Master Thesis

Startup Ecosystems and Venture Capital

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Abstract

Die vergangen Jahre haben im Speziellen gezeigt, dass ein hohes Maß an unternehmerischer Aktivität und die Gründung von High-Growth-Ventures (Startups) im globalen Kontext, aber vor allem sehr konzentriert auf geographisch stark eingeschränkte Gebiete sowohl regional wie auch global großen Wert und Wohlstand erzeugt.

Dieser große Erfolg ist unter anderem darauf zurückzuführen, dass sich um die erfolgreichen Unternehmen ein starkes Unterstützungsnetzwerk aufgebaut hat, welches wertvollen Nährboden für unternehmerischen Erfolg schafft. Solch ein Netzwerk wird häufig als unternehmerisches Ökosystem (oder Startup-Ökosystem) bezeichnet. Diese Ökosysteme bietet Gründern und Unternehmen Infrastruktur, Ressourcen und Unterstützen auf einer Vielzahl von Ebenen and und tragen so maßgeblich zu deren Erfolg bei.

Bei der Betrachtung und Analyse erfolgreicher existierender Ökosysteme fällt speziell auf, das sich jedes dieser organisch entwickelt hat und deshalb grundsätzliche Eigenheiten verschiedenster Art aufweisen. Trotz dieser Einzigartigkeit ist es von großem Wert, solche Systeme zu modellieren und ein grundsätzliches Verständnis für deren Strukturen und internen Prozesse sowie Dynamiken zu erlangen.

Im Speziellen sind diese Modelle und Erkenntnisse essentiell, um die Replikation und Förderung solcher Ökosysteme weltweit voran zu treiben. Dieses Wissen kann angewendet werden, um entsprechende Komponenten in gewissen Phasen der Entwicklung gezielt zu fördern sowie Probleme und Bedürfnisse des Ökosystems effektiv zu adressieren. Da die Bestrebungen vieler Staaten und Regionen dahin gehen, ein möglichst ideales Umfeld für die Gründung und das Wachstum von Startups zu schaffen, muss diesen Initiativen fundiertes Verständnis der entsprechenden Systeme zu Grunde liegen.

Diese Arbeit behandelt verschiedene Modelle, um genau diese Systeme sowie deren interne Strukturen und Prozesse sowie Eigenschaften und Dynamiken abbilden und beschreiben zu können. Sie stellt daher verschiedene Ansätze gegenüber, und vergleicht diese im Kontext von erfolgreichen realen Ökosystemen und deren Entwicklung.

Weiters stellt diese Arbeit ein neuartiges Modell vor, um die Struktur und Entwicklung von Startup Ökosystemen vor allem in frühen Phasen zu beschreiben und zu verstehen: Das Startup Ecosystem Lifecycle Model (SESLCM). Das SESLCM führt ein neuartiges Modell ein, um die Struktur des Ökosystems zu beschreiben, welches sich primär auf Verbindungen von Komponenten des Ökosystems untereinander in verschiedenen Arten konzentriert. Basierend auf diesem primären Kriterium der internen Netzwerkstruktur, teilt das Modell die zeitliche Entwicklung eines Ökosystems in diskrete Phasen ein und beschreibt diese qualitativ. Das vorgestellte System wird aus verschiedenen Blickwinkeln analysiert und anhand von Case-Studies bestehender Ökosysteme validiert.

Abschließend fokussiert sich diese Arbeit auf zwei essentielle und sehr einflussreiche Komponenten von Startup Ökosystemen: Venture Capital und Startup Accelerators. Dabei beschreibt sie im Detail, wie diese Komponenten funktionieren, wie sie aufgebaut sind, welche Ziele sie verfolgen

und vor allem wie sie sich auf das Ökosystem in das sie eingebettet sind auf verschiedenen Ebenen auswirken und dieses beeinflussen.

Abstract

The past two decades have shown that very high entrepreneurial activity and the creation of high growth ventures (startups) globally, but especially very concentrated in limited regional areas has created a very high level of economic wealth for these regions and the global economy. This success is mainly caused by the fact that an intense support system around these ventures has emerged, which creates a great environment for entrepreneurial activity and success. These environments are commonly referred to as entrepreneurial ecosystems (or startup ecosystems) and offer infrastructure and support for entrepreneurs and other stake holder on various levels.

When looking at successful existing ecosystems, it becomes very clear that most of them have emerged very organically and each and every one of them is very unique in many different aspects. Nevertheless, it is of great value to find ways to model and analyse these ecosystems and develop an understanding of it's structures and internal processes and dynamics.

Besides other motivations, this is highly interesting in the context of fostering the creation and fast replication of such entrepreneurial ecosystems around the globe. A good understanding of how entrepreneurial ecosystems work and how they develop is critical in the creation of new ecosystems and the acceleration of their growth as particular needs and problems can be addressed along the way. As many countries, regions and societies shift their efforts towards creating great conditions for the creation and growth of startups, this knowledge and understanding must form the key basis for any initiative of that kind.

This thesis addresses different models for understanding the structure and processes within startup ecosystems and deals with their specific dynamics and characteristics. It therefore describes various different models for startup ecosystems and different characteristics and compares them in the context of cases of successful ecosystems.

Further this thesis introduces a new model to describe the structure and development of startup ecosystems focused on early stages. This system, the Startup Ecosystem Lifecycle Model (SESLCM), introduces a new structural model for startup ecosystems when primarily focusing on the network structure (connections) of components in the ecosystem in different forms as main trajectory for success. Based on this criteria, the model proposes a classification of the development of startup ecosystems into five stages as well as characteristics for each of those stages. The proposed model is further validated against cases studies picturing the development of existing startup ecosystems.

Finally, the thesis focuses on two of the most influential elements of a startup ecosystem: venture capital and startup accelerator programs. It explains in-depth how these elements work, what their internal structures and processes are and what effects and implications they have on their surrounding ecosystems.

Contents

Figures

Tables

Abbreviations

PDM	Product Development Model
CDM	Costumer Development Model
USP	Unique Selling Proposition
MVP	Minimum Viable Product
VC	Venture Capitalist or Venture Capital Fund
ROI	Return On Investment
LP	Limited Partner
PC	Portfolio Company
SES	Startup Ecosystem
SESLCM	Startup Ecosystem Lifecycle Model
M and A	Merger and Acquisitions
VC	Venture Capital
BA	Business Angel
LOI	Letter of Intend
B2C	Business to Customer
B2B	Business to Business
OLC	On Layer Connections in SESLCM
ILC	Inter Layer Connection in SESLCM
GDP	Gross Domestic Product

1 Motivation and Basic Definitions

1.1 Motivation

Entrepreneurial spirit and a high number of high-quality entrepreneurs founding innovative and disruptive companies across different industries and verticals is widely considered the trajectory that first world economies need to align their efforts to. In startup hotspots, a majority of jobs and economic wealth is created by entrepreneurs founding and scaling up ventures growing at a tremendous pace and becoming world leaders in their fields (or creating new markets) in an extremely short period of time.

As we see the global number of startups rise significantly, it can be seen that very successful companies tend to come out of same geographic regions sharing many common connections and networks. We can clearly see, that certain geographic areas tend to form very good substrates of circumstances in many dimensions for companies to be created and grow. In such areas, we can observe a system of high interaction between a number of very diverse individuals and institutions complementing, challenging and supporting each other in different ways and therefore providing great circumstances for founders and young high-growth ventures. Such geographic areas and systems are commonly viewed as startup ecosystems (SES), where different components intensively interact with each other in various ways. As creating great circumstances for startups to be founded and grow becomes of utter importance to countries around the globe, understanding and replicating these ecosystems becomes essential in these efforts.

This thesis deals with exactly this ecosystem view of this local phenomenon, discusses different models of how it can be viewed and describes and extracts different general characteristics of SES based on different models and perspectives. Further, this thesis introduces a new structural model for startup ecosystems, which specifically focuses on the interconnection between different SES-components as a primary measure for activity and progress of the ecosystem. In contrast to existing ones, the introduced model tries to put the current state of a SES in strong chronological perspective and tries to give hints on the future development of certain components or the whole ecosystem. The thesis puts a specific focus on two very interesting components of a SES, startup accelerators and venture capital companies. These components and their influential factors are covered in-depth in order to give a good idea about their functionality and great impact on any SES.

1.2 Definitions

This section briefly defines some of the basic terms and concepts used throughout this thesis and declares some vital distinctions required to understand facts and coherences related to topics covered in this thesis. It has to be noted that specific definitions are made within relevant chapters throughout this thesis. A few required general definitions are made here.

1.2.1 Entrepreneurship

An obviously important definition to be made is entrepreneurship itself. This thesis will define certain aspects of entrepreneurship, when basing all of this on the following very simple and general definition: Entrepreneurship is the process of designing, launching and running a new business which involves innovation in the form of new products, new production methods, new markets or new organisational forms. [Schumpeter, 1947] [Yetisen et al., 2015]

1.2.2 Startup - Small Companies vs. High-Growth Ventures

Of special importance in the context of a startup definition is the distinction between small businesses and high-growth ventures (so called startups). While traditional businesses are very incremental, profitable, growing at a fairly low pace and mainly oriented towards providing wealth to it's owners, high growth ventures aim towards extremely high growth rates and becoming a leader and globally relevant player in their specific market as soon as possible. This brings great requirements to (mainly) the scalability of a certain product or service. Even though both of these type of businesses are very important, they are different things and differentiate greatly in terms of development process and approach. The differences between these two types of companies can be summarised in the following four aspects [Schumpeter, 1947]:

- **Amount of wealth creation**: Instead of the substitution of an income stream in a traditional employment situation (small business), high growth ventures seek a very high level of wealth creation (several millions of dollars in annual profit or more).

- **Speed of wealth creation**: In contrast to traditional businesses, high-growth ventures create a very high level of wealth in a very short amount of time.

- **Risk**: In contrast to small businesses, high-growth ventures are tightly are related to a very high level of risk of the venture on many dimensions.

- **Innovation**: High-growth are commonly related to very profound and disruptive innovation

of different kinds.

In this thesis, the term *startup* will be used as a synonym for high-growth ventures.

1.3 Outline

Firstly, this thesis will cover the central topic of startup ecosystems, their structure as well as essential characteristics. Further, the here proposes *Startup-Ecosystem Lifecycle-Model* (SESLCM) is introduced and it's structure, underlying ideas and principles as well as limitations and consequences are discussed in detail.

Secondly, the thesis will cover two very interesting elements of a startup ecosystem, venture capital and startup accelerators, in detail. This part covers those components in detail and covers their history, internal functionality as well as their impact on existing and future entrepreneurial ecosystems.

2 Startup Ecosystems

2.1 Introduction

As the idea of high growth ventures as driver of innovation, disruption and new technological developments started to spread across the globe, people started realising that the frameworks allowing the creation of successful companies were a very local phenomenon. Based on the example of great entrepreneurial successes in areas around the world, it became clear that certain circumstances and conditions need to be given locally so that startups can form and succeed. An approach for describing this phenomenon is by viewing the framework around startup companies as an ecosystem of components interacting with each other. This chapter deals with different models of describing such an ecosystem, it's behaviour and ways to rate, classify and compare them. This is done focusing on three major aspects of such ecosystems: their structure, their development and their overall characteristics.

Furthermore, the chapter introduces a new approach of viewing the structure and processes inside such an ecosystem. This view heavily focuses on the structure in terms of the ecosystem network and it's development over time. The model aims to provide a model for understanding the structure of startup ecosystems and classifying it's developments based on this internal criteria.

2.2 Structure of a Startup Ecosystem (SES)

Every startup ecosystem is unique and results from the combination of many different parts and influential factors, there are important common components which can be observed in any of them. These components fulfil different important roles and interact and influence each other in a very active way. Due to the complexity of a startup ecosystem, there exists no unique model of how to describe it. This chapter aims towards giving an overview over models to describe these ecosystems as well as describing important common components and their roles.

2.2.1 Overview over SES-Models

Various organisations and institutions describe models for entrepreneurial ecosystems with varying elements. The models described below are mainly used to understand and measure the performance or development status of startup ecosystems . Table 1 gives an overview over the components explicitly or implicitly covered by some of those models. The following will briefly describe each of the models and their characteristics.

a) **Babson College - The Babson Entrepreneurship Ecosystem Project** (BEEP): The BEEP model is based on the basic observation, that in locations where entrepreneurship occurs in a very self-sustaining and recurring way, a certain ecosystem has established. Such a system is defined by many different components and factors, which this approach models as six interacting domains. [Isenberg, 2011]

a) **Council of Competitiveness (CoC) - Asset Mapping Road map**: The CoC model is based on a comprehensive mapping of assets present in a regional ecosystem. Therefore, it aims toward discovering essential resources and listing their importance and influence factors as well as impact on one another. The framework pays special attention to the elements networks and culture as inputs to a so called *Regional Innovation Environment* (among the other mapped assets) producing innovation, productivity and prosperity as its output. [Kempner and Levine, 2007]

a) **George Mason University - Global Entrepreneurship and Development Index**: The components of a startup ecosystem are measured and described using 14 pillars, formed by institutional measures in the categories attitudes, abilities and aspirations. Each of those measures is based on widely used relevant data from institutions such as UNESCO, International Telecommunication Union (ITU) or the World Bank. [Autio, 2015]

a) **Koltai and Company** - Six + Six Model: The Six + Six model aims to qualitatively and quantitatively discover strengths and weaknesses of a startup ecosystem. It models the ecosystem as six fundamental actions as well as the six participants of the system performing them. [ORBIS International, 2014]

a) **OECD - Entrepreneurship measurement framework**: Rather than taking a purely structural approach, this framework models an entrepreneurial ecosystem as factors supporting or impeding entrepreneurship (*determinants*), indicators for the current state of entrepreneurship (*entrepreneurial performance*) and results form the entrepreneurial process (*impact*). So *determinants* are the key factors influencing *entrepreneurial performance. Entrepreneurial performance* represents indicators for activity believed to affect defined objectives in a positive or negative way. The model lists a comprehensive set of elements in those three categories and defines indicators for measurement. What is exceptional about this model, is that *entrepreneur-*

ship itself, is not defined in relation to new businesses or ventures. Rather than that, it defines entrepreneurial activity as:

> [...] the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets [Entrepreneurship, 2008].

Therefore the defined model applies to new ventures and existing (potentially large) businesses the same. [Entrepreneurship, 2008]

a) **World Economic Forum** (WEF): The WEF defines an entrepreneurial ecosystem as relying on the eight pillars: *Accessible Markets*, *Human Capital*, *Funding and Finance*, *Support Systems*, *Education and Training*, *Major Universities* and *Cultural Support*. In the WEF research, this model is used to describe, measure and compare startup ecosystems globally by identifying developed pillars as well as which ones entrepreneur perceive as most important. [World Economic Forum, 2014]

Domain	BEEB	CoC	GEDI	Rainf.	6+6	OECD	Doing B.	WEF
Policy	x	x	x		x	x	x	x
Finance	x	x	x	x		x		x
Infrastructure	x	x				x	x	x
Markets	x		x			x		x
Human Capital	x	x	x	x	x	x		x
Support/Services	x	x	x		x	x		x
Culture	x	x	x	x	x	x		x
R & D/Innovation	x	x	x	x		x		x
Quality of Life		x						
Macroeconomic Conditions						x		

Table 1: Overview of various different models of startup ecosystems and components they cover. Adapted from [Ande, 2013]

2.2.2 Six Domains of a Startup Ecosystem

This thesis mainly facilitates the model published by the *Babson Entrepreneurship Ecosystem Project* to describe the structure and components of an SES, when using definitions from different models [Isenberg, 2011]. Isenberg describes, that each entrepreneurial ecosystem is defined by hundreds of factors, where most of them can be categorised in one of 6 domains. Figure 1 illustrates these domains and some of the contained factors.

This model was chosen since it covers most components commonly used and excludes external factors such as *Quality of Life* or *Macroeconomic Conditions*. Even though these factors clearly influence a SES in certain forms (e.g. it might be hard to raise money in a recession), it was decided
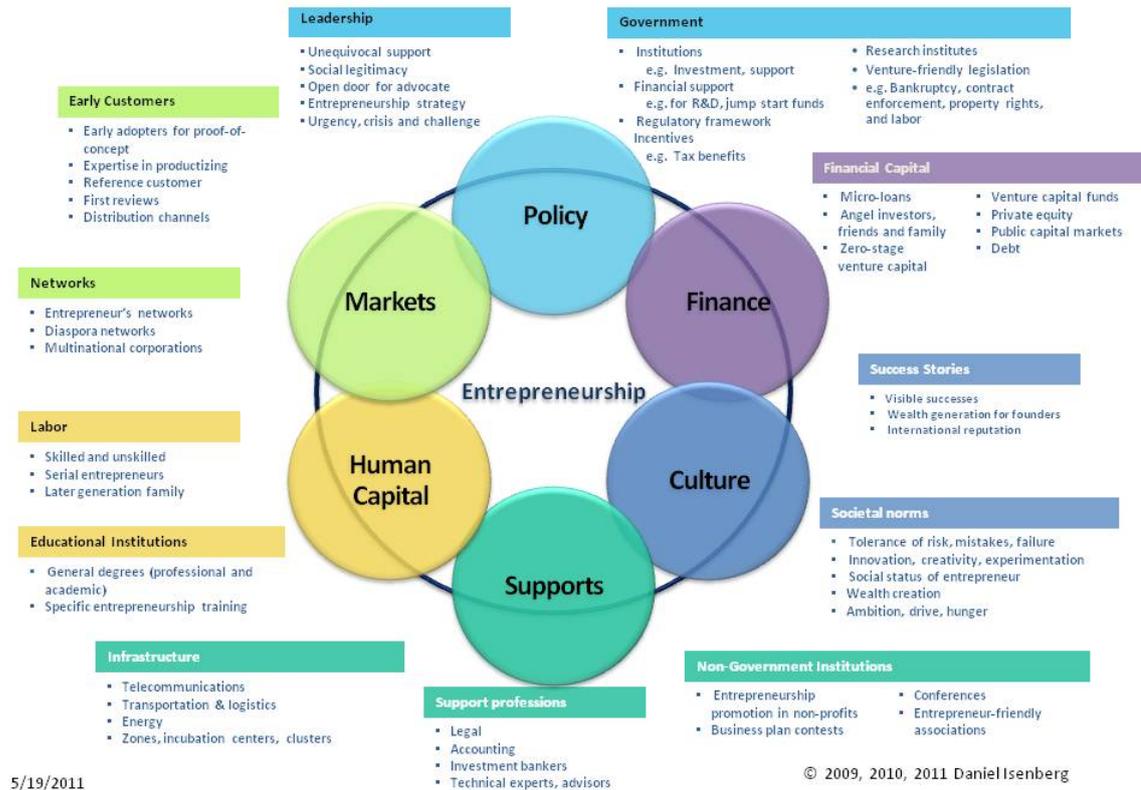
Figure 1: The 6 domains in the entrepreneurship ecosystem as defined by Isenberg. [Isenberg, 2011]

to focus on the SES itself. It has to be mentioned that a SES naturally depends on a indefinite number of external factors. Therefore, a line has to be drawn, which in this thesis was done by excluding those two factors.

The following describes each of the domains of this model, which components can be contained and gives specific examples for such components [Isenberg, 2011]:

a) **Culture:** Culture state a major component of SES. On one hand, this is defined by success-stories of founders, who started businesses and either had an exit or have been able to grow the company to significant global size. These stories provide the community with role models for entrepreneurial success and prove the feasibility of creating a successful venture within the ecosystem. On the other hand, it is defined by societal norms forming the base for entrepreneurial activity and practices. These norms are defined by characteristics as the societies perception and status of entrepreneurs, the tolerance of taking high risks and experimenting as well as the important element of failure in the culture. Not only entrepreneurs, but the whole society must understand the necessity of taking risks, failing and learning in order to create

great wealth for individuals and the society itself. The society and it's norms must accept and encourage innovation and believe in the wealth and good it can create.

As an example, positive culture regarding failure encouraging the moral principle of failing as a step in the learning process is key to success of entrepreneurs.

b) **Human Capital:** Since startups are driven by innovation and change, the human capital required to establish this is an essential component of a startup ecosystem. The challenges in starting and running a startup are very diverse, which is greatly reflected in the spectrum of requirements to the resource human capital. Firstly an ecosystem requires highly talented and (formally or informally) educated founders and employees to drive innovation and create successful businesses. In addition, great practical expertise and experience in running and growing those companies is essential. This expertise can come from mentors, serial entrepreneurs and early employees and executives of other or previously established companies. Since many of the above mentioned skills require profound education, educational institutions form a vital component to provide the resource human capital and the gain and preserve subject specific and entrepreneurial knowledge.

As an example, it is extremely important for growth stage startups to find and hire experience executive leading fast and profound transformation in that time. Therefore the availability of this resource plays an important role in the success of the ecosystem.

c) **Markets:** The presence of two different types of markets is of significant relevance for the success of startups. Firstly, an early adopter market ensures important first testers, users and customers for startups. The availability of a market open to innovation and disrupting products and services ensures to be able to test products, features and assumptions about markets very fast and let's startups develop, learn and move at the required pace. Secondly, an addressable market of large and international customers with global networks is essential for growing and scaling businesses and find paying customers on a global level. Only the combination of both markets allows for the agile creation and development of highly innovative products and services with the possibility to scale massively and form future global businesses.

As an example, it is crucial for any early stage B2B (Business to Business) startup to find reference customers and implementations in order to build up required reputation. The availability and willingness of businesses to take this role represents the described ecosystem characteristic here.

d) **Policy:** Legal and political policies and framework form the basic for economical activity. These regulations highly affect new and existing ventures and have high impact on the potential success of new businesses. Governmental policies include federal research programs, public funding programs as well as tax and legal regulations. Besides this regulatory policies, basic principles on one of the most important factors for entrepreneurial success are included in

this component: leadership. For an ecosystem, this defines the presence of a certain mind and skill-set as well as a certain level of education regarding leadership.

For example, at an early stage of a startup, legal circumstances allowing fast, well structured and easy funding is important for a company to move and learn fast. Without this ecosystem component in place, startups might not be able to focus on much more important activities at this stage.

e) **Finance:** Financials form the basis for being able to start and run high-growth businesses. The great diversity of individuals and institutions required in this space is key to having financial partners and investors in place for different stages of startups. This ranges from business angels, investing at very early stages to huge venture capital funds providing capital for expansion and growth of later stage startups. Different financing types besides equity investments provide the required flexibility for versatile and challenging business situations.

For instance, the availability of capital at seed and growth stages is required, which is unlikely to be provided by the same institution. Availability and diversity of financial institutions is key to success here.

f) **Support Systems:** Besides the above mentioned components, startups heavily rely on external resources supporting their success. This involves assets such as proper infrastructure and logistics, required supporting services like legal or tax services and organisation supporting the ecosystem and it's network. Examples of other parts of this system are networking organisations, meet-ups, entrepreneurial and idea - competitions or any other measure to encourage entrepreneurial activity.

