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Evaluation of young companies / startups based on the

multiples approach and DCF method

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Abstract

In this paper the concept of startups is explained in more detail, occasions for the valuation of these type of companies and the procedures for determining the company value presented. Two processes, the Multiples approach and the DCF method are applied to one example case. Finally, the results of both methods are compared and evaluated. For future work, there are also further possibilities for company valuation by young companies.

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List of symbols used

β_i	beta for the investment i
c	cost of capital
$E(r_i)$	expected return of a risky investment i
$E(r_M)$	expected return on market portfolio M
$EV_{Z,t}$	enterprise value of the target company at time t
Es	Equity share
FCF_t	free cash flow for the period t
g	growth rate
i	discount rate
M	industry average multiplier
r_f	risk-free interest rate
t	tax rate
T	end of investment horizon (exit)
V_T	company value at time T
X	key figure of the company (e.g. profit)

List of abbreviations

APV	adjusted present value
CAPM	Capital Asset Pricing Model
CF	cash flow
Cf.	confer/conferatur (compare)
DCF	Discounted Cash Flow
EBIT	earnings before interest and taxes
e.g.	exempli gratia (for example)
et al.	et alii (and other people)
etc.	et cetera
EUR/€	Euro
EV	enterprise value
FC/FCM	First Chicago/ First Chicago Method
FCF	Free Cash Flow
i.e.	id est (that is)
Ibid.	the same as above
IPO	initial public offering
IRR	internal rate of return
LBO	leveraged buyout
M&A	mergers & acquisitions
MBO	management buyout
PE	private equity
PV	present value
TV	terminal value
USA	United States of America
VC	Venture Capital
WACC	Weighted Average Cost of Capital

1. Introduction

The role of startups is gaining more importance over time. They contribute to the renewal and growth of an economy. Startups create new jobs, they are most of the time a source for new and innovative technologies, products and services. They contribute to the modernization of different businesses and branches. These and many other arguments are reasons to support startups with great potentials.

The support which the startups need is not only with expertise but more with the topic of financing. In order to have an Idea how much financing a company can get, it is important to be able to evaluate a company. To be able to carry out a company valuation of a young company, suitable input parameters and valuation models are required. This is a challenging task, since most young companies have no or only a short history.

Berlin has an important role regarding Startups. In a survey conducted by the KPMG group, 16.8% of the participant startups are based in Berlin. So that puts Berlin in first place in Germany.[1] "Every 20 hours a new startup is founded in Berlin" is stated by the newspaper Tagesspiegel.[2]

Therefore, the question of how to evaluate a startup is more important than ever. But in addition to all difficulties of evaluating a startup the problematic of the short to non-existent prehistory does only make it more difficult to answer this question.

Therefore, this Bachelor thesis will deal with the problematic of evaluating a startup. The first step is to clarify here is what a young company or a startup is and why it is so difficult to evaluate them. Furthermore, this work will clarify the importance of determining the value of a company. During this work the question of, which requirements are needed and suitable for the evaluation models, will be checked.

Furthermore, different evaluation models will be delineated. In addition, a fictitious example case will be calculated, with the discounted cash flow method, the multiples method and the venture capital method as an extra. The use of multiple methods will make it easier to compare the strength and weaknesses of the different methods.

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[1] Cf. KPMG, Deutscherstartupmonitor (2017), p. 19
[2] Cf. Tagesspiegel, Gründerzeit

The company valuation of established companies is a topic which is already dealt by a big group of people like managers, economists, analysts, consultants and other professionals. A big number of methodologies have already been developed for this purpose, which, depending on the case, provide reliable and accurate values. With the help of traditional Valuation methods such as the capitalized earnings value method or the DCF method it is possible to determine the enterprise value or determine partial values to evaluate a company. The evaluation on the basis of multiples, i.e. with the help of key figures of comparable and listed companies, peer groups, and transactions, which is a popular method of evaluation because of its simplicity.

However, all these conventional assessment methods mostly work with prehistoric data. In addition, they only take into account very low measures of the possibility of high revenue growth in the future. This makes therefore the evaluation of young companies very difficult, as they are usually characterized by a young age and rapid growth.[3]

1.1 Objectives and methodology

In order to identify the characteristics of startups and their value drivers, this topic will be clarified at the beginning of the work on the basis of relevant literature. In addition, the reasons for such an evaluation will be clarified.

Following this step, the basics of the evaluation methods will be explained as they are present in the literature, whereby only selected, practice-relevant methods will be dealt with here.

As the graphic down below also illustrates, the aim is to categories the work into two parts so that both the theoretical and practical relevance of the question can be professionally addressed.

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[3] Cf. Baldeweg, Dirk K (2006), p. 49

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┌─────────────┐      ┌─────────────┐      ┌─────────────┐
│   Basics of │  ──► │Principles of│  ──► │   Example   │
│   Startups  │      │   company   │      │ application │
│             │      │  valuation  │      │             │
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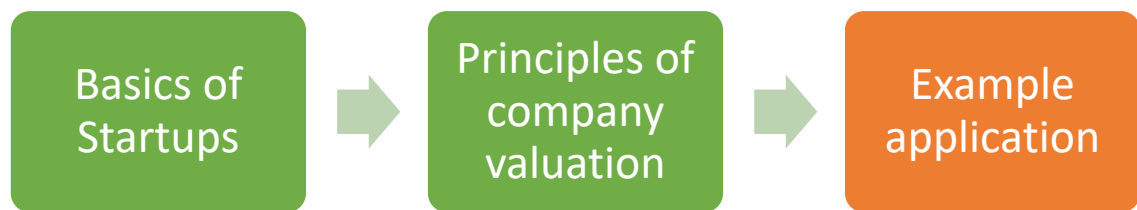
Figure 1: Subdivisions of the work

In a final step, a fictitious valuation of a startup in the field of finance will be carried out to demonstrate possible approaches and difficulties of such a valuation.

2. Young Companies

2.1 Explanation of the term

Young companies have certain and special characteristics. Therefore, it is very important to differentiate whether it is a new founded company or a startup. The name already indicates that the company is newly established. However, this does not mean a newly opened bakery, or a new gas station can be called a startup. Therefore, this chapter will clarify and distinguish the differences between newly founded companies and startups.

The differentiation in this chapter is an important step to make because of the different requirements and needs, which comes with the establishment of a startup. This is important because a startup usually has different requirements in many areas than, for example, the foundation of a subsidiary by another company. Consequently, this influences the enterprise value. Prof. Dr. Dr. Achleitner and Nathusius refer in their book "Venture Valuation - Bewertung von Wachstumsunternehmen" to various criteria which aim to distinguish startups. Independence that the founders of the startup have is an important criterion.[4] This means the level of independency which is sought for the future. The management, of a startup which is dependent, mostly consist of professionals who work for the founding company and get transferred to the startup. This show one of the

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[4] Cf. Achleitner/Nathusius (2004), p. 1

differences between a startup and a subsidiary. Since these company foundations have a completely different set of possibilities, means, aims and limits, set by the founding company, there are not called startups. The opposite, the independent foundation, is not bound and can have their own aims and goals.[5] Furthermore a company can be established on the foundations of an already existing organization. There is already substance on which the new company can build on.[6] These types of foundations are described as derivative foundations and are a good example for management buyouts. A management buyout describes the process of a takeover of a company through the existing management.[7]

In this work the focus will be on the "original" company foundation, where is no substance on which the company can build on or the company is found as a subsidiary. But there are still more criteria then just the ones listed till now. Otherwise the bakery would still qualify as a startup. Since, as mentioned at the beginning, a newly opened bakery would also fulfil the previous criteria, there must also be other characteristics that distinguish the establishment of a startup from the establishment of a bakery. The growth potential and the degree of innovation, which in turn are closely related, are two of the probably most important characteristics of young enterprises.

According to Rudolf and Witt, increased productivity leads to economic growth, e.g. the same services and products can be offered with less factor input and/or in a shorter production time.[8] This is favored by the development of new products, innovations or also by new manufacturing processes. Many young companies in the technology business initially invest heavily in research and development and thus achieve a high degree of innovation.

As early as the late 1940s and early 1950s, Peter L. Bernstein, an American historian and economist, was already concerned with the concept of economic growth and what constitutes young growth companies. He found that economic growth is possible through population growth, monetary wealth growth or technological progress. Companies cannot directly influence population growth. As a result, companies that only generate higher sales due to a growing population are not growth companies. According to

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[5] Cf. Achleitner/Nathusius (2004), p. 1
[6] Cf. Achleitner/Nathusius (2004), p. 2
[7] Cf. Wirtschaftslexikon Gabler, Definition: Management-Buyout
[8] Cf. Rudolf, Markus/ Witt, Peter, (2002), p.7

Bernstein's definition, a growth company must operate at the limits of a company's technological development.[9] However, Bernstein implied that there are high barriers to entry and that companies are asserting themselves and hoping for high profit margins. This has changed considerably since the 1950s. Entry barriers, for example in the Internet industry, have fallen very sharply, which has led to fierce price competition among competitors. Sales growth is much more important than profit for many companies today. The monopolistic behavior, implied by Peter L. Bernstein, as a result of his technological lead in the growth companies of the 1950s can no longer be observed to[10]

2.2 Reasons for the company valuation of young companies

When a typical startup, i.e. a young company with a good and innovative idea, is founded, one of the most important questions is the question of financing. Many startups turn to so called business angels or venture capitalists. Business Angels are private investors who can support young companies financially and at the same time support them with their knowledge and contacts.[11] Investors who take high risks with their investments and have to expect not to receive a return on their investment or even to lose the entire invested capital are called venture capitalists.[12] They support companies with venture capital. Venture capitalists often have the advantage that they can provide companies with more capital than business angels.[13]

These and other potential investors, e.g. banks, naturally want to know how much profit they could make over time if they invest in a particular startup. So, this is one of the most important reasons for an initial assessment of the new company.

