START-UP VALUATION

Solving the valuation puzzle of new business ventures

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Abstract

Generally, valuation fundamentally stays the same irrespective of the type of firm to be analyzed and, thus, every firm can be subject of valuation. The question remains whether we are willing to accept noisy estimates of values. Noise increases especially in three distinctive cases: (a) companies with negative earnings, (b) young companies with no historical financials, and (c) unique firms with no or only few comparable firms.

Start-ups combine all three cases and, hence, the inherent noise results in a compounded complexity. This research paper scrutinizes various valuation approaches for young business ventures. An introduction to the start-up market allows the reader to get familiar with the peculiarities of the ecosystem involved in start-up markets. Business formation, development phases of start-ups and exit routes are thoroughly discussed to gain a foundational knowledge of said topic. Determinants of start-up valuation, including its three-sided interplay of factors related to start-ups, VC and its external environment are established before the specific valuation approach is presented and discussed.

Traditional valuation methods, such as the DCF method, trading multiple method or transaction multiple method cannot be applied due to the above-mentioned restrictions of start-ups and the uncertainty related thereto. Alternative valuation approaches such as the Venture Capital method, First Chicago method or Real Option method include qualitative, non-financial factors, which allow for a more meaningful replication of the inherent value.

However, there is still no consensus on which specific method delivers the most consistent, credible, and accurate output. The sheer complexity of the underlying issue is demonstrated in a case study regarding a potential Airbnb IPO valuation.

Eventually, the research paper concludes with an illustration of further compelling scientific issues for future research. The establishment of a one-size-fits-all valuation methodology with universal acceptance would be highly desirable. However, might it be possible that the start-up valuation puzzle can only be optimized but never entirely resolved?

Key words: Start-up valuation, start-up market, business formation, development phases of start-ups, Exit routes for start-ups, determinants of start-up valuation, traditional valuation methods, alternative valuation methods for start-ups, new start-up valuation approaches, start-up discount rate, DCF method, Venture Capital method, Damodaran method, First Chicago method, Real Option valuation, Intangibles valuation, Bill Payne's Scorecard method, Airbnb case study, Airbnb valuation

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Table of contents

List of figures

List of Tables

List of abbreviations

CAPM	Capital asset pricing model
CCF	Commercial cash flows
DCF	Discounted cash flow
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation and amortization
ERP	Equity risk premium
EV	Enterprise value
FCFF	Free cash flows to the firm
g	Growth rate
IP	Intellectual property
IRR	Internal rate of return
K	Initial investment or strike price
k**e**	Cost of equity
k**C**	Cost of debt
MRP	Market risk premium
NOPAT	Net operating profit after taxes
NPV	Net present value
NWC	Net working capital
PBR	Price book ratio
PER	Price earnings ratio
r**b**	Risk-free rate
r**k**	Return of the market
S	Present value of all future cash flows of the underlying
t	Tax rate
TV	Terminal value
V**=**	Equity value
V**C**	Net debt value
WACC	Weighted average cost of capital
β**m**	Levered beta
β**n**	Unlevered beta
σ	Volatility

1 Introduction

1.1 Problem Statement

"There are fewer topics more cloaked in mystery, black magic and aspiration than start-up valuation. People regularly speak of inflated valuations - or insane valuations - but it is difficult to know what anchors the numbers" (Vetter, 2016).

As of April 2018, Dow Jones Venture Source and the Wall Street Journal account for more than 170 venture-backed unicorns – privately owned companies with a valuation of more than one billion US dollars. Compared to the 45 unicorns as of January 2014, this constitutes a skyrocketing growth rate of more than 250% in only three years (Austin et al., 2016). Unicorns such as AirBnB overtake most of all well-established players in their respective markets in terms of valuation. Unsurprisingly, in the light of current unicorn craze, financial regulators such as the US Securities and Exchange Commission heightened their interest in the valuation process of investors, venture capitalists, private equity firms and mutual funds as well as their application of said methodologies on start-ups (Grind, 2015).

Clearly, a thorough and in-depth understanding of critical determinants of valuation-influencing factors is of upmost importance not only to regulators, but also to investors and entrepreneurs alike. While venture capitalists base their returns on the difference between the initial investment valuation and the final level of exit proceeds, entrepreneurs determine potential dilutive effects and control right transfers based on the same underlying valuation (Cumming and Dai, 2011; Hsu, 2004; Zheng et al., 2010).

Valuation is a main element of financial management, and start-up valuation is a key component of the free enterprise system, which constitutes a main driver of any economy. Valuation is regarded to be more art than science. Thus, coming up with a valuation for a well-established firm already inhibits multiple stumbling stones. The task of valuation for a young business venture, consequently, exhibits Nostradamus-like proportions as the start-up lacks any reliable projection metrics or financial history, is still in the process of loss-making and is typically solely based on equity financing (Bulko, 2017).

Cash flows are assumed to be the foundation of any enterprise valuation. However, new business ventures usually lack the required reliable cash flow histories and, hence, the business valuator has to model projections based on a high degree of assumptions and arbitrary educated guesswork (Vara, 2013).

Joseph Schumpeter, the famous economist, considered capitalism as an evolutionary process in which innovation drives development and progress through *creative destruction*.

The entrepreneur serves the role as *agent of change* during the whole process. The respective counterparty is taken by the investor and its willingness to provide funding to entrepreneurial ventures. Therefore, the process of business creation is driven by two opposing forces. As a result, investment funding is allocated from where it is vastly available (i.e. Wall Street), to where it is desperately awaited (i.e. Main Street) allowing for continuation of its creative destruction and fostering of innovation (Vara, 2013).

At present, the start-up valuation process can best be described to be a tug of war. Naïve, desperate entrepreneurs on the one side and confident, savvy investors on the other side – both sides bitterly sour and unsatisfied by the final valuation with the strong aftertaste that the true, inherent value of the start-up has not been identified appropriately (Bell, 2014; Heughebaert and Manigart, 2012; Miloud et al., 2012). Logically, assuming the same dollar investment awarded, the lower the valuation, the higher the share of the company captured by the investor and the higher any potential return of investment. Contrary thereto, the higher the valuation, the higher the share retained by the founder. Because valuation determines the equity allotment for each party involved in the entrepreneurial investment negotiation process, start-up valuation is a key determinant of investment yield both for the entrepreneur and the investor (Bell, 2014).

From a factual perspective, it must nevertheless be borne in mind that every year thousands of start-ups fail due to an overwhelming amount of challenges new ventures are faced with. Recent research states that more than half of new ventures established fail within the first two years upon inception (Song et al., 2009). Taking into account the uncertainty involved in the valuation assessment, an agreement on terms is often reached via ‘contentious negotiation’, which leaves both parties behind embittered (Bell, 2014).

1.2 Aim of the Paper

The purpose of this paper is to demonstrate the current state of research in the area of start-ups. Interestingly, academia can only rely on very limited resources in said research area. Existing literature is not only scarcely available, but also highly fragmented with no well-structured conceptual framework that integrates empirical research accordingly. The call of regulators to receive further insights is omnipresent as the domain’s significance elevates exponentially.

Consequently, this paper aims to contribute to the literature by shedding light on the dark of current valuation techniques. More importantly, this paper might help to identify academic voids and directions for further research on start-up valuation.

Firstly, this paper intends to contribute to a general understanding of the start-up market, which is steadily growing in importance compared to the respective industries and the economy as whole, yet has received only little attention within the academic realm. Secondly, this paper shall assist to better comprehend the tools utilized by investors and both their positive and negative implications. It may also result in ways to superiorly handle current challenges faced by all parties involved in the process.

1.3 Research Questions and Methodology

In respect to the main aim of the paper, the following research question has been identified:

1. How to value a start-up?

In order to address these objectives, the first part consists of a comprehensive overview of the start-up market and the *status quo* of academia in terms of literature and research findings. Beginning with the start-up market in general is essential to acquire a sophisticated foundational knowledge of the topic under review. On such basis, the analysis will be continued with a profound literature review of traditional valuation methodologies and followed by new entrepreneurial venture valuation approaches. Multiple methods are available to the valuator at first sight, however, each individual approach has to be scrutinized in detail to assess its suitability for the valuation of young ventures. Traditional methods are mainly developed for valuation of ongoing, mature businesses concerns. Start-up valuation approaches, however, are based on an amalgamation of traditional methods such as discounted cash flows or income/asset-based multiples, and novel methods based on qualitative factors such as management experience. Additionally, further refinements via real options or multiple-stage scenarios can be considered.

The second part of this research paper consists of a case study on Airbnb. Only very few companies in the private-tech segment have the disruptive innovation potential and growth opportunities comparable to Airbnb. Previous financing rounds indicate that Airbnb is more valuable than most major players in the travel and lodging industry without owning any properties and by simply providing a service to the public. The main reason for choosing a case study as an appropriate tool for the present topic is that it allows for a detailed analysis of a start-up over its life, thereby helping to better identify causalities and actual measures taken to steadily increase the valuation of a company. 2018 was speculated to be the year of Airbnb's IPO with latest rumors indicating an initial public offering slightly later. However, the overarching question is still yet to be solved: What is the valuation of Airbnb and how can we measure it? The case study enables understanding the evolution of Airbnb and selecting adequate valuation methods to appropriately identify the valuation of Airbnb.

Hence, the case study should help to identify suitable methods which are most useful to be replicable and applicable for future start-up valuation and its inherent challenges. This, in turn, facilitates the interpretation of interrelations of the multiple key aspects of Airbnb and its connection to any additional added value. Finally, the case study approach might reveal novel drivers and fields of interest, which have not yet been considered, but might unveil concepts for future research.

2 Definitions

Definitions allow us to obtain a common understanding of the most striking words or subjects within the start-up valuation framework. Consequently, ‘start-up’ and ‘valuation vs. pricing’ are defined as follows:

2.1 Start-up

“The term start-up describes a company in the early stage of the business lifecycle with a high degree of innovation looking for capital resources. The difference to other companies in their early stage is the level of innovation and outstanding growth potential” (Achleitner, 2016).

Besides an innovative idea, start-ups have to develop a scalable business model and a business plan and depend on sufficient capital to realize their business idea. In addition, the founding team is in principle very small and centered towards personal relationships to establish a dense network for know-how transfer within the cluster (Hahn, 2014). Generally, a start-up can be characterized by three main attributes.

Firstly, a start-up typically possesses a binary business model. More precisely, this constitutes the fact that the business model is not yet proven, and a successful continuation of the business endeavor cannot be predicted with certainty. Radical innovation in product features, production processes or target customers are only few of many ways on how to trigger re-invention. Hence, the degree of innovation and firm-internal speed of change is generally very high (Kühnapfel, 2015).

Secondly, start-ups are still in the phase of negative Free Cash Flow or loss making. Clearly, target markets of new ventures are typically highly dynamic in terms of growth, disturbances and only limited customer loyalty. Consequently, the risk of failure is significantly higher compared to well-established companies (Damodaran, 2009).

Thirdly, based on the unproven track record, start-ups are generally fully equity financed. Business development is projected based on forecasts, estimates and assumptions as real-life experiences and data are not yet available. Hence, start-ups need to establish relationships with Seed- or Start-up-investors and venture capitalists to gain sufficient capital for their survival (Miloud et al., 2012).

2.2 Valuation vs. Pricing

A valuation is the process of determining the fair market value of a company in a notional context, meaning that the valuation is a) time specific, b) there is no negotiation, and c) there is no exposure to the open market (Divestopedia, 2018).

Many analysts and investors alike use “valuation” and “pricing” interchangeably. However, the both differ significantly in their respective nature. More precisely, valuation is based on its intrinsic value drivers – cash-flows of assets, risks and growth – and its mutual interplay between each other. The primary focus lies on the company’s capabilities to grow its potential cash-flow stream.

Contrary thereto, pricing – in particular, the price of an asset – is based on the market’s supply and demand curve. Hence, it is not solely determined by business fundamentals. Rather more it is highly influenced by market momentum and sentiments, incremental information and any potential illiquidity issues. Clearly, market forces can trigger stock prices to create their own dynamics and thereby deviate from the true, intrinsic value implied by a company’s fundamentals. The deviation results in the gap between valuation and pricing (Damodaran, 2016).

Figure 1: An illustration of price-value-gap (Damodaran, 2016)

As pricing techniques rely upon supply and demand within the public market, reasonable and accurate data sets for private companies, such as Airbnb, are impractical if not even infeasible. Consequently, the focus of this research paper rests upon valuation methods within the larger valuation framework.

3 Literature Review

3.1 The Start-up Market

Start-ups operate in an ecosystem, in which a set of intertwined parties guide entrepreneurs through the required steps of creating a new venture. The ecosystem constitutes of a network with a focus on start-up success and is composed of policy, finance, culture, human capital, and market specifications. Noteworthy, every ecosystem is unique in its own nature due to the local characteristics of individual markets. Whereas one country possesses favorable attributes for start-ups during its early phase, other countries might be more supportive for new venture establishments during later stages. As rough differentiation, while early stage start-ups are confronted with a high level of uncertainty and in search of an appropriate product-market fit, start-ups in later phases already recorded first sales and try to fine-tune their business models to increase scale (Funke and Fandl, 2012).

Within a globalized and highly competitive landscape, start-up companies deliberately take risk with innovative new ideas to establish new business segments and eventually stimulate economic growth on a larger scale. Some specific regions are well known for its unique knowledge and skill-set such as Silicon Valley in the U.S. in software engineering, ergonomics in Europe, specialized treatment and stitching of leather goods in Italy or highly-advanced manufacturing abilities in Japan. All these regions are on a constant outlook for further innovations in each of its respective areas (Olviatt et al., 1995).

Nonetheless, creative novel ideas are certainly not a guarantee for long-term success. The environment for start-ups is risky and distinguished by a high level of uncertainty due to its non-proven business idea, lack of historical data and experience, aim for financial resources and a well-above mortality-rate within the first years of funding (Maroni et al., 2015).

Surviving in the market constitutes the most challenging activity of new ventures as they must remain innovative, establish a steady management system and business processes, and constantly screen new trends in their market environment, which also includes other stakeholders such as suppliers, customers and competitors (Maroni et al., 2015).

This allows them to be better informed about any changes in workforce demographics, new market entrants and any adaptations in regulatory requirements. In addition, normative venture creation models emphasize on the market environment screening aspect as it increases the sustainability of start-up success. Some of the tools used for screening include monitoring of market size and growth rates on a macro-level, such as in-depth analyses of competitors and the industry as well as of individual customer purchase behavior on a micro-level (Peters and Brush, 1996). Additionally, as mentioned by

Endemann et al. (2016), a systematic market- and competitive analysis lays the foundation for future start-up success. Hereby, a new venture not only can extract useful information and additional market insights to further define and shape its business concept and future objectives, but also refine the scope of its products or services, target customers, market segment, and its pricing policy going forward.

Interestingly, the market entry of start-ups tends to intensify competitor's productivity and potential for innovation and, thus, a country's economic growth (Munemo, 2016). Generally, an enhancement in productivity and efficiency leads to cost reduction. Clearly, mature companies benefit from the increased competition and would not experience the same level of progress without innovative start-ups in their competitive landscape. Research from Olviatt et al. indicates a shift of competitive advantages away from mature companies towards young ventures with unique know-how and growth potential. This transition successfully diminishes business mortality and contributes to a country's overall growth (Olviatt et al., 1995).

The entry of new ventures plays a crucial role and is one of the main drivers of economic and productivity growth. The term 'start-up turnover' identifies the total number of new ventures within a specific field, while differentiating between three constituents: entry and exit of business units, changes in sizes and market shares of established business units, and changes between companies in control of continuing business units. Economies with high levels of turnover and entries/exits imply the existence of many start-ups and high-growth ventures. This high turnover level and its involved enhanced competition in the market forces mature companies to improve their respective performance. In case the mature company fails to improve, it might have to downsize or even exit the market. Consequently, only the most competitive start-ups and well-established companies survive in the market. In the short-run, the increased pressure on existing players triggered by the new ventures leads to a continuous increase in average product or service quality. In the long-run, the high turnover results in higher productivity and economic growth. Therefore, start-up turnover figures can be utilized as an indicator of competitiveness of the respective industries and the start-up market overall (Koster et al., 2012).

Additionally, research states that start-ups account for a much higher rate of job creation compared to traditional established companies due to its high growth potential (Munemo, 2016). As indicated by Kollmann et al. (2016), European start-ups employ on average twelve workers (including founders) and project another 5.2 hires within the near future. Young, highly qualified individuals are sought after and offered intensive and steep learning experiences. Further, start-up founders typically try to utilize locally available resources such as business premises and employees (Cashman, 2012).

A successful new venture also depends on the geographic location in which it sets its foundation. In developed countries such as the U.S., the role of start-ups in the economy and its view within society is highly esteemed. Over the years, Silicon Valley can look back on the creation of some of the most important unicorns such as Google, Facebook, Apple, or Cisco. A recent study indicates that around 90% of all start-ups situated in Silicon Valley receive high and satisfying investment values during its funding rounds. To ensure its success, around 299,000 angel investors are invested in Silicon Valley based start-ups. Moving to Europe, the European Startup Monitor states that European start-ups have raised approximately two billion Euro in new external cash and plan to raise an additional 2.7 billion Euro in 2018 (Kollmann et al., 2016).

In contrast, new ventures in developing countries experience a considerably fiercer initial situation. In Brazil, approximately 50% of all start-ups are a bust within four years upon establishment. Further, the total number of angel investors is considerably lower with about 6,500 (Maroni et al., 2015).

In sum, a huge growth potential is inherent to the entire global start-up scene. Consequently, a supportive entrepreneurial ecosystem and high educational standards are inalienable to fully maximize such potential (Kollmann et al., 2016). A further stimulus for start-up creation is a supportive environment in terms of barriers of entry and operations such as a simplification of applicable regulatory and administrative obligations. Moreover, further growth may be achieved by measures aiming at tax relief, assistance in capital raises and general supportive measures for start-up founders (Kollmann et al., 2016).

3.2 Business Formation

Business formation can be defined as the foundation of a permanent economic entity with the aim for financial profits by supplying goods and/or services (Deutsches Institut für Wirtschaftsforschung, 2016). The establishment of a new business can have many different motives, such as personal fulfilment, independency, reputation, social environment, business ideas, or unemployment (Beyer, 2006).

3.2.1 Formation Process

Küsell (2006) developed a new method for the business formation process and concluded that it can be split into eight sequential steps. Beginning with the identification of a business idea, followed by a pre-examination, planning, financing, legal structure selection, business plan creation, legal formalities and the first steps phase. The eight-steps process can be condensed to the below figure in order to gain a holistic understanding of the business formation process:

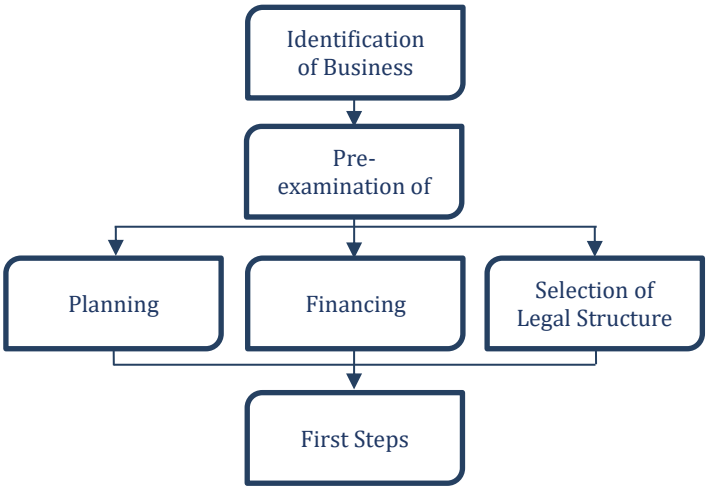

Figure 2: Business Formation Process (adapted from Küsell, 2006)

3.2.1.1 Business Idea

A business idea generally originates from the knowledge and experience of the founder. Hence, most of the time the idea is related to a specific field in which the founder received his educational background and/or gained his work experiences. To withstand fierce competition, the new venture must not only rely on the original business idea, but needs to reinvent itself on a constant basis.

To establish a successful venture in the long-run, the initial business idea must be innovative, unique and be clearly distinguishable from already existing concepts. A further refinement of existing processes is another option and might not only increase efficiency of the process itself, but also lead to an opening of new distribution channels such as e-commerce, novel sourcing strategies or implementing a target group. Nevertheless, an excellent business idea alone is not sufficient. Success also depends on implementation, execution and, most importantly, the identification of new opportunities within the market (Klandt, 2006).

A business idea can be identified via three different options according to Klandt (2006) and Küsell (2006). Klandt (2006) differentiates between a completely new idea, an idea based on social developments and trends or an adapted version of an already existing idea. Contrary, Küsell (2006) distinguishes between a new idea, replication of an idea or full adoption of an existing concept. Subsequently, the beforementioned concepts will be discussed in more detail. The concept of “idea creation” can be regarded the most innovative approach as it attempts to fulfil a need which does not yet exist. Creative processes such as brainstorming, checklists and brainwriting should be utilized. Additionally, systematic approaches such as value analysis, functional analysis, lists of characteristics, and morphological methods need to be deployed (Klandt, 2006).

After the establishment of a core idea, an in-depth analysis of the current market situation and trends is critical. The analysis targets deeper insights about key stakeholders such as potential customers, competitors, current supply and demand in the market, inefficiencies on individual business and market level, customer satisfaction levels, and current pricing strategies. Initially, family members and a close circle of friends can contribute invaluable insights and diverse perspectives on the product itself or on the potential future field of operations.

In general, demographic, economic, social, cultural, technological, political, or regulatory trends have to be considered right from the beginning of establishment. Regarding current trends, it might be as multifaceted as returning to traditional values, alterations in gender roles or a focus on regional products. A continuous analysis of trends abreast technological advances and their evolvement going forward are deemed a necessity for the permanent refinement of the business idea (Klandt, 2006).

Ideas can also be obtained from analyzing different industry best practices or from regional and supra-regional particularities. This process of adaption may bear less risk, but requires considering a potential infringement of intellectual properties or copyrights and only involves very little innovative aspects (Klandt, 2006). Hence, the adaption together with the full adoption of an existing business idea are not appropriate ways to establish new business ventures.

3.2.1.2 Preliminary examination of the Business Idea

After agreeing on the business idea, further steps and processes are necessary to reduce the potential risk of failure. The preliminary examination of the business idea consists of six core steps: formulating core elements of the idea, specifying products and services offered, examining competitors, understanding the industry, comprehending key figures, and knowing the final customer (Küsell, 2006).

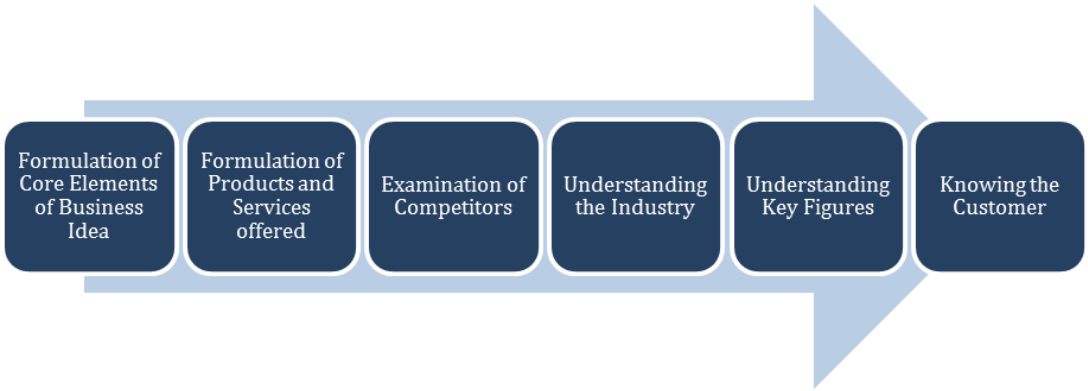

Figure 3: Business Idea pre-examination (Küsell, 2006)

Firstly, a clearly defined outline of core elements sets the cornerstones of the new venture. Useful tools such as hypotheses provide helpful guidance to specify desired outcomes such as products and services offered, the overarching target of the new venture, market, competitor identification, and target group identification (Küsell, 2006).

