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Towards the use of qualitative data in the valuation of new technology-based ventures

Erik Sæbu Vatn
Trond Ytre-Arne

Industrial Economics and Technology Management
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Supervisor: Øystein Moen, IØT

Norwegian University of Science and Technology
Department of Industrial Economics and Technology Management

PROBLEM DESCRIPTION

The valuation of new technology-based ventures is a difficult task. Current practice seems to be a combination of ”gut feeling” and the use of valuation methods whose underlying assumptions are not fulfilled. During the last 20 years there has been a substantial contribution to the knowledge of what determines the success of new technology-based ventures.

The purpose of this master thesis is to explore the possibilities of combining qualitative data and valuation methods in a framework for valuating new ventures. It is our intention to arrive at a framework that can be operationalised and tested on a sample of ventures. The framework is intended to be “user friendly”, and it is therefore not consider part of the assignment to include dynamics and flexibility in the framework.

Assignment given: 17th January 2011

Supervisor: Øystein Moen

PREFACE

This is the final work on our Master of Science in Industrial Economics and Technology Management, within the field of Strategy (Erik Sæbu Vatn) and Finance (Trond Ytre-Arne) at the Norwegian University of Science and Technology.

This thesis consists of two parts. Part one is an article written for publication in a scientific journal. Part two is a report written for distribution in the venture industry, including entrepreneurs, venture capitalists, relevant government authorities and academia. Our work with the subject started in the autumn of 2010, and some of this thesis is based on this work. Some passages in the article and report are identical.

We would like to express our gratitude to our supervisor, Øystein Moen, for great advice and support. Further we would like to thank Joar Welde of Viking Venture, Karl Klingsheim from TTO at NTNU and Bjørnar Reitan of Impello Management for inspiring discussions and help along the way. We would also like to thank Sigmund Waagø and Øyvind Bjørgum for access to data from the database of NTNU Entrepreneurship Centre.

Finally we would like to thank our classmates during the five years, for contributing discussions, sharing knowledge and creating a great competitive and inspiring environment.

Trondheim, June 2011

Erik Sæbu Vatn and Trond Ytre-Arne

Vår 2011

PART 1 - ARTICLE

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

A NEW METHOD FOR NEW VENTURE VALUATION USING VENTURE PERFORMANCE CRITERIA

DEVELOPMENT, PROCEDURE AND APPLICATION

Erik Sæbu Vatn and Trond Ytre-Arne
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Keywords:
New Venture, Technology, Valuation, Success criteria, Venture Performance.

ABSTRACT

Valuation of new technology-based ventures is an important and challenging task, which is usually conducted with focus on the financials of the company in question. This article proposes a valuation framework that also takes non-financial aspects into consideration when valuating new ventures. There is an understanding in the literature that one can identify the factors that drive venture performance, and we explore whether these factors can be used in a venture valuation framework, especially focusing on aspects that indicate venture success. We conduct a thorough literature review and identify a series of success criteria. A framework is developed based on a theoretical development of the identified criteria. A preliminary empirical investigation to verify the identified factors is also conducted, and an indication of its ability to predict success is assessed. The framework is applied in a case study, and the results are compared to reference values. Conclusions on its applicability and value are drawn.

INTRODUCTION

BACKGROUND

New ventures have a key role with regards to economic development, especially as contributors to economic growth and employment (Spilling 2000; Storey 1994). Entrepreneurship is argued to be a driver of economic growth (Acs and Armington 2006; NaudÈ 2008) and to possibly have a rejuvenating effect on industries (Song et al. 2008a). In 2008 venture backed companies accounted for 21% of US GDP and 11% of private employment (NVCA 2009). Of the new ventures, new technology-based ventures are especially important (Chen 2009; Drucker 1999; Hayton 2005) and has according to Chen (2009) accounted for 25% of net job creation and 95% of radical innovations (Allen 1999; Chen 2009; Timmons and Spinelli 1994) over the last two decades. This highlights the importance of new technology-based ventures, both as a source of technology

commercialisation and as a source of increased employment. Nevertheless valuation of new ventures is somewhat neglected in the relevant research literature. A study from 1998 concludes that few venture valuation frameworks exist (Wright 1998) and a working paper by Ge and Mahoney (2005), find that "New venture valuation is also an under-developed area in the research literature (Barry, 1994; Davila, Foster and Gupta, 2003; Sarasvathy, 1999)". Reasons for this might be that valuation in general is a subjective activity (Tipping et al. 1995), and that valuation of technology-based ventures is no exception. Further, technology is traded in a suppliers' market; and thereby, use of market mechanisms to obtain a balanced value is difficult (Boer 1998). However, venture valuation is of current interest and importance (Damodaran 2009a) given the important role of new ventures in the economy (Storey 1994).

Existing frameworks that can be used to valuate new technology-based ventures can be divided between scholarly venture/technology specific valuation frameworks and traditional financial frameworks applied to a venture setting. Of the former we find a monetary technology valuation framework created by Park and Park (2004) who use structural relationships between technology and market to establish the value of a technology project (Park and Park 2004), and a valuation technique where the traditional financial models are altered to better fit the venture market proposed by Damodaran (Damodaran 2009a; Damodaran 2009b). Of the latter we have investor associations guidelines and case study methods such as "*The venture capital method*"(Sahlman and Scherlis. 1987) or the "*EVCA guidelines"(AFIC et al. 2006).* Common for these last methods are that they to a large extent are one sided, only focusing on the financials of the new venture and not on its intrinsic aspects.

Within new venture literature there has been a focus on research concerning drivers of new venture performance (Chrisman et al. 1988; Kakati 2003; Song et al. 2008b). There are theoretic models explaining venture performance (Chrisman et al. 1998; Sandberg 1986) and several empirical studies identifying new venture success criteria(Chandler and Hanks 1994a; Roure and Keeley 1990; Stuart and Abetti 1987). There are, however, few examples of these findings being applied to a commercial or business setting. It seems that the research largely is motivated by the intention of explaining coherences and connections within a venture, while there is less attention to how these findings might be used in practice.

Though some attempts at including non-financial aspects in valuation frameworks has been made (Park and Park 2004), we argue that the potential that lies within this field has been underutilized, and that there is a gap between financial and venture literature that should be devoted more attention.

OBJECTIVE AND STRUCTURE OF PAPER

In this paper we aim to create a technology valuation framework through bridging venture performance literature with financial valuation literature. We argue that one should take a two-sided approach when valuing a new venture, not only focusing on the financials, but also on the inherent aspects of the venture, especially on factors that can predict venture success. The argument is based on the value of a venture being driven by its performance, and that one by assessing identified criteria can predict venture success, and thereby the venture value. We rely heavily upon research predicting venture performance and success, and aim to combine this insight with traditional valuation methods to create a framework that estimates an objectifiable value based on the venture's likelihood of success as well as the risks involved. We aim to create a framework that will be useful, practical and advantageous for entrepreneurs, investors and authorities, and therefore we avoid severe complexity as well as advanced mathematical and statistical methods. As a result of this the framework takes a deterministic approach and aspects such as flexibility and dynamics in future development are not modelled.

The remainder of this paper is organised as follows. First we explore venture performance models and financial valuation theory as well as their theoretical implications when applied to a venture setting. Then an overview of criteria predicting success of new ventures is presented. Next we develop and present our framework, based on the theoretic developments from part one. A preliminary empirical verification of the identified success criteria's abilities to predict success is conducted, and the framework is tested through a case study. The last section summarizes, concludes and indicates directions for further research.

THEORY

In this section we highlight the venture performance literature and financial models that form the basis of our framework. We also consider the theoretical implications of applying financial models in a venture valuation setting.

VENTURE PERFORMANCE THEORY

As highlighted above new ventures are central to economic development. This might be a contributing factor to the amount of attention devoted to new ventures in the literature. Over the past decades several theoretical works examining what drives venture performance have been published. One of the first widely recognised works within the field is Sandberg's (1986) model arguing that new venture performance is a function of the "*entrepreneur*", "*industry structure*" and "*business strategy*". Sandberg based his work on growth firms backed by venture capital institutions (Sandberg 1986), and a further tested and revised version of the model was published in 1987. When published

the model rejected the common academic understanding at the time – that venture performance only was determined by the aspects of the entrepreneur (Sandberg and Hofer 1987). Further verifying the model, but also arguing that "*resources* " and "*organisational structure processes and systems*" should be included as determinants of venture performance, Chrisman, Bauerschmidt and Hofer extended the model in 1998 (Chrisman et al. 1998). The expansion resulted in a comprehensive venture performance model that includes and builds on aspects from strategic management theory, organisational theory, resource theory and entrepreneurship research. As highlighted by Gilbert et al. (Gilbert et al. 2006) the findings of Chrisman Bauerschmidt and Hofer are supported by other theoretical works focusing on isolated aspects of venture performance such as the entrepreneur, managerial capability, and access to resources (Thakur 1999),and characteristics and background of the entrepreneur (Box et al. 1993). There is also empirical work supporting their findings such as Baum, Locke and Smith (Baum et al. 2001).

The venture performance model proposed by Chrisman Bauerschmidt and Hofer (1998) takes a somewhat linear approach, where the determinants of venture performance build heavily on each other. The relationships are not clearly identified and this is acknowledged by the authors who give directions for future research to take a more contingent approach by stating questions such as "*How do the various variables that represent the determinants of new venture performance interact*?" and "*What sorts of strategies work best with certain types of distinctive competences?"* (Chrisman et al. 1998). Baum, Locke and Smith address this aspect through a comprehensive contingent model identifying relationships between micro and macro factors concerning new venture growth (Baum et al. 2001). However they reach the same conclusion in their contingent model as Chrisman et al (1998) arguing that "*Individual, organizational, and environmental research domains predict venture growth better when the web of complex indirect relationships among them is included than when only multiple simultaneous direct effects are studied*" (Baum et al. 2001).

There are also studies covering selected relationships of the variables in Chrisman et al's. model. Covin and Slevin (2001) examine the effect of organization structure and environment on the relationship between strategy and sales growth, finding that planned strategies are better for mechanic firms in hostile environments while emergent strategies are positive for firms with organic structures in benign environments (Slevin and Covin 1997). Brettel et al (2010) examines the relationship between management style and performance contingent on venture life cycle stage, finding support for a positive relationship between performance and an "highly involved management style" in early phases (Brettel et al. 2010). Vanhoutte et al (2010) examines the relationship between initial resources, strategy and environment, finding that organizational and human capital are important initial resources. They also find that bundles of

resources are more important than individual resources to gain competitive advantage. However, they emphasise that competitive advantage can be reached in multiple ways (Vanhoutte et al. 2010).

Chrisman, Bauerschmidt and Hofers' (1998) model applies to new ventures in general and is not technology-venture specific. However, technology is addressed. For a new technology-based venture the technology will be its main product, and thereby technology is implicitly treated in Chrisman et al's. model through the products role as a strategic element. Technology is included as one of the possible differentiation strategies posed under business strategy in the model, and also treated through the option of product differentiation and innovation strategies (Chrisman et al. 1998). However, specific technology-venture literature indicate that the importance of the venture's technology is somewhat underestimated in Chrisman et al's model (Li and Atuahene-Gima 2001). Li and Atuahene-Gima (2001), highlight that several theorists argue that product innovation is a critical strategy for new technology ventures (Boeker 1989; Eisenhardt and Schoonhoven 1990; McCann 1991). Empirical findings on the matter have been both inconclusive (Chandler and Hanks 1994b) and mixed (Capon et al. 1990), however Li and Autahene-Gima argue that this might be due to the moderation effects of the environment and relationships surrounding the venture (Li and Atuahene-Gima 2001).

Further support of this perspective is found in new product development (NPD) littearture, where aspects regarding the product have been identified as performance drivers. Cooper and Kleinschmidt have done much of the important ground-breaking work within this field (Cooper et al. 1994; Cooper 1979; Cooper and Kleinschmidt 1986; 1987a; b; 1995; 2007), and identified factors within NPD process, organisational aspects of NPD, cultural aspects of NPD and strategy that are critical for success. The three latter categories are to a certain extent covered in Chrisman et al's model, however the NPD process category includes new aspects. The common findings of interest in a new technology venture setting within the NPD process category are related to three areas: market research (Cooper 1979; Cooper and Kleinschmidt 1986; 1987a; b; 1995), customer integration in the product development process (Cooper et al. 1994; Cooper 1979; Cooper and Kleinschmidt 1986; 1987a), and the market launch (Cooper et al. 1994; Cooper 1979; Cooper and Kleinschmidt 1987a; b). With regards to market research equal conclusions have also been made within new venture specific research, as Atuahene-Gima (1995) argues that venture strategy should be based on market research (Atuahene-Gima 1995).

EMPIRICALLY VERIFIED SUCCESS CRITERIA

There has been performed extensive research on factors predicting success of new ventures, and one finds several empirical studies identifying such factors in the literature. There does not, however, exist an overview of the findings

connected to new technology-based ventures, and it is the aim of this section to develop such an overview. To do this a thorough search of empirical studies spanning the last 25 years was conducted[1]. Separate searches were conducted for each of the categories in Chrisman et al's (1998) model and also for the added "product"-category. Several combinations of the following keywords where applied to each search; *"criteria", "indicator", "factor", "determinant", " technology", "tech", "technological", "venture", "success"* and *"performance".* A manual search of the last five to seven volumes of the most relevant and acknowledged journals within the field was also conducted. All studies that had empirically identified success criteria based on a sample of new technology ventures were included in the scope. The success measures used in the studies were survival, sales growth and return on sales, where the latter is argued to be the most common success measure in the entrepreneurship literature (Murphy et al. 1996). The identified factors was categorised in accordance with Chrisman Bauerschmidt and Hofers' (1998) venture performance model including product as an extra venture performance indicator. The factors and their sources are listed in Table 1 below.

Category/Name	**Factors**	**Success indicator**	**Sources**
Entrepreneur			
Inherent Factors	Persistency, Enthusiasm, Creativity,	Higher is better	(Kakati 2003; Lee et al. 2001; Stuart and Abetti 1987)
Experience and education	Industry/ventur e experience, Education	Higher is better	(Jo and Lee 1996; Kakati 2003; McGee et al. 1995; Reuber and Fischer 2002; Shrader and Siegel 2007; Song et al. 2008b)
Entrepreneurial orientation	Risk handling, Leadership style.	Risk willing is better. Informal and opportunity driven leadership style is better. (Dependent on market life cycle	(Kakati 2003; Lee et al. 2001; Stuart and Abetti 1987)
Industry structure			**Theoretical**

[1] We searched the databases that the Norwegian University of Science and Technology subscribes to.

Market growth	Growth rate	Higher is better	(Chandler and Hanks 1994b; Kakati 2003; Shrader and Siegel 2007)
Industry life cycle	Market life cycle	Growth or shakeout is better	Technology specific: (Hofer 2003; MacMillan and Day 1987) General: (Covin Dennis and Jeffrey 1990; Lumpkin and Dess 2001; McDougall et al. 1994)
Entry barriers	Competition, economics of scale, Capital requirements	Dependent on life cycle	(Robinson and McDougall 2001; Roure and Keeley 1990; Song et al. 2008b)
Resources			**Theoretical**
Resource based capabilities	Managerial capability, Technical capability, Marketing capability Specific resources	Stronger capabilities are better. Access to specific resource is important.	(Chandler and Hanks 1994a; Kakati 2003; Lee et al. 2001)
Financial resources	Financial resources	Extensive access is better	(Lee et al. 2001; Song et al. 2008b)
External networks	Relevance and quality, Supply chain integration	Bigger and more relevant is better More integrated is better	(Lee et al. 2001; Song et al. 2008b)
Organisational structures processes and systems			**Theoretical**
Organisational structures processes and systems	Team experience of working together, Social interaction, Managerial positions filled at first funding.	Higher is better for all indicators	(Lechler 2001; Roure and Keeley 1990; Shrader and Siegel 2007)
Product			**Theoretical**

Product superiority	Improvement, Technology life cycle	Larger improvement is better, Growth and shakeout phase positive	(Roure and Keeley 1990) (Zahra and Bogner 2000)
Product protectability	Intellectual property rights	Clear strategy is better.	(Kakati 2003; Song et al. 2008b; Stuart and Abetti 1987)
Product development process	Product developed to satisfy a need, Customer inclusion in development process, Market Launch.	Clear need and inclusion of customer is better. Quality and effectiveness in market launch better.	(Dwyer and Mellor 1991; Gruner and Homburg 2000)
Business strategy			**Theoretical**
Strategic fit	Match of strategy and capabilities, Match of strategy and resources, Match with external environment	Important with clear matches.	(Chandler and Hanks 1994a; Hofer 2003; Kakati 2003)

TABLE 1 - NEW TECHNOLOGY-BASED VENTURE SUCCESS CRITERIA

An aggregation of research findings such as the one above is pragmatic and not without methodological implications. Even though all studies were selected within the same scope and with the same requirement to quality of sample and research method, there were several differences between the identified studies and the studies were also exposed to individual weaknesses. A summation of the weaknesses and their main causes are listed in Table 2 below.

Weakness	Cause of weakness
Lack of longitudinality	Research is primarily focused on differences at one point in time.
Data bias and use of proxies	Not common proxies and data are from different sources
Varying success measure	There is not an universal defined success measure in the research

Sample Bias	Samples differ in size, industry, age/life-span, nationality, technology-level, exhaustiveness and macroeconomic environment.
Degree of causality	Few and somewhat varying attempts at describing relationships between cause and effect.
Cross-sectional studies	Studies are not experimental
Applicability	Few of the studies state which circumstances that their findings are applicable in.

TABLE 2 - WEAKNESSES AND THE CAUSES OF WEAKNESS REGARDING THE COLLECTED SUCCESS CRITERIA.

Based on the weaknesses stated above, and since Chrisman, Bauerschmidt and Hofer (1998) highlighted that future research should attempt to confirm the propositions of their findings, an empirical verification of the findings was found necessary.

FINANCIAL VALUATION THEORY

Dittmann et al. provide a good overview of the literature on valuation (Dittmann et al. 2004). They state that one in any of the major corporate finance textbooks will find recommendations for discounted free cash flow analysis as the most applicable company valuation technique (Berk and DeMarzo 2007; Myers and Brealey 1988) and that more comprehensive overviews also include methods based on book values, comparable companies and real options (Cornell 1993; Damodaran 2001). The valuation methods can be separated between explicit and implicit methods. The former are methods trying to assess the value based on intrinsic aspects of the venture, such as discounted the cash flow methods where value is assessed based on forecasts of the cash flows the venture will generate in the future, while the latter are methods based on comparing the venture with relevant established firms and transactions in the industry (French 1997). There is no consistency regarding which method that would fit the venture setting best, however French (1997) on a general basis argues that which model one should apply to get a correct valuation is dependent on the situation (French 1997). Damodaran (2009) advocates that a discounted cash flow approach should be used when valuing new ventures, however given some alterations to take the characteristics of the venture market into consideration (Damodaran 2001; Damodaran 2009a; Damodaran 2009b).

Another key aspect of financial valuation is determining the cost of capital and especially the cost of equity. The two main theories in this area are the capital asset pricing model (CAPM) (Lintner 1965; Mossin 1966; Sharpe 1964) and arbitrage pricing theory (APT)(Ross 1973). They both rely on some common and some individual assumptions regarding the capital market that will impact their

applicability in a venture valuation setting. An overview of the assumptions is displayed in Table 3 below.

#	Model market assumptions	CAPM	APT
1	**No transaction cost or taxes**	X	X
2	**Homogenous investor expectations**	X	X
3	**Investors only hold efficient portfolios**	X	
4	**Single stage model**	X	
5	**Complete market**		X
6	**Diversified portfolios**	X	X

TABLE 3 – CAPM AND APT MARKET ASSUMPTIONS[2]

When applied to a venture setting, use of both CAPM and APT will be in violation of the assumptions behind the theories.

Assumption one implies that all information is readily available and that the market is liquid, however this is not the case in the venture market. Firstly, most ventures are privately held, which implies a more lenient regulatory regime with regards to reporting financial information, thereby creating transaction costs since investors will have to devote severe time and effort to obtain information (Ge et al. 2005). Secondly Lerner (1994, 2001) and Gompers (2001) argue that due to regulation, tradability of new ventures is low (Lerner 1994) which means that the assumption of liquidity will be violated since there is no ready market for shares of new ventures. Ventures are also traded in big lots (Elango et al. 1995; Matson 2003), further reducing the liquidity of the market and increasing the transactions costs.

Assumption two implies that all investors have the same expected reward for equal levels of risk. However, the value investors set on a unique venture tend to differ, indicating that different investors can have different expected reward for the same investment (Ge et al. 2005). Empirical studies also indicate that expected reward differs geographically, and that private investors tend to have higher expectations than public (Manigart et al. 2002).

Assumption three and four, which only applies to the CAPM, are also violated in the venture market. Given the structure and illiquidity of the market it will be challenging for investors to hold efficient portfolios (Berk and DeMarzo 2007). Holding efficient portfolios also implies that returns are normally distributed which is not likely given that it is argued that 4% of new ventures contribute

[2] (Lintner 1965; Mossin 1966; Ross 1973; Sharpe 1964)

with 50% of the economic growth caused by new ventures in a 10 year period (Storey 1994). A technology venture often follows a stage-wise development and a venture investment is often a stage-wise endeavour. However CAPM is based on utility theory which is originally defined in a single period perspective (Markowitz and Markowitz 1991; Savage 1954). This initially makes the CAPM a single stage model, however it can be extended to a multi stage setting (Elton et al. 2009; Fama 1970; Kazemi 1991), given even stricter assumptions. This further emphasises the theoretical challenges of applying the CAPM on a venture market.

The venture market is also in violation of assumption five that only applies to arbitrage pricing theory. The APT relies upon a complete market implying that any project can be replicated by a combination of other projects in the market (Myers and Brealey 1988). However a new technology venture might introduce a disruptive technology that cannot be replicated, as it might represents new combinations of risk and reward. The derivation of the model also relies on the possibility to create arbitrage portfolios that cost no net wealth, have zero risk and zero return. This will only be possible with an infinite number of assets (Copeland and Weston 1989), an aspect that does not apply in a venture setting.

Assumption 6 applies to both theories and is one of the key propositions behind the models. It states that all investors must hold diversified portfolios, however empirical data from Norway and Canada provides a foundation for arguing that this is seldom the case (Cumming 2006; Matson 2003).

As the deduction above suggests using either CAPM or APT on the venture market will be in violation of the market assumptions of the theories. The implication of this is that the validity of the calculated rates of return cannot be verified theoretically, indicating that when using the methods on a venture market, one needs to be aware of the pragmatism involved. However, obtaining an objectifiable discount rate is still key to obtaining a reasonable venture value. A survey from 2004 shows that investors often use arbitrarily set discount rates that are not related to the actual cost of capital when performing explicit DCF valuations of new ventures (Dittmann et al. 2004). This is in strong contrast to evidence showing that *"the use of DCF is correlated with superior investment performance only if applied in conjunction with an objectifiable discount rate."* (Dittmann et al. 2004). Examples of possible solutions found in the literature are few, however Damodaran (2009) suggest that CAPM can be applied, given some alterations (Damodaran 2009b).

DESCRIPTION OF FRAMEWORK

In the following section a framework for venture valuation based on both venture performance theory and financial theory is developed. As the previous sections indicate, there will be several implications when applying and

combining traditional financial models and venture performance models in a technology-based venture valuation setting. The framework relies on Chrisman et al.'s venture performance model, however expanded to also include *"product"* as a performance determinant, given the technology setting. Further it utilises the identified success criteria to assess the ventures' likelihood of achieving high performance. The framework is aimed to be applicable for all new technology-based ventures and therefore takes an explicit form. Since a technology-based venture's product might be disruptive it is not obvious that usable comparable transactions will be available, if one were to rely on an implicit valuation. The framework follows a concept where one first projects a best-case cash flow scenario. The scenario is then adjusted, using a success criteria analysis to reflect the ventures probable performance, and then discounted to account for market risk. This form of concept is advocated by Johnsen (1997) arguing that "One should be careful adjusting a discount rate, but instead strive to estimate as realistic cash flows as possible" (Johnsen 1997).