Other reasons could be, for example, the sale of the company later on. Many companies are founded with the intention of selling them again in the event of success. An example of this is the company Rocket Internet, which is based in Berlin and always follows the so-called exit strategy.[14] So the sale of the company after a certain time. An initial public offering (IPO), i.e. the IPO and first sale of the shares, is also an occasion for a valuation.

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[9] Cf. Rudolf, Markus/ Witt, Peter, (2002), p.13
[10] Cf. Rudolf, Markus/ Witt, Peter, (2002), p.14
[11] Cf. Gabler Wirtschaftslexikon, Business Angels
[12] Cf. Gabler Wirtschaftslexikon, Venture Capital
[13] Cf. Rudolf, Markus/ Witt, Peter, (2002), p.27
[14] Cf. Rocket Internet, Webseite

It is also always good for the founders of a startup to know how much their company is worth at the moment.[15]

2.3 Problems in the evaluation of young companies and the resulting requirements for the evaluation procedures

The evaluation of fast growing and young companies is associated with fundamental peculiarities or difficulties which must also be taken into account while searching for suitable assessment procedures in the sense of the task at hand.[16]

2.3.1 No past - no future

When evaluating companies that have been active for many years, it is easy to find out values for turnover, profit, etc. and to make forecasts for the coming years.[17] Since young companies, as the name implies, have only existed for a short period of time, it is impossible to obtain this data from the past. Even if companies have been active for a few years, it is difficult to make forecasts, as these companies are still in the growth phase, as described in the previous section and because of this nor predictable. It is even more difficult with startups for which there is a business plan, but that is all. Often it is also the case that the markets in which the companies operate are only very young and therefore the existence of rules is not given.[18] The short company history of young companies and the lack of historical data make various demands on the valuation procedures. These should be oriented towards the future of the company and include its growth opportunities.[19] Investments at the beginning and other high costs contribute to young companies, especially in the initial phase of their development.[20] Therefore, a valuation model based only on historical data or using only current data for valuation is useless for the valuation of young companies and startups.

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[15] Cf. Rudolf, Markus/ Witt, Peter, (2002), p.25
[16] Cf. Baldeweg, Dirk K (2006), p. 49
[17] Ibid.
[18] Cf. Baldeweg, Dirk K (2006), p. 50
[19] Cf. Achleitner/Nathusius (2004), p. 6
[20] Cf. Baldeweg, Dirk K (2006), p.50

2.3.2 Flexibility

Opportunities for young companies and startups often arise from their ability to react quickly compared to already established companies. For example, a young company in the software development industry often has no profits after a few years. However, there are many opportunities for the company to be successful in the future. And so, these opportunities do not affect current sales or profits, but future profit expectations can increase.[21]

2.3.3 Inclusion of strengths and weaknesses

It makes a big difference whether experienced managers want to start a new company or young students want to implement a good idea. The experienced managers often have financial advantages because they have already saved enough money to set up the company and make ends meet in the early days. This is not the case for students. In their book, Rudolf and Witt cite the "four F´s" as a source of financing in the early stages of a startup. The four F´s stand for: "...Founders, Family, Friends, Fools. "[22] This means the founders, which of course have to make their money reserves available if they are existent. In addition, there are family members, friends and the nicely described "fools". Founders of a company who have been working in the industry for several years also have a better eye for the market situation and can use the network of contacts they have built up over the years. These advantages must also be included in the evaluation of companies. In addition, all strengths and weaknesses of the company should be taken into account. "[23]

2.3.4 No Profits

In most cases, a startup in an early stage has no sales, let alone a profit.[24] In this phase, the founders focus on expanding their business activities and growth.12[25] So it particularly important to consider the future cash flows.

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[21] Cf. Rudolf, Markus/ Witt, Peter, (2002), p. 203
[22] Cf. Rudolf, Markus/ Witt, Peter, (2002), p. 26
[23] Cf. Achleitner/Nathusius (2004), p. 6
[24] Cf. Damodaran (2012), p. 215
[25] Cf. Braun (2013), p. 8

2.3.5 Many fail

Of all the newly founded startups, only the most successful overcome the hurdle of commercial success and the fewest startups are still active after few years.[26] In a study by Knaup and Piazza (2007), they come to the conclusion that in the USA only 44 % of all enterprises established in 1998 dure over four years and 31% over seven years.[27] Furthermore, the survival rates are very highly dependent of the industry. In a study carried out by Eurostat (2016) 44 % of all newly founded companies in 2009 in Europe have survived beyond five years.[28] A similar result was found by the Statistic Austria. The survival rates after 5 years for newly established companies between 2010 and 2015 were in average at 53,3%.[29]

2.3.6 High degree of uncertainty

With young companies, the future development cannot be clearly predicted. The high level of uncertainty is not a constant and decreases as far as time passes by from the valuation date. Assuming the Going Concern premise, it applies an infinitely long evaluation period, therefore the valuation is subject to a high degree of uncertainty. This uncertainty can also be influenced by the changing and unpredictable Variables such as development, sales, competitive situation, interest and tax rates.[30]

2.3.7 Acceptance and practicability

The acceptance and practicability of the evaluation procedures are not problems that arise from the companies. These are challenges to the evaluation procedures themselves. When applying valuation models, it should be possible to achieve results without having to invest too much effort. Theoretically, all variables can be included in the evaluation. However, the question arises as to whether the effort is also commensurate with the success. In addition, the valuation methods must be generally accepted. This means, for example, that in a contract negotiation for the purchase/sale of a company, several parties must meet and ultimately agree on the price of the

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[26] Cf. Damodaran (2012), p. 215.
[27] Cf. Knaup/Piazza (2007), p. 5
[28] Cf. Eurostat (2016), paragraph 12
[29] Cf. Bundesanstalt Statistik Österreich, Statistik zur Unternehmensdemografie (2016)
[30] Cf. Hayn (2003), p. 27

company. However, this is only possible if all parties can understand the valuation of the company.[31]

3. Selected startup statistics

A good indicator to recognize that Startups are getting more interesting, through the rising number of researches and statistics. Some key figures will be listed in this part. The focus will be on Europe with a closer look at Germany and Austria. While most startups worldwide are in the fields of Fintech, Life sciences & healthcare and Artificial Intelligence[32], the European startups are in the fields of IT / software development, software as a product and Industrial technology/production/hardware[33]. There are also differences in the fields which are less popular. While there are at least startups worldwide in the areas of advanced manufacturing & robotics, cybersecurity and agtech,[34] in Europe the field of offline services, games and stationary wholesale and retail count the least number of startups[35].

While the largest growth in funding worldwide occurred in the years 2012 to 2017 in the areas of advanced manufacturing, blockchain and agtech, the last three fields were occupied by gaming, cleantech and adtech.[36]

The gender distribution clearly shows that men dominate the startup scene in Germany with 86.1 % and even 92.9 % in Austria. The age distribution is 50.1% under 34 years in Germany and 63.4% in Austria.[37]

The startups are of course much younger. 85.8% of all European startups are less than or equal to five years old and only 1.4% are 10 years old.[38] In Germany and Austria the average age of a startup is 2.5 years.[39] In Germany 10.9% of the startups do not achieve any turnover and approx. 18.2% of the startups achieve a turnover of more than € 1 million.[40]

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[31] Cf. Achleitner/Nathusius (2004), p. 7
[32] Cf. Startup Genome, Global Startup Ecosystem Report 2018, pp. 49-116
[33] Cf. ESM, European Startup Monitor 2016, p. 25
[34] Cf. Startup Genome, Global Startup Ecosystem Report 2018, pp. 49-116
[35] Cf. ESM, European Startup Monitor 2016, p. 25
[36] Cf. Startup Genome, Global Startup Ecosystem Report 2018, pp. 49 116
[37] Cf. ESM, European Startup Monitor 2016, p. 39
[38] Cf. ESM, European Startup Monitor 2016, p. 22
[39] Cf. ESM, European Startup Monitor 2016, p. 22
[40] Cf. Bundesverband Deutsche Startups, Deutscher Startup Monitor 2017, p. 54

While the survival rate in Austria after the first year is the highest with 90.3%, it is 53.8% in year five. Between 2011 and 2016, 41,790 new startups were founded in Austria. Of these, 4,241 were in the manufacturing sector and 37,549 in the service sector. The survival rate after 5 years is the highest in the manufacturing sector with 57.2% and it is 49.4% in the service sector.[41]

4. Startup financing

4.1 Financing and development phases of a startup

The evaluation of startups and their financing is closely related. A suitable concept for sustainable financing not only ensures enough liquidity in the various development phases, but also has a major influence on the speed of development and the value of the company. The individual development phases are characterized less by a certain time span than by the operational and financial challenges of the respective phase.[42]

There is no fixed number in the scientific literature, but it is mainly divided into three phases: The early stage, consisting of seed capital and startup phase, the expansion stage as growth and internationalization phase and the later stage consisting of bridge or pre-IPO phase and exit phase.[43] The phases are well suited for recording in detail the development, financing and business processes. It is important to note that the model of financing and development phases only describes the ideal typical process. The speed with which the individual phases are completed also depends on the startup, the form of financing and the industry. While startups in the technology sector complete the development phases relatively quickly, in the medical and pharmaceutical sector years can pass due to the protracted examination and approval of individual patents or drugs.[44]