Secondly, products and services offered by the company are defined as all company's offerings target at resolving a customer's problem or satisfying specific customer needs (Küsell, 2006).

Thirdly, an in-depth analysis of the market and competitors needs to be carried out. As previously mentioned, trends and competitor's activities must be observed and evaluated on a constant basis. The self-positioning of the new venture is a critical element to correctly identify direct and indirect competitors. A top-down approach is most commonly used to identify direct competitors. Starting with all potential competitors, a spatial differentiation allows to significantly downsize to the direct competitor universe. Eventually, softer criteria such as quality and the price range are used as benchmarks to correctly identify directly competing businesses (Küsell, 2006).

Fourth, it is essential for the founder to gain a holistic understanding of the underlying industry. In this context, it is essential that common industry best practices and structures are not taken for granted and, hence, have to be reflected thoroughly in order to uncover any potential efficiency enhancements. Dell clearly knew how to gain a competitive advantage by disrupting the existing business model by selling directly to customers instead of using the existing structures of retail selling. Potential areas for improvements and disruptions are sales and/or marketing, production, and procurement. (Küsell, 2006).

Fifth, the entrepreneur must have a clear and integrated view on all of the ventures' key figures such as market positioning, total market size, potential market size for the company, potential revenues, and cost structure and its resulting total profit potential (Küsell, 2006).

Lastly, the most critical step lies in the full understanding of customer needs and how the customer eventually perceives the newly introduced product. Consequently, continuous feedback loops during the development process are necessary to build a product that is saleable. Instead of testing the final product in the market, which is a common misperception of young and unexperienced entrepreneurs, this feedback mechanism allows amendments in earlier phases of development in accordance with real customer requirements. Hence, only products that match the final consumers' needs are produced, rather than already produced products have to be adapted again. This extra layer of interim feedback also prevents any further delays in delivering the final products to the customers. (Küsell, 2006).

3.2.1.3 Planning

The planning phase consists of the following main tools: finance plan, marketing and sales plan, resource plan, and organizational structure breakdown. Clearly, the business plan also constitutes a major part of the global planning regime. However, a business plan is rather more a communication and documentation tool and does not include a high level of granularity in terms of details (Küsell, 2006). The Austrian Chamber of Commerce defines a business plan as a tool to acquire fresh capital by allowing high level insights on a venture's overall potential, profitability, and final customer value. In short, it offers a quick company overview to external stakeholders (Wirtschaftskammer Österreich – Gründerservice, 2016).

3.2.1.4 Financing and Legal Structure

The most common form of legal structure utilized by entrepreneurs in the very early stage is a sole proprietorship. The legal form constitutes a binding framework for operations and can be differentiated in terms of minimum capital required, formalities, profit, and liability (Klandt, 2006). Regarding the final success of the new venture, financing aspects represent one of the most essential key success factors. Hence, the appropriate form of financing during the right phase of the start-up is critical. Whereas in the early stages such as seed and start-up phase, mostly equity capital is injected, later stage ventures introduce debt capital in order to maximize the cost of capital mix (Klandt, 2006). Since financing contributes to success, a detailed view will be provided in a later chapter dealing with success factors.

3.2.1.5 First Steps

The focus of first steps is overcoming administrative hurdles such as business registration, trade register registration, insurance coverage and tax considerations to name only few of them. Those steps are a prerequisite before the actual operating phase of the new venture can be started off (Küsell, 2006).

3.3 Development Phases of Start-ups

As every newly established venture has many company-specific attributes, there is no exhaustive list of characteristics to qualify as start-up. Even though qualitative and quantitative key performance indicators to distinguish start-ups from well-established business exist, it is a challenging and not yet resolved task to put these factors into a common framework with universal applicability.

The *status quo* of a firm within its business life cycle might provide evidence whether a company can be classified as a start-up. According to de Buhr (2014), the business life cycle framework can be split into Early Stage, Expansion Stage and Later Stage. Some academics determine that a start-up as in its original nature can only be part of the Early Stage of the business life cycle. Many experts contend, however, that this explanation is insufficient, and evidence is not conclusive. Consequently, other research suggests that even companies which prepare to file for a potential IPO during its Later Stage of the cycle can still qualify as start-ups.

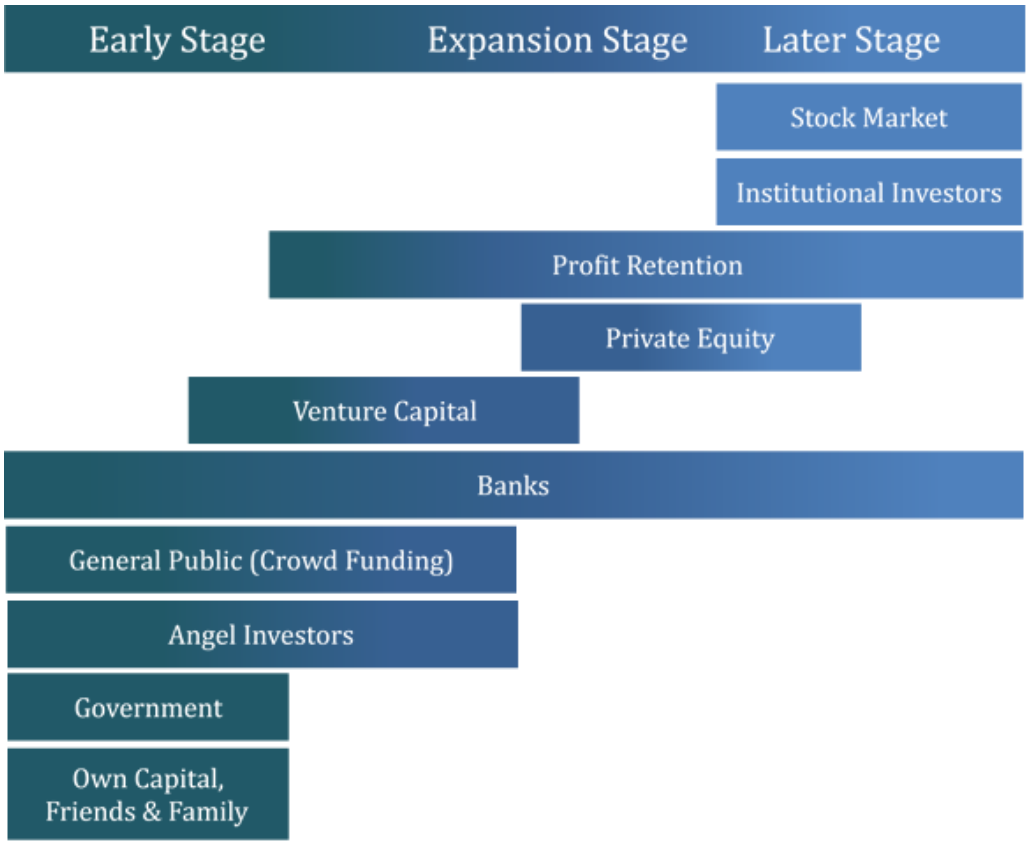

Figure 4: Business Life Cycle Framwork (Buhr, 2014)

3.3.1 Early Stage

The Early Stage phase of the business life cycle can be divided into three distinctive phases: Pre-Seed-, Seed-, and Start-up-Phase. The Pre-Seed stage is associated with the phase of idea generation in which a new business idea must be detected and in a following step be tested for any prospective success. The Seed stage is coherent with the phase of idea formulation in which a pre-defined idea is examined in terms of feasibility. Eventually, the Start-up stage is closely related to the phase of idea implementation (Hahn, 2014).

In his introduction to the **Pre-Seed- and Seed-Phase**, Hahn (2014) indicates that no legal entity was founded yet. The focus at this stage is on the creation of a business idea and, consequently, in the implementation of a specific business model. The main tasks include further research and development activities, identification of an appropriate legal form and preparation of an appealing and solid business plan. On the product side, a first prototype is to be created or a general outline on the services to be offered is inevitable.

Capital requirements are usually low to very low during the Early stage and mostly include operating expenses for preparatory work steps such as feasibility, market acceptance, and target customer analyses. Funding is provided through personal savings, family savings or bootstrapping. During the Early Stage, especially in the Pre-Seed and Seed phase, no revenues or profits are recorded (Klandt, 2006). Summing up, founders face extremely high entrepreneurial risks in the Early Stage in which the cornerstones are set, but without any predictive power in terms of any potential future success.

In the **Start-up-Phase** the real formation of the business takes place, which includes the registration in the commercial register and the preparation of a partnership agreement or a charter (Klandt, 2006). Depending on the pre-defined business plan, the operating phase now kicks off and the following tasks are now required to be performed: the product or service can now be launched, additional hires might be needed, contracts with suppliers for resources are finalized and proceeding market investigations and analyses need to be coordinated with a consistent marketing strategy. Additionally, production takes off and first sales are now recorded in the books (Hahn, 2014).

Capital requirements increase significantly due to the start of operations and production activities (Heinrichs, 2009). Consequently, the search for outside investors such as angel investors, venture capitalists, or other capital investors intensifies. After finding a suitable partner, a participation agreement secures the founders various rights in terms of economic, legal, and financial interests. During the start-up stage it is common that new ventures are still to break even and, hence, continue to generate losses in this early phase of the business life cycle. Business risks can still be classified as very high as a successful

outcome of the venture is still not predictable. After kicking off the venture successfully with the start-up in search of its place within the competitive landscape, the Start-up-Phase is completed, and the company moves forward to the next phase, the Expansion Stage. The transition from the Early Stage to the Expansion Stage is imbricated and, hence, does not constitute a clear-cut transformation (Hahn, 2014).

3.3.2 Expansion Stage

According to Hahn (2014) and Heinrichs (2009), the Expansion stage of the business life cycle is mainly marked by growth and expansion activities. Sales levels improve significantly, and the total number of customers starts to multiply. The focus is on gaining further market penetration and additional market shares, continuing to grow, and decreasing the inherent business risk.

Furthermore, the new venture starts to generate positive Cash-Flows, which indicates that the business model is well received in the market. To secure further growth, additional sources of funding might be required. The previously recorded positive Cash-Flows can be used for the upcoming expansion plans as the Break-Even-Point has been reached and self-financing is now feasible. However, typically these funds are not sufficient and additional funding on the equity and debt capital markets may be inevitable.

As expansion continues along, further investments in HR and on an executive level are vital. The extension outside national borders into international distribution channels depends on a highly specific management know-how (Hahn, 2014). As highlighted by Heinrichs (2009), as the start-up continues to grow, further investments in operating systems and processes must be considered so that the company structure can keep up the pace of its expansion route. To sum up, during the Expansion Stage, the start-up shows the highest levels of growth in the entire business cycle.

3.3.3 Later Stage

The transition from the Expansion Stage into the Later Stage is connected via the **Bridge-Phase**. Complementary to the Expansion Stage, distribution channels continue to expand by recognizing new opportunities in the market not only via horizontal and vertical integration, but also via tapping into new domestic and foreign markets and broadening of product offerings (Heinrichs, 2008).

Finally, during the Later Stage the entrepreneurial risk declines to a minimum level. Turnover continues to increase, even though not that sharply as in the Expansion Stage. Eventually, the new venture found its place in the market and established itself as a mature

player with stable Cash-Flows (Hahn, 2014). Reaching this stage with the beforementioned attributes allows the company to reconsider its ownership structure (Kemler et al., 2016).

As highlighted by de Buhr (2014), during the Later Stage of the business life cycle, businesses become attractive targets for any potential transactional modifications. Management Buy Outs (**MBO**), Management Buy Ins (**MBI**) or as indicated by Hahn (2014) an Initial Public Offering (**IPO**) are reasonable options for current shareholders to exit the investment. Even though the company moved along its business life cycle to the Later Stage, a high level of inherent business risk is still involved and must be considered from multiple angles before any further steps can be arranged (Klandt, 2006).

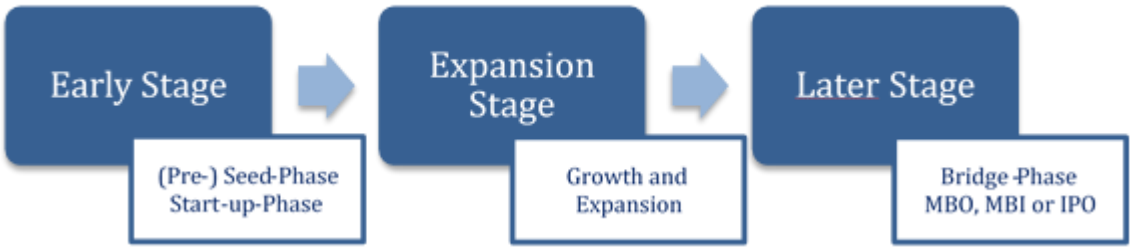

Figure 5: Business Life Cycle Review of Phases

3.4 Exit routes

The exit value is a key element in the return for private equity and venture capital companies and is already thoroughly considered before even the initial investment has been made. The timing and means of the final exit significantly influence the exit value. Besides the company performance, further critical factors such as the dynamics of the respective industry, overall economic cycles and interest rates must be rigorously reflected. Typically, five main exit routes exist: (1) an initial public offering (IPO), (2) trade sale or secondary market sale, (3) management buyout (MBO), (4) recapitalization and (5) liquidation.

(1) An initial public offering means that the company's equity is offered for public sale and usually results in the highest exit value due to widened access to capital, enhanced liquidity and the potential to hire more highly-qualified employees and executives. Typically, IPOs are suitable for businesses which can rely on a well-established operating history and strong growth capabilities. Nevertheless, an IPO exit also includes multiple disadvantages such as (a) high disclosure requirements; (b) potential lock-up periods; (c) risk of stock market volatility; (d) long lead times; and (e) high transaction costs to be paid to law and investment banking firms. The timing of an IPO is also critical and, hence, should be scheduled during times of appreciative market conditions and a positive momentum. Looking back to the tech

bubble in 2000 and the logical burst of the whole economic system in the U.S., venture capital firms needed to consider alternative routes for exiting their investments.

(2) A trade sale or secondary market sale represents a sale to another investor, group of investors, or another company interested in the purchase such as strategic buyers. Trade sales can be executed through private negotiation or an auction. In the case of buyouts, secondary transactions are quite common. Benefits of a trade sale consist of (a) a fast and simple execution; (b) lower transaction costs compared to an IPO process; (c) lower disclosure requirements, but higher confidentiality due to a limited number of potential acquirers; (d) immediate cash inflow for the fund; and (e) higher valuations of strategic buyers due to anticipated synergies. Disadvantages of a trade sale include (a) a lower attractiveness to employees; (b) potential resistance of the management; (c) only a limited number of interested acquirers; and (d) in case of low interest, a potential lower price compared to an IPO. However, strategic buyers are already active in the same industry and might have specific strategic reasons to acquire the company such as the aim to expand its market shares. Moreover, strategic buyers are likely to pay a very high price as any potential synergies associated with the target can offset the additional premium paid to acquire the company. Occasionally, VC portfolio companies are acquired via a buyout, but this route of exit does not happen too often since VC companies are too immature to carry high levels of debt.

(3) Instead of selling the company to other strategic players or financial sponsors in the market, the management might step up and buy the company via a management buyout (MBO). This exit strategy involves a high level of leverage to fund the transaction. Even though the management holds a strong interest in the future performance of the company, the flexibility of the management's decision-making process is considerably limited due to the high debt burden.

(4) In case the company is already more established and mature, a recapitalization is especially attractive during time periods of low interest rates as leverage is easily and cheaply available in the market. Admittedly, recapitalization is not a true exit strategy, though, it constitutes a mean to exit for the investor via extracting some money by re-levering the company and issuing a special dividend. Most of the time, a recapitalization is only the prelude for the inevitable later exit.

(5) Liquidation or write-off occurs when the business venture is not well received in the market and did not take off as anticipated. As a result, the remaining value of the company is liquidated via an outright sale of the firm's assets to receive at least a low quote in terms of liquidation proceeds, whereas the amount between book value

and actual value is written off the books. Negative publicity accompanied by the failure also has to be considered by the invested venture capitalist firm.

The above exit routes can be combined, pursued individually or performed on a partial exit. A dual track, in which an IPO and a trade sale is pursued simultaneously to achieve the highest possible valuation, is quite commonly used in the market. Anticipated exits during a time span of up to two years can be estimated via exit valuation multiples without too drastic errors. Protracted periods of more than two years are fairly uncertain to predict, and additional stress testing is required on a wider range of possible values (Kaplan, 2016; CFA Institute, 2016).

Understanding the difference between venture capital and buyout investment is crucial. Hence, the below table outlines the major distinctions based on multiple characteristics:

Characteristics	Venture Capital Investment	Buyout Investment
Cash Flows	Potentially unrealistic forecasts with low predictability	Predictable and stable cash flows
Product market	New product market with uncertain future	Strong market position with a possible niche position
Products	Product is based on new technology with uncertain prospects	Established products
Asset Base	Weak	Substantial base that can serve as collateral
Management team	New team although individual members typically have a strong entrepreneurial record	Strong and experienced
Financial leverage	Low debt use with a majority of equity financing	High amounts of debt with a large percentage of senior debt and substantial amounts of junior and mezzanine debt
Risk Assessment	Risk is difficult to estimate due to new technologies, markets, and limited company history	Risk can be estimated due to industry and company maturity
Exit	Exit via IPO or company sale is difficult to forecast	Exit is predictable

Operations	High cash burn rate required due to company and product immaturity	Potential exists for reduction in inefficiencies
Working Capital Requirements	Increasing requirements due to growth	Low requirements
Due Diligence performed	Private equity firms investigate technological and commercial prospects, investigation of financials is limited due to short history	Private equity firms perform extensive due diligence
Goal Setting	Goals are milestones set in business plan in growth strategy	Goals reference cash flows, strategic plan, and business plan
Investment returns	High returns come from a few highly successful investments with write-offs from less successful investments	Low variability in the success of investments with failures being rare
Capital Market Presence	Generally not active in capital markets	Active in capital markets
Sales Transactions	Most companies are sold as a result of the relationship between venture capital firm and entrepreneur	Companies are typically sold in an auction-type process
Ability to Growth via subsequent funding rounds	Companies are more scalable as subsequent funding is typically larger	Strong performers can increase subsequent funding amounts

Table 1: Key Characteristics of VC and Buyout Investments (CFA Institute, 2016)

4 Review of traditional valuation methods for start-ups

4.1 DCF method

“The intrinsic value of a cash-flow generating asset is a function of how long you expect it to generate cash-flows, as well as how large and how predictable these cash-flows are” as described by Aswath Damodaran (2018) who is one of the most highly-recognized valuation experts nowadays. This citation clearly shows the theoretical justification of the DCF approach.

More precisely, the Discounted Cash Flow (DCF) method values a company by discounting the free cash flows to the firm (FCFF) using a company’s weighted average cost of capital (WACC). The resulting Enterprise Value is then deducted by Net Debt to derive a company’s shareholders’ equity value. The enterprise value can be computed as follows:

$$Enterprise\ Value\ (EV) = \sum_{t=0}^{\infty} \frac{FCFF_n}{(1+WACC)^n}$$

$$WACC = k_E x \frac{V_E}{V_D + V_E} + k_D x (1-t) x \frac{V_D}{V_D + V_E}$$

k_E	Cost of Equity
k_D	Cost of Debt
t	Tax rate
V_E	Equity Value
V_D	Net Debt Value

Depending on the business plan assumptions of the company, the forecast horizon may be divided into three separate parts: high growth period, normal growth period and terminal growth period.

The high growth period normally constitutes two to five years until growth rates start to decline towards the normal growth period for another up to five years. These two growth periods are part of the “explicit projection period” in which calculations are broken down into a high level of granularity. Depending on the industry, cash flows are forecast for a certain number of years.

In general, the explicit forecast period heavily depends on business plan assumptions, discussions with the management team including short- and long-term strategic orientation and analysis of key performance indicators and metrics such as revenue growth, margins,

and cash generation based on a company's past performances and estimates going forward.

The free cash flows are calculated as follows (Beneda, 2003):

$$\boldsymbol{Free\ Chash\ Flow\ to\ the\ Firm}\ (\boldsymbol{FCFF}) =$$
$$Operating\ income\ (EBIT)\ x\ (1 - Tax\ rate)$$
$$-Capital\ Expenditures$$
$$+Depreciation\ and\ Amortization$$
$$-Change\ in\ Net\ Working\ Capital$$

For Cash Flows generated after the explicit forecast period, a Terminal Value (TV) calculation must be performed. Hereby, assumptions for growth rate, margins, and investment needs progressively decline to approach their respective terminal value. The Terminal Value can be computed using two different methods: the Perpetuity Growth Method or the Multiple Method.

Regarding the perpetuity growth method, the assumption is that the terminal year FCFF will grow continuously and generate FCFF in perpetuity. The perpetuity growth rate g normally follows historic GDP growth or historic inflation rate (Vernimmen, 2014). The Terminal Value can be calculated using the following formula:

$$TV = \frac{FCFF_t x(1+g)}{WACC - g}$$

In contrast, the Multiple Method is mainly based on multiples such as EV/Sales or EV/EBITDA median multiples of a peer set of comparable companies. This multiple is then used to multiply the FCFF of the last projected forecast year as shown below:

$$TV = Terminal\ Multiple\ x\ Corresponding\ Financials\ for\ final\ forecasting\ period$$

Eventually, the sum of present value of after-tax Cash Flow during the explicit forecast period and the Terminal year result in the Enterprise Value of the company under review (Vernimmen et. al., 2014).

In general, the Terminal Value constitutes a major part of the inherent enterprise valuation and is based on a company's historical performance, its WACC, and growth assumptions going forward.

4.1.1 Limitations

After understanding the concept of the DCF method, we have to admit that this intrinsic valuation technique cannot be applied on start-up companies. Below we discuss the most striking findings which underline such conclusion.

4.1.1.1 Growth asset issue

Firstly, new ventures can only rely on a few years of available financial data. This lack of history constitutes a major pitfall as the DCF method bases its forecast assumptions on historical data and, hence, **growth forecast becomes very subjective** (Damodaran, 2009). As highlighted by Damodaran (2018), the DCF method evaluates cash flows not only from existing assets, but also from the "expected growth of both, new investments and improved efficiency on existing assets". Clearly, existing assets are negligible and only constitute a small portion of the overall intrinsic value. Consequently, the major bulk of value is derived from "growth assets" which will be acquired in the course of time without any indication in terms of revenue generation potential and profitability levels. Consequently, the terminal value for start-ups can amount up to 90% or more of the total value (Mills, 1998) and, hence, vary significantly from any standard values normally used within the DCF framework. Additionally, the terminal value is based on a stable growth rate. However, adequately predict the timing and value of said growth rate is highly questionable (Beneda, 2003).

4.1.1.2 Business model fallacy

In terms of business model, the DCF approach can only account for one scenario and allows no flexibility for the inherent high level of uncertainty involved in a new venture with more than 50% of start-ups failing within the first three years of operation (Knaup and Piazza, 2007). Predicting the probability of survival, therefore, constitutes an integral part. Moreover, start-ups are in a constant process of learning and adaptation and, hence, require multiple optional expansion strategies. As the DCF method is based on fixed schemata, it does not permit options such as expanding, contracting, reallocating or delaying critical investments. Option strategies constitute a necessity for start-ups and, therefore, increase doubts regarding the appropriateness of the DCF approach within the start-up valuation framework.

4.1.1.3 Discount rate paradox

The discount rate used in the DCF method for start-ups possesses several issues. Firstly, a start-up experiences different stages within the business life cycle. Each of these stages constitutes different levels of risks involved. However, the DCF model is based on a single discount rate for all periods (van Schootbrugge and Wong, 2013). This clearly shows the impracticability of the approach for young ventures. Going one level deeper, the cost of debt is normally based on outstanding publicly traded bonds, however, start-ups are not yet publicly traded. In terms of cost of equity, the major issue appears to be that start-ups are typically fully equity-financed with different financing terms for each round of funding and,

hence, resulting in multiple cost of equity values. Evidently, these multiple rounds of financing result in a diverse level of priority agreements with preferential rights for primary investors to protect their initial interest. As these equity investments are only available on the secondary market, this illiquidity increases the complexity to allocate the appropriate value to the underlying equity stake.