A great example of such instruments are hackathons. A hackathon (from the phrases *to hack* and *marathon*) names a programming competition, where groups of people work on a software project or idea for (mostly) 24 - 48 hours straight. The clear goal of a hackathon is to bring a specific idea to a prototypical state as soon as possible and present and demo the outcome at the end. Such events have proven to be extremely valuable to any startup ecosystem as they provide a great playground to implement and test ideas and get feedback very fast.

2.3 Development Stages of Startups

As described in Section 2.2, any startup ecosystem consists of many different factors categorised in the above mentioned six pillars. The examples given in the previous section made clear, that the necessity for certain forms of these components is not only based on a structural demand for external factors, but rather also on the development stage of a venture. Startups run through certain stages of their development, each characterised by specific challenges, problems and related

requirements to their surrounding or ecosystem. Even though every startup is unique and therefore defines a very specific set of requirements, there are distinct phases defined by shared requirements that most startups go through. This section gives an overview of these different phases and the set of characteristics and requirements unique to them.

The stage a startup is in can be classified by very different criteria and from varying perspectives. Hence, many different definitions of startup development stages exist. This chapter will describe five popular models for startup stages, evaluating a company from different viewpoints.

2.3.1 Customer Development Model

The *Customer Development Model* (CDM) was introduced by Steve Blank in [Blank, 2003]. Based on it's popularity, the model is not only used as a methodology, but also for describing different stages of startups. The model introduces a methodology/philosophy for starting a company and building a product. This model heavily emphasises the focus on customers and markets from day one of the business rather than mainly focusing on building the product. This *Customer Development Model* is based on observations of startups failing because of a lack of focus on their customers in every step of the process. The methodology followed in those cases of failure is described as the *Product Development Model* (PDM) consisting of the following stages [Blank, 2003]:

1. Concept/Seed: In this stage, founders capture their business idea as well as vision for a company. They perform desk research and (probably) customer interviews to determine if their product is needed, what problem it solves and who the customers will be. The founders determine if and how the product can be built, point out certain competitors and express characteristics differentiating them. The founders compress this knowledge about the market, problem and solution, sales and distribution strategies, financing and many more into a so called business plan of any form.

2. Product Development: At this stage, the team focuses on building. The right staff is hired, and every division of the team starts working on developing the product envisioned in the business plan created in the prior stage. Marketing and other departments work on refining and improving the market metrics and performs tasks required to ramp up sales as soon as possible, once the product is finished.

3. Alpha/Beta Test: At this stage, the product is tested with a limited group of alpha/beta testers. The goal of this test is to ensure the product meets the requirements defined at the beginning of product development and fix bugs discovered by these testers. Marketing and other departments and external partners finish their preparation for the sales process and first paying customers are brought on board. Everything prepares for the big launch of the

product.

4. Product Launch and First Customer Ship: In this final stage, the company launches the product and ramps up sales channels and organisations as fast as possible. This is what the whole team has been working for in all prior stages and now the product is shipped to customers. A lot of money is spent on scaling up sales and distribution in order to reach defined goals.

Figure 2: The Product Development Model [Blank, 2003]

Figure 2 illustrates this process and it's stages. Even though, this model is used by every organisation launching a new product, based on insights into the process, history and methodology of failed businesses, Blank points out the following weaknesses of this model for startups [Blank, 2003]:

- **Where are the customers?:** The PDM is completely agnostic regarding the one most significant risk of startups: the development of customers and market. Startups don't fail because they lack a product, but rather because they lack users using the product and customers paying for the product to a degree sufficient for the pursued business model. Not getting sufficient traction or paying customers states the main reason for startups to fail.

- **The focus on first customer ship date:** Following the above described model, everyone in a startup works and coordinates activities based on the date of first customer ship. Sales and marketing perform actions in order to be ready to distribute and sell the product to as many customers as possible. The severe problem here: First customer ship date is only the point in time, where product development (according to the defined requirements) is

completed. At this point, the startup does (very likely) not understand who their customers are and how they can be addressed. The whole process is based on the assumption of having the right understanding of who the customers are and how they behave. Assumptions made before getting anyone's (except for testers) hands onto the product and getting real broad feedback and therefore very likely to be wrong.

- **Emphasizes on execution rather than discovering and learning:** The PDM encourages the perception of executing a plan based on well known and proven parameters, which is not the case for a startup. The goal of the whole organization has to be to gain deep understanding and proof of these parameters on the way.

- **The lack of meaningful sales, marketing and business development mile-**

11

stones: Even though the PDM logically reflects the rough process for product development (engineers, designers etc.) it gives other areas such as marketing or sales the wrong perception of what their milestones have to be. Rather than aligning with this process, important milestones for these areas have to aim towards getting deep understanding of customer groups, customer problems and behaviour rather than preparing execution based on wrong assumptions. Further, milestones following the PDM approach lack iterations and *stop-points* helping to not proceed until a certain understanding of the customer and market is reached.

- **The use of product development methodology to measure marketing and sales:** Just as the PDM lacks meaningful milestones for these tasks, it also leaks ways of measuring success in the areas marketing and sales. Rather than following this process, success must be measured by gaining customer information and proofing assumptions.

- **Premature scaling:** The organisation and execution of a startup can only ramp up and scale once the customer and market is understood and certain assumptions are proven to work. Scaling a business based on wrong or insufficiently proofed assumptions leads to a disaster in execution. Plans to scale (especially marketing and sales) need to be based the progress made according to the previously described milestones and measures as well as customer feedback. If the company comes to the conclusion that there are no customers or the target markets are not addressable using the proposed mea-

sures, there is no point in scaling. Further than that, premature scaling is lethal for a startup.

- **Death spiral:** As an effect of premature scaling, a series of events and dynamics are likely to take place, ultimately killing the startup. This chain of events is commonly referred to as the *death spiral*. Very simplified, a prematurely scaled organisation is built on shaky assumptions and without a deep customer and market understanding. As an effect of the large infrastructure and organisation in place, the burn-rate of the startup is very high when at the same time, expectations and predictions about sales numbers cannot be met. Besides many other effects, this might lead to a situation of high burn-rate, when not being able to raise new capital based on missed goals.

- **Not all startups are alike:** The PDM ignores the fact that not all startups are alike. The PDM might work well for organisations introducing new products to known markets (customers and markets are well understood). Despite the fact that this is almost never the case for startups, every company is unique, which the model not adjusts to.

- **Unrealistic expectations:** The PDM encourages three main misconceptions: a) The PDM can be used to guide activities other than product development. b) Finding and understanding customers has a schedule and moves on the same schedule as product development. c) The product will receive acceptance upon first customer sale (launch). All of the above create unrealistic expectations the venture

will not be able to hold up to.

To deal with these major weaknesses and provide an additional framework and methodology suitable for the requirements and nature of startups, Blank ([Blank, 2003]) introduced the so called *Customer Development Model* (CDM). This model has the primary goal of "*learning and discovering who a company's initial customers will be, and what markets they are in*" [Blank, 2003]. So this model can be seen as an addition to the PDM aimed towards discovering a startups market. The model is structured into four steps or stages as illustrated in Figure 3.

In contrast to the PDM, the CDM implies iterating in each of the stages and explicitly defines *stop* points after each of the stages. So the model already implies that the goals of each stage (explained later in this section) will likely not be achieved by going through the stage once. Rather than that, it will require certain iterations and attempts before the *stop-point* can be passed and it can be moved on to the next stage. The model even implies that going back to a prior stage is viable and important under certain circumstances. The four stages of the model are [Blank, 2003]:

1. **Customer Discovery:** This steps consists of finding out who the first customers are, if they face a specific problem and if it is important to them. Hence, the goal is to validate the hypothesis about a customer problem and the importance of that problem defined in the vision of the company. This steps emphasises the need to get *out of the building* and start discovering customers by rather talking to many different potential customers than performing market research etc.

2. **Customer Validation:** The goal of this step is to proof, that the company has found customers and a market reacting positively to the product by selling it to first customers. In this step, it is key to validate, that the product has a repeatable sales process, repeatable customers and their behaviour supports the proposed business model.

3. **Customer Creation:** At this stage, the company has stress fully discovered it's first customers and their high-value problem and proven their positive reaction of the product. Based on this validation, the goal in this stage is to build high demand for the product (marketing) and convert demand into sales of the product (sales). So now the marketing and sales organisation is built up and the startup starts to scale through heavy spending on marketing and sales. The crucial aspect to note here is that the moment of scaling has been delayed to a point, where customer existence, the importance of the problem and the repeatable sales process have been validated.

4. **Company Building:** Based on early market success, the company builds up an organisation to carry out defined tasks in this stage. Rather than premature scaling, departments are built up incrementally and supported by market success. Each department starts carrying out defined tasks.

It has to be noted that these stages model an iterative process (especially) between the first two phases. In case, the intended customers cannot be validated in the second phase, the model suggests going back to the start and changing basic parameters of the business such as the problem it solves, it's solution, it's *Unique Selling Proposition* (USP) or it's target customer group. This process of performing such an iteration over these parameters is referred to as *Pivot*.
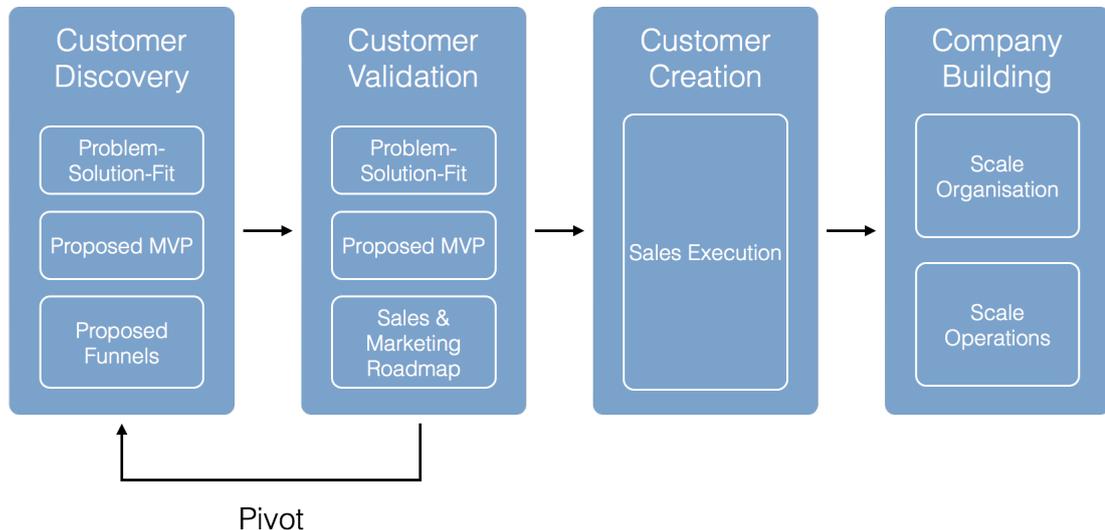
Figure 3: The Customer Discovery Model. Adapted from [Blank, 2003]

Based on the four steps of the model, startups are classified into the stages

1. Customer Discovery (= Product/Problem Fit)

2. Customer Validation (=Product/Market Fit)

3. Customer Creation or Company Building

2.3.2 Marmer Stages

The so called *Marmer Stages*, introduced by *Max Marmer* as a founder of the *Startup Genom Project*, mainly consists of six stages with different levels and sub stages as described in [Marmer and Bjoern, 2011]. The most important stages are the four top-level stages, which are mainly based on the previously described stages of the *Customer Development Model*, but are focusing on the product (product centric) rather than at the company itself (company-centric). The assessment of these stages is based on product oriented and startup type dependent milestones (e.g. *Minimal Viable Product* (MVP) etc.) rather than conventional metrics such as funding, team size or user growth. Even though the *Marmet Model* is not based on those metrics, the authors state average

values for those metrics based on self-reported data of startups to describe the stages. The stages of the *Marmer Model* are (1-4: top-level) [Marmer and Bjoern, 2011]:

1. **Discovery:** At this stage, the startup is heavily focused on evaluating if they are solving a real problem and if users are interested in their solution. In this initial phase, the founding team is formed and first activities towards learning about the customer problem and working on first MVPs is started. Value propositions and differentiators to other solutions are formed and validated. The startup might join an incubator or accelerator at that time and raise first money from friends and family.

2. **Validation:** In this phase, startups seek validation of their hypothesis based on early purchases of customers or user traction. At this stage, first seed funding is raised and first employees are hired. Metrics tracking is installed and the first attempts to grow the user base are made. First paying customers are acquired and validate the business model.

3. **Efficiency:** At this stage, the primary goal of startups is to find a way to efficiently acquire users and convert them to customers. This involves activities such as optimising the customer funnel, achieving high growth, be able to establish a repeatable sales process.

4. **Scale:** The goal in this phase is to use additional funding (series A) to drive extensive user growth over tested and validated channels. A first process for activities in the startup are put in place to drive this massive user acquisition activities. The product needs to be refined to meet scalability requirements and first departments and structures within the organisation are formed.

5. **Sustain**, and 6. **Conservation:** The final two stages of the model are mentioned, but not described in the available publications. The authors refer to future publications which are not yet available at the time of writing this thesis.

Based on this model, startups are mainly classified into the stages *Discovery*, *Validation*, *Efficiency* or *Scale*.

As mentioned before, the model does not rely on startup metrics such as funding, team members or user growth. Although, it provides empirical data for startups in the different stages based on collected data from 663 startups. [Marmer and Bjoern, 2011] This average data for the different stages are shown in Table 2.

The authors point out, that each of the stages is highly dependent on the specific type of the venture, and therefore define the following four main types (and subtypes) of startups defined by their key characteristics (only a part of which are described here): [Marmer and Bjoern, 2011]

	Avg. Months	Avg. Funding (k$)	Avg. # Employees	Avg. User Growth (Month)	Top Competitive Advantages	Top Challenges
Discovery	7	227	1	6	IP, Technology	CA, Over capacity
Validation	11	800	4	21	Partners, Insider Infos	CA, PMF, PSF
Efficiency	17	900	4	29	Traction, IP, Insider Info	CA, TB, Fundraising
Scale	25	3000	17	43	IP, Traction, Technology	CA, TB

Table 2: Average metrics of startups in the different *Mermer Stages* based on empirical data from startups. [Marmer and Bjoern, 2011], CA...Costumer Acquisition, TB...Team Building, PMF...Product Market Fit, PSF...Problem Solution Fit

a) The **Atomiser:** Self-service customer acquisition, product centric, fast execution, often automate a manual process, need the least capital of all types, tackle existing markets, technology heavy founding team beneficial **Examples:** Google, Dropbox, Eventbrite, Slideshare, Mint, Pandora etc.

b) The **Social Transformer:** Self-service customer acquisition, critical mass, runaway user growth, winner takes it all market, network effects, typically create new ways about how people interact, well balanced teams beneficial **Examples:** Ebay, AirBnB, Craigslist, LinkedIn, Facebook, Twitter, Youtube etc.

c) The **Integrator:** Lead generation with inside sales reps, product centric, SME focus, take innovation from consumer to business market, business heavy founding teams beneficial **Examples:** Kissmetrics, Mixpanel, HubSpot, Zendesk etc.

d) The **Challenger:** Enterprise sales, high customer dependency, complex markets, business heavy founding teams beneficial **Examples:** Oracle, Salesforce, RedHat, Atlassian, Palantir, Cloudera etc.

2.3.3 Funding Stages

The model of *Funding Stages*, as mainly introduced by *Paul Graham* in [Graham, 2005], categorises startups into stages based on the type of funding a startup has raised or is raising.

The model defines the following four stages or so called rounds [Graham, 2005]:

1. **Seed Round:** At this stage, the investment is mainly used to set up the company and pay for the living cost of the founders for several months. The goal at this stage is to develop a first version of the product to base any further activity on and raise more funding. This product does not contain the final feature set, but already includes features unique to the solution and supporting the proposed *Unique Selling Proposition* (USP). A first version of a *Minimal Viable Product* (MVP). The founding team writes a skeleton business plan addressing essential questions about their venture.

2. **Angel Round/Early Stage:** With the MVP in hand, the founders reach out to their network to raise money. At this stage, the idea will be primarily interesting to angel investors

(therefore wealthy individuals investing their own money). The money raised will be used to cover current costs for up to a year and hire first employees. The goal is to release a first version of the product as soon as possible and get initial traction.

3. **Series A(+)/Growth Stage:** After being able to proof their product based on initial traction, the founders decide to raise more funding from VC's (Venture Capital). They get introductions to VCs and pitch their idea and a refined business plan.

4. **Late Stage:** The model described in the published literature does declare this late stage in it's model and considerations, but never states a description of properties of it. In this thesis, it is assumed this is published in further papers or publications.

2.3.4 Startup Key Stages

An additional startup lifecycle stage model often referred to in practice is the model of *Startup Key Stages*. In contrast to the previously introduced models, this consists of six stages and has the clear goal of creating a common (and simplified) understanding of the development of startups and corresponding activities and needs. The model was proposed in [Commons, 2015] and contains of the following stages:

1. **Ideation:** At this stage, a person or a vague defined team has the idea of a product or service. The team thinks about the potential market size and business models. The team does not necessarily show clear commitment to the idea.

2. **Conception:** The team plans out the process of building the company for the next (more than) three years. The team consists of one to three co-founders and additional members with low commitment.

3. **Commitment:** The team consists of several members with a well balanced skill-set. The founding team is able to build the first MVP of the product/service (could be present already) without relying on any low-commitment members of the team. The founding team has agreements in place to arrange aspects such as equity, commitment, vesting, money etc.

4. **Validation:** The product/service of the startup already shows some initial traction and the startup can generate some first revenues. The clear goal of the startup is to validate it's target market.

5. **Scaling:** The startup can attract significant funding and scales at an extremely high rate in a rapidly growing market.

6. **Establish:** Great and sustainable growth can be achieved. Required resources can be

attracted easily and company tries to act as a startup for as long as possible.
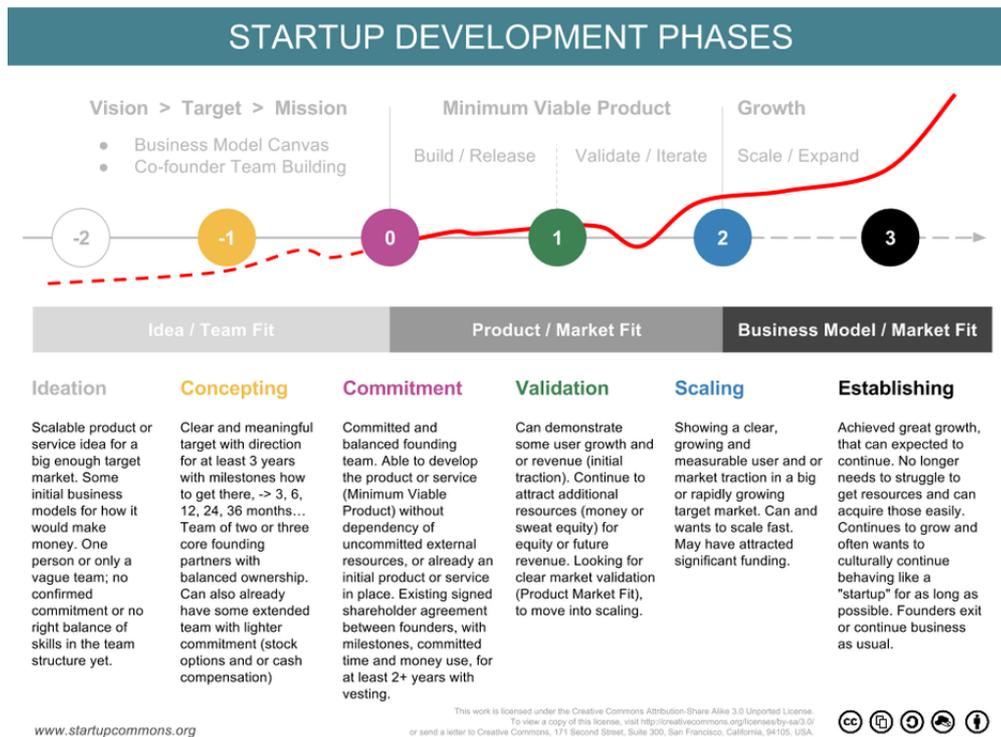
Figure 4: The six *Startup Key Stages* [Commons, 2015].

2.4 Characteristics of a Startup Ecosystem

This thesis discussed basic definitions and structure of a *Startup Ecosystem* (SES) as well as stages and corresponding needs and characteristics of startups in different stages within a SES. An interesting aspect of viewing entrepreneurial activity from an ecosystem perspective is to find a way to model and describe the whole system as a such and make it comparable to other ecosystems. This sections discusses different approaches of how to develop such a model of SES characteristics and elaborates on their ideology and point of view.

The general ability to measure and compare SES brings a huge advantage in analysing strengths and weaknesses and make strategic decisions, for both entrepreneurs and other stakeholders in the SES. By analysing and bench marking different SES, weaknesses and strengths can be discovered, and measure can be taken to develop the SES in the intended direction.

There are several models in literature defining such characteristics. Some of these models will be explained and discussed in the following.

2.4.1 Startup Ecosystem Report 2012

The *Startup Genome Startup Ecosystem Report*, as in [Herrmann et al., 2012], compares startup ecosystems using eight indices. These indices highly correlate with the different components of SES, as described in Section 2.2. The characteristics rated in terms of these indices are [Herrmann et al., 2012]:

a) **Startup Output**: This characteristic represents the overall entrepreneurial activity as well as the maturity of startups in a specific region or SES.

b) **Funding**: Measures the presence and activity of risk capital in the SES. This mainly covers funding types such as Venture Capital of Angel Investors rather than conventional financing types such as depth financing.

c) **Performance**: States a measure for the overall performance of startups in a specific SES. The performance is measured by diverse factors such as revenue, job creation, growth or potential future revenue.

d) **Mindset**: Measures the mindset of the entrepreneurial community (especially founders) in terms of: visionary thinking, resilience, taking risks, work ethics and the ability and willingness to overcome problems typical to a startup lifecycle. All of these characteristics are seen as very positive forming the mindset of *great entrepreneurs*.

e) **Trendsetter**: Characterises how fast startups in a SES adopt to new technologies, business models or management processes. Ecosystems adopting very quickly to these are considered very successful. Therefore the trendsetter index is considered to be the highest indicator for future SES success making it very important and vital to any ecosystem.

f) **Support**: This index measures the quantity and quality of the entrepreneurial support system in a specific SES. This system consists of components such as service providers (legal, accounting etc.), mentorship or the diversity of different funding sources and types (apart from just risk capital sources such as venture capital).

g) **Talent**: The talent index measures the talent and quality of founders in an SES. Factors influencing this index are age, education, previous entrepreneurial experience and success, domain expertise and many more.

h) **Differentiation**: As a last index, the *Startup Genome Report 2012* [Herrmann et al., 2012] defines the differentiation of a SES to the Silicon Valley ecosystem based on criteria such as demographic and type of startups. This index is based on taking Silicon Valley, the strongest SES in the world, as reference and measuring the uniqueness of ecosystems by how different they are to it.