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[41] Cf. Bundesanstalt Statistik Österreich, Statistik zur Unternehmensdemografie (2016)
[42] Cf. Hahn, (2014), p. 84
[43] Cf. Achleitner/Nathusius (2004), p.84
[44] Cf. Roland Berger, Venture Capital Fueling innovation and economic growth

4.1.1 Early Stage Seed Capital Phase - pre-foundation phase

The early stage phase is further divided into the seed capital phase and the startup phase. In the seed capital phase, the startup is still in the test phase before it is founded. Often no legal foundation has taken place at this stage, instead the idea and product development as well as the legal steps for the company foundation are prepared in the pre-foundation phase.[45] The aim of this phase is to evaluate the potential of the business idea in order to develop a concrete business model on the basis of this data.[46] In addition to developing the business idea, the focus is on product and concept development, research and development, especially in the area of technology and the analysis of potential markets, customers and competitors.[47]

Financially, the startup is already dependent on capital for the development of a prototype. This can prove to be problematic because investments cause losses and no sales or cash flows have yet been generated. However, since the capital requirement is relatively moderate in most cases, the founders often use their own funds or financing through Family and Friends Funding[48]. A young alternative to early financing is crowdfunding, in which the founders finance their idea through many small investors.[49]

4.1.2 Early Stage Startup Phase - Company Formation

The Early Stage Startup Phase describes the actual startup phase. In addition to the legal foundation, the further development of the prototype up to product maturity and planning of the market launch is pursued. The market entry is prepared by an initial launch. The feedback from potential customers is used to develop a sales and marketing concept.[50]

Since the first sales are only generated by the launch in a small circle of customers, financial bottlenecks can occur. Capital is needed above all for the high product development costs, initial marketing activities and the need for additional personnel. In

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[45] Cf. Kollmann & Kuckertz (2003), p. 38
[46] Cf. Kollmann (2014), p. 110
[47] Cf. Stadler (2001), p. 34
[48] Ibid.
[49] Forbes, What is crowdfunding?
[50] Cf. Kollmann (2014), p. 110

order to cover the growing need for liquidity, new sources of financing must be tapped. This is mainly done by business angels, but also by early stage venture capital companies (see Figure 2). Especially in startup cities such as Berlin or Vienna, startup incubators help to supply capital and technological infrastructure. The startup phase ends with the market entry.[51]

4.1.3 Expansion stage - growth phase

The goal of the growth phase is to expand as strongly as possible and open up new markets in order to reach the breakeven point.[52] To achieve this goal, the target markets must be penetrated, and sales and production further developed.[53] The startup is right in the middle of the production start in order to advance production ready for series production and expansion into international markets. It is important that a scalable and mature product meets a rapidly growing market.[54] The product research and development phase as well as the market analysis should be largely completed before market entry.

On the financial side, capital requirements are initially high, but will decrease as the business develops. Major investments and expansion into international markets are leading to a significant increase in sales and a stabilization of cash flows. In the meantime, however, some startups are not yet fully self-financing and continue to depend on growth financing from investors.[55] Since business angels often invest smaller sums in early stages, they are replaced by venture capital companies and private equity firms specializing in growth capital financing (see Figure 2). At the end of the expansion stage, the company should reach break-even point so that it can generate sustainable profits and positive cash flows in the later stage phase. This provides considerable access to cheaper sources of debt capital such as bank loans.[56]

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[51] Cf. Kollmann & Kuckertz (2003), p. 37

[52] Cf. Mann & Schütt (2015), p. 13

[53] Cf. Hahn (2014), p. 199
[54] Cf. Stadler, (2001), p. 35
[55] Cf. Achleitner (2001), p. 516
[56] Cf. Kollmann & Kuckertz (2003), p. 39

4.1.4 Later Stage - Bridge Phase

In the bridge phase, the aim is to diversify the product portfolio and achieve concentrated market penetration with marketing campaigns.[57] The startup should already have established itself nationally and continue to expand into international markets. Bridge financing is used to initiate the necessary steps for an exit, for example by going public.[58] It serves as a link between the expansion phase and the actual later stage exit phase. The operational challenges are associated with high capital requirements. On the financial side, the strong growth in sales and profits is slowing (see Figure 2). In the later stage, enough cash flow should be achieved at least in the established markets. This means that further internationalization will also be co-financed from the company's own cash flow. Nevertheless, the startup is still dependent on external financing. Since it is easier to forecast revenues and costs in later stages, it is possible to tap further sources of financing such as private equity funds or investment banks.[59] Bridge financing helps to improve the equity capital of a startup when planning an initial public offering or selling it to industrial investors.[60]

4.1.5 Later Stage - Exit Phase

In the exit phase, the startup has developed into an established company. A possible exit scenario is the sale of company shares in an initial public offering, in which the venture capital companies are bought out by shareholders with the help of investment banks. This changes the investor structure and the venture capital companies are replaced by institutional or private investors.[61] As an alternative is to go public, the venture capital investor can also resell the company shares to private equity funds through a trade sale or sell them back to the founding team in a buy-back transaction.[62] In the latter case, the current internal management buys back the company shares in a management buy-out, or in the reverse case, an external management can take over the company in a management buy-in.[63]

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[57] Cf. Nathusius (2001), p. 59; Cf. Hahn (2014), p. 201
[58] Cf. Achleitner & Nathusius (2004), p. 10
[59] Cf. Stadler (2001), p. 34
[60] Cf. Schefczyk (2000), p. 22
[61] Cf. Stadler (2001), p. 36
[62] Cf. Achleitner & Nathusius (2004), p. 9
[63] Cf. Achleitner (2001), p. 516
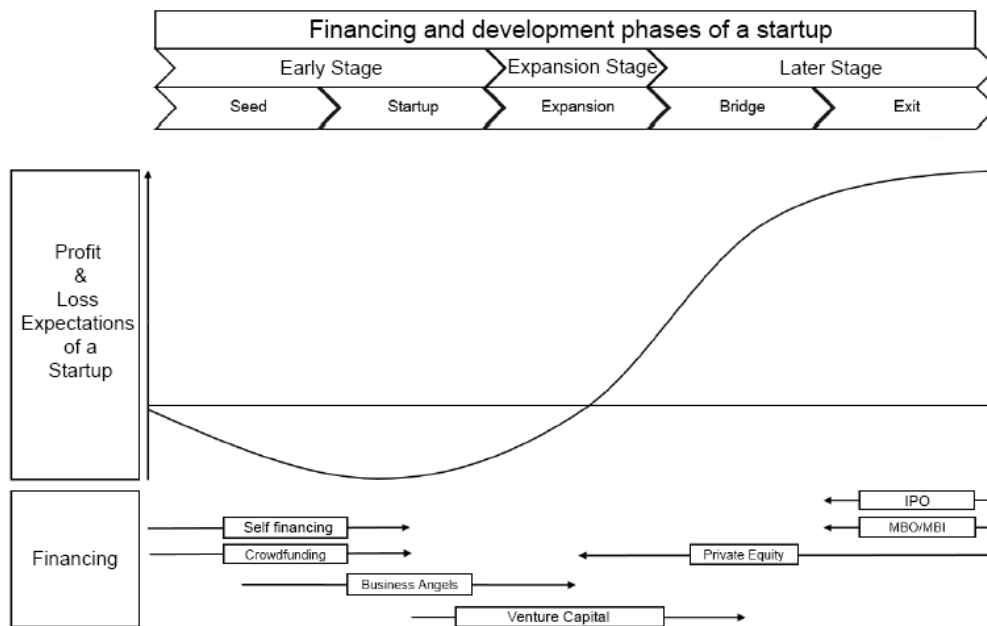
Figure 2: Own recreation with reference to: Achleitner & Nathusius (2004), p. 10[64]

5. Investment criteria and value drivers

In addition to quantitative factors, qualitative factors (also called "soft" factors) are included in a startup valuation. Especially in early financing rounds, these are primarily analyzed in order to verify an investment and justify a company's value. The logic is that this check is carried out before a potential startup is evaluated, so the value drivers or investment criteria should now be identified.

The following description explains the importance of investment criteria for early investors like venture capital companies. The data is collected from the empirical research of MacMillan[65] and Brettel.[66]

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[64] Cf. Achleitner & Nathusius (2004), p. 10
[65] Cf. MacMillan/Siegel/Narasimha (1986), pp. 119 – 128.
[66] Cf. Brettel (2002), pp. 305 – 320.

Source	MacMillan[67]	Brettel[68]
Country	USA	Germany
Criterion		
Founder/Team		
Personality Founder/Team	+++	N/A
Experience Founder/Team	+++	N/A
Risk assessment	+++	+++
Performance	+++	+++
Familiar with the target market	+++	+++
Product/Service		
Property/Patent	+++	++
Proven Market Acceptance	++	++
Developed Prototype	++	N/A
High-Tech	++	++
Market characteristics		
High growth rates	+++	+++
Threat of Competition	++	++
Opening up new markets	+	++
Financial considerations		
High value growth possible	+++	++
Liquid ability	+++	++
Participation in further rounds	+	+

+= not Important | ++= important | +++= very important

The empirical survey taken up by MacMillan led to a considerable number of follow-up studies, which took similar approaches, also outside the USA, and drew comparisons. The tabular representation of the two studies signals in sum the relevance of founders and team and financial considerations in particular. However, this should not lead to a

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[67] Cf. MacMillan/Siegel/Narasimha (1986), pp. 119 – 128.
[68] Cf. Brettel (2002), pp. 305 – 320

generalization of this result, as the investment decision is more a holistic and individual approach.