4.1.1.4 Stickiness of losses and its timing conflict

During the Early Stage of the business life cycle, new ventures are characterized by no or only little revenue and operating losses. Establishing growth rates and operating margins for the DCF can only be predicted very vaguely. Moreover, small changes in the assumptions can lead to severe alterations in overall valuation outputs (Kotova, 2014). Additionally, DCF accounts for time value of money, which can normally be considered to be appropriate. However, many high-tech and pharmaceutical ventures project to long-term periods of up to 20 and more years (van Schootbrugge and Wong, 2013). Due to the sensitivity of time value of money, none of these ventures will be eventually launched. Hence, high uncertainty and long periods without any positive Cash Flows would prevent the advancement of these sectors when using DCF.

4.2 Multiple method

Besides intrinsic valuation methods, relative valuation approaches such as the Multiple Method (also known as Trading Multiples, Comparable Company Analysis, Peer Group Analysis, Public Market Multiples or Equity Comps) are heavily used by investment professionals. The Multiple method is the quickest way to value a company and is used for comparing similar companies. More precisely, the current value of a company is compared to other similar companies by looking at multiples such as P/E, EV/Sales or EV/EBITDA. Special attention has to be given in the selection of the peer set as these companies should be as similar and comparable as possible to the company under review. Only then, reasonable output multiples can be expected. On a technical side, the multiple method attempts to capture a firm's operating and financial attributes in a single aggregated number that eventually will be multiplied by a financial metric (eg. EBITDA) to result in the total enterprise or equity value. Multiples are commonly expressed as a ratio of capital investment to a financial metric which are attributable to providers of capital. Multiples of EBITDA are most commonly used. Two classes of multiples can be differentiated (Vernimmen et. al., 2014): Enterprise value and Equity Value multiples.

Enterprise Value Multiples	Equity Value Multiples
EV / EBITDA	Price / EPS ("P/E")
EV / EBIT	Equity Value / Book Value
EV / Sales	P / E / Growth ("PEG Ratio")
EV / Unlevered Free Cash Flow	

Table 2: Enterprise Value and Equity Value (Vernimmen et. al., 2014)

One important side note relates to Enterprise Value (EV) as EV multiples are calculated using denominators which are attributable to *all* stakeholders (stock and debtholders). Consequently, the respective denominator applied is always *before* interest expense, preferred dividends, and any minority interest expense. Contrary, Equity Value (EqV) multiples use denominators attributable to equity holders only and, hence, the denominator applied is *after* interest, preferred dividends, and any minority interest expense.

The selection of a specific multiple is heavily dependent on the nature of the underlying business or on overall industry particularities. EV/(EBITDA−CapEx) multiples are often applied for the valuation of capital intensive companies such as cable businesses. Equity research reports generally give a good understanding on which multiple to use for a specific company or industry.

In general, enterprise value multiples are more often used than equity value multiples as EV allows for direct comparison of different firms and is not dependent on the capital structure of the underlying peer set. Theoretically, the value of a firm is independent of capital structure. However, equity value multiples are biased due to the injection of leverage. Exemplary, firms with a high level of leverage typically have higher P/E multiples as their returns on equity are expected to be higher. Moreover, EV multiples are generally purer in the sense that discretionary accounting rules represent less distortion as the denominator is located on EBITDA or EBIT level instead lower down the income statement.

Additionally, empirical evidence indicates that forward-looking multiples are more precise predictors of true value compared to backward-looking, historical multiples. Consequently, the valuation of publicly traded companies is based on *projected* earnings and cash flows figures. Projections and forward-looking estimates can be found on reliable sources such as IBES; First Call and Bloomberg and are compiled by equity research analysts. The average multiple from various research reports is most commonly used to receive a broker consensus estimation. (Vernimmen, 2014)

4.2.1 Limitations

As forest forth with respect to the DCF method, the multiple method also possesses some unique aspects which need to be considered thoroughly to allow for a final recommendation for the usefulness of the approach for young ventures.

4.2.1.1 Non-existent peer and risk intricacy

Relative valuation methods value a firm based on publicly traded peers within the same industry and similar size. However, for start-up valuation, comparable companies are small companies, which are not yet traded publicly. Hence, market prices and other financial information is only available in limited form. As a rough approximation, publicly traded companies within the same industry can be utilized, however, disparate business fundamentals such as different growth rates, cash flow levels and a completely diverging risk level, only allow for a very vague estimation. Furthermore, standard deviation of equity returns or beta is generally used as proxy for risk. Thus, with respect to start-ups beta is not available and standard deviation of financial metrics is problematic due to a lack of historical figures. An objective risk identification is, hence, not feasible. (Damodaran, 2009)

4.2.1.2 Measurement and illiquidity pitfall

Multiples need to be based on common metrics such as EBITDA, EBIT or Net Income. However, most start-ups by definition are loss making during the early stages of their lives and, therefore, most financial indicators are negative. Alternatively, multiples on Sales are not recommendable due to their small and fluctuating size. Cash Flows are most certainly negative during early stages and, hence, not useful either. To sum up, multiples based on negative metrics cannot be used for a meaningful valuation. Besides, start-ups are not readily tradeable and, thus, the illiquidity negatively effects valuation. As previously mentioned, equity financing rounds with multiple diverging terms also need to be factored in. (Damodaran, 2011)

4.2.1.3 Survival and timing factor

An additional factor of risk has to be added to start-ups to appropriately consider the heightened probability of failure. As a result, start-ups should be discounted more heavily to reflect the limited probability of survival. As the median multiple reflects the risk of failure of the peer set of publicly traded companies, this additional discount is inevitable. However, the underlying question remains on how to identify an appropriate level of discount. In this context, no universal answer can be given as it requires an assessment on an individual basis and strong approximations without any general guidelines available. In addition, the

median multiple is based on the comps set' average development stage, whereas the start-up is only in the very beginning. It can take years until the start-up reaches the median development level of the peer set. During this time, market conditions and multiples can deviate significantly (van Schootbrugge and Wong, 2013).

The Multiple method is known for its fast and simple usability. However, it is not appropriate for the valuation of start-ups. The above-mentioned limitations such as to find a proper peer set, non-existent useful common metrics or additional risk adjustments clearly show that application of the multiples is accompanied with a vast amount of additional layers of complexity and uncertainty (Damodaran, 2011). Accordingly, the output can only be seen as a very rough approximation and its usefulness for start-up valuation is more than questionable.

4.3 Transaction method

The transaction method is based on the premise that the value of a firm can be predicted by examining the average prices which are paid for similar companies. It is related to the Multiple approach, except that analyzing precedent transactions gives a better understanding on premiums paid to gain control of newly acquired companies. This refers to the control premium paid within transactions and, consequently, transaction multiples are typically higher than trading multiples based on peer set (Vernimmen et. al., 2014). Therefore, the price implies any synergies and premia paid for respective companies. Generally, the transaction method allows to gain deeper insight on

i. multiples and control premiums paid within an industry and
ii. how other participants value private market transactions.

Advantages	Disadvantages
• Public information • Certain level of plausibility of Multiples as precedent transactions were successfully placed in the market • Trend identification such as consolidating acquisitions, foreign direct purchases, more financial buyers active compared to strategic ones	• Public data might be limited and misleading • Market conditions might have strong impact on valuation (e.g. consider industry specific business cycles, overall competitive environment, demand for scarce asset) • Multiples do not capture softer value aspects such as commercial agreements or corporate governance issues

• Identification of very active players in the market e.g. who acts as consolidator or is highly acquisitive • Analysis of market demand for various asset types • Identification of frequency of transactions and their respective multiples	• Limited applicability in case of highly fluctuating multiples • Every single transaction has its unique aspects and limits direct comparability of various transactions

Table 3: Pros & Cons of Transaction Method (Vernimmen et al., 2014)

Precedent transactions require a thorough knowledge of the industry and the assets involved. In a valuation context, the most comparable transactions should be studied in detail to understand the underlying circumstances of a specific valuation multiple.

The selection of precedent transactions should follow the below guideline criteria:

i. Industry characteristics and financial metrics
   Sector or financial attributes of precedent transactions need to be comparable to the underlying company under review.
ii. Size consideration
   Comparable transactions in terms of similar size are more relevant than significantly larger or smaller deals.
iii. Transaction related characteristics
   Understanding the particularities of each precedent transaction is crucial in order to form a relevant benchmark. Attributes such as underlying market conditions, domestic vs. cross-border transaction, full auction vs. privately negotiated deal, and financial vs. strategic buyer need to be scrutinized in detail. Hence, each of these characteristics influence the value of the deal and might therefore bias the overall benchmark construction.
iv. Time
   The more up-to-date the transactions, the more appropriate the benchmark.

4.3.1 Limitations

Similar to other relative valuation methods, precedent transactions possess various deficiencies, which hinder their usefulness for the valuation of start-ups. Some of the most striking limitations include:

4.3.1.1 Disposability of transaction data

Damodaran (2009) highlights that start-ups need to be valued based on comparable private companies. However, transaction multiplies are only available for publicly traded

companies, whereas share purchases of start-ups are held behind closed doors through private transactions. More importantly, financial information of start-ups is only made accessible to private investors and not to the general public during financing rounds. To sum up, sensitive financial information of start-ups is rarely available and, similarly, the final investment injected by an investor for a stake in company is publicly announced only in rare cases. As a result, private transactions multiples cannot be used for start-up valuation due to a lack of data availability.

4.3.1.2 Infrequency and locational particularities

Compared to deals with publicly traded companies, private transactions only take place infrequently. As discussed previously, timing constitutes a critical factor in the selection process of precedent transactions. Thus, tracing multiple comparable private transactions within a specific time frame can be very challenging if even feasible at all. Moreover, for instance the U.S. is known for its very active scene of young business ventures and, as a result, coverage of transaction is mainly focused on the U.S.. In contrast, sophisticated databases for European counterparts are only partially available. As valuation is also heavily dependent on the geographical presence of ventures, a valuation of e.g. a European start-up based on U.S. companies cannot guarantee valid outputs in terms of multiples. (Damodaran, 2009)

4.3.1.3 Measurement and illiquidity pitfall, again

Similar to the Multiple method, precedent transactions require common metrics such as Sales or EBITDA. Though, these metrics are either non-existent or negative and result in meaningless output. Thereto, current financial metrics of a start-up cannot be considered as appropriate indicators of any future potential of the young venture. Accounting distortions throughout to the bottom of the income statement only magnify the already existing issues. Additionally, as start-up stakes are privately negotiated with investors, current valuations of equity claims rely heavily on Cash Flows and current control rights while always considering the illiquidity of the underlying business. Even a simple side-by-side analysis between two start-ups in the same industry is hardly possible due to diverging control right mechanisms negotiated during various financing rounds.

As for the Multiple approach, precedent transactions are not an appropriate tool for start-up valuation. The limitations are multi-faceted and do not produce an objective valuation output. Traditional valuation methods commonly used for mature and publicly traded companies, therefore, indicate their impracticability within the young venture valuation framework. In a next step, further valuation techniques commonly known to be more appropriate for its applicability on start-ups will be scrutinized in detail (Damodaran, 2011).

5 Review of alternative valuation methods for start-ups

A research conducted by Black (2003) clearly highlights that Cash Flows should be preferred over earnings, as it constitutes a better measure for the valuation of start-ups. Nevertheless, it is important to note that earnings, cash flow and book value of equity are likely to change over the full life cycle of a young venture (Black, 2003). Consequently, valuation methods appropriate for start-ups attempt to circumvent the previously described issues and are based on the following key characteristics:

i. Short time horizon:
   Intrinsic methods such as DCF are based on long-term predictions, whereas start-ups cannot be predicted accurately over a longer time-span due to their high level of uncertainty involved. A forecasted time horizon of more than three to five years has only limited meaning.

ii. Mix of relative and intrinsic valuation:
   In order to avoid any one-sided valuation outputs, a healthy mix of different intrinsic and relative valuation methods might be judicious. Exemplary, instead of valuing the terminal value based on an arbitrary figure into perpetuity, exit multiples based on publicly traded comparable companies might turn out to be a more sensible and reliable approach.

iii. Little financial information:
   Due to a lack of historical financials and the difficulty to come up with reliable predictions, many venture capital valuation techniques solely rely on high-level figures such as top-line revenue or bottom-line earnings (Damodaran, 2009).

iv. Risk and discount rate:
   Start-ups imply higher risk levels not only because of a lower probability of survival, but also due to increased earnings volatility, enhanced pressure to macroeconomic cycles, funding and cash burn rate concerns and the uncertainty of success regarding their binary business model (Knaup and Piazza, 2007). All these issues have to be reflected in an elevated discount rate to accurately account for the inherent risk involved.

5.1 Venture Capital method

As mentioned during the analysis of traditional valuation techniques for start-ups, it represents a difficult task to project future cash flows for Venture Capital portfolio companies. Hence, the income approach aka Discounted Cash Flow analysis is usually not applied as primary valuation method for young ventures. In the same line, a market approach aka Relative Valuation techniques lack comparable companies to estimate an appropriate benchmark price multiple by virtue of start-ups' unique characteristics. Moreover, the application of replacement cost approaches is just as inappropriate as the previously mentioned methods. As a result, alternative approaches such as the venture capital method or real option analysis seem to be the most suitable substitutes to gain reasonable valuation outputs (CFA Institute, 2016).

5.1.1 Theoretical framework of the venture capital method

The two fundamental concepts within the venture capital framework are pre-money (PRE) valuation and post-money (POST) valuation. An investor makes an investment (INV) in an early-stage venture. At the point in time of the new investment, the discounted present value of the projected exit value, PV(exit value), represents the post-money valuation. The value before the investment is conducted, calculated by post-money valuation minus the actual investments, is called pre-money valuation.

$$POST = PV(exit\ value)$$

$$PRE = POST - INV$$

The post-money valuation of the investee company is:

$$PRE + INV = POST$$

To determine the number of new shares, $shares_{VC}$, to be issued by the company to the venture capitalist, the fraction of the total company value (post investment), which is represented by the actual investment, needs to be calculated. The calculation can be conducted via two separate methods but result in the same value. The ownership fraction (f) of the venture capital (VC) investment based on the two approaches, NPV and IRR, is:

First approach, the NPV method:

$$f = \frac{INV}{POST}$$

where:

INV = amount of new investment

POST = post-money valuation after the investment

$$POST = \frac{exit\ value}{(1+r)^n}$$

Second approach, the IRR method:

$$f = \frac{FV(INV)}{exit\ value}$$

where:

FV(INV) = future value of investment in first round at projected exit date

Exit value = company valuation upon exit

The fractional ownership required (f) amounts to the same value as long as the same compounded discount rate is applied to compute the present value of the exit value and the future value of the investment.

Once we have computed (*f),* it can be proceeded with calculating the number of shares issued to the investor based on the total number of existing shares belonging to the founder prior to the investment.

$$shares_{VC} = shares_{Founders}\left(\frac{f}{1-f}\right)$$

The actual price per share for the investment is simply calculated by the total investment divided by the number of new shares issued.

$$price = \frac{INV}{shares_{VC}}$$

In the case of multiple rounds of financing, we have to work backwards to induce the initial investment value. Subscripts 1 and 2 are used to differentiate between the multiple investment rounds and, hence, denote financing round one and two, respectively.

In the event of a second round of financing (INV_2), we use the NPV method to compute the new fractional ownership (f_2) and the new number of shares required ($shares_{VC2}$):

$$f_2 = \frac{INV_2}{POST_2}$$

Where $POST_2$ represents the present value of the company at the time of the second round of financing, which is the post-money value after the second round of investments.

$$POST_2 = \frac{exit\ value}{(1 + r_2)^{n_2}}$$

and

$$PRE_2 = POST_2 - INV_2$$

As a next step, $POST_1$ represents the present value of the company at the time of the first round of financing, which is the post-money value after the first round of investments.

$$POST_1 = \frac{PRE_2}{(1 + r_1)^{n_1}}$$

As previously presented, the fractional ownership of the first-round investment (f_1) can be determined by applying the NPV method:

$$f_1 = \frac{INV_1}{POST_1}$$

The number of new shares to be issued to the investor in return for the first round of financing and its respective price per share can be computed as follows:

$$shares_{VC1} = shares_{Founders}\left(\frac{f_1}{1 - f_1}\right)$$

$$price_1 = \frac{INV_1}{shares_{VC1}}$$

The number of new shares to be issued to the investor in return for the second round of financing and its respective price per share can be computed as follows:

$$shares_{VC2} = (shares_{Founders} + shares_{VC1})\left(\frac{f_2}{1 - f_2}\right)$$

$$price_2 = \frac{INV_2}{shares_{VC2}}$$

Typically, the second round of financing is considered to be less risky as the business venture already survived for a longer time period. As a result, it is legitimate to use a lower discount rate when calculating the present value of the exit value during the second financing round (CFA Institute, 2016).

5.1.2 Alternative methods to account for the risk within the VC framework

The venture capital method is highly dependent on the assumptions initially made. Sensitivity tables are a necessity to reasonably evaluate and determine changes in input and their respective implications on the output valuation. Small changes especially for the

discount rate and terminal value assumptions have significant influence on the overall valuation.

Entrepreneurs tend to be overly optimistic in their projections and normally do not even consider the possibility that their venture might fail. Instead of arguing with the entrepreneurs, investors simply apply a higher discount rate to cover not only the probability of failure, but also the overestimated projections in order to balance the final outcome (CFA Institute, 2016).

5.1.2.1 Adjusting the discount rate

To account for the increased level of risk, the discount rate can be adjusted to accurately reflect the potential risk of failure of the venture. This application results in more realistic valuation levels.

$$r^* = \frac{1 + r}{1 - q} - 1$$

where:

r* = adjusted discount rate

r = unadjusted discount rate (not considering any probability of failure)

q = probability of failure

In an alternative approach, the investor could also have deflated all future cash flows in order to level off the cumulative probability that the venture might fail.

Damodaran (2009) highlights that target rates of return of venture capitalists are based on start-ups' current stage in their life cycle and follows the below guidelines:

Development stage	VC target rate of return
Start-up stage	50% - 70%
First stage	40% - 60%
Later stage	35% - 50%
Bridge / IPO stage	25% - 35%

Table 4: Development Stage and VC Target Rate of Return (Damodaran, 2009)

5.1.2.2 Adjusting the terminal value via the application of scenario analysis

Generally, the future earning levels are projected and multiplied by an industry multiple to eventually arrive at the terminal value. As discussed multiple times, there are not any companies truly comparable to early stage companies so that only a biased multiple can be

utilized. Additionally, as price multiples highly fluctuate due to current market conditions, they are only a limited indicator of any future value, which can be derived. Scenario analysis can constitute some form of relief by reflecting the probability of different terminal values under multiple assumptions.

In essence, VC valuation is heavily dependent on the underlying assumptions and how risk has been taken in account. Sensitivity and scenario analysis provide remedy to better understand the final valuation ranges.

Notably, the aim of the venture capital method is not to derive one true value, rather, it gives some bounds on the value of a company before initial negotiations between investors and founders take place. Any final value agreed on and paid for is particularly conditional on the bargaining power of the respective parties involved (van Schootbrugge and Wong, 2013).

5.1.3 Limitations

The Venture Capital Method was specifically designed to eradicate the detrimental aspects of traditional valuation methods during the application for young business ventures. Nevertheless, the method received some criticism, as its approach might be considered not intricate enough to reach a certain level of sophistication.

5.1.3.1 Top-line and bottom-line focus with the exclusion of cash-flow items

The venture capital particularly focalizes on revenue and earnings and, hence, start-ups will try to push the projections to the very upper limit. Capital expense all along the income statement will be scaled down in order to inflate any potential positive earning to the maximum extent. Contrary thereto, venture capitalists and investors try to enforce the exact opposite dynamics. As a result, the venture capital method constitutes more of an allegory of two opposing forces rather than an objective, dispassionate evaluation of the *status quo*.

Moreover, the venture capital method does not assume any interim cashflows and only perceives the initial investment and final exit. Hence, no money outflow such as dividends is considered. Clearly, this matter of fact constitutes a major downside of the method, especially, as investors are more willing to invest in high-risk ventures if interim cash flows aka dividends are returned to the capital providers (Damodaran, 2011).

5.1.3.2 Infelicitous multiples and uncertainty matter

As previously discussed, sensitivity and scenario analyses help to establish value ranges rather than single valuation outputs. However, the terminal value or final exit value is still derived via the application of multiples based on publicly traded comparable companies. Without applying a discount on the multiple, the start-up would be assumed to be of equal

risk as the mature and well-established peer set. In addition, the multiples are based on current market conditions and market sentiment and might be overly high and low at the point of calculation. To be more precise, the underlying valuation should be performed at the point in time when the multiple is used. The cash flows are highly unpredictable and cannot be accurately predicted for this future time period. Consequently, the level of uncertainty is not minimized by the venture capital method (van Schootbrugge and Wong, 2013).

5.1.3.3 Discount rate assimilation

During the discussion on alternative methods to account for the additional risk, it was tried to mitigate the critical issue of any risk consideration. However, the venture capital method is based on the required rate of return desired by the investors. This target rate already accounts for the likelihood of failure. The approximated discount rates demanded by venture capitalists are excessively high and are considerably more than the normal discount rate should be (Damodaran, 2009).

A general valuation fundamental states that the discount rate is based on cost of capital rather than on any equity investor's demand. Downward-adjusting the discount rate during follow-on financing rounds, as previously discussed, at least accounts for the minimized probability of failure, as the venture continues to operate and becomes more and more mature. The adjustment follows the recommendation that the risk and, hence, the discount rate should be modified along the life cycle of a business venture (Damodaran, 2009).

As previously highlighted by Damodaran (2009), different discount rates are applied depending on the life cycle stage of the start-up. However, venture capitalists utilize these reference values without considering the underlying investment in detail. A different discount rate should be applied conditional on the probability of potential success. Complementary thereto, an in-depth analysis of the industry and the business model used by the company is critical and triggers further refinements on the final discount rate. Capital-intensive start-ups, with a profound asset base, may retrieve higher liquidation quotes than business models solely built on intellectual property. A uniform discount rate without a thorough reflection of these additional factors severely distorts the valuation and, hence, does not accurately represent the actual intrinsic value of the venture.

5.1.3.4 Misconception of equity investments and any potential dilution

The post-money valuation does not proportionally increase with the injection of new equity capital. Rather, it depends on the usage of said investment. In case the company sees the fresh capital as a mere tool to refinance itself or pay out other investors, it does not

necessarily increase the post-money valuation of the company. To be accurate, the venture should deduct the amount from the post-money valuation as only investments made to directly benefit the company itself, such as capital expenditures or additional funds available for working capital requirements, increase the valuation of the venture via the extra cash flows generated through the capital injection (Damodaran, 2009). Nevertheless, the magnitude in change of discount rate between the financing rounds is highly discretionary and subjective.

With each additional round of financing, former investors might face dilution, which drastically lowers their stake in the company. Specific anti-dilutive clauses are implemented in legal documentation to mitigate the level of dilution for older investors. Admittedly, the venture capital method only vaguely considers dilutive effects and, hence, this fact severely reduces the accuracy and verisimilitude of the method under review.

Further, the Venture Capital Method significantly reduces the problem areas inherent to traditional valuation methods. Admittedly, this partially repatriates to the lessened complexity of the venture capital valuation methodology. Nevertheless, the method does not deliver a sustainable approach to systematically diminish the uncertainty involved with start-up valuation.

5.2 First Chicago method

The First Chicago method was first introduced by Sahlman and Scherlis (1987) in their article “A method for valuing high risk long term investments: the venture capital method” and was then first applied by First Chicago Corporation’s venture capital group. The method considers multiple pay-out ratios dependent on three scenarios in order to value the average, expected cash flow of new business ventures. Moreover, it allocates different probabilities of success or failure to the individual scenarios and consequently uses a lower expected discount rate.

The venture capital method does not consider any probability of success in its approach and simply assumes the same relative cash flows, especially under the liquidation scenario, for every start-up, whereas the scenario probability allocation is one of the cornerstones of the First Chicago Method. Additionally, depending on a start-ups’ capital intensity, the respective discount rate used by the venture capitalist should vary accordingly.

The main advantage of the method is the reflection of possible outcomes of a start-up and its outlook on how it might evolve. Thus, it provides a better view on the company’s overall potential compared to the DCF or the venture capital method. Additionally, to some extent it covers the imbedded value of real options through the application of various scenarios.