Figure 5 show the evaluation of a SES according to those eight indices. As mentioned earlier, the model rates each of the indices relative to the score of the Silicon Valley SES.
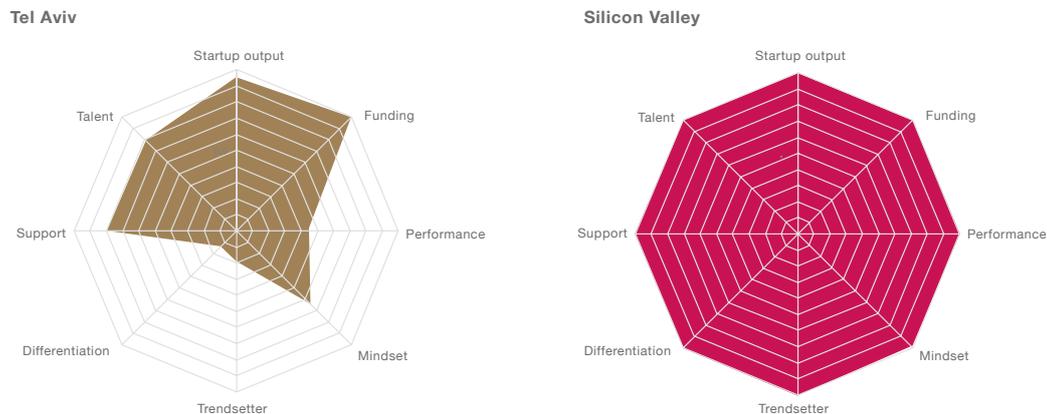
Figure 5: The eight characteristics of the *Startup Ecosystem Report* applied to the Tel-Aviv ecosystem. Silicon Valley forms the reference for the characteristics of this model. [Herrmann et al., 2012]

In this specific example, it can be observed that the Tel-Aviv SES shows great values for most indices, but lacks especially in differentiation to Silicon Valley and quick adoption to new technologies and business models. It can be clearly seen that this model of SES characteristics lacks the coverage of SES components, referring to the model illustrated in Section 2.2. Mainly, it lacks consideration of the components *Markets* and *Policy* when introducing measures like *Performance*, which are hard to categorise in one of the mentioned domains of a SES. (Presenting all those results and considerations, it has to be mentioned, that the report was written in 2012 and renewed in 2015.)

2.4.2 Isenberg - Four Defining Startup Ecosystem Characteristics

As another model, Daniel Isenberg describes four important characteristics to (a successful) SES in [Isenberg, 2014] as follows:

a) **A SES consists of hundreds of components** which interact with each other in a very complex way. All of those components can be categorised in one of six domains. The six domain Isenberg refers to are the ones described as components of a SES in Section 2.2. The presence of each of those components/domains is essential and equally important to the ecosystem. The interaction of the components can vastly vary and form the individual characteristics of a SES.

b) **Every SES is unique** an although all can be described using the same components and domains, the interaction and involvement of the components with each other form a unique system defined

by the context and history of it's evolvement. Every existing ecosystem on earth was formed under unique economic and societal circumstances and the way interactions and dependencies of components in the SES formed greatly reflects these.

c) Attempts to determine **concrete root causes** for the formation of SES is of **limited practical value**. Even though there is clear evidence for the direct impact of e.g. universities or regulatory framework on the ecosystem, Isenberg argues that this impact is rather short term and not overwhelmingly significant. Rather, big step changes in the development of an ecosystem are the result of many variables working together in a unique (and probably uncertain) way (so called *High Order Interactions*). So even though external conditions for a flourishing ecosystem might be objectively present, small events or a small group of people can act as a trigger for an ecosystem step stone. What can, even though, be clearly observed is the fact that **success breeds success** and entrepreneurial success stories have dramatically positive impact on the ecosystems they evolve in.

d) **SES become self-sustaining**. Because of these *spill-overs* of entrepreneurial success (*success breeds success*), the different components and domains of a SES sustain each other over time. Therefore, Isenberg argues there is a tipping-point, where governmental involvement into ecosystems shall be dramatically decreased (not quit) because of the self-sustaining and mutually reinforcing nature of those ecosystems.

2.4.3 The Boulder Thesis

Another, very empirical, model for describing sustainably successful startup ecosystems is the so called *Boulder Thesis* [Feld, 2012]. The thesis, named after it's origins in the experience when building up the SES in Boulder (CO, USA), describes four characteristics which need to be met in order to create a successful (long term) SES apart from other external factors. The intention behind the model is to provide a framework for building up SES in different locations. The key components of this model are [Feld, 2012]:

a) **The SES has to be lead by entrepreneurs**: Many different people and organisations in different domains (as illustrated in Section 2.2) contribute to a local SES. Most of those contributors play roles such as Investors, Mentors or Service Providers and are therefore not entrepreneurs themselves. Even though these non-entrepreneurs play key roles in the SES, Feld claims the ecosystem needs to be lead by entrepreneurs. The history of existing ecosystems have shown, a SES cannot succeed if non-entrepreneurs take over the lead, which they naturally try to do. SES lead by non-entrepreneurs are considered not sustainable in this model. What's very interesting about this model is, that it explicitly distinguishes two forms of companies (and therefore entrepreneurs): *Small Businesses* and *High Growth Entrepreneurial Companies*. The thesis makes a clear difference between the two (differences are described in Section 1),

but states that both are equally important to the SES. No matter which type of company an entrepreneur has (co)founded: The ecosystem has to be lead by entrepreneurs. This principle is mainly based on the observation that participants in a SES, other than entrepreneurs either run on very different time cycles or have vastly different motivations behind their engagement compared to entrepreneurs. As an example, universities (non-entrepreneur but participant) execute in terms of years rather than months, when startups need to plan and act much than that. Service providers, for instance, might have the motivation of increasing their own revenue by increasing their client base, which differs from the primary goal of building a successful and sustainable ecosystem.

Generally, Feld [Feld, 2012] describes two different types of people contributing to an SES: Firstly, **leaders** lead the whole community, spread the spirit of entrepreneurship, make things happen and inspire others to participate in the SES or become entrepreneurs and leaders themselves. They need to have a long-term commitment to the SES, must welcome everyone into the SES and encourage activity in the entire entrepreneurial community. According to the priorly described principle, those leaders need to be entrepreneurs in different leadership roles. Secondly, there are **feeders**, which consist of every other participant in a SES, except from the leaders. This involves any component from any of the aforementioned SES domains, except for entrepreneurs.

Both, leaders and feeders are equally important, but a distinct separation of the two roles is incredibly important. According to Feld, the absence of entrepreneurs as leaders or a dominance of feeders in leading roles dooms every SES to failure.

The model names the following pillars of successful SES [Feld, 2012]:

a) **The need for long-term commitment**: Especially leaders in the SES need to make a long-term commitment to supporting the SES. Feld [Feld, 2012] a argues this must be at least 20 years, and therefore represent a significant share of an entrepreneurs work-life. Economy moves and develops in cycles and there will be multiple ups and downs while developing a successful company. The development of a SES take several of those startups life cycles and therefore involves many phases of economically tough phases. Leaders (and therefore entrepreneurs) need to continue working on the SES, independent of the economical situation. Feld mentions, that only a subset of leaders will be willing and able to make this commitment. Nevertheless, the example of successful SES has proven that such leaders exist and that this subset can deliver sufficient guidance to a successful ecosystem.

a) **Philosophy of inclusiveness**: A successful SES can only exist, if the whole community, and especially the leaders, foster a philosophy of extreme inclusiveness. Anyone who wants to engage in the ecosystem, should be able to do so. Independent of if participants want to become entrepreneurs, work for startups or participate in any other form in a SES, especially the leaders must engage them to do so and help getting started. Participants have to follow the mindset,

that the growth of the startup system in terms of more participants, is solely positive without any competitive considerations or strategic benefits for individuals.

a) **Engage the entire entrepreneurial stack**: Regular events on the SES, which engage the whole entrepreneurial stack of entrepreneurs, mentors, investors and all other stakeholders in the ecosystem are vital to it's success. Even though every form of event is beneficial, Feld points out some events which tend to engage people in an outstanding way and produce great outcome for the ecosystem. These events such as hackathons, startup weekends, office hours or accelerator programs encourage participants (all types) to take actions and produce outcome for the SES. In contrast to that, meet-ups or monthly meetings are important, but usually limited in output. As mentioned before, these events and activities must include everyone interested and engage the whole SES without exception. Leaders in the SES must support every participant and engage and open doors for all participants and new leaders. Leaders must understand, that the development of an SES is not a zero-sum game, where there are winners and losers, but that overall success for every participant can be generated.

If an ecosystem follows and fulfils these four principles, Feld argues that the chances for it to become successful are maximised. Therefore, these four characteristics can be used as indicators for successful SES and provide a great addition to before mentioned criteria solely based on rating components as described earlier.

2.4.4 Summary

While previous sections have shown multiple different approaches of describing the characteristics of an SES, the following extracts some basic characteristics along the lines of all of these statements. The following **five key characteristics of SES** can be extracted:

1. Startup Ecosystems are a **local phenomenon** happening in a certain dense geographic area.

2. **SES develop over** time and **the course of many years** and require dedication for this long time.

3. **Strong SES require a diverse set of many different participants** (=components) and a leadership that allows for this diversity.

4. **Every SES is unique** and searching for distinct root causes for success of a SES might be of limited value.

5. Over time, strong **SES become self sustaining** and create tremendous wealth.

2.5 The SES Lifecycle Model

An entrepreneurial ecosystem is an organic system with many different components and a high level of interaction between them. As shown earlier, there exist frameworks to asses the development of a SES in terms of rating the current status of it's components in different domains as well as showing the distinct characteristics it has developed. Further there exist methodologies, where output measures (such as SES value, startup performance etc.) of a SES are taken as indicator for it's development level.

Even though these schemes have great value to evaluation the current state of a SES and compare it's components and particularities, it carries little information about it's past and future development, does not analyse or attempt to understand it's internal structure and puts it in no perspective [Motoyama et al., 2014] such as startup-lifecycle models, as discussed in Section 2.3, do. So there are no approaches of classifying SES according to their chronological development stage.

A concept for such a classification, as well as a proposal for it's components, limitations and interpretations is provided in this chapter.

A classification like this requires an understanding of a *Startup-Ecosystem-Lifecycle* (similar to stages in a startup-lifecycle model) and distinct stages that SES can be roughly classified into. Further, this requires a set of rating factors and clear definitions for criteria to be met in order to fall into one of the defined stages.

Therefore, the following requirements for such a development model can be stated:

- A clear lifecycle-model with defined stages: Since the development of a SES is a incremental and continuous process, it is very hard to determine discrete stages to it's development. Lines between such stages will always be fuzzy due to the nature of the subject. Nevertheless, the model must define concrete stages to be followed.

- A set of determinable factors to classify ecosystems into. These factors should include both internal and output measures to the ecosystem and should be clearly measurable.

- A set of characteristics which can be mapped to each stage of the lifecycle model. Since SES are so diverse in how they develop, quantitative factors might be very hard to assign to different stages in this model Therefore, certain characteristics must be provided to classify a SES on hand.

2.5.1 Basic Structure Model

The proposed model builds upon the components and domains of a SES explained before. In particular, it builds upon the six domains of a SES, as published by Isenberg [Isenberg, 2011] and explained in Section 2.2. This model names many different components grouped into six general fields or domains. The lifecycle approach now models a SES by two main elements: **components** and **interconnection**. It defines a structure model which interprets these six domains (+1 for startups themselves) as layers which coexist in an ecosystem. The proposed components operate on these layers and can have connection to other components on the same or on different layers.

Figure 6 illustrates this basic model as having components on the levels *Human Capital*, *Support Systems* and *Finance*. Components on each layer are modelled as dots. This model reflects the current state of a startup ecosystem in terms of components and interconnections. Not every layer (=domain) has to be present for every SES and in every stage. So there can be zero to six layers present in the stage and there can be from zero (layer not present) to any number of components on each of those levels. Interconnections in this representation are modelled as edges between different components. Interconnections can be present between any components independent on which layer they are. The representation defines three different types of interconnections:

1. Business-Cooperation: This includes every form of cooperation which is based on one of the two participants business model. So if e.g. a venture fund (or business angel) invests in a startup, this happens according to it's business model and is therefore a business-cooperation. If a startup sells it's product to a company in the ecosystem, this happens according to the business model of the startup and is therefore a business-cooperation.

2. Spin-Off: This names connections where a new components becomes existent out of another. This is e.g. the case when founders or employees of a startup become investors or when employees of a company create a new startup.

3. Mentorship: Mentorship names a relation where one components provides advice or help to another one aside from it's business model and (often) without direct compensation. For example, a founder of a successful startup might enter a mentorship relation with another startup and provide network and advice.

Figure 6 shows some example of such relations in the introduced structural model.

2.5.2 Stages of the SES Lifecycle Model

A definition of clear development stages of a SES is proposed in the basic structure model. The following explains the different stages and visualises their main characteristics with regard to
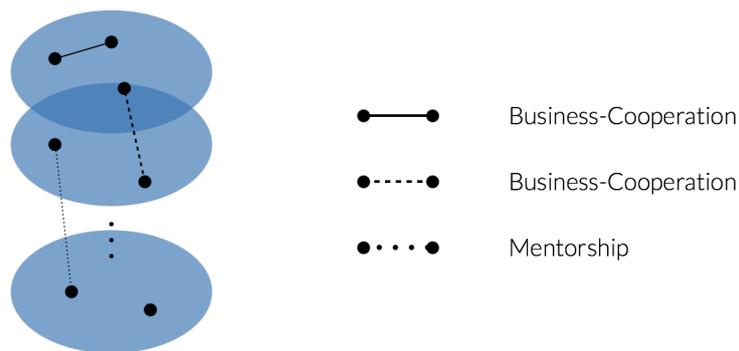
Figure 6: Basic structure used in the SESLCM.

components and interconnection using the above introduced structure model. The proposed stages are *Unawareness*, *Separation*, *Layer-Connection*, *Interconnection* and *Take-Off* as illustrated in Figure 7. Each of the stages and the development between the stages will be illustrated using a fictional example of a startup ecosystem *Startupville*.

Figure 7: The five stages of the Startup-Ecosystem-Life-cycle-Model.

2.5.2.1 Unawareness

The first stage of an ecosystem is referred to as *Unawareness*. The model proposed here is based on the idea, that entrepreneurship happens in any place around the world in some form. Therefore the unawareness in this stage relates to the presence of an ecosystem that supports entrepreneurship. So entrepreneurs and other components in the ecosystem are not really aware of it's existence and operate mainly in there own networks to run their businesses. In this stage, the activity around entrepreneurship is very low. This includes the actual foundation of companies as well as startup related events, meetups, festivals or any form of social gathering in an entrepreneurial context. Besides the fact that there will always be certain company networks, the components of the ecosystem are in this stage barely aware of each other. Further, the general public is barely aware of - and interested - in entrepreneurial activity and new ventures in the area. This model

suggests this situation as the minimal possible ecosystem (*MPE*), based on the assumption that entrepreneurship exists in every community in some form.

The structure of a SES at this stage is illustrated in Figure 8. It can be observed that some layers of the ecosystem as well as some components are present. The structure of these components is mainly based on historical development and similar factors.
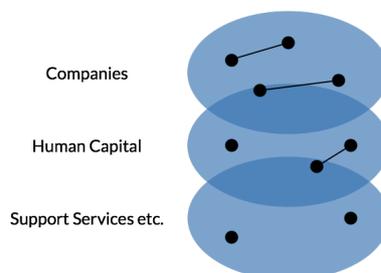
Figure 8: The first stage of the SES lifecycle model: Unawareness

Example

Following our example, the entrepreneurial ecosystem in *Startupville* is in this early stage. Even though some components of the ecosystem, such as universities, service providers and some potential business angels and banks exist, nobody thinks about an ecosystem of entrepreneurship as such. The number of companies, startups and newly established businesses is average and the networks between the companies are mostly limited to the entrepreneurs personal networks and business-field related connections. The population of *Startupville* is not aware of the entrepreneurship scene in town and limits it's interest to the direct employment or customer relationships to companies.

2.5.2.2 Separation

The second phase (*Separation*) is defined by a massive growth in entrepreneurial activity. This means the number of company foundations and venture creations increases significantly over time. The general public becomes increasingly aware of startups and entrepreneurs and more components on each layer of the structure model appear. New layers on the structural model appear and first connections between components can be identified. This stage is mainly characterised by growth of the structure that later forms the entrepreneurial ecosystem. Most of the components and players in the ecosystem act isolated without engaging in a community or fostering mutual support, which the name of the stage relates to.

Figure 9 illustrates the structure of an ecosystem at this stage. It shows that the components on each level as well as the number of levels (layers) start to grow rapidly. This is extremely important

since this trajectory of growth is what any further development in the community is based on.
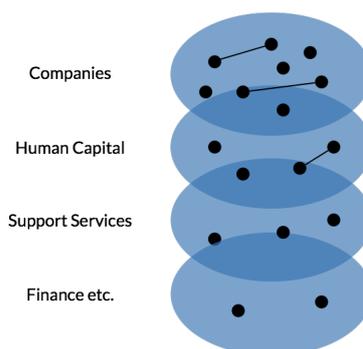
Figure 9: The second stage of the SES lifecycle model: Seperation

Example

At the *Separation* stage, the ecosystem in our city starts to growl. Mostly inspired by the example of other great ecosystems and entrepreneurial success, people start working on own ideas and thinking in an entrepreneurial way. The overall entrepreneurial activity therefore rises and a framework around it forms. Besides companies and startups themselves, other organisations start to form around entrepreneurship. So three journalists pick up the topic of startups and write about it on a regular basis. Further, supporters of the startup scene organise regular tech meetups, where interested people meet and network. Most of the companies and founders interact with each other based on existing social connections and business relations. So some founders know others from college and have tax consultants in their network. But the interconnection of the scene is mostly limited to these connections.

2.5.2.3 Layer-Connection

The third stage in this model is named *Layer-Connection* and is mainly defined by the buildup of interconnections between components on the same layer. The entrepreneurial activity reaches a high level in this phase and components and organisations on the same layer start to intensively communicate, cooperate and engage in an "on-layer" community. All three types of interconnections between components are possible on the same level and events dedicated to this community are created. Leaders of the "on-layer" communities start to crystallise which engage and coordinate the community. Certain norms and ideals start to be established on a layer and members in elements develop an intensive awareness of the community as such. This state of the ecosystem, where a system of parallel ecosystems on different layers steps into existence, can be defined as a *Community Type 1*. The general public now becomes very aware of startups and the newly established networks of components. Topics of relevance to the "on-layer" community become increasingly interesting to the common public.

This existence of parallel communities or ecosystems is also reflected in the structure of the ecosystem as illustrated in Figure 10. It is characterised by heavy activity and interconnection between components on the same layer and the awareness of the community by both, outsiders and insiders. It can be observed that there exist connections between components of different layers (due to the nature of business relations), but the structure is highly defined connections on the same layer. No community like interconnection can be observed between layers.
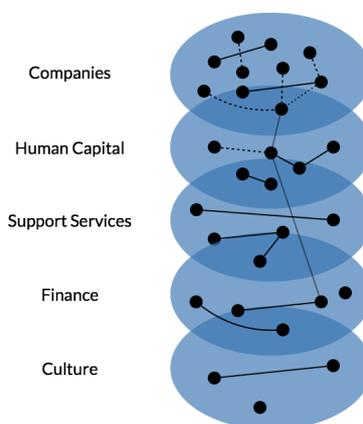
Figure 10: The third stage of the SES lifecycle model: Layer Connection

Example

In our example at this stage, founders start becoming aware of the ecosystem and start understanding that this system is not a zero sum-game. This means they understand, that it's not a give and take of supporting others and getting back, but more of a support to the community. Therefore, people start opening up their network and supporting others not for the sake of getting an immediate favour back, but to support the overall community. This way, many different layers of the *Startupville* ecosystem, such as startups, service providers, supporting organisations etc. get more an more interconnected. Founders in the city start building up strong networks and mentor each other. Some business angel consortium form, investments are made and first institutional investors enter the stage. The public is now increasingly aware of the term startup and many people have founders or employees of startups in their networks.

2.5.2.4 Interconnection

When the prior stage *Layer-Connection* was mainly defined by strong growth of interconnections between components on the same layer, the fourth stage, *Interconnection*, is defined by a strong growth of interconnections between components on different layers. In this phase, all six layers are

present in the ecosystem and the main change of the structure in this phase is the heavy intercon-
nection of the different layers and components in a vertical manner. The general entrepreneurial
activity continues to grow very strong based on the support provided by the new interconnections.
Leaders of different layers (previous stage) connect and *global leaders* across the whole ecosystem
establish. The social and cultural norms which arose in the previous stage start to spread and form
across layers. Everyone in the ecosystem is very aware of the system as such and the general
public is heavily exposed to entrepreneurial activity. This level of a very interconnected ecosystem
structure can be defined as *Community Type 2*.

Figure 11 illustrates the changes happening to the structure of the SES. As mentioned before,
the two major trajectories here are major growth of entrepreneurial activity (components) and
heavy vertical interconnections of components between layers. At this stage, the layer definition
looses dramatically in significance and becomes more of a grouping of components without any
implications on connections and activity. The whole ecosystem starts to be very connected and
connections increase the creation of new connections.
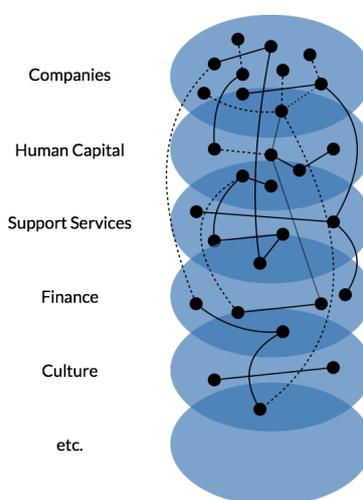
Figure 11: The fourth stage of the SES lifecycle model: Interconnection

Example

At this stage, the whole ecosystem of *Startupville* is incredibly interconnected. Founders do
not only have a very strong network of founders, but also of service providers (lawyers, tax
consultants, accountants, funding experts etc.), investors and other mentors with relations
to potential customers. As several previously started companies have been exited to big
corporations, the success stories drive new entrepreneurs which now have hands on proof for
that local startups can be successful. Further, the two founders of one of these startups invest a
fair share of their money back into startup in the scene and go out to found two new startups.
A strong scene around entrepreneurship forms as now many events around this topic take place

and business is done across all layers and involving many components.

2.5.2.5 Take-Off

The last stage of the *Startup Ecosystem Lifecycle Model* is called *Take-Off* and is mainly defined by exponential growth in different areas. This exponential growth refers to the entrepreneurial activity in general (i.e. number of components in the structure) as well as to horizontal and vertical interconnections. So components influence and support each other to a degree higher than linear. Co-operations between components create new components and new interconnections leading to new cooperation. When at previous stages, the system needed to be stimulated by external factors (such as e.g. public funding) or external parties (e.g. governments) to compensate for a lack of required components, now the SES becomes fully self-sustaining. Entrepreneurial success (exits) create new entrepreneurial activity and contribute to the ecosystem. So usually in this stage, many such successes and spillover on other startups can be observed. A major characteristic of a SES in this stage is attraction of external components. In prior stages, many of the components were defined by local or historical constraints. Even though startup communities remain a local phenomenon, the success and activity of the SES now attracts external components in a significant way. This means that external contributors, such as entrepreneurs, engineer or investors are actively attracted by the ecosystem. This opens a lot of new possibilities for the ecosystem, since the dependence on local sources can be overcome.