As the theory suggests, using either CAPM or APT in the venture market will be in violation of the assumptions of the models. However, one still need to assess the cost of capital if one is to perform an explicit valuation of a venture. Of the two models the CAPM is argued to be the most popular (Carlin and Finch 2009; Graham and Harvey 2001), and given our aim to create a "user-friendly" framework we apply the CAPM model as it should be easy to understand for the user. We acknowledge that this is a pragmatic approach. The problem of identifying the sensitivity of different arbitrage drivers in the arbitrage pricing theory model is also a contributing factor in not choosing the APT model, as these sensitivities will vary among different sectors, dramatically increasing the complexity of the framework.

The value obtained by the framework is aimed to be a value that is objectifiable given the venture's financial outlook and indication of performance. It is not necessarily the value that an investor or an entrepreneur would obtain for a venture, as the deviating interests of the respective actors often influence these values. The framework is outlined in Figure 1 below.

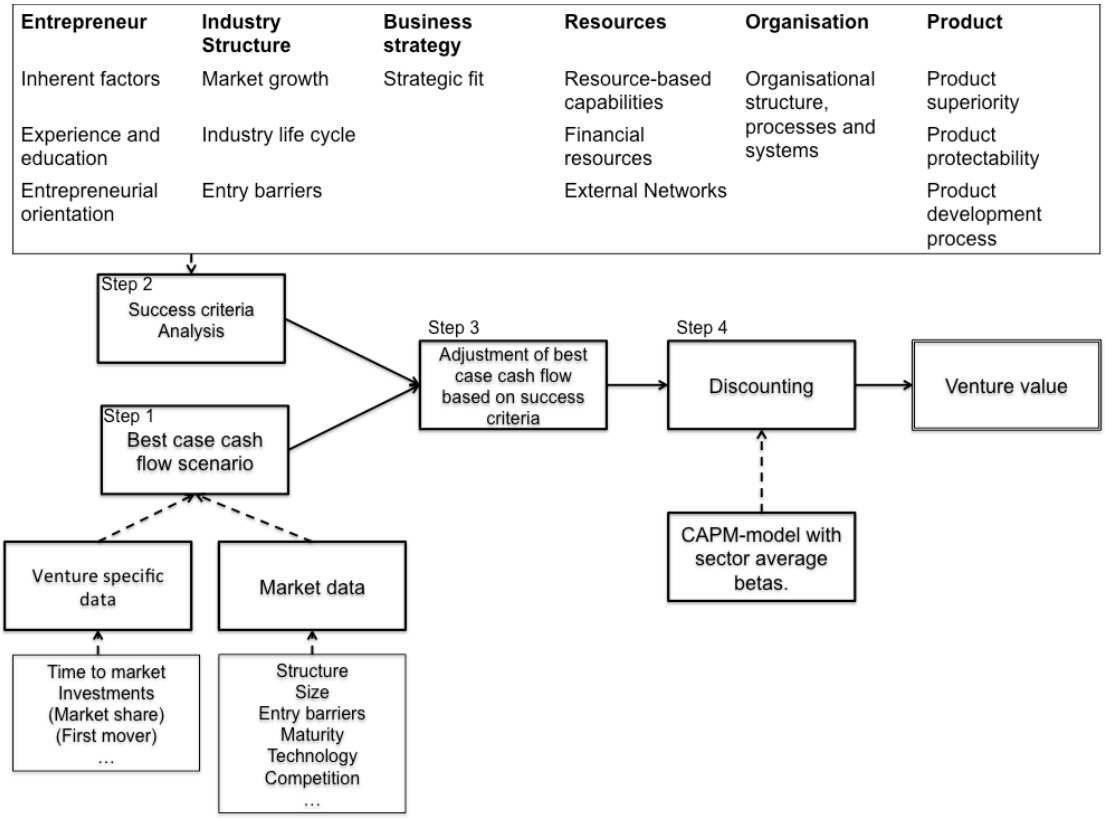

FIGURE 1 FRAMEWORK FOR VALUATION OF NEW TECHNOLOGY-BASED VENTURES

STEP 1 - BEST CASE CASH FLOW SCENARIO

The first step of the framework is to generate a best-case cash flow scenario. There are several possible approaches, and which to use depends on the available information. Whatever method is used, the results will be subject to errors due to the foreseeing nature of the process. However we want to emphasize that an explicit approach should be used, where the cash flow is built based on the venture in question, and not based on comparison to other ventures. The cash-flow estimate is supposed to be a best-case cash flow. I.e. the cash flows that the venture could obtain if "everything is perfect".

STEP 2 – SUCCESS CRITERIA ANALYSIS

The second step is to perform a success criteria analysis of the venture. This consists of assessing the venture on several factors prediction success There are in total 14 identified criteria within six categories *("entrepreneur", "industry structure", "business strategy", "resources", "organisational structure, processes and systems" and "product")*. The results of the success criteria analysis is used in step 3 to adjust the best-case cash flow scenario.

STEP 3 – ADJUSTMENT OF THE CASH FLOWS

Step 3 is to adjust the cash flow scenario for indicated venture performance obtained in step 2. The concept is that the venture's performance within the identified success criteria is used to adjust the input factors of the best-case

scenario. As an example: If a venture that in a best-case scenario market its product all over the world is to obtain these best case conditions, it will probably need substantial financial resources and an organization with international experience. If the venture scores low on these two indicators, international expansion is less likely and the future market share is to be drastically reduced. There will be several such dependencies and interdependencies between the success criteria and the input factors, and these will differ from venture to venture. It is important that the adjustments are integrally realistic, and that they represent the totality of the indication in the success criteria analysis.

STEP 4 - CALCULATION OF NET PRESENT VALUE

The final part is to discount the cash flows. The discount rate should estimate the required compensation for market risk when investing in the venture, and is calculated using the CAPM-model. Acknowledging its pragmatism we lean on Damodarans approach of using CAPM with sector average beta based on the listed incumbent firms in the ventures' target industry to calculate the cost of equity (Damodaran 2009a; Damodaran 2009b). The CAPM-model assumes diversified investors, however this is not the case for most venture investors (Cumming 2006; Matson 2003). Damodaran compensates for lack of diversification through using the R^2-meassure of the initial beta calculation as a proxy of exposure to idiosyncratic risk. The approach is sensible given a large stock market (Damodaran is located in the US where there are many listed companies), however in smaller markets this approach will pose a problem since the beta-regression will be calculated based on very few data points. Instead we argue that the intrinsic risk will be handled through the success criteria analysis. Based on the cost of equity and the cost of debt (if the venture has debt) we find the weighted cost of capital (WACC). Finally the venture value is calculated as the net present value of the ventures future cash flow using the WACC as discount rate.

EMPIRICAL TESTING AND CASE STUDIES

PRELIMINARY VERIFICATION OF PERFORMANCE INDICATORS

Since the success criteria analysis is based on collected criteria from several different surveys spanning several different samples, there is uncertainty connected to its ability to predict success. To get a prediction of the validity of the identified success criteria a preliminary empirical investigation was conducted.

PROCEDURE AND SAMPLE

Obtaining data to perform the test was challenging, and time and effort was devoted to finding and getting access to data sources containing coded data regarding the different variables, however without any satisfactory results.

Conducting a survey was considered, however given the aspects of the data needed (with regards to sensitivity, accessibility of respondents, longitudinallity and concern of respondent bias) this form of data collection was abandoned. The resort was to code the data ourselves, based on access to 20 business plans from a database of new technology-based venture business plans located at the NTNU entrepreneurship centre. 10 less successful ventures and 10 somewhat successful ventures were selected. A venture was labelled as a success if it was still operating or had been acquired by another firm. The ventures that went bankrupt or where there was no or little activity were labelled as failures. The outcome of a venture was disclosed after the data was coded to avoid assessment bias. The database contained business plans for technology start-ups that had taken part in a regional commercialisation programme. The business plans spanned the last 6-12 years, and follow-up data on performance from the year of the business plan until today was collected from the Brønnøysund Register Centre (The Norwegian Business Registry).

To code the data a success criteria analysis following the subsequent procedure was performed for each venture. Within each category *("entrepreneur", "industry structure", "business strategy", "resources", "organisational structure, processes and systems" and "product")* several questions were answered to assess the success criteria within the category. The questions were based on the factors within each success criteria, which are listed in Table 1 above. For each factor the venture was given a score on a scale from 1-7 (where 7 was the highest score). Each factor within a category was assigned equal weight, since the internal weighting between the success criteria was not known, and the average score in each category was calculated. Finally the average scores from the six categories where summed up resulting in a final score for each venture. Based on this, average scores for successes and failures were calculated.

RESULTS

The results from the empirical test of the success-criteria analysis are listed in Table 4 below

Results. Successes: N=10, Failures: N=9	**Score**
Average score successful ventures	23,72
Average score failed ventures	20,52
Standard deviation successful ventures	1,94
Standard deviation failed ventures	2,72
Mean difference	3,2

TABLE 4 - RESULTS FROM EMPIRICAL STUDY. (ONE VENTURE WAS VIEWED AS AN EXTREME CASE AND WAS REMOVED

The mean difference between successful and failed ventures is 3.2. Levene's test indicates that the two groups have equal variance (Sig >0,05) and the Sig. (2-tailed) is 0.009 indicating that there is less than 1% chance that the mean difference is random. These results indicate that the success criteria analysis has an ability to predict success. This is an interesting result since it verifies that the concept of a success criteria analysis based on Chrisman et al.'s (Chrisman et al. 1998) model expanded to include product, and operationalised through empirical investigations, has an ability to predict success, even with the weaknesses involved. However, there are also some implications since the test is preliminary. Firstly it does not verify the isolated elements of the model. Secondly, the standard deviation of the successful ventures is lower than for the unsuccessful ventures, indicating that there is more variation in the scores among the unsuccessful ventures, implying that a low score is a better indication of a possible failure than a high score is of a possible success. A closer look at the failures reveals that the ventures that went bankrupt in average scores lower than the ones who were put on hold, giving an indication that the performance model also can predict different degrees of failure.

The limited sample combined with a relatively large number of variables reduces the possibility of finding further statistically significant results and therefore the investigation is to be considered as preliminary. We acknowledge this as a weakness with regards to our findings, however based on the accumulated findings we argue that a further empirical examination of the performance criteria should be conducted, and that a preliminary verification of the validity of the performance model is obtained.

CASE STUDY

To test the framework in a setting realistically replicating an actual valuation, a case study was performed. The aim of a case study in general is to *"provide an analysis of the context and processes which illuminate the theoretical issues being studied"* (Cassell and Symon 2004). Further a case-study is argued to be flexible, especially when addressing areas of planned and emergent theory (Cassell and Symon 2004; Robson 2002) and are preferred when questions of "how" and "why" are to be answered (Yin and Campbell 1994). In our case we seek to answer the questions stated below.

1. How does the obtained valuations compare to reference values?
2. How does combining finance and venture literature contribute in the valuation process?
3. How does the valuation framework perform from a practical standpoint?
4. Has the goal of creating a framework that "objectively" measures value been reached?

According to Yin (2009) there are six main sources of evidence for a case study (Yin 2009). This research utilises documentation, interviews and archival records, which are three of the sources argued by Yin (2009).

PROCEDURE AND SAMPLE

Three new technology-based ventures were selected for the case study. The source of information used when applying the framework were the business plan of the ventures, as well as public information on the Internet. All three ventures were assessed based on business plans from 2007. As with the empirical test of the success criteria the success criteria analysis was conducted without knowing the later history of the ventures. When generating and adjusting the best-case cash flow scenario we strived to use what we assumed were the market-outlooks in 2007. Helping us doing this where the descriptions of the markets in the business plans, and it is our opinion that the scenarios were not widely influenced by our knowledge of what happened with the markets and ventures after the time of valuation.

Case	Description	Data sources	Actual performance	Note
Venture A	Accessories to a consumer discretionary product.	Business plan and official registers.	Acquired by a large producer of similar consumer discretionary products.	The entrepreneurs considered the sale as a success. The venture was largely funded by government grants and loans.
Venture B	Accessories to a consumer discretionary product.	Interview with venture fund manager and investment plan.	Still in operation in a worldwide market, however with new owners.	From the investments funds point of view this venture was a failure as an investment and the venture was sold for a symbolic amount.
Venture C	High tech construction material.	Business plan and official registers.	Activity has been reduced gravely the last years, however the firm still exists.	Has been put on hold due to economic downturn in target industry.

TABLE 5 - INFORMATION AND RESULTS FROM CASE ANALYSIS

The value of each venture was calculated following the steps described in section 3. The questions in the performance analysis were answered based on the business plans and questions where data was not available were omitted. The discount rate was calculated based on historical financial data available online (Bloomberg 2011). The values obtained in the case-study are calculated at the point in time where the data was initially collected. This enabled us to compare the values we estimated with the venture's actual future development.

Experience using the framework, Analysis and Results

Conducting a case study revealed several interesting aspects that impact the framework in multiple ways. An overview of the most interesting experiences and findings follows.

Best case scenario

Calculating the cash flow scenarios was as expected a challenging task. It is of our impression that one to obtain accurate and realistic cash flows need considerable business understanding and market insight. It is however assumed that the entrepreneurs and investors performing an actual valuation will have more experience, knowledge and insight than what the authors had when performing the case study.

Performance analysis

Assessing the factors in the venture performance analysis was straightforward given our data, except for the factors concerning the entrepreneur's personality and the interpersonal aspects of the entrepreneurial team. It is however assumed that one in an actual valuation setting will have access to interviewing the entrepreneurs and therefore this aspect is not considered as a limitation of the framework.

Adjustment of cash flow scenario

The adjustment of the cash flow scenario was perhaps the most challenging step in the framework. Vast insight in both the venture and its market and industry was needed to undertake the adjustment and to keep the scenario holistic and integrally realistic. The facilitating effect of the success criteria lightened this work considerably, and it is assumed that potential users will have great benefit of this aspect.

Discount rate

The assumed weakness - that some sectors will have few listed firms to base the calculations on - became evident when calculating the discount rate. Further, it was somewhat challenging to determine which market one should base the calculations on, since the ventures potentially could be listed in several different markets.

The results from the case study are presented in Table 6 below

Case	Generated Framework valuation	Reference value from venture transaction	Type of reference value
Venture A	NOK 42,3 million	NOK 20 million (2010)	Acquisition value
Venture B	NOK 89,9 million	NOK 104 million (2007)	Valuation at investment
Venture C	USD 6,124 million	USD 2 million (2006)	Investment by angel investor some months prior to valuation

TABLE 6 - RESULTS FROM CASE STUDY

Firstly, the reference values should not be viewed as the correct answers, as the reference values are biased by the transaction situation, whereas the framework aims to find an objectifiable value of the venture. We do however make some comments on why there are differences. The questions stated in the introduction of the case study are now addressed in order of appearance.

The values for venture A and C are double and triple the reference value while the value of venture B is somewhat lower than the reference. An important difference between Venture A and C and Venture B is that venture A and C had not achieved product acceptance in the market, and Venture A also targeted a non-existing market. The lack of market acceptance and an established market might be a factor reducing the value of the ventures in the reference transactions due to the uncertainty involved. This is in accordance with the findings of Shepherd et al. (Shepherd et al. 2000).

When performing a success criteria analysis of Venture B, the success criteria related to the products received low scores. This was one of the main factors contributing to the reduction in the cash flow scenario. A follow-up interview with the VC who invested in the venture revealed that the product also had been a problem in real life. This is an interesting aspect that contributes to verifying the validity of the principle behind the framework, that venture value can be assessed based on indicators of venture performance.

After the time of valuation Venture B was severely impacted by the worldwide economic downturn in 2008. This led to a fall in the market for the venture's product. Due to this the venture did not obtain the sales that were projected in the adjusted cash flow scenario, and the investors who invested in 2007 also had to exit at a loss. Venture C experienced a similar effect of the economic downturn. Their targeted market was heavily exposed to the condition of the general economy. When the market plummeted so did the sales of Venture C, and eventually they put the entire venture on hold. These two cases show that the

framework does not account for such large shifts in the economy, and that the exposure to macro factors in general can be questioned, however such aspects are in general hard to foresee.

With regards to question two, the case study reveals that several benefits are obtained from bridging finance and venture literature. The inclusion of intrinsic venture aspects in a financial valuation setting contributed to facilitate aspects that usually are dealt with implicitly in venture valuations, such as the quality of management. The venture capitalist we were in contact with highlighted the importance of a strong venture team, and stated that the quality of the venture team impacted the ventures attractiveness as an investment object, thereby indicating that intrinsic aspects are of value. Another intrinsic aspect is the assessment of the venture's product. As the case study reveals the venture product can be an important factor impacting venture value. This emphasises the importance of the product in a venture setting, as well as its impact on venture performance and thereby venture value. These intrinsic aspects are factors that are not included in traditional financial valuation, however they are assessed in the framework presented in the article.

The case-study shows that the framework is practical and sensible to use and it is believed that question three, the aim of creating a *"user-friendly"* valuation framework, has been confirmed. It is, however, not possible to draw clear conclusions on the validity and objectivity of the values obtained when compared to real life transaction values, so a clear answer to question four cannot be provided. It is however of our understanding that the framework can be of value for entrepreneurs and investors, especially as an objective reference when comparing new venture investment opportunities.

CONCLUSION

In this article we have developed and tested a new technology venture valuation framework based on venture performance analysis. Building on a theoretical development we have argued that venture value is driven by new venture performance, and that one thereby can use indicators of new venture performance as input in a venture valuation framework. First Chrisman, Bauerschmidt and Hofers (1998) well-recognised model of venture performance was extended to better fit a technology valuation setting by increasing its focus on product and technology. Then several empirical performance indicators were identified and a preliminary verification was performed with satisfactory results. Further we looked at the implications of applying financial models (CAPM and APT) to the venture market. Using the theory we developed a framework that conducts an explicit valuation based on calculating net present value of success-adjusted cash flows. The work has been built on bridging venture and finance literature.

The main contributions of this article are listed below.

- We have created a framework that will be valuable in a venture valuation setting because of its combination of key aspects from both financial and venture performance literature
- Preliminary empirical investigations of a set of identified success criteria reveal an ability to predict success, and thereby indicate that further work with venture success criteria analysis should be undertaken.
- The case study found that the framework is practically usable, and able to predict values based on factors beyond those usually assessed in a venture valuation setting, giving an objectifiable value that is not biased by the venture setting.

The work that is detailed in this article has contributed to bridging the gap between finance and venture literature, and the vast potential that lies in bridging these research streams has been verified. Further, our research has to a certain extent verified existing literature such as Chrisman et al.'s (1998) venture performance model, and also highlighted areas of insufficiency such as research on cost of venture equity and the role of product and technology within venture performance.

FURTHER RESEARCH

Although the article arrives at a framework, research is yet to be undertaken before the framework and its concept can be ultimately verified. Further research should concern the following main areas. Firstly empirical testing, preferably with a longitudinal approach and utilising large samples should be performed to verify the identified performance indicators. Exploratory research of the links between performance indicators and cash flow scenario input factors should also be undertaken, utilising both contingent and unconditional approaches. It is assumed that several universal relationships between success criteria and the input factors of the cash flow scenario exist, and a clarification of such relationships will be of great value for the applicability of the framework. Modelling flexibility and uncertainty in the framework should also be considered. Further the framework should be tested with regards to consistency of calculated values in reference to values obtained using other frameworks as well as transaction values.

Regardless if future time and effort is devoted to the framework proposed, it is the hope of the authors that this article can contribute to a further bridging between the different research streams concerning new technology-based ventures so that a better understanding of new venture value can be obtained. Further it is of our perception that new venture research in general could prosper from increased cross-sectional work, and that synergistic effect could be

obtained from increased combination of research from the different research streams concerning new ventures.

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APPENDIX

Results from empirical investigation.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
Equal variances								95% Confidence Interval of the Difference	
	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Assumed	.943	.345	2.975	17	.009	3.19904320978	1.07548769678	.92996251334	5.46812390622
Not assumed			2.921	14.339	.011	3.19904320978	1.09515936340	.85536553338	5.54272088617

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PART 2 - REPORT

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Valuation of new technology-based ventures

Erik Sæbu Vatn & Trond Ytre-Arne

Norwegian University of Science and Technology

PREFACE

The aim of this report is to be a practically oriented introduction to the art of valuating new technology-based ventures. The guide is targeted at several groups, amongst others entrepreneurs, venture capitalists, government authorities and academia. This report was written in parallel with an article aimed for publication. While the report has a somewhat applied context the article has a more exhaustive theoretical basis. Readers who whish to endeavour deeper into the theoretical background of our findings are advised to consult the article. Given the close relationship between the article and the report smaller sections will be identical in the two works.

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INTRODUCTION

New ventures have an important role with regards to economic development, especially as contributors to economic growth and employment (Spilling 2000; Storey 1994). Further entrepreneurship is argued to be a driver of economic growth (Acs and Armington 2006; NaudÈ 2008) and to possibly have rejuvenating effects on industries (Song et al. 2008).

In 2008 venture backed companies accounted for 21% of US GDP and 11% of private employment (NVCA 2009b). Venture capital backed firms had an economic benefit (revenue) of USD 2,9 trillion in 2008 and there were a total of 12,1 million people working in venture-backed firms in the U.S. As Figure 1 below shows the trend has been increasing over the last decade.

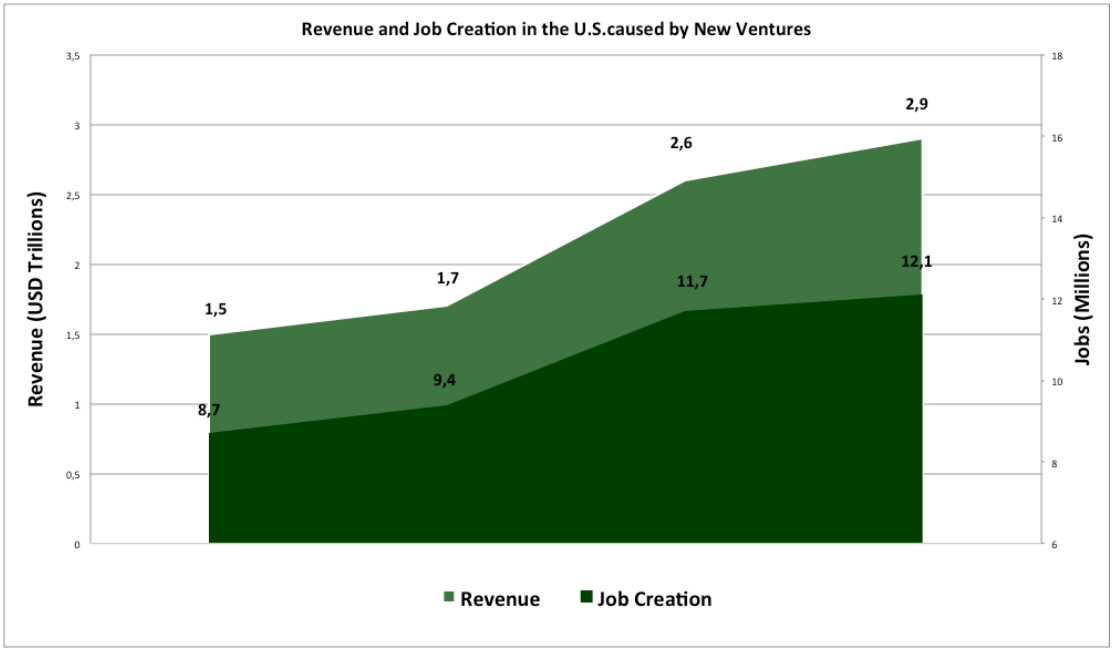


FIGURE 1 - EMPLOYMENT AND REVENUE OF US VENTURE BACKED FIRMS

There is also a severe investment activity in new ventures. As Figure 2 below shows there have been committed a lot of financial resources to new ventures over the last years, with a total of $149,94 billon invested. Venture capital tends to by cyclical, and follows the general changes in the economy with increased activity in boom periods and reduced activity in downturns. Over the recent years investment peaked in 2007 and fell dramatically with the economic downturn of the fall 2008, however it has been rejuvenating since.