A major downside of the DCF lies in the fact that it only suggests a single outcome. To balance the low probabilities of survival for young ventures, very high discount rates are applied in the DCF. However, the First Chicago Method builds on that by addressing the risk via the application of three different scenarios, namely Success, Sideway and Failure:

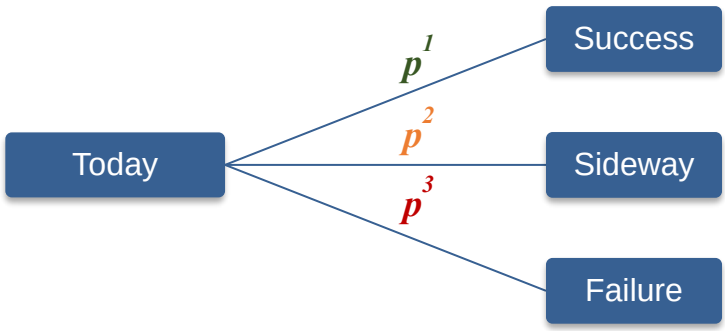

Figure 6: First Chicago Method Scenarios (Sahlman and Scherlis 1987)

$$Enterprise\ Value = \sum_{i=1}^{3} p^i\ Valuation^i$$

i. Success scenario:

The First Chicago method presumes that a yearly dividend is distributed to investors and that investors are willing to dispose their stake in the company at listing on a stock exchange. As a result of multiple financing rounds, the final investor stake cannot be determined *ex ante*. However, the total value is calculated by the addition of accrued dividends and any potential terminal value depending on the ownership level held in the company. As previously mentioned, the First Chicago Method inherits three scenarios; contrary thereto, the venture capital method is very limited in its approach as it only considers a single scenario - a success scenario.

ii. Sideways scenario:

The sideways scenario assumes only an average successful business endeavor and, hence, the company only distributes yearly dividends. An IPO does not take place in this average risk scenario. Nevertheless, investors might be able to divest the investment via a privately negotiated sale, an additional financing round or the sale of the company to a strategic or financial buyer.

iii. Failure scenario:

The failure scenario is conterminous to a worst case, in which the business venture slides into bankruptcy. In this scenario, the recovery amount is highly conditional on the capital intensity and level of outstanding liabilities and can, therefore, vary significantly.

Instead of using discount rates as high as 70%, one can capture the risk of failure of mediocrity. Clearly, the DCF calculated for the best-case scenario significantly surmounts the value extracted from a single DCF computation. However, the higher scenario output is offset by a low probability in the case of success.

$$Valuation^i = \frac{TV^i}{(1+r)^h} + \sum_{t=1}^{h} \frac{CF_t^i}{(1+r)^t}$$

i	index of scenario
h	Time to exit
T	Terminal Value
CF	Cashflow

5.2.1 Limitation

The First Chicago method with its multiple scenarios approach appropriately reflects the uncertainty involved in the level of Cash Flows within early stage ventures. Contingent on the risk involved in each of the scenarios, the First Chicago Method can specifically adjust the underlying discount rates and Cash Flow levels for each respective scenario and, hence, more accurately and faithfully reflects the true investment valuation. Nevertheless, the method entails a major downfall as the method calculation needs to be repeated for each expected round of financing to eventually maintain the required rate of return. More specifically, for each investment round, the investor's required ownership, retention rate and number of shares have to be recalculated to overcome this stumbling block (Sahlman and Scherlis, 1987). Please note that the overall discount rate used, however, will roughly stay the same, as it is not based on financing decisions, but rather on the inherent business risk of the company in its entirety.

5.3 Damodaran method

Damodaran (2009) introduced further refinements to the traditional Discounted Cashflow method to increase its applicability for young business ventures, either using a top-down or bottom-up approach. In general, the top-down approach is based on the following principles.

i. **Cash flow prediction**

   The total market potential constitutes the basis to derive the market size for a specific product or service. From there on, future cash-flows can be predicted. In particular, growth is dependent on market acceptance, competitive landscape, availability of financing and its inherent risk (Goldman, 2008).

ii. **Market share**

   To reflect an appropriate market share in the future, it is reasonable to make a side-by-side comparison between the start-up and the established players in the market in terms of market share and product quality. Moreover, management team quality and capabilities are main dimensions in start-up valuation (Damodaran, 2009).

iii. **Opex**

   Key metrics from established players in the market can reasonably be assumed for the steady state of financial forecasts. However, the initial way in terms of expense levels and margin retention towards the steady state is highly uncertain to predict accurately. The level of granularity should be decreased gradually the longer the

projections are estimated in the future as uncertainty is getting more prevalent (Damodaran, 2009).

iv. Capex

Capital expenditures are a necessity for any future growth to be realized. Moreover, incremental revenue or an increased profitability are equally unlikely without any corresponding investment in growth via capital expenditures. However, Capex is always seen negative by business ventures as it constitutes straight cash outflows. A classical mistake in financial forecasting is when revenues grow significantly faster than its investments in assets and any related expenses. Founders are often seen to estimate dramatically too low reinvestment rates in their business plans. Generally, reinvestment rate is a lagging indicator as it needs some time that the initial investment realizes some incremental revenue (Damodaran, 2009).

v. Tax situation

Tax carry-forward agreements allow start-ups to delay tax payments to the government until profitability kicks in. Negative earnings are brought forward until they can be netted with positive results (Damodaran, 2009).

In contrast, the bottom-up approach is based on firm-specificities, in which revenue is forecasted only as the last step. Typically, the bottom-up approach delivers more conservative projections and is mainly applicable for business ventures with constraints based on financial or human capital related limitations (Damodaran, 2009)

5.3.1 Discount rate approximation

As traditional discount rate approximations are not applicable to start-ups, Damodaran (2009) recommends the following procedure:

i. cost of equity should include both, market and firm specific risks, as start-ups are primarily owned by completely undiversified owners;
ii. cost of debt is not appropriately measurable by rating as start-ups typically have no outstanding bonds. Moreover, banks generally factor a premium charge on interest rates to accurately reflect the inherent riskiness of the business venture; and
iii. venture capitalists' target rates are not appropriate as they specifically account for an ongoing bankruptcy risk and are generally to high.

In contrast thereto, Beneda (2003) proposes the following alternative valuation approach to estimate the discount rate of young business ventures:

i. **Cost of Debt**

The cost of debt is estimated via the risk-free rate plus a default risk spread. The risk-free rate is typically based on a long-term (e.g. 30 years) treasury bond yield rate. The default risk spread is generally dependent on the credit rating of the underlying companies. In most cases, start-ups are not yet rated and, hence, Beneda (2003) recommends to approximate the rating of start-ups to derive a reasonable default risk spread.

ii. **Cost of Equity**

The capital asset pricing model (CAPM) is utilized for the cost of equity approximation. The risk-free rate is the same as within the cost of debt framework. Market excess returns are derived from historical excess returns from small firms over the government bond yield. Beneda (2003) proposes the value disclosed by service providers (e.g. Compustat or Value Line) for similar start-ups who recently went public to approximate Beta in an appropriate way.

iii. **Market value of debt**

According to Beneda (2003), the most valid approximation of the market value of debt is based on the book value of debt of the most recently disclosed balance sheet of the company.

iv. **Market value of equity**

For Start-ups the market value of equity is approximated via the most recent book value of equity on the balance sheet. Alternatively, Beneda (2003) suggest to use the equity value established during the last equity financing round.

5.3.2 Terminal value calculation

Terminal value constitutes an even bigger part for start-ups compared to traditional, established companies. Above all, since an even larger stake of earnings rests in future years. As relative valuation multiples are inappropriate for start-ups, Damodaran (2009) proposes three alternative ways for terminal value calculations:

i. **Perpetual growth**

This method assumes that cash flows grow into perpetuity and is most suitable for established start-ups, which follow the path of being acquired by a strategic player or aim for an initial public offering.

ii. **Growth assumptions**

In cases in which a perpetual growth is too optimistic, the terminal value can be projected by a summation of the present value of cash flows within the survival period.

iii. **Liquidation**

At the end of the projection period, a hypothetical liquidation is assumed in which the terminal value is calculated based on the salvage value of the assets. Companies with only limited operating licenses are predestined for the liquidation method.

5.4 Real option method

Traditional valuation methods have been proven to be too static and do not offer any flexibility to appropriately reflect the uncertainty inherent to start-ups. The managerial flexibility of decision-making and its concurrent unpredictability of its respective cash flows cannot be captured within a rigid framework such as the Discounted Cashflow method. However, real options offer exactly this flexibility needed to expand, contract, defer or reallocate investment decisions in order to account for the volatility of cash flows. (Alexander & Chen, 2012) Timing, scale and scope of any investment can be decided on a discretionary basis so that it represents a value additive investment opportunity. (Benaroch, 2001)

5.4.1 Option valuation

The real option method accounts for the downsides of traditional valuation methods, allows for incorporating multiple scenarios and possesses the following characteristics:

i. **Underlying asset**

The higher the value of the asset, the higher the value of the respective call option. Inversely, put options become more expensive the steeper the decline in the underlying asset value.

ii. **Variance of underlying asset**

The higher the volatility of the underlying asset, the higher the intrinsic value of both call and put options. In general, higher volatility allows for an enhanced profit opportunity, as the downside is limited to the initial option price.

iii. **Dividends**

Any dividend issuance reduces the value of call options, whereas it has a positive impact on the value of put options.

iv. **Interest rate**

A hike in interest rates constitutes a positive implication on the value of call options and negatively impacts the put option value.

v. **Strike price**

The higher the strike price, the less expensive the option in question, as it takes more appreciation for the option to be in the money. Conversely, the higher the strike price, the more expensive the option as the in-the-money area can be achieved easier.

vi. **Expiration date**

The longer the time period until final expiration, the higher the intrinsic value of the option as it gives the option an extended time frame to produce positive payoffs.

Increase in …	Change in call option	Change in put option
Underlying asset	Increase	Decrease
Variance of underlying	Increase	Increase
Dividends	Decrease	Increase
Interest rate	Increase	Decrease
Strike price	Decrease	Increase
Expiration date	Increase	Increase

Table 5: Overview on changes in option values

5.4.2 Two option valuation methods

1. *The Cox-Rubinstein formula*

The binominal option pricing theory or binominal lattice, also known as Cox-Rubinstein formula, represents the most simplistic discrete approach to value options: it only allows any asset to either move in two directions, up or down, during any time period. (Arnold & Crack, 2004).

2. *The Black-Scholes formula*

Black Scholes (1972) is based on a continuous approach for European option valuation with the assumption that prices remain within a normal distribution. The Black & Scholes approach is recognized as one of the most recognized and widely-used option valuation techniques as it possesses a flexible nature, is relatively simple to use and is based on risk neutral probabilities.

5.4.3 Limitation and applicability

The downside of real option valuation needs to consider several factors in order to gain a holistic view of the valuation technique in question. Real options are limited to growth opportunities that are not captured by the current cash-flows as the normal growth is already embedded in the cash-flow growth. More precisely, real options should only be used selectively in cases in which the option value cannot be reflected within the normal cash-flow growth (Damodaran, 2009). Research shows that options are particularly interesting for start-ups with patents pending (Lin and Herbst, 2003). More interestingly, options allow for the flexibility that management amends its decisions during any development stages and accurately reflects the exclusivity and adaptive nature within the option premium (Banerjee, 2003). Moreover, option volatility highly influences the option value and, hence, any final start-up valuation. Interestingly, volatility within an industry varies up to 80%, whereas the weighted-average cost of capital is typically within a 15% bandwidth. Accurately estimating the inherent volatility constitutes a major obstacle and cannot be assessed with a highly predictive power (Benninga and Tolkowsky, 2002).

5.5 Valuation of Intangibles

Currently, many technologically inclined start-ups possess only a limited amount of real assets on the balance sheet. Most of their value is derived from intangible assets. To recognize intangible assets, three main conditions are required: identifiability, control over a resource and existence of future economic benefits. Intangible assets can be divided into the following segments (Kothari et al., 2013).

i. marketing (e.g. names)
ii. customer (e.g. customer lists)
iii. contract (e.g. royalties)
iv. technology (e.g. software)
v. patents, copyrights, and trademarks
vi. franchise licenses or government licenses
vii. goodwill

In general, intangibles can either be created internally or purchased from the market with varying term periods of a finite or infinite life span. Most of the time, intangible assets of start-ups are developed internally as function of its technology-based role of innovative market disruptor. The below-listed methods are applicable to value intangibles:

5.5.1 Market based valuation method

Comparable transactions in the market are analyzed to appropriately determine the applicable royal rate (Kothari et al., 2013). In any case, identifying a comparable for tangible assets is difficult and even more so for intangibles. More interestingly, start-ups often take on the role of an innovative disruptor in their respective industries by creating a new market where hitherto no market existed before. In such case, how is possible to find comparables for a non-existent market?

5.5.2 Cost based valuation method

Two main methods are utilized within the cost-based framework, namely the “cost to create” and the “cost to replace” approach. The “cost to create” method is based on historical costs and takes into account any direct or indirect costs needed to develop the intangible asset. However, no real consideration is reflected in terms of specific know-how needed to come up with the innovative idea, which constitutes a major downside. In contrast, the “cost to replace” method focalizes on the value needed to reproduce the technology in question. Admittedly, neither method considers the potential growth opportunities and future value added via the technologies and, hence, does not adequately reflect the inherent value of the intangible asset (Goldman, 2008).

5.5.3 Income-based valuation method

Future earnings will be attributed to a specific intangible and projected over its lifetime. The present value of the forecasted earnings constitutes the value of the intangible asset (Kothari et al., 2013). More precisely, within the “relief from royalty” framework, a royalty stream of a willing buyer is capitalized to reflect the intangible value. Obviously, market sentiment and overall supply and demand directly influence the value of the intangible, which stays in direct contrast to the previous discussion between valuation and pricing. Nevertheless, the income-based approach most accurately resembles inherent free cash-flow generation and, hence, is a valid valuation tool for intangible assets.

5.6 Cayenne Consulting Calculator

Cayenne Consulting LLC has developed a set of 25 questions which outputs a pre-money valuation range for early stage companies in the seed and start-up phase. More specifically, Cayenne Consulting titles it ‘High Tech Start-Up Valuation Estimator’. As it is mainly used for investment purposes, the questions also indicate cases in which no sufficient progress has been made to justify a certain investment level. The valuation range is not restricted to a specific amount and, hence, valuations between $480k and more than $40m are possible. It is recommended that entrepreneurs answer the questions in a first attempt as conservatively as possible to receive a minimum valuation level. In consecutive steps, they can answer the questions using different scenarios such as worst case, realistic case or best-case assumptions. The full questionnaire can be found in the appendix, below you can find some sample questions used within the framework (Cayenne Consulting, 2018):

My product or service will:

- Have some novelty value (i.e., there is only minor demand for the product in the marketplace)
- Make life a bit easier or more enjoyable for many people, but not solve any fundamental problems (i.e., a "nice to have" but not a "must have" for most buyers)
- Help a lot of people or companies do what they do a bit better, faster, and cheaper (i.e., the product addresses a fairly substantial need in the marketplace)
- Save lots of lives and/or money (i.e., the product is urgently needed in the marketplace)

My primary competitors (others who are competing for the same consumer dollar by satisfying the same consumer need) are:

- Nonexistent, since customers are not spending money to satisfy the need that I think they have
- Large companies with big R
- D and marketing budgets and existing distribution channels (i.e., I'm entering a mature industry dominated by large competitors)
- Other startups that I may or may not know about (i.e., I'm entering a fairly new market being explored by other startups)
- Substitutes (e.g., the word processor is a substitute for the typewriter, which in turn is a substitute for pen and paper - in other words, what I offer is new and doesn't have a direct competitor yet, but customers have other ways to satisfy these needs)

If a Fortune 500 company decided to put their resources behind competing with my startup tomorrow, my startup would be:

- ○ Toast
- ○ Happy that the market is being validated by a major player, but would have to settle for a smaller market share
- ○ Able to stay a step ahead through innovation, agility, and speed
- ○ Delighted to partner with them and license our proprietary technology to them, since there's no way they can get in this market without infringing on our rock-solid patents

My revenues over the next 12 months are expected to be:

- ○ $0-$999,999
- ○ $1,000,000 - $4,999,999
- ○ $5,000,000 - $9,999,999
- ○ $10,000,000 or more

The Cayenne Consulting Questionnaire is particularly useful for pre-revenue companies. Using the calculator while already generating first revenues might produce lofty valuation levels, which are not representative and/or unrealistic. Nevertheless, the Cayenne method is highly regarded among entrepreneurs, especially as it produces valuation at the upper end of the range.

5.7 Dave Berkus Valuation Model

D. Berkus (2016) famously said: “Pre-revenue, I do not trust projections, even discounted projections”. In particular, Berkus highlighted the fact that his valuation method is specifically created for early stage ventures as a way to detect a starting point without being dependent on the financial projections of founders. The methodology focuses on the primary drivers for value between Seed and Series A stage ventures.

A graphical representation of the Dave Berkus Model for a start-up valuation is set forth below:

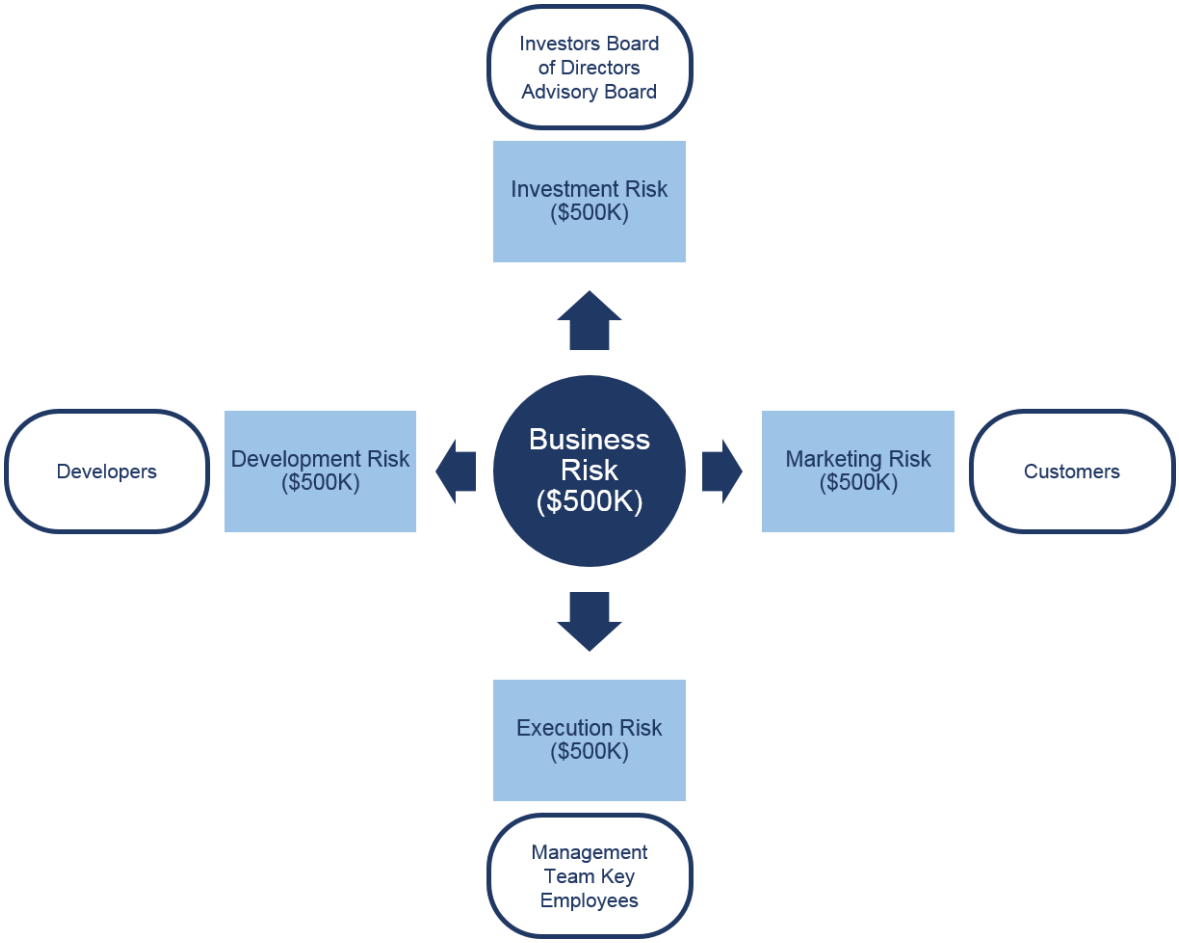

Figure 7: Start-up Enterprise Valuation Framework (Berkus, 2016)

Please note that the maximum amount per item is limited to $500,000, which provides a boundary for a subjective assessment in the respective key areas. Hence, the maximum valuation can reach $2.5 million pre-money.

More specifically, the Berkus Method is based on both qualitative and quantitative factors to generate a valuation based on five key elements:

If exists	Risk mitigation	Add to company value (max. per item)
Sound Idea	basic value	$500,000
Prototype	reduces technology risk	$500,000
Quality Management Team	reduces execution risk	$500,000
Strategic Relationships	reduces market risk	$500,000
Product Rollout or Sales	reduces production risk	$500,000

Table 6: Berkus valuation model guidelines (Berkus, 2016)

5.8 Bill Payne's Model (Scorecard Valuation Method)

The Scorecard Valuation Method, also known as the Bill Payne Model, is one of the most commonly used methodologies by business angels. The method compares the target start-up (raising investment) to typical angel-funded ventures and adjusts the median valuation based on specific comparison factors such as team strength, size or product. More importantly, due to its regional applicability, the model adapts itself to the market conditions in any given region as the peer set is selected based on recently funded ventures in the area.

In his book "The Definitive Guide to Raising Money from Angels" Bill Payne highlights that his method focuses on the main aspects of a new venture's challenges and opportunities by allocating a value to each. More precisely, the Scorecard Method assigns individual weighted percentages based on various quantitative and qualitative factors per categories to obtain an appropriate start-up valuation. Bill Payne's model consists of four consecutive steps:

i. Calculating the average industry pre-money valuation
ii. Assigning the individual weights to the item set
iii. Allocating comparison factors to the percentage weights
iv. Multiplying the factor sums (Payne, 2011b)

5.8.1 Calculating the average industry pre-money valuation

The first step requires a determination of the average pre-money valuation for newly established ventures. Angel groups tend to examine pre-money valuations across regions as a good baseline. Bill Payne surveyed 13 angel groups in 2010 based on a Scorecard Valuation Methodology Worksheet, indicating a pre-money valuation range between $1M-$2M. Naturally, competition may differ between regions, which might lead to higher valuations and data skewness towards the upper range of data points. A median value discovered during Payne's research was $1.5M, which also constitutes the base pre-money valuation in his model (Payne, 2011b).

5.8.2 Assigning the individual weights to the item set

Comparison factor	Weights	Key questions
Strength of the Entrepreneur and the Management Team	0-30%	**Impact** Experience **+** Many years of business experience **++** Experience in this business sector **+++** Experience as a CEO **++** Experience as a COO, CFO, CTO **+** Experience as a product manager **-** Experience in sales or technology **---** No business experience **Impact** Willing to step aside, if necessary, for an experienced CEO **---** Unwilling **0** neutral **+++** Willing **Impact** Is the founder coachable? **+++** yes **---** No **Impact** How complete is the management team? **-** Entrepreneur only **0** One competent player in place **+** Team identified and on the sidelines **+++** Competent team in place
Size of the Opportunity	0-25%	**Impact** Size of the target market (total sales) **--** < $50 million **+** $100 million **++** > $100 million **Impact** Potential for revenues of target company in five years **--** < $20 million **++** $20 to $50 million **-** > $100 million (will require significant additional funding)
Strength of the Product and Intellectual Property	0-15%	**Impact** Is the product defined and developed? **---** Not well defines, still looking a prototype **0** Well defined, prototype looks interesting **++** Good feedback from potential customers **+++** Orders or early sales from customers **Impact** Is the product compelling to customers? **---** This product is a vitamin pill **++** This product is a pain killer **+++** This product is a pain killer with no side effects **Impact** Can this product be duplicated by the others? **---** Easily copied, no intellectual property **0** Duplication difficult **++** Product unique and protected by trade secrets **+++** Solid patent protections
Competitive Environment	0-10%	**Impact** Strength of competitors in this marketplace -- Dominated by a single large player **-** Dominated by several players **++** Fractured, many small players **Impact** Strength of competitive products

		-- Competitive products are excellent **+++** Competitive products are weak
Marketing/Sales Channels/Partnership	0-10%	**Impact** Sales channels, sales and marketing partners **---** Haven't even discussed sales channels **++** Key beta testers identified and contacted **+++** Channels secure, customers placed trial orders **--** No partners identified **++** Key partners in place
Need for Additional Investment	0 – 5%	**+++** None **0** Another angel round **--** Need venture capital
Other	0 – 5%	**++** Positive other factors -- Negative other factors

Table 7: Bill Payne's Scorecard Valuation Method (Payne, 2011b)

Please note that the ranking of the factors is highly interchangeable and subjective in its nature. However, Payne highlights that "in building a business, the quality of the team is paramount to success. A great team will fix early product flaws, but the reverse is not true." Consequently, major emphasis in his method is on the team aspect, together with the overall scalability of the underlying project (Payne, 2011b).

