-profit, EBIT-potential, cash burn rate
How to evaluate business model				
Customer Lifetime-Value importance rating	N/A (skipped)	3.5	5	

Customer Lifetime-Value importance reason	N/A (skipped)	More about LTV development and LTV in conjunction with other KPIs like retention, acquisition etc.	Lock-In and repeat use/buy is important as In B2B space acquisition of customers is costly and long	N/A
Market Opportunity rating	N/A (skipped)	5	4	4.5
Market Opportunity reasoning	N/A (skipped)	Since don't have any numbers in early stage, this is key Wouldn't get involved in a too niche market	Follow on investors look at that Also help see the founders the bigger picture - can the use case be applied elsewhere or extended The more flexible a technology, the better	
How to assess market opportunity	Revenue, customer acquisition, Life-time Value SAAS - similar: monthly recurring revenue, how fast is it growing Cleantech, enterprise IT - very different metrics and milestones Digital & SAAS quite well known metrics	Look at other approaches that solve the problem and use this market as a proxy Evaluate in context of macro-economic trends over the next decades Challenge assumptions on market numbers of founders	N/A	With commercial advisor
Revenue/profit dev dynamic?		N/A (skipped)	More important to understand the underlying revenue model and if it needs to be switched - this leads to different growth rates	
Estimate future demand?		N/A (skipped)	Asking the network ("Friends")	
Lack of historic data?		Technology is sound, market is big enough, people are good Very different from later stage investing	Talk to existing customers If no customers at all - no deal	
Competition rating	N/A (skipped)	3	5	3.5
Competition reasoning	N/A (skipped)	Strategy of the company depends on what the competition looks like; lots of older players that are not innovating --> exciting; very crowded with startups --> not good	Competition is a good sign it is an attractive market	Wouldn't invest if you think competition is better - if they are and you can't invest in those, then not invest at all Depends on the management team that can cope with the competition
How to evaluate competition	N/A (skipped)	There is never no competition Let the startup do the research	Desk research and asking network ("Friends")	
Problems with evaluating future earnings?	N/A (skipped)	N/A (skipped)	B2B is less difficult, mechanics work always more or less the same	
Evaluating risk	N/A (skipped)	Type of risk: Failing to make it to next funding round Bring in technical experts for tech evaluation	Extensive discussion process w. founders	We have a risk return angle Others do weighted return Given the high risk in these and there is a high risk that you lose everything, you look for opportunities that have an outsized return Outsized - for seed: 10xplus , late stage: 4-5x plus With liquidity preferences, good terms might even get comfortable with 3-4x because you are the last investor to come in before it stops burning cash, so good downside protection
Evaluate exit scenarios?	N/A (skipped)	N/A (skipped)	Talking to network ("friends") - opinions Friends are potential customers or acquirers often	

Non-Financial Criteria				
General	Team is much more important than anything else	N/A (skipped)	Team must be impressive	Customer Growth, customer retention
R&D Rating	2.5	3	N/A (skipped)	N/A (skipped)
R&D Reasoning	Only relevant for more established companies	Not a separate function at this stage	N/A (skipped)	N/A (skipped)
How factoring R&D in			N/A (skipped)	N/A (skipped)
Engagement KPIs?		N/A (skipped)	Yes, especially stickiness	
Understanding Product/Service?		Make founders talk to 100 potential customers Ask industry experts Look at industry trends and see how product would fit in	Need to be able to pitch it himself and for that needs to understand the business case Understand the price point Ask network for additional input	
Understanding Business Model?		N/A (skipped)	First sale as validation necessary Ask network to get to a price point Check how competition is doing it	
Importance of Founder Team?	5	5	5	5
Explain importance	Knowledge, capacity to be creative and think out of the box; need to adapt fast; not just raw brainpower, capacity to adapt and be open; Ability to work with us, listen to us, deep open relationship	(was originally 6, but that was not an option)	(was originally 6, but that was not an option)	If things do NOT go well, need to have a team that can manage that; flexible, can react, you trust and want to work together
How evaluate Founder Team?	Evaluate psychologically	Conversations w. team, w. references No Plan B, fully committed Trust is important and trusted references	Track record in achieving, completeness Personal like	Internal expertise - people that met hundreds of management teams Looking for: trust, honesty, highly ambitious, able to execute and deliver; track record in/with previous companies
Importance of intangible IT assets/capabilities?			1	5
Why?		N/A (skipped)	Sales is more important than technical skills, can always buy those in	Just believe in the team but not the product, that's an issue
How evaluate intangible IT assets?		N/A (skipped)		
Importance of networks			5	1.5
Why?		N/A (skipped)	In B2B this is how you can understand how to solve a problem; you need to come from the business	That's what investors bring to the table
How evaluate?		N/A (skipped)	References, talk to clients	
Learning				
Intuition, gut feeling, personal experiences?		Mainly in the human component: Evaluating the founders, especially if something seems "off" Judging if someone will be "coachable"	Sees patterns from experience Red flags - e.g. lack of leadership If not sure, not doing it	Needs to have the right chemistry with the founder team, this is relationship-driven But want to back this up with facts and other perspectives Financials: No gut feel at all; if market doesn't exist yet - you really believe personally that the market develops, then maybe also