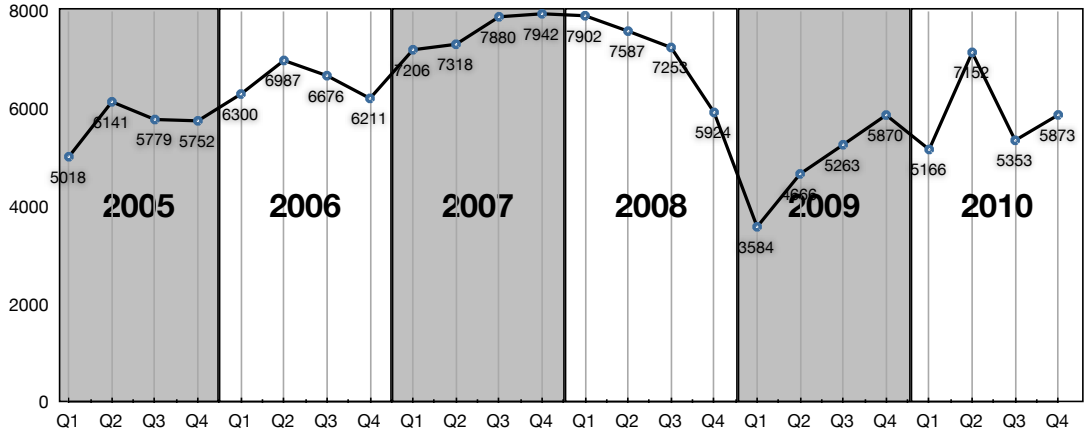


FIGURE 2 – QUATERLY VENTURE CAPITAL INVESTMENT IN THE US 2005-2010 ($MILLION)

(PWC 2011)

Although the U.S. is the biggest venture market in the world, there is also substantial investment activity outside the U.S. As Figure 3 below shows there have also been substantial financial commitment to the venture sector in Norway over the past 7 years.

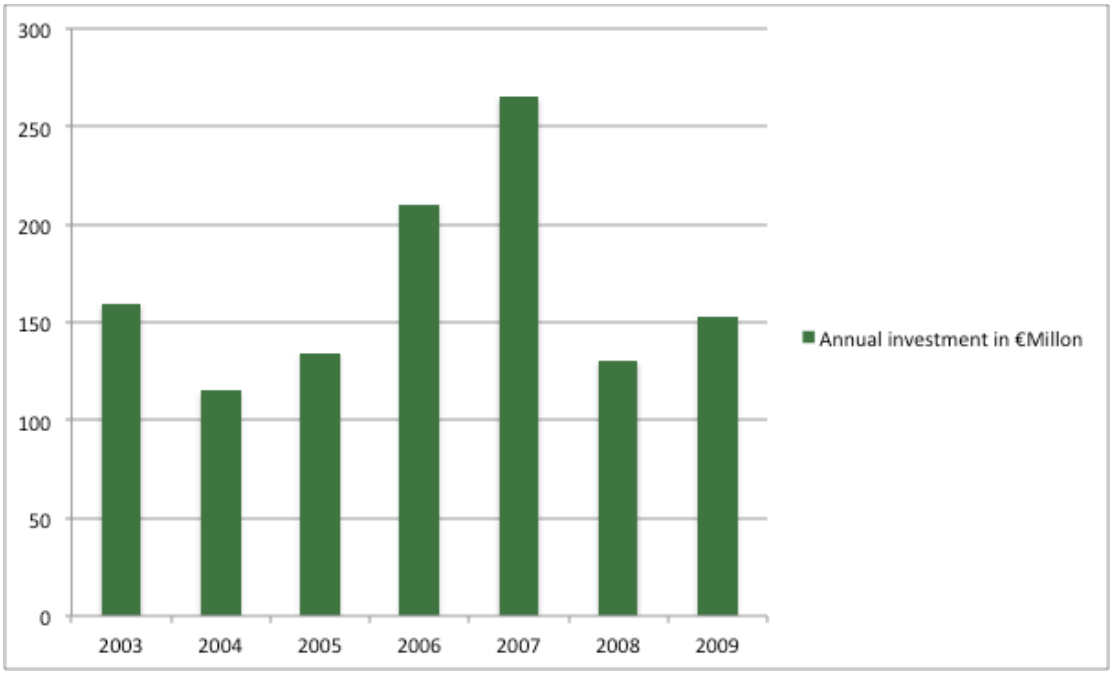


FIGURE 3 – ANNUALLY INVESTED VENTURE CAPITAL IN NORWAY[1]

New ventures are also important with regards to commercialisation of new technology. Of the new ventures, new technology-based ventures are especially

[1] (NVCA 2009a)

important (Chen 2009; Drucker 1999; Hayton 2005) and has according to Chen (2009) accounted for 25% of net job creation and 95% of radical innovations (Allen 1999; Chen 2009; Timmons and Spinelli 1994) over the last two decades. The U.S. National Venture Capital Association (NVCA) also state that a majority of their investments are in high technology firms (NVCA 2011).

It is clear that new ventures are important and that especially an understanding of new technology-based ventures and the technology venture setting is crucial for entrepreneurs, investors, authorities and employees. The technology venture setting is however complex, and there are several factors that impact a new venture on it's way to growth and maturity. The lack of an objective way to determine the value of a new technology ventures is a contributing factor to this complexity, and it is this area we address in this report. It is the aim of this report to generate an overview of the technology venture valuation setting, as well as to present a new framework for technology-based new venture valuation.

In the first part of the report we give an overview of the new venture setting through looking at the typical venture development timeline and through highlighting some aspects regarding financing of new ventures. We also look at statistics concerning new venture failures.

The next section presents an overview of traditional financial valuation models as well as their implications when applied to a venture valuation setting. We address both the theoretical and practical aspects of valuation in the venture market.

Section 3 look into factors predicting success for new technology-based ventures. A systematic overview of the recent empirical findings is presented.

In section 4 a framework for new technology-based venture valuation is developed. The framework relies upon combining the factors predicting success from the previous section with traditional financial models from section two. To our knowledge such a framework has not been developed earlier.

In the next section the framework is applied on three ventures in a case study. Its applicability, implications and performance is assessed, and lessons learned from applying the framework are presented.

Lastly an alternative valuation method applying success criteria analysis is indicated.

1. THE VENTURE SETTING AND VENTURE FINANCING

In this section we first take a close look on the stage wise development of a new venture from the first external investment to IPO, buy-out or in many cases failure. We then present some of the important new venture stakeholders, before we switch the attention to new venture survival. At last we look at the aspects that impact values that are calculated in venture transaction processes.

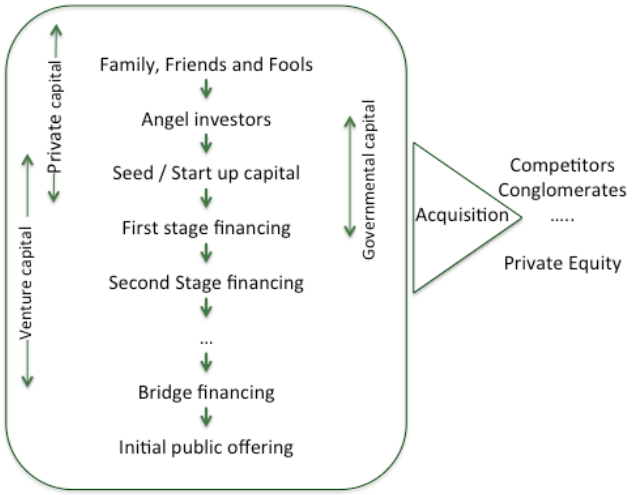
1.1. THE VENTURE CYCLE

The process of starting a new venture is a long and difficult one. There are many hurdles to overcome along the way, and many do not make it to commercial success. One of the main challenges is to get the required financing in place at the right time. For the entrepreneur this is a challenging task because there are many aspects to consider. The less external financing the entrepreneur gets, the larger amount of the company (s)he will retain, so accepting vast funding early is perhaps not a good idea. Also, the further you could survive without financing, the more your company is probably worth at the point of financing. This point must be weighted with the need for rapid development of the company. Many entrepreneurs choose to "bootstrap" as long as they can, perhaps on the expense of time to market. For some they might have been better off with a more rapid growth but a smaller share of the company.

AN ENTREPRENEURS MAIN CHALLENGES:

- Financing
- Technology development
- Technology protection
- Business Models
- Organisational development

As a venture moves through the different stages it will need capital, and is thereby a potential candidate for different types of financing (Gompers 1995). During the first stage the entrepreneur often uses some of his own money or "borrows" money form the **3Fs**, family, friends and fools. The money is often used to develop a functioning prototype, or to establish the legal entity. The next step for some is to get an **Angel Investor** on board. These are investors who often have more than just financial reasons to invest and that take fairly high amounts of risk. Those reasons might for instance be a wish to support local entrepreneurs or a certain technology/product. In the early stages there are also sometimes governmental grants and subsidies available, however there are often political criteria that apply and such arrangements are of course dependent on which country the venture operates in. The next potential source of financing is **seed/start up capital.** This is often used to enable the company to go to market and launching their first products.



What is called the **First stage financing** is often provided by professional venture capitalists and used to scale up the production/sales and growing the organisation. The Second (and sometimes also Third) stage financing is also used in order to grow the business.

FIGURE 4 - FINANCING OF NEW VENTURES

Some ventures also require **Bridge financing**. This is capital injected in order to prepare the company for public offering. This round of financing is sometimes offered by venture capital firms specialised in taking ventures public. The last stage of the new venture process is the **Initial Public Offering**. This is also a capital addition to the firm. The majority of new ventures never reach IPO, but are acquired by other companies or Private Equity firms in buy-outs along the way. The failure rate of new technology ventures is also high, and failures happen in all stages of the process.

1.2. STAKEHOLDERS

A new venture has several stakeholders who have different interests and perspectives on the venture process.

1.2.1.1.1. ENTREPRENEURS

The entrepreneur is of course a key stakeholder for a new venture. This is the person who has the business idea and who initiates the start of the new company, and the entrepreneur is often the person with the greatest insight and commitment to the venture. The entrepreneur takes a lot of risk when deciding to start a venture, and several fail. Many new ventures are passion projects where the entrepreneur strives to commercialise an idea that he has spent severe time and effort to develop. With the amount of passion involved, a lot of entrepreneurs are reluctant to let others take interest in their project and want to retain as much control as possible as the venture grows. Retaining large amounts of control and ownership can be at the cost of rapid development of the venture, however entrepreneurs do often not have enough business insight to apprehend this perspective.

1.2.1.1.2. VENTURE CAPITALISTS

Financing of new ventures often takes place through venture capital that usually is provided either by wealthy individuals or by venture capital funds. In the

latter form there is usually some sort of management structure that controls and follow-up the day-to-day investment activities and usually a board of directors that supervises the investment decisions. The funds are usually provided by either private or institutional investors. Venture capital funds are often divided in tier 1 and tier 2 VCs, where the former are lager institutions with large organisations that manage substantial wealth and have vast experience, and the latter are smaller more dynamic funds that move faster and more loosely. Venture capital funds earn money by investing in new ventures and later selling at a higher price, either through a buy-out or through an IPO.

EXAMPLE OF A VENTURE FUND

Investments: 10
Perspective: 3-5 years

- 1 great success
- 4 marginal survivors
- 3 on life support
- 2 total failures

IRR: 10% - 30%

All in all: A moderate success
Source: European venture fund

A fund usually follows a pre-defined structure where investors commit their money with a given time horizon, often 10 years. All investments in new ventures are made with clear exit-strategies, and the potential buyers are usually mapped out in advance of investment. Venture capitalists are often active owners who direct and assist the venture they are invested in. The venture capitalist we interviewed in the process of making this report stated that up to 90% of his time could be devoted to follow-up of investments (Interview 8.03.2011).

The performance of venture funds varies since failure rates among new ventures are high. Venture capital funds are not publicly traded and are therefore not obliged to report data on performance, and it is therefore hard to assess the overall return that the business has provided. However the head of a regional technology transfer centre said that venture funds in average go even in the long run, however this also included governmental funds (Interview 2.02.2011). Anyhow, the amount of money invested signals that the funds are attractive to investors.

1.2.1.1.3. GOVERNMENTS AND AUTHORITIES

For governments and authorities (G&A) the economic growth caused by new ventures is of great importance. New venture contribute with jobs and tax-payments, and have a key impact as drivers of development. G&As therefore often takes a role as facilitators for new ventures, by providing research grants, incubators, business loans and other types of funding to stimulate venture activity. They might also back new ventures out of political reasons, such as a wish to increase employment in rural areas or to secure a focus on a certain type of technological development.

As owners G&As are often less active then the venture capital funds, and this is evident in the results of G&A venture investment activity. The performance of G&A controlled venture capital funds is poor compared to private funds (Interview 2.02.2011). Further an investigation of 15 seed funds controlled by G&A in Norway revealed that 14 had negative profits (Grünfeld et al. 2009). G&As often measure venture success as the total revenue plus salary expenses, which is in strong contrast to the success measures of entrepreneurs and venture capitalist. This exemplifies the vast difference in perspective on the venture setting taken by G&As contra the other stakeholders.

1.3. VENTURE SURVIVAL

Failure rates among new ventures are high. There are several reports on venture survival. Knaup and Piazza (2007) reports that of the ventures who started in the US in 1998 only 31% was still in operation after seven years (Knaup and Piazza 2007). Further statistics on Norwegian ventures show an even higher failure percentage with only 30% of new ventures surviving the first 5 years (Statistics 2008). The statistic does however indicate that if a venture survives a given year, the probability of also surviving the next year increases, implying that the risk of failure declines as the venture matures. A further overview of the statistics can be found in Figure 5 below. It should be emphasised that the statistics are for all new ventures and not only technology-based new ventures.

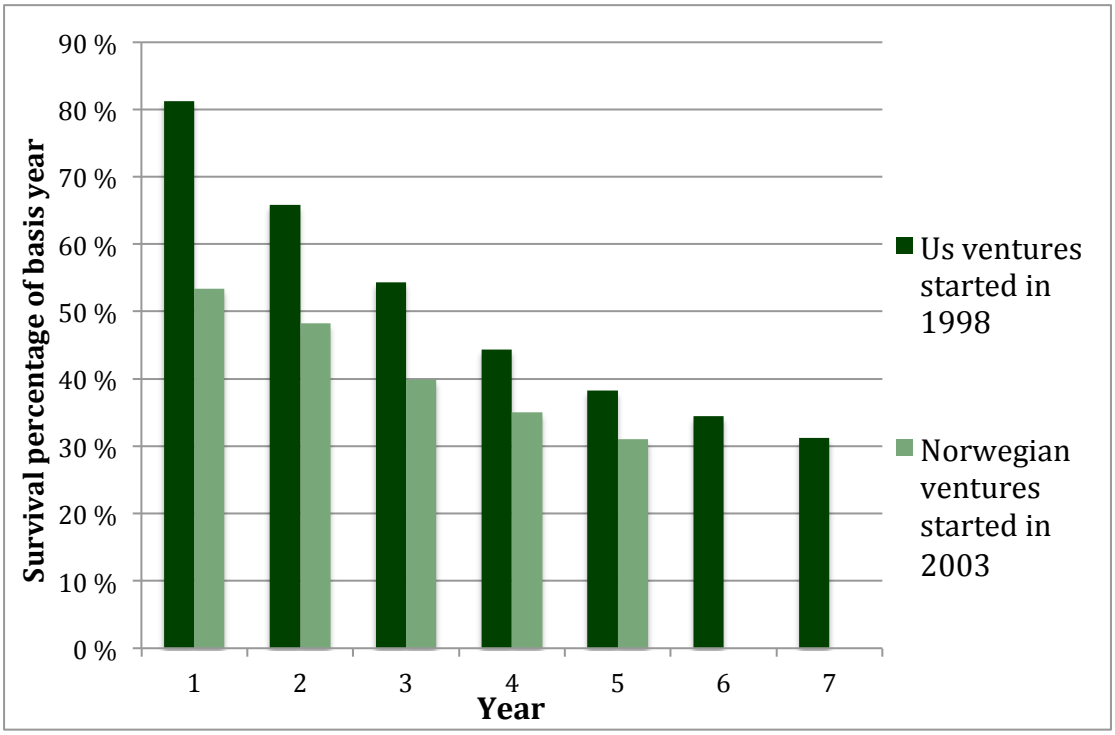


FIGURE 5 - SURVIVAL OF NEW VENTURES STARTED IN THE US[2] IN 1998 AND NORWAY[3] (THERE WERE ONLY DATA FOR THE FIRST 5 YEARS AVAILABLE FOR NORWAY)

The high failure rates are an indication of the risks involved, and will have an implication for the value of new ventures, especially in early stages. However the potential upside in a successful new venture secures the attractiveness of the new venture market for investors as well as entrepreneurs.

1.4. VALUES OBTAINED IN VENTURE FINANCING SETTINGS

Valuation is a key aspect of venture financing since it contributes to determine the share that the investor is to obtain and the price he is to pay. However entrepreneurs and investors often have different perspectives on how the value should be determined. The entrepreneur usually has an opinion on what his venture is worth and a perception of how much money he needs. Based on this he calculates the share that the investor is to obtain if he invests the money needed. The investor however has an opinion on how big a share of the venture he is to obtain if he invests the money needed (He often also has a different opinion on how much money that is needed), and calculates venture value based on this. The different perspectives will often result in deviating valuations.

[2] (Knaup and Piazza 2007)

[3] (Statistics 2008)

Entrepreneur Valuation: $1 000 000

Needs $100 000

VC gets 10%,

VC means that for $10 000 he should receive 15 percent this sets the venture value at $666 667 which is less than what the entrepreneur means it is worth.

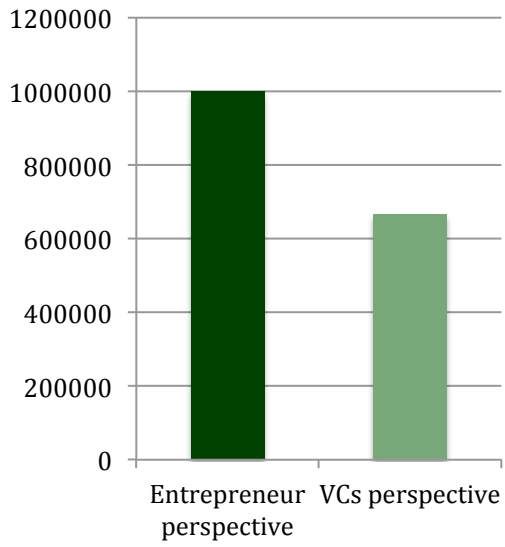


FIGURE 6 - EXAMPLE OF DIFFERENT VALUATION PERSPECTIVE

1.4.1.1.1. ADVERSE SELECTION PROBLEM

The investors generally wants to pay as little as possible for their share of the venture, whereas the entrepreneur wants the venture valuated as high as possible. Investment in a new venture therefore often takes place through negotiations between investor and the entrepreneur, and this will have an impact on the valuations that are performed when investing. There will also often be information asymmetry in this negotiation process. The entrepreneur will have information that the venture capitalists wants, and since the entrepreneur wants the venture to be perceived as positively as possible he might hide or polish unflattering information regarding the new venture. This makes the relationship vulnerable for the adverse selection problem (Amit et al. 1990; Barry 1994), where the investor is the principal and the entrepreneur the agent. Sahlman (Sahlman 1990) also describes situations where the opposite could be the case, that the entrepreneur is the principal "hiring" financial advice from the agent (the venture capitalist). These are aspects that might impact the valuation, as there will be uncertainty regarding the validity of the information the different parts have.

1.4.1.1.2. OWNERSHIP SIZE, BOARD POSITION, POWER AND CONTROL

When a venture capital fund invests in a new venture it usually wants to obtain enough ownership to be able to impact and control the venture. A study of American venture capital firms revealed that in average 50% of the investments where lead investments (Elango et al. 1995), while a study of Norwegian VCs revealed that they always made sure to obtain board membership (Matson 2003a). In an interview with a managing partner and associate in a venture consulting firm this aspect was further highlighted, and its impact on valuation was discussed. They argued that there are certain thresholds that the venture capitalists want to obtain in a venture, and that these thresholds are dependent

on the amount of influence the VCs wants to obtain. They also stated that these thresholds will have an impact on venture valuation in a financing setting, since venture capitalists' marginal utility of an extra per cent will not follow a linear function (Interview 18.03.201). For instance the difference in value between 49% and 51% ownership might be very high. This will affect the values that are obtained in the investment process.

1.4.1.1.3. LIQUIDITY

Another aspect that affects the valuation by venture capitalist is the illiquidity of the investments. VCs usually invest with a time horizon of several years and investors that commit their money to a venture fund usually commit them for at least the same period. The investors in a VC fund will require compensation for this lack of liquidity and therefore the fund will have to take this into consideration in their calculations. This is usually handled through adding a liquidity premium to the discount rate used when valuating.

As the aforementioned aspects indicate the perspectives of the stakeholders bias the values obtained in a venture-financing situation. This highlight the need of an objective venture valuation framework, that assesses the value of the venture based on its potential as well as the risk involved.

1.5. VENTURE CAPITAL HISTORY

Venture capital had its origin in the U.S. in the late 50s with the passage of the small business investment act, allowing small private business investment companies to invest in start-up firms.. The industry evolved through the 60s and 70s and became gradually more sophisticated and professional. The venture capital industry was from the beginning associated with technology firms, and the firm that is known to be the first venture-backed start-up was Fairchild Semiconductor; a circuit-company. With the IT-development in the late 70s and 80s venture capital got a lot of exposure, however the first big failures also occurred in this time and the risks of venture capital investment became evident. With the internet-bubble in the late 90s and early 00s venture capital investment rose to new and extreme highs, however there was a consequential large downturn when the bubble busted. In the last decade venture capital investment has been steadily increasing with a peak in 2007. Venture capital has traditionally been an American industry, however the rest of the world has picked up the pace the recent years. During the 90s venture capital got an upswing in Europe, and several investors from the U.S. started looking for investment opportunities across the pond. In Asia venture capital has had a slower start, however investment has increased over the last decade and is now rising as the Asian economies develops (EVCA 2011; Knowledge@Wharton 2004; NVCA 2011). During the past 10 years there have also been some innovation within the financing of new ventures. Two such examples are highlighted below.

HACKFWD : FIXED PRICE FOR NEW VENTURES

A fixed price for a new venture? No, that got to be impossible with all the complexity and uncertainty involved! Well HackFWD, a German pre-seed fund launched in 2010 says it otherwise. If a start-up fulfils a set of predefined criteria it will be eligible for financing through HackFWD at a fixed price. Although the concept is only aimed at software start-ups and is pre-seed, it is a great example of innovation within technology venture investment (HACKFWD 2011).

CROWDFUNDING OF START-UP PROJECTS

Crowdfunding is a concept where a project is financed through (relatively) small contribution from a large number of people. An example is Trampoline Systems, a British enterprise software vendor, who raised a total of £1 million from over 100 investors giving an average investment of £10 000. Trampoline systems was the first technology venture that relied on crowdfunding as its primary sources of equity. Although crowdfunding is not very widespread as a venture financing solution the concept has received great support within smaller projects (Trampoline-Systems 2011).