5.8.3 Allocating comparison factors to the percentage weights

These steps require in-depth sector knowledge as they rely on professional judgment of allocating a specific comparison percentage weight to the venture. For example, in case the product and its underlying technologies significantly stand out compared to its peers, assigning a weight of 150% might be considered reasonable (Payne, 2011b).

5.8.4 Multiplying the factor sums

The last step only requires the multiplication of the percentage weight with the comparison weight to receive the final factor weighting. An example of the method's application can be found below.

Comparison Factor	Weight (in %)	Comparison (in %)	Factor = (WxC)
Strength of Entrepreneur and Team	30%	100%	0.3000
Size of the Opportunity	25%	125%	0.3125
Product/Technology	15%	150%	0.2250
Competitive Environment	10%	80%	0.0800
Marketing/Sales/Partnerships	10%	100%	0.1000

Need for Additional Investments	5%	100%	0.0500
Other Factors (Great Location)	5%	125%	0.0625
SUM			**1.1300**

Table 8: Bill Payne's Factor Multiplication Approach (Payne, 2011b)

To sum up, a key ingredient of the Scorecard Method is an excellent knowledge of the average of pre-money valuation of comparable pre-revenue start-ups in a region. Subsequently, the Scorecard Method allows angels to subjectively apply techniques to further refine the valuation of a target venture for early stage rounds of investments.

5.9 Risk Factor Summation Method

The Risk Factor Summation Method focuses the investor's attention on the various risk types involved in a specific venture and forces to reflect on all risks involved to create a reasonable exit within the scheduled time frame. Generally, the larger the total number of risk factors, the higher the overall risk. In terms of priority, management risk is considered to be the major risk factor and needs the largest amount of time for scrutinization (Semenchuk, 2017).

Figure 8: Risk Factor Summation Model (Semenchuck, 2017)

In terms of value, a base valuation level of $1.5 million constitutes a starting point, in which each respective risk is individually evaluated while increments of $250k are either added or subtracted from the initial value. An expert valuator assesses the risk items according to the following outline:

- +2, if extremely positive for the growth and performance of the company
- +1 if positive
- 0 Neutral
- -1, if negative for the growth performance of the company
- -2, if extremely negative

Hence, a maximum of +/- $500k per risk element can be allocated to the final enterprise value (Semenchuk, 2017).

5.10 Replacement Method or “All-in” Method

A common reasoning of founders and entrepreneurs is that their venture is worth, at a minimum, the collective amount of all ‘replacement costs’.

Exemplary, if two executives have worked for three years without any pay, and everyone would typically have been receiving $250,000 salaries had they simply continued their previous occupation, then the new business venture is worth at least $750,000 pre-money. In addition, the entrepreneurs put the value of all assets on the balance sheet, plus additional money granted but not yet funded on top of the above calculation.

The National Angel Capital Organization, formerly known as the National Angel Organization, published in “Age of the Angel: Best Practices for Angel Groups and Investors” that all the money and effort spent is only past input and has no reflective implication on the allure of any prospective investors. Put simply, entrepreneurs must not mix up input and effort, which is similar to sunk cost, with output and results, which creates additional value. Some entrepreneurs are guided by the maxim that says that past effort is comparable to the runway just past when landing an airplane, whereas only the runaway ahead really matters (National Angel Capital Organization, 2015).

5.11 Rule of Thirds

This valuation technique allocates 1/3 of a new venture's equity to Founders, 1/3 to the management team via option pools, and 1/3 to Seed Stage investors. The rule of third is commonly used as sanity check for other valuation methodologies. The rule of thumb is often cited with the statement that those investors who are bold enough to invest in a new

business venture deserve to own one third of it, regardless of the sector or any potential future dilution.

One downside of the method constitutes the fact that following the above logic, post-money valuation increases by 3x for every additional dollar provided by investors. Clearly, entrepreneurs are inclined to raise as much capital as possible, irrespective of the actual cash needs. Additionally, an allocation of 1/3 for the management team significantly overweighs the initial option pool during Series A funding rounds. One of the greatest positive aspects of the rule of thirds lies in the fact that a founding team often refuses to give up more than own third to external business angels or venture capitalists. Naturally, these reference values have strong implications on any pre-money valuations negotiated between the different parties (Venture Choice, 2018).

5.12 Rule of “Development Milestone”

In an attempt to increase the level of “quantification” in the assessment of a pre-money valuation, during Seed Stage some more sophisticated investors try to estimate the total cash needed to accomplish certain major development milestones. Regardless of the total amount, the investors equate it to up to 60% of fully diluted, post-money valuation (Venture Choice, 2018).

6 Case Study

"The world's largest accommodation provider, Airbnb, owns no property."

McRae, 2015

The story of Airbnb began in 2008 when Brian Chesky and Joe Gebbia (Nathan Biecharczyk joined slightly later) were unable to pay the outstanding rent for their property. To resolve the issue, they built a simple webpage with a map and offered three mattresses to rent with breakfast included: AirBedandBreakfast.com was created. During its beginnings, the founders used the money received from selling cereal boxes to further improve the website and arranged photographers to take high-resolution pictures of the apartment to stimulate click-rates (Phillips and Kulkami, 2017).

Airbnb's rising star led many industry experts to label the company as a technological disruptor. There is no doubt that Airbnb disrupted the travel and in particular the lodging industry. However, slowly but steadily the labelled "disruptor" moves into mainstream. Nowadays, Airbnb has more than 5 million listings in more than 81,000 cities in 191 countries (Euromonitor International and Geerts, 2017).

Only very few companies in the private-tech segment have the disruptive innovation potential and growth track comparable to Airbnb. Previous financing rounds indicate an implied valuation of Airbnb higher than most major players in the travel and lodging industry. Long-established hotel chains (e.g. Hyatt and Hilton), airline companies (American Airlines and United Airlines) and travel operators (e.g. Expedia) appear to be less valuable than Airbnb, despite the fact that Airbnb does not even own a single asset (Phillips and Kulkami, 2017).

2018 was highly speculated to be the year of Airbnb's IPO. Latest rumors indicate that an initial public offering might take place slightly later. Nevertheless, the overarching question is still yet to be solved: What is the value of Airbnb?

In this case study, we are going to have a closer look at the evolution of Airbnb over time. In particular, an in-depth analysis of Airbnb's business model, its revenue potential and coherent risks is conducted. This framework constitutes a solid foundation to tackle the valuation quest of Airbnb ahead of its expected IPO in the near future.

6.1 Company Overview

Key facts		
		• Founded in 2008, Airbnb is still a privately-owned company • Airbnb is an online marketplace, facilitating private accommodation bookings between hosts and guests • The company operates a pay-per-booking model, charging a 3% fee to the host and anywhere from 6% to 12% to the guest on the value of the booking • As of April 2018, the company has more than five million listings in over 191 countries • In total, Airbnb has arranged over 300 million guest arrivals since its inception in 2008 • Even though lodging constitutes the core activity, Airbnb is on the lookout for peripheral services • Airbnb has raised cumulatively $4.5bn capital since 2008
Headquarters:	San Francisco, USA	
Regions:	Global	
Industry:	Short-term rentals	
Short-term rentals market share:	23.6% (Global, 2017)	
Lodging market share:	2.8% (Global, 2017)	

Table 9: Key Facts Airbnb (Euromonitor International and Geerts, 2017)

As of April 2018, the top markets in terms of listings are: London, New York, Rio de Janeiro, Los Angeles, Barcelona, Rome, Copenhagen, Sydney, and Amsterdam. Currently, Airbnb has nearly 3,000 castles and 1,400 treehouses in its portfolio with 19 offices globally. New Year's Eve 2017 was Airbnb's record date with 3 million stays booked via the platform (Airbnb, 2018).

6.2 Sharing Economy Principle

The sharing economy principle is currently disrupting many different industry sectors. The largest taxi provider, Uber, does not own cars. The most widely known social media firm, Facebook, does not create any content. The largest retailer, Alibaba, does not carry any stock. Airbnb, the largest accommodation service provider, does not own any properties. The below graph constitutes a representation of sharing economy players in selected verticals who disrupted their respective industries (McRae, 2015):

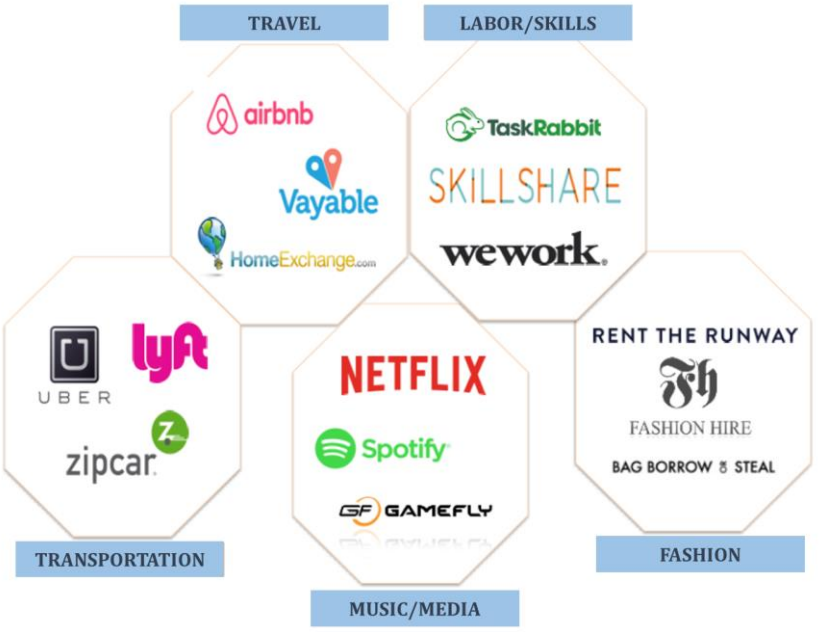

Figure 9: Sharing Economy Players in Select Verticals (Rao and Wolff, 2016)

The sharing economy is based on a peer-to-peer economy that has evolved to enable buyers and sellers to easily transact business between each other. In particular, it allows sharing of human and physical resources, in which it includes collaborative consumption of services and goods of shared ownership. No services or goods will be directly provided to individuals, rather more it connects buyers and sellers. Hence, this business model has tremendous growth potential due to greater worldwide connectivity (Rao and Wolff, 2016).

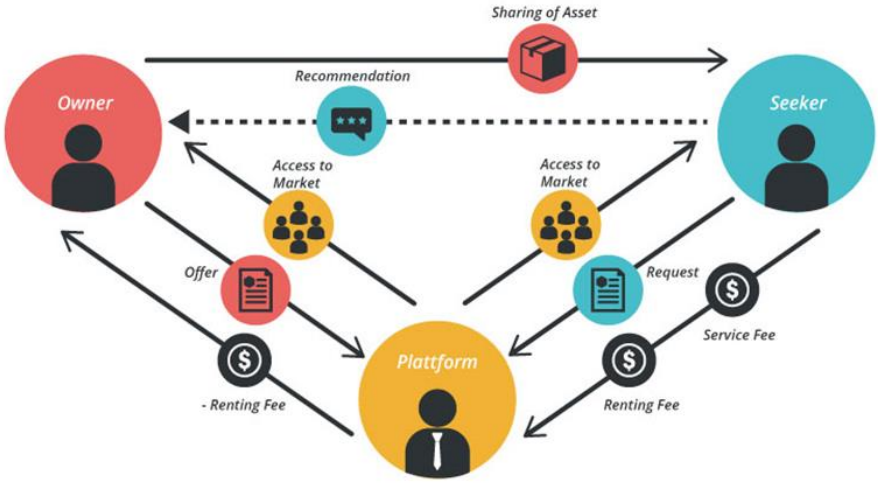

Figure 10: Sharing Economy (Business Model Toolbox, 2018)

Airbnb is based on a subset of the sharing economy principle, in which a two-sided online platform simplifies the process of private home bookings across the globe. In short, Airbnb facilitates sharing in a commoditized manner. On one side, it allows owners to list their private space and be compensated with rental income. On the other side, Airbnb provides travelers access to millions of listings of private rental spaces (Rao and Wolff, 2016).

6.3 Business Model Canvas

The Business Model Canvas discussed in following chapter includes nine building blocks as shown in the following figure:

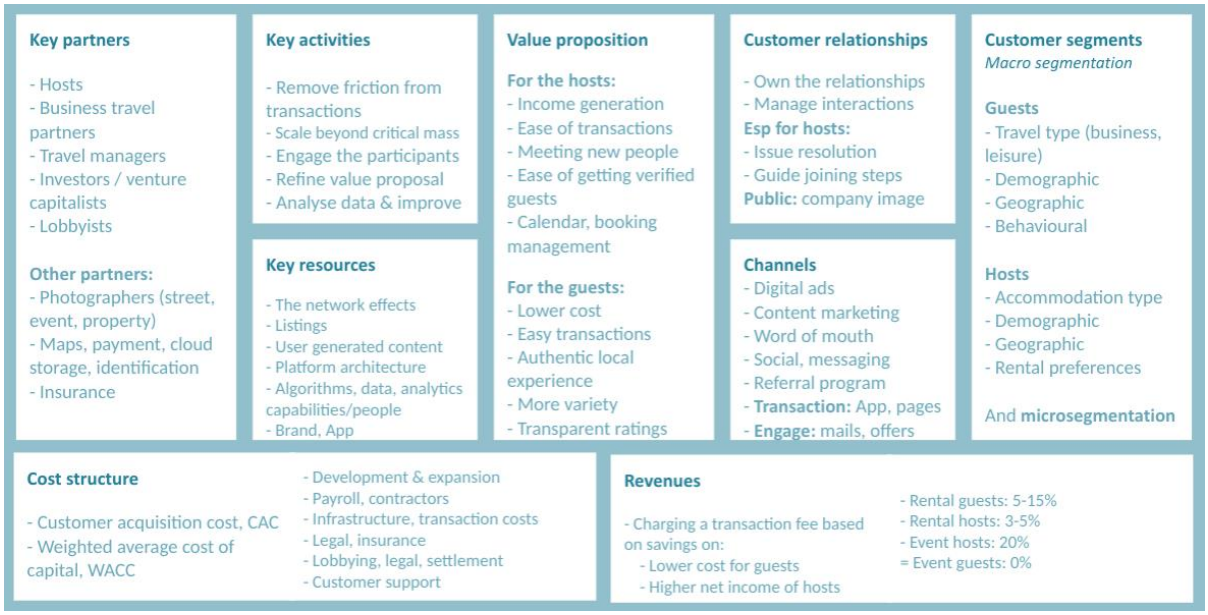

Figure 11: 9 Building Blocks of Business Model Canvas (Uenlue, 2017)

6.3.1 Mission statement

"Airbnb connects travelers seeking authentic experiences with hosts offering unique, inspiring spaces around the world."

(Uenlue, 2017)

6.3.2 Key partners

Key partners are not easily replaceable. They contribute significantly to the success of the company and influence its future trajectory.

i. **Hosts** constitute the supply side of the two-sided Airbnb platform via providing their rental spaces. A critical mass of supply is necessary to attract travelers. Hosts can be divided into two separate groups:

   a. **Rental hosts**, who provide rental spaces such as houses, condos, rooms, or more exotic accommodation, such as tree houses or castles

   b. **Event hosts,** who offer local experiences such as food, fashion, nightlife or art events

ii. **Investors** (including venture capital firms) provide the necessary funding depending on the current stage of the start-up. The funds are needed to unfold the full potential of the business idea by developing the functionality or algorithms or simply by helping to acquire customers for the platform.

iii. **Lobbyists** are essential on two different fronts. Firstly, lobbyists can be utilized to push for favorable legislative actions. Secondly, lobbyists can be employed to ward off adverse measures of other lobby groups (e.g. the hotel lobby group might start an action to push for a ban of Airbnb).

iv. **Corporate travel partners** allow Airbnb to significantly increase the user group by offering business travel arrangements via alliances with Flight Center or Concur.

v. **Corporate travel managers** have a high level of discretion to decide which suppliers of accommodation are in compliance with corporate travel policies. Confirming with such policies drastically increases the user base. Particularly, early adopters can act as role models for fellow peers (Uenlue, 2017).

Non-critical partners offer Airbnb various options to choose from and are highly replaceable without incurring much additional costs (Uenlue, 2017).

i. **Freelancing photographers** are hired to provide professional photos of listed rental spaces to increase click-rate. Even if all photographers in partnership decide to terminate current contractual obligations, new ones can be hired easily.

ii. **Cloud storage providers, maps services and payment platforms** are vastly available and, hence, do not possess a significant level of leverage to negotiate.

iii. **Insurance companies** are critical to have, but highly interchangeable as, in fact, they constitute easy-to-replace commodities by now.

Airbnb's strategy is also based on acquiring small tech players which eventually could end up being key resources in case they significantly contribute to the company's growth (Uenlue, 2017).

6.3.3 Key activities

Network effects constitute the competitive advantage of platform business models, with positive network effects reciprocally improving the underlying platform (Uenlue, 2017).

i. Boost positive network effects between hosts and guests by attracting additional users to join

ii. Decrease negative network effects by making the host-guest process more efficient

iii. Expand the platform by adding new cities or providing complimentary offers

iv. Increase stickiness of users on both ends (high level of occupancy for hosts and engaging additional offerings for guests)

v. Use data to ameliorate every step in the process chain (e.g. fine-tune the check-in based on guest feedback received)

vi. Remain faithful to the customer proposition

6.3.4 Key resources

Network effects are key activities and key resources at the same time. Exemplarily, hosts not only provide the rental space, but also voluntarily offer recommendations on what to do in their respective cities. This indirect collaboration enhances positive network effects. Key resources include *inter alia* (Uenlue, 2017):

i. Rental spaces offered

ii. Events offered

iii. Network effects

iv. Content provided by the hosts

v. Data received and its underlying algorithm

vi. Website and app including sufficient traffic to perform data mining

vii. Human capital employed

viii. Brand image and value

ix. Access to sufficient funding via debt and equity capital markets

6.3.5 Value proposition

A two-sided platform can only survive if it provides sufficient value to both ends, the host and the guest, respectively. Airbnb is capable to create value on three different layers (Uenlue, 2017):

i. Individualized experience: Hotels try to reach a level at which quality is delivered in the same way all around the world. Any individuality is therefore lost. Airbnb can provide this uniqueness via its personalized host-guest relationship right from the beginning.

ii. Connecting the community: Quality of offering is constantly improved through the increasing user base, allowing every member a perfect fit to his desired rental preferences

iii. Regional influence: Offering events at the respective destinations allows for true local experience for guests

Additionally, Airbnb has a certain set of rules for minimum hospitality standards, including hosting guidelines on important topics such as neighbors, hazards or safety. Dispute resolution can be processed via Airbnb to allow for a standardized settlement process. All these measures enable common standards and quality results on a global scale (Uenlue, 2017).

6.3.6 Customer segments

On a two-sided business platform, customers can be found on both sides. A macro-level view results in a classification of rental hosts or event hosts only, or the combination of both via bundling offers. One level deeper, guests can be differentiated by travel type, demographic, income bracket or interest. Hosts are classified by the location of rental space, type of accommodation provided and location type (e.g. metropolitan, suburb or countryside). Based on an individual profile and previous search requests, the underlying algorithm delivers only listings appropriately fitted to the targeted person (Uenlue, 2017).

6.3.7 Customer relationships

Managing the relationship vis-à-vis customers is key to maintain a high retention rate and not lose any customers to hotel chains or travel operators. Consequently, certain requirements are immensely important and produce certain quality standards (Uenlue, 2017):

i. Appropriate and timely dealing with customer issues

ii. Managing risks and inappropriate behavior (e.g. housing trashing guests or harassing hosts)

iii. Keeping personal data confidential

iv. Reflecting company image via traditional and social media platforms

As two-sided business platforms, which provide only an intermediary function, are relatively new, a full transparent public opinion is yet to be formed and, hence, can be influenced in a positive way to receive an appreciative customer's view on the platform. As a result, Airbnb has to showcase the economic and social footprint of the platform, proactively

interact with communities to emphasize the positive communal impact, manage company image across the media landscape and prevent negative incidences from spreading. Airbnb established its Airbnb newsroom, Airnbnb Citizen, Airbnb Facebook presence and news articles on sustainable travel to strengthen the public opinion in an affirmative manner (Uenlue, 2017).

6.3.8 Channels

Customer acquisition and initial awareness are the main output delivered via different channels coverage. Traditional and digital ad campaigns, content marketing via the Airbnb newsroom, simple word of mouth recommendation and free media coverage based on innovative platform integrations are reasonable channels to interact with the public crowd. Automated processes such as e-mails or push-notifications engage and stimulate participation and are a necessity to keep a high level of customer retention (Uenlue, 2017).

6.3.9 Cost structure

Airbnb possesses multiple layers of capital and operating expenditures. Some of the costs are passed on to the clients through the different fee structures applied on hosts and guests. However, the most important costs include (Uenlue, 2017):

i. Referral credits, advertising expenditures, cost of customer acquisition
ii. Enhancement of algorithm and addition of innovative features to the platform
iii. Costs related to the expansion to new city and countries
iv. Salary of existing workforce
v. Infrastructure costs such as cloud storage or bandwidth
vi. Regulatory compliance costs
vii. Insurance and legal settlement costs
viii. Lobbying costs
ix. Customer support

6.3.10 Revenue

6.3.10.1 Reservation process in detail

After paying the initial listing fee, a host can list his apartment on Airbnb. Once a traveler has found a suitable property, he can proceed with the booking by paying the fees including booking charges upfront. The booking request is sent to the host for confirmation. After check-out, the host receives his share reduced by incurred hosting fees (Agriya, 2017).

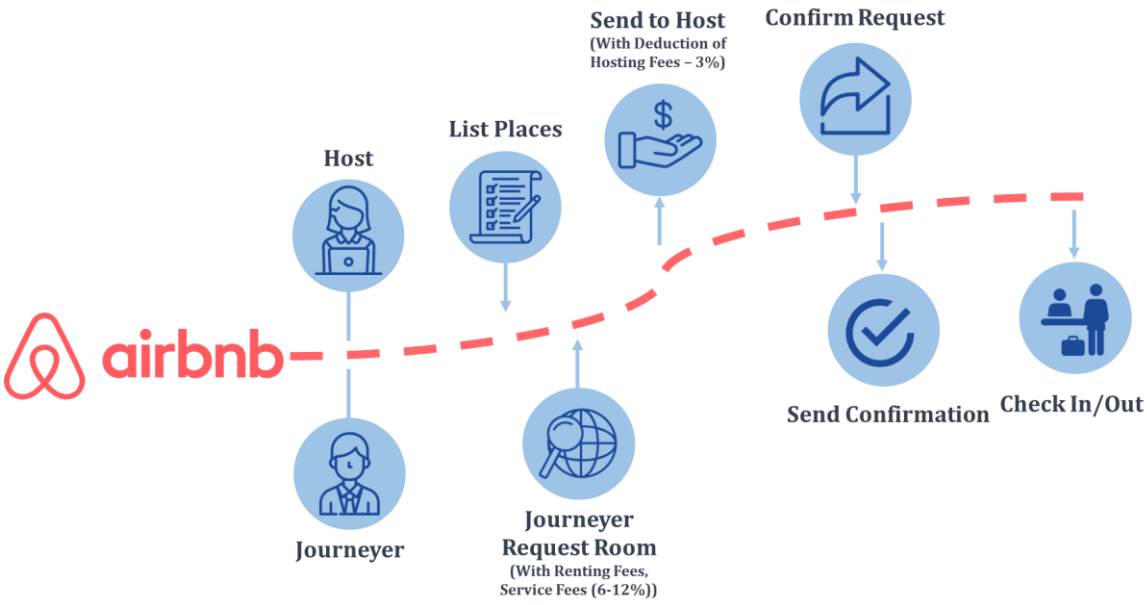

Figure 12: Airbnb's Streamlined Workflow Model (Agriya, 2017)

6.3.10.2 Revenue generation

Airbnb generates revenue from both, hosts and guests, for providing its services. Depending on the length of the stay, guests pay on average a 6 − 12% service charge for each reservation. The larger the size of the booking, the higher the cost savings for the traveler. Airbnb reasons that this fee model allows groups and families to save money for other travel-related expenses. The service charge is primarily imbedded to cover the cost for keeping the room check-in ready. In contrast, hosts incur a 3-5% service charge to cover payment processing. Individual profiles of hosts display the property, show important information related to it and include a review and rating system based on previous guests. Eventually, hosts decide whom to rent out their space via the final confirmation of any booking request (Rao and Wolff, 2016).