How to avoid errors?		N/A (skipped)	Tie everything together into financial models, then examine all assumptions and if the hypothesis works through every step Also, factor in human component into strategy (are founders willing to move?)	More of a financial investor, less operating investor Rely on outside advisors - consultancies, former executives of similar businesses Also rely on management team Invest into the management team, you need to be comfortable with what they tell you
How adapt evaluation models?	Roll it up from milestone back and then come up with valuation based on that Later stage: typical valuation stage KPIs, revenue, etc. - can calculate current discounted cash flow	N/A (skipped)		N/A (skipped)
What do they do if their valuation is wrong?		N/A (skipped)	Detach emotionally, let them be Let professional investors fix it	Should understand why other market participants see the company differently/apply different value - you should still stick to your assessment, if it is sound
Learning process in place?		N/A (skipped)	Talk to more friends	Track valuations over time and cross industries & historic valuations
VC Behaviour				
Do most investors fail to analyse IT startups correctly?	More variability above series A and on seed stage - depends on the type of investor; Angel, fund? Are they experienced? Hard to say wether people are doing the right valuation or not; based on promise and growth potential	Angels are too cautious VCs follow hypes too much - "we need to be in there"	Most investors are followers, they neglect due dilligence Valuations so high that cannot make significant money; already down rounds in the US	Some investors are more bullish, some more value-oriented Lots of capital that needs to be deployed and public markets that drive up valuations
Hype & Risk of investments being mis-invested?		Money goes into not so solid, but hyped companies while great startups in an early stage struggle to raise money		
Closing				
Is there a hype right now?		No, not really But media is sometimes hyping certain people and companies, and often for the wrong reason - because they managed to raise money	More in the consumer business B2B very conservative	Valuations are unjustified and valuations levels will come down - Yes Bubble? Hard to predict Lot of money invested in unjustified valuations without rooting in the n
Unicorns	"Some unicorns deserved their valuations above a billion, because they are growing extremely fast and sometimes even profitably. A lot of unicorns that were created in the last 3 years and many of them should not have had such high valuations at that stage. It's sobering to see that when these companies go public they normally trade down. Particularly for some of the more hyped cases in the world the day will come when they will be acquired or go public and personally I forsee that sky high valuations - particularly above 10 billion - will be extremely hard to protect. Many others in the low range of 1 - 5 bn which I think are also just worth a fraction of that. It's part of the industry that you have a high failure rate."	Some individual cases were overhyped as founders were good at (just) that: raising money Those are outliers though	Lots of money in the market Unicorns attract all resources (also employees) from not growing "old" companies	"Not many people really understand in a lot of details how these valuation levels come together to create a unicorn valuation. All these valuations in a private round - this is all on paper. It doesn't really mean that this is a long-term stable valuation level. There is also an inherent risk at becoming a unicorn. You are applying a high valuation to your company and as long as you are not cashflow positive this can actually be quite hurtful aswell. Overall I'm sceptical about the overall quantity of unicorn valuations but also the quality of unicorn valuations"
Hot Topics		N/A		N/A