Nevertheless, there is interest in research in this versatile field, which shows the development of further studies. Another survey shows a divergence of results taking into account the different financing phases (taken into account: seed/startup/expansion).[69] Franke, Gruber, Henkel and Hoisl were examined by the founding teams on the basis of a conjoint analysis. They come to the conclusion that the team's existing industry experience is the most important factor.[70] Franke, Gruber, Harhoff and Henkel interviewed 51 VC experts and conclude that less experienced VCs attach more importance to the qualifications of individual team members when making investment decisions, while experienced VCs value the cohesion of the team more.[71] In a study of 81 VCs surveyed, Kollmann and Kuckertz additionally split the investment criteria into screening phase, evaluation phase and structuring phase and analyze how to deal with uncertainty.[72]

6. Principles of valuation methods

6.1 Overview of the different procedures

In order to give an enterprise an expression of monetary size, this must be properly assessed.[73] This can be achieved using the various methods. A startup is also characterized by the inflow of future monetary funds, which makes it possible to determine a value. There are numerous approaches to company valuation, but not all of these approaches are suitable for a startup valuation for reasons of feasibility or complexity. Nevertheless, the methods can be adjusted according to the situation for specific industries or companies, which is also assumed here. In this work the focus will be on the DCF and multiples method. But in addition, the venture capital method and the First Chicago method will be explained too. To check the plausibility of the two main methods (DCF and multiples) the VC method will be applied on the example case too.

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[69] Cf. Brettel (2002), p. 308
[70] Cf. Franke et al. (2002), S. 14
[71] Cf. Franke/Gruber/Harhoff/Henkel (2008), p. 478
[72] Cf. Kollmann/Kuckertz (2010), p. 30
[73] Cf. Hayn (2003), S. 34 – 76; Ballwieser/Hachmeister (2016), pp. 1 – 7.

6.2 Discounted cash flow method

In this chapter the discounted cash flow (DCF) method will be explained in principle and consequently the applicability for young, dynamic and strongly growing companies will be examined. Not all characteristics of the different discounted cash flow methods[74] are discussed, but only the most relevant aspects for a modified valuation. In addition, risk adjustments that contribute to a startup evaluation are also to be examined more closely. The DCF method is based on discounting a company's future free cash flows (FCF)[75], if the WACC method is assumed, using a risk-adequate interest rate.[76] The next three to five budgeted years from the business plan of the detailed planning phase are usually used, as well as a terminal value (TV) estimated.[77] Various methods can be distinguished. A basic distinction is made between the gross procedure (entity approach) and the net procedure (equity approach).[78] The main difference is that the gross procedure results in a total capital value, whereas the net procedure calculates an equity value.[79] The gross method can still be divided into the WACC approach and the Adjusted Present Value approach (APV),[80] whereby the approaches lead to the same results when applied consistently.[81][82] For reasons of relevance for startup companies, only the Weighted Average Cost of Capital (WACC) approach is to be dealt with in more detail in this paper.

6.2.1 WACC procedure

This gross method is used to discount a company's future free cash flows using a weighted cost of capital. The formula for calculating the entity value provides a starting point for further execution:[83]

$$EV_{wacc} = \sum_{t=1}^{T} = FCF \frac{FCF_t}{(1 + c_{wacc})} + \frac{TV_T}{(1 + c_{wacc})} \tag{1}$$

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[74] Cf. Modigliani/Miller (1958), p. 268.
[75] Cf. Baetge/Niemeyer/Kümmel/Schulz (2012), p. 368.
[76] Cf. Hayn (2003), p. 191.
[77] Cf. Wipfli (2001), p. 125.
[78] Cf. Ballwieser/Hachmeister (2016), p. 137.
[79] Ibid.
[80] Cf. Baetge/Niemeyer/Kümmel/Schulz (2012), p. 434.
[81] Cf. Drukarczyk/Schüler (2011), S. 125.
[82] Cf. Walter, (2003), p. 77.
[83] Cf. Walter (2003), p. 79.

The cash flows considered represent the available financial resources potential for servicing equity and debt capital providers. However, these do not correspond to the actual net payments to the equity and debt lenders, as the cash flows are calculated without the tax-reducing effect of outside capital. In the WACC method, the benefit of external financing is not considered in the cash flows, but in the discount rate through the tax shield. Therefore, cash flows represent a company that is completely self-financed.[84]

The weighted average cost of capital, which can ultimately be used to calculate the present value, is calculated using the following formula:[85]

$$c_{WACC} = r_{equity} * \frac{Equity}{Debt} + r_{debt} * (1 - t) * \frac{Debt}{Total\ Capital} \qquad (2)$$

The cost of equity is calculated using the much-discussed Capital Asset Pricing Model (CAPM).[86] The WACC is ultimately the unit-linked opportunity costs of all investors.[87] This procedure can lead to a circulation problem that arises from dependencies in the capital structure if actual equity and debt capital ratios are used. This can be circumvented, for example, by reckoning with a previously defined target capital structure for equity and debt.[88]

Finally, to determine the value of equity, the difference between the total value of the company and the market value of debt is calculated:[89]

$market\ value\ of\ total\ capital\ (WACC\ approach)\ -$
$market\ value\ of\ interest\ bearing\ liability =$
$market\ value\ of\ equity\ (shareholder\ value)$

6.2.2 Determining the residual value

The problems involved in determining the terminal value can be clearly seen when considering startups. This results on the one hand from the necessity of having to make

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[84] Cf. Mandl/Rabel (2012), p. 66
[85] Cf. Ballwieser/Hachmeiser (2016), p. 169.
[86] More about this below
[87] Cf. Wipfli (2001), p. 128
[88] Cf. Achleitner/Nathusius (2003) p.8
[89] Cf. Walter (2003), p. 81.

an estimate for the residual value and on the other hand from the high value contribution of the terminal value to the company value. It is not unusual for the perpetual residual value of a young company to account for 90%-100% or even more of the current value of the company.[90] VC funds select companies from which they expect long-term, high growth. This premise can be ensured by calculating the residual value according to the *Gordon Growth Model*:[91]

$$TV = \frac{FCF_{t+1}}{c - g}, for\ g < c \tag{3}$$

It is assumed that the starting position is characterized by a constant EBIT margin, with free cash flows and sales growing at a constant growth rate.[92] C is the cost of capital rate, which in practice usually assumes the value of the WACC. In the formula, g represents the expected growth rate of the perpetual FCF.

However, a constant growth rate in the long term is very unrealistic. Strictly speaking, research show that no company can grow at a higher rate of growth than the economy in the long term.[93] A two-phase model therefore makes sense, at which t_n, g1 changes to g2 (where g2<g1).[94] The first growth factor g1 represents the above-average growth of a startup and g2 the average market growth.[95] The formula for calculating the terminal value using the two-phase model is:[96]

$$TV = \sum_{t=T}^{t_n} \frac{FCF * (1 + g_1)^t}{(1 + c)^t} + \sum_{t=t_n+1}^{t_n} \frac{FCF * (1 + g_1)^t * (1 + g_2)^{t-t_n}}{(1 + c)^t} \tag{4}$$

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[90] Cf. Damodaran (2012), p. 218.; Cf. Wipfli (2001), p. 132.
[91] Cf. Mandl/Rabel (2012), p. 70
[92] Cf. Ernst/Schneider/Thielen (2012) p. 41.
[93] Cf. Damodaran (2012), p. 3.
[94] Cf. Walter (2001), p. 87.
[95] ibid
[96] Cf. Walter (2001), p. 88.

6.2.3 Calculation of the cost of capital

The calculation of the cost of capital rates for the DCF model is dominated by the Capital Asset Pricing Model (CAPM), which is based on the capital market theory.[97] This model is intended to explain pricing on the capital market. The CAPM is based on very restrictive premises[98], which cast doubt on the appropriateness of this approach to business valuation. Nevertheless, the model provides an intuitive and understandable approach for calculating the cost of equity, which is why it is often used in practice. The CAPM equation can be represented as follows:[99]

$$E(r_i) = r_f + \left(E(r_m) - r_f\right) * \beta_i \tag{5}$$

The expected return on a risky investment is calculated by adding the risk-free interest rate with the product of beta (the systematic risk factor related to the i, which is the investment) and the market risk premium.[100] Historical values are usually used to calculate the market risk premium.[101] Risk-free interest often corresponds to the return on long-term, preferably 10 years, government bonds.[102] In principle, it can be said that the capital costs correspond to the return expectations of the owners.

6.2.4 Alternative variant for adjusting risk premiums

Theoretically, the risk should already be priced into the capitalization interest rate, however, due to the extremely unpredictable future development of the young company, as well as due to return expectations of the investor and dilution effects in practice, additional premiums and discounts are taken into account.[103] The alternative and practice-oriented approach of Gunter Festel (2010) is applied here. In this case (high-tech) startups can be systematically analyzed using a grid[104] and the cost of equity can be adjusted by adjusting the beta factor. The calculation of this approach is given by the fact that neither a direct comparison with a peer group nor historical data can be used

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[97] A derivation of the CAPM and a description of the capital market theory are not provided.
[98] Cf. Meitner/Streiferdt (2012), p. 515
[99] Cf. Baetge/Niemeyer/Kümmel/Schulz (2012) p. 382
[100] Cf. Copeland/Koller/Murrin (2002), p. 265.
[101] Cf. Ballwieser/Hachleitner (2016), p. 104.
[102] Cf. Copeland/Koller/Murrin (2002), p. 266.
[103] Cf. Festel (2010), p. 175; Wirtz/Becker (2001), p. 253
[104] An example of this grid is available in the appendix for viewing.

for early stage startups to calculate a risk-adequate beta factor.[105] For this reason Festel has developed a valuation grid with which the surcharges or discounts of the beta (in addition to the basic beta factor) for (high-tech) startups can be determined.[106]

In contrast to previous approaches, qualitative criteria are quantified in this evaluation grid. It also shows that the evaluation of a startup in the early phase using the DCF method is suitable.[107] The model is extremely intuitive and can be applied simply and practically. In addition, it offers an examination of a selected company for the specified criteria. Such a startup audit can also be carried out in a short time, which would be advantageous, for example, in a pre-screening. In addition to building on CAPM, the simplicity may also be seen as a weakness of the model, as this grid cannot provide a comprehensive picture of the future development of a startup. Nevertheless, the model is capable of supporting practitioners in risk adjustment and represents a modification to the classic DCF model.