The above-mentioned fees incurred on the host and guest constitute the primary revenue sources for Airbnb. This revenue model allows Airbnb to perform account arbitrage, in which travelers prepay their stay a couple of months ahead of time, while hosts only receive their money after check-out. Consequently, Airbnb can use the time-gap between the cash in-

and outflow to increase the capital via other forms of investments. Besides, Airbnb already spread its wings to diversify and generate some additional revenue via offering of excursions, restaurant reservations and corporate travel arrangements (Rao and Wolff, 2016).

On a general level, Airbnb has the following pricing model:

- Rental guests pay 5-15%
- Rental hosts pay 3-5%
- Event hosts pay 20%
- Event guests pay 0%

However, some quite interesting findings on Airbnb's pricing model are set forth below (Rao and Wolff, 2016):

i. It can be seen that guests have to pay a fee, which is 2-3 times higher than the one for hosts. This is highly interrelated to supply and demand and its respective incentive scheme. While there are only a limited number of hosts available and willing to rent a spare room or apartment (= scarce resource), the demand side, the guests, is easily obtainable and anyways incentivized via lower costs compared to traditional hotel booking.

ii. Rental hosts pay a 3-5% fee dependent on the strictness of their cancellation policy. A flexible cancellation fee is the most guest friendly and desired option and, hence, equipped with a 3% fee. The more stringent the cancellation policy, the higher the respective fee for the host. Clearly, hosts also miss out on customers who only book based on flexible cancellation policies. However, in case a rental space is highly popular, a strict cancellation scheme should be unproblematic.

iii. Guest service fee ranges between 5%-15% and is mainly oriented on the lower end. The higher the total transaction value, the lower the respective fee. The reasoning behind this simply shows the fact that fixed costs per booking remain the same for a low and high value transaction.

iv. Event fees on the other hand are only imposed on hosts as there is a very high supply of hosts available and each additional booking constitutes an incremental income for the host.

6.3.10.3 Cost recoveries

Some of the costs incurred by Airbnb are directly forwarded to the customers. Exemplarily, Google paid search costs are passed over to the hosts. Hosts can decide to refrain from participating in the Google scheme. However, the search engine will not list the respective property in this case. Additionally, professional photographers can be hired to take state-of-the-art pictures of the rental space. Airbnb provides the photographers, though, hosts must settle any incurred costs. Cleaning personal according to Airbnb standards can be arranged via Airbnb, but must be paid by the host in any case (Uenlue, 2017).

6.3.10.4 Cost comparison

Financial observations allow to conclude that Uber provides a very similar value proposition compared to traditional taxi companies. However, Airbnb deviates in its value proposition quite significantly compared to a traditional hotel offering. Thus, a simple cost comparison based on price does not appropriately capture the holistic nature of the additional added value (Uenlue, 2017).

6.3.10.5 Cost base for hosts

In any case, an accommodation listed on Airbnb has to be less expensive (including any incurred additional fees) compared to a tradition hotel offering. In order to accurately evaluate the appropriate cost base, we have to consider different cases of host accommodations:

i. **Rooms** – only a single room is rented out with shared amenities for kitchen, living room and bathroom. Two typical cases apply:
    a. The host never intended to rent out a single room via a classical rental scheme. In this case, the rental charges demanded are straight additional income
    b. In case the host rented the room out, the main desire is to achieve higher income via Airbnb listings compared to the classical rental model. Obviously, Airbnb rentals incur a minimum level of servicing after each guest's stay and, hence, a higher workload in relation to a simple long-term rent agreement.
ii. **Houses or apartments** – the above-stated reasoning is equally applicable for houses and full apartments. Most of the time, a house or an apartment is rented out in case the homeowner is away and, thus, wants to receive some incremental income.

Clearly, this discussion shows that it is essential to understand the motivation of hosts to be willing to list rental spaces on the Airbnb platform. More importantly, it demonstrates that thinking goes beyond pure financial considerations. Interestingly, the overarching question remains whether a platform is capable to generate a sufficient amount of cumulative value so that it still able to extract enough value for itself. The cost base of hosts and guests is the crux of the revenue matter for Airbnb (Uenlue, 2017).

6.4 Investment opportunities

6.4.1 Alternative lodging is a fragmented market with great growth potential

Nowadays, home-sharing applications such as Airbnb possess tremendous scaling and revenue potential, with the capabilities to disrupt multiple sectors concurrently. The global travel and tourism sector is estimated to be worth $2 trillion. Travel accommodations are valued in the range between $650 and $700 billion, with a clear, secular trend towards online booking channels and away from traditional, offline alternatives (Phillips and Kulkami, 2017).

Current estimates stipulate that approximately 10-15 percent of all travel accommodations are occupied via home-sharing, but only 5 percent of potential shared-home listings are online. Both developments offer Airbnb huge future potential and opportunities to further gain market share (Phillips and Kulkami, 2017).

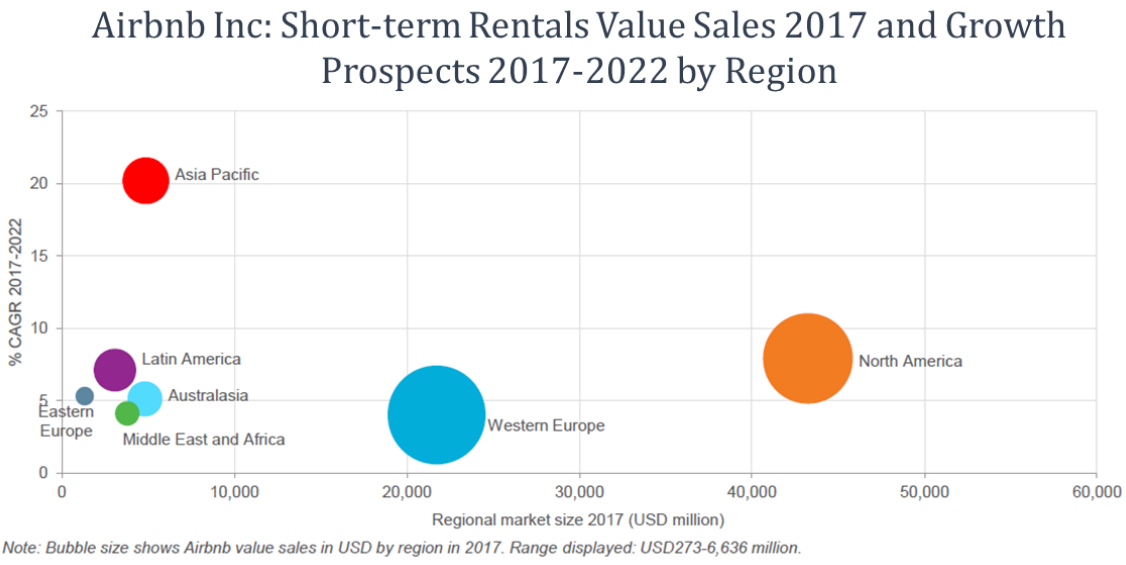

Figure 13: Regional Performance (Euromonitor International and Geerts, 2017)

In terms of Airbnb's regional performance in the short-term rental market, it can be clearly seen that North America and Europe constitute the largest markets. However, the Asia

Pacific region offers huge future upside potential as indicated by the highest 2017-2022 CAGR. In particular, China shows massive potential as Airbnb is still trying to find its place, with Tuija, the local competitor, currently outshining Airbnb in the Chinese market. Latin America, by now a relatively small market, also offers great growth opportunities compared to an already saturated European market (Euromonitor International and Geerts, 2017).

6.4.2 Airbnb benefits from substantial secular and demographic tailwinds

Home-sharing applications exploit secular trends at an intersection between the travel, mobile and technology industries. Complementary thereto, favorable demographic and cultural changes are paired with behavioral modifications associated with an increasing millennial population (Phillips and Kulkami, 2017).

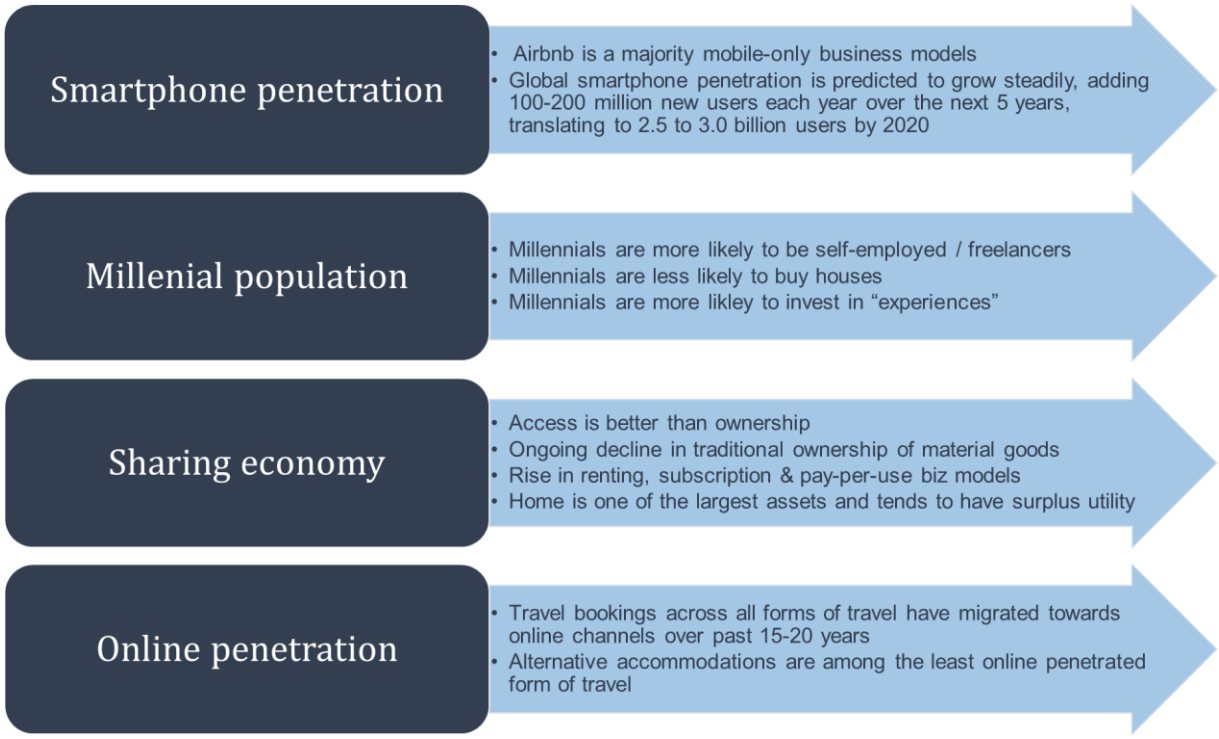

Figure 14: Secular & Demographic Tailwinds (Phillips and Kulkami, 2017)

6.4.3 Cities and property values experience a net positive effect

Recent research shows that an average Airbnb guest not only spends more time in the city, but also lives a much more local experience. Essentially, the savings made from the less expensive Airbnb rents flow directly back to local economies. Therefore, there is increasing evidence that the net effects of the value added by Airbnb on cities and property values are incrementally positive.

Additionally, Airbnb discloses not only rental prices and service fees, but also taxes and the real competition in a certain area. Consequently, investors can receive a more accurate view on a location's potential and implied valuation before moving ahead with any

acquisition. Eventually, Airbnb has increased transparency and efficiency in the market and opened it up for a truly global audience (Rao and Wolff, 2016).

6.4.4 Airbnb benefits from reciprocal network effects of the two-sided platform

In sum, Airbnb severely benefits from positive network effects that supports driving substantial growth and allows creating barriers to entry. Increasing marketplace activity establishes barriers to exit and, thus, is a key driver for loyalty (Phillips and Kulkami, 2017).

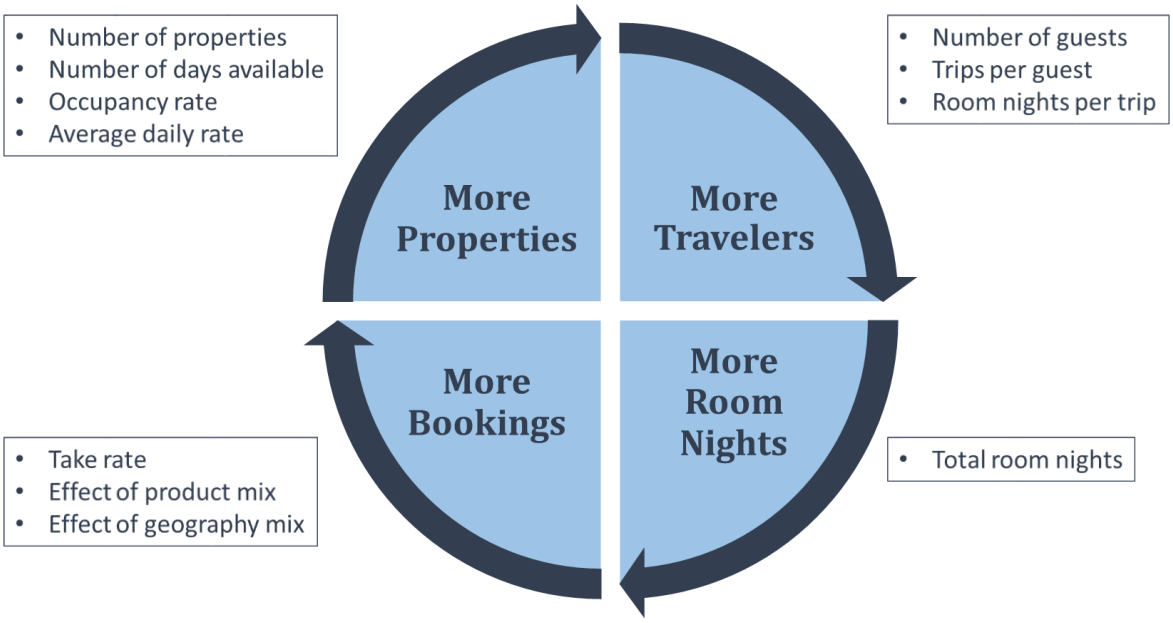

Figure 15: Airbnb "Marketplace" Network Effects (Phillips and Kulkami, 2017)

6.4.5 Airbnb faces several greenfield investment possibilities

Naturally, Airbnb focuses to expand its geographic footprint, surge its total number of users on the platform and increase its listing density. However, incremental revenue growth opportunities include *inter alia* an implementation of core travel bookings (e.g. airlines and hotels), further integration of corporate travel bookings, online advertising, subscription offerings for hosts, expansion to emerging markets and further tourism adjacencies such as entertainment activities (Phillips and Kulkami, 2017).

6.4.6 Airbnb has an excellent management team

The core founding team of Airbnb is still intact and has vital roles in the company. Hence, Airbnb remains a founder-led, VC-backed start-up with a team of seasoned and highly experienced co-founders (Phillips and Kulkami, 2017).

6.5 Investment risks

6.5.1 Airbnb faces strong competition from OTAs and hotel chains

"We spent the last 15 to 20 years wiring up independent and branded hotels. Now we are just wiring up all these vacation homes."

Dara Khosrowshahi, Expedia CEO asked on vacation-rental business

Primary components of the competition in alternative accommodations are the network size, inventory pricing and brand recognition. Over the last few years, large OTAs such as Priceline and Expedia have increased their focus towards alternative accommodation types via aggressive acquisition strategies. Nevertheless, it is reasonable to assume that Airbnb can maintain its leadership position and competitive advantage due to its strong brand awareness in the near to medium future (Phillips and Kulkami, 2017).

Figure 16: Airbnb Current and Potential Competition (Phillips and Kulkami, 2017)

6.5.2 Uncertainties of Airbnb's regulatory environment

As is the case with Uber, regulatory uncertainties for Airbnb vary depending on different geographies. The two overarching questions constitute a) is it legally viable that private persons rent out their spare rooms in exchange for money, and b) might a regulatory structure be necessary to handle any occupancy tax levied (Phillips and Kulkami, 2017)?

In essence, regulatory frameworks lag any innovation and, hence, disruptive tech companies always face legal troubles and uncertainties. By now, Airbnb follows a very cooperative regulatory stint, signing more than 275 tax agreements with governments across the globe. Clearly, Airbnb pushes for acceptance within the economical and political frameworks of cities and countries, respectively. In 2017, Airbnb collected more than $240 million in taxes, emphasizing the willingness for cooperation with tax authorities and positioning itself next to instead of opposite any policymakers in charge (Euromonitor International and Geerts, 2017).

6.5.3 High price competition and price sensitivity in online travel

Within the travel decision-making process, price sensitivity remains the most decisive factor. The lower price found on platforms such as Airbnb is the top reason for switching from traditional hotel lodging to private home rental spaces (Phillips and Kulkami, 2017).

6.5.4 Marketing expenditure weighs on Airbnb's profitability potential

Online travel agents spend a significant amount of their variable operating expenses, often more than 60%, for marketing efforts. Airbnb's long-term cost structure and margin levels are still unproven to be sustainable and, hence, at least debatable. The increase in brand awareness is one of Airbnb's necessities to experience the needed growth level, but dampens profitability quite considerably (Phillips and Kulkami, 2017).

6.5.5 Airbnb faces marketplace management risk

Airbnb has only limited power to influence the final consumer experience and its respective quality. In this regard, Airbnb is highly dependent on the performance of its hosts. Negative experiences are almost impossible to avoid and cannot be reversed retrospectively. In any case, Airbnb has to balance demand-side and supply-side incentives via its pricing policies and ongoing innovation of the product portfolio. Over-monetizing issues are strictly to be prohibited to avoid any conflict potential (Phillips and Kulkami, 2017).

6.5.6 Travel sector remains in aggressive consolidation mode

Historically, the travel sector has always been very active in terms of consolidation. In the U.S. only three major airlines are active with United, Delta and American. The ten biggest car rental companies are owned by only three companies with Hertz, Enterprise and Avis. In the lodging space, more than 80 hotel brands are owned by less than eight firms. An even more aggressive consolidation trend can be seen in the online travel sector with two companies standing out from the crowd with Priceline and Expedia. Airbnb's latest acquisitions were mainly product-, technology-, or people-driven (i.e. "acqui-hires"). In any

case, acquisitions entail significant integration risks and mostly influence EBITDA and margins negatively in the short-term (Phillips and Kulkami, 2017).

6.6 Competitive Positioning

As Airbnb is operating in the short-term rental process, it creates blurry boundaries between being a lodging provider or an intermediary. Thus, Airbnb is often seen as a direct competitor to traditional hotel chains and OTAs (i.e. Online Travel Agents) such as Booking.com or Expedia. Besides the rental business, Airbnb is on a constant outlook to disrupt further industries and segments related to travelling. Excursions and restaurant reservations are two to name and which are already implemented in the product portfolio (Euromonitor International and Geerts, 2017).

Figure 17: Airbnb vs Travel Growth (Euromonitor International and Geerts, 2017)

The huge threat that hotel chains, OTAs and short-term rental businesses fear when dealing with Airbnb are manifested once growth rates over past years are analyzed. The 2012-2017 CAGR was 1.3% for hotels, 1.7% for intermediaries and 10.3% for short-term rentals. In contrast thereto, Airbnb's CAGR was an astonishing 62% during the same time period. The year-on-year growth can be seen in the chart above and indicates that Airbnb's growth is downward-sloping, but still multiple times larger than any competing travel category (Euromonitor International and Geerts, 2017).

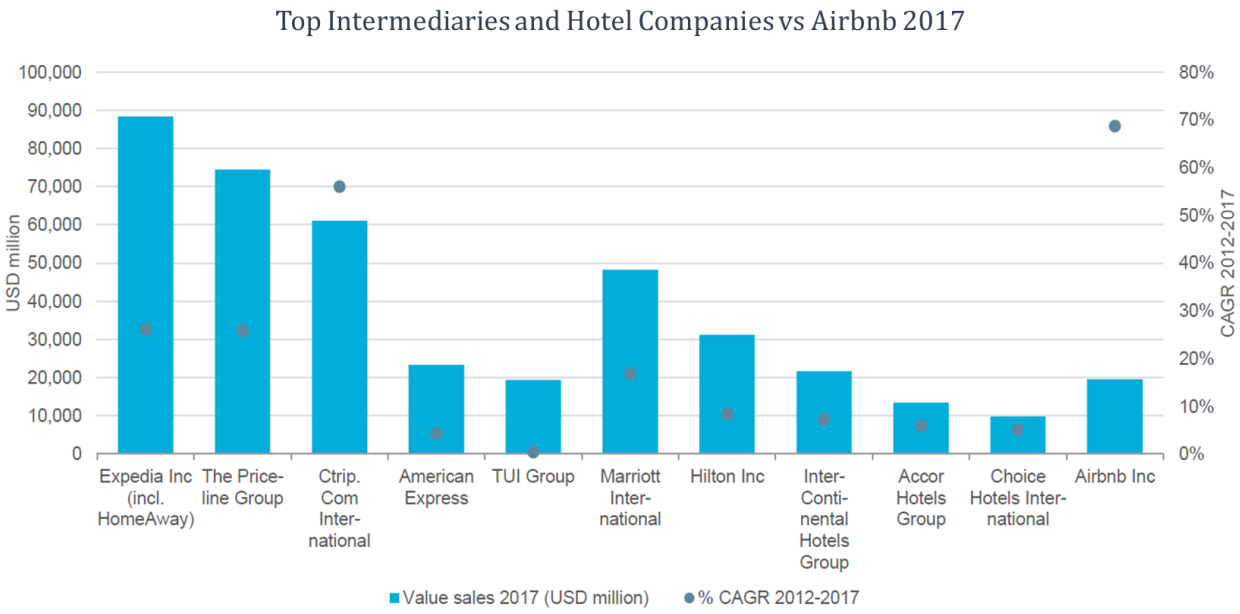

Figure 18: Intermediaries/Hotels 2017(Euromonitor International and Geerts, 2017)

In order to provide a basis for comparison, the above chart shows the revenue figures for the five biggest players of hotels and intermediaries vis-à-vis Airbnb. Including both segments is reasonable as Airbnb is in direct competition with OTAs over transactions and with hotels over the actual lodging conducted (Euromonitor International and Geerts, 2017).

Clearly, Airbnb has already surpassed most major hotel chains in terms of revenue figures, with only Marriot, Hilton and Intercontinental being left larger.