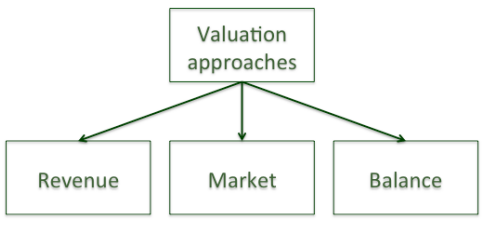
2. TRADITIONAL FINANCIAL VALUATION

2.1. THE VENTURE VALUATION SETTING

Valuation of new ventures is a great challenge due to the special aspects of the new venture setting. Firstly there is a great amount of uncertainty connected to a new venture since one usually is trying to assess a future revenue stream or sales value without having any historical data or knowledge of the ventures performance. Usually one does not know how the venture's product will be received in the market, and one is also unsure of the venture's ability to perform as a business and it is therefore difficult to set a value. Secondly there is no ready pricing mechanism in the venture market due to the low trading activity. Since new ventures seldom utilise debt financing due to poor lending terms and limited ability to handled interest and principal payments (First revenue might be years away), they usually rely on external investors or in some cases governmental and political funding. Since external investors in most cases obtain a share of the venture large enough to secure influence at board-level, the liquidity of the venture market becomes low since the blocks of shares that are traded are large. This is especially evident in regions with few venture capital funds. A further effect of this is that it will impact venture valuation since the values obtained in new venture transactions will be largely influenced by the negotiations between the parts involved. Because of the aforementioned aspects there will very often be differences between the values obtained using models and frameworks, and the price actually used in the transaction.

2.2. VALUATION MODELS AND TECHNIQUES FROM FINANCIAL LITERATURE

How to most accurate put a value on an asset, whether it is a public or private firm, financial instrument, or new venture, is one of the fundamental questions in financial theory. The literature within the field ranges from straightforward pragmatic valuation tools that in practice can be used as rule of thumb, to complex and intricate theoretic methods that require a high level of mathematical and statistical competence. Common for all models are that one needs to be aware of which value the model is trying to estimate. Different models might have varying perspectives one new venture valuation, which results in deviating values dependant on method used. Valuation is argued to be a subjective activity (Tipping et al. 1995), and when performing a valuation one has several possible tools at hand. The traditional financial models that can be applied in a venture valuation setting can be arranged in three different groups.



2.2.1. Revenue based valuation

Revenue based valuation methods are methods that explicitly assess the value of a venture based on the discounted sum of future cash flows. The cash flows are estimated based on assessment of the ventures future performance and can be modelled with methods such as the economic value added method (EVA) or the free cash flow method (FCF) (Myers and Brealey 1988). Revenue based valuation implies finding a discount rate, which usually is a combination of the cost of equity (which is the investors required return given the risk he is exposed to) and the cost of debt. The cost of equity is usually a combination of the risk free rate and some market premium, and can be estimated through theoretic models such as the capital asset pricing model (CAPM) and arbitrage-pricing theory (APT).

2.2.1.1. Capital Asset Pricing Model CAPM

The capital asset pricing model (CAPM) models the cost of equity as the risk free rate plus a risk premium. The risk premium is estimated by multiplying the premium of the market portfolio with the beta-factor of the asset (in our setting the venture). The beta-factor is a measure of the sensitivity of the return of the asset relative to the return of the market portfolio (Myers and Brealey 1988). One of the key assumptions of the CAPM model is that the investor holds a diversified portfolio of investments. It is assumed that it is possible for the investor to remove all idiosyncratic (asset-specific) risk through diversification, and that he therefore not should be rewarded for risk that can be avoided. Therefore the beta-factor only measures the risk related to changes in the total market and not related to individual aspects of the venture (Lintner 1965; Markowitz and Markowitz 1991; Mossin 1966; Sharpe 1964).

$$CAPM: r_r = r_f + \beta r_{mp}$$

2.2.1.2. Arbitrage Pricing Theory (APT)

Arbitrage pricing theory is another theoretical model to estimate the cost of equity. The theory argues that one can describe the cost through a linear factor model where different factors representing risk premiums associated with macroeconomic circumstances are added to the risk free rate. The factors are weighted to reflect their sensitivity with the market (Huberman 1989; Ross et al. 2004; Ross 1973b). In practise this means that the cost of equity is given as the risk free rate plus a weighted sum of risk premiums compensating for systematic risk.

$$APT: r_r = r_f + \beta_1 r_{mp1} + \beta_2 r_{mp2} + \cdots + \beta_n r_{mpn}$$

2.2.2. Market based valuation

Marked based valuation methods are implicit valuation methods that assess the venture's value in comparison to a reference value such as a recent transaction

or valuation. The methods rely upon using multiples to compare ventures. Examples of such multiples are price/earning, price/sales or value/employees (Dittmann et al. 2004). The methods are labelled as implicit since one can set a value for a venture without knowing the specifics about it. For instance one can compare price/earnings without knowing what determines prices and what determines earnings (Myers and Brealey 1988). An advantage with market based valuation methods is that they are relatively easy to use and that data is usually easy to obtain.

2.2.3. BALANCED BASED VALUATION

Balanced based models are based on estimating venture value through assessing what one can sell its assets for. Examples of these methods are liquidation value, book equity value or intrinsic value. These methods are not very applicable in a venture valuation setting since a new venture seldom holds significant assets, however in some cases where patents or verified technology exists, they might be of use.

2.2.4. COMBINATORIAL VALUATION METHODS.

There are also methods that combine elements from the different valuation-types. An example of such a method is the venture capital method. The method combines elements from both balanced-based and revenue-based valuation and is based on estimating the income of the venture at a given point in the future and adjusting it with an appropriate marked-based multiple to obtain a future value. The value is then discounted back to present value using an arbitrarily set interest rate, often in the range of 50% to 100%. The method highlights a common practise in the industry where values are obtained using known and established methods, however neglecting the assumptions and fundamentals of the models (Dittmann et al. 2004). Instead of being used in accordance with their theoretical development, the models often figure as justification-tools of values obtained based on experience, gut-feeling etc.

2.2.5. OTHER VALUATION SETTINGS

Valuation of new ventures is also necessary in other settings than transactions. Venture funds have to report values to their investors and owners, and to secure consistency in this reporting several venture capital organisations have agreed upon a set of international private equity and venture capital valuation guidelines (AFIC et al. 2006). Another guideline that sometimes is applied is the *"Fair value measurement and disclosures topic."* an accounting standard codification published by the Financial Accounting Standards board (FASB ASC).

2.3. THEORETICAL IMPLICATIONS OF THE VENTURE MARKET ON VALUATION

Most of the traditional financial valuation methods were created with an aim of valuating mature firms in established markets, but are also often applied when

valuating new ventures. However, given the unique characteristics of the venture market, there will be theoretical implications if applying the traditional financial models when valuating new ventures. These implications are especially evident when it comes to revenue-based valuation, since these models have the strongest theoretical foundation of the three different groups. Balanced based methods are not very applicable for new venture valuation since the new ventures seldom have assets that are of great value, and market based valuation is, though still very relevant, based on pragmatic principles of scaling and comparison.

It is especially use of the CAPM and APT that is problematic in a venture valuation setting. Both the CAPM and APT rely on several assumptions of the market in which some are individual and some are common. An overview of the assumptions is found in Table 1 below. As the next section highlight the venture market is in violation of more or less all of these assumptions.

Model market assumptions	CAPM	APT
No transaction cost or taxes	X	X
Homogenous investor expectations	X	X
Investors only hold efficient portfolios	X	
Single stage model	X	
Complete market		X
Diversified portfolios	X	X

TABLE 1 - CAPM AND APT ASSUMPTIONS VERSUS VENTURE MARKET CHARACTERISTICS

Sources: (Berk and DeMarzo 2007; Fama 1970; Lintner 1965; Mossin 1966; Ross 1973a; Sharpe 1964)

2.3.1. NO TAXES AND TRANSACTION COSTS

The first common assumption of both CAPM and APT is that investors can trade all securities at competitive prices, without transaction costs or taxes (Berk et al. 2004). The assumption implies that information is easily available without any cost for all investors since investors that have to pay or utilise a lot of time to access information about the market will experience transaction costs. The assumption also implies that the market is highly liquid, since all investors will not be able to trade in an illiquid market.

Ge, Mahoney et al (2005) argue that the first part of the assumption does not hold. Almost all new ventures are privately held, and thereby not obliged by law or regulation to report financial information in such a way as the publicly held companies. Such information is hard to come by and verify in other ways, and thereby creates transaction costs for potential investors seeking the information.

New ventures also have a short history, and therefore accounting data is limited, and might be severely misleading creating an information asymmetry between the entrepreneur and the investor which is in violation of the underlying assumptions that all information is publicly available (Ge et al. 2005).

When it comes to part two of the assumption Lerner (1994, 2001) and Gompers (2001) argue that due to regulation, tradability of new ventures is low (Lerner 1994), which implies that there is no ready market for shares of new ventures. This is in violation of the assumption of a highly liquid market, since there is no "easy" way of instantly selling or buying assets in the market. Since the ventures are not publicly traded, and the venture capital firms often want to acquire sufficient ownership of a new venture so they get enough control to make the changes they find it necessary, liquidity is further reduced since lot sizes often are substantial. A study of American venture capital firms revealed that in average 50% of the investments where lead investments (Elango et al. 1995). There are however geographical differences. A study of Norwegian VCs did not reveal the same need for a majority lot, however the VCs claimed that they always make sure to obtain board membership (Matson 2003a).

All together this means that the venture market does not fulfil the first assumption of the CAPM and the arbitrage pricing theory.

2.3.2. Homogenous investor expectations

The second common assumption is that investors have homogenous expectations when it comes to volatilities, correlations and expected returns of the assets in the market. Also this assumption is hard to accept in a new venture market, since the potential investors do not make their expectations arbitrarily, but base them on the information they have available. As it was pointed out regarding the previous assumption the available information is limited and varied, resulting in that investors set deviating values for equal new ventures As an example 31 venture capital firms who valuated a small avionic company produced results differing between $6 million and $17,5 million (Ge et al. 2005) which indicate that there is not a common expected value of the ventures in the venture market. It could however be argued that the investors does not need to hold perfect information as long as they behave rational with the information they have (Berk and DeMarzo 2007). Savvy investors will find the mispriced assets and try to utilise the arbitrage-opportunities, thereby pushing the prices back to the efficient price. However it is not likely that all investors are rational when it comes to new ventures, since they usually have tight bonds to the ventures they invest in. Another aspect indicating that the investors do not have homogenous expectation is that different venture capital firms have different required returns on their investments. A study reveals that VCs from the UK and the U.S. have a significantly higher required return than VCs from Belgium, France and the Netherlands. Market aspects of the countries in question might

explain the different rates, however it was also found that privately held firms have higher requirements than public, even if they were in the same country (Manigart et al. 2002a). Further the illiquidity of the market reduces the possibility to exploit arbitrage opportunities. Together this indicates that the second assumption does not hold for the new technology venture market.

2.3.3. Efficient portfolios

The CAPM-model assumes that investors only hold efficient portfolios, and that these portfolios can be replicated by holding the risk free rate and the market portfolio, indicating that the market portfolio is efficient. A portfolio is argued to be efficient only if it yields the maximum possible return given its volatility (Berk and DeMarzo 2007), an assumption which is not probable when applied to a new venture setting, since there is so much uncertainty regarding the new ventures. Even if the investors strive to hold efficient portfolios it is not given that they are able to estimate the weights, risks, returns and other factors involved correctly. The CAPM also assumes that the returns are normally distributed, an assumption that is not likely to hold for a market consisting of new ventures. Further it is assumed that the investors have strictly monotone increasing, concave quadratic utility functions, however it is hard to assess whether this is the case, although it is assumed that venture investors are less risk averse than the common investor since venture investments are known to be risky and uncertain.

2.3.4. Multi stage challenges

A venture often follows a stage wise development and venture investment is therefore often a multi-stage endeavour. This poses a problem with regards to the CAPM, since the model is based on utility theory which is originally defined in a single period perspective (Markowitz and Markowitz 1991; Savage 1954). This initially makes the CAPM a single stage model, however it can be extended to a multi stage setting (Elton et al. 2009; Fama 1970; Kazemi 1991). Fama (1970) proved that an extension of the CAPM to a multi stage setting is possible if the multi stage utility function has the same characteristics in every stage as is required by the single stage utility function (Risk aversion: monotone, increasing and strictly concave) (Fama 1970). This makes the assumptions of the model even stricter, further emphasising the theoretic implication of applying the CAPM on a venture market.

2.3.5. Completeness of market

The arbitrage pricing theory assumes that there is a complete market. A market is argued to be complete if any project can be replicated by a combination of other projects in the marked in a portfolio (Myers and Brealey 1988). This implies that you can create a portfolio that replicates your project both financially and risk wise, using only assets that are traded in the same market. You can then use the risk premium of the portfolio as the risk premium of your

asset (Vik and Matson 2002). For a new venture it is not given that this holds. A new technology venture might introduce a new technology that will not be possible to replicate by the assets in the market, since the technology might be disruptive and add new possible market outcomes. Further it is not given that the market for new ventures holds enough assets to be complete. If this is the case, the arbitrage pricing theory will not hold anymore since it relies on the possibility to create portfolios large enough to diversify all idiosyncratic risk. It must also be possible to create unique portfolios that represent the return of each factor that not are correlated to portfolios representing other factors in the model. The derivation of the model also relies on the possibility to create arbitrage portfolios that cost no net wealth, have zero risk and zero return. This will only be possible with an infinite number of assets and a complete market (Copeland and Weston 1989).

2.3.6. Diversification as a measure to remove specific risk

A general problem of using both methods is their approach to specific risk. Both the CAPM model and arbitrage pricing theory assumes that idiosyncratic risk is eliminated through diversification. It is argued that diversification is hard to obtain when dealing with new ventures (Matson 2003a). If we assume that most investors in new ventures are venture capital firms, diversification can take place through co-investment and such activity is especially practised when there are high risks and high capital requirements (Matson 2003a). A study by Douglas Cumming (2006) revealed that Canadian VCs in average had about 19 ventures in their portfolios and that the syndicating frequency was 0,5 indicating that half of the investment were in co-operation with other venture capital firms (Cumming 2006). It is hard to determine precisely if this is enough diversification to eliminate the specific risk, however it is argued that a portfolio of about 30 firms will be sufficient (Elton et al. 1977), indicating that there is not enough diversification in many of the VC portfolios. It should be emphasised that a principle of the CAPM and arbitrage pricing theory is that one will not get paid for exposure to specific risk, since it can be removed by holding a diversified portfolio, however a lot of the VCs base their investment strategies on their ability to handle such risk, thereby not assuming a CAPM or APT world.

2.4. Practical implications when valuating new ventures

There are also several other challenges besides the theoretical ones when evaluating a new venture. The future and development of a new technology venture is often very uncertain, and failure rates are high (Knaup and Piazza 2007). There are uncertainties related to technology, market development, financial aspects and entrepreneurial aspects etc. The uncertainties also change as the venture develops and more information is revealed. A new technology venture evolves through phases where decisions made in early phases impact unknown events in the latter phases. This further highlights the uncertainty,

however it also reveals that there is a lot of flexibility, since the future path of the venture is not fixed. As the venture evolves there will be flexibility present though the possibility of different options, and also more information will be revealed, as the venture gets older. For instance there might be an option of selling the technology before it is commercialised, or there might be value connected to salvage possibilities. All these aspects have a practical impact on the valuation and especially on the forecasting part of the models.

It is not within the scope of this report to devote a lot of attention to different techniques of handling this flexibility and uncertainty, however we highlight some aspects.

2.4.1. Flexibility and dynamics in valuation modelling

When evaluating a new venture there will often be a lot of uncertainty related to the future development of the venture, and it will often be necessary to implement this uncertainty in the valuation model. For instance there will often be several known decisions with unknown consequences that will impact venture value that somehow must be modelled. There exist several tools to handle such uncertainty, however the models often become very complex and mathematically challenging to understand.

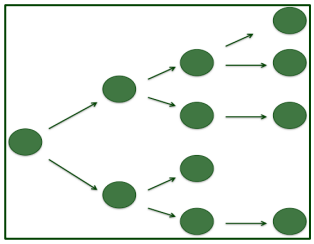
2.4.2. Real option theory

Another aspect that often needs to be modelled is the value of the ventures flexibility when it comes to future options, for instance the opportunity to postpone an investment or the choice of business model. In these kinds of situation one can assess the value of the flexibility through real options analysis (Trigeorgis 1996) where value is calculated as the net present value of the cash flows the investments will generate plus the value of the option to postpone investment (The option premium). Matson argues that the characteristics of real options theory imply that the method lends itself well to valuation of new technology firms, since "investment in new technology projects are typically irreversible, highly uncertain and require extensive stage-wise monitoring". However since the underlying asset is not traded, there might be difficulties when choosing the correct stochastic process to represent dynamic uncertainty in the project (Matson 2003b). This follows the same argumentation as mentioned earlier regarding the lack of a complete market. These methods often become mathematically complex, and surveys show that they are relatively moderately used in the industry (Dittmann et al. 2004).

2.4.3. Decision trees

Decision trees can on the other hand represent a more trivial approach, however there are possibilities to combine the method with real options theory in a more complex setting. Since a new venture usually follows a phase-wise development it can be rolled out in a decision tree giving a systematic and structured overview

of the possible future of the firm (Hillier et al. 1990; Matson 2002). A decision tree creates the possibility to both consider the uncertainty in different stages of evolvement and devise the right outcome of each stage (Matson 2002). Such a model has been used in a new venture setting by Vik and Matson (2002), Matson Tomasgard et al (2001), Quinlan (2002) and Borgen, Elvemo et al (2002). One of the main drawbacks regarding decision trees is that the tree grows fast as the problem gets more complicated. For some venture one might get trees so big that they are difficult to handle.



2.4.4. Existing approaches to cost of equity for new ventures in the literature

Several venture capitalist use DCF-methods without applying a theoretical objectifiable discount rate (Dittmann et al. 2004). Damodaran (2009) argues that the common rationale behind this is an aim of using the discount rate as the *"vehicle of all uncertainty"* (Damodaran 2009a; Damodaran 2009b), however he also indicate that this is a shortcut taken by analysts because of the difficulties posed by the venture markets characteristics. There are few examples in the literature of how one in an objectifiable way can obtain such a discount rate, however there is one attempt that we are aware of. Damodaran argues that one can use a variation of traditional financial methods to find the discount rate, however it will involve some pragmatism. Damodaran agues that one should take an approach that uses the capital asset pricing model when valuating a venture. Calculating the beta will of course not be possible since historical stock returns of a venture will not exist, however Damodaran argues that one could use the sector average beta of the market sector in which the venture would have been traded if it were to go public. Acknowledging that venture investors seldom will hold diversified portfolios (Cumming 2006; Matson 2003a) and that idiosyncratic risk thereby will be present, Damodaran (2009) further argues that one can use the R-squared measure of correlation[4] from the beta-regression as an estimate of how much of the sector return deviation that is a result of systematic risk thereby identifying how much variation that is a result of idiosyncratic risk (Damodaran 2009b). One can then adjust the beta to account for this idiosyncratic risk. The argument made by Damodaran (2009) is somewhat backed by the findings of Kerins et al who based on a large sample of recent IPOs find that *"early-stage firms have market risk levels similar to more*

[4] The R-squared measure is a measure of the global fit of the regression. It has a value between 0 and 1, and represents the proportion of variability in the dataset that may be attributed to some linear combination in the regression.

established firms (…), but have higher total risk." (Kerins et al. 2004). This further verifies the eligibility of the approach.

2.5. APPLIED VENTURE VALUATION

There has been performed some surveys on which valuation methods that are used in the industry. Dittman and Maug (2004) found that 60% of the VCs used marked based multiples and 58% used discounted cash flow methods. However only 19% of the VCs used theoretical models to determine the cost of capital, and only 6% used stock-market data to calculate premiums and beta-values. Only 2% relied on balanced based methods. Further 11% responded that they used real options theory (Dittmann et al. 2004) and 34% responded that they relied upon experience when valuating ventures. Research also indicates that the methods used vary from region to region. Manigart et al who studied VCs in Belgium, France, The US, England and Holland found that DCF-methods were more popular in Belgium and Holland, multiples where popular in England and the US and that one in France relied upon "solicit bids for the potential investee" or recent transaction prices (Manigart et al. 2002b).

3. WHAT VENTURES BECOME SUCCESSFUL?

Being able to determine what ventures become successful is a goal of most actors in the venture markets. The societal economic impact of being able to pick the right ventures to invest in is large. This task has however proved to be difficult, and many myths are tied to what ventures survive and become successful.

3.1. WHAT IS SUCCESS?

Most ventures strive for some kind of success. However, success might be different things for the entrepreneur, the employee, the venture capitalist, the government and the academic. A venture assessed to be a success to the entrepreneur and the government can be a striking failure for the venture capitalist. Some governments operate with measures of value creation in the society. These are often heavily influenced by political goals. In Norway the government (for some purposes) use salary-costs plus net profit as a measurement of value creation, and a venture can therefore be characterised as a success without generating profits. The same venture would by a typical venture capitalist most probably be defined as a failure.

Measuring the performance of new ventures is also difficult because many of the traditional performance measures like return on investments/assets/employees are hard to apply (Walsh and White 1981) and can give misleading results due to the reason that first profits might be years away.

In the research on ventures the academics have tended to use one or more of the following measures

- Survival
- Return on sales
- Sales growth

Which covers several different aspects of a ventures development.

3.2. VENTURE SUCCESS CRITERIA

New venture success has been a popular area of research due to the general importance of the area. Some of the most appraised works in the field have been done by Sandberg and Hofer (Sandberg and Hofer 1987) and Chrisman et al(Chrisman et al. 1998). Sandberg & Hofers article about *"Improving new venture performance*" argues that the success criteria that matter can be divided in three main categories, entrepreneur, industry structure and strategy. Chrisman et al built on Sandberg and Hofer's model when they in 1998 added resources and organisation to the model. This categorisation of the success

criteria has been adapted by many researchers and also suits our purpose of giving a structured overview of what criteria that indicate success.

3.2.1. THE ENTREPRENEUR

The Entrepreneur

Success criteria:

- ✓ Inherent factors
- ✓ Experience and education
- ✓ Entrepreneurial orientation

The entrepreneur or the founding team is the most covered category within the field of success criteria research. In general the entrepreneur is a determinant of success because (s)he is a key decision maker for the venture (Chrisman et al. 1998). Scherer, Adams et al argues that the entrepreneurs decisions are determined by the skills, values and experiences of the entrepreneur (Scherer et al. 1993). The implication is that entrepreneurs with the right skills, values and experiences will make decisions leading to venture success (Van de Ven et al. 1984).

3.2.1.1. INHERENT FACTORS

Stuart and Abetti (1987), Kakati (2003) and Lee, Lee and Pennings (2001) have all concluded in the direction that there are some inherent factors of the entrepreneur that determine success (Kakati 2003; Lee et al. 2001; Stuart and Abetti 1987). Inherent factors are factors regarding the entrepreneur that are characteristics of the personality, and the inherent factors with most empirical support are creativity, persistence and enthusiasm (ibid).

3.2.1.2. EXPERIENCE AND EDUCATION

An entrepreneurs experience and education is also much appraised topics. The obvious fact that technology ventures are working with and developing technology supports the assertion that expertise and education are important factors. The formal education within technology usually doesn't include many entrepreneurial subjects, which means that the importance of entrepreneurship experience also can be supported. There are several empirical findings that supports the assertion that experience and education are success criteria (Jo and Lee 1996; Kakati 2003; McGee et al. 1995; Shrader and Siegel 2007; Song et al. 2008).

3.2.1.3. ENTREPRENEURIAL ORIENTATION

Entrepreneurial orientation concerns the behaviour, leadership style and values of the entrepreneur. One can claim that this is a function of the inherent factors, but we argue that the inherent factors alone do not give a complete picture of the entrepreneur. We also include the managerial qualities of the entrepreneur in the category.

Kakati finds strong empirical support between venture performance and the entrepreneurs' ability to evaluate and react to risk well (Kakati 2003). This is somewhat supported by Lee et al (2001) who find weak statistical support for a positive relationship between venture success and attitude towards risk (Lee et al. 2001) indicating that the entrepreneurs attitude towards risk is an important factor. An informal leadership driven by opportunism combined with good networking and communication skills are important for venture success (Stuart and Abetti 1987). However Kakati (2003) only finds weak support for a relationship between leadership quality and venture success.