6.2.5 Critical reflection

Some difficulties may arise in the application of the DCF procedure for the evaluation of startups in the early phase. The reason for this is that these companies are usually completely self-financed and only tend to borrow money over time.[108] The fact that the capital structure can change quickly also makes correct and undistorted valuation difficult. As a result, the WACC approach raises a circularity problem[109], which can be solved either by a constant target capital structure or by complex procedures. Theoretically, however, it would be correct to assume period-specific cost of capital rates in an autonomous financing strategy because the capital structure changes over time.[110] To ensure this, however, the market values of equity and debt capital entered into the WACC must be calculated repeatedly in each period.[111]

In addition to the capital structure, the use of CAPM together with venture capital also leads to conceptual shortcomings. CAPM is based on homogeneous investor

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[105] Cf. Festel (2010), p. 176
[106] Cf. Festel (2010), p. 177
[107] Cf. Festel (2010), p. 178
[108] Cf. Braun (2012), p. 7
[109] Cf. Achleitner/Nathusius (2004), p. 136
[110] Cf. Walter (2001), p. 98
[111] Cf. Mandl/Rabel (2012), p. 74

expectations, no transaction costs and equal access to information.[112] However, this cannot be guaranteed, since it is precisely these information and transaction advantages that make venture capital companies competitive. The premises of CAPM are therefore not adhered to. The CAPM also has methodological weaknesses.[113] For example several studies, have not established a positive correlation between the return on securities and the beta factor.[114]

In addition, it is usually difficult for young companies or generally unlisted companies to identify a peer group that is listed on the stock exchange.[115] Therefore, it is difficult to identify an adequate beta factor. However, methods such as Pure Play Beta, Bottom Up Beta, Residual Beta, Instrumental Beta, Accounting Beta, Full Information Beta can be used .[116]

Most listed companies offer similar characteristics but are at an advanced stage and often already offer several products or services, which means that direct comparability is no longer possible. Quantitative statistical methods for determining the beta are not used for startups, as they access historical data that is not available in this case.[117]

The quantification of qualitative statements can lead to problems[118], especially the subjective estimation of the evaluator plays a role here. Nevertheless, this offers a pragmatic approach for the valuation of startups. VC managers generally have the advantage that they have a wealth of experience, which allows to make an educated estimate, but this is not a precise method[119] Here, the systematic adaptation model from Festel, which is based on a qualitative beta adjustment is superior to a supposedly educated estimate from a VC manager due to the transparency of the evaluation grid.
Another difficulty results from the consideration of the terminal value. Since the TV usually accounts for a considerable share of the company's value[120], a precise estimate is necessary. Particularly in the case of startups in the early phase the majority of the value is derived by the TV, since the cash value of the cash flows for the period is often

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112 Cf. Hayn (2003), p. 410
113 Cf. Hahn (2001, p. 87
114 Cf. Jagannathan/McGrattan (1995), p.2
115 Cf. Meitner/Streitferdt (2012), p. 560
116 Cf, Meitner/Streitferdt (2012), pp. 560 - 564
117 Cf. Walter (2001), p. 100
118 Cf. Hayn (2003), p. 264
119 Cf. Walter (2001), p. 101
120 Cf. Wipfli (2001), p. 132

negative.[121] If a growth factor is used, the assumption of constancy can be problematic. Very high growth is to be expected for young innovative companies, but this will decrease again over time, which is why refined growth models are to be preferred.[122]

6.3 Multiple approach

6.3.1 Introduction

Multiplier approach is a market-oriented procedure in which the enterprise value sought is determined by comparison with known enterprise values (target companies) of comparable companies (reference companies/ peer groups).[123] However, the latter method also requires that the comparable companies are listed on the stock exchange, which is why this method is most frequently used in the USA.[124]

6.4 Comparable Company Method

For reasons of relevance, the multiplier method will be examined in more detail using the Comparable Company method as an example. In this valuation by multiples, the traded market prices are set in relation to a key figure. This forms a ratio key figure, namely the multiplier.[125] For this, key figures such as revenue, profit, EBIT, EBITDA, PER or book values are generally used.[126] However, for startups, these key figures often cannot be used with current figures but with expected values, as these are still in the loss zone, do not yet generate sales and material assets hardly play a role.[127] For this reason, for example, customer values or R&D intensities are also used as key figures here as an alternative and compared with other companies.[128] With the emerging Internet companies, key figures such as Page View, Unique Visitors or Subscribers have also established themselves here.[129] However, such alternative key figures often have no

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[121] Cf. Copeland/Koller/Murrin (2000), p. 267
[122] Cf. Walter (2001), p. 102
[123] Cf. Walter (2003), p. 103; Hayn (2003), p. 83
[124] Cf. Wipfli (2001), p. 15
[125] Cf. Mandl/Rabl (2012), p. 79
[126] Cf. Hayn (2003), p. 84
[127] Cf. Damodaran (2012), p. 219.
[128] Cf. Achleitner/Nathusius (2003), p. 13
[129] Cf. Rudolf/Witt (2001), p. 181 – 187

direct connection with financial performance measures[130] and, like all multiples, give a relative value to comparable companies and no absolute number.[131]

Furthermore, an average value, e.g. the median of the ratio indicators of a peer group, is selected for the general calculation. This peer group should operate in the same industry as the company / startup to be valued, show similar growth and a similar risk return structure.[132] In addition, a similar phase in the life cycle and comparable financing and regulatory requirements should be aimed at as a basis for comparison.[133] As a result, it is assumed that the average multiplier corresponds to the ratio of the companies to be valued.[134] Formula 6 can therefore be determined:[135]

$$\frac{EV_z}{X_z} = \frac{\sum_{V=1}^{V} \frac{EV_V}{X_V}}{V} \tag{6}$$

The transformation results in the required enterprise value:[136]

$$EV_z = \frac{\sum_{V=1}^{V} \frac{EV_V}{X_V}}{s} * X_z \tag{7}$$

Normally, liquidation discounts of up to 40 % (low fungibility) are expected for the valuation of non-listed companies.[137] In the early stages of startups, however, due to a lack of "traditional" key figures such as profits and sales, etc., liquidation problems can be evolve. This problem can be can be solved, for example, by using a sales multiple with future sales targets. The enterprise value is determined on the basis of future sales figures as follows:[138]

$$EV_{z,t_0} = \frac{\frac{EV_{V,t}}{S_{V,t}} * R_{Z,t}}{(1 + c_{WACC})^t} * X_z \tag{8}$$

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[130] Cf. Rudolf/Witt (2001), p. 199
[131] Cf. Koller/Goedhart/Wessels (2010), p. 332
[132] Cf. Achleitner/Nathusius (2004), p. 137
[133] Cf. Ballwieser/Hachmeister (2012), p. 214
[134] Cf. Walter (2003), p.106.
[135] Cf. Achleitner/Nathusius (2003), p. 13
[136] Ibid.
[137] Cf. Mandl/Rabel (2012), p. 79
[138] Cf. Walter (2003), p. 112

For the time t, an estimate of the sales of the target company and the benchmark company is required. The product of the multiplier and future sales is discounted at the company's weighted average cost of capital to maintain its current value.[139]

6.5 Comparable transaction method

Valuation using M&A transactions of comparable companies (comparable transaction method) is in principle very similar to that of comparable listed companies. The main difference is that it is not the stock market price but the price for a corporate transaction.[140] This method usually aims to quantify the control premium in the event of a majority takeover of an M&A transaction.[141] Problems with regard to startups may arise with regard to the availability of data on these comparable transactions[142], as a purchase price is only published for a small number of transactions and these should have taken place as soon as possible on the valuation date.[143] VC companies can also proceed in this way by orienting themselves on other investments made by VC companies in comparable companies as a valuation basis.[144]

6.6 Critical reflection

The Comparable Company method offers a simple and quick method of application, but it also has conceptual shortcomings, in addition to those already mentioned.[145] In general, it can be criticized that, unlike the DCF method, the valuation is not based on detailed cash flow planning but on a company-specific reference figure.[146] Furthermore, comparable companies are based on exchange-traded values, which means that they are exposed to the valuation level of the capital market at the time of valuation.[147] Furthermore, the lack of consideration of subjective expectations, targets and risk assessments can be criticized. Therefore, company-specific conditions of the valuation

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[139] Cf. Walter (2003), p. 122
[140] Cf. Walter (2003), p. 103
[141] Cf. Wipfli (2001), p. 153
[142] Cf. Löhnert/Böckmann (2012), p. 691
[143] Cf. Wipfli (2001), p. 153
[144] Cf. Walter (2003), p. 103
[145] Cf. Damodaran (2012), p. 90
[146] Cf. Walter (2003), p. 114.
[147] Cf. Rudolf/Witt (2005), p. 116; Wirtz/Becker (2001), p.237; Ballwieser/Hachmeister (2012),p. 213

object are neglected in this procedure. In general, the comparison procedures are not valuation methods in the true sense, but rather pricing procedures.[148]

It can be specifically criticized for the startup valuation that, as already mentioned, the key figures for young startups are not as noticeable as those of listed companies.[149] If, for example, a sales multiplier is assumed, it must also be taken into account that the comparable company generally does not generate this turnover with just one product/service as is usually the case with startups. It is also assumed that the peer company and the target company have identical profit margins.[150] However, this is usually not the case for the companies considered here, since the degree of innovation at established companies ensures cost advantages through intangible resources ownership rights and patents, to which competitors do not have access in the short or medium term.[151] For this reason, surcharges and discounts must usually be used due to the lack of comparability.[152] The problem with the non-financial key figures is that no fundamental value drivers such as the cash flow of the company to be valued can be deduced.[153] This leads to a limited meaningfulness of this variant.