Figure 12 shows the structure of this final stage in the model. The structure is defined by extreme activity and interconnection and the attraction of external ecosystem components. The ecosystem becomes so connected, that it virtually appears as a whole components rather than a set of interconnected parts making it hard to determine a clear structure.

Example

In this final step, the SES in *Startupville* becomes incredibly successful. Many of the now founded companies have been acquired by large competitors. Some startups have taken their companies public and acquired others in and outside the SES. Disruptive technology is being developed as capital becomes increasingly available. Startups with risky business models get funded and can grow their user base. The global entrepreneurship community is now aware of *Startupville*, as companies with multiple millions of users are created here. The local universities become known for their good education and chances of getting a job in a startup rise, which drives migration of students into the city. Venture capital funds of other cities and countries become aware of the great successes and start investing in the SES. Big corporations seek the partnership with startups and open branches in the ecosystem. Executives of successful
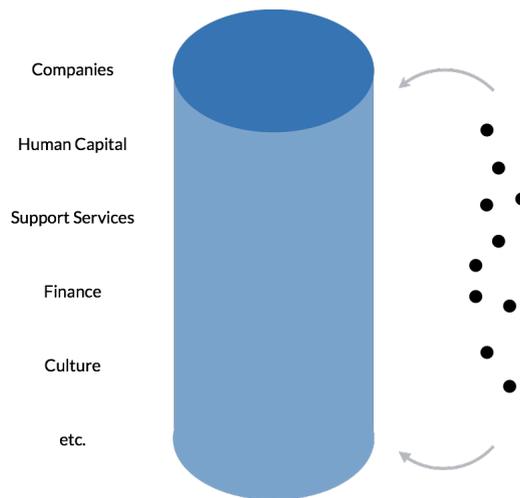
Figure 12: The fourth final of the SES lifecycle model: Take-Off

startups become founders or early executives of other companies increasing the probability of them to succeed and sharing experience. Greatly skilled employees found new companies and their ex-bosses become investors. To sum up, the SES has become self-sustaining and self-reinforcing which manifests itself in exponential growth and great success of startups.

2.5.3 Development of Ecosystems

It has to be noted that, even though the proposed model suggest a chronological development, the development of a SES does not have to follow this in a strictly sequential manner. An ecosystem can develop back and forth between the different stages while evolving and developing over time. The development path of a SES will show ups and downs and this is reflected in the change between different stages. Nevertheless, a successful and powerful startup ecosystem is suggested to go through all of the defined stages in this order without leaving out stages or performing jumps between them. Further, the model does not define any time-periods a specific SES reside in a certain stage neither does it imply, that every SES reaches the *Take-Off* stage. Some startup-ecosystems might do pretty well, but never reach this final stage and dismantle or even reside in one of the other stages for a very long time. Only some SES will make it to the final stage and develop to high-performing SES recognised world-wide.

Figure 13 illustrates four examples of such developments. Part *a)* shows a very straightforward, but unrealistic development. Here, the interconnection (on layer connection (OLC), inter layer connection (ILC)) increases linearly over the first four stages of the LifeCycleModel (LCM). After reaching a certain interconnection-threshold, the interconnection begins to increase exponentially.
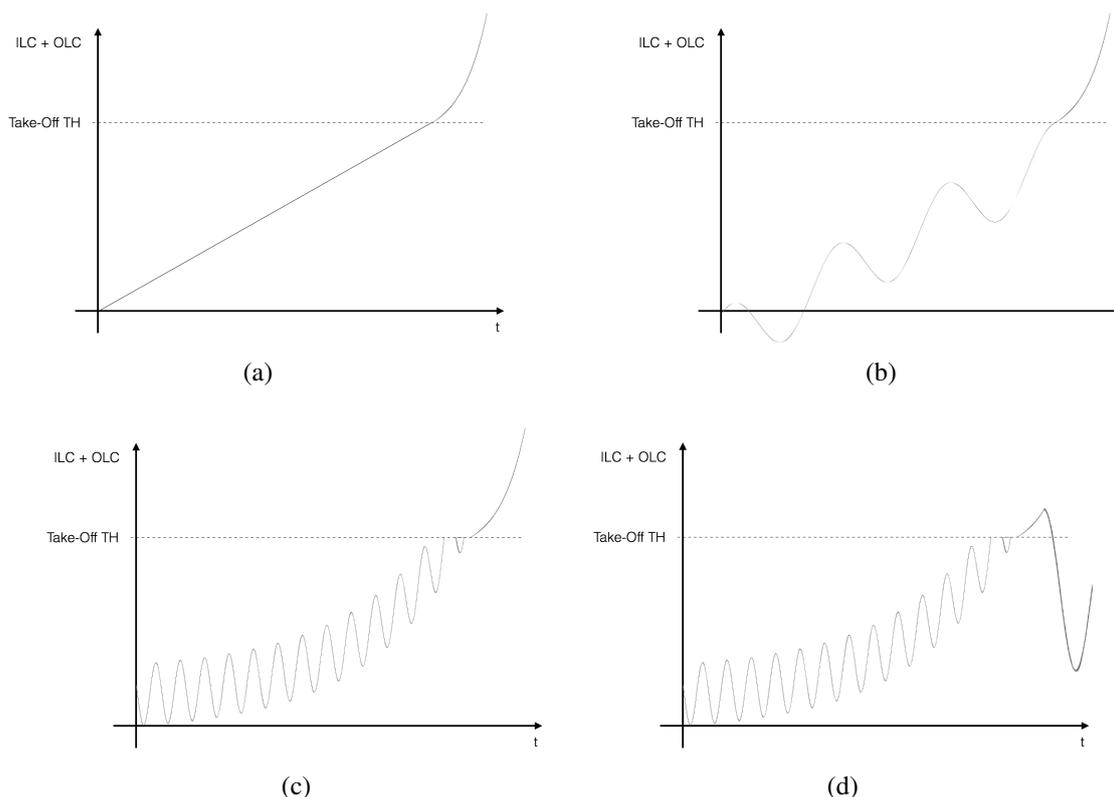
Figure 13: Examples of fictional but possible developments of SES, TH=Treshhold for entering the *Takeoff* stage, OLC=On-Layer-Connections, ILC=Inter-Layer-Connections

Part *b)* shows a more realistic variation of this, where clear ups and downs in the development can be seen. The SES in this example changes back and fourth between stages to finally pass the define threshold and show exponential growth. Part *c* illustrates a modification of *b*, where the development in early stages follows more of an exponential function itself. This means that in early stages of the life cycle, the growth is considerably flat, where in stages close to take-off, stronger growth can be observed. This might be close to the development of real-world examples, since in phases before but close to take-off, network effects and synergies increase the growth rate. Finally, part *d)* demonstrates the fact, that SES can also fall back to prior stages after having reached the take-off threshold. This is absolutely possible as SES face various transitions between stages while developing. A reason for such a development could e.g. be changes in the macroeconomic conditions of the SES, or the sudden absence of a critical component. Even though this is much less likely in this final stage (due to the characteristic of self-sustainability of the SES at this stage), it is still possible.

2.5.3.1 SESLCM (Startup Ecosystem Lifecycle Model) Portfolio

The before described development of a startup ecosystem (SES) can be illustrated as a portfolio chart. This is illustrated in Figure 14, where the arrows mark the transitions between stages in the *Startup Ecosystem Lifecycle Model* (SESLCM). The portfolio illustrates the development and SES classification by evaluating the interconnection of components on a layer (*On-Layer Connections* = OLC) vs. the interconnection between components on different layers (*Inter-Layer-Connections*=ILC).

The following describes the different fields/areas of the portfolio in the context of the *Startup Ecosystem Lifecycle Model* (SESLCM) as introduced in section 2.5.

Unawareness is characterised by low ILC and especially low OLC (only business-organic connections). As described before, *Separation* is characterised by low OLC and low ILC, whereas in *Layer-Connection* OLC is high and ILC is still low. In the stage *Interconnection*, OLC and ILC become very high forming the upper-right quadrant of the portfolio. The final *Take-Off* is represented by any *off-chart* values characterised by very high OLC and very high ILC. As suggested by the arrows, transitions are only possible between the defined sequential states, where the time a SES resides at a specific stage is not defined.

The upper-left corner of the portfolio is characterised by an impossible state of low OLC and high ILC. As described before, the model is based on the assumption that the ecosystem must first form a *On-Layer Community* before strong interconnections are possible. This state would, for instance, represent a SES where most startups are extremely well connected to service providers, universities, investors etc. whereas they lack a network of other startups. The proposed model relies on the assumption that ILC is only possible due to high OLC and inter-layer networking on a specific layer.

Please note that the introduced model and portfolio do not state *sharp* boundaries between the different stages, whereas the axes of the portfolio are only divided into *high* and *low*. Even though such boundaries and measures to determine them might be provided in the future, no interpretation whatsoever is intended by us at this point.

2.5.4 Value and Differentiation of the SESLCM

A natural question arising from the introduction of the previously described model and it's discussion is the on it's added value. There are arguably many different models for describing startup ecosystems published, and different models take different approaches towards describing, rating, examining and comparing them. What is worth mentioning is the fact, that these systems all take a snapshot of the status-quo in an ecosystem without putting it in a greater context or
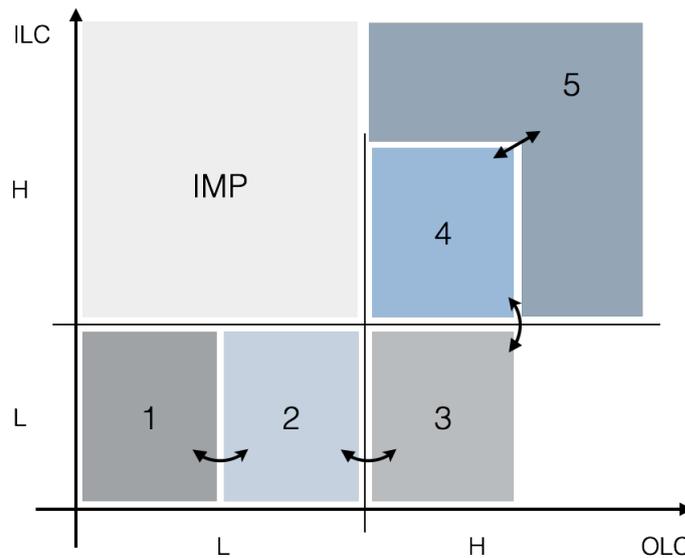
Figure 14: The portfolio illustrating the different stages of the SESLCM and it's transitions between stages. H=High, L=Low, ILC=Inter Layer Connections, OLC=On Layer Connections, IMP=Impossible area as an assumption of the model

perspective. So a SES is examined by the output of the SES (as measured in exits, number of startups, jobs created, revenue, etc.) and/or by the performance of it's components (such as capital, mentorship, culture etc.) without taking a look at it's internal structure and looking at it's (possible) future and past. So these models operate on a model of the SES, which does not consider any form of internal function. The proposed *SESLCM* tries to extend this by using the network or interconnections of components of the same or different *types*. By taking this step forward, the model could potentially provide more helpful insights into an ecosystem, independent of its individual characteristics (remember: every SES is unique!).

Even though, measuring such a system could turn out to be extremely difficult, having a base model following a life-cycle could provide great value for better understanding and monitoring processes and development in the SES. Like the discussed life-cycle models for startups, it further could provide a common ground for discussing the topic of SES development and success factors in the future.

So now one could argue, that proposing this model violates one of *Isenberg's four defining characteristics* as described in Section 2.4.2 by looking into the the SES and searching for root causes of the success of the ecosystem. But it needs to be stressed here, that connections occurring within a ecosystem definitely form an effect rather than a cause for the success of the same. Factors like the engagement of event organisers, university programs or entrepreneurs themselves lead to connections established between components of the system and therefore can be clearly identified as effect of other measures. In that perspective, the newly introduced model only takes

the components in the given categorisation, and introduces a new dimension to look at by bringing the connection between them (in addition to their presence and strength) into consideration.

The *SESLCM* proposed around this new structure representation tries to put the status of a SES in context to it's past and possible future development under only one assumption: **ILC is caused by OLC**.

2.5.5 Case Study - The Buenos Aires SES

The following case study is supposed to illustrate this interconnection and establishment using the example of existing ecosystems to provide better understanding of this fact. Further, this case-study is used to validate basic assumptions the SESLCM is based on.

The *World Economic Forum* [World Economic Forum, 2014] provides a great example of the structure and development of SES by examining the Buenos Aires technology entrepreneurial ecosystem. Buenos Aires provides a great example for this illustration, since Argentina has provided an arguable tough spot for entrepreneurs to launch businesses in over the last decades. Besides the very unstable and swingy economic, dramatic political changes, a weak legal system, high inflation and infrastructural deficits have dominated recent decades and therefore made conditions for startups more than difficult.

Nevertheless, the entrepreneurial ecosystem in Argentina has grown and evolved in a very impressive way. Over recent decades, hundreds of high-tech firms have been launched and great exits (some at valuations over $100 Million) have been achieved. This ecosystem provides a very good example for examining the internal structure of an SES, since the success can in no form be traced back to any form of governmental support or intervention whatsoever. Rather than that, it is based on the organic formation of a unique and self-sustaining (see Section 2.4) structure of interconnection between different components and participants.

The *WEC*, based on a format of *Endeavor Insights*, illustrates the development and interconnection of companies in the SES as a graph diagram shown in Figure 15. In this format, nodes of the graph represent start-ups (size correlates with size of the company), where arrows represent connections or influence between companies. The colours of the arrows indicate the type of influence, cooperation or dependency between the startups. The types are mainly given as inspiration, founder, former employee, investment and mentorship. The diagram is arranged in different circles, where each of the circles represents the companies founded in one of four *generations* of the SES evolution.

This form of illustration is very similar to the one introduced for the SESLCM earlier. Transferred to terms and data model of the SESLCM, these different types of connections represent connections between different layers in the model. So instead of characterising all connections between

companies in different angles, the SESLCM models different components of connections separately in different layers.

Figure 15 shows this illustration in the years from 1990-1996. It can be observed, that the entrepreneurial landscape was very sparse in this early generation. Only 11 companies were founded in that era, and connections between the companies were barely present resulting in a rather isolated environment instead of an interconnected ecosystem.

Figure 15: The structure of the Buenos Aires entrepreneurial ecosystem in 1996. [World Economic Forum, 2014]

Figure 16 illustrates the ecosystem in 1999. It can be observed that 15 companies have been founded in the years from 1997 to 1999. It can be seen that, even though companies mainly operated in isolation, a variety of new types of connections between companies (especially between generations) were established. In this era, companies which turned out to be of significant relevance later were founded in the areas of fintech (financial technology) and e-commerce. Many of the founders of those companies made their first steps into the ecosystem after coming back from attending universities in other (much more advanced) ecosystems (mainly in the US) and entered into the SES with templates and experience from those systems. The whole ecosystem can be characterised as emerging at this point, since strong connections between different companies are establishing.

Applied to the SESLCM, this would be represented by high on-layer connections. So connections and communities had formed between entrepreneurs, investors and other components of the SES.
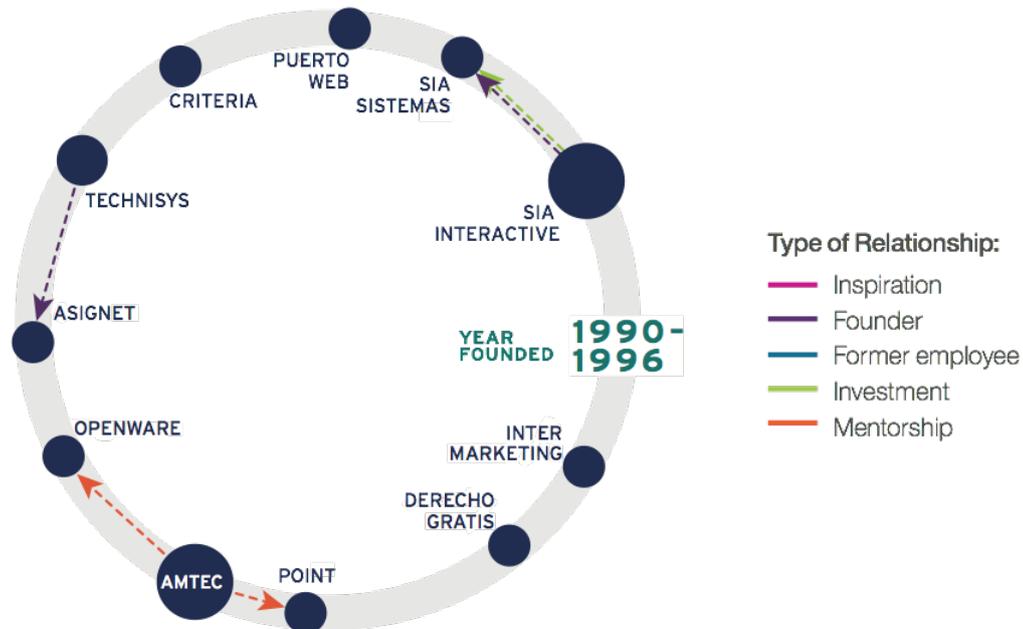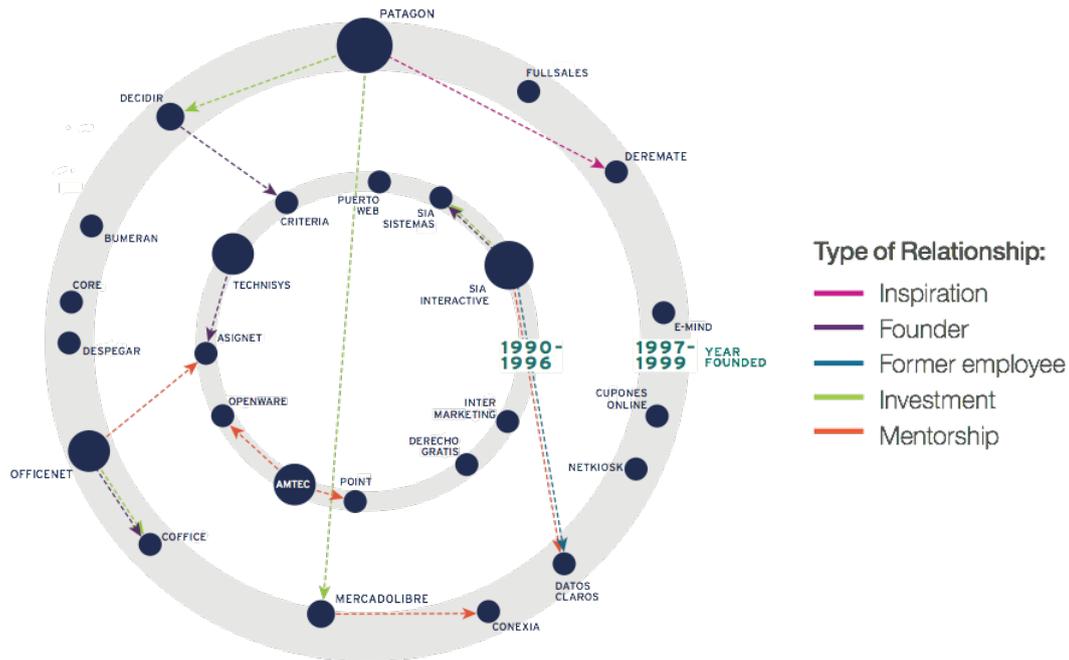
Figure 16: The structure of the Buenos Aires entrepreneurial ecosystem in 1999. [World Economic Forum, 2014]

Figure 17 captures the situation in 2006 after the third generation of startups in the SES (2000-2006). It can be seen, that the ecosystem had evolved from an isolated character to an interconnected network with diverse influences of different companies on each other. As it can be seen in the graph diagram, *Patagon* and *Officenet* became centrally connected startups in the ecosystem and influenced a variety of other companies through mentorship, investments or inspiration. These companies had become increasingly successful and important, and therefore supported the entire ecosystem in different roles. In 2000, a majority of the shares of *Patagon* where sold at a 1 billion $ valuation and *OfficeNet* and parts of *MercadoLibre* where acquired by US companies. These acquisitions now had major spillovers on the ecosystem triggering a so called *virtuous circle*. Now not only could companies support others in the ecosystem, but also a lot of smart capital was pumped into the ecosystem and therefore benefiting major players in it. In terms of the SESLCM, at this point in time, strong inter-layer connections started to form. Figure 18 now illustrates a model of the Buenos Aires ecosystem in 2011. The ecosystem had now developed to a flourishing and well established SES, with major players and highly complex interactions between companies of the same and different generations. The founders of companies such as *Patagon* or *OfficeNet* had become major players, leaders and drivers of the ecosystem and spillovers to new generations of startups encouraged entrepreneurial spirit, culture and other components of the SES. What is very interesting and worth mentioning here is that startups of the first generation of the SES could not become very large or land major exits. Nevertheless, these companies and all people involved laid the foundation for all later development and success of other startups.
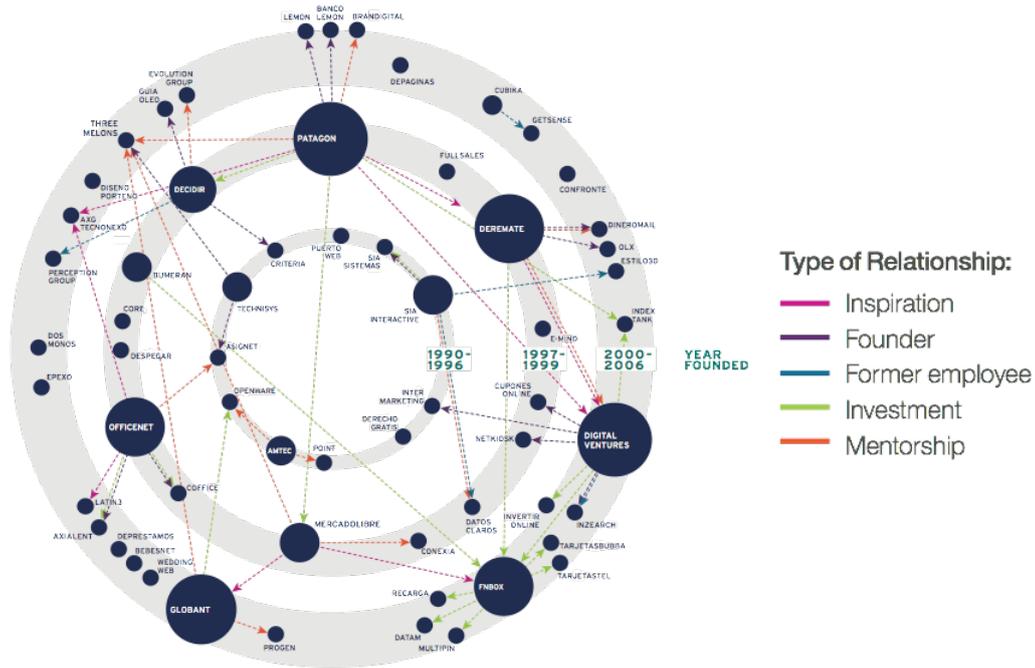
Figure 17: The structure of the Buenos Aires entrepreneurial ecosystem in 2006. [World Economic Forum, 2014]

As it can be observed when looking at this example of a developed SES, the connections between companies are very complex and diverse. Please note, that this representations only pays attention to the interconnection between companies in the ecosystem without considering additional connections with other components such as universities, governments, service providers or markets. This greatly demonstrates the complexity of entrepreneurial ecosystems in an advanced state.