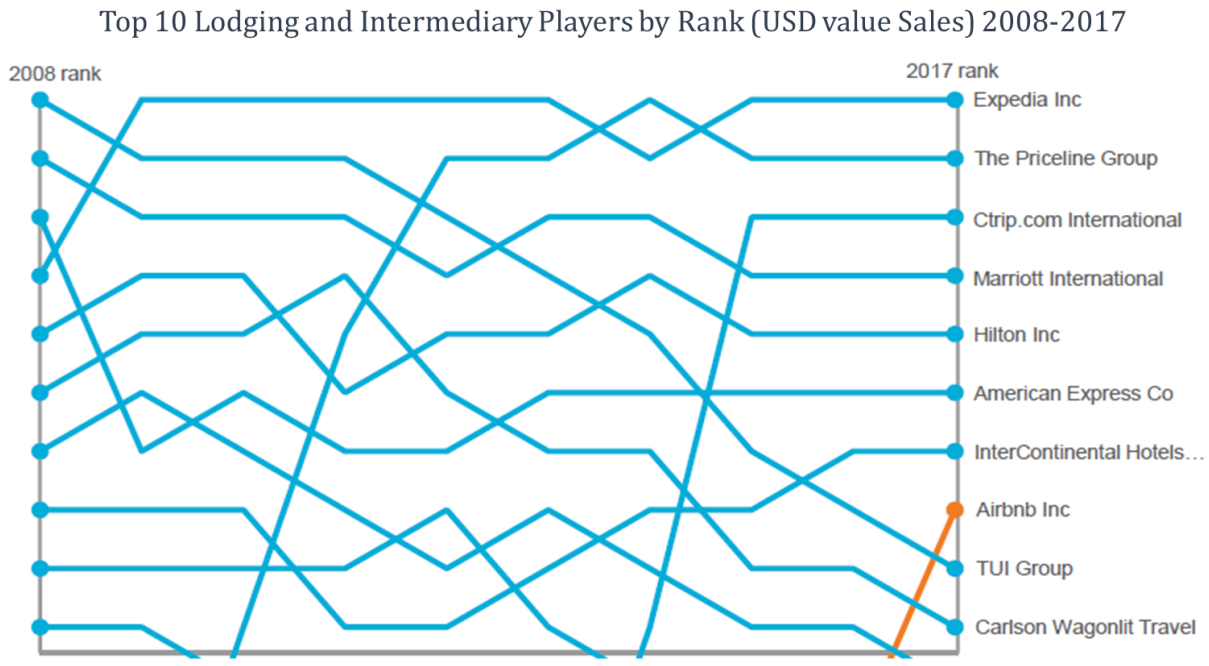

Figure 19: Top 10 Lodging (Euromonitor and Geerts, 2017)

In terms of largest OTAs, Airbnb still has to catch up with giants such as Expedia and Priceline. Noteworthy, the largest OTAs experience much higher growth rates compared to traditional hotel chains. Looking one layer deeper, the high 2012-2017 CAGR for Expedia and Priceline is mainly driven through very active M&A activities, whereas Ctrip.com has grown organically in China. Nevertheless, no company has experienced a similar level of growth compared to Airbnb (Euromonitor International and Geerts, 2017).

2017 was also the year that Airbnb entered the elite when being ranked 8th in terms of total sales value among all intermediary and lodging players. The graph shows the evolution of the key players in the field over the last ten years. Clearly, online travel agencies such as Expedia and Priceline experienced a strong hike, whereas traditional intermediaries such as TUI and Carlson Wagonlit Travel dropped significantly (Euromonitor International and Geerts, 2017).

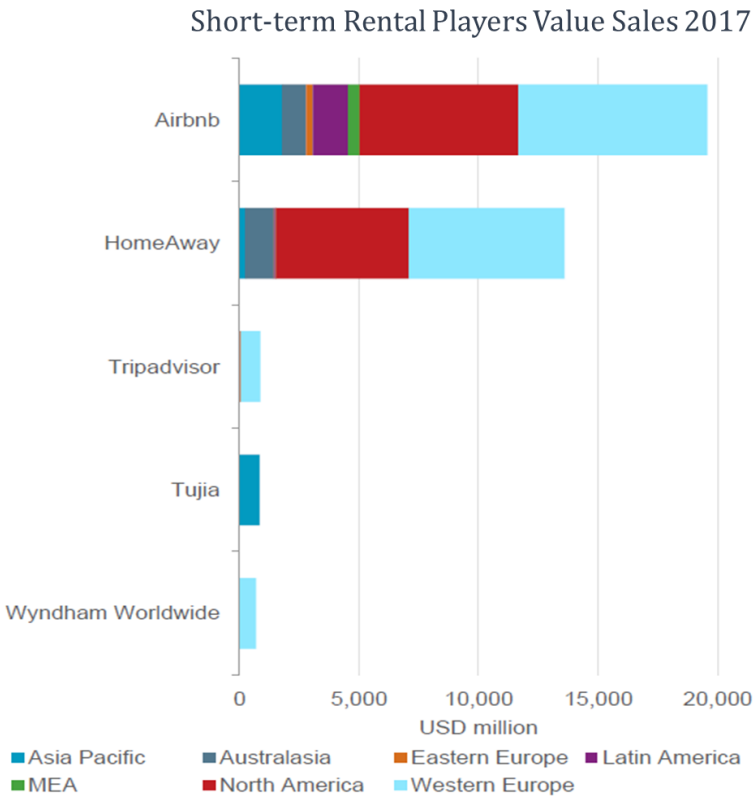

Figure 20: Short-term Rental Value Sales (Euromonitor and Geerts, 2017)

After analyzing the global intermediary and lodging market, we now have a closer look at Airbnb's home field, the short-term rental market, and its competitive landscape:

- Based on Euromonitor's market share analysis, Airbnb and HomeAway dominated the short-term rental market in 2017.

- HomeAway was acquired by Expedia in 2015 and was falling behind Airbnb, but with the backing of the Expedia machine, the brand seems to be performing more strongly again.
- TripAdvisor has acquired a couple of rental platforms such as Spain-based Niumba, US-based Flipkey and UK-based HolidayLettings.
- Tujia is China's largest player and started expanding to Japan. However, Airbnb is already well positioned in South-east Asian countries in general. It will be interesting to see how Tujia competes for market shares with Airbnb.
- Wyndham was initially present in holiday rentals. With the acquisition of Wimdu and 9flats, it joined the private rentals market already praised as the biggest competitor for Airbnb in Europe. Nonetheless, both companies struggle to scale up their operations to compete against Airbnb (Euromonitor International and Geerts, 2017).

Figure 21:Airbnb's Competitive Landscape (Rao and Wolff, 2016)

6.7 Financials

$ in millions	2017A	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E
Total Guests (in m)	**137.2**	**180.4**	**225.5**	**274.0**	**319.2**	**351.1**	**382.7**	**411.5**	**436.1**	**457.9**	**476.3**
Y/Y Change (in %)		31.5%	25.0%	21.5%	16.5%	10.0%	9.0%	7.5%	6.0%	5.0%	4.0%
Average Nights per Guest	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	2.0	2.0	2.0
Y/Y Change		3.5%	3.7%	4.0%	3.3%	3.0%	3.5%	3.0%	3.0%	2.0%	2.0%
Total Active Listings (in m)	3.5	4.6	5.7	6.8	8.0	9.2	10.4	11.5	12.7	13.8	14.9
Y/Y Change		30.0%	25.0%	20.0%	17.5%	15.0%	12.5%	11.0%	10.0%	9.0%	8.0%
Nights Booked (in m)	206	280	363	459	552	626	706	781	853	914	969
Y/Y Change		36.1%	29.6%	26.4%	20.3%	13.3%	12.8%	10.7%	9.2%	7.1%	6.1%
Average Revenue per Room	98	100	103	105	107	109	111	113	114	116	118
Y/Y Change		2.5%	2.4%	2.1%	2.0%	2.1%	1.5%	1.5%	1.5%	1.5%	1.5%
Bookings Value (in $m)	**$20,168**	**$28,136**	**$37,347**	**$48,182**	**$59,144**	**$68,418**	**$78,343**	**$88,047**	**$97,571**	**$106,066**	**$114,203**
Y/Y Change		39.5%	32.7%	29.0%	22.8%	15.7%	14.5%	12.4%	10.8%	8.7%	7.7%
Revenue											
Guest Revenue	1,896	2,701	3,660	4,770	5,914	6,910	7,991	8,981	10,050	10,925	11,763
Take Rate	9.4%	9.6%	9.8%	9.9%	10.0%	10.1%	10.2%	10.2%	10.3%	10.3%	10.3%
Host Revenue	605	928	1,344	1,783	2,366	2,805	3,290	3,786	4,293	4,667	5,025
Take Rate	3.0%	3.3%	3.6%	3.7%	4.0%	4.1%	4.2%	4.3%	4.4%	4.4%	4.4%
Total Revenue (in $m)	**$2,501**	**$3,630**	**$5,004**	**$6,553**	**$8,280**	**$9,715**	**$11,281**	**$12,767**	**$14,343**	**$15,592**	**$16,788**
Consolidated Take Rate	12.4%	12.9%	13.4%	13.6%	14.0%	14.2%	14.4%	14.5%	14.7%	14.7%	14.7%
Y/Y Change		45.1%	37.9%	30.9%	26.4%	17.3%	16.1%	13.2%	12.3%	8.7%	7.7%
EBITDA (in $m)	**$402**	**$599**	**$1,201**	**$2,064**	**$2,815**	**$3,400**	**$4,061**	**$4,724**	**$5,450**	**$6,081**	**$6,715**
Margin	16.1%	16.5%	24.0%	31.5%	34.0%	35.0%	36.0%	37.0%	38.0%	39.0%	40.0%

Table 10: Airbnb's Revenue und EBITDA Projections

Technical notation:
Black color stands for linked cells; Blue color cells include hard-coded data points
2017A figures are based on publicly available information, 2018E-2027E period is based on analyst consensus and management guidance

The revenue projections for Airbnb are based on multiple factors such as general industry fundamentals, the company's competitive positioning, and growth assumptions appropriate for Airbnb's business model. In any case, it needs to be pointed out that Airbnb is still privately held and, therefore, the amount of publicly available information is very limited. As previously mentioned, Airbnb has clearly transformed the hospitality industry and can be titled the most disruptive company in the sharing economy.

In terms of methodology used, a combination of 'Total Guests' and 'Average Nights per Guest' allow deriving the total amount of 'Nights Booked'. 'Total Guests' is one of only very few key metrics regularly disclosed by Airbnb. Hence, it proves to be the most reliable and accurate starting point for the revenue model. Further down the line, from total number of nights booked and 'Average Revenue per Room" we derive the total booking value.

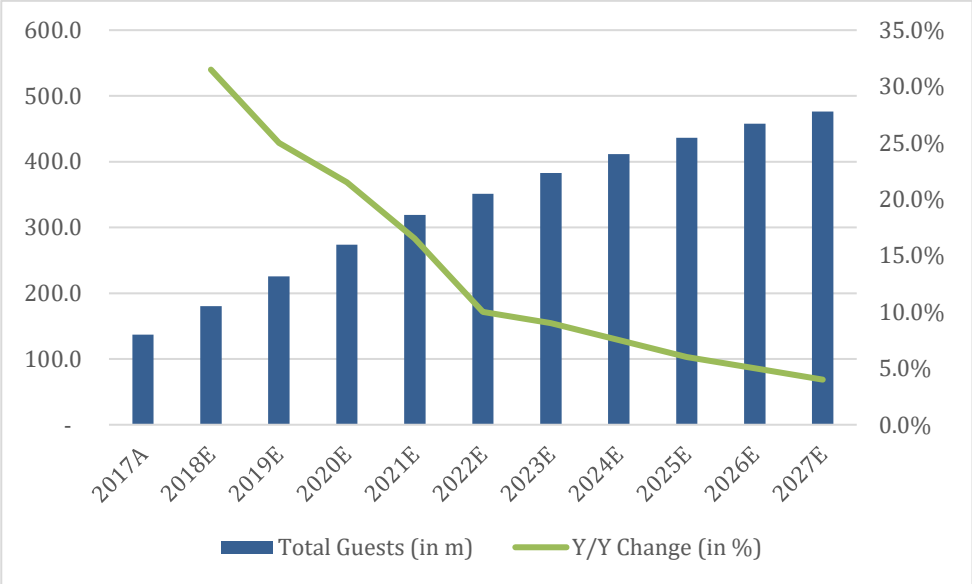

Figure 22: Airbnb Total Guests Projections

Airbnb collects revenue from both hosts and guests for its service. The fee charged for hosts covers processing payments and administrative costs and remains in the range of 3-4%. In contrast, guests are charged a 6-12% service fee per reservation depending on the total amount and length of stay. The take rate from both revenue streams are modelled to start in the low 9% and 3% for guests and hosts, respectively. Once the business model gets more established and the two-sided platform can rely on a profound basis of users on both ends, the take rate starts to rise continuously.

The 'Bookings Value' and both the take rate for guests and hosts respectively allow us to derive the revenue of Airbnb for each year. In terms of EBITDA, it can be noted that a positive value is more easily achievable for Airbnb based on its asset-light business model. Management guidance showed that for 2017 an EBITDA of ~$400m was reached. Airbnb achieved profitability for the first time already in 2016 with more than $100m in profits.

6.8 Funding

Airbnb's cap table shows that the company already raised around $3.5 billion to date via 11 funding rounds. The last round (Series F) was held in March 2017 at $105 per share with an implied post-money valuation of $31 billion.

Investors	Date	Total Raised ($m)	Original Issue Price / Share	# Shares	Implied Post-Money Valuation ($bn)
Founders and Employees	-	-	-	171,581,414	-
Seed Sequoia Capital Dave Morin Y Ventures	Apr-09	$0.64	$0.02	31,827,492	**$0.0037**
Series A Greylock Partners Bezos Expeditions Brian Chesky Elad Gil	Nov-10	$7.20	$0.42	17,197,416	**$0.10**
Series B Andreessen Horowitz Ashton Kutcher Bezos Expiditions CrunchFund DST Global General Catalyst Partners	Jul-11	$112.00	$6.62	17,351,343	**$1.50**
Series C Founders Fund Sequoia Capital Andreessen Horowitz General Catalyst Partners CrunchFund iNova Granite & Founders	Dec-12	$200.00	$11.79	16,960,077	**$2.97**
Series D Sequoia Capital TPG Growth Dragoneer Eniac Ventures Raptor Group WinstonVentureSequoia T.Rowe Price	Jul-14	$519.70	$40.71	12,765,000	**$10.50**
Series E General Atlantic TPG Growth	Jul-15	$1,580.00	$93.09	17,000,000	**$26.50**
Series F Capital G TCV	Mar-17	$1,000.00	$105.00	9,555,353	**$31.00**
Total Funding To Date **Total # Shares**		**$3,419.54**		**294,238,095**	

Table 11: Airbnb Cap Table

Some of the most known players in the venture capital world are invested in Airbnb. Right from the beginning, during Seed stage, Sequoia Capital invested in the company and believed in the business model. Other famous lead investors during the respective funding rounds are Greylock Partners, Andreessen Horowitz, Founders Fund, General Atlantic and TCV. Over the passage of time, Airbnb's implied valuation steadily increased from a mere $3.7 million in 2009 to $31 billion in 2017 during the last funding round.

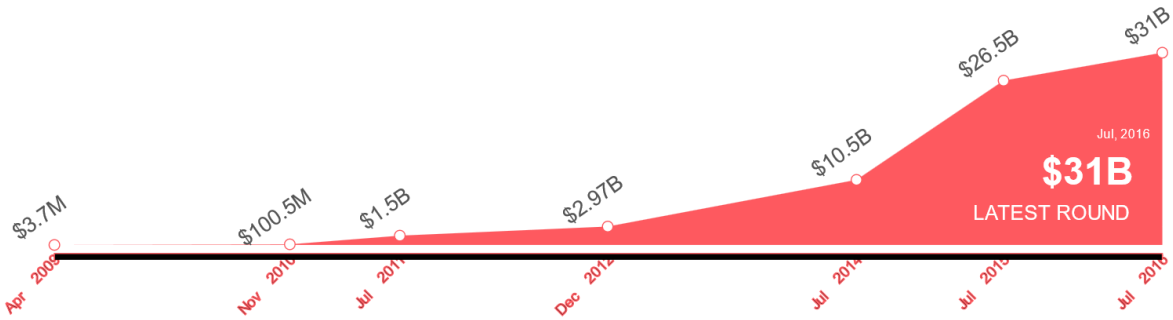

Figure 23: Airbnb Implied Valuation over time

In terms of percentage increase of initial money investment, Sequoia stands out with an increase of 543,294% of its series seed investment of $615,000, which is now valued at $3.3 billion. Sequoia invested again during the Series D funding round in 2014 and already received a 158% increase in value since then.

Funding round	Lead Investor	Initial investment	Latest valuation	% increase	% Ownership
Founders & employees	-	-	-	-	58.1%
Series Seed	Sequoia	$615k	$3.3bn	543,294%	10.8%
Series A	Greylock Partners	$7.2m	$1.8bn	24,980%	5.8%
Series B	Andreessen Horowitz	$115m	$1.8bn	1,485%	5.9%
Series C	Founders Fund	$200m	$1.8bn	790%	5.8%
Series D	Sequoia	$520m	$1.3bn	158%	4.3%
Series E	General Atlantic	$1.6bn	$1.8bn	13%	5.7%
Series F	TCV	$1.0bn	$1.0bn	0%	3.2%

Figure 24: Airbnb Funding Rounds

In terms of ownership, it is evident that the founding members and employees (in red) hold approximately 58.1% of Airbnb and, hence, own more than all venture capital companies, which invested during the multiple funding rounds (Series Seed – Series F) over time.

6.9 Valuation

Company	Ticker	Price (in $)	Diluted Shares (in m)	Market Cap (in $m)	EV (in $m)	EV/Rev 2017A	EV/Rev 2018E	EV/Rev 2019E	EV/Rev 2020E	EV/EBITDA 2017A	EV/EBITDA 2018E	EV/EBITDA 2019E	EV/EBITDA 2020E
Lodging													
Hyatt Hotels	NYSE: H	84.18	116.97	9,847	10,090	2.2x	2.2x	2.1x	2.0x	9.9x	12.9x	12.3x	11.9x
Marriott (incl. Starwood Hotels)	NASDAQ: MAR	138.34	353.36	48,884	57,030	2.5x	2.5x	2.3x	2.2x	16.7x	16.3x	14.9x	13.8x
Hilton Hotels & Resorts	NYSE: HLT	82.65	300.42	24,830	30,830	3.4x	3.3x	3.0x	2.9x	18.3x	14.7x	13.6x	12.8x
Mean						**2.7x**	**2.7x**	**2.5x**	**2.4x**	**15.0x**	**14.7x**	**13.6x**	**12.9x**
Vacation Rental Companies													
Tripadvisor (FlipKey)	NASDAQ: TRIP	55.21	137.40	7,586	6,943	4.5x	4.2x	3.9x	3.5x	29.4x	19.5x	17.7x	15.2x
Expedia (HomeAway)	NASDAQ: EXPE	120.02	150.15	18,021	19,450	1.9x	1.7x	1.5x	1.4x	13.1x	10.5x	9.1x	8.0x
Wyndham Worldwide Corp.	NYSE: WYND	48.71	99.78	4,860	10,840	2.1x	2.7x	2.6x	2.4x	11.3x	11.2x	10.7x	10.3x
Mean						**2.8x**	**2.9x**	**2.7x**	**2.5x**	**17.9x**	**13.7x**	**12.5x**	**11.2x**
Online Travel Agents													
Expedia	NASDAQ: EXPE	120.02	150.15	18,021	19,450	1.9x	1.7x	1.5x	1.4x	13.1x	10.5x	9.1x	8.0x
MakeMyTrip Ltd.	NASDAQ: MMYT	35.30	101.98	3,600	3,211	4.8x	4.6x	3.9x	3.5x	NM	NM	NM	NM
Booking Holdings Inc.	NASDAQ: BKNG	2,128.94	48.18	102,572	104,680	8.3x	7.2x	6.3x	5.6x	20.9x	18.3x	16.2x	14.4x
Sabre Corp	NASDAQ: SABR	24.93	275.74	6,874	9,964	2.8x	2.6x	2.5x	2.3x	10.7x	9.1x	8.6x	8.1x
TripAdvisor	NASDAQ: TRIP	55.21	137.40	7,586	6,943	4.5x	4.2x	3.9x	3.5x	29.4x	19.5x	17.7x	15.2x
Mean						**4.4x**	**4.1x**	**3.6x**	**3.3x**	**18.5x**	**14.4x**	**12.9x**	**11.4x**
Apartment Rentals/REITs													
Apartment Investment & Mgmt	NYSE: AIV	41.05	157.35	6,459	10,760	10.7x	11.4x	11.1x	10.6x	18.7x	18.4x	18.1x	17.2x
AvalonBay	NYSE: AVB	167.11	138.21	23,096	30,560	14.2x	13.5x	13.0x	12.3x	22.1x	21.0x	20.1x	18.8x
Camden Property Trust	NYSE: CPT	89.24	92.77	8,279	10,460	11.9x	11.0x	10.4x	9.8x	18.9x	19.2x	18.0x	16.9x
Equity Residential	NYSE: EQR	63.83	368.21	23,503	32,390	13.1x	12.6x	13.7x	11.9x	18.4x	19.9x	19.2x	18.4x
UDR, Inc	NYSE: UDR	36.77	267.60	9,840	13,570	13.6x	13.3x	12.7x	12.2x	20.7x	20.4x	19.2x	18.7x
Mean						**12.7x**	**12.4x**	**12.2x**	**11.4x**	**19.8x**	**19.8x**	**18.9x**	**18.0x**
Pure Marketplace Models													
Ebay	NASDAQ: EBAY	38.34	993.98	38,109	42,530	4.4x	3.9x	3.6x	3.3x	13.1x	11.6x	10.8x	9.8x
Etsy	NASDAQ: ETSY	31.62	119.48	3,778	3,442	7.8x	5.9x	4.7x	3.9x	48.8x	26.3x	19.5x	15.1x
Zillow	NASDAQ: Z	59.03	193.35	11,413	10,980	10.2x	7.4x	5.3x	3.4x	NM	39.7x	29.1x	23.0x
Alibaba	NYSE: BABA	204.34	2,566.00	524,336	522,070	13.8x	8.5x	6.3x	4.7x	31.0x	24.1x	18.1x	13.7x
Mean						**9.1x**	**6.4x**	**5.0x**	**3.8x**	**31.0x**	**25.4x**	**19.4x**	**15.4x**
Consolidated Mean Multiple						**6.3x**	**5.7x**	**5.2x**	**4.7x**	**20.4x**	**17.6x**	**15.5x**	**13.8x**
Median						4.4x	4.1x	3.6x	3.3x	18.5x	14.7x	13.6x	12.9x

Table 12: Airbnb Comparative Valuation

Note: Prices as of 1 June 2018

Due to the scarcity of key financial metrics, a valuation of a privately held company is more art than science. Moreover, start-ups offer a disruptive approach to traditional industry and, hence, true comparable companies are not yet existent. In particular, Airbnb offers a completely new service, which is characterized by its uniqueness.

Consequently, the comparative valuation analysis combines multiple industries that possess some of Airbnb's constituents such as classic lodging, vacation rental companies, online travel agents, apartment rentals / REITs and pure marketplace models. This basket full of the most applicable and relevant public comps can be used as a proxy to infer the value of a private company such as Airbnb. To accurately reflect Airbnb's outstanding growth projections and efficiency in operations, further adjustments to the implied valuation are a necessity to reach a fair valuation for Airbnb.

The comparative valuation consists of a blend of two main multiples: Enterprise Value / Revenue and Enterprise Value / EBITDA. A mean multiple will be calculated for each market segment, which flows into the consolidated mean multiple. These multiples are then used within the implied enterprise valuation framework. The framework is applied to both the revenue and EBITDA multiple and finally results in the implied blended valuation.

The last private market valuation of Airbnb – Series F in 2017 – was valued at $31 billion, or 8.5x of our 2018 revenue estimates. Contrary thereto, our blended valuation of Airbnb results in an enterprise value of $38.7 billion or $131 per share based on 294 million fully diluted shares outstanding. The blend rests upon $39.5 billion based on EV/Revenue, and $37.8 based on EV/EBITDA multiple. Airbnb's blended valuation of $38.7 converts to 10.7x the 2018 revenue estimate of $3.6 billion. In order to gain a more complete picture, this reference multiple can be compared to Expedia, which trades at $18.0 billion, or 1.6x consensus 2018 revenue forecast. Marriot trades at $48.9 billion, or 2.2x of its consensus 2018 revenue forecast. In contrast thereto, Ebay – a pure marketplace model – trades at $38.1 billion, or 3.5x of its consensus 2018 estimate. Clearly, Airbnb is valued at a significant higher multiple compared to some of the major players in their respective industries.