3.2.2. Industry structure

Industry structure

Success criteria:

- ✓ Market growth
- ✓ Industry life cycle
- ✓ Entry barriers

Advocates of the structure-conduct-performance paradigm argue that the most important decision a venture has to make is "What businesses should we be in?" and that this decision is determined by the industry structure. Hence the industry structure determines if, and how, a firm should enter a market. Porter (1980) argues that industry structure determines whether a new venture will have success, and if it will live to have it (Porter 1980). Chrisman et al (1998) are a bit more moderate, arguing that the market-entry-decision not will be free of context due to the importance of the skills of the entrepreneurs (Chrisman et al. 1998).

The empirical research indicates that aspects of the industry structure are important determinants of venture success.

3.2.2.1. Market Growth

Market growth is a significant characteristic of a market, and it is natural to assume that it will affect both market behaviour and venture performance. A market will have some growth rate (positive or negative) and the empirical literature tries to assess how this is related to venture performance.

The empirical evidence is quite clear when it comes to the effect of market growth on new technology venture success. The empirical evidence indicates that entering a market with higher growth rate increases the probability of success, but the reserach does not determine the scale of the measure (Chandler and Hanks 1994; Kakati 2003; Shrader and Siegel 2007).

3.2.2.2. Industry Life cycle

The industry life cycle divides the industry into different stages of evolvement. There are several different classifications in the literature, but they are not very different in practise. As an example McDougall (1992) describes the life cycle of a technology firm in the following way:

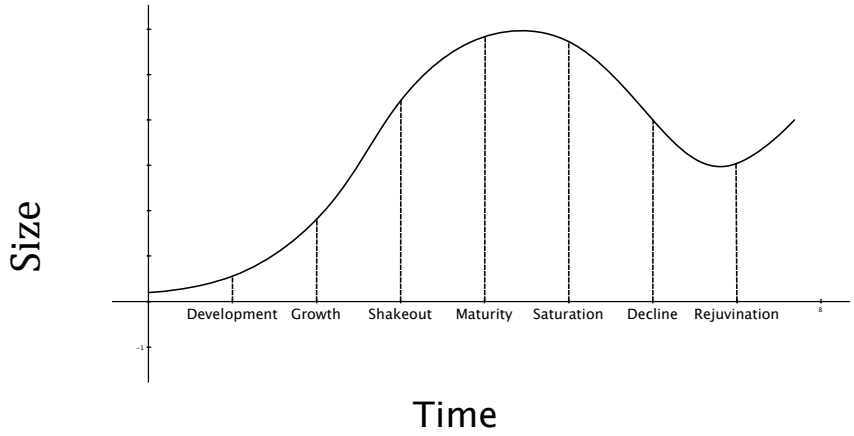


FIGURE 7 – INDUSTRY LIFE CYCLE [5]

A new venture might be affected by the life cycle of the industries it enters. MacMillan and Day (1987) argue that the most successful ventures are those launched in the growth phase of an industry (MacMillan and Day 1987), however the majority of business start-ups happen in mature industries (The state of small business 1992)[6].

Hofer and Bacon (2003) takes a contingent approach and find empirical evidence for the importance of matching the ventures resources and capabilities with the industry life cycle. They also highlight the importance of intellectual properties as a way of handling competition, especially when entering markets in the shakeout stage (Hofer 2003).

Even though there is little empirical evidence regarding this matter, we believe that it is an important factor that will affect the venture to a great extent, and we also find support for this in empirical research that is not technology-specific (Covin Dennis and Jeffrey 1990; Lumpkin and Dess 2001; McDougall et al. 1994).

3.2.2.3. ENTRY BARRIERS

Entering a new market is seldom straightforward for a new venture. Aspects that serve as barriers to entry are: economics of scale, capital requirements, product differentiation, brand identity, switching cost, access to distribution, government policy, expected retaliation and absolute cost advantage (Bain 1956; Porter 1980; Siegfried and Evans 1994; Yip 1980). Barriers to entry are especially discussed in the industrial organisation literature and they are argued to be important aspects of market entry. Based on 70 empirical studies Siegfried and Evans concluded that entry is more frequent in more profitable, rapidly growing

[5] (McDougall 1992)
[6] The state of small business: A report of the President, 1992. 1992. Washington, D.C.: United States Government Printing Office, 65–90.

industries and slower when there are high capital requirements for building efficient scale plants (Siegfried and Evans 1994), however this sample is not based on new ventures.

When it comes to the impact of entry barriers on new ventures, Robinson and McDougall (2001) find weak empirical support for the direct independent effect of entry barriers on new ventures. However when taking a contingent approach they find a greater support, which implies that accordance between new venture strategy and entry barriers is important (Robinson and McDougall 2001). Song et al (2008) finds that market scope is a key success factor for new ventures. They define market scope as "variety in customer segments, their geographic range and the number of products". This is a broad variable that implicitly concerns some elements of entry barriers, such as product differentiation and brand identity. Roure and Keeley (1990) find empirical evidence of the importance of a high projected market share on the success of the new venture. They also find that ventures entering markets with low competition have a higher probability of success (Roure and Keeley 1990). This further highlights the importance of a clear understanding of the entry barriers. To get a high market share one has to overcome the entry barriers, and the entry barriers will also affect competition. Porter (1980) argues that one of the main drivers of competition is threat of new market entry, which again is determined by the barriers of entry, implying that entry barriers is an important determinant of competition (Porter 1980; 1993).

3.2.3. Business strategy

Business strategy

Success criteria:

- ✓ Industry structure, resources and strategic fit

Where the corporate strategy defines in which industry a venture seeks opportunities, the business strategy defines the particulars of the opportunities, such as products, customers and technology (Abell 1980) and also how resources are deployed (Chrisman et al. 1988), which together implies that the business strategy defines how a firm competes in a given industry. For a new venture business strategy is an important aspect when trying to identify key success factors, since it directly affects the operations of the firm. For new ventures, it is especially the strategic fit between industry structure, resources and business strategy that is discussed in the empirical literature when it comes to business strategy.

3.2.3.1. Industry structure, resources and strategic fit

Taking a resource-based view one can argue that the strategy defines the fit between resources and industry structure (Gibbert et al.) and from an industrial organisation view one can argue that a firm has to use strategy to align its resources to the industry structure (Lipczynski et al. 2005). This indicates that

strategic fit is important whether you view it from the market perspective (industrial organisation) or from the firm perspective (resource-based view).

There have been several empirical findings within the field, however these are all contingent (the strategic fit being a contingent factor itself), so the findings are dependent of the situation. Chandler and Hanks (1994) finds support for a positive relation between fit of strategy, resources and venture performance when it comes to a cost-leader strategy or a product differentiation strategy. Hofer and Bacon (2003) supports the findings. They find that distinctive competencies when matched to low-cost strategies, and intellectual capabilities when entering the shakeout-stage, are positively related to venture success. They further argue that their "results imply that entrepreneurs should match their strategic resources to the situation" (Hofer 2003) indicating that the importance of strategic fit can be generalised to other strategies. Kakati (2003) finds support for the importance of a clear competitive strategy. Ventures who had a clear quality-, cost-, innovation- or customisation strategy where more successful than other ventures. Kakati argues that his findings tentatively suggest that choice of strategy should be linked to resource-availability and industry structure. He also emphasises that his findings shows that the ventures who failed could not develop resource-based capabilities to back their strategies (Kakati 2003).

3.2.4. Resources

Resources

Success criteria:

- ✓ Resource-based capabilities
- ✓ Financial resources
- ✓ External networks

The resource-based view emphasises the importance of a firms resources. This includes both the tangible and the intangible assets a venture controls or seeks to be in control of (Barney 1991; Dierickx and Cool 1989; Hall 1992; Wernerfelt 1984). Tangible assets are in general resources with well-defined markets and thereby defined values, while intangible assets are harder to valuatee since they are not traded in defined markets. Taking a resource-based view, venture survival is dependent on the firms ability to secure tangible resources (Chrisman et al. 1998). However this is only in short term, and many argue that sustained venture success depends more on the ability to obtain and develop intangible assets (Aldrich and Dubini 1991; Barney 1991; Hofer and Schendel 1979; Reed and DeFillippi 1995).

3.2.4.1. Resources-based Capabilities

Resources on their own are seldom productive unless they are put to use somehow, hence there is need of capabilities. Grant (1991) views resources as the firms' source of capabilities, and capabilities as the firms' source of competitive advantage. Empirical testing of the resource-based theory faces

great challenges, since the intangible assets are hard to measure (Hoskisson et al. 1999). This leads to an extended use of proxies and replicating measures, which might limit the research somewhat (Godfrey and Hill 1995).

There are some empirical findings in the literature. Lee et al (2001) uses patents and trademarks as a proxy of technological capabilities, indicating that the number of acquired entities are an indicator of technological capability. They find that technological capability is positively associated with the performance of new technology ventures (Lee et al. 2001). Chandler and Hanks (1994) find that ventures that have a broad variety of resource-based capabilities have a higher probability of high growth and increased business volume (Chandler and Hanks 1994). Kakati (2003) also find support for the importance of resource-based capabilities. Ventures with managerial, technical, marketing and input sourcing capabilities are more successful than ventures without.

All in all there is considerable support to conclude that resource-based capabilities are success criteria for new technology-based ventures.

3.2.4.2. ACCESS TO AND UTILISATION OF FINANCIAL RESOURCES

Empirical findings indicate that access to financial resources is an important success factor for new ventures. Lee et al (2001) find that the financial resources invested during the development period is positively related to venture success. Song et al (2008) also identify financial resources as a key success factor for new technology ventures. The access to financial resources is closely related to a ventures relationship with venture capital firms, banks and other financial institutions. It could be argued that these relationships will be a function of other variables such as industry structure (amount of other venture seeking financing) and business strategy (will the investors have faith in your strategy), however we argue that access to financial resources should be assessed explicitly.

3.2.4.3. EXTERNAL NETWORKS

Access to and position in networks is an important resource for a venture. Different partnership linkages, such as with other firms, venture capital firms, universities, suppliers and customers can be important determinants of venture success. Lee et al (2001) finds support for a positive relationship between linkages to venture capital firms and new venture success. They also found that linkages to financial institutions had an effect on technological capabilities and financial resources invested during the development period (Lee et al. 2001). Song et al (2007) found supply chain integration as a key success factor for a new technology venture. They define supply chain integration as "a firms' cooperation across different levels of the value added chain" indicating that interaction with the external actors is an important factor (Song et al. 2008).

The empirical research shows clear evidence of external networks being a determinant of venture success.

3.2.5. ORGANISATIONAL STRUCTURE, PROCESSES AND SYSTEMS

Organisational aspects

Success criteria:

- ✓ Organisational structure, processes and systems

Chrisman et al argues that organisational structure processes and systems are important determinants of venture performance (Chrisman et al. 1998). They argue that the initial structure of the venture gives rise to an emergent culture that will impact further growth of the venture (Bouwen and Steyaert 1990; Chrisman et al. 1988; Kilmann et al. 1985).

There are few empirical studies directly concerning organisational structure, processes and systems. One of the reasons might be that new ventures to a large extent have small sporadic ad-hoc organisations, and thereby are hard to research. Instead the empirical studies focus on interaction, completeness and joint experience of the entrepreneurial teams. We argue that this is an organisational matter and therefore include the findings from the studies in this category.

Roure and Keeley (1990) find that completeness of the founding team is a determinant of venture success. They find that team characteristics are more important than individual characteristics, and that the number of key positions filled at the first major outside founding is positively related to success. It is also positive if the founders have experience with working together from previous organisations (Roure and Keeley 1990). Shrader and Siegel (2007) find a link between venture performance and team experience, however they only find a weak statistical relationship (Shrader and Siegel 2007). Lechler (2001) argues that the social interaction of the entrepreneurial team is an important factor. He finds empirical evidence for the quality of social interaction being critical for venture success, including elements such as communication, coordination, mutual support, work norms, cohesion and conflict resolution within the entrepreneurial team (Lechler 2001).

Based on the empirical findings it is reasonable to believe that organisational structure, processes and systems is a success criteria

3.2.6. PRODUCT

Product

Success criteria:

- ✓ Product superiority
- ✓ Protection of the product
- ✓ Product development process

There has been little focus on products and technology in the research trying to reveal the critical success factors for new ventures. Of the somewhat recognised works available are Roure and Keeley (Roure and Keeley 1990) and Kakati (Kakati 2003) the most explicit on the importance of the product. Several

suggestions could be made as to why there has been such a silence on this field. One is the effect of a good entrepreneur. One could argue that a good entrepreneur with a strategy adapted to his resources and intended industry would also make sure that his product is at least good enough, and that the product aspect thus is included in the other measures.

Another reason could be that the subject somehow is not interesting enough in the new venture setting, or sufficiently significant to perform research on. Product was not introduced in the now widely accepted model by Sandberg and Hofer (Sandberg and Hofer 1987) that was extended by Chrisman et al (Chrisman et al. 1998). This has perhaps led to a lack of focus on this area.

It could also be that the product characteristics is seen as only a qualifying factor for the entrepreneurs, and will thus not be a critical success factor. By this it is understood that all ventures eligible for capital (or that have gone through the venture capital screening process) would have developed products satisfactory for the market. Those with inferior products would not have made it far enough to be included in the research projects, and therefore the product attributes are not revealed as critical success factors. Although there might be several reasons why the product category has not been included in past research, few have commented on it. Therefore it is of our impression that this is a gap in the current literature on new venture performance.

3.2.6.1. PRODUCT SUPERIORITY

There are however a few that have included product aspects in their research. Roure and Keeley (Roure and Keeley 1990) tested whether product superiority had an impact on venture success. In order to measure how superior a product was they asked the respondents to rate how much of an improvement the product represented. They found that product superiority is a significant contributor to venture success. Together with team completeness, buyer concentration and development time, product superiority explained 57 % of the regression variance. One of the weaknesses with the study is that product superiority in large is a qualitative measure, thus exposed to biased assessment.

3.2.6.2. PROTECTION OF THE PRODUCT

Song et al (2008) found that patent protection is a key determinant of success for new technological ventures (Song et al. 2008). Kakati (Kakati 2003) also assessed the impact of various product characteristics on venture performance. He tested whether uniqueness of the product (relative to the competitors), the protection of the product, market acceptance, the development of a functioning prototype and the stage of development had an impact on venture success, and found strong support for the protection of the product being a success criteria. The research on protection of the product has had a focus on patents, however for many new ventures a proficient intellectual property rights (IPR) strategy

should (also) include other elements such as secrecy and branding. Some ventures can have a sufficiently good IPR-strategy without the use of patents.

The results from the research of the importance of the product within new ventures are not many and not very consistent. In the New Product Development (NPD) research there has however been done a significant amount of research on this subject. Although there are some differences between the two research streams it is of our opinion that it is possible to build on some of the findings when looking for critical success factors for new ventures.

3.2.6.3. NEW PRODUCT DEVELOPMENT PROCESS

In the New Product Development research stream there has also been a focus on trying to determine what the critical success factors are. Cooper and Kleinschmidt have done much of the important ground-breaking work (Cooper et al. 1994; Cooper 1979; Cooper and Kleinschmidt 1986; 1987a; 1995; 2007; Cooper and Kleinschmidt 1987b), and the rest of the research within this stream has accommodated to their categorisation of factors. The main categories are:

- NPD process
- Organisational aspects of NPD
- Cultural aspects of NPD
- Top management support
- Strategy

The Organisational and Cultural aspects of NPD, the Role and commitment of senior management and Strategy are to a certain extent included in the other categories of Sandberg and Hofers (Sandberg and Hofer 1987) model, extended by Chrisman et al (Chrisman et al. 1998). These are therefore considered redundant. The category called NPD process is however of interest, due to the lack of research done within new venture success on this field.

Some of the findings that are common within Cooper and Kleinschmidts studies of the NPD process are related to 3 areas, the market research (Cooper et al. 1994; Cooper 1979; Cooper and Kleinschmidt 1986; 1987a; 1995; Cooper and Kleinschmidt 1987b), the customer integration in the process (Cooper et al. 1994; Cooper 1979; Cooper and Kleinschmidt 1986; 1987a) and the market launch (Cooper et al. 1994; Cooper 1979; Cooper and Kleinschmidt 1987a; Cooper and Kleinschmidt 1987b).

Market Research is an activity that is extremely important for a new venture. The assessment of the customer needs and demands, together with the estimation of market size and possible share of this market, is part of the foundation the venture is built on. The market research also should be used to develop the strategy of the venture (Atuahene-Gima 1995).

Cooper and Kleinschmidt, and also others (Dwyer and Mellor 1991; Gruner and Homburg 2000), found that involving the customer in the process of developing products is a success criteria. The customer can contribute to make the product more suitable to satisfy the needs of the market.

The last factor that Cooper and Kleinschmidt finds support for are the importance of the market launch. They emphasise the quality, effectiveness and proficiency of the launch, and also stress the importance of marketing skills.

3.3. MILESTONES OF A VENTURE

The aforementioned criteria are success criteria identified by scientists through empirical studies. They are applicable more or less regardless of venture stage. However, during several of our interviews other factors have been mentioned influencing the uncertainty and thereby the valuation of the venture (Interview 11.02.2011, interview 2.02.2011, interview 8.03.2011). Perhaps the most important have been the milestones of getting the technology verified and achieving product acceptance in the market (Interview 08.03.2011, Interview 02.02.2011). Technology verification is attained when the central technologies a product is reliant on is tested and ready for commercialisation. Many technology-based ventures base their products on already existing technologies, and therefore are not dependent on the development and verification of technology. Some ventures however do research and develop their technologies themselves, and for those the verification is an important milestone.

Milestones

- ✓ Technology verification
- ✓ Functioning prototype developed
- ✓ Market acceptance
- ✓ Legal entity
- ✓ Funding

Product acceptance is achieved when the product has reached substantial sales in the market. The acceptance indicates that the venture to a certain extent has been successful in developing a product the customers will buy. By getting market acceptance a venture has significantly reduced the market risk. The venture will also be impacted by the acceptance of their type of product in the market. If the venture's product is a complete novelty, the market potential of such a product is very uncertain, however if the venture markets a product that is an alteration of an established product the uncertainty will be smaller.

When reaching such milestones a ventures future becomes more predictable, thus influencing the attractiveness and possibly the valuation of the venture.

4. VALUATION OF NEW TECHNOLOGY-BASED VENTURES

4.1. WHY A FRAMEWORK?

As the previous sections indicate, a new vnture is a very complex entity that is affecte by man factors both internal and external. Due to the number of factors and complexity involved it is important that one when valuating a new venture is able to identify the right aspects to assess, and that one apply a systematically methodology with an ability to produce trustworthy values that are viable for comparison. A framework is an appealing way to achieve this. Using a framework implies that the same factors are considered every time a venture is evaluated. This is an aspect that will contribute to the valuations applicability in a comparison setting, since one can be confident that the values were calculated with the same basis and starting point. It will have a positive effect on the stability of the values over time, indicating that two equal ventures assessed at different points in time will have the same time-adjusted value. This can be a preventing factor against fads and fashions in the valuation business and in the market in general. A valuation framework will also provide good guidelines for the users and make the task of valuating a venture easier. There will also be a value in the process of going through a valuation framework since it will have a facilitating effect on the users by forcing them to consider aspects they might omit elsewise. This can be positive both towards obtaining a more correct value, but also for the venture in general since one might become aware of aspects that will impact the ventures operations and strategy.

As highlighted in section 1.3 financing of a new venture often result in negotiations between the new investor and the entrepreneur (or the current investors if the venture has been financed earlier.) The negotiation process often includes widely different value-estimates and there is little agreement on the method of valuation. In such a situation a framework that could estimate an objectifiable fair venture value would be of great use. In this report we present such a framework. Our intention is to provide a fairly objective method to estimate the value of the venture in its early stages. The framework could be used both by the venture capitalists and the entrepreneurs. Our intention is not that our framework should be the one correct answer, or that the values it produces should be the same as what a VC or am entrepreneur would produce. It is that aim that the estimates from using the framework should be a reference when negotiating financing. Therefore we take a neutral perspective in the negotiation process.

4.2. EXISTING FRAMEWORKS FOR VALUATION OF NEW TECHNOLOGY VENTURES

To our knowledge there does not exist any valuation frameworks especially aimed at new technology-based ventures, however it does exist some valuation frameworks that are specific for technology projects, which might be applied to such a setting. Technology valuation frameworks are applicable in a new technology-based venture valuation setting since new technology ventures usually consist of commercialisation of a single new technology project. There might however be some aspects of uncertainty connected to the new venture that not necessarily are accounted for by the technology valuation models.

4.2.1. PARK AND PARK: A NEW METHOD FOR TECHNOLOGY VALUATION IN MONETARY VALUE

Park and Park present a stepwise valuation framework that is based on the structural relationships between technology factors and market factors. The framework follows a stepwise development where one starts with assessing 8 value of technology factors (in a VOT-module). The factors include both applications of the technology and its intrinsic aspects. The results from the value of technology assessment are used to calculate an adjustment factor and a discount rate. The adjustment factor aims to weight the amount of income the technology will generate in the market, and the discount factor aims to adjust for the risks connected with income risk in the market. The next step is to identify value-type of the technology related to the market (VOM-module). The value-type is either profit generating or cost-saving. Based on this one estimate a tentative income flow for the technology in the market. The next step is to adjust this income flow by the adjustment factor to create a final income flow. The final income flow is discounted by the discount factor to estimate the total value (Value Computation Module). The method is by Park and Park argued to be easily understandable, applicable, considerate of the relationship between technology and market factors, flexible, systematic and objective (Park and Park 2004).

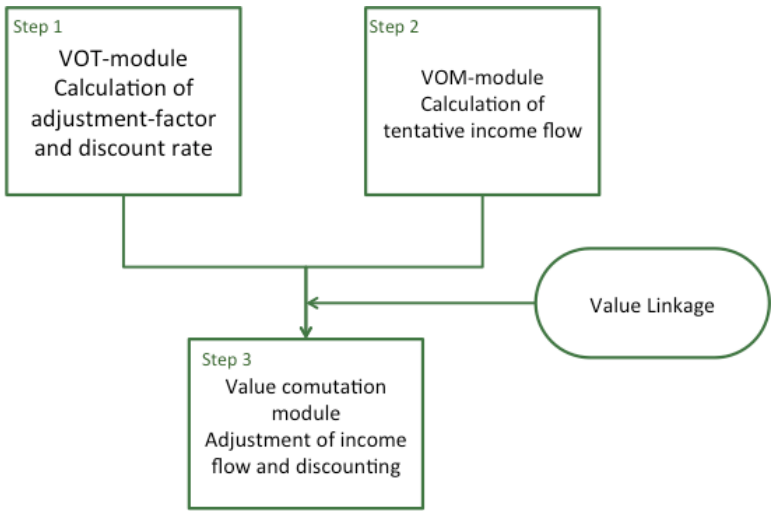


FIGURE 8 - PARK AND PARK'S VALUATION FRAMEWORK

4.2.2. MATSON, TOMASGARD AND VIK'S FRAMEWORK FOR NEW TECHNOLOGY VALUATION

Matson et al. argues that a valuation method for a new technology should address technology, intellectual capital and handling of uncertainty. The first step of the method is to make a qualitative assessment of the technology in question, by ranking the importance of several technology determinants. These are: Technology type, Technological level, Technology novelty, Development phase, Production process, Risk of imitation, Criticality, Complexity, Substitution potential and Market reach. The aim is to determine which of the determinants that are critical for success of the technology in question. Step 2 is to assess which aspects of the intellectual capital that are critical for success. The third step is to create stories of the future. Matson et al. emphasise the importance of including the possibility of bankruptcy in the stories. The aim is to create more realistic scenarios, and to try to disclose the vulnerabilities of the firm. Step 4 is to convert the stories into scenarios. This involves calculating monetary values for the different stories. The qualitative aspects of the earlier steps of the model make it easier to calculate quantitative estimates. The last step is to introduce dynamics to the model. In reality the scenarios will not be fixed, so one should take the possibility of strategic changes into consideration. Based on the scenarios created by the model one can do stochastic simulations, create decision trees and find the expected present value of the technology (Matson et al. 2001).