In summary, it can be stated that the use of the multiplier method does not necessarily mean that a decision value can be determined, but that a potential market price can be estimated.[154] For this reason, the multiplier method should only be used in a complementary manner and in combination with other valuation methods in order to ensure an objective valuation. It is particularly suitable for checking the plausibility of results from future success methods.[155]

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[148] Cf. Hayn (2003), p. 95.
[149] Cf. Rudolf/Witt (2005), p. 115
[150] Cf. Walter (2003), p. 115
[151] Cf. Walter (2003), p. 115
[152] Cf. Walter (2003), p. 115
[153] Cf. Rudolf/Witt (2005), p. 198
[154] Cf. Mandl/Rabel (1997) p. 274
[155] Cf. Drukarczyk/Schüler (2011), p. 454

6.7 Venture capital method

In addition to the valuation methods already described, an alternative method is also used in practice by venture capital companies for the valuation of startups. Venture capital funds generally invest in companies for a limited investment period followed by an exit.[156] The expected returns are to be generated upon exit. With this method, the investor calculates back from the estimated exit value with his expected return and already has an idea of the amount of his investment.[157] The venture capital valuation method can be divided into the following four steps:[158]

1. Determination of future enterprise value
2. Determination of the current enterprise value
3. Determination of the company's share
4. Determination of dilutive effect

In the first step, the enterprise value is calculated at the exit time. This exit can take place directly through sale on the capital market (e.g. through an IPO) or as a sale to a strategic investor. The sale of the shares requires a successful development of the invested startup, which is always assumed with the venture capital method.[159] The future value of the company is estimated with the aid of average multiples and the time T is selected, which is the time, when the exit shall take place:[160]

$$V_T = M * X \qquad (9)$$

Once the future value of the company (VT) has been determined, it is discounted to the current enterprise value (V) using a discount rate (k), which is the target return of the venture capitalist (this is a post-money valuation):[161]

$$V_0 = \frac{V_T}{(1 + c)^T} \qquad (10)$$

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[156] Cf. Walter (2003), p. 132
[157] Cf. Wipfli (2001), p. 147
[158] Cf. Achleitner (2001), p. 927
[159] Cf. Achleitner (2001), p. 929
[160] Cf. Achleitner/Nathusius (2003), p. 15
[161] Ibid.

In a further step, the venture capitalist calculates what share of the company (equity share = I) he receives for the amount of his investment (I_0). The following formula[162] is used for this purpose:

$$ES_0 = \frac{I_0}{V_0} \qquad\qquad (11)$$

The assumption so far has been that there will only be one financing round until the venture capital company exits. However, it is more realistic to assume that several financing rounds will be necessary before the exit. If this is assumed, the dilution effect must be taken into account in the calculation. This effect results either from the new issue of shares in further financing rounds, or from the granting of stock options to the management.[163] To allow this effect to flow into the calculation, the following formula can be used:[164]

$$ES_0 = \frac{ES_T}{conservation\ quotient} \qquad\qquad (11)$$

6.7.1 Determining the discount rate

The discount rate used in the VC valuation procedure corresponds to the target return of the venture capital company. The average expected return, depending on the phase and the region, ranges from 25 - 70 %, according to Damodaran.[165]

	Early Stage	Expansion Stage
Damodaran (2012)[166]	40% - 70% (USA)	25% - 50% (USA)

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[162] Cf. Walter (2001), p. 134
[163] Cf. Iannotta (2010), p. 34
[164] Cf. Iannotta (2010),p. 35; Walter (2003), p. 135
[165] Cf. Damodaran (2012) p. 222
[166] Ibid.

Especially in the financing of startups which are still in an early phase (early stage) of the life cycle, very high returns are generally required. These cannot be explained by CAPM alone if it is assumed that investors can only expect a return for the systematic risk.[167] The average discount factor for the VC method is 60 % and is partly due to the high risk involved in investing in the startup.[168] Furthermore, these high target returns also include a premium for the low liquidity of the company shares, which, unlike listed companies, cannot be resold at any time.[169]

In addition to the restriction on liquidation, compensation for the management support provided by the venture capital companies in the future is often also included. This *Value Added* includes industry experience and functional management experience, particularly in the areas of marketing, sales and strategic planning.[170] In order to contribute this resource, the venture capitalist, by planning a Premium, will be financially compensated. Such compensations may be direct or indirect. In the direct option, this is levied either in the period size as it is a payout for the company or by the premium on the discount factor.[171] Indirectly, it is used in the valuation, assuming that a better performance of the startup is achieved by the advice of the venture capital managers, which ultimately results in a higher exit value.[172]

Another reason for an increased premium on the discount factor is that the cash flow expectations of the startup founders were over-optimistically assessed and the resulting increased risk is to be compensated by a higher discount factor.[173]

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[167] Cf. Pereiro (2015), p. 8
[168] Cf. Damodaran (2012) p. 222
[169] Cf. Pereiro (2015), p. 8
[170] Cf. Walter (2003), p. 136
[171] Cf. Walter (2003), p. 137
[172] Ibid.
[173] Cf. Achleitner/Nathusius (2001), p. 931

6.7.2 Critical reflection

A clear advantage of the venture capital process, which is widely used in practice, is its ease of use. In contrast to some traditional valuation methods, this approach allows for a relatively quick and efficient way to determine the enterprise value.[174]

This approach also offers the possibility of including several financing rounds in the valuation and thus also addressing the dilution effect.[175] Nevertheless, there are weak points of the procedure, which lie in the strong simplification.[176]

The end value-oriented approach is problematic from the point of view that the exact future exit time of the venture capital company is very difficult to determine.[177] The exit time depends on both environment-specific factors and company-specific factors. Either an investor must be found to take over the company for the exit, or the conditions must permit an IPO.[178] Above all, the latter depends very much on the development progress of the innovation and a marketable product.[179]

The company value is determined by multipliers, for which the points of criticism in Chapter 6.6 apply too. With regard to the discount factor, it is questionable whether the mark-ups are justified. In theory, venture capital companies can only charge a premium for the systematic risk, since the unsystematic risk associated with the individual investments can be eliminated.[180] Furthermore, the exact determination of the value of the liquidation restrictions is problematic to the extent that this is more like an estimate than a well-founded approach.[181] A problem can also be identified with the advice provided by the venture capital companies. The question that arises here is whether such a lump-sum premium, which significantly reduces the value of the company, is appropriate. Here it might be better to determine the exact costs incurred by the advice of venture capital managers, which can also be difficult, and compensate accordingly. An example for this would be rewarding the manager with equity shares in the company.[182]

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[174] Cf. Achleitner/Nathusius (2001), p. 932
[175] Cf. Iannotta (2010), p. 34
[176] Cf. Wipfli (2001), p. 150
[177] Cf. Walter (2003), p. 138
[178] Cf. Walter (2003), p. 13
[179] Ibid.
[180] Cf. Achleitner/Nathusius (2001), p. 929
[181] Cf. Walter (2003), p. 139
[182] Ibid.

6.8 First Chicago Method

The First Chicago method is an alternative valuation method that has been widely used in the United States to date. This situation-specific method is based on the venture capital method, but not only describes the best-case scenario, but also the base-case and the worst-case scenario.[183] The best-case scenario achieves the highest growth rates, which is why an exit with a high return for the venture capital company is assumed.[184] In the base case scenario, the venture capital provider still receives a return on investment, but this is comparatively meagre compared to the best case.[185] The worst case scenario outlines a completely unsatisfactory company development and usually results in the liquidation of the company in an early phase.[186]

With this method, the respective scenarios are weighted with probabilities with regard to their occurrence and the expected cash flow to the venture capital providers is calculated. Compared to the venture capital method, the First Chicago method offers two central advantages. First, payments from the investee (e.g. dividend payments) to the venture capitalist can be included.[187] Second, by taking into account several scenarios, compared to the venture capital method, a lower interest rate can be calculated.[188] This interest rate, which consists of several variables (as already mentioned in the venture capital method), is reduced in particular by a lower risk premium.[189] The uncertainty aspects are already integrated in the First Chicago method by taking into account the probability of occurrence of the respective scenarios.[190] Although the First Chicago method takes into account a lower target return, it also pursues a more pessimistic view of the future, since both the base case scenario and the worst case scenario are included in the final value calculation.[191]

The investor is thus forced to deal with the more disadvantageous development prospects of the startup and also to determine them quantitatively. Another advantage of the model discussed here, which is caused by the use of the scenarios, is the increased transparency, in contrast to a lump-sum premium on the target return. This

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[183] Cf. Steffen/Douglas (2007), p.11
[184] Cf. Achleitner/Nathusius (2005), p. 338
[185] Ibid.
[186] Cf. Achleitner/Nathusius (2005), p. 339
[187] Ibid.
[188] Cf. Steffen/Douglas (2007), p. 12
[189] Cf. Steffen/Douglas (2007), pp. 12 -13
[190] Cf. Timmons/Spinelli (2009), p. 466 f
[191] Ibid.

can lead to an improved negotiating position of the venture capitalist. Together with the founder, the negotiators can agree on joint target figures, which is hardly possible with a yield premium. [192]

7. Startup evaluation using an example

Since the theory has already been discussed, a startup evaluation is now to be carried out based on a fictitious example.