The case of Buenos Aires gives a great example for how an ecosystem is developed and how it's structure changes with it. Figure 19 shows the number of startups over time in the above described generations. Positive spillover effects from successful entrepreneurs can be clearly observed as the growth of the number of startups increases on recent decades. By the end of 2011 over 140 startups had been founded, exits of several 100 M$ had happened and massive risk capital from international market had been attracted in an only 15 year old SES. The illustration also shows major milestones regarding other components of the SES, such as the launch of incubators, major international tech-companies opening branches in Buenos Aires or demographic changes, such as the creation of tech-districts in the city.
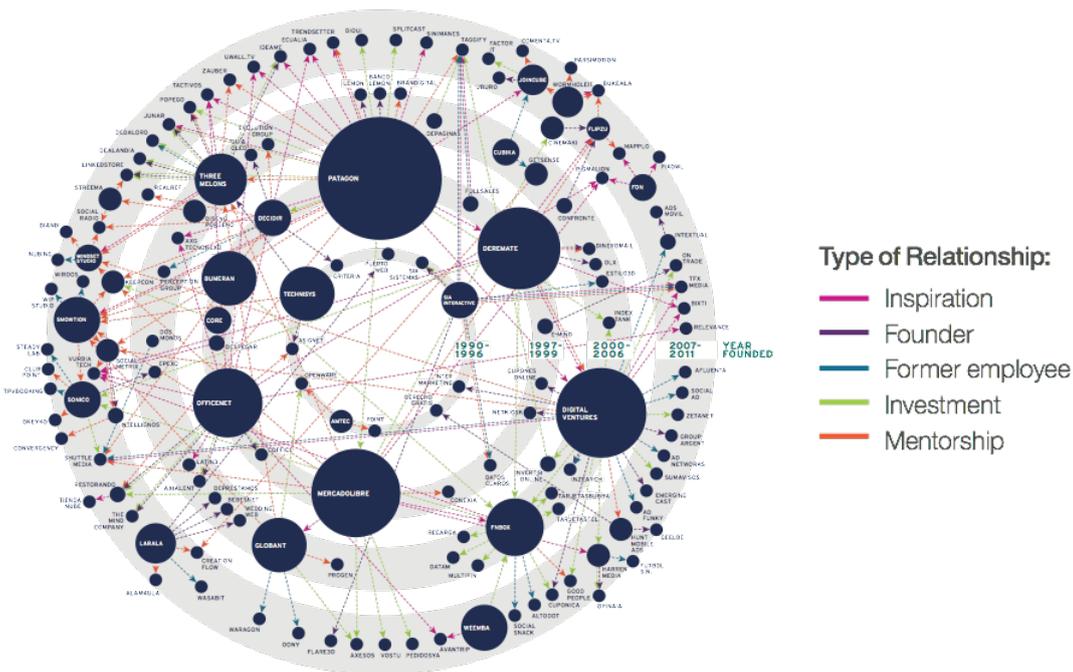
Figure 18: The structure of the Buenos Aires entrepreneurial ecosystem in 2011. [World Economic Forum, 2014]

2.5.6 Case Study - The Saint Louis SES

Another great example of the importance of connections within a SES is an analysis performed by the Kauffmann Foundation in [Motoyama et al., 2014]. This study analysed the structure of the Saint Louis (MO, USA) SES when specifically focusing on the connection between components in the ecosystem. Following the same approach as illustrated in this work earlier, the paper highlights the importance of understanding the structure and network of an SES given through it's internal connection and it's development over time. The study illustrates this on the practical example of an existing SES.

The authors conducted an analysis by tracing (mainly) connections between startups and other components from a defined starting point in the development of the ecosystem over time. This starting point was given by the creation of *Arch Grants*, a nonprofit cooperation organising business plan competitions and giving out grants to the winners of this competition.

Taking the first grant of this support as a reference starting point of the SES, the development and connections of Arch-Grant recipients was analysed over time to gain deeper insights into the structure of the SES. This was done by conducting interviews with different members of different organisations within the SES.

Number of companies
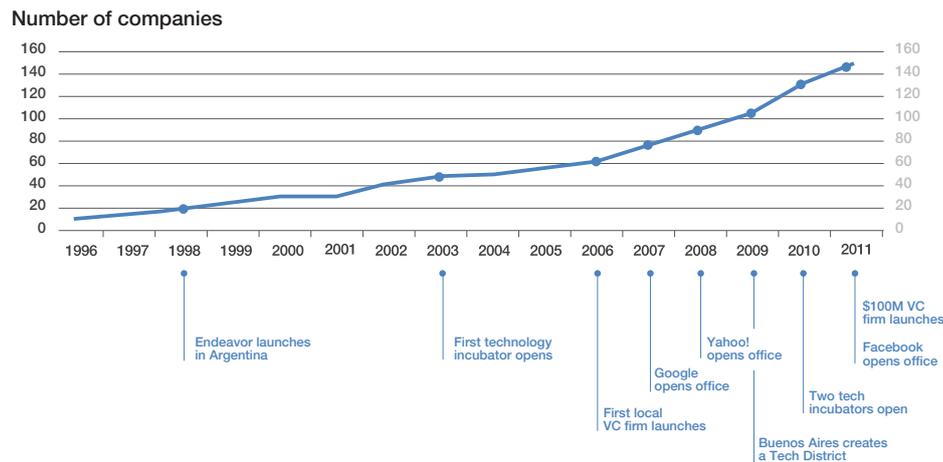
Figure 19: The development of number of startups in the Buenos Aires SES over the considered 4 generations including major milestones regarding different components of the ecosystem. [World Economic Forum, 2014]

During this analysis, the authors discovered four main types of connection in the ecosystem:

- **Connections Between Entrepreneurs**: This type of connection was discovered between different kinds of entrepreneurs across verticals, startup stages and levels of experience. These connections are mainly about learning from each other, giving feedback and perspective as well as sharing advice and experience.

  Figure 20 illustrates connections of this type between targeted recipients of the Arch-Grant. It can be observed, that most of the entrepreneurs showed periodic (when not necessarily dense) interaction with other entrepreneurs in that target group. Further the authors describe the forming of community of entrepreneurs, where interaction happens frequently and feedback is given on progress. This form of community building of similar components in the SES is exactly described by on-layer-connections in the proposed SESLCM and therefore models this situation well. In contrast to this, it can be seen that some entrepreneurs seems badly connected or isolated to this forming community.

  To describe this community and relationships between founders, the authors quote an entrepreneur in their interview as [Motoyama et al., 2014]:

  > These interactions created an environment in which they not only could learn from their peers, but also support each other emotionally through the rough and uncertain journey they, as entrepreneurs, were facing.

- **Connections Between Support Organisations**: The second type of connection discovered appeared between support organisations in the ecosystem. This covers any form of connec-

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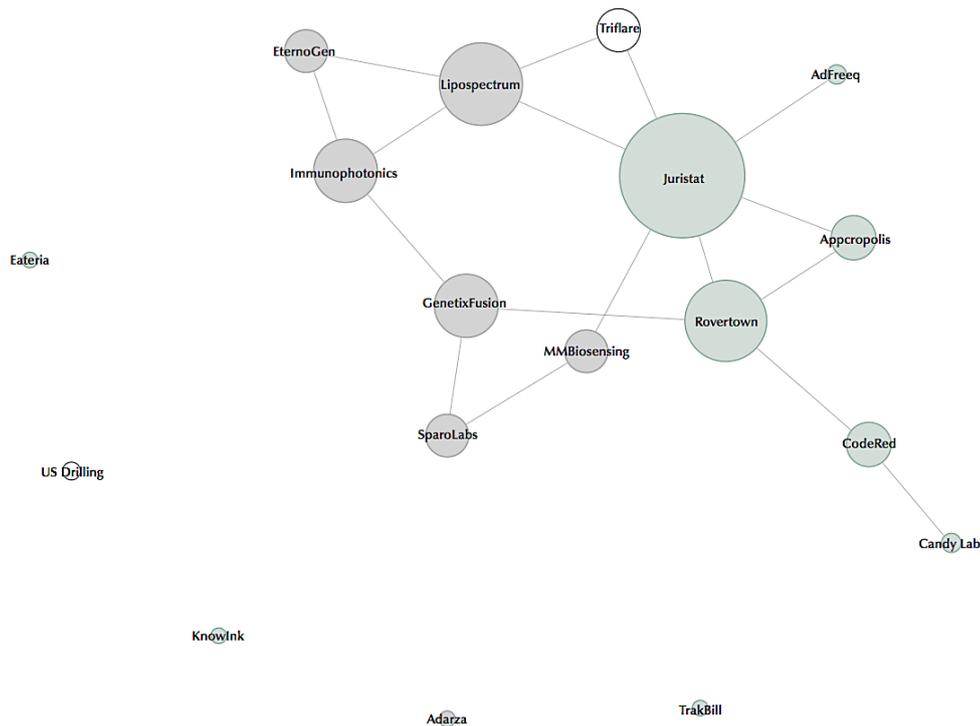
Figure 20: The structure of connections between entrepreneurs in the Saint Louis SES [Motoyama et al., 2014]. Different colours indicate different industries.

tion or collaboration of support organisations of very different types, where the authors draw no differentiation between the (potentially) diverse organisations and individuals. It could be observed that the characteristics of connections between this support organisations exist in many different types and change dynamically based on a variety of factors. Interestingly, the study shows, that these connection are not loose and casual but turn out to be very strategic and functional with the goal of providing coordinated support when services only overlapping intentionally.

Figure 21 illustrates these connections between support organisations. It shows that support organisations themselves are well connected to one another. These connections clearly map to on-layer connections in the SESLCM of a different layer with the difference, that the SESLCM does not contain a layer for all support organisations, but distinguishes between several types of such components (and therefore layers).

- **Connections Between Entrepreneurs and Key Support Organisations**: This covers any type of connection between an entrepreneur and any form of support organisation of great relevance to both sides. The authors discovered two support-types present: On one hand, the *broad types* include support in the form of mentoring of providing network, whereas the *financial and functional types* circle more around topics such as business model assistance
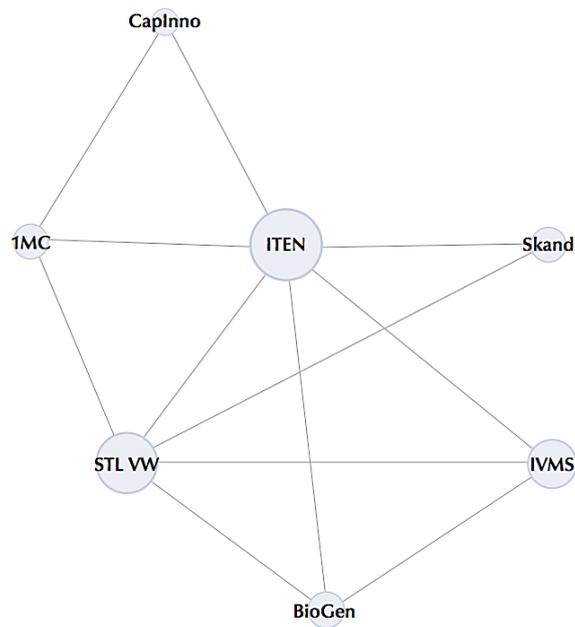
Figure 21: The structure of connections between support organizations in the Saint Louis SES [Motoyama et al., 2014].

of pitch practices.

This type of network, as illustrated in Figure 22 can be seen as a combination of information provided in Figure 20 and Figure 21 showing any connections between entrepreneurs and support organisations. Interestingly, the study shows, that even entrepreneurs that appeared isolated from other entrepreneurs (Figure 20), are modestly connected to other entrepreneurs through one or more support organisations.

This phenomenon directly correlates with inter-layer connections as described in the SESLCM and illustrates the high complexity of the network in an SES as a crucial requirement of it's success.

- **Miscellaneous Support Connections**: Finally, this last connection type describes any other form of connection in the ecosystem. This forms a very heterogeneous set of connections in terms of components as well as type and intensity of the connection itself. Examples for such connections are informal mentoring provided by peers and senior entrepreneurs as well as casual referrals by well established companies.

The authors mainly discovered mentorship and startup events (=the connections to the corresponding organisations) as valuable components falling in this category. The SESCLCM
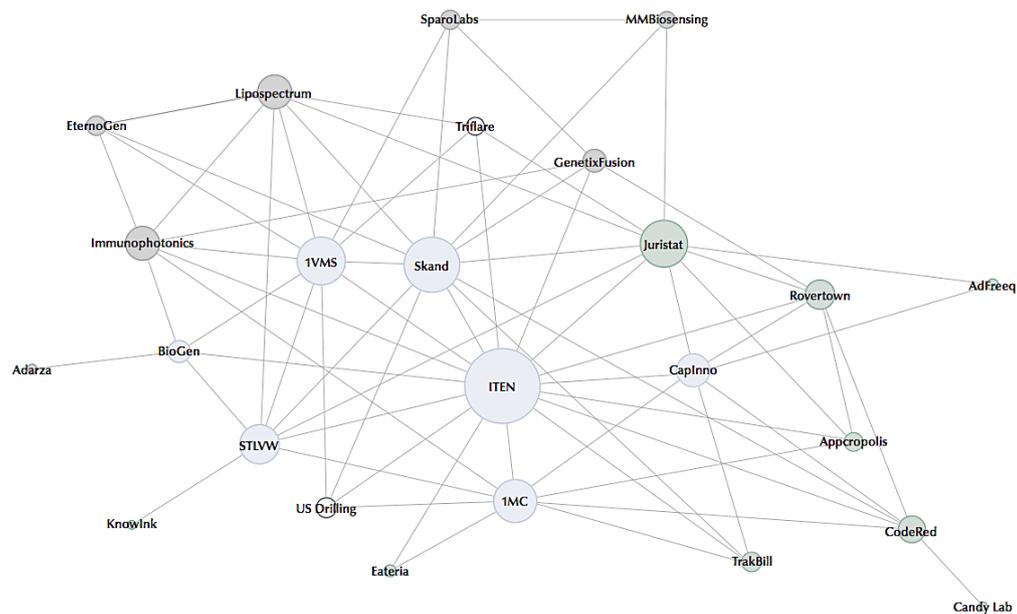
Figure 22: The structure of connections between support organizations and entrepreneurs in the Saint Louis SES [Motoyama et al., 2014]. Different colours indicate different industries.

supports this idea of having several different layers beyond entrepreneurs and support organisations present in a SES. In the SESLCM case this is modelled by additional layers of components with on-layer and inter-layer connections.

Even though the importance of the structure in the SES and it's development over time is highlighted by the authors, the study does study does not focus on how the discovered types of connections evolve over time and what this implies for the whole SES. This whole aspect is considered in the SESLCM in great detail.

2.5.7 Case-Studies Conclusion

In summary, both of the covered case-studies clearly show the significance of the internal structure of a SES in order to be able to understand and predict it. Further, both case studies have shown that a defining characteristic for the internal structure is given by the presence and types of connections between components of the ecosystem. It has become clear, that these connections can exist between components of the same or different types and can therefore be classified into two groups. In addition, it could be observed that these connections firstly tend to form between components of the same type (=community) and then further spread out connections with other types of

components.

All of these observations in real SES validate the basics assumptions the SESLCM is based on.

2.6 The Top Existing Startup Ecosystems

After discussing SES components, developments and characteristics in theory, this chapter is designated to provide an overview over existing ecosystems and their ranking and characteristics. It will cover some of the world's top performing and top-emerging ecosystems and give an overview over strengths and weaknesses. The chapter finally ends with conclusions on interesting finding when ranking different SES as described by the organisations performing the bench-marking.

2.6.1 Ranking

There exist different organisations performing analysis and ranking of different startup ecosystems. This chapter will focus on the ranking as presented in the *Global Startup Ecosystem Ranking 2015* [Compass, 2015] due to it's up-to-date data. The criteria this ranking is based on are [Compass, 2015]:

- Performance: Performance on the funding and exit valuations.

- Funding: How much can VC funding be raised and how long does it take to raise it.

- Talent: Quality, availability and cost of technical talent.

- Market Reach: Size of the local ecosystem GDP (Gross Domestic Product) and changes for internationalisation.

- Startup Experience: Experience of founders in the ecosystem that is linked to success of startups.

Figure 23 shows the ranking of the top 20 SES globally as well as their ranking in each of the five described categories. It further shows their previous ranking conducted in 2012 as an indicator for growth in the ecosystem.

The ranking clearly demonstrates the sophistication of well known SES such as Silicon Valley or New York, but also shows some interesting emerging SES such as Berlin or Bangalore with great growth potential. Further, newcomers in the ranking, such as Austin or Amsterdam illustrate that it is possible for less known ecosystems to evolve and perform extremely well.

	Ranking		Performance	Funding	Market Reach	Talent	Startup Exp.	Growth Index
Silicon Valley	1	◄	1	1	4	1	1	2.1
New York City	2	▲ 3	2	2	1	9	4	1.8
Los Angeles	3	◄	4	4	2	10	5	1.8
Boston	4	▲ 2	3	3	7	12	7	2.7
Tel Aviv	5	▼ 3	6	5	13	3	6	2.9
London	6	▲ 1	5	10	3	7	13	3.3
Chicago	7	▲ 3	8	12	5	11	14	2.8
Seattle	8	▼ 4	12	11	12	4	3	2.1
Berlin	9	▲ 6	7	8	19	8	8	10
Singapore	10	▲ 7	11	9	9	20	9	1.9
Paris	11	◄	13	13	6	16	15	1.3
Sao Paulo	12	▲ 1	9	7	11	19	19	3.5
Moscow	13	▲ 1	17	15	8	2	20	1.0
Austin	14	NEW	16	14	18	5	2	1.9
Bangalore	15	▲ 4	10	6	20	17	12	4.9
Sydney	16	▼ 4	20	16	17	6	10	1.1
Toronto	17	▼ 9	14	18	14	15	18	1.3
Vancouver	18	▼ 9	18	19	15	14	11	1.2
Amsterdam	19	NEW	15	20	10	18	16	3.0
Montreal	20	NEW	19	17	16	13	17	1.5

Figure 23: Overview over the ranking of global SES [Compass, 2015].

2.6.2 Findings

The *Startup Ecosystem Report 2015* [Compass, 2015] provides a great level of insight into the global situation of startup ecosystems and how they compare to each other. Especially the comparison over time to the past ranking in 2012 (performed by the same institution) makes it a powerful indicator for future developments and gives great insights. The following provides a short fraction of the key insights as published in [Compass, 2015] related to the ranking of the top 20 SES in the previous section.

- All 20 SES grew in number of startups over the last few years.

- Top geographies are North America and Europe (16/20)

- Silicon Valley dominates the ranking with being #1 in 4/5 categories. The only category where it is not ranked #1 is *Market Reach*.

- SES in Asia have grown significantly (Singapore and Bangalore)

- Silicon Valley has captured 47% of the total global startup exit values. Nevertheless, SES other than Silicon Valley have gained 14% of total exit value over the last three years.

- SES other than Silicon Valley (further down in the ranking) show tremendous growth rates. Examples are Berlin (x20) or London(x4).

- Exit value in Europe SES grew very strong (x4,1) compared to North American ones (x1,5).

- Total VC investments across the 20 SES rose 95% from 2013 - 2014

To conclude this ranking, it has to be stressed that this evaluation does neither consider internal structure of the SES, nor put the SES in a development perspective or carry any information about it's past and future development. Even though this ranking provides great insight, this is what motivates the creation of the SESLCM.

3 Venture Capital and Risk Capital

This chapter deals with funding sources and possibilities for startups, when focusing on risk capital sources for high growth ventures. After giving a general overview of different risk capital types and sources, the chapter specifically focuses on *venture capital* (VC), the structure of VC companies and funds as well as different types of VC funds and their characteristic. It is intended to provide a basic understanding of the parts and players involved in venture capital, as well as the process of venture capital investing and business models and structural dynamics behind it. As the topic of venture capital is closely related to many highly interesting topics such as decision theory, startup valuation or investment theory and practise - this chapter aims towards delivering a basic understanding rather than elaborating on each of these highly interesting fields.

3.1 Introduction

As mentioned in prior chapters of this thesis, high growth ventures have very specific requirements in many different fields often divergent from those of traditional businesses. The probably most significant of those differences are formed by the requirements in terms of financing. While traditional businesses can finance themselves and their growth through their own revenues or other forms of traditional financing such as bank loans, these options mostly don't meet the capital demand and risk structure of startups. Therefore, these ventures rely on risk capital sources such as venture capital funds, business angels or public funding sources. The following chapter deals with types, structures and functioning of such funding sources.

3.1.1 Definitions

Firstly, this section briefly establishes basic definitions for the terms used throughout this chapter. This will allow to agree on simple and basic definitions of words commonly used in various different fields and contexts.

- **Capital:** The term *capital* is widely used in different contexts and it's meaning can vary. In this chapter, the term is used to describe wealth or financial resources available for investment [Investopedia, 2015a] Dictionary [2015].

- **Investment:** Similarly to capital, the term *investment* can be used in various different ways, in this thesis we would like to agree on a very basic definition of investment as a monetary asset that is purchased in hope/expectation of increase in wealth or future income or appreciation that can be derived from it [Investopedia, 2015b].

- **Risk Capital**: Capital available for investment with an extraordinary high level of risk involved in the investment process. Please see chapter 3.3.1 for a more detailed definition.

3.2 Company Funding Sources

Every company needs to keep it's business up and running and produce profits for it's shareholder in the future. To fulfil this requirement, capital is required to execute different tasks. Providing the capital required to do so from various different sources is called funding. There are many different types of sources for capital which can be classified into four groups based on the two classifications dimensions: **capital origin** and **capital ownership** [Wöhe et al., 2002].

3.2.1 Capital Origin

The classification in the dimension capital origin defines where the capital comes from in two distinct options. On one hand, **external funding** is sourced from outside of the organisation or company. So independent from the type of funding, a party external to the company (outside of the firm) has to provide the capital. In contrast to that, **internal funding** describes a funding source, where the capital is provided by the company itself resulting from it's operative activity. Therefore, a strong property of internal funding is the fact, that no external party has to commit capital to the company [Wöhe et al., 2002].