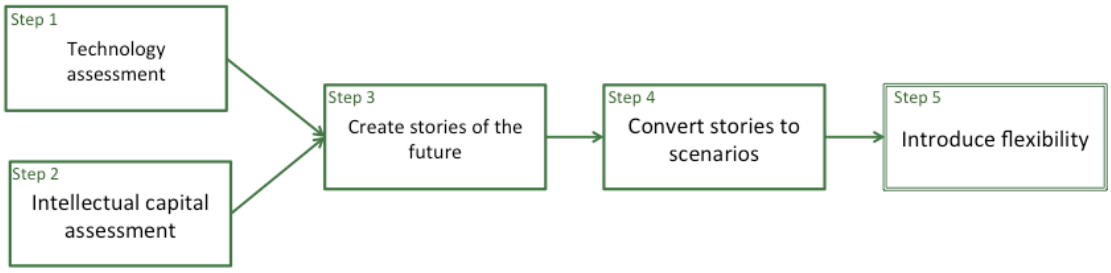


FIGURE 9 - MATSON, TOMASGAARD AND VIK'S FRAMEWORK FOR NEW TECHNOLOGY VALUATION

5. VATN AND YTRE-ARNES FRAMEWORK

In this chapter a framework for valuation of new technology-based ventures is presented and explained. The framework intends to find an as-objective-as possible reference value for practical use in valuation settings. The section starts with a brief theoretic background followed by a stepwise presentation of the framework. The section is concluded with a thorough guide on how to use the framework in practise.

5.1. THEORETICAL AND METHODOLOGICAL BACKGROUND AND DESCRIPTION OF PRINCIPLE

There is currently few venture specific valuation frameworks available, and those who exist are often based on modifying financial frameworks to better fit the venture setting. The framework proposed in this report takes a different approach, and is based on the principle of venture value being driven by venture performance, and that venture value thereby can be assessed using criteria indicating venture success combined with traditional financial models.

The value obtained by the framework is not aimed to be the value a venture capitalist or investment analyst will arrive at, nor is it the value that an entrepreneur would set for his venture. It is aimed to be an objective value that gives a correct representation of the venture given its forecasted future cash flows and the risks it is exposed to. Further it is aimed that the value can be of use as a reference value in a financing situation, or as an objective value when comparing investment opportunities in two or more new ventures. Due to this aim, the aspects regarding liquidity and obtained share of a venture highlighted in section 1 are not accounted for in our framework.

5.1.1. THEORETICAL BACKGROUND

Theoretically the framework relies upon Chrisman, Bauerschmidt and Hofer's (1998) model of venture performance, however expanded to better account for aspects regarding the ventures product. The expanded model states that a ventures performance can be modelled as a function of *"entrepreneur", "industry structure", "resources", "organisational structures processes and systems", "product"* and *"business strategy"*. Empirical findings have identified aspects within each of these categories that indicate venture success and it is argued that one through assessing these indicators can predict the venture's ability to perform in the future. Through a literature study we identified 14 success criteria with empirical support in the literature. To verify the constellation of criteria we performed an empirical test on their aggregated capability of predicting success on 20 new technology based ventures.

Results. Successes: N=10, Failures: N=9	Score
Average score successful ventures	23,72
Average score failed ventures	20,52
Standard deviation successful ventures	1,94
Standard deviation failed ventures	2,72
Mean difference	3,2

TABLE 2 - RESULTS FROM EMPIRICAL TEST ON SUCCESS CRITERA. (ONE VENTURE WAS VIEWED AS AN EXTREME CASE AND WAS REMOVED

The test showed an ability to predict success, providing confidence in the selected success criteria. A more detailed description of the test is presented in the appendix.

5.1.2. METHODOLOGICAL BACKGROUND

Methodologically the framework relies upon methods from traditional finance. Value is found by calculating the net present value of forecasted future cash flows, however as a modification the cash flows are adjusted based on the success criteria analysis to obtain a more realistic scenario. The principle of discounting future cash flows when valuating firms is found in a series of corporate finance books (Berk and DeMarzo 2007; Myers and Brealey 1988), and the principle of adjusting CFs before discounting is advocated by Johnsen (Johnsen 1997). The cash-flows are discounted using a discount rate that compensates for the market risk within the ventures target sector and is found based on principles argued by Damodaran (Damodaran 2009a; Damodaran 2009b), however with some alterations. In contrary to Damodaran's approach our framework addresses intrinsic aspects of the ventures operations through a success criteria analysis, and we argue that one based on this can get a better representation of the venture specific risk than one gets through the statistical adjustment done by Damodaran. We acknowledge that this is a somewhat pragmatic approach, however we argue that its pragmatism is outweighed by the need and importance of having a discount rate that somehow reflects market risk A further argument in favour of this alteration is that using Damodaran's approach in a small market might lead to statistical misrepresentations since the R^2 of the beta-regression will be calculated based on very few data points.

The framework undertakes an explicit valuation of the new venture, an approach that was chosen due to two main reasons. Firstly the principle of venture value being driven by venture performance calls for an explicit valuation approach since it relies on intrinsic aspects of the venture. Secondly we do not want the framework to rely upon existence of comparable values, as one would do if adopting an implicit valuation technique. We argue that a new venture is such a complex and unique entity, that comparing new ventures without assessing their internal aspects will not provide a representative value. Of the explicit valuation techniques the DCF-principle is adopted due to its flexibility, and its wide

recognition as the most common method of the explicit revenue-based valuation approaches.

The framework, as it is presented in this report, is largely deterministic, and does not utilise probability or decision theory. It is however suitable for expansion to adopt such theories, so one can better account for uncertainty and flexibility. This is however left for future research to undertake, if found necessary.

5.2. METHODOLOGICAL WALKTHROUGH

The following section contains a stepwise methodological walkthrough of the framework. The outline of the framework is presented in Figure 10 below, and the different steps are described in the following sections.

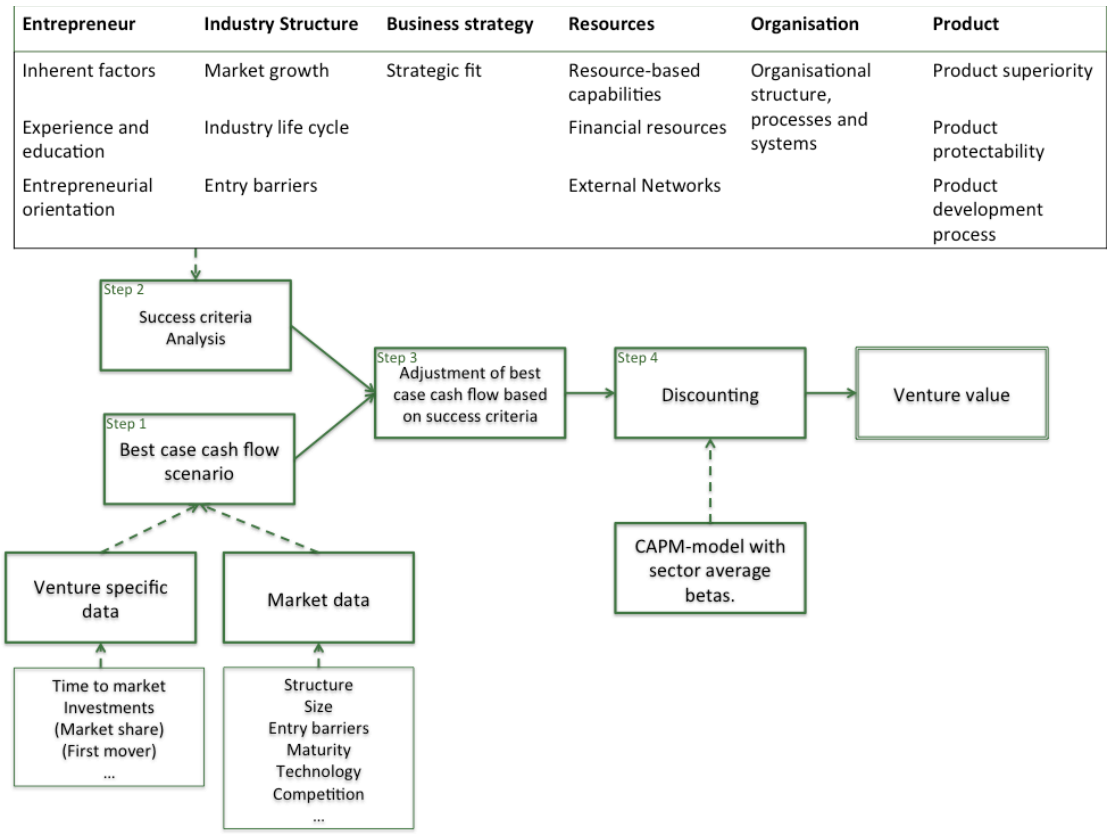


FIGURE 10 - THE FRAMEWORK

5.2.1.1. STEP 1 - MARKET ASSESSMENT AND GENERATION OF BEST-CASE CASH FLOW SCENARIO

The first step is to estimate a best possible cash flow scenario for the new venture. This is the cash flow the venture obtains if everything goes perfect in the given market. General market data as well as some venture-specific data (history among others) constitute the basis for this estimation. The step involves estimating the development of the market, as well as the market share, prices

and costs the venture is likely to have if everything goes perfectly. Based on this one is to establish a forecast of future cash flows.

5.2.1.2. STEP 2 - SUCCESS CRITERIA-ANALYSIS

The second step is to perform a success criteria analysis of the venture. This involves assessing the venture on several factors predicting success. The factors concern elements of the venture within the categories *"entrepreneur", "industry structure", "resources", "organisational structures processes and systems", "product"* and *"business strategy"*. There is a total of 14 success criteria that should be assessed, and they can be found listed in Table 3 below.

Category	**Success criteria**	**Variables addressed**
Entrepreneur	Inherent factors	The entrepreneurs enthusiasm, creativity and persistency
	Experience and education	Industry and venture experience and relevant education
	Entrepreneurial orientation	Risk handling ability, Leadership style, Level of opportunism
Industry structure	Market growth	Annual growth rate in the target market
	Industry life cycle	Position in industry life cycle
	Entry barriers	Competition and capital requirements in the target industry
Business strategy	Strategic fit	Match of strategy and capabilities. Match of strategy and the external environment. Match of strategy and resources.
Resources	Resource-based capabilities	Managerial, technical, marketing and business capability. Reliance and access to specific resources
	Financial resources	Access to and utilisation of financial resources.
	External networks	Access to and position in external network. Level of integration in supply chain.
Organisational	Organisational	Social interaction within team

structure, processes and systems	structure, processes and systems	Experience of working together. Managerial positions filled at first major funding.
Product	Product superiority	Level of improvement relative to current market standard. Position in technology life cycle.
	Product protectability	Intellectual property rights strategy.
	Product development process	Product developed to address a customer need. Inclusion of customer in development process, Quality an effectiveness in market launch.

TABLE 3 – FACTORS IN THE SUCCESS CRITERIA ANALYSIS

5.2.1.3. STEP 3 - ADJUSTMENT OF THE BEST-CASE CASH FLOW SCENARIO

The third step is to adjust the best-case scenario form step 1 in accordance with the findings in the success criteria analysis in step 2. The goal is to obtain the most realistic cash flow scenario possible, based on the information regarding the venture obtained in step 2. For ventures with a less than perfect score on the success criteria the best-case cash flow will be adjusted to reflect the probable outcome of the venture. The different success indicators will impact the best-case scenario in different ways and this will vary from venture to venture. The adjustment is in large a qualitative task and the considerations regarding the internal weightings and strengths of the different links have to be performed by the user.

5.2.1.4. STEP 4 - DISCOUNTING OF THE CASH FLOWS

The forth step is to calculate the net present value of the adjusted cash flow scenario. This step is purely mathematical and follows the calculations presented below

$$Venture\ value = \sum_{I=1}^{N} \frac{CF_i}{(1 + WACC)^i}$$

Where CF_i is the cash flow in year i and $WACC$ is the weighted average cost of capital.

The WACC is obtained with the following formula where r_d is the cost of debt and r_e is the cost of Equity

$$WACC = \left(\frac{D}{D+E}\right) r_d + \left(\frac{E}{D+E}\right) r_e$$

The cost of equity is calculated using the CAPM where r_f is the risk free rate, β_{sa} is the unlevered sector average beta and r_{mp} is the market risk premium.

$$r_e = r_f + \beta_{sa}(r_{mp})$$

The sector average beta is calculated using the following formula where β_a is the levered sector average beta, τ is the corporate tax rate and $\left(\frac{D}{E}\right)_a$ is the average debt/equity ratio of the target sector.

$$\beta_{sa} = \frac{\beta_a}{(1 + (1-\tau)\left(\frac{D}{E}\right)_a)}$$

5.3. USER GUIDE

This section contains a user-orientated walkthrough of how to apply the framework when valuating a new venture. Using the framework consists of four different parts: generating a best-case cash flow scenario, assessing the company's score on the success criteria, adjustment of the best-case cash flows and discounting the adjusted cash flows.

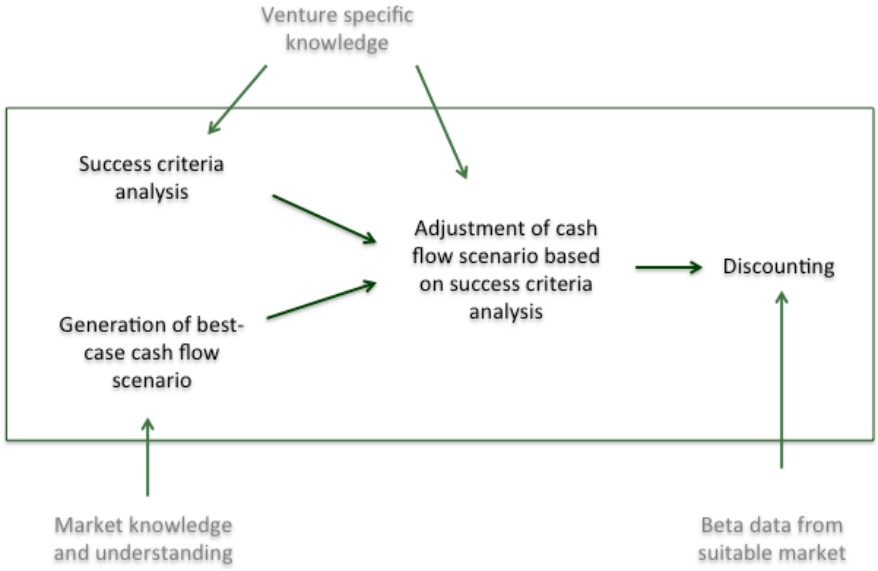


FIGURE 11 - FRAMEWORK WITH MAIN STEPS

5.3.1.1. STEP 1 - GENERATION OF BEST-CASE CASH FLOW SCENARIO

The intention of the best-case cash flow scenario is that it shall be the highest possible scenario for the *perfect* venture in the given market.

Generating the best-case cash flow scenario can be done in several different ways. The company's own cash flow prediction can in some instances be used as a best case, since these often are optimistic in nature. Another option is to build the scenario based primarily on assessments of market characteristics and other market-related data. For this last alternative there are several different approaches on how to construct the scenario, and in practical use one must probably adapt the method to the data available.

A possible method suggested by the authors (and used in the following case-study) is as follows. The first task is to assess today's total size of the market the venture is targeting, as well as the assumed maximum level the market could realistically reach. Market-developments can often be approximated with a sigmoid-curve. By knowing the current market size, the future maximum market size as well as the number of years until this state is reached, one can develop such a curve by using the sigmoid-function. Examples of this are shown in the figures below. The market in Figure 12 is in the development phase, versus the market in Figure 13 that is well into the growth phase, about to reach maturity. The sigmoid curve is a well-known way to forecast market development, but will not be applicable in all situations. Some markets develop differently, and if this is the case other models should be used.

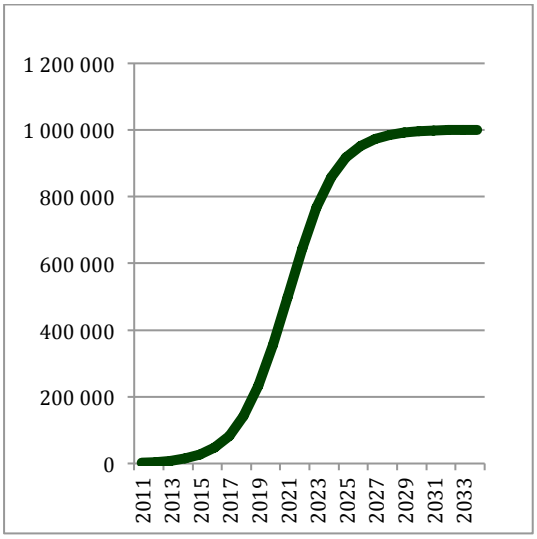


FIGURE 12- SIGMOID CURVE OF A MARKET CURRENTLY IN THE DEVELOPMENT PHASE

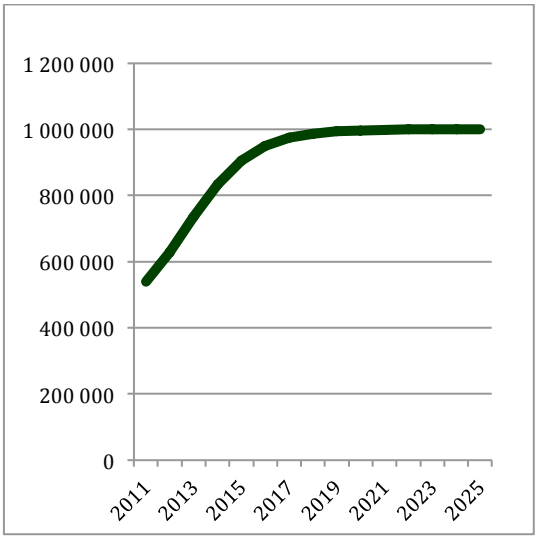


FIGURE 13 - SIGMOID CURVE OF A MARKET CURRENTLY IN THE GROWTH PHASE

With the development of the total market in place the next step is to analyse the market with regards to the number of competitors. Some markets will at maturity have more competitors than others due to for example economies of scale, local toll/duty regimes or the characteristics of the product. In some markets there will at maturity be as few as two or three actors (or in some even just one), while there in other markets will be several actors. The number of

large actors will affect how large market-share a single company can take at the most. After assessing the size-development of the market one should assess the market share the perfect venture can achieve by taking the number of competitors into consideration.

When the market share over time is analysed the margins a venture can achieve must be assessed. Both the sales price and the purchasing costs can vary over time depending on the market development and the competition. The total costs of the best-case venture must also be assessed. The question here is how large/small the fixed costs should/must be. The last aspect to analyse is the changes in working capital needed for the venture to achieve the estimated sales-scenario. Rapid growth often requires large increases in working capital due to the need of financing of production/purchasing of more products. Other investments in aspects such as facilities, distribution etc is also likely. An example of a possible structure for such an analysis is showed in Table 4 below.

Year	Total market size [#]	Market share [%]	Sales [#]	Income per product [$]	Cost per product [$]	Fixed costs [$]	Operating result after taxes [$]	Changes in working capital [$]	Discountable result [$]
2011	150	30	45	700	420	15 000	1512	1000	512
2012	175	40	70	650	350	18 000	2160	1500	660
…									

TABLE 4 - CASH FLOW SCENARIO FOR A NEW VENTURE

5.3.1.2. STEP 2 - SUCCESS CRITERIA-ANALYSIS

The success criteria-analysis is the core of the framework and essential in order to calculate the value of the new venture. There are 14 identified criteria in 6 categories covered by 28 questions. The key to a good analysis is substantial knowledge about the venture and the factors that has to be considered.

The authors have suggested the following set of questions as guidelines to assessing the different success criteria. The questions are based on empirical findings indicating success and it is important that the user is both consistent and realistic when answering the questions. It is also important that the whole scale is used, including the extreme ends. For instance if the entrepreneur has no relevant education he scores zero on that success criteria regardless if he has a lot of non-relevant education.

SUCCES CRITERIA ANALYSIS

ENTREPRENEUR

Q1: To what degree would you describe the entrepreneur(s) as persistent?

Q2: To what degree would you describe the entrepreneur(s) as enthusiastic?

Q3: To what degree would you describe the entrepreneur(s) as creative?

Q4a: To what degree does the entrepreneur/entrepreneurial team have sufficient relevant experience?

Q4b: To what degree is experience important in the ventures target industry?

Q5a: To what degree does the entrepreneur/entrepreneurial team have sufficient relevant education?

Q5b: To what degree is education important in the ventures target industry?

Q6: Assess the entrepreneur(s) ability to evaluate and handle risk.

By risk we mean commitment of substantial resources to uncertain projects.

Q7: To which degree are the entrepreneur(s) opportunity driven?

Q8: Asses the entrepreneurs' leadership style along the following scales

Formal to Informal

Static to Dynamic

INDUSTRY STRUCTURE

Q1: What is the yearly growth rate in the target market of the new venture?

Q2: In which phase of the life cycle is the market the venture is entering?

Q3: What degree of competition is there in the venture's target market?

Q4: To what degree does the incumbents benefit from economics of scale?

Q5: Assess the capital requirement in the venture's target industry:

RESOURCES

Q1: Assess the venture's managerial capability and business understanding.

Q2: Assess the venture's technical capability.

Q3: Assess the venture's marketing capability.

Q4a: To which degree does the venture rely on specific resources?

Q4b: To which degree does the venture have access to these specific resources?

Q5: To which degree does the venture have access to sufficient financial resources?

Q6: Assess the relevancy and quality of the venture's network.

Q7: To which degree does the venture have an integrated supply chain (high level of cooperation with suppliers and customers)?

ORGANISATIONAL STRUCTURES, SYSTEMS AND PROCESSES

Q1: How much relevant experience of working together does the entrepreneurial team have?

Q2: Assess the social interaction within the entrepreneurial team.

Social interaction includes aspects such as communication, cohesion, work norms, mutual support, coordination and balance of member contribution

Q3: Which of the following managing positions are/were filled at the time of the first major outside funding?

President, Marketing Manager, Engineering manager, Operations Manager, Finance Manager

PRODUCT

Q1: To what degree is/was the product developed to satisfy a need in the market?

Q2: To what degree are/were the customers included in the product development process?

Q3: To what degree is/was there a focus on quality and effectiveness in the market launch?

Q4: To which degree does the venture have a good Intellectual Property Rights (IPR) strategy?

This concerns the ventures ability to protect and maintain its competitive advantages.

Q5: How much of an improvement does the new venture'' product(s) represent, with reference to the current market standard?

Q6: In which stage of the technology life cycle is the venture's product?

BUSINESS STRATEGY

Q1: To what degree does the venture's strategy match its capabilities and the external environment?

By the external environment we mean aspects regarding the industry and market, as well ass the technology environment/climate.

Q2: To what degree does the entrepreneurial capabilities match the venture's strategy?

TABLE 5 – OPERATIONALISATION OF SUCCESS CRITERIA

5.3.1.3. STEP 3 - ADJUSTMENT OF THE BEST-CASE CASH FLOW SCENARIO

One of the key premises of the framework is that the projected cash flow scenario is adjusted based on the identified success criteria. This is done to obtain a more likely and realistic representation of the future cash flows. It is very important that the adjusted cash flows are integrally realistic, and that they represent the totality of the indications in the success criteria analysis. There does however not exist, or is not yet identified, general clear consistent relationships between the success criteria and the variables used to estimate cash flows. Such relationships will probably also vary in both strength and magnitude among different ventures and markets. As a solution to this, the framework is flexible and leaves the user with the possibility to model the impact of such aspects when adjusting. The user has to analyse for each of the input factors to the cash flow scenario how it will be impacted by the venture's performance on each of the success criteria. For example will rapid sales growth often be dependent on access to capital, and thereby low capital availability reduce the venture's chance of achieving rapidly increasing sales, and result in a moderating adjustment of the cash flow scenario.

It is in this step important that the user uses his understanding of the venture and the market to best account for the impact of the success criteria. A suggested procedure can be to for every possible pair of success criteria and input factor assess whether it will have an impact, and how strong the impact will be. It is also important to acknowledge that the relationships between success criteria and the cash flow scenarios need not to be linear. For instance can a score of

80% on a given success criteria result in the venture failing, since success was so difficult to obtain that score of 90% or 100% was needed. It is also important to realise that failure is a possible outcome, and that one after performing the success criteria analysis can find indications that the venture will fail.