Appendix C: Abridged & Anonymised Full Analysis Participants 9-12

	Participant 9	Participant 10	Participant 11	Participant 12
Context	VC	Angel	VC	Angel
Experience	Tech industry / startups	Tech Industry / Startups	Tech Industry	Tech Industry
Education	Economics	Computer Science	Business Admin	Business Admin
Person & Org	VC arm of a large company and startup building incubator Venture developer - find startups in tech sector	Business Angel for student startups	Principal at VC Firm	Angel Pack
Investment Volumes	50k - 2 mio; follow up rounds	3k - 10k	200k - 50mio	20k - 200k $
Geographic Focus	Worldwide	Specific European country	Global	Global
Industry Focus	iOT, urban smart and connected devices, markets related to operations of parent company		Internet companies, only digitally enabled models Consumer	Software
General				
Investment Strategy	disruptive that in best case already have a little bit traction we help find product-market fit and help scale	Better to invest in teams not ideas Only invest if founders also invest financially	Stage: Early Stage investor, then invest across life cycle Category-Defining businesses, help to accelerate growth with capital, know how Businesses where there is a value add beyond finances	Invest in people
Parallels to Dot-com times	FOMO - Fear of missing out "People invest in certain sectors because of FOMO - fear of missing out or some kind of herd culture - just following other investors because it sounds like an interesting opportunity. Or there is a hype generated." Herd-culture, hype --> Virtual Reality; biggest investment volumes in 2015	Newly founded companies seek investment, they don't want to make money in Exits, but in investment rounds	Most models thought out back then turned out to be valid business models "Most of the models that were thought out or started back then - they turned out to be valid business models. But back then there was just no customer base."	N/A
Differences to Dot-com times	Market for internet was very small, 1/10th, slow internet "The market was just one tenth of what it is now. Internet was very slow. This has changed tremendously. We have a totally different market situation now." Now >3bn ppl	In 1997 was one shot to make a really big wheel Now money is flowing into the company, not the shareholders; only at (last) exit can cash out	No customer base back then Investments that were raised didn't have any fundamental backing; Now everyone is online Now lower entries to entry for founders, enables to test the waters, gather data; enables more informed investor decisions Investors became more sophisticated and specialized in certain industries; knowledge wasn't there back then on detail questions	N/A
Lessons taken from Dot-com times	Be careful when something feels overvalued Not putting the same multiples in valuations now as back then	Nobody made the calculations; should always try to do it	Timing matters Pets.com was valid, but too early back then We try to catch the right time for a company	N/A
Know How				
Market Knowledge Importance Rating	4	4	4	3
Market Knowledge Importance Reasoning	Qualified assumptions & hypothesis put out by the startup you need some knowledge	Without ideas of the industry you could get tricked Bring in the network and that is usually industry knowledge	B2B - 5 B2C - 3 (above "4" is average) More important to understand the business models than the customers, because can tell a lot of the dynamics from the data	Only need to know enough to know red flags and risks; rest the founder must know
Own Market Knowledge	4.5	4	3	2