The question remains why Airbnb is valued so much higher? This can mainly be answered by drawing attention to the incredible growth rate (+62% Y/Y for Airbnb vs. 11.7% for the entire peer group in 2017) and the huge potential of Airbnb to disrupt the whole rental market place and lodging industry. Positive regulatory changes, enhanced conversion rates and the strong pace of new listings on the platform cement Airbnb's valuation to be justifiable.

6.10 Real Options

As already extensively elaborated during the theoretical part of the thesis, real options embed the possibility to expand, contract, reallocate or defer investment opportunities and, consequently, allow for more flexibility with the consideration of cash flow's timing and volatility. Applying the real option approach means that spot price, exercise price, volatility, Delta-T, risk-neutral probabilities and a decision tree have to be calculated in order to perform backward option value calculation.

As Airbnb matures, the company is constantly on the lookout for further investment opportunities in order to become a more profound booking platform. As the strategic outlook given by management and industry reports from renowned sources such as Euromonitor, Airbnb is clearly driven to diversify its current business model.

6.10.1 Spot Price Calculation

The spot price constitutes the present value of positive cash flows in the future coming from the expansion option. An underlying DCF model allows to capture the inherent value of the option and at the same time it is the basis for the following further computation steps within the decision tree and its backward option value calculation framework.

One of the main options that consists for Airbnb is the opportunity to increase its visibility by entering in the field of flight searches. A flight tool would allow Airbnb directly competing with the industry giants Priceline and Expedia as the two before-mentioned companies directly negotiate prices with all leading airline companies. Contrary thereto, Kayak simply redirects flight offers to airlines and, hence, only gets a distribution fee. Direct negotiations with airlines, however, enable to change to capture way higher commission fees. In addition, Airbnb can increase its footprint by offering complete travel packages with 'flight & accommodation' altogether bookable on Airbnb's platform. Additional revenue streams captured by offering full package services are projected as shown in the below graph.

	Base	1	2	3	4	5	6	7	8	9	10	Terminal
Airbnb annual bookings (in m)	137.2	180.4	225.5	274.0	319.2	351.1	382.7	411.5	436.1	457.9	476.3	493.4
% of bookings need flight package	15%	16%	16%	17%	17%	18%	18%	19%	19%	19%	19%	19%
# bookings need flight package (in m)	20.6	28.0	36.1	45.2	54.3	61.5	68.9	76.1	82.9	87.0	90.5	93.7
Market penetration (in %)	3%	6%	9%	12%	15%	18%	17%	20%	19%	22%	21%	24%
Total Package Bookings (in m)		1.7	3.2	5.4	8.1	11.1	11.7	15.2	15.7	19.1	19.0	22.5
Package Price (in $)	650.0	661.4	672.9	684.7	696.7	708.9	721.3	733.9	746.8	759.8	773.1	786.7
Commission Fee (in %)	12%	13%	13%	14%	14%	14%	14%	15%	15%	15%	15%	15%
Revenue (in $)		**143.2**	**292.8**	**505.2**	**794.0**	**1,113.4**	**1,216.5**	**1,620.1**	**1,728.4**	**2,138.1**	**2,159.7**	**2,601.8**
Cost of Capital	11%	11%	11%	10%	10%	10%	10%	10%	10%	9%	9%	
PV of revenues		129.1	239.2	375.0	537.4	689.8	688.6	844.8	833.2	956.5	899.9	
PV of explicit forecast period	6,193.6											
PV of Terminal value	19,538.1											
Sum of PVs	**25,731.7**											

Table 13: Airbnb Option Revenue Projections

6.10.2 Exercise Price Calculation

The exercise price represents the present value of negative cashflows and, hence, constitutes the cost of exercising the call option in question. Clearly, an option does not only contribute additional revenue, but also causes incremental costs related to the revenue generation. The expense side follows the same logic used for the spot price calculation, with the below formula used to derive the inherent costs:

$$Expenses = Income * (1 - Margin)$$

	Base	1	2	3	4	5	6	7	8	9	10	Terminal
Revenue (in $)	-	143.2	292.8	505.2	794.0	1,113.4	1,216.5	1,620.1	1,728.4	2,138.1	2,159.7	2,601.8
Margin (in %)	3%	6%	9%	7%	8%	8%	9%	9%	10%	10%	11%	11%
Operating expenses *(1 - margin)*		134.6	266.5	469.9	734.4	1,024.4	1,113.1	1,474.3	1,564.2	1,924.3	1,932.9	2,315.6
Cost of Capital	11%	11%	11%	10%	10%	10%	10%	10%	10%	9%	9%	
PV of expenses		121.4	217.7	348.7	497.1	634.6	630.1	768.7	754.1	860.9	805.4	

PV of explicit forecast period	5,638.8
PV of Terminal value	17,388.9
Sum of PVs	**23,027.6**

Table 14: Airbnb Option Expense Projections

6.10.3 Volatility Calculation

Volatility constitutes the uncertainty of any future cash flows captured by standard deviation. Due to the limited time of Airbnb within the market, volatility can be derived by looking at the standard deviation of tech companies within the S&P 500. Analysing the daily returns of 69 constituents that match the needed profile and eventually annualizing data points from the last five years results in an annual standard deviation of approximately 15.5%. Additionally, an illiquidity premium can be added to accurately reflect that Airbnb is still privately held – 20% seems to be a fair evaluation of Airbnb's volatility estimates.

S&P 500 Information Technology	
Number of Constituents	69
Annualized Standard Deviation	**15.54%**
Illiquidity Premium	4.46%
Airbnb Volatility	**20.00%**

Table 15: Airbnb Volatility Estimate

6.10.4 Delta-T Calculation

Delta-T is needed for the calculation of upside and downside factors and can be represented by:

$$\frac{Time\ to\ expiration}{Periods}$$

The time to expiration has been assumed to be five years with the reasoning that Airbnb's business model needs time to be mimicked and, hence, it has chance to consider the option

without any pressure from outside competitors within the stipulated time frame. Sooner or later, competition will enter and exploit any value leftover. Management also possesses the leeway to call the option within the next five years. Consequently, we receive a Delta-T of one.

6.10.5 Upside and Downside Factor Calculation

Incremental price changes of the underlying are displayed through the upside factor μ and the downside factor d with the following framework:

$$\mu = e^{volatility*\sqrt{\Delta t}}$$

$$d = \frac{1}{\mu}$$

6.10.6 Risk-Neutral Probabilities Calculation

The risk-neutral probabilities take the notation p, whereas p constitutes an upward move and (1-p) means a downward move. The formula used is:

$$p = \frac{e^{r*\Delta t} - d}{u - d}$$

6.10.7 Decision Tree Calculation

As a next step, the upside and downside factors are used to start building the decision tree for the next five periods. The option value as of each node can be derived by subtracting the exercise price from the spot price. If the option is in the money, it inherits positive value for Airbnb and, therefore, it will be exercised. Contrary thereto, out-of-the-money options expire worthlessly. Hereby, a negative value is not meaningful and, hence, will be shown as zero.

					69,946
				57,267	
			46,886		46,886
		38,387		38,387	
	31,429		31,429		31,429
25,732		25,732		25,732	
	21,067		21,067		21,067
		17,248		17,248	
			14,122		14,122
				11,562	
					9,466

Table 16: Airbnb Decision Tree

The option values in the future need to be discounted in order to accurately reflect their value at t=0. From the end nodes at t=5 beginning, the option values are calculated and discounted step-by-step via the following formula:

$$C_{t,t} = e^{-r\Delta t}(C_{t+1,t+1} * p + C_{t+1,t} * (1-p))$$

The discounting process is captured by $e^{-r\Delta t}$, with r constituting the risk-free rate. Eventually, we receive the option value as of t=0.

										S(5,5):	69,946
										C(5,5):	46,918
								S(4,4):	57,267		
								C(4,4):	35,172		
						S(3,3):	46,886			S(5,4):	46,886
						C(3,3):	25,503			C(5,4):	23,859
				S(2,2):	38,387			S(4,3):	38,387		
				C(2,2):	17,772			C(4,3):	16,091		
		S(1,1):	31,429			S(3,2):	31,429			S(5,3):	31,429
		C(1,1):	11,942			C(3,2):	10,168			C(5,3):	8,401
S(0,0):	25,732			S(2,1):	25,732			S(4,2):	25,732		
C(0,0):	**7,781**			C(2,1):	6,167			C(4,2):	4,244		
		S(1,0):	21,067			S(3,1):	21,067			S(5,2):	21,067
		C(1,0):	3,636			C(3,1):	2,144			C(5,2):	-
				S(2,0):	17,248			S(4,1):	17,248		
				C(2,0):	1,083			C(4,1):	-		
						S(3,0):	14,122			S(5,1):	14,122
						C(3,0):	-			C(5,1):	-
								S(4,0):	11,562		
								C(4,0):	-		
										S(5,0):	9,466
										C(5,0):	-

Table 17: Airbnb Decision Tree with Call Option Value

Since the option's spot price exceeds the exercise price - meaning that the option is in-the-money - it is reasonable to assume that Airbnb will proceed and realize the option. As indicated by the above decision tree, the option has a value of around $7.8 billion for Airbnb. It also shows that traditional valuation methods lack the ability to accurately capture the full inherent value of such investment opportunities as demonstrated by the real option methodology.

7 Conclusion

In principle, valuation fundamentally stays the same irrespective of the type of firm to be analyzed. Hence, every firm can be subject of a valuation. The question remains whether we are willing to accept noisy estimates of values. Noise increases especially in three distinctive cases: (a) companies with negative earnings, (b) young companies with no historical financials, and (c) unique firms with no or only few comparable firms. Start-ups combine all three cases and, thus, the inherent noise results in a compounded intricacy (Damodaran, 2009).

After analyzing the *status-quo* of literature with respect to start-up valuation, in essence, no standardized or uniform valuation is currently feasible. Each valuation method uses a unique approach with a unique valuation as a result. Thus, the overarching question remains on how to select the methodology with the most accurate output or 'true' value. It is debatable whether it is even possible to accurately reflect the true inner value of a company. Academia suggests that the only true value resides in the value that both opposing entities, the entrepreneur and investor, agree on during negotiations (Douglas et al., 2014; Heughebaert and Manigart, 2012). Naturally, entrepreneurs push for higher valuations, whereas investors try the opposite to receive the highest possible stake for a given dollar investment.

Notably, the lack of relevant historical data hinders an effective valuation performance and, hence, prevents the usage of traditional valuation methodologies. Alternative approaches with their inclusion of qualitative, non-financial factors allow for a more meaningful replication of an inherent value. However, there is still no consensus on which particular method delivers the most consistent, credible, and accurate output (Bulko, 2017).

It might even be possible that further examination of literature suggests focusing the impetus of research towards micro factors. Such micro factors would focalize on how to (i) determine the true discount rate in an appropriate manner or (ii) quantify qualitative factors through a standardized process. Nevertheless, it cannot be predicted whether a highly sophisticated but rather complex methodology would be appreciated and eventually accepted by market participants (Bulko, 2017).

To sum up, the performed literature review generates the following compelling questions (Bulko, 2017):

1. Is it possible to establish a best-practices valuation method for start-ups? More precisely, is it feasible to devise a universally applicable valuation approach, which is equally accepted both by investors and founders?
2. Is it feasible to derive an interrelation between the willingness of investors to fund start-ups and the effective valuation output? If yes, would the universally applicable valuation method (as established under question one) result in increased investment funding? The heightened funding amount would be implied by the newly-established method as it guarantees a floor level for uncertainty involved in terms of future performance of the company and investment risk with more accurate return on investment projections.

Further questions involving more specific but equally interesting issues related to the valuation process are as follows (Bulko, 2017):

3. In case of no need of a new standard approach, why is the current *status-quo* not sufficient or accepted among investment professionals?
4. How accurate and reliable is any research conducted? Is it possible to further refine existing methodologies to increase valuation accuracy? Is it applicable to include other non-financial characteristics to improve current valuation formulations?
5. Small deviations in the calculation of the discount rate result in wide fluctuations of the final valuation. Consequently, the discount rate constitutes a main factor in multiple valuation approaches. Academia is well aware that the discount risk should reflect the inherent business risk as reflected in the cost of capital. However, the process of arriving at the discount rate can be considered to be, mildly formulated, only a rough approximation. Does academia discuss this fundamental issue? Is there a way to enhance the calculation process to increase accuracy? Can the discount rate be quantified in another way?
6. Apart from quantitative factors, qualitative non-financial factors are included to increase the viability of start-up valuation. In this context, is there a possibility to accurately translate these qualitative discussions into monetary terms (i.e. assigning dollar values accordingly)?

The fundamental question remains whether it is possible to establish a one-size-fits-it-all valuation methodology with universal acceptance, or might it be quite the contrary that the start-up valuation puzzle can be tweaked but never entirely resolved?

List of References

Achleitner, A.-K., 2018. Start-up-Unternehmen. Springer Gabler Verlag. http://wirtschaftslexikon.gabler.de/Archiv/427/start-up-unternehmen-v7.html. (Accessed 27. April 2018)

Agriya, 2017. A Complete Overview of Airbnb's Business and Revenue Model. https://www.agriya.com/blog/complete-overview-vacation-rental-airbnb-business-and-revenue-model/. (Accessed 20. March 2018)

Airbnb, 2018. Official Homepage of Airbnb. https://www.airbnb.com/a/?af=43720035&c=.pi2.pk1295224732334656_809515675 80951_c_12026464216&msclkid=88f2c90bd74a159a3467921af317715a&utm_sour so=bing&utm_medium=cpc&utm_campaign=USA%3ADTM%3ASRC%3ABRD%2B BAirbn%5BEXACT%5D&utm_term=airbnb&utm_content=Airbnb%3AGeneric%2BE xBEx. (Accessed 20. March 2018)

Austin, S., Canipe, C., Slobin, S., 2016. The billion dollar startup club. Wall Street J. http://graphics.wsj.com/billion-dollar-club. (Accessed 20. April 2018)

Bell, J. R., (2014). Angel investor sophistication: Increasing application of pre-revenue venture valuation methodologies. Journal of Private Equity, 17(4), 59-64. Retrieved from Business Source Complete, EBSCOhost database.

Beneda, N. L., 2003. Estimating free cash flows and valuing a growth company. Journal of Asset Management, 4(4), 247–257.

Berkus, D., 2016. After 20 years: Updating the Berkus Method of valuation. https://berkonomics.com/?p=2752. (Accessed 18. April 2018)

Beyer, A., 2006. Unternehmensgründungen: Motive und Herausforderungen . Wirtschaftskammer Tirol. https://www.wko.at/Content.Node/Interessenvertretung/Daten--Fakten--Zahlen/t/RPST31_2.pdf f. (Accessed 20. April 2018)

Black, E., 2003. Usefulness of financial statement components in valuation: An examination of start-up and growth firms. Venture Capital, 5(1), 47–69.

Bulko, J.P., 2017. Startup Valuation Conundrum. https://financeexplainedblog.wordpress.com/2017/01/23/startup-valuation-conundrum/. (Accessed 27. April 2018)

Business Model Toolbox, 2018. Sharing Economy. https://bmtoolbox.net/patterns/sharing-economy/. Berlin, 2018. (Accessed 27. April 2018)

Cashman, A., 2012. Why startups are good for the economy. http://www.deskmag.com/en/why-startups-are-good-for-the-economy-coworking-spaces-374. (Accessed 18. April 2018)

Cayenne Consulting, 2018. https://www.caycon.com/valuation.php. (Accessed 27. April 2018)

CFA Institute, 2016. Alternative Investments and Portfolio Management. CFA Program Curriculum 2016, Level I, Volume 6.

Cumming, D., Dai, N., 2011. Fund size, limited attention and valuation of venture capital backed firms. JEmpir Financ 18(1):2–15.

Damodaran, A., 2009. Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuation Challenges. Available at SSRN 1418687.

Damodaran, A., 2011. The Little Book of Valuation: How to Value a Company, Pick a Stock and Profit. John Wiley & Sons.

Damodaran, A., 2018. The Dark Side of Valuation, Valuing young, distressed and complex businesses, 2nd Edition.

De Buhr, L., 2014. Unternehmensbewertung: Anwendbarkeit von Bewertungsverfahren bei Start-up Unternehmen. Diplomica Verlag, 1. Auflage.

Deutsches Institut für Wirtschaftsforschung, 2016. DIW Glossar Unternehmensgründung. https://www.diw.de/de/diw_01.c.420670.de/presse/diw_glossar/unternehmensgruendung.html. (Accessed 20. April 2018)

Divestopedia, 2018. Valuation – Definition – What does Valuation mean? https://www.divestopedia.com/definition/993/valuation. (Accessed 18. March 2018)

Douglas, E. J., Carlsson-Wall, M., & Hjelström, T., 2014. Negotiating equity share and management control of the entrepreneurial new venture. Venture Capital, 16(4), 287-307. doi:10.1080/13691066.2014.970334.

Endemann, O., Gerstheimer, O. and Wüst, S., 2016. Lean Product Innovation: „Digital Driving Experience“ für TomTom Telematics. Einblicke in ein Lean-Start-Up-Projekt von der Idee bis zum internationalen Launch. In: Hess, S. and Fischer, H. (Hrsg.):

Mensch und Computer 2016 – Usability Professionals, 4. - 7. September 2016, Aachen.

Euromonitor International, Geerts, W., 2017. Passport – Airbnb in Travel (World). http://www.euromonitor.com/airbnb-inc-in-travel/report. (Accessed 27. April 2018)

Funke, T. and Fandl, U., 2012. Austrian Start-up Report: Development and Status Quo of the Entrepreneurial Ecosystem. Austrian Star-up Report 2012. https://wirtschaftsblatt.at/images/downloads/6/8/b/report20121023104316.pdf. (Accessed 18. April 2018)

Goldman, M., 2008. Valuation of Startup and Early-Stage Companies. The Value Examiner, (August 2008), 8–16.

Grind, K., 2015. Regulators look into mutual funds' procedures for valuing startups. Wall Street J. http://www.wsj.com/articles/regulators-look-into-mutual-funds-procedures-for-valuing-startups-1447796553. (Accessed 18. April 2018)

Kaplan, Inc., 2016. Schweser Notes for the CFA Exam. Alternative Investments and Portfolio Management. Level II, Book 5.

Klandt, H., 2006. Gründungsmangement: Der Integrierte Unternehmensplan. R. Oldenbourg Verlag München Wien, 2. Edition**.**

Hahn, C., 2014. Die Start-up-Szene in Deutschland. In: Finanzierung und Besteuerung von Start-up-Unternehmen. Springer Fachmedien, Wiesbaden

Heinrichs, N., 2009. Bewertung von Wachstums- und Startup-Unternehmen. Analyse traditioneller Bewertunsverfahren un des stochastischen Modells von Schwartz und Moon. Diplomica Verlag GmbH, 1. Auflage.

Heughebaert, A. and Manigart, S., 2012. Firm valuation in venture capital financing rounds: The role of investor bargaining power. Journal of Business Finance & Accounting, 39(3/4), 500-530. doi:10.1111/j.1468-5957.2012.02284.x.

Hsu, DH., 2004. What do entrepreneurs pay for venture capital affiliation? J Financ 59(4):1805–1844.

Knaup, A. E., and Piazza, M. C., 2007. Business Employment Dynamics data: Survival and longevity, II. Monthly Labor Review, 130, 3–10.

Kollmann, T., Stöckmann, C., Hensellek, S. and Kensbock, J., 2016. European Startup Monitor. http://europeanstartupmonitor.com/fileadmin/esm_2016/report/ESM_2016.pdf. (Accessed 27. April 2018)

Koster, S., van Stel, A. and Folkeringa, M., 2012. Start-ups as drivers of market mobility: an analysis at the region-sector level for The Netherlands. Small Business Economics, 39(3), 575-585.

Kothari, M., Ranka, N. M., and Sharma, L**.,** 2013. Intangible Assets: A Study of Valuation Models Measurement Subsequent to Acquisition : Cost Model and Revaluation Models. Research Journal of Management Sciences, 2(2), 9–13.

Kotova, M. V., 2014. The Theoretical and Methodological Basis of Startups Valuation. Economics: Time Realities, 1(11), 107–112.

Kühnapfel, J. B., 2015. Prognosen für Start-up-Unternehmen. Springer Fachmedien Wiesbaden.

Küsell, F., 2006. Praxishandbuch Unternehmensgründung. Gabler Verlag, Wiesbaden 2006.

Maroni, I., Arruda, A. and Aroujo, K., 2015. The design and technological innovation: how to understand the growth of startups companies in competitive business environment. Procedia Manufacturing 3 (2015), 2199 – 2204.

McRae, H., 2015. Facebook, Airbnb, Uber, and the unstoppable rise of the content non-generators. One creates no content, one owns no property, the other owns no cars. The propertiy is at the interface. https://www.independent.co.uk/news/business/comment/hamish-mcrae/facebook-airbnb-uber-and-the-unstoppable-rise-of-the-content-non-generators-10227207.html. (Accessed 18. March 2018)

Miloud, T., Aspelund, A., & Cabrol, M., 2012. Startup valuation by venture capitalists: an empirical study. Venture Capital, 14(2-3), 151–174.

Munemo, J., 2016. Foreign direct investment and business start-up in developing countries: The role of financial market development. The Quarterly Review of Economics and Finance (2016), http://dx.doi.org/10.1016/j.qref.2016.08.010.

Oviatt, B. M., Phillips McDougall, P. and Loper, M., 1995. Global Start-Ups: Entrepreneurs on a Worldwide Stage. Academy of Management Executive (1993-2005), Vol. 9, No. 2, 30-44.

Payne, B., 2011a. Valuations 101: The Cayenne Calculator. http://blog.gust.com/startup-valuations-101-the-cayenne-calculator/. (Accessed 18. April 2018)

Payne, B., 2011b. Scorecard Valuation Methodology, Establishing the Valuation of Pre-revenue, Start-up Companies.

Peters, M. P. and Brush, C. G., 1996. Market Information Scanning Activities and Growth in New Ventures" A Comparison of Service and Manufacturing Businesses. Journal of Business Research 36(1996), 81-89.

Phillips, J., Kulkami, R., 2017. Company report - Airbnb: Unlocking Travel's Final Frontier. SharesPost Inc. 2017.

Rao, S., Wolff, M., 2016. Airbnb. Manhattan Venture Research LLC, 2016.

Sahlmann, W. A., & Scherlis, D. R., 1987. A method for valuing high-risk, long-term investments: The "Venture Capital Method." Harvard Business School Publishing.

Semenchuk, M., 2017. How much is your startup worth? Angels perspective. https://medium.com/practical-blockchain/how-much-is-your-startup-worth-angels-perspective-b4e4544a15a4. (Accessed 18. April 2018)

Uenlue, M., 2017. Business Model Cancas Airbnb. http://www.innovationtactics.com/business-model-canvas-airbnb/. (Accessed 20. March 2018)

van de Schootbrugge, E., & Wong, K. M., 2013. Multi-Stage Valuation for Start-Up High Tech Projects and Companies. Journal of Accounting & Finance, 13(2), 45–56.

Venture Choice, 2018. Valuation. http://www.venturechoice.com/articles/valuation.htm. (Accessed 20. April 2018)

Vernimmen, P., Quiry, P., Dallocchio, M., Le Fur, Y., & Salvi, A., 2014. Corporate Finance: Theory and Practice (4th edition). John Wiley & Sons.

Vetter, M., 2016. A real-time valuation application for startups and exit-seekers. Forbes. http://www.forbes.com/sites/moiravetter/2016/08/22/a-real-time-valuation-application-for-startups-exit-seekers/#5dbf4ac71ef2. (Accessed 20. April 2018)

Wirtschaftskammer Österreich – Gründerservice, 2016. Wozu ein Business Plan? https://www.gruenderservice.at/Content.Node/gruenden/Businessplan/Wozu-ein-Businessplan-/Wozu_ein_Businessplan_.html (Accessed 20. April 2018)

Zheng Y., Liu, J., George, G., 2010. The dynamic impact of innovative capability and inter-firm network on firm valuation: a longitudinal study of biotechnology start-ups. J Bus Ventur 25(6):593–609.