3.2.2 Capital Ownership

In contrast to the previously discussed source of capital, the factor of **capital ownership** defines who owns the invested capital. In general, we can distinguish between two different forms here: Firstly **debt funding** is a form of funding, where the capital is owned by an entity other than the company itself and has (under certain conditions) to be paid back. Secondly, in the case of **self funding**, the capital is owned by the company itself and does not have to be paid back. Even though one might think this definition is tightly related to (or even the same as) capital origin (where e.g. external funding is automatically debt funding) in practice there exist forms of capital sources which proof otherwise as described in the following [Wöhe et al., 2002].

3.2.3 Resulting Funding Source Types

Based on the defined classification of funding sources in the explained dimensions, there result the following four general types of funding, which are illustrated in Figure 24 [Wöhe et al., 2002]:

a) **External debt funding**: In this rather straightforward funding source type, capital is provided by external parties and has to be paid back under certain conditions. An example of such a funding is a **bank loan** granted to the company.

b) **External self funding**: Methods of this funding type are characterised by external parties providing money, which is then converted to property of the company. Such a method would be any form of **equity investment** where equity in a company is bought by an external party such as a business angel or venture capital firm. In such a transaction, the investor provides the company with capital in exchange for a certain amount of equity (=share in the company) according to the companies current valuation. As soon as the transaction is completed, the investor becomes a shareholder in the company, whereas the exchanged money is now in possession of the company. Note that the described scenario is not equivalent to the transaction of equity in a company from one shareholder to another. In this case, the transferred money is, of course, in possession of the selling party. In the described scenario, (dependent on the legal instance of a company etc.) new company shares are issued in order to provide equity for the new shareholders. Dependent on applicable regulations, existing shareholders might face dilution of their shares in the company.

c) **Internal self funding**: In the case of internal self-funding, money in possession of the company is internally provided to fund certain business activity. An example of a funding method in this category is provided by **reinvestment**, where profits (rather than being paid out to the shareholders) is held back to enable the targeted investment. Other examples for such a funding type include sale of company assets (e.g. buildings etc.) or funding provided by the existing shareholders of the company.

d) **Internal debt funding**: A case of internal debt funding is given, if the company internally allocates capital resources for an investment, where the capital is not owned by the company. An example would be facilitating **credit terms** (payment to supplier is e.g. delayed a certain time) to fund other business activities.

Based on the situation of startups, most of the above mentioned funding options are rarely available. Firstly, high growth ventures very unlikely produce profits in their first time of existence due to their focus on growth or uncertainty about their exact product or market. Therefore, forms of internal funding are barely an option. Secondly, due to the high risk of startup ventures, external debt funding is barely available. Institutions such as banks providing such funding, are generally not able (and supposed to) to deal with the implied high risk of losing the invested money. Therefore,
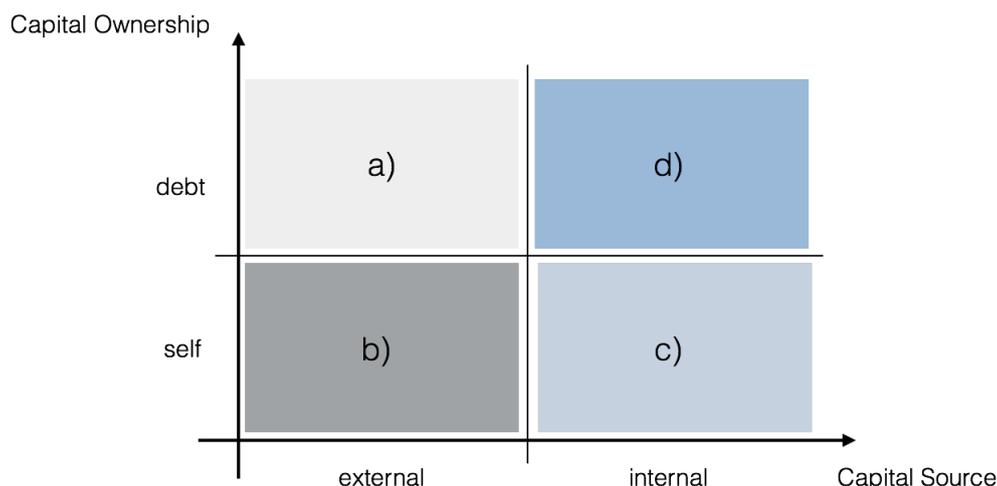
Figure 24: Different types of company funding sources by the dimensions *funding source* and *capital ownership*.

conventional forms of external debt funding are mostly not an option. These circumstances leave the main option of internal self funding by seeking investments from external investors, which is the main funding source for startups especially in early stages. These investors deploy capital in exchange for equity while expecting the value of the company (and therefore their equity stake) to dramatically increase in the future. These investors must accept and deal with the high risk involved in their investments and increase likelihood of their investment to pay off by setting a variety of measures depending on the investor-type.

The following focuses on this external self funding option for startups, characteristics of investments and the involved parties and implications for both sides of the deal.

3.3 Risk Capital

Having explained the basic types and differentiations of funding, this chapter deals with the term *Risk Capital*, it's definition and common forms of it. It covers the most common forms of risk capital sources as well as some context and their basic characteristics. This is intended to provide a rough overview over different risk capital forms and their properties in practise and therefore form the basis of context for further discussion on venture capital itself.

3.3.1 Definition

Risk Capital can be very simply defined as capital available for investments with an extraordinary high level of risk involved. This risk mainly refers to the the increase of value of the investment and therefore a return (rather than on interest rates etc.). So the investor faces a great risk of loosing the invested capital (decrease in value) in contrast to a usually very large opportunity of great returns. This great opportunity justifies the risk and therefore the investment in the first place.

Traditional and modern investment portfolio theories usually encourage a certain (small) portion of the portfolio to be high risk investments and seize the opportunity that lies in it. Most risk capital sources/providers as discussed in this chapter do not only facilitate risk capital as a small portion of their investment portfolio, but are specifically oriented towards high risk investments and dealing with the related risk and opportunity. Even though investment risks might vary within the portfolio, all investments can be classified as very high risk investments.

Even though there exist a great variety of risk investment types, investments in high growth startup companies form a respectable area within this field. This section will exclusively deal with risk capital in the context of startup funding.

In this context, a set of basic distinctions can be made which are illustrated in the following sections.

3.3.2 Common Forms of Risk Capital

As previous considerations of risk capital are rather abstract, this section will present common forms of risk capital sources for startups as well as some characteristics. Further, examples describe the different risk capital forms and give specific ideas about it's characteristics.

3.3.2.1 Business Angels

Business Angels (BA) are commonly referred to as wealthy individuals who invest capital and their time/experience/mentorship in a startup. In contrast to any other investment source described here, business angels usually invest their own money rather than a raised fund of capital. The most unique characteristic about business angels is, that these individuals are usually experienced entrepreneurs or executives themselves, which allows them to provide very intensive and useful support for new ventures in various phases beyond the capital investment itself. This support can range from mentorship or introduction to relevant contacts to active involvement or taking over operative roles in the company.

Very commonly, business angels heavily operate in syndicates and business angel networks. This mainly has the advantage of being able to distribute a BA's money among multiple investments and companies (and therefore deviate risk) while being able to provide sufficient funding for all portfolio companies.

It has to be noted, that the investment process when raising from business angels also greatly differs from venture capital sources. As business angels invest their personal capital, they are not bound to any investment process and can act much quicker compared to other investment sources. In addition, the due-diligence performed by BAs is commonly way more casual and investments can be closed way more straightforward compared to other risk capital providers.

> **Example**
>
> In this example, we consider the business angel BA who has been an entrepreneur herself and recently exited a company she founded to a large competitor in the pharmaceutical industry. After the transition phase of the M&A process (the process of merging with or getting acquired by another company), BA decides to quit working with the company and invest her profits and personal capital in very early stage startups. She starts attending startup related events in the city and leverages her network to get referred to prosperous entrepreneurs. She primarily focuses on startups near here as she want's to stay in high contact with the founding teams. After a few weeks, she has set up several meeting with entrepreneurs through the local ecosystem as well as her personal network. BA is particularly impressed by the ideas and personalities of founding team of startup *PheryTec* which provides software solutions in the area of pharmaceutical manufacturing. As BA really resonates with the vision of the founding team and feels she can provide impactful support and network to the company, she decides to invest 100k$ of her personal money in the startup. Since this does not cover the whole entire capital demand of the company at this point, BA leverages her network to bring another business angel on board. Together, they provide the required funding for the startup. As the company is in a very early stage, BA receives a considerably large amount of equity comparable to one of the founder's shares and takes over an operative role in the company. She is mainly responsible for sales and distribution through her well established network in that industry. BA is aware of the risk involved into investing in such an early stage and put's her personal time and effort into the company to maximise *PheryTec*s chances for success.

3.3.2.2 Venture Capital

In contrast to the previous discussed capital type, Venture Capital provides an institutional investment source. A VC company raises a certain amount of money (fund) from other investors over a certain period of time, to invest into startups. The VC company itself takes over the responsibility

of managing the fund, investing it into promising companies, arranging an appropriate liquidity event and returning the profits of the fund to the initial investors.

As this chapter is dedicated to this very special form of risk capital, a detailed definition of the structure and process as well as many characteristics and considerations around the topic of venture capital are provided later in this chapter.

3.3.2.3 Debt Funding

Venture Debt funding provides another form of risk capital which provides debt capital to startups (usually venture backed). As usually, high growth ventures are very rarely fundable by traditional debt funding sources due to their risk profile, venture debt companies focus on crafting compensation models and terms which take this high risk into consideration and enable this kind of funding. To make this possible, in addition to a common interest rate and relatively short duration, options for obtaining equity in the venture is usually used as a warrant for the loan. Therefore the debt provider, as one of the common terms in a deal and under certain conditions, receives the right to obtain ownership (equity) in the company. This special clauses and conditions significantly transform the risk profile of the company and therefore make a debt investment viable while offering benefits to both sides [Fellows, 2012].

Example

As an example, the startup *CRMatic* offers CRM software to providers to advertisement and related affiliate networks. The company raises 2M$ to build a sales force and scale to target customers. The company considers raising this capital in a conventional funding round as suboptimal, as the expected valuation a few steps ahead in the process is considered much higher as the sales force can provide strong validation for the planned customer acquisition channels and methods. The company decides to consider venture debt funding and approaches *VDFun* as a provider. They both agree on the terms of the financing. The terms include a interest rate of 15% as well as 2.5% ownership in the company. The provider further receives the right to obtain further equity as a warrant on the loan. the company receives the capital, builds up the sales force, meets it's expectations and is able to raise a further financing round at a quadrupled valuation 6 months later. Considering the total cost of capital, the company is able to reach it's milestones and funding goals at a much lower dilution of the shareholders which states a very beneficial situation compared to a funding round at an earlier point in time.

3.3.2.4 Public Funding

Public funding usually describes instruments and measures, a government facilitates in order to support it's startup ecosystem/overall economy and trigger future success and growth. Even though measures of public funding vary greatly between governments, common instruments include government loans, grants in different forms and warrants on other debt financing. We commonly see combinations of different instruments in this sector being applied in various public funding measures. Public funding is commonly used to compensate for the absence or weakness of certain components in a SES. So if, for instance, a local ecosystem is lacking very early stage investors, the government might decide to offer public funding to close this severe gap and put measures in place to incentivise angel investment in the region. Since the development of an angel investment scene might take time, public funding provides the funding source needed by local entrepreneurs as a temporary measure.

It further has to be noted, that public funding usually is not only provided to startups in the sense of high growth ventures, but commonly used to finance innovation projects in well established companies. In contrast to many other funding sources, public funding usually offers a formal application process that interested companies go through. So whereas raising capital from business angels or venture capital funds can't be done in a *standardised way*, any company can simply apply for government funding instruments when fitting the target profile.

Example

As an example, the Austrian startup *SecureMergant* offers an innovative encryption system for hospitals and external doctors to encrypt patient documents. The company applies for government funding to develop certain parts of the solution and get to a working prototype that can be tested with customers. After various different application phases, the Austrian government offers the startup a grant over 30% of the development costs as well as low interest rate debt funding for another 20%. The company accepts the offer, finds a business angel to finance the remaining 50% of the project and starts developing it's solution. After the prototype has been created, the company experiences great success on the market, pays back the government loan and creates hundreds of new jobs in the local economy.

Grants for public funding usually cover the funding of a wide range of expenses and activities such as office space, rent, external services or expert counsel.

3.3.2.5 Crowd Funding

As a last example for different types of risk capital, crowd funding has become increasingly popular over the past few years. The basic idea behind crowdfunding is, that a company or startup can raise money from a large number of individuals, each contributing a relatively small amount of capital. To ensure this works properly, an independent third party platform is facilitated to manage the fundraising process. Examples of such platforms are given by Kickstarter, Indiegogo, Seedmatch or Green Rocket. It has to be noted, that the form of investment (equity, loan, etc.), investment process and business models vary greatly among platforms.

In order to make an investment attractive, companies and platforms offer investors different forms of incentives. Possible forms of incentives are reduced prices on the product or participation rights in future profits.

Example

The startup *Notibike* offers a solution that notifies bike riders of incoming phone calls and messages while on the bike. Their core product is an alerting device, that can be mounted to the handle of the bike and lights up in different colours based on a pre-configured smartphone event. The company has developed the product and is ready for production. But it will cost *Notibike* around 200k$ to put the first 10000 units in production and get it out to customers. The company decides to launch a crowdfunding campaign on the *Kickstarter* platform to finance this production. The team creates marketing material to explain what their product does and starts the campaign. The investors on the platform do not actually get the chance to obtain equity in *Notibike*, but investors can purchase the product at a 30% discount (compared to the later retail price) and pay the price up front. The company is therefore able to fund the first production cycle without any equity dilution of the founders. Further the campaign creates great marketing side-effects for the company and orders for far more than the targeted 10000 units can be secured.

It is important to note, that different sources of risk capital are not equally available to startups of all stages. The availability of different funding sources usually highly depends on capital demand and development stage of the startup. Due to factors such as the implications of the fundraising process, the relationship between investor and portfolio company or the type of product itself, the number of legitimate funding sources for a startup are usually limited. [for Regional Policy, 2002]

As this thesis focuses on risk capital in the very exciting form of venture capital, this chapter will now focus on this specific type of funding source.

3.4 Venture Capital

As previous sections have covered risk capital in general and risk capital sources relevant for startups in particular, this chapter now focuses on a specifically relevant source of startup funding: venture capital. The section will deal with several internal and external aspects of venture capital and cover topics such as internal structure of VC, it's lifecycle and investment process as well as different components and stakeholders involved and their relation to one another. Further, this section covers the basic business model of venture capital and gives an overview over different types/classifications within VC based on the configuration of previously discussed components. The overall goal of this section is to provide a basic understanding and overview over how VC works and related implications for entrepreneurs.

3.4.1 Structure of VC

Venture capital companies are based on and operate in a tight structure of different players enabling it's business. This chapter gives an overview over this structure, the roles of participants involved and the relationships between the participants.

The general players in this structure are the following [Braun, 2013], [Schefczyk, 2006]:

a) **Venture Capital Fund**(VC-fund): The venture capital fund is a limited partnership of capital providers with the goal to invested in companies and produce a return on investment (ROI) for it's partners. The shareholders of a fund provide investment capital for the fund and therefore receive the right to participate in it's profits generating their ROI. Dependent on the type of fund (see later) the lifetime and other properties of this limited partnership may vary.

b) **Limited Partners** (LP): The investors (and therefore partners) in the venture capital fund are called limited partners. These individuals or organisations decide to, instead of investing directly in companies, join forces and invest in a fund (and ultimately in companies) together. The LP structure of venture capital funds can be very diverse whereas common limited partners include endowments (universities etc.), public pension funds (e.g. the *California Pension Fund*), corporate pension funds (e.g. IBM), sovereign wealth funds (e.g. governmental funds) or family offices (e.g. Rockefeller family investment fund). The limited partners don't participate in the operational business of the actual investments and take no responsibility or liability (LP) for the activity related to the investment of the venture capital fund.

c) **Venture Capital Company** (VC): The venture capital company is responsible for structuring the discussed limited partnership (fund) and deciding on/executing the actual investments. So the venture capital company raises the fund by searching and convincing potential LPs and setting up the structure for this limited partnership. It then searches for potential companies

and invests using the money aggregated in the fund. Dependent on the type of fund, the VC company further provides network and additional services to catalyse the investment in portfolio companies. More information about the activities and responsibilities of the VC firm is provided later in this chapter. It has to be noted that the VC company itself (or it's partners) don't necessary have to be LPs in the fund themselves. A separate compensation model for the VC company is in place and will be discussed later. Nevertheless, it is very common for founders or partners in the VC company to also contribute capital to the limited partnership and benefit from it's profits.

d) **Portfolio Companies/Startups**(PC): The portfolio companies are startups receiving investment by the VC firm. So they state the assets the LPs finally invest their money in, hoping for good performance and ultimately high returns. All companies a specific fund has invested in is called the funds (or the VCs) portfolio. As mentioned earlier, the VC fund invests in the startup in return for equity. Therefore the return on investment is generated by value increase of the company (and therefore it's equity) itself.

Figure 25 illustrates a simplified version of the so created structure between the above explained players. The arrows in this figure particularly illustrate the capital flow between the parties in chronological order of the investment process. 1) LPs put capital into a fund 2) The VC company takes the fund under management and 3) invests the fund in portfolio companies 4) The VC company crafts an exit and de-invests in the portfolio company 5) Capital + Performance of the fund is returned to LPs.
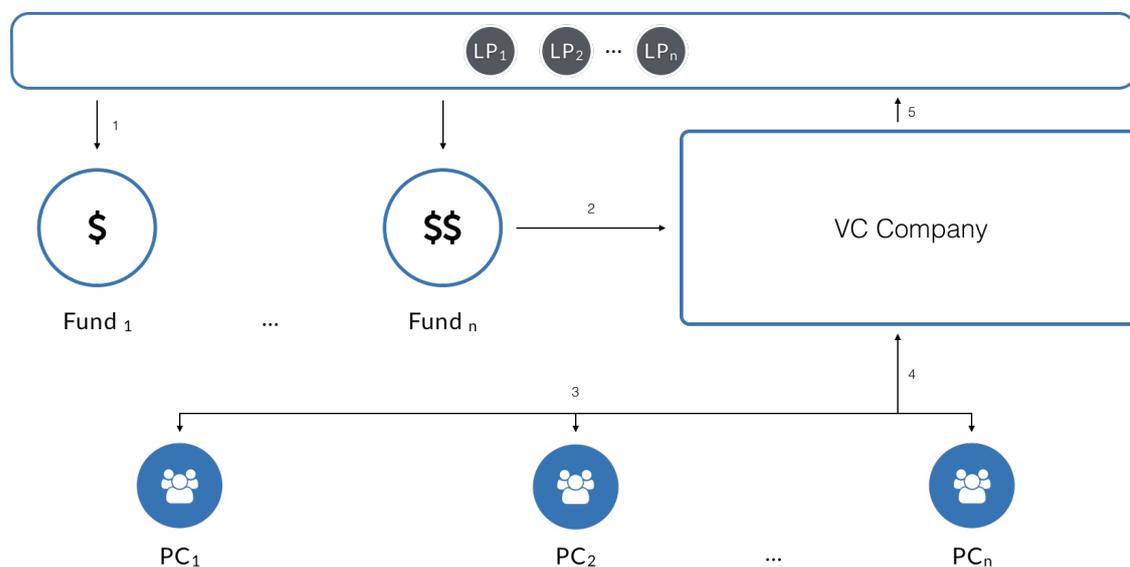

Figure 25: The structure and involved parties in a venture capital fund and investment process. Adopted from [Braun, 2013] and [Schefczyk, 2006]

To sum up, limited partners (under the coordination of the venture capital company) provide capital

and thereby form a limited partnership with the purpose of investing the provided capital. The venture capital firm raises and sets up this fund (=finding LPs and forming fund) and starts finding and executing investments in a portfolio of companies using the capital provided by the fund. So the fund owns equity in these companies and the venture capital fund performs operational tasks in order to invest the capital and take measures to increase the value of the portfolio companies and therefore the fund.

It further has to be noted, that the general partners of a venture capital company are very commonly LPs in the fund themselves. This commitment to the fund gives them the credibility and involvement to raise from LPs since it demonstrates that they deeply believe in the success and related returns of the VC fund. This investment of the GPs in the fund is generally referred to as **GP Commitment**. This commitment ensures a maximum of motivation on the GP side to maximise the returns of the fund, which is often essential for LPs. [Divestopedia, 2015].

Based on the explained parts of this structure, the following characteristics apply for the relationships between involved parties [Schefczyk, 2006]:

- **Limited Partner $\longleftrightarrow$ Venture Capital Fund**: The limited partner becomes part of the fund and participates in with a share proportional to it's relative capital provided to form it. The Limited Partner has a right to participate in the profits the fund generates (=increase in value + liquidation event) and is limited in it's liability for the fund. The LP is a passive party in the above described activity. LPs simply provide capital and cash out in case of certain events or points in time. Any other tasks necessary are carried out by the VC company. An LP might invest in different funds and might even be part of different funds of the same VC company.

- **Limited Partner $\longleftrightarrow$ Venture Capital Company**: LPs hand all organisational and management tasks off to the venture capital company. Further, the VC company raises the fund and approaches LPs with the offer to join. For all this activity, the VC company receives compensation, usually in the form of *Management Fees* (fixed part for running the fund) and *Carried Interest* (variable part as participation in fund success). More information about the compensation models for VC company services is provided in Section 3.6.

- **Venture Capital Fund $\longleftrightarrow$ Venture Capital Company**: The VC company is authorised to invest money of the fund with the goal of good *fund performance*. It performs additional tasks as described above to increase the probability of a successful portfolio. Even though this is possible, the VC company is not necessarily a LP of the fund it manages and does not necessarily participate in it's success (exception: carried interest and other variable compensation models).

- **Portfolio Company $\longleftrightarrow$ Venture Capital Company**: The VC company invests in prosperous companies and provides capital, network and know-how in return for participation

(usually an equity stake in the company) and control (making sure the VC has influence). So the portfolio company receives capital to build up or expand the business and (dependent on VC company) gets access to additional resources supporting and accelerating the venture. In return, the VC (or fund) is shareholder in the company and therefore participates in it's success (especially in case of a liquidity event) and gains a certain level of control over the company. So the VC makes sure, it can influence the development of the business to a certain degree and control the development of the investment. Usually, this is expressed by special control rights and a seat in the board of directors. Dependent on the term-sheet and specific deal, the VC receives a considerable amount of control over the portfolio company.

It has to be noted that the portfolio companies are usually never confronted with the LP of a fund. The LP is a pure financial investor, investing capital and gaining profits (or carrying losses). All management of the fund and activities such as generating deal flow, evaluating companies, performing due diligence, negotiating shareholder agreements or providing network and advice for the entrepreneurs are executed by the VC company. So even though the capital provided is (mainly) not provided by the VC company, it acts as if it was when in the background being compensated for it by LPs.

3.4.2 Organisation of VC Companies

After having discussed the general structure of a venture capital company in terms of it's funds and the relation between acting elements of the company, this section gives a short overview over how venture capital companies are usually organised in terms of staffing and the organisation system of people working for the company.

Even though we can observe many different forms of venture capital firm organisations in practise, a majority of companies is organised in a very specific way as described in this chapter.