7.1 Starting position from the point of view of a venture capital company

As part of a First Stage financing, the fictitious Austrian Startup Pay Quick & Safe is to be evaluated at the start of market entry.

Assumptions:
- The startup has not yet generated any sales, but strong sales growth is expected at market launch.
- Revenue of EUR 4 million should be achieved in year five.
- A technical due diligence was carried out and shows a unique and solid technology, which is competitive.
- Very competent founder and team with experience in this branch.
- Negotiated a EUR 1 million investment with a venture capital company.

	2018	2019	2020	2021	2020
Revenue	0	0	1100	2500	4000
EBIT	-60	-300	500	1600	2500
Reinvestment	-12	-38	-120	-200	-500
FCF	-72	-338	380	1400	2000

In thousand EUR

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[192] Cf. Achleitner/Nathusius (2005), p. 339

7.2 Modified DCF model

In the example of the startup Pay Quick & Safe, the cash flows are predetermined and fictional. In practice the cash flows can be determined by using the top-down or bottom-up method.[193] The following table shows the figures which are important to the DCF model and displays the next 5 years.

According to Damodaran venture capital companies expect for an investment in an early stage a target return of 50-70 %.[194] Therefore, in this example an expected return of 50% is assumed, because of the positive technical due diligence.

The actual average annual return (IRR) of venture capital funds should be used and a risk neutral mean value should subsequently be calculated. The actual return can be derived from a pan-European study by the EVCA (European Private Equity and Venture Capital Association) and amounts to 4.47 % over a period of five years in the seed/early stage.[195] The return is taken from the section "Top Half Fund"[196], what is assumed here for the venture capital company which is making the EUR 1 million investment. The risk-free interest rate and the market risk premium are still required in order to be able to allocate a beta value to each of these returns. The risk-free interest rate can be calculated by using the yield of a five-year Republic of Austria Government Bonds, which is -0.028 %[197] annual interest at the moment. Austria's market risk premium is 8.09 %.[198] These data can now be used to calculate a beta factor by transforming the CAPM formula and thus form a risk neutral mean value from these two values, as shown in the table down below.

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[193] Cf. Damodaran, Valuing young or Start-up firms
[194] Cf. Damodaran (2012) p. 222
[195] Cf. EVCA (2014), S. 10
[196] Ibid.
[197] Cf. Investing.com; Austria government bonds
[198] Cf. Marktrisikoprämie.de, Östereich

	Expected return	Risk-free rate	Market premium	Beta
Expected return VC	50%	-0,028%	8.09 %	6,16
Actual Return (EVCA)	4,47%	-0,028%	8.09 %	0,56
Average				3,36

If a beta factor of 3.36 is assumed, the cost of equity rate of 27,25 %[199]can be calculated using the CAPM formula. However, this calculated interest rate does not yet include a risk adjustment for a possible total loss of the invested startup in particular. To make an adjustment here, the survival rate of Austrian Startups is to be used in the finance and insurance branch of industry of 54.1%[200]. The data was collected from the Startups which are still commercially active after five years. Accordingly, the calculated and non-risk-adjusted value of the company is to be adjusted. To arrive at the company value, however, a terminal value must first be calculated. The TV is set to be calculated at the exit point of the venture capital company in year 5.

In order to arrive at the final and risk-adequate enterprise value of the startup, the value determined is still to be adjusted to the probability of "survival". As already mentioned, 54.1% of Austrian Startups which manage to continue their business activities over the five-year hurdle. As Pay Quick & Safe is a well-managed Startup and a technical due diligence has already been carried out, the probability of default can be expected to be lower than the average. According to this, a probability of success of 70% or a probability of failure of 30% is to be assumed. If the amount resulting from the DCF method is adjusted, this results in an enterprise value of EUR 2.28 million.

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[199] Formula: $E(r_i) = r_f + (E(r_M) - r_f) \times \beta_i$, cf. Baetge/Niemeyer/Kümmel/Schulz (2012) p. 382.
[200] Cf. Statistik Austria; Statistik zur Unternehmensdemografie

7.3 Adapted multiplier method

A similar procedure can also be used to determine the company value by multipliers. Instead of a flat-rate discount factor of 50 %, the cost of equity should now be used for the calculation. In addition, the value determined by a multiplier can also be multiplied, with the same probability of failure at the fifth year.

Peer Group	EV/Sales
Visa Inc.	16,4[201]
Master Card Inc.	15,7[202]
Paypal Inc.	6,6[203]
Wirecard AG	12,4[204]
Aeon Financial Service Co. Ltd.	1,4[205]
American Express Company Inc.	3,7[206]
First Data Inc.	1,6[207]
Fidelity National Information Services Inc.	3,4[208]
Average	4,6

EV/Sales	4,6
Sales	4000
Value	18,400
Adjusted Value	12,880
EV today	3,862.63

In thousand. EUR except of EV/Sales

According to the adjusted multiplier method we have an enterprise value of EUR 3.86 million. The reason for such a high value compared with the adjusted DCF method is because of the high EV/Sales multiplier of the peer group. Company such as Visa Inc.,

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[201] Cf. Yahoo finance, Visa
[202] Cf. Yahoo finance, Master Card
[203] Cf. Yahoo finance, Paypal
[204] Cf. Yahoo finance, Wirecard
[205] Cf. The Wall Street Journal, Aeon Financial Service
[206] Cf. Yahoo finance, American Express Company
[207] Cf. Finanzen.net, First Data
[208] Cf. Finanzen.net, Fidelity National Information Services

Master Card Inc. and Wirecard AG inflate the average. To find a midground, an average value of the two can be calculated using different methods. The enterprise value would amount [(2.28+3.86)/2] = 3.07, EUR 3.07 million. The value should be seen as an indicator of the enterprise value or as a range of an investable amount (EUR 2.28 million - EUR 3.86 million).

The more precise the approach to survival rates (e.g. through own statistics on survival rates from previous investments), the more accurate an assessment becomes. The risk can certainly never be eliminated, but the aim of such a startup evaluation must be to create an evaluation that is as realistic and plausible as possible. The existing methods of company valuation can serve as an orientation and, as far as the available information allows, they can be modified in the best possible way to the startup to be evaluated. Further proposals for adjustment possibilities would be key person deductions, in case of their resignation, or the calculation of a multiplier by regression analysis.[209]

7.4 Venture Capital Method

As an extra the venture capital method will be used to determine the enterprise value of Pay Quick & Safe. In the VC method, an exit value must first be determined using the multiplier method, which can then be discounted. In this respect, companies with similar characteristics are needed. This step is already done in chapter 7.3 and the multiplier amounts to 4,6. This multiplier is now used to determine the expected enterprise value in five years.

$$Expected\ enterprise\ value\ in\ five\ years = Revenue\ in\ year\ 5 * \frac{EV}{Revenue}$$
$$= 4 \times 4.6 = EUR\ 18.4\ million$$

Since the company has no history to fall back on and the risk is estimated to be correspondingly high, a discount factor (= target return) of 50 % should be used. This is the average of the amount stated by Damodaran.[210] The percentage used here also includes an illiquidity premium, as the startup cannot be sold under the same conditions as the comparable companies used.

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[209] Cf. Damodaran (2016), pp. 248 – 278
[210] Cf. Damodaran (2012) p. 222

$$EV\ today = \frac{Estimated\ EV\ in\ 5\ years}{(1 + expected\ return)^5} = \frac{18,4}{(1,5)^5} = EUR\ 2,42$$

In the next step, a post-money value can be calculated. When this is determined, the ratio of investment amount to post-money value indicates the share in the company that an investor should receive for the amount, based on the VC method.

Post-money value = pre-money value + investment amount = 2.42 + 1
= EUR 3.42 million

$$Equity\ Share = \frac{Amount\ Invested}{Post-money\ value} = \frac{1}{3,42} = 29\%$$

It should be noted that these figures or the share of equity capital are dependent on the negotiations and the calculated share is the minimum that a venture capital provider would accept. While the founder will argue for the highest possible value for the company, the venture capitalist will try to keep it as small as possible in order to achieve a larger equity share.[211]

The post-money value of the company lies between nearer to the multiplier values as far as the same EV/Sales multiplier is used. This gives the investing company a good idea of the enterprise value. Using this approach, a value for the startup can be determined relatively quickly and easily on the basis of comparable companies and expected returns. Nevertheless, a strong simplification and thus possible distortions are accepted.

7.5 Critical reflection

This evaluation of a fictitious startup has shown what possible approaches in this regard could look like. The adapted multiplier methods should be used rather as a suggestion, instead of an explicit recommendation to evaluate. Of course, conceptual weaknesses can be found in almost every valuation method. The general shortcomings regarding the individual methods have already been dealt with in previous chapters. Therefore, the limitations of the used specifications will be dealt with in more detail now.

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[211] Cf. Damodaran (2012), p. 225

- These examples do not specifically address prevailing tax regimes. These were not examined, as the focus of a startup valuation is not on the tax practice to be applied, but on dealing with the high uncertainty also because of the mostly pure equity financing. The tax issue may be very important for established companies with less risk and uncertainty, but not primarily for young companies.