Market Knowledge explanation	4-5			
Knowledge of technology/tech trend importance rating	4.5	2.5	3	4
Explanation	4-5(averaged)	Changing very rapidly; more important that the software architect/CTO know what they do Check the architecture with external expert 2-3 (averaged)	"The more technical the business model is, the more important" don't need to understand in depth, that's why you invest in good teams with good knowledge	
Own Knowledge of technology/tech trend rating	4.5	2	3	4
Own Knowledge of technology/tech reasoning	4-5			
How to assess tech trend	Market experts, internal organisation - industry knowledge 5-30 years Buy in external experts for specific cases	Always triggered from people who approach him, no active search for startups	Talk to companies and see through pattern recognition what new trends come up Backtrack business models that might fit	Assess the potential impact on consumer behaviour & general life improvement Even without data, intuitively is fine
Evaluation Criteria				
General Financial Method or model	Potential exponential growth	Not a standard model, more reliant on experience small calculations are sufficient; if it's too complicated, something might be wrong	No internet investor uses DCF models, no data for that multiple based evaluation with companies in the sector with the same business model ideally Bottom up: sanity check; forecast, sensitivity analysis if growth is actually possible for a good return	No
Financial KPIs	Depends on the phase Seed funding: can only show trends Do projections, models, assumptions to see how market share impacts revenue			Revenue GROWTH, can be unsustainable at start, but must have a plan to make the growth sustainable
How to evaluate business model				
Customer Lifetime-Value importance rating	5	4	5	
Customer Lifetime-Value importance reason	Mission/Vision: High customer lifetime value; looking for sticky business	(fill in later)	Transactional only in connection with CAC and scalability Transactional: 5	
Market Opportunity rating	4.5	2.5	5	
Market Opportunity reasoning	Whale-hunters - no little fishs, few big whales	Markets are changing fast, competitors are entering fast	Hard to gather in advance; sometimes create their own market	
How to assess market opportunity				
Revenue/profit dev dynamic?	Yes, definitely dynamic possible, but usually exception	Linear; will challenge hockey stick assumptions		
Estimate future demand?	Expert panels to evaluate future of the market Old revenue streams will vanish, so this is paramount, be very diligent			
Lack of historic data?	Founder team - industry knowledge, general experience, do they understand the dynamics of the market	Any market has at least some kind of historic data, and every business models too	Valid data on unit economics and scalability is clear, you don't have to have large history Otherwise all other factors need to be better: blue ocean, exceptional team	
Competition rating	5	5	4	
Competition reasoning	If there is no competition, there is a reason for that	You have to know your competition, how they do their job and are they able to copy you	can't really predict; always assume great business model always attract competition	

How to evaluate competition		Initial analysis by the startup "There isn't" --> ask them to go back researching		
Problems with evaluating future earnings?	N/A (skipped)	Only can do short-term, everything longer gambling		
Evaluating risk	Only 1 out of 10 suceeds in our field If we thought we found 10 whales, we know only 1 survives	Only low sums	Look at the different factors that make a great company (market, business model, team, unit economics), and size it up Multi-factor model	
Evaluate exit scenarios?	Yes, but not the goal Build long-term business models that can be implemented in the existing structure	Yes, but more for first 2-3 years only (buying shares back for multiple fixed at beginning) Multiples of revenue, not profit for the shares	Try to find potential acquirers no exact science; can't plan for it	Sometimes, by looking at market trends and needs
Non-Financial Criteria				
General		Outside financial key figures, not many Qualitative Feedback	"Team is the most important, but also most difficult factors to size up for an investment" "a B-Team can screw up an A opportunity"	Founder - growing and learning; listening to investors
R&D Rating	N/A (skipped)	2	N/A (skipped)	N/A (skipped)
R&D Reasoning	N/A (skipped)	Prototyping is not same as R&D	N/A (skipped)	N/A (skipped)
How factoring R&D in	N/A (skipped)		N/A (skipped)	N/A (skipped)
Engagement KPIs?				Growth, conversion, return users/visitors
Understanding Product/Service?	Structured in "knowledge centers", each of which have expertise for specific area	Use it himself, give it to people who need it, qualitative feedback	The earlier an investment, the more important to understand this as an investor yourself and having a hypothesis on how this will play out on the market	Shouldn't require big consumer behaviour change, they are difficult to evaluate
Understanding Business Model?		Has to understand in every detail Friend of very lean startups, component-based founders; outsource what is possible 5+	Of highest importance for investment; some businesses are great businesses but no good investments "Some businesses are great businesses but they are not good investments. Because they are too expensive to build or can't grow big enough or have other dynamics that prevent them from exiting at some point."	Should be viable from day one, not just "some day when we have users"
Importance of Founder Team?	3.5	5	5	5
Explain importance	We might add value from ourselves, put somebody into the team	With a good business model and team you will find a market (was originally 6, but that was not an option)		
How evaluate Founder Team?	First get to know the market, then interview the team Expertise, experiences, approach to market	Standardized psychological assessment test Discuss with the team the rules for the future company to see how they think and interact	Track record, sector knowledge Interaction with the investment team; setup of the team, how they complement each other How the investment material is prepared - is also a symptom of the team	Want to have the feeling that I would like to be part of the startup myself
Importance of intangible IT assets/capabilities?		5		4
Why?		Possible to buy more skills in with money (education or people) Soft Skills: 6 Other Skills 4-5	N/A	