As a starting point, the authors have suggested some universal relationships that it is assumed will be present for all ventures. The input factors and the related success criterion are illustrated in Figure 14 below.

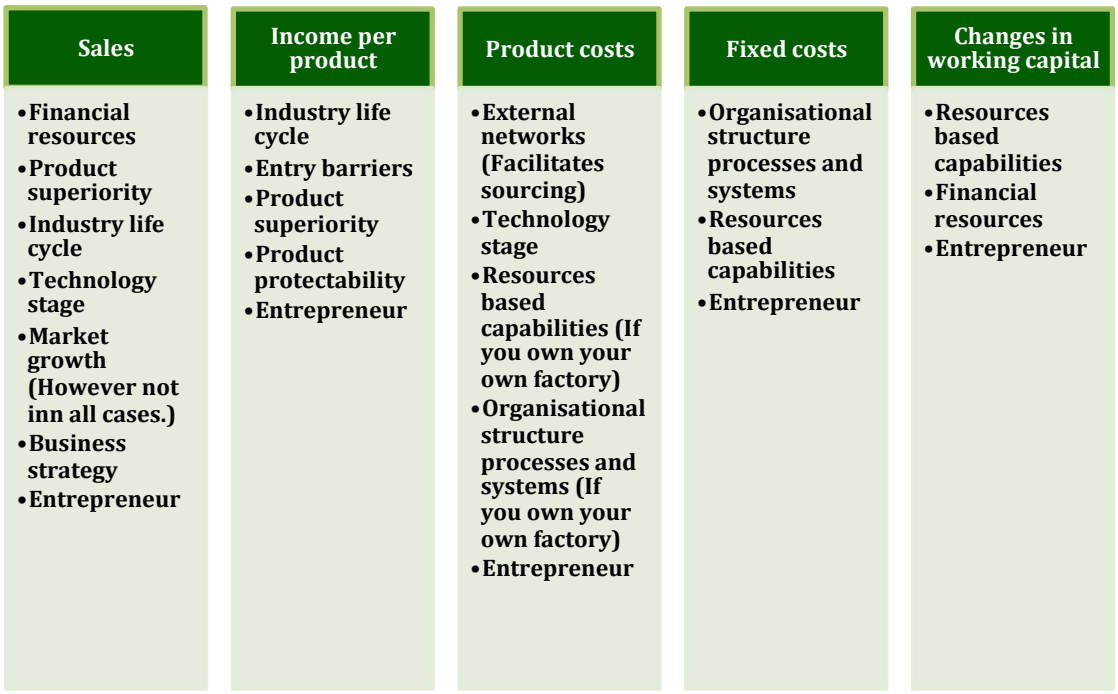


FIGURE 14 – LINKS BETWEEN SUCCESS CRITERIA AND CASH FLOW ANALYSIS.

5.3.1.4. STEP 4 – CALCULATION OF DISCOUNT RATE AND NET PRESENT VALUE

The last step of the framework is largely a mathematical task of calculating net present value of the discounted cash flows. The discount rate is the weighted average cost of capital, which is a weighted sum of the cost of equity and the cost of debt. The cost of equity is calculated using a modified version of the CAPM, while the cost of debt is, if relevant, assumed provided by the banks. The method is described in section 5.2.1.4 above and should be straightforward to apply. There are however some aspects that the user should be aware of, especially in relation to the input factors that has to be estimated.

The first aspect the user has to be aware of is the betas used in the CAPM model in the framework. Since the venture is not traded in a public market, one cannot use the traditional beta that measures the assets' sensitivity to variations in the market since there will not be data available. Instead the sector average beta of the publicly listed firms in the venture's target sector is used as an

approximation. To find the sector average betas one has to find the beta of the listed firms within the ventures target sector. These can either be calculated based on historical data, or be collected from a financial database. The sector average beta is then calculated as the average of these betas. The user should be aware of the possible statistical pitfalls of this approach when applied to industry sectors contacting few listed companies. In cases where there are few companies to based the sector average betas on, one has the possibility to also include firms from other markets in the calculations. Aspects such as regulation, tax and toll regimes of moving capital between different geographical markets should then be taken into consideration and properly adjusted for in the calculations.

The CAPM-model assumes diversified investors, however this is not the case for most venture investors (Cumming 2006; Matson 2003a). Damodaran compensates for lack of diversification through adjusting the beta reflecting the R^2-level of the initial beta calculation. The approach is sensible given a large stock market (Damodaran is located in the US where there are many listed companies), however in smaller market this approach will pose a problem since the beta-regression will be calculated based on very few data points. Instead we argue that the venture specific risk will be handled through the success criteria analysis.

The second aspect is the risk-free rate. The risk free rate is the theoretical rate of return one can receive without being exposed to any risk, however such a entity does not exist in practice since all securities will be exposed to some sort of risk in some sort of way. Instead returns on government bonds and treasury bills from large stable economies are often used as an approximation of the risk-free rate. The authors suggest that one should rely upon Metricks' (Metrick 2007) approach and use current treasury yield for an equal time horizon as the perspective of the investment. Data on treasury yield should be easy to obtain from a financial database.

The last factor of the CAPM model that needs to be devoted some attention is the market risk premium. The market risk premium is the difference between the expected return of the market portfolio and the risk free rate of return. An estimation of the premium can be calculated by using historic returns of the market portfolio, however it is often possible to find good estimates of this premium in financial databases.

It is very seldom that a new venture uses debt financing since they often face problems whit creditworthiness when approaching lenders, often resulting in high interest costs (Chua et al.) However if the venture has debt it is assumed that the cost is known for the user of the framework and if not that it will somehow be possible to obtain it.

6. CASE STUDY – VATN AND YTRE-ARNES FRAMEWORK IN USE

This section consists of a practical case study of the framework. The framework is applied on three different ventures targeting three different markets. The first case is described thoroughly whereas for the other cases only the significant differences from the first case are presented. Using case studies has two main purposes, the first is to perform a test of the framework and the second is to provide an example of how the framework can be applied.. Due to the sensitivity of the data involved the new ventures used in the cases are kept anonymous. Results and experiences using the framework are presented at the end of the section.

The methodology of the case study is discussed in the appendix.

6.1. CASE COMPANY 1 - VENTURE A

Venture A was founded by the entrepreneur in 2008 and was joined in 2009 by two more employees. The venture has developed an accessory for the consumer discretionary market, targeted at parents of young children. At the time of assessment the product was two months from the stores. The production is carried out by suppliers in China, and the products will be sold at baby-equipment-stores, airports and through the ventures website. The venture's product is based on their own patented technology.

6.1.1. MARKET ASSESSMENT AND GENERATION OF BEST-CASE CASH FLOW SCENARIO

For Venture A we have chosen to build the best-case scenario based on market analysis (as opposed to relying on the predictions from the company). The company deliver consumer products to a potentially global market. Venture A defines its primary markets as northern and western Europe due to the product characteristics. The total market potential for a geographical submarket is quite easy to estimate because the number of buyers, and hence the number of sold products, is assumedly strongly correlated to the number of births per year. The birth rate as a fraction of the total population is estimated to be 1,09% for Europe[7], therefore it is reasonable to operate with a optimistic total European market of about 2 million units sold per year. As of "today"(1st of April 2009) there are no similar products sold, however there are some products on the market that satisfies some of the same needs. Venture A will be able to deliver products to the market very soon, and will, until other competitors enter the stage, therefore drive the market development themselves. With the large potential market size it is reasonable to believe that the competition will intensify, especially in the global market where there are actors selling the

[7] http://en.wikipedia.org/wiki/List_of_countries_by_birth_rate

product which Venture A sells an accessory to who have deep pockets. The entry-barriers to the market are considered to be quite low. Due to the low capital-need to "establish" production (buy production-time from Asia). However, the access to a distribution network is perhaps more of a barrier to entry. Another effect that could be a benefit for Venture A is if there exist considerable first-mover advantages. One can argue that Venture A's patent might be a sort of technological leadership that gives them a head start, but in the long run this is not considered a first mover advantage. The switching costs are not very applicable either because the product is not an article of consumption. A person will most likely not buy more than one or two products during their lifetime. Based on the aforementioned we conclude that there are no significant first-mover advantages that Venture A will be able to obtain, and that the competition will intensify significantly. For the best case we have started out with a 100% market share that over the years is reduced to a stable 33% indicating that there will not likely be less than 3 dominant actors in the market.

The growth rate for Venture A will to a large extent depend on the access to financial resources and good market channels/distributors. This could be viewed as a strategic choice where a venture can choose a less risky development with slower growth. It could also be viewed as a matter of having access to resources, and therefore dependent on the quality/attractiveness of the venture.

We have assumed that the market as a best case can reach the maximum level within 20 years. After ten years we assume that there will be sold 1 million items at the best, and 2 million after 20 years. With three dominant actors in the market this gives Venture A 660 000 units sold per year as a best case. We have also assumed that as the competition intensifies the income per product will fall, however the production costs will also probably decrease as the volumes increase. All in all the margins in the best case are therefore fairly constant at 300 NOK per item.

The costs are also an important element of the cash flow-predictions. For a company like Venture A that does not produce or sell the items themselves to the end customer (except from their webpage) the internal costs (purchasing costs excluded) can be kept fairly low.

Table 6 below shows the best-case scenario for Venture A.

Year	Total market [# units sold]	Sales for the company [# units sold]	Income [NOK]	Total costs [NOK]	Result [NOK]
0	4 946	4 946	4 451 646	4 467 764	-2 011 605
1	8 994	8 994	8 094 234	6 496 796	-1 849 845
2	16 326	14 694	13 224 239	11 346 800	-2 648 243
3	29 549	25 117	20 093 454	18 558 409	-3 894 767
4	53 195	39 896	31 917 125	23 958 563	730 165

5	94 853	56 912	39 838 304	32 764 745	3 092 962
6	166 347	83 173	58 221 433	41 110 716	10 319 716
7	283 704	113 482	79 437 102	53 718 551	17 517 357
8	462 952	152 774	99 303 307	61 832 296	25 979 128
9	708 690	233 868	152 013 907	76 466 887	53 393 854
10	1 000 002	330 001	214 500 429	102 500 165	79 640 190
15	1 905 148	628 699	377 219 390	157 949 997	157 373 963
20	1 995 055	658 368	395 020 842	181 673 614	153 610 004
30	2 000 000	660 000	330 000 000	182 000 000	106 560 000
60	2 000 000	660 000	330 000 000	182 000 000	106 560 000

TABLE 6 – VENTURE A BEST-CASE CASH FLOW SCENARIO

6.1.2. SUCCESS CRITERIA-ANALYSIS

After the best-case cash flow scenario for Venture A was developed we assessed the ventures score on the success criteria. As a benchmark the imaginary perfect venture was used, and Venture A's performance relative to this was the basis for the score.

Category	**Success criteria**	**Assessment**	**Score (out of 7)**
Entrepreneur	Inherent factors	The entrepreneur has shown herself to be quite enthusiastic (by getting media attention) and persistent (long time entrepreneur)	5
	Experience and education	Does not have much experience or relevant experience, but the requirements for this case is not considered to be high.	7
	Entrepreneurial orientation	The leadership style of the entrepreneur is assessed to be somewhat formal and static	4
Industry structure	Market growth	Dependant on the ventures growth (because the market is currently non-existing)	
	Industry life cycle	In the development phase. Market acceptance for concept and product unknown.	1
	Entry barriers	Low entry barriers.	6,33
Business strategy	Strategic fit	The strategic fit is considered to be fairly good. Some lacking resources to fulfil the strategy.	4,5

Resources	Resource-based capabilities	Fairly low capabilities within marketing, technology and management, but access to the specific resources that are needed is good	4,25
	Financial resources	High risk venture with less-than-perfect-protectability targeting the consumer market can have difficulties attaining the large amounts of cash needed for rapid international growth	3
	External networks	Experienced board and broad network in the local market. Lack of international network.	6
Organisational structure, processes and systems	Organisational structure, processes and systems	The venture is young, and not many of the key positions are filled. High risk affiliated with the development of the organisation.	2,5
Product	Product superiority	The product is considered to be superior to other products trying to fulfil the same need	6
	Product protectability	Although Venture A has a patent their ability to avoid competition and to defend their patent is considered to be questionable	4
	Product development process	Distinct need in the market and the customers have to a certain extent been included in the development process	5,5

TABLE 7 – VENTURE A SUCCESS CRITERIA ANALYSIS

In general Venture A scored quite well on most of the criteria, but some scores are concerning. Perhaps the most worrying is the industry life cycle and the organisational aspects. The early stage of the industry/market entails higher uncertainty regarding sales volume because the product acceptance and market response is unknown, thereby lowering the score on the success criteria. Also the prematurity of the venture's organisation is considered a risk that must be taken into account. For some of the criteria proxies were used, such as the ability to get media attention as a proxy for enthusiasm within inherent factors.

6.1.3. ADJUSTMENT OF THE BEST-CASE CASH FLOW SCENARIO

The next task is to adjust the best-case cash flow scenario with regards to Venture A's performance on the success criteria. Venture A's product is breaking new ground in the market. This means that the market development in the

beginning is strongly correlated to the development of Venture A itself. For the criteria inflicting the sales of the venture they scored fairly low on both industry life cycle and financial resources. We therefore adjust the total market size down by 25% and also delay the market development somewhat. Venture A's market share is also adjusted to take this into account. The income per product is also adjusted slightly downwards due to many of the same reasons as the sales. Also the mediocre score on product protectability has a negative influence on the ability to maintain the income over time. Further, the product costs are adjusted somewhat upwards due to lack of good contacts with production companies.

Venture A's low score on organisational structure, processes and systems, as well as mediocre score on the resource-based capabilities, imply that we adjust the fixed costs upwards compared to the relation between sales/fixed cost of the best-case.

The last adjustment to the best-case cash flow scenario is to the changes in working capital. A slower growth and lower maximum sales level decreases the need for working capital. However, Venture A's poor access to capital can lead to a larger change in the working capital because they need to withheld more cash from operations due to lacking credit from financial institutions.

All in all this gives the following adjusted cash flow scenario for Venture A.

Year	Total market [# units sold]	Sales for the company [# units sold]	Income [NOK]	Total costs [NOK]	Result [NOK]
0	3 710	3 710	3 338 966	4 062 408	-2 520 879
1	5 986	5 687	5 117 893	5 658 115	-3 388 960
2	9 649	8 684	7 815 874	8 640 883	-4 594 006
3	15 532	13 202	10 561 559	12 409 832	-5 330 756
4	24 941	18 706	14 964 409	15 712 630	-4 538 719
5	39 897	23 938	16 756 619	18 623 785	-3 344 360
6	63 436	31 718	22 202 595	22 868 673	-2 479 576
7	99 914	39 965	27 975 787	28 535 302	-1 402 851
8	155 102	51 184	33 269 450	32 322 550	-318 232
9	235 645	70 694	45 950 787	40 648 773	2 817 450
10	347 215	104 164	67 706 900	59 894 566	4 624 881
15	1 152 788	185 000	101 750 000	97 125 000	2 830 000
20	1 460 105	200 000	110 000 000	95 000 000	10 800 000
30	1 500 000	200 000	100 000 000	90 000 000	7 200 000
60	1 500 000	200 000	100 000 000	90 000 000	7 200 000

TABLE 8 - VENTURE A ADJUSTED CASH FLOW SCENARIO

6.1.4. DISCOUNTING OF THE CASH FLOWS

CALCULATION

As argued in the chapter about financial valuation the discount rate is aimed to

give an indication of how the investor should be compensated for risks that are connected to the market in which the venture is operating. For venture A the public market in question is Oslo Stock Exchange (OSE). We use OSEs' predefined sectors (See Table 9 below) and since Venture A sells a durable consumer product this places it in the consumer discretionary sector.

OSE sectors
Energy
Materials
Industry
Consumer discretionary
Consumer Staples
Health care
Financials
Information technology
Telecommunication services
Utilities

TABLE 9 - SECTORS ON OSE

The first step is to calculate the sector average beta. The consumer discretionary sector includes the following firms with Betas and debt/equity ratios and we arrive at an average beta of 0,876.

Firm	Beta (Levered) vs. OSX[8]	Debt/Equity ratio [9]
BWG Homes ASA	0,936	1,5
Ekkornes ASA	0,575	0,3
Gyldendal ASA	n/a (Very low trading activity)	
Hurtigruten ASA	0,954	2,7
Kongsberg Automotive ASA	1,069	3,3
Komplett ASA	0,542	0,6
Polaris Media ASA	n/a (Very low trading activity)	
Royal Caribbean Cruises Ltd	1,064	1
Schibsted ASA	0,99	1,9
Statoil Fuel And Retail ASA	n/a (Not sufficient trading history – listed 1 month ago)	
Average	0,875714286	1,614285714

TABLE 10 - BETA AND DEBT/EQUITY FOR OSE CONSUMER DISCRETIONARY SEGMENT

[8] www.bloomberg.com
[9] www.proff.no

The next step is to find an estimation of the risk-free rate and the market risk premium. A 5 year average of the 12 month NIBOR (Norwegian InterBank Offered Rate) (Based on monthly data points) is used as an estimate of the risk free rate. The data for this was readily available from the Norwegian Central Bank[10]. An estimate for the market risk premium was collected from a recent survey investigating premiums used by analysts, listed companies and investment managers. The average for Norway was 5%, but the result was only based on 8 respondents. However, since the average was equal to the Euro-average (Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden and Switzerland), which was based on 197 respondents, and there is in practice free flow of capital between Norway and the countries included in the euro average (Except from Switzerland, who have several bilateral agreements with the EU, and Croatia they are all members of either the European Union[11] or the European Economic Agreement[12]), the average was found credible as an estimate. The tax rate was set at 28%, which is the corporate tax rate in Norway[13].

A summary of the numbers, calculations and the final calculated required rate of return to compensate for systematic risk are listed in the table below

Summary of Numbers	
Average Beta	0,876
Average D/E-ratio	1,614
Tax rate	28 %
Unlevered beta	0,405
Market risk premium	5 %
Risk free rate	4,09 %
Required rate	**6,11 %**

$$\text{Unlevered Beta} = \frac{0{,}876}{1 + (1-0{,}28)*1{,}614} = 0{,}405$$

$$\text{Required} \quad 4{,}09\% + 0{,}504 * 5\% = 6{,}11\ \%$$

TABLE 11 – VENTURE A CALCULATION OF RATE

As we can see, since the beta suggest that the consumer discretionary sector in the Norwegian stock market is less volatile than the total market resulting in a somewhat low compensation for systematic risk for the investor.

We now have all the numbers needed to calculate the net present value of the adjusted future cash flows. The calculation follows the formula described in

[10] http://www.norgesbank.no
[11] http://europa.eu/abc/european_countries/index_en.htm
[12] http://eeas.europa.eu/eea/
[13] http://www.skatteetaten.no

section 5.2 where CF_i is collected from the adjusted cash flow scenario and the *WACC* is the same as the cost of equity since Venture A does not have debt.

$$Venture\ A\ value = \sum_{I=1}^{N} \frac{CF_i}{(1{,}0611)^i} = NOK\ 42{,}4\ million$$

The value of venture A obtained using the framework is NOK 42,3 million.

6.2. CASE COMPANY 2 – VENTURE B

Venture B was founded by an experienced team in 2004. The venture sells an accessory to a consumer discretionary product targeting the high-end segment, however the product has no similarity with venture A's product.

The valuation of the venture is done with data from early 2007, and at this point in time the venture had experienced sales and was rigging for future growth. The venture handles product development, marketing and wholesale itself, while production is outsourced and sales are carried out by established retailers.

6.2.1. MARKET ASSESSMENT AND GENERATION OF BEST-CASE CASH FLOW SCENARIO

In early 2007 there were expectations of strong growth in Venture B's target market. It was expected to grow to a saturated level of 123,6 million units or approximately $4,95 billion in 5 years. In a best case-scenario Venture B is assumed to obtain 5% of the total market, as the venture is addressing the high-end segment, and since competition is high and the incumbents have deep pockets.

Year	Total market [# units]	Sales [# units]	Income [NOK]	Total costs [NOK]	Result [NOK]
0	57 865 571	578 656	115 731 143	93 905 078	1 151 288
1	82 241 497	1 233 622	246 724 492	193 875 257	23 051 449
2	108 316 341	1 949 694	389 938 827	307 705 650	44 207 888
3	119 681 684	2 393 634	478 726 735	377 076 883	61 975 068
4	122 713 748	2 454 275	490 854 993	395 869 870	68 112 527
5	123 405 652	2 468 113	493 622 607	407 876 390	61 659 537
6	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200
7	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200
8	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200
9	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200
10	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200
15	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200
20	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200
30	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200

60	123 600 000	2 472 000	494 400 000	420 940 000	52 891 200

TABLE 12 – VENTURE B BEST CASE CASH FLOW SCENARIO

6.2.2. SUCCESS CRITERIA ANALYSIS

The success criteria analysis shows good results with especially high scores on entrepreneurial team, and somewhat low scores on product.

Category	**Success criteria**	**Score (out of 7)**
Entrepreneur	Inherent factors	5
	Experience and education	7
	Entrepreneurial orientation	5,5
Industry structure	Market growth	High
	Industry life cycle	7
	Entry barriers	3,667
Business strategy	Strategic fit	4,5
Resources	Resource-based capabilities	5,5
	Financial resources	5
	External networks	5,5
Organisational structure, processes and systems	Organisational structure, processes and systems	5
Product	Product superiority	2
	Product protectability	5
	Product development process	3

TABLE 13 – SUCCESS CRITERIA ANALYSIS FOR VENTURE B

6.2.3. ADJUSTMENT OF THE BEST-CASE CASH FLOW SCENARIO

The venture scores in average high on the success criteria analysis, however the low scores on product superiority and product development processes leads to drastically reductions of sales, especially given the ventures strategy of targeting the high en market. Further the lack of product superiority leads to reduced margins as the market saturates. The adjusted market projection is displayed in Table 14 below.

Year	Total market [# units]	Sales [# units]	Income [NOK]	Total costs [NOK]	Result [NOK]
0	57 865 571	578 656	115 731 143	93 905 078	1 151 288
1	82 241 497	822 415	156 258 845	130 138 096	3 806 939
2	108 316 341	1 083 163	205 801 048	176 642 877	5 993 883
3	119 681 684	1 196 817	221 411 115	194 562 315	8 770 204
4	122 713 748	1 227 137	214 749 059	192 595 716	15 829 324
5	123 405 652	1 234 057	209 789 608	195 427 347	10 307 789
6	123 600 000	1 236 000	203 940 000	192 590 000	8 172 000
7	123 600 000	1 236 000	203 940 000	192 590 000	8 172 000

8	123 600 000	1 236 000	197 760 000	189 500 000	5 947 200
9	123 600 000	1 236 000	197 760 000	189 500 000	5 947 200
10	123 600 000	1 236 000	191 580 000	186 410 000	3 722 400
15	123 600 000	1 236 000	191 580 000	186 410 000	3 722 400
20	123 600 000	1 236 000	191 580 000	186 410 000	3 722 400
30	123 600 000	1 236 000	191 580 000	186 410 000	3 722 400
60	123 600 000	1 236 000	191 580 000	186 410 000	3 722 400

TABLE 14 - VENTURE B ADJUSTED CASH FLOW SCENARIO

6.2.4. DISCOUNTING OF THE CASH FLOWS

The cash flows are discounted following the same procedure and using the same discount rate as Venture A since the two firms are in the same industry.

$$Venture\ B\ value = \sum_{I=1}^{N} \frac{CF_i}{(1{,}0611)^i} = NOK\ 89{,}9\ million$$

The value of venture B obtained using the framework is NOK 89,9 million.

6.3. CASE COMPANY 3 – VENTURE C

The third case venture has developed a product in the building-material category. Their product satisfy the base need just as well as other products already in the market, but has less side effects and can be produced cheaper than their competitors. The technology has been developed in a university-environment for over 10 years. The valuation is done with data from April 2007.