- This example does not deal with the determination of cash flows. This is probably a big, if not the biggest hurdle in practice. However, this step contains numerous subjective elements. Data and figures are estimated for both top-down and bottom-up approaches. It is therefore only partially apparent to outsiders how the cash flows are estimated, so this step was omitted.

- In the DCF model, the CAPM is used and a beta factor is derived using the "inverse method". Here it can be argued that different values can also be found, which therefore imply a different result. For example, a higher/lower target return for investors could be considered correct. Likewise, the actual average return of venture capital companies in the early phase taken from the EVCA statistics can be replaced by another value. As a result, a subjective character in the selection of returns cannot be ruled out in this step. Furthermore, the question arises as to whether the cost of equity calculated as the average beta factor actually describes a risk neutral value, or the underlying CAPM does not already give rise to a risk premium (apart from the systematic risk premium). In this case, further adjustment through the survival rate could be dispensed with.

- The multiple approach can lead to the inflation of the enterprise value if the target companies / peer group have a very high multiplier. This leads to an enterprise value which might be far away from the reality.

- As the German Federal Statistical Office has no industry-specific data on survival rates, only the existing data can be used. In Austria, Statistics Austria provides more precise information in this respect, which also allows a more precise estimate of the chances of survival for a startup to be evaluated. Nevertheless, statistics such as these also raise questions about their composition and methodology. It is not clear under what conditions these companies were founded and it is also not clear why the established companies are no longer active. These data were mostly collected by recognized statistical offices and are therefore to

be regarded as credible and correct. Nevertheless, care must be taken when handling data.

- If a "classic" valuation method is used for the startup, without taking into account the special properties, the result is probably a significantly higher value. In general, there can also be major differences in the assessment of the risk.

In this valuation example, an enterprise value was determined by alternative methods, particularly for the modified DCF method. A different approach was the combination of the determination of the beta factor through the demonstrated procedure with the adjustment of the company value not yet adjusted to the company-specific risk

8. Summary in the form of the thesis

The aim of this work was to assess the valuation problems of startups in early phases while using and comparing the DCF and multiples method. The results of the exact question are now presented on the basis of these points:

- The evaluation of young companies proves to be a complex and delicate task due to its unique characteristics. It was made clearer that the high level of uncertainty, the lack of history, the low survival rates and the lack of key balance sheet figures in particular generate special valuation problems. This problem can best be countered with adjusted valuation methods, which present the relevant factors in a transparent manner.

- The determination of future cash flows is one of the most important point as far as these vouch for the enterprise value today. Estimating these are harder than it might be thought. The information one needs to make an estimation are mostly not public or the number of public accessible work are infinitesimal. This lead to a very subjective estimation and less to an objective estimation.

- The identification and assessment of various scientific surveys has shown that the value drivers of startup valuations are very strongly based on soft factors. It also showed that the VC companies focus strongly on these soft factors, above all the founding team, are most important, followed by the product and market environment. Financial factors definitely also play a role, but at the early stage

these are often subject to great uncertainty, which is why, viewed in isolation, financial key figures are only conditionally value-driving.

- In order to assign the young companies an adequate enterprise value, the literature suggests fundamental analytical methods such as the DCF model and market-oriented methods such as multiplier model to assess startups on a situation-specific basis. Nevertheless, adjustments are also made here, so high risk premiums are usually applied in order to counter the risk problem.

- The fictitious evaluation example has shown how different methods can be used in such an early phase evaluation. Especially with the DCF method, difficulties in determining the beta factor can be located. In the example calculation, the mean value of expected and actual returns of VC funds was calculated and a beta value calculated as a result. In addition, a synthesis was created from the risk-adjusted company value and the adaptation to the survival rates of startups. This approach seems more transparent and expedient for the evaluation objective, in contrast to conventional methods. It is therefore advisable to modify methods in the startup valuation according to the characteristics of the valuation object, for example with survival rates, key person deductions or risk-specific premiums or discounts. This is more transparent than the flat-rate discount factors used in the VC method.

Finally, it is safe to say that the evaluation of a startup, which is not as standardize as a normal company evaluation, is very complex due to its highly individual aspect. This can result in different enterprise values when done by different companies. Therefore, it is best if startups are evaluated with more than the two methods which was the aim of this work. The need for more research and reliable data is urgent. There is a big potential in this field and will be more important as time goes by. Quantitative factors / Soft factors play an important role as the financial figures. Finally it is safe to say that one cannot state the fact that the DCF or the multiplier methods are good or bad to evaluate young companies. Evaluation methods should be adjusted to the branch and company and used then. This makes the methods more or less usable according to the evaluated company. So it is clear that evaluating companies need an individual approach to every case and not a standardize method.

Representation of the grid for systematic adjustment of the beta factor [212]

Kategorie	Subkategorie	Systematische Anpassung des Basis Betafaktors					Ergebnis
		1	0,5	0	-0,5	-1	
Technologie	Technologiereife	Technologie funktioniert noch nicht im Labormaßstab	Technologie funktioniert im Labormaßstab	Technologie funktioniert im Technikumsmaßstab	Technologie funktioniert im Pilotmaßstab	Technologie im großtechnischen Einsatz	
	Vorteile gegenüber Konkurrenztechnologien	Keine Vorteile erkennbar	Vorteile nicht klar erkennbar	Nur Kosten- oder Qualitätsvorteile erkennbar	Kosten- und Qualitätsvorteile erkennbar	Signifikante Kosten- und Qualitätsvorteile erkennbar	
	Reputation der Wissenschaftler	Keine Reputation	Geringe Reputation	Mittelmäßige Reputation	Hohe Reputation	Sehr hohe Reputation	
	Patentschutz	Keine Patentanmeldungen vorhanden	Erste Patentanmeldungen vorhanden	Grundlagenpatente kurz vor der Erteilung	Grundlagenpatente erteilt	Umfangreiches Portfolio mit erteilten Patenten	
Produkte	Produktnutzen	Produktnutzen nicht erkennbar	Kein klarer Produktnutzen erkennbar	Produktnutzen klar erkennbar	Produktnutzen von ersten Kunden bestätigt	Produktnutzen von zahlreichen Kunden bestätigt	
	Alleinstellungsmerkmale	Alleinstellungsmerkmale nicht erkennbar	Keine klaren Alleinstellungsmerkmale erkennbar	Alleinstellungsmerkmale klar erkennbar	Alleinstellungsmerkmale von ersten Kunden bestätigt	Alleinstellungsmerkmale von zahlreichen Kunden bestätigt	
	Konkurrenzsitation	Aktuell starke Konkurrenz	Potenziell starke Konkurrenz	Mittelmäßige Konkurrenz	Geringe Konkurrenz	Langfristig geringe Konkurrenz	
	Profitabilität	Grundsätzlich geringe Profitabilität	Gefahr von geringer Profitabilität	Durchschnittliche Konkurrenz	Aktuell hohe Profitabilität	Grundsätzlich hohe Profitabilität	
Umsetzung	Geschäftsmodell	Geschäftsmodell nicht nachvollziehbar	Geschäftsmodell mit offenen Fragen	Geschäftsmodell plausibel	Geschäftsmodell schon vereinzelt erporbt	Geschäftsmodell schon mehrfach erporbt	
	Technischer Entwicklungsplan	Entwicklungsplan nicht nachvollziehbar	Entwicklungsplan schwer nachvollziehbar	Entwicklungsplan nachvollziehbar	Entwicklungsplan realisierbar	Entwicklungsplan problemlose realisierbar	
	Marketingplan	Marketingplan nicht nachvollziehbar	Marketingplan schwer nachvollziehbar	Marketingplan nachvollziehbar	Marketingplan realisierbar	Marketingplan problemlose realisierbar	
	Geschäftsentwicklungsplan	Geschäftsentwicklungsplan nicht nachvollziehbar	Geschäftsentwicklungsplan schwer nachvollziehbar	Geschäftsentwicklungsplan nachvollziehbar	Geschäftsentwicklungsplan realisierbar	Geschäftsentwicklungsplan problemlose realisierbar	
Organisation	Managementteam	Managementteam mit großen Lücken	Managementteam mit einigen Lücken	Managementteam vollständig	Managementteam vollständig und kompetent	Managementteam vollständig und sehr kompetent	
	Standort	Problematischer Standort	Standort verbesserungsfähig	Standort in Ordnung	Standort mit Vorteilen	Standort mit großen Vorteilen	
	Beirat	Kein Beirat	Mäßiger Beirat	Guter Beirat	Sehr guter Beirat	Optimaler Beirat	
	Effizienz der Prozesse	Prozesse ineffizient	Prozesse wenig effizient	Prozesse effizient	Prozesse sehr effizient	Prozesse außergewöhnlich effizient	
Finanzen	Umsatzplanung	Umsatzplanung nicht nachvollziehbar	Umsatzplanung schwer nachvollziehbar	Umsatzplanung nachvollziehbar	Umsatzplanung konservativ	Umsatzplanung sehr konservativ	
	Kostenplanung	Kostenplanung nicht nachvollziehbar	Kostenplanung schwer nachvollziehbar	Kostenplanung nachvollziehbar	Kostenplanung konservativ	Kostenplanung sehr konservativ	
	Break-even	Break-even nicht nachvollziehbar	Break-even schwer nachvollziehbar	Break-even nachvollziehbar	Break-even konservativ	Break-even sehr konservativ	
	Liquidität	Finanzmittel für das nächste Jahr nicht gesichert	Finanzmittel für das nächste Jahr gesichert	Finanzmittel für die nächsten 2 Jahre gesichert	Finanzmittel für die nächsten 3 Jahre gesichert	Finanzmittel für die nächsten 4 Jahre gesichert	
Total							

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[212] Festel (2010), p. 177

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