How evaluate intangible IT assets?		Soft skills: see above Hard Skills: by marks and opinions of other teachers	N/A	The engineer(s) need(s) to be very strong
Importance of networks		2.5		1
Why?		Angel should bring in the networks; young people don't know the important people In this region it is not easy to get access by yourself to such people	N/A	
How evaluate?			N/A	
Learning				
Intuition, gut feeling, personal experiences?	Only speak for myself: Definitely part of the game, always mix between market insight Once we amas	More than I should Sympathy for the founder is important Sometimes not easy to talk about failures then; easier if hardline business and communication approach Market and marketing side it is important to use intuition; hard facts with how to build the company are important	As little as possible "Given the uncertainty there is always a large portion of gut feel and belief in there. That's something that gets better over time, with pattern recognition"; Experienced investors tend to do better "Team is hard to nail down with quantitative measuring, so that's where this come in the most"	When reading people Integrity is most important When evaluating assumptions and ambitions
How to avoid errors?	Evaluate the documents the startup gave Independent market analysis and due diligence process	Check the team thoroughly; look at small behaviours also Are they really able to go through hell together	Involve several people, investment team Carefully evaluating everything Investment committees to catch overconfidence	
How adapt evaluation models?				
What do they do if their valuation is wrong?		Work with the founders to fix it Early stage problems are a lot but not heavy	Help the team to change the path, get back on track Help pivot	Nothing, too late
Learning process in place?	Regular startup best practices - lean startup business model canvas, management techniques from Peter Drucker, BCG matrix MVP thinking, Agile development	Exchange experiences with other investors to get ideas and knowledge	Improving the evaluation of all the different factors that make up a company success; this is an on-going process Investment committee is the safety net; institution that helps the team in assumptions Financial valuation --> mispricing is not a big factor	Get better at reading people, better at coaching the team and train leadership
VC Behaviour				
Do most investors fail to analyse IT startups correctly?	80/20 within field of specialized 60% are good 40% are followers	Some investors are black sheep Some investors invest in every new idea A lot of show around the Venture Capitalist It is important to find the right investor fitting to a startup rather than just a well known one or one with the most money	Everyone makes mistakes On average according to Kaufmann foundation - VC have not done a good job in the past Some funds make successful investments There is some luck involved	Yes, most don't even care about generating profit, just about exiting
Hype & Risk of investments being mis-invested?	Hype is the wrong word as this would mean we are in a bubble The startup culture is new entrepreneurial mantras, they became fundamental part of economics,			

Closing				
Is there a hype right now?		Yes, too much money in the market No interest rates for other investments, stocks are stagnating Housing market is hot, is also bubbly Everybody wants to invest in startups right now; each Dax company and mid-sized company has a venture arm looking for the next big thing; Problem for the founders - think they only need a good idea and then receive lots of money	No, not necessarily Internet sector is clearly pointing towards this is a growth sector the next decades Some decisions in hindsights might be wrong, but mostly rational decisions	
Unicorns	Already have Decacons (?) Can't compare it to the dot-com bubble because now some companies even though they have not the revenue streams that totaly ratify their valuations, they are on the way getting there	Some like Airbnb are ok, they make sense - market was existing before, just fragmented; combination w. p2p was great idea; no competition Others not E.g. Same day, same hour deliveries - don't see how this is such a game changer	Don't like the term Current unicorns are strongly under scrutiny Necessary breakout success for a fund Some are justified, some are not; can say from our own assumptions already if a company is overvalued	Willing buyers, willing sellers - the market is regulating this
Hot Topics		N/A	Artificial intelligence, machine learning	Artificial Intelligence, Fin-Tech