6.3.1. MARKET ASSESSMENT AND GENERATION OF BEST-CASE CASH FLOW SCENARIO

Venture C has two main products, both within business-to-business building-materials. They aim for the US market, with a combined current size of about $1,1B (according to the business plan of the venture). The market is growing after a downturn in 2002-2003, but is in general saturated. As a best-case scenario it is suggested that a perfect venture can reach a market share of 25%. Reaching this level will however take long time because the competitors are well established in the market.

Year	Total market [$]	Income [$]	Total costs [$]	Result [$]
0	1 196 402 758	1 196 403	1 717 842	-875 436
1	1 197 802 611	5 989 013	5 593 408	-715 164
2	1 198 661 430	11 986 614	10 191 969	-207 855
3	1 199 185 972	23 983 719	18 390 232	2 527 311
4	1 199 505 475	35 985 164	26 591 099	5 263 727
5	1 200 000 000	54 000 000	37 400 000	10 952 000
6	1 206 000 000	72 360 000	50 652 000	14 829 760

7	1 212 030 000	96 962 400	67 873 680	20 143 878
8	1 218 090 150	121 809 015	85 266 311	25 510 747
9	1 224 180 601	183 627 090	128 538 963	39 163 451
10	1 230 301 504	246 060 301	172 242 211	52 649 025
15	1 261 368 158	315 342 040	220 739 428	67 913 881
20	1 293 219 285	323 304 821	226 313 375	69 833 841
30	1 359 354 690	339 838 673	237 887 071	73 405 153
60	1 578 754 650	394 688 662	276 282 064	85 252 751

TABLE 15 – VENTURE C BEST-CASE CASH FLOW SCENARIO

It is assumed that the market will increase with 0,5% per year over time.

6.3.2. SUCCESS CRITERIA ANALYSIS

The success criteria analysis showed a fairly good overall score for Venture C, however with some concerning low scores. The venture is entering a mature market with strong incumbents, which has a negative effect due to tougher competition for market shares, as there is little growth in the markets.

Category	**Success criteria**	**Score (out of 7)**
Entrepreneur	Inherent factors	3,67
	Experience and education	5,6
	Entrepreneurial orientation	4,5
Industry structure	Market growth	1%-3%
	Industry life cycle	3
	Entry barriers	2,33
Business strategy	Strategic fit	3
Resources	Resource-based capabilities	5
	Financial resources	5
	External networks	3,5
Organisational structure, processes and systems	Organisational structure, processes and systems	4,5
Product	Product superiority	4
	Product protectability	6
	Product development process	3

TABLE 16 – SUCCESS CRITERIA ANALYSIS FOR VENTURE C

6.3.3. ADJUSTMENT OF THE BEST-CASE CASH FLOW SCENARIO

The best-case scenario was then adjusted for the scores on the success criteria. Venture C scored overall fairly well on the criteria, but considerate adjustments had to be made. Due to low scores on the industry life cycle and entry barriers the total sales of Venture C was decreased.

Year	Total market [$]	Income [$]	Total costs [$]	Result [$]

0	1 196 402 758	598 201	1 508 471	-1 155 394
1	1 197 802 611	1 197 803	3 018 132	-2 310 637
2	1 198 661 430	5 993 307	7 294 646	-2 436 964
3	1 199 185 972	7 195 116	8 256 093	-1 763 903
4	1 199 505 475	8 396 538	8 881 369	-1 149 078
5	1 200 000 000	9 600 000	9 604 000	-802 880
6	1 206 000 000	10 854 000	10 314 880	-111 834
7	1 212 030 000	12 120 300	10 984 210	317 985
8	1 218 090 150	18 271 352	16 261 504	947 091
9	1 224 180 601	24 483 612	21 790 415	1 939 102
10	1 230 301 504	30 757 538	27 681 784	2 214 543
15	1 261 368 158	63 068 408	58 022 935	3 632 740
20	1 293 219 285	64 660 964	63 367 745	931 118
30	1 359 354 690	67 967 735	67 288 057	489 368
60	1 578 754 650	78 937 732	78 148 355	568 352

TABLE 17 – VENTURE C ADJUSTED CASH FLOW SCENARIO

6.3.4. DISCOUNTING OF THE CASH FLOWS

Calculating the discount rate followed the same procedure as for venture A, however the input data was somewhat different as Venture C is in the materials sector.

Summary of Numbers	
Average Beta	1,091
Average D/E-ratio	0,97
Tax rate	28 %
Unlevered beta	0,644
Market risk premium	5 %
Risk free rate	4,09 %
Required rate	**7,31 %**

$$\text{Unlevered Beta} = \frac{1{,}091}{1+ (1\text{-}0{,}28)*0{,}97} = 0{,}644$$

$$\text{Required rate} = 4{,}09\% + 0{,}644 * 5\% = 7{,}31\ \%$$

TABLE 18 - VENTURE C- SUMMARY OF NUMBERS FOR DISCOUNT RATE CALCULATION

The value of venture C is calculated as the sum of the discounted future cash flows.

$$Venture\ C\ value = \sum_{I=1}^{N} \frac{CF_i}{(1{,}0731)^i} = \$US\ 6{,}124\ million$$

6.4. RESULTS AND LESSONS LEARNED FROM THE CASE STUDY

For the three case ventures there exists reference values that can be used to assess the outcome of the framework. Even though our framework does not attempt to estimate the values set by investors or acquisitionists the differences highlight some interesting aspects. It should be emphasized that these aspects

are based on three cases, and that the results must be threated accordingly. There might exist other impacting aspects not revealed by the case studies. The results from the cases, as well as reference values are presented in Table 19 below.

Case	Calculated value	Reference value from actual venture transaction	Type of reference value
Venture A	NOK 42,3 million	NOK 20 million (2010)	Transaction value from when an established firm acquired the venture
Venture B	NOK 89,9 million	NOK 104 million (2007)	Valuation by investor at point of time for investment
Venture C	UD 6,214 million	USD 2 million (2007)	Investment by angel investor some months prior to valuation

TABLE 19 - RESULTS FROM CASE STUDY

An interesting difference between the three cases is that the framework for venture A and C estimate a higher value than the references and for Venture B vice versa. This discrepancy can have several reasons, one of them being the case-venture's **different stage of development**. While Venture A at time of valuation had not sold a single product and Venture C had only done pilot projects outside targeted market, Venture B had already had multiple products on the market and had obtained sales. It is our opinion that the milestones described in section 3.3 affect the value an investor would pay to a large extent. All ventures had verified their technology, however the product acceptance of ventures A and C's products were still unknown, both as a concept and as an individual product. The use of the framework does not take this difference in uncertainty into account, and hence the results will deviate from the reference valuations. The buyers in the transaction probably used the uncertainty connected to the product acceptance to lower the price during the bargaining. For venture B the product acceptance was already established both as a concept and for the actual product of the venture.

When performing a success criteria analysis of Venture B, the success criteria related to the **products** received low scores. This was one of the main contributing factors to the reductions in the cash flow scenarios. Follow-up interviews with the VC who invested in the venture revealed that the product also had been a problem in real life (Interview 8.03.2011). This is an interesting aspect that contributes to verifying the validity of the principle behind the framework, that venture value can be assessed based on indicators of venture performance.

After the time of valuation Venture B was severely impacted by the worldwide economic downturn in 2008. This led to a fall in the market for the venture's product. Due to this the venture did not obtain the sales that were projected in the adjusted cash flow scenario, and the investors who invested in 2007 also had to exit at a loss. Venture C also experienced a similar effect of the economic downturn. Their targeted market was heavily exposed to the condition of the general economy. When the market plummeted so did the sales of Venture C, and eventually they put the entire venture on hold. These two cases show that the framework does not account for such large shifts in the economy, and that the exposure to **macro factors** in general can be questioned. This should be considered a weakness of the framework, however it is important to remember that few economists managed to foresee the economic downturn. Creating a framework that manages to foresee such events is therefore challenging to say the least.

Using the framework was mostly a straightforward task that was carried out without problems, however there were some difficulties along the way. For some of the success criteria, especially those concerning the entrepreneur's personality and the social interaction within the team, it was challenging to obtain good results given the **data available**, however we argue that the potential users of the framework will have access to more information regarding the venture than we had. Of the steps in the framework it was the adjustment of the best-case cash flows that posed the biggest challenge. A lot of time was devoted to understanding the business models and target market of the case-ventures and it is assumed that this task will be easier for someone with greater insight into the relevant markets and the venture itself.

The case-study also revealed some challenges related to the methodology presented in step 4 of the framework. The calculation made us aware of several challenges and weaknesses of the model. First it became apparent that for some industry sectors there are **few listed companies** to base the sector average beta on, thereby making it very sensitive on the incumbents in the sector. This aspect will be present in all small markets, however it will diminish if the venture in focus is in an industry with a larger public market. A possible approach to accommodate this weakness is to include surrounding markets in addition to the home market of the venture. In our case one could calculate the beta based on consumer discretionary firms in the total Nordic stock market instead of just the Norwegian. New ventures often seek capital from international sources (Madhavan and Iriyama 2009) and it is therefore possible that they might go public in other markets than the national one. Using this approach will likely give a less sensitive beta while still being theoretically correct and realistic.

We also noticed that the operations of the listed firms within a sector could vary a lot, and that there in some cases will be large variations between the

operations of the venture one is valuating and the incumbents in the target sector. In our case the listed firms in on of the sectors span furniture, media, housing, leisure, automotive parts and consumer electronics retail, while the case venture in question was within childcare products. This might be a source of misrepresentation in the calculations, however it will diminish as the sectors become larger.

Another weakness highlighted by the case study is that the calculation of the discount rate is based on ventures **targeted for public stock markets**. Especially in small markets (such as the Norwegian) some new ventures do not aim to be listed publicly on a stock exchange. Several ventures aim to stay privately held through backing from private equity and ownership funds, or aim to be bought by existing private companies. It is possible that the private companies don't react the same way to changes in the market as the listed companies and that thereby a discount rate reflecting market behaviour might give misrepresenting results.

6.5. WEAKNESSES REGARDING MODEL AND STUDIES

The framework presented in this report has some known and some potential weaknesses and is to a certain extent prone to different biases. Different aspects, some that are results of the theory and empirical basis used and some that are result of the choices made when modelling the framework cause the weaknesses. The following section addresses both type of weaknesses.

The weaknesses related to the model are all factors of the choices made when modelling, as well as the premises that the framework was based on. These are factors that can be accounted for by extending the model, however such work is left for further research. The implications of the weaknesses are that there are aspects of the new venture that it will not be possible to model, such as the flexibility of future strategic options, or the risks connected to changes in the macro-economy. The aspects that are not included are all results of trade-offs made towards level of applicability and complexity in the framework.

Area	Weakness	Reason
Model	Lack of flexibility and dynamics	The model does not account for flexibility and dynamics.
Model	Does not take macro factors into account	Large economic changes is not taken into account. Whether this is possible to model in a practical way is left for economists to handle.
Model	Prediction over long time	As we do not want to estimate a terminal value, the investment horizon is kept long.

TABLE 20 – WEAKNESSES REGARDING THE MODEL

There are also weaknesses with the framework that are caused by the theory and the empirical basis the framework is founded on. The impactions of these weaknesses are harder to assess since their impact is hard to verify. They are however aspects that could be addressed, if further work with the framework shows deviating and insufficient results.

Area	Weakness	Reason
Study	Success criteria from different studies	The success criteria used in the model is collected from several different studies. This is itself a weakness. Further, each study has weaknesses related to it, such as causality etc.
Financial theory	Pragmatic approach to cost of equity	With the financial models that currently exist one has to be pragmatic if one is to avoid severe limitations and complexity in the framework.
Modelling of empirical findings	Operationalisation of success criteria	The operationalisation of the success criteria is an aggregation of several empirical works and some pragmatism had to be applied in the process. It is a potential weakness that we cannot be certain if the questions we ask in the success criteria analysis assess the factors we want to address.

TABLE 21 – WEAKNESSES REGARDING THE STUDY

6.6. AN ALTERNATIVE VALUATION MEHTOD - USING MULTIPLES

This intent of this section is to highlight that success criteria analysis also can be used together with other financial valuation methods. As highlighted by Dittmann Maug et al. (2004) multiples is one of the most common new venture valuation methods used in the industry (Dittmann et al. 2004) and we therefore present an example of how this method can be combined with success criteria analysis.

Valuation by multiples method is flexible with a vast selection of different multiples, some of them to a certain extent applicable in a venture setting. Using multiples is an implicit method where the required knowledge about the company is limited, thereby being an option if using an explicit method proves too difficult. The method has its advantages in being easy and quick to apply, and is also very scalable, so that one can easily compare transactions relative to each other. But the method also has some weaknesses. Perhaps the most important one lies in the nature of the method; the pragmatic comparing of different ventures and the effects of this, as the firms one compare might have radical differences that are not ultimately displayed without a more thorough investigation. As mentioned in chapter 2 the valuation of ventures in financing

and buy-out situations are subject to bargaining, and therefore caution must be made when using such references as comparable prices. Further it is not given that one has any relevant venture to compare with. Due to this the valuation using multiples will not be an objective reference-value, but rather what could be the outcome of such a bargaining process.

Since the use of multiples does not take the intrinsic aspects of the venture into account the method has a clear potential to prosper if combined with a success criteria analysis. The following procedure is suggested:

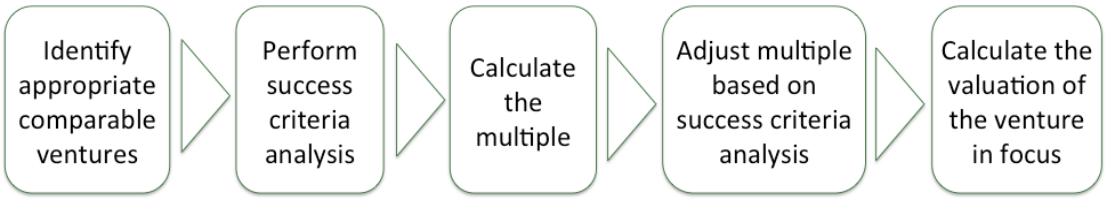


FIGURE 15 – PROCEDURE USING MULTIPLES

For new ventures the availability of financial information is scarce, and often they do not achieve profits for many years. This limits the availability of multiples, and in some instances also the availability of comparable ventures. The EV/Sales-multiple is perhaps the most applicable in the venture setting, however its use is limited to ventures with considerable sales, or using estimates for future sales. Although there exists multiples partially using non-financial data (such as sales/head), these are considered to take little account for the intrinsic aspects of a venture. The most relevant multiples in a venture setting are therefore probably the price/sales or enterprise value/sales which is accordance with the findings of Dittmann et al. (Dittmann et al. 2004).

6.6.1.1. IDENTIFYING APPROPRIATE COMPARABLE VENTURES

In order to make use of a multiple-approach, the ventures forming the basis of the multiple in use must be comparable to the venture in focus. This implies that the ventures used to calculate the multiple should be in more or less the same industry and stage and have the same business model as the venture one is valuating. The choice of multiple implies what data must be collected from the comparable ventures. Information about the comparable ventures price must also be available. Due to the market the ventures are traded in this can be a difficult task because the transaction details are seldom publicly known, however a venture capital firm we were in contact with indicated that they had a good overview of the transactions in the market (Interview 8.03.2011).

6.6.1.2. PERFORMING SUCCESS CRITERIA ANALYSIS

The next step in the suggested approach is to perform a success criteria analysis for both the companies used to calculate the multiples as well as the venture in focus.

6.6.1.3. CALCULATING THE MULTIPLE FOR THE SUCCESS CRITERIA

The desired multiple(s) should then be calculated based on the comparable ventures. Using several ventures in the calculation of multiples increases the confidence of the multiple, and reduces the exposure to risk associated with single ventures.

6.6.1.4. ADJUSTING THE MULTIPLE

The next step is to adjust the multiple based on the different ventures scores in the success criteria analysis. There are several possible ways of doing this. Although it has not been tested, there could exist explicit ratios between the scores on the success criteria analysis and the adjustment of the multiples. Another option is to perform a qualitative adjustment of the multiples, assessing the characteristics of the venture versus the inherent factors of the multiple. A third viable option is to calculate the individual multiple of (at least) two different ventures, and using these as well as the scores on the success criteria to interpolate (or even extrapolate) between the multiples (as shown in Figure 16 - Suggested valuation with framework including multiples below).

6.6.1.5. FINAL CALCIULATIONS

After the multiple is adjusted according to the success criteria the valuation of the venture in focus should be calculated.

	Sales MNOK	Success criteria score	Transaction reference value MNOK	Transaction Reference Value/Sales	Adjusted multiple	Estimated price MNOK
Comparable Venture 1	20	28	50	2,5	-	-
Comparable Venture 2	10	22	18	1,8	-	-
Venture in focus	20	25	-	-	2,15	43

$$Adjusted\ multiple: \frac{28-22}{28-25} = \frac{2{,}5-1{,}8}{2{,}5-x} \Rightarrow x = 2{,}15$$

FIGURE 16 - SUGGESTED VALUATION WITH FRAMEWORK INCLUDING MULTIPLES

The figure shows one possible way of adjusting the multiple based on success criteria analysis and financial information from two comparable ventures, as well as the estimated transaction value for the venture in focus. The multiple approach suggested in this section has been included as an example of other possible ways to utilise success criteria analysis in a valuation setting. It has not

been tested empirically or through case studies, however if the approach is found interesting it is a possible direction for future research.

7. APPENDIX

7.1. PRELIMINARY VERIFICATION OF PERFORMANCE INDICATORS

As the success criteria analysis is based on collected criteria from several different surveys, thereby spanning several different samples, there is some uncertainty connected to its ability to predict success. To get an initial predication of the validity of the success criteria a preliminary empirical investigation was conducted.

7.1.1. PROCEDURE AND SAMPLE

Obtaining data to perform the test was challenging, and time and effort was devoted to finding and getting access to data sources containing coded data regarding the different variables, however without any satisfactory results. Conducting a survey was considered, however given the aspects of the data needed (with regards to sensitivity, accessibility of respondents, longitudinallity and concern of respondent bias) this form of data collection was abandoned. The resort was to code the data ourselves, based on access to 20 business plans from a database of new technology-based venture business plans located at the NTNU Entrepreneurship Centre. 10 ventures that failed and 10 ventures that succeeded were selected, however if a venture had failed or not was disclosed after the data was coded to avoid bias. The database contained business plans for technology start-ups that had taken part in the Take-Of commercialisation programme. The business plans spanned the last 6-12 years and to find out how the ventures had performed, follow-up data from the year of the business plan until today was collected from the Brønnøysund Register Centre (The Norwegian Business Registry).

To test whether the success criteria could actually predict success, an analysis was conducted for each venture in the sample. To code the data the following procedure was conducted for each venture. Within each category *("entrepreneur", "industry structure", "business strategy", "resources", "organisational structure, processes and systems" and "product")* several questions were answered to assess the success criteria. The questions were based on the factors within each success criteria, which are listed in Table 3 above. For each factor the venture was given a score on a scale from 1-7 (where 7 was the highest score). Each factor within a category was assigned equal weight since the internal weighting between the success criteria was not known. The average score in each category was then calculated. Finally the average scores from the six categories where summed up resulting in a final score for

each venture. Based on this average scores for successful ventures and average scores for failed ventures were calculated. The results can be found in Table 22 below. A venture was labelled as a success if it was still operating or had been acquired by another firm. The ventures that went bankrupt or where there was no or little activity were labelled as failures.

7.1.2. RESULTS

Successes: N=10, Failures: N=9	Score
Average score successful ventures	23,72
Average score failed ventures	20,52
Standard deviation successful ventures	1,94
Standard deviation failed ventures	2,72
Mean difference	3,2

TABLE 22 - RESULTS FROM EMPIRICAL STUDY. (ONE VENTURE WAS VIEWED AS AN EXTREME CASE AND WAS REMOVED

The mean difference between successful and failed venture is 3.2. Levene's test indicates that the two groups have equal variance (Sig >0,05) and the Sig. (2-tailed) is 0.009 indicating that there is less than 1% chance that the mean difference is random. These results indicate that the success criteria analysis has an ability to predict success. This is an interesting result since it verifies that the concept of a success criteria analysis based on Chrisman et al's (Chrisman et al. 1998) model expanded to include product, and operationalised through empirical investigations, has an ability to predict success. However there are some implications. Firstly it does not verify the isolated elements of the model. Secondly, the standard deviation of the successful ventures is lower than for the unsuccessful ventures, indicating that there is more variation in the scores among the unsuccessful ventures, implying that a low score is a better indication of a possible failure than a high score is of possible success. A closer look at the failures reveals that the ventures that went bankrupt in average scores lower than the ones who were put on hold, giving an indication that the performance model also can predict different degrees of failure.

The limited sample combined with a relatively large number of variables reduces the possibility of finding further statistically significant results and therefore the investigation is to be considered as preliminary. We acknowledge this as a weakness with regards to our results, however based on the accumulated findings we argue that a further empirical examination of the performance criteria should be conducted, and that a preliminary verification of the validity of the performance model is obtained.

7.2. CASE STUDIES

To test the framework in a setting realistically replicating an actual valuation, a case study was performed. The aim of a case study in general is to *"provide an*

analysis of the context and processes which illuminate the theoretical issues being studied" (Cassell and Symon 2004). Further a case-study is argued to be flexible, especially when addressing areas of planned and emergent theory (Cassell and Symon 2004; Robson 2002) and case studies are preferred when questions of "how" and "why" should be answered (Yin and Campbell 1994). In our case wee seek to answer the questions.

1. How does the obtained valuations compare to reference values?
2. How does combining finance and venture literature contribute in the valuation process
3. How does the valuation framework perform from a practical standpoint?
4. Has the goal of creating a framework that "objectively" measures value been reached?

According to Yin (2009) there are six main sources of evidence for a case study (Yin 2009). This research utilises documentation, interviews and archival records, which are three of the sources argued by Yin (2009).

7.2.1. PROCEDURE AND SAMPLE

Three new technology-based ventures were selected for the case study. The sources of information used were the business plans of the ventures, as well as public information on the Internet. All three ventures were assessed based on business plans from 2007. As with the empirical test of the success criteria, the success criteria analyses were conducted without knowing the later history of the ventures. When generating and adjusting the best-case cash flow scenarios, we strived to use what we imagined were the market-outlooks in 2007. Helping us doing this where the descriptions of the markets in the business plans, and it is our opinion that the scenarios were not to a large extent influenced by our knowledge of what happened with the markets and ventures after the time of valuation.

Case	Description	Data sources	Actual performance	Note
Venture A	Accessories to a consumer discretionary product	Business plan and official registers.	Acquired by a producer of the consumer discretionary product	The entrepreneurs considered the sale as a success. The venture was largely funded by government grants and loans
Venture B	Accessories to a consumer discretionary	Interview with venture fund manager and	Still in operation and in a worldwide market,	From the investments funds point of view this venture was a

	product	investment plan	however with new owners.	failure as an investment and the venture was sold for a symbolic amount.
Venture C	High-tech building material	Business plan and official registers.	Activity has been reduced gravely the previous years, however the firm still exists	Worldwide economic downturn had an severe impact on building activity, thereby sales plummeted.

TABLE 23 - INFORMATION AND RESULTS FROM CASE ANALYSIS

The value of each venture was calculated following the steps described in section 3. The cash flow scenarios were calculated based on data from the business plans and other public sources. The questions in the success criteria analysis were answered based on the business plans, and questions where data was not available were omitted. The discount rate was calculated based on historical financial data available online (Bloomberg 2011). The values obtained in the case-study are calculated at the point in time where the data was initially collected. This gave us the possibility to compare the values we estimated with the venture's actual future development.

7.3. INTERVIEWS

Interview 2.02.2011 – Head of regional technology transfer office

Interview 11.02.2011 – Responsible for Norwegian research program on new technology based ventures

Interview 8.03.2011 – Partner in European Venture capital firm

Interview 18.03.2011 - Managing partner and associate in venture consulting firm

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