In general, VC companies tend to be organised in a very democratic way. Based on the hypothesis that groups of well informed people make better decisions than any individual within that group, VC companies tend to operate and make decision in groups of people or committees. People with similar (or the same) roles in such a company form those committees and make decisions using democratic processes within this group. [Bussgang, 2010]

We can distinguish the following roles within a VC company [Vinturella and Erickson, 2013]:

- General Partner/Partner: Is the most advanced position in a venture capital company. General Partners make final investment decisions and take board member positions in portfolio companies. Many times (especially in relatively young companies), general partners will also be shareholders in the company itself. General partners will (mostly likely) raise

funds of the VC company and manage and operate the company as the most experienced investment professionals in the company. [Bussgang, 2010]

- Principal: Principals are young investment professionals striving to become managing partners. At this level, they perform required analysis and research for general partners to base their decisions on and conduct due diligence on companies of interest to the general partners. Principles might be able to make recommendations about investments without ever making the investment decision. [Bussgang, 2010]

- Associate: Associates are the least experienced people in a VC company. They assist principals and general partners in their job and perform research and analysis tasks. Associates are usually not included in the investment decision process whatsoever. [Bussgang, 2010]

- Entrepreneur in Residence: An EIR can not really be considered an employee of a VC in a conventional sense. EIRs are people engaged in entrepreneurship (founders, ex-founders, startup CEOs or executives etc.), which enter a partnership with a VC. The expressed goal of this partnership is to either start a company in a specific space ((co-)founded by the EIR, backed by the VC) or take over a executive (or CEO) role in one of the VCs present or future portfolio companies. Activities of the EIR while still holding that position are providing ongoing support for portfolio companies without taking on a position in the organisation, helping with the due diligence process and providing domain expertise. The position of an EIR is never permanent since the goal of the relationship is to either start a new company or become an executive in one . [Bussgang, 2010] [Kane, 2014]

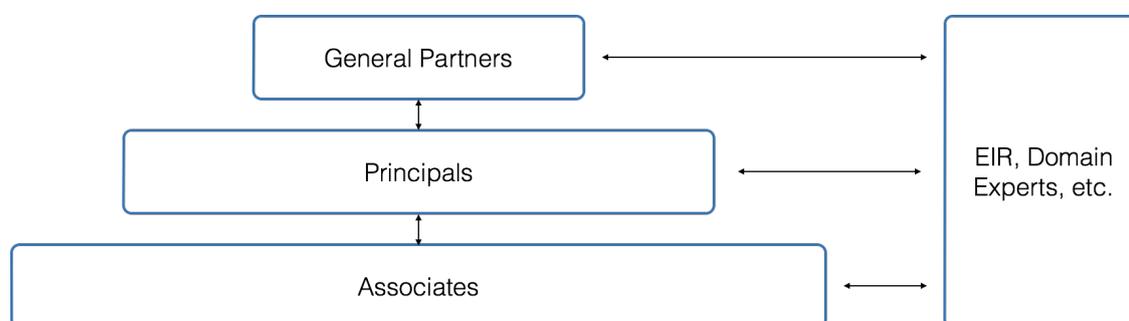Figure 26 illustrates the described components and relations of roles in a VC company.

Figure 26: The generic organisations of VC companies with distinct roles and based on democratic principles.

3.5 The Venture Capital Process

As explained in previous sections, the business of venture capital consists of raising a fund from LPs, investing the capital in startups and selling the equity at a higher value at a later point in time in order to produce profits for the VC company itself and it's LPs. This repeated process, the *Venture Capital Process*, can be classified into the following phases as illustrated in Figure 27.
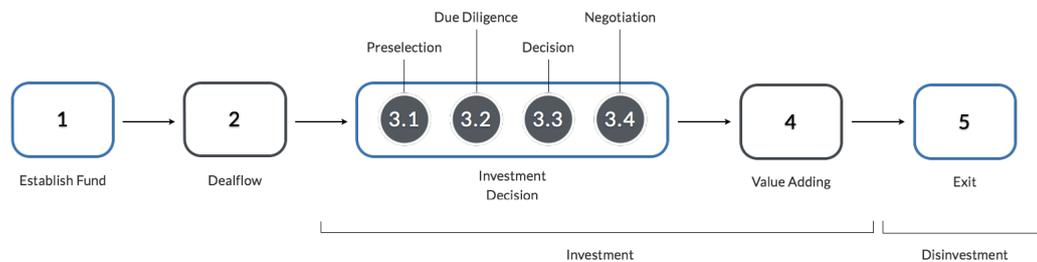
Figure 27: The repeatable venture capital process illustrating it's main phases. Own illustration inspired by [Tyebjee and Bruno, 1984]

It can be observed that the process takes place in several stages, where the stages can be classified into three major categories. In the first phases, the fund is established and conditions required to screen and execute investments are set up. After this initial step, the *investment* phases describe steps involved in investing raised capital. The final step in the process is determined by *de-investment*. Therefore it is characterised by liquidation of acquired assets and the payout to LPs and VCs. So at a very high level view of venture capital, the process is represented by establishing a fund and investing and de-investing in equity assets in a repeated process.

The following sections describe each of the illustrated phases of this venture capital process in more detail and gives examples based on a fictional venture capital company in this process.

3.5.1 Establish Fund

The whole process starts with the gathering of the required capital. To do this, the VC company defines characteristics like industry focus (e.g. fintech, SaaS etc.), investment stage (e.g. seed, first, etc.), regional focus or life-time of the fund. Based on these principals, the fund is raised from the LPs and the limited partnership, as described before, is formed. The focus is important, since the LPs might themselves have investment preferences, based on which they invest in funds. For instance, an investor might be interested in investing in a specific industry or prefers a risk profile that makes early stage investments difficult. The size of the fund, it's characteristics (lifetime etc.) and size express basic strategic decisions of the VC firm and can be adapted to external circumstances such as presence of high quality startups or macroeconomic conditions.

Example

Three previously successful entrepreneurs decide to form a venture capital company (*ExCapital*) and start investing in startups in addition to their business angel activity. Therefore, they form the company and now need to raise a fund. All three partners therefore leverage their networks to address wealthy individuals, pensions funds and other LPs. Prior to and during the fundraising process, they define the fund to have a lifetime of 8 years, be focused on startups in the area of financial technology and IT security, focused on seed-stage investments with investment tickets up to 1 M$ and startups in the US. These parameters are based on the partners preferences, knowledge and network as well as on preferences of the addressed LPs. After a fundraising time of 6 months, they establish a fund of 100 M$ and form a limited partnership with their VC company as general partner.

3.5.2 Deal Flow

In this phase, the primary goal for the VC company is to create a continues stream of companies interested in being funded by the VC company (the so called *Deal Flow*). The more companies approach the VC company in need for funding, the higher the chances for the VC company to make a great deal. Establishing such a stream can be done in a proactive or reactive manners dependent on the strategy and situation (reputation, history, etc,) of the VC company.

Figure 28 illustrates different methods for active and passive deal flow generation according to [Böhner, 2007]. With passive deal flow generation, the VC company waits to be actively approached by companies seeking funding. Active deal flow generation can be active (such as presentations at conferences, participation in discussions and panels, advertising and any other marketing measures) or passive. Active measures aim towards increasing the awareness of entrepreneurs and the targeted ecosystem of the existence of the venture capital firm. Passive measures involve any type of introduction of the VC company to a potential portfolio company out of the partners private of professional network. As most of the deal flow of VC companies comes from referrals out of the partner's network (US: 65% vs. 26% direct [Tyebjee and Bruno, 1984]), maintaining a large network of other VCs, bankers, consultants, service providers lawyers, angel investors etc. as potential sources of deal flow is essential for venture capital companies and their partners [R. Sweeting, 1981].

After this phase has been completed and a proper deal flow matching the defined goals has been established, the process enters the next steps of the investment phase.
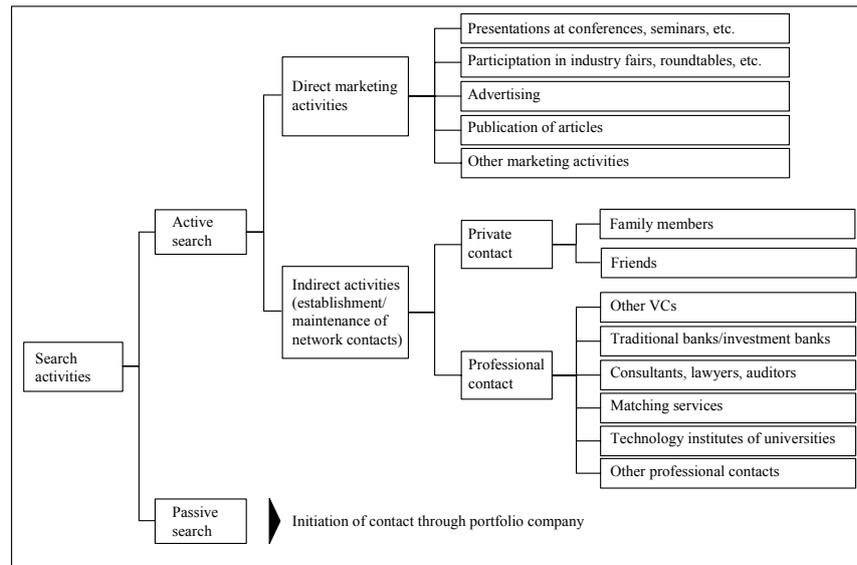
Figure 28: An overview over potential methods for generating dealflow. [Böhner, 2007]

Example

Using our example company *ExCapital*, the firm now takes measures to create significant deal flow. Primarily, this deal flow is created through the network of the partners. Since they used to be entrepreneurs themselves, they have very good connections to people in various positions in different ecosystems. Therefore, the partners leverage their networks and make sure everyone knows they are running a VC company now and are looking for promising companies to invest in. These contacts involve both, their professional and private contacts in various positions. Even though the founders have a good network, their new VC company is unknown to most target entrepreneurs. Therefore, they decide to accept certain invitations to speak at conferences, start a blog focusing on marketing trends in the areas of financial technology and IT-security and start being very active in discussions around funding and entrepreneurship in communities on the internet. After a few weeks, the company has received a respectable amount of business plans, request and introductions to prosperous entrepreneurs and can continue to build on these channels to establish deal flow. The company can now start further processes to ensure a consistent deal flow and start the actual investment process.

3.5.3 Investment Decision

Once a proper deal-flow has been established, a major task for the VC company is to evaluate companies in order to find opportunities to invest in and execute the investment itself. As illustrated in Figure 27, this process step covers all activity from the first screening of potential investments to the closing of the deal and execution of the investment. This wide process can be subdivided into the following sub-steps:

3.5.3.1 Screening and Pre-Selection

The goal of the prior step described lies in maximising the deal flow in order to get in contact with promising companies and potential investments. This comes with usually high quantity of investment opportunities which need to be screened and pre-selected for further investigation. So the deal-flow is screened and analysed in order to sort out less attractive companies and find companies matching the funds characteristics and criteria.

Based on the nature of the business, VC companies can only invest in a very small fraction of the given companies. Thus, a large number of opportunities needs to be reduced down to a relatively small number of interesting companies. Since this forms a very difficult but critical step in the process, this often takes place in multiple steps. Dependent on the specific process of the VC company, the selection is performed in several layers where companies are sorted out and the selection becomes more intensive with each step.

So if a basic research on a company is completed and the results are promising, the next deeper and more intense level of analysis is applied. The goal of this process is to get from a lot of investment opportunities to a reduced set of very promising companies with respect to the funds focus points and the venture capital firms preferences and judgement. The process is often completed by issuing a *Letter of Intend* (LOI) for the investment to the company to proceed to the next phase. In this LOI, both parties express their interest in proceeding with the investment process. On one hand, this ensures a degree of confidentiality (non-disclosure) for the following process steps while on the other hand it also ensures certain rights of exclusivity for the VC company. [Krebs, 2012]

This activity of screening new ventures and performing analysis on the deal is very intense and takes up a significant share of time of venture capitalists.

> **Example**
>
> In our example, *ExCapital* has now received over 300 initial applications and introductions to promising companies in about a month. The team has set up a process of three steps to screen

and pre-select companies and get to the most exciting opportunities on hand. So partners of the VC company take a look at every pitch deck received and firstly check if the company suits the focus of the fund. In the second step, the analysis of the remaining opportunities is primarily focused on severity of the addressed problem and market opportunity. As a third step, the individual partner schedules a call with the founders, hears the pitch and requests a demo of the product. As the final step, startups are invited to the VC company to present their company in front of all partners and do an extensive discussion of the company. By applying this process, the number of opportunities can be reduced down to 8 companies for a potential investment.

3.5.3.2 Due Diligence

After the pre-selection of companies has been completed the next step involves a very intensive investigation of every investment opportunity in multiple dimensions. This step is called *Due-Diligence*. It accounts for a considerable share of the total investment process duration and can take from several weeks up to six months to complete [Fiet, 1995]. The goal of this step in the process is to gather a lot of company related information to assess and rate risk, opportunity and assets of a company.

Factors which make evaluating an investment opportunity difficult and therefore extend the duration of the due-diligence process are: [Isaksson, 2006] [Amit et al., 1998]

a) **Potential**: The complexity of determining the potential of a specific company is very high and therefore linked to a huge analytical effort. The opportunity of a company is further dependent on many different internal and external factors and therefore hard to determine.

b) **Risk**: Similarly to the potential of a venture, risk assessment forms an important factor of the due diligence process. Generally high risk for failure and complexity of assessing the risk increase the effort going into a proper and profound analysis.

c) **Information**: A very high level of information asymmetry between investor and potential portfolio company makes the investment and due-diligence process very difficult. Based on it's operations and experience, the portfolio company has a lot of insight and vital information in areas such as market, product, future trends or competition. In this phase of the process, the VC company needs to gain maximum of information in all these areas to form a basis for the investment decision.

Whereas in a prior pre-selection step, decision factors such as market size and conditions play a major role, the due diligence process now looks at all factors which might determine the success

or failure of the startup. Such factors include: attractiveness of market (potential exit, valuation etc.), product, competition or founding and management team [Hall and Hofer, 1993]. To perform this step of the process, VC companies leverage their personal networks, references and external industry experts to asses and rate the company in regard of these different factors.

At the end of this process, the VC company has performed sufficient analysis to compensate for potential information asymmetries and be able to make a reasonable investment decision based on these criteria [Hall and Hofer, 1993].

Example

In this phase, *ExCapital* now performs heavy due-diligence on the remaining companies. At this point, the companies get specifically assigned to certain partners to perform further steps. So the partners leverage their networks to find out everything there is to know about the founders and current executive teams. Further, external industry experts are brought in to evaluate the market situation, competitive landscape, market trends and strategic validity ofthe companies mission. Technology experts are hired to examine the built products and all material and immaterial assets in the company are valued and assesed. Risk profiles are created and opportunities are evaluated. After the due-diligence, sufficient information to perform an investment decision has been gathered and the process can move to it's next step.

3.5.3.3 Decision

After the due diligence step in the investment process, the VC company has to make the final decision on if they want to invest into a portfolio company on hand. The information gathered in the previous phases must be sufficient to base this decision on and this decision marks the point, where the VC company wants to move further in the process.

When prior activities in this process where always about gathering information about various factors of the company, this step is performing a decision-oriented analysis of the collected data. Since this decision will very likely be made in the context of great risk, unclear opportunity and high uncertainty in influencing factors, there exist several different decision methods to structure this process.

Example

In the illustrated example, *ExCapital* has collected a vast amount of information on the remaining 8 companies. To have a basis for a structured and objective decision, three different investment decision methods are applied to the startups acting as base for further discussion.

The partners of the VC company meet and discuss every of the opportunities. The responsible partners argues in favour of the company and tries to convince the rest of the partners. After long discussion, the partners device to invest in four of the eight companies.

3.5.3.4 Negotiation and Contracting

The negotiation phase of the process now handles the determination of parameters for executing the investment (if possible). These parameters can vary greatly dependent on the specific deal but naturally include the following:

- Valuation: One essential part of the negotiation is the valuation (=total value of the company) agreed on for the execution of the investment.

  This valuation can be determined using various different methodologies, which vary greatly between deals. It is important to note, that even though methods to determine the valuation might be applied, the result is still subject to negotiations and can often depend on subjective (or even personal) factors of the negotiation process.

  Among other methodologies, the following are commonly leveraged for this purpose: [Desbrières et al., 1999]

  a) **Capitalised maintainable earning - P/E (Price Earning Ratio) multiple/EBIT (Earnings before income and taxes) multiple**: In this class of methods, current performance metrics of the company (such as earnings or EBIT) are combined with an assumed (or industry specific) multiple value to determine the companies value. As an example, the EBIT multiple m_{EBIT} is calculated as $m_{EBIT} = \frac{Value}{EBIT}$. Assuming a fixed multiple of 10 (based on e.g. previous acquisitions in a market) in a specific industry, the company value can be calculated as $Value = EBIT \cdot m_{EBIT}$. Assuming the company shows an EBIT of 10 M$, the value of the company would be estimated to 100 M$.

  b) **Recent transaction prices for acquisitions in the sector**: This valuation is purely based on similar transaction on the market. So if investments in this space have been executed at certain valuations, this provides a guideline.

  c) **Discounted cash flow (DCF)**: This valuation method is based on estimating future cash flows of the company and reflecting their values to the given point in time. So the valuation deals with two questions a) What future cash flows will the company create? b) What is the value (considering risk etc.) of these future cash flows today? After finding an estimation for a), the values are discounted to the present using a company

specific rate reflecting various factors (commonly used: Weighted Average Cost of Capital (*WACC*)). As an example, assuming cash flows of 15M$ (next year), 45M$ (in 1 years) and 75M$ (in 2 years) as well as a *WACC* of 15% the current value of the company can be determined as $Value = \frac{15M\$}{(1+0,15)} + \frac{45M\$}{(1+0,15)^2} + \frac{75M\$}{(1+0,15)^3} \approx 96,4M\$$

d) **Pay back period**: This method is commonly used to determine the amount of time, it takes for annual cash flows of an investment to fully compensate for total investment costs. In the context of valuation, a fixed pay back period and equity stake can be used to come up with a valuation.

e) **Industry's special rule of thumb pricing ratios**: When applying this method, experience in a specific area/field/industry is used to determine a company value based on previous investments and transactions.

f) **Historic cost book value**: This method forms a basis for a valuation by historically accumulating past costs of establishing the company up to this point.

g) **Liquidation value of assets (orderly or forced sale)**: Another commonly used method for valuation is to determine the liquidation value of all assets in the company in different sale-scenarios.

Interestingly, [Desbrières et al., 1999] showed that the overall decision making process and valuation as well as the applied valuation methodology itself greatly vary between countries and macroeconomic conditions. This means that not only does the situation of financial markets and location affect valuations of startups, but these factors also influence the methods applied to determine this valuation in the VC investment process.

It has to be noted, that previously described methods are often based on current data and metrics of the venture. In early-stage investment (e.g. pre-revenue), required metrics such as revenue or profits are typically unknown which makes these methods virtually impossible or useless to apply. Therefore, the valuation of early stage investment is commonly based on factors such as subjective perception of opportunity (=future revenues), current capital needs of the venture and strategic decisions. Such strategic thoughts could involve factors such as motivation of the founders (leaving them with too little equity) or follow up investment rounds (attractiveness of the venture to later stage investors).

Based on the valuation agreed on in this step, the equity share for the VC company (dependent on the financial structure of the investment) is calculated. When talking about valuation in the context of investments, a major distinction is commonly made between the terms *pre-money valuation*, which reflects the value of the company before the investment has been executed (money raised in this round does not contribute to the value of the company) and *post-money valuation* (valuation after the investment and therefore including the invested

capital). As an example, raising 10M$ at a pre-money valuation of 44M$ results in an immediate post-money valuation of 54M$.

- **Financial Structure**: Finally, the financial structure defines the specifics of the execution of an investment. Dependent on legal/regional system and preferences of investors and founders many different forms are available. Please note that the financial structure is highly dependent on the legal system and entity of the portfolio company. Based on a high variation in this sector, this will only briefly describe common concepts without going into specifics. The following types/classes of financial structure are commonly used in venture capital:

  a) **Equity Capital**: In this straight forward way of financial structure, the VC company/fund invests money (and knowledge etc.) into a startup in exchange for an equity stake in it. So dependent on a the previously negotiated valuation and the size of the funding round, the investor receives shares representing a proportional equity stake. These shares can be issues as common or preferred stock showing different benefits and drawbacks for both sides of the deal.

  b) **Convertible Investment Forms**: With convertible notes, the investment is offered to the portfolio company as a debt that might convert into equity at a later point in time under (partially) predefined conditions. This is especially popular for early stage investments, where determining a proper valuation is hard and the result will likely be of limited quality. With convertible notes, the decision on a valuation is postponed to the moment on conversion. Although usual clauses of convertible notes (cap, discount) require some negotiation about broader limits of such a future valuation.

Besides the actual investment type, the timing and pay-out of the investment play a major role. Especially in early-stage investments, the pay-out of portions of the invested capital is bound to specific milestones defined during the previous phase of the process. This means, that e.g. the investment might be split up into 5 parts, where each of the parts is paid out after a certain milestone (such as development of a prototype with certain functionality or first sale to a specific customer etc.) has been achieved by the company. This reduces the risk for the VC company, since not all of the invested money is out of control and the investment can be very tightly controlled. On the other hand, this heavily restricts the company in their freedom to do what is best for the business. If for e.g. the business decides to pivot it's product, the milestones defined with the investor might not make sense any more and therefore could not be reached leading to a financial problem for the company. This process completes the execution of the investment itself.

- **Economics and Control**: Another vital parameter for the execution of an investment are formed by arrangements around two essential areas: control of the VC in the company and participation conditions (economics) in case of a liquidation event. Even though term sheets include extensive agreements and regulations around various topics, these two aspects are

at the core of every such agreement. These two factors model the most important aspects for venture capital as they define how the VC participates in order to realise returns for LPs, and how the VC can control and influence the company in order to maximise chances for a success or better control the risk of failure for the company [Feld et al., 2011].

- **Contracting**: The final step of the negotiation phase is the actual contracting. This names the actual creation of legal agreements and execution of the investment. While the basic parameters for the investment have been agreed on in the previous step, these and additional parameters are compiled to legal documents. Besides the legal regulations of the investment (dependent on location and the investment type) this focuses on many terms such as pay-to-play, vesting of shares, employee participation mechanisms, anti-dilution regulations, protective provisions, drag-along agreements, redemptions rights, informational rights or registration rights [Feld et al., 2011]. Such regulation handle multiple different hypothetical future scenarios and rights and obligations between the company, founders as well as current and future shareholders and potential investors. For a very comprehensive and understandable explanation of the dynamics of venture capital investment negotiations, dynamics and terms please refer to [Feld et al., 2011].

  Creating a set of contracts reflecting all parameters and agreements made during the process is the main objective of this stage. It ends with the signing of the contracts and the actual execution of the investment.

So this third step in the VC process concludes with the execution of the investment. It has to be noted that not all activities in this second phase can be seen as linear. Especially the steps of negotiation and contracting can be seen as a highly iterative process. This is mainly due to the complexity of shareholder agreements and related implications for both investors and founders. So event though two parties might have agreed on basic parameters on the investment, small legal mechanisms in the contracts can require additional negotiation efforts.

In addition, negotiations and contracting can be significantly more complex in later rounds, since in addition to the interests of the founders, also existing investor's interests need to be satisfied. For instance, a topic regularly causing the need for vast negotiation and discussion between existing and new investors is the legal arrangement around liquidation preferences.

> **Example**
>
> In this phase, *ExCapital* knows which startups it wants to invest in based on information and decisions made in previous processes. In this exmaple let's illustrate the example of one of those companies *AuthTec* providing a new type of authentication service for websites. Based on due-dilligence from the startup side, *AuthTec* is interested and wants to pursue the investment with *ExCapital*. Therefore the dedicated partner and the founders of *AuthTec* start

the negotiation process.

The startup has previously raised a 500k$ financing round from three business angels in this field and are now raising a seed round of 1.5M$. Further it has developed their authentication technology and released a beta version with respectable traction and partnerships with several website using their authentication. The startup has not yet launched and therefore not generated revenues to date. The VC syndicates with two other investors and acts as the lead investor in this deal. Therefore, *ExCapital* leads all negotiations and contracting.

Based on the absence of revenues, determining the valuation can not rely on current business KPIs and metrics. *AuthTec* wants to raise the whole round (=1.5M$) from the investor syndicate at a target valuation of around 7,5M $. *ExCaptial*'s approach toward a valuation is based on two components: Firstly, a recent investment in a similar authentication startup was executed at a 7.7M$ valuation. But in this case, the startup had already launched a product and entered the market. Secondly, the partners of the VC company are well aware of the fact, that holding more than 25 % of the company after the investment, would make negotiations with the investors of an upcoming round very difficult. A stake of 25% would represent a valuation of 6M$. Based on these internal valuation approaches, both sides start off into the negotiations and finally agree on a pre-money valuation of 7M$, which equals a share of $\cong 21,43\%$ and a post-money valuation of 8,5M$ after the execution of the investment.

The other negotiations and contracting phases go pretty well, mainly since both parties agree to be using standard open-source shareholder agreements (as for example available from YCombinator or 500 startups) and adopt these documents to their needs. Both parties agree to be executing an equity deal for preferred shares in the company. For *ExCaptial* it is essential to gain several rights including an exclusive drag-along right, stacked liquidation preference in relation to prior angel investors and a seat on the board of directors. Since the required stacked-liquidation preferences is not accepted by the existing investors, both parties agree on an equal liquidation priority for all investors but grant *ExCapital* and additional right-of-first-refusal for the sell of shares in the next financing round. Further, it is essential for the founders of *AuthTec* to not have the investment bound to hard milestones. This is mainly due to the fact, that the company has not launched a product and thus not validated a sufficient product/market fit for their product. The founding team estimates, that certain pivots and changes in their strategy might be necessary to reach that fit and being bound to specific milestones would heavily restrict the needed agility on those business decisions. Both parties agree to this requirement after some negotiation.

After finalizing the negotiations involving all shareholders and new investors, the contracts for the investments are signed and the capital of 1.5M$ is wired to *AuthTec*'s bank account. This concludes the investment and starts the partnership between *AuthTec* and *ExCaptital*.

3.5.4 Business Development/Value Adding

The responsibilities of the investor don't end with the execution of the pure investment. After the investment, partners of the venture capital company become active in the portfolio company and add value of certain kinds. This support and value can reach from network and introductions out of their network to having a seat on the board of directors and overseeing important business decisions to taking over operational roles in the company. The degree of involvement highly depends on the specific VC company and therefore varies greatly. After the execution of the investments, investors want to add as much value as possible to the company in any form, since the increase in value and the later sale at a high price is their primary goal.

Commonly, a formal or informal monitoring mechanism is in place to keep track of the portfolio company's progress and difficulties and be able to counteract occurring problems from the VC side as soon as possible [Krebs, 2012].

Example

With the investment executed properly, *AutTec* now starts the execution of the business while focusing on development of the software (upcoming release) and testing and establishment of distribution channels as well as the acquisition of first test customers. Regular board meetings (*ExCapital* is a member of the board) help make strategic decisions about the company. *ExCapital* now tightly works together with the founders to leverage the VC partners network to acquire first test-customers. Further, the VCs actively help to attract and recruit highly talented engineers for *AuthTec*. The VC further provides guidance for the founders when having to make tough decisions and besides that try to support the company in every possible way.

3.5.5 Craft and execute exit strategies

By definition, the VC company makes money by buying equity, increasing it's value and selling the equity at a much higher price later. So as an implication, the VC company will only be able to make money in case of a liquidity event of the company. Examples for liquidity events are:

- IPO: In case of an *initial public offering*, the shares of the company are offered for trading at a public market. This forms an exit since the VC company can now sell their shares on public markets and therefore liquidate the investment (as required by the purpose of the fund/the LPs).

- Acquisition/Trade Sale: In this exit-scenario, the company is acquired by another company for various reasons. Such reasons include strategic motives, the acquisition of IP, acquisition

of the user base of the startup or an *acqui-hire* in which the main purpose of the acquisition is absorbing the startup's team. The shares are sold to the (external) buyer.

- Secondary Sale: In the case of a Secondary Sale, the VC company sells it's shares in a company to another VC company commonly as part of a financing round. So the transaction of shares in this case is executed from one VC company to another.

- Buyback/MBO: Another possible exit strategy is a *Buyback* or *Management Buyout* in which the founders or part of the management of the venture acquire shares from the VC company and therefore cause a liquidity event for it.

So at a certain strategic stage of the VC process, the VC company needs to encourage or induce a liquidity event in order to realise it's increase in value as profits for the fund. Therefore, this point is predefined from the first step of the venture capital process by factors such as the lifetime of the fund and is part of every consideration of the VC company from the very beginning. It is very important for the entrepreneur to be aware of this, as it dramatically affects the company from the day it raises venture capital. In this final phase, it is the job of the VC company to arrange such a liquidity event (=exit). The type of pursued exit is highly dependent on the type of company and the VC's focus. In case of an exit, the VC company is compensated according to the defined conditions and the LPs are paid out their share in the fund performance.

Example

At the end of the lifecycle of *ExCapital*'s fund, among all the other portfolio companies the general partners decide, that *AuthTec* needs to be sold. As over it's lifetime, multiple large cybersecurity players have shown interest in it's product, and the prediction that other exit scenarios (such as an IPO) are suboptimal at this point, an acquisition seems the best option for an exit. So the general partners (and *AuthTec*'s partner in particular), leverage their network and signal that the company might be for sale. After several weeks, five companies show strong interest in an acquisition of the company. As the founders want their company and products to remain on the market, two of the potential buyers look prosperous as the others are only interested in the underlying technology for their own products. The VC in coordination with the founders enters a negotiation phase with the two. After a few weeks of intense negotiations, one of the candidates offers significantly better conditions and is chosen by the VC. Due to terms in the shareholder agreement signed upon the investment of *ExCapital*, it can force every current shareholder of *AuthTec* to sell their shares alongside the VCs shares. This enables an acquisition of all shares by the buyer and finally, *AuthTec* is sold for 350 M$. Since *ExCapital* invested at a valuation of 7M$, the exit represents a 50 fold ROI for the VC company and therefore it's fund and LPs. The VC company exits all it's remaining portfolio companies in the fund and pays out the performance to LPs (and GPs accordingly). The lifecycle of the fund is therefore over and *ExCapital* starts raising another fund.

This final step concludes the described lifecycle of a fund, but not the one of the VC company. Most VC companies actually manage multiple funds with different sizes, lifetime or focuses at the same time and keep raising new funds. The steps described in this process are therefore executed in parallel as well as repeatedly by a VC company.

3.6 The VC business model

As mentioned in earlier sections, the venture capital company, in the whole process and structure of VC financing, is not the (primary) capital source for the executed investments. Further, the VC company takes over management and organisational roles and is compensated for that. This section covers how this compensation takes place.

In general, there are two different types of compensations for the VC company: **fixed compensation and variable compensation**. Fixed compensation is mostly represented by the so called *Management Fee*. So the VC company takes a fixed fee (relative portion of the fund) [Bussgang, 2010] for handling all the tasks. This fee is supposed to cover all expenses of the VC company such as salaries, fixed costs (office etc.) or measures to acquire or generate deal flow (the stream of potential deals coming in) for the company. Management fees are usually in the range between 2-2,5% of the whole fund size annually. So if, for instance the raised fund is 100 M$, the annual management fee for the company in case of a 2% fee would be 2 M$ per year. This covers all expenses of the VC company. The dependency on the fund-size usually makes sense, since the effort required to manage a fund usually increases with it's size (at least certainly for early stage investment, since the deals sizes will be relatively small). The management fee is in no way dependent on the success of the fund in terms of ROI delivered to it's LPs. As mentioned earlier, the VC company, or some of it's partners can act as LPs and push capital into the fund - in this case they do participate as an LP but never in their role as the VC company. Variable compensation is a second (and additional) form of compensation for the VC company. This component of it's compensation is coupled to the performance of the fund and therefore related to the LPs ROI. So in this form, the VC company participates in the performance and profits generated by the fund's value increase. The percentage of profits going to the VC (in case of good performance) is called the carried interest and usually varies between 20-30% of the funds performance. This *carry* is only paid out if the venture fund reaches certain performance goals and therefore states a major motivation and incentive for the venture capital company. The usually relatively high range of this percentage also reflects the necessity of the LPs to create a strong incentive in the structure of VC financing. As mentioned earlier, the LPs are not actively involved in any operational activity over the funds lifetime and therefore have very little insight and control over what happens in these areas. All the difficult tasks are handed of to the VC company and the LPs want to make sure that very high ROIs is among the primary interests of the VC company [Bussgang, 2010].

Common parameters for the compensation of VC companies are 2% annual management fee and

20% carry on the fund (referred to as *2-20 terms*). Top VC companies demand higher carries of 30%, but often reduce the management fee. These parameters highly vary dependent on the VC company, and it's operational model, structure and strategy.

The example below illustrates such a compensation model featuring both components.

Example

A venture capital company *SampleCapital* is founded by 4 general partners. Each of the partners of the firm travels the world to find suitable LPs and raise a fund. After six months, a fund of 200 M\$ is raised. The fund is set up where the LPs agree to compensate the VC company with 2% annual management fee as well as 20% carried interest. So the fund starts it's activity and received 4 M\$ in annual revenue. After paying for their expenses, associate and principal salaries etc. each of the partners is left with a 400.000 \$ salary a year. Now two scenarios can occur. Firstly, if the fund does not perform well and therefore the variable compensation part is paid out. If, on the other hand, the fund performs well and returns 400 M\$, the carried interest is paid out. So of the 200 M\$ capital gain, the VC company receives 40 M\$ (=20%) in carried interest. This means that each partner (if arranged that way) gets a carried interest share of 10 M\$. So each of the general partners ends up with a 400.000 \$ annual salary as well as 10 M\$ in carried interest.

Based on the above pictured example, we can see how large the carry for each partner is compared to what can be gained from management fees. This reflects the discussed incentive the LPs offer to the VC company.

Both, management fee and carried interest, always depend on the agreement between LPs and VC company and can greatly vary from one constellation to another. The tendency here is that VC companies with a very high reputation tend towards negotiating very low management fees (or non at all) and take higher carried interest rates. Since venture capital investment success is considered to be highly dependent on the company once (as a LP) invests money in, most LPs will accept this deal. Others (e.g. newly established companies) might need to charge relatively high management fees to be able to finance their ongoing operations dependent on their structural and operational needs. If, for instance, a VC company decides to extensively support their portfolio companies with operational expertise by having highly qualified teams of field experts support them, this staff needs to be financed over either high management fees or large fund sizes. This will be as well reflected in the carried interest rates.

Note that other parties in the VC company can participate in this carry too, dependent on the arrangements made within the board of general partners and in the company. Such arrangements reach from only general partners participating over splitting based on the hierarchy in the company towards full splitting between all employees of the VC company.

3.7 Types and Characteristics of VC Funds

After having discussed the structure, process and various characteristics of venture capital funds, the following describes some special forms of venture capital companies and funds commonly seen in practise. As types of funds and classifications between forms of them greatly vary, the following is only supposed to provide some basic distinctions as well as ideas for characteristics of different types of funds.

3.7.1 Corporate Funds

Whereas other types of VC funds purely aim for the creation of wealth for LPs and the VC company itself, the situation is different for *Corporate Funds*. This type of fund is not raised by independent LPs, but all the fund's capital is provided by a single corporate company. This company invests in startups not only for financial, but mostly for strategic reasons. These motivations range from access to new technologies and know-how, to expertise in certain business models or markets or synergies between the startup and the corporate. It is very typical for the corporate to support a portfolio company beyond the pure investment through it's venture capital company [Chesbrough, 2002].

Due to this combination between financial and synergy motives for corporate venture investments, investment decisions can be very complex and diverse in reasoning. The types of investment made in such a setting can be classified along the following two dimensions: [Chesbrough, 2002]

- **Corporate investment objective:** Even though the objectives can be very complex, many investment decisions can be classified as financially driven or strategic. As an example of a financial investment, a corporate venture fund of a telecommunication company might invest in a e-commerce startup due to purely financial reasons and great expectations of the specific niche the startup operates in. This expectation can be based on industry inside or expertise, but the investment itself is purely driven by high expectations in gain in valuation and returns. On the other hand, a strategic investment in a SME software platform might make strategic sense, as it increases the revenue opportunity of the corporate for various of it's products.

- **Link to operational capability:** As a second dimension, the level to which the operational activities and orientations of the startup and the corporate are linked can be added. As an example, another investment of the corporate fund in a startup in the space of network security can be mainly based on a high level of synergy between the startup and the corporate. So the corporate could become a customer of the startup and deliver according security benefits to it's customers, while further acting as a distributer of the solution facilitating it's well established distribution channels.

77

Based on these two dimensions, four basic types of investments can be distinguished in a useful framework. [Chesbrough, 2002]

a) **Driving Investments:** This type of investment is characterised by a highly strategic investment rational combined with a tight link between the operational capabilities of the two actors. In this form, the corporate sees a high potential for synergies between the companies and supports the startup with various resources beyond the capital provided through the investment. As an example, Microsoft heavily invests in startups leveraging it's software and service ecosystem to drive adoption of it's services and technologies. Investments of this type often involve the additional support of the startup in terms of resources and internal corporate services.

a) **Enabling Investments:** This investment type represents strategic focus while having low-coupling between the corporate and the startup in place. The underlying theory is that success of the startup positively influences the corporates success in the market. The companies are very loosely coupled and no tight cooperation and support as in the first example can be observed. As an example, Intel could invest into startups building products depending on it's processors or other components.

a) **Emergent Investments:** In this type, the operational capabilities of the parties are tightly aligned, but the investment has no strategic, but rather a financial motivation. Nevertheless, due to shifts on the market the investment could become of strategic interest to the corporate. Considerations in this direction can form the basis for investment decision making. A classical example for this type are investments in technologies, the corporate expects to play a major role in it's future strategy and development.

a) **Passive Investments:** The final type of investment is defined by financial motivation combined with low synergies in operational capabilities. The corporate clearly sees no strategic value for it's own business in the deal but rather bases the decision on rather classical venture capital decision making. In executing this type of investments, corporate venture capital does not differ from other forms of venture capital.

Figure 29 illustrates the two dimensions as well as the investment types described here.

It has to be noted that most corporate venture investment decisions will fall between the simple framework described here and cannot be modelled to a sufficient degree. Nevertheless, it gives an easy to understand framework on the decisions that drive investments in this form of venture capital.
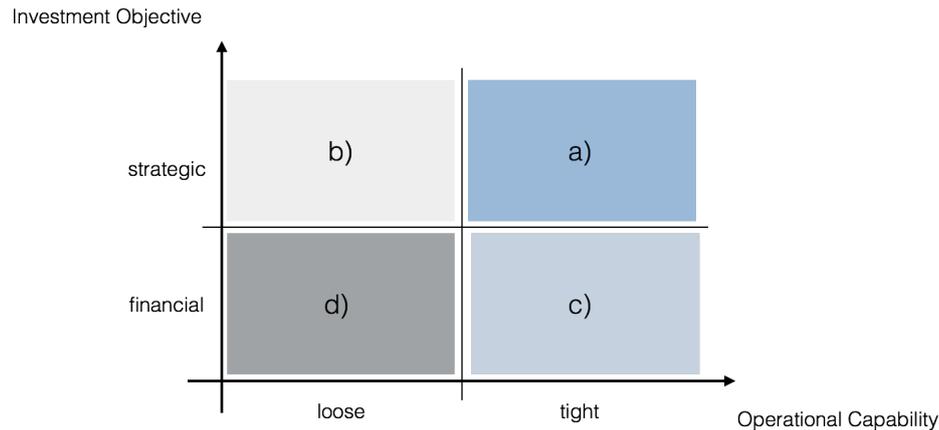
Investment Objective

strategic   b)   a)

financial   d)   c)

loose   tight   Operational Capability

Figure 29: Different types of corporate venture capital investments in two dimensions. Adapted from [Chesbrough, 2002]

3.7.2 Classification based on LP-Structure

Another fairly obvious way to distinguish between different classes or types of funds is the structure of it's LPs. As LP structure, and therefore interest, motivation and focus of LPs greatly affect the basic framework in which a venture capital company can operate, it greatly affects the final investment decisions and portfolio. Therefore venture capital funds can be classified in many different groups. Among those classifications, it is commonly referred to the following ones [Employment and Economy, 2016] [Fink, 2015]:

- Traditional vs. Asymmetric Funds: This first classification is based on the relation of LPs to the fund. In traditional models, as discussed in this chapter, every LP investing in the fund does this under the same conditions and obligations. In contrast to this, in an asymmetric fund there exist different groups of LPs subject to different terms and rights of the investment in the fund [Employment and Economy, 2016].

- Public vs. Private Funds: Another criteria, commonly referred to for classification purposes is structure of LPs in terms of governments or private LPs. So if the predominant LP of a fund is a government, the fund is considered public. Private funds are predominantly raised from non-government LPs.

- Captive vs. Independent Funds: Similarly to the previous point, captive funds are defined as funds, which are entirely raised from one LP. So all capital sources of the fund come from one distinct investor giving this LP dominant influence on the fund itself. In contrast, independent funds are raised from numerous LPs, where a more diverse balance of power between providers of capital can be observed. A traditional example for captive funds are corporate venture capital funds, as they are, besides the ownership of the venture capital

79

company itself, raised from the corresponding corporate [Fink, 2015].

3.7.3 Classification based on VC Company Ownership

Another classification of venture capital funds can be based on the ownership of the VC company itself. Besides the LP-structure, the shareholders in the VC company greatly influences every aspect of the process and activities of the fund. Commonly, the following forms are distinguished [Braun, 2013]:

- **Independent Fund**: Independent VC companies, the classical for of venture capital, is not dependent on strategic interests of any shareholders and can freely make decisions based on the LP structure and parameters of the fund. A VC company is commonly considered independent, if less than 20% of it's shares are held by governments, corporates or financial service providers. As described before, such funds purely focus on the financial aspect of investment or their whole portfolio.

- **Public Fund**: A fund is considered public if it is entirely owned by a government or country. Governments set up funds to support the local ecosystem and push technology oriented companies with great growth potential in (usually) early stages.

- **Corporate Fund**: An entire ownership of the VC company by a corporate company, is considered corporate venture capital as described before in detail.

3.7.4 Classification based on general fund characteristics

In this chapter, the standard and most common model for venture capital was introduced. As this model has been around for some time now, different new requirements and learning from the LP and GP side have driven the development of very interesting deviations of the standard model. Among the most important of which are [Fink, 2014]:

- **Evergreen Funds:** A characteristic of the traditional venture capital model having potentially bad influence on the success of the fund is the pre-defined and limited lifetime. This creates a very static cash-in/cash-out situation for LPs, as pushing capital into/out of a fund is only possible at the beginning/end of it's lifetime. In addition, the limited lifetime might be problematic as the lifetime forces the VC company to encourage/trigger liquidity events in the portfolio, even though this might not make sense from a valuation perspective. So very good portfolio companies might have to be sold too early due to the ending lifetime of the fund. Even though many funds find ways around this to, for instance, carry parts of

a portfolio to a follow-up fund, this situation states a structural problem of model. [Fink, 2014]

Based on these weaknesses of the introduces model, the concept of evergreen funds was developed. In contrast to the discussed model, an evergreen fund's lifetime is not limited per definition. Instead, the fund hypothetically exists forever and LPs get the change to enter or change their investment in a fund at periodic points in time (typically four years). So, for instance, such a fund is raised and the LPs get the chance to change their investment in it every four years dependent on internal (performance of the GPs etc.) or external factors (macroeconomic conditions etc.). This offers the following benefits [Fink, 2014]:

- From a LP perspective, an evergreen fund shows a drastically different profile in terms of liquidity. As the investment can be dynamically adapted on a regular basis, the gain in dynamic is significant and offers new possibilities on the LP side.

- Decisions concerning liquidity events of portfolio companies can be solely based on company characteristics rather than constraints of the fund.

- The flexibility gained helps GPs to focus on the vision of portfolio companies and developing great businesses, rather than worrying about fund-lifetimes or internal problems at inadequate points in time. So for instance, the ending lifetime of a fund, might incentivise a GP to sell a great company to early in order to generate great returns for LPs and be able to raise a second round. The ability to stay focused on the business owner and the visions of the company states a great benefit.

- **Syndicate Funds:** As mentioned in earlier parts of this chapter, business angels are an essential and important instrument for providing financing and added value to early stage companies. Further, it was discussed that angel investors commonly operate in syndicates (groups of angel investors performing investments together under a common lead) to deviate risk while still providing required capital for their companies and increasing the number of supporters for a startup. Due to the recent evolvement of technology platforms to organise such business angel syndications (e.g. AngelList), syndicates have become increasingly powerful and impactful as a large number of investors can easily join a syndicate and perform investments with great names in the scene. This trend is also causing innovation in the area of venture capital, as over the last years, venture capital funds solely investing in syndicates have emerged. These VC companies raise funds from LPs which will be used to back and multiply the investments of popular and well-proven angel syndicates. This form of venture capital has great impact since it tremendously increases the ticket volume of such angel syndicates and allows the syndicate to also lead and participate in later stage financing round of startups (such as Series B/C etc.).

Having the volume of a traditional VC investment with the syndication power and support

network of a strong angel syndicate provides a very beneficial support structure for portfolio companies and can therefore have great impact. (examples: Maiden Lane Ventures http://www.maidenlane.com)

3.7.5 Final Notes

This chapter defined the basics of risk capital in general, and venture capital as investment form in particular. It defined the basic terms and showed and explained the basic structure and process behind traditional venture capital investments and therefore gave an overview over the field and important characteristics. The final parts of this chapter were intended to give an idea of the flexibility and room for innovation and dynamic solution this framework of venture capital provides.

As entrepreneurs strive to raise capital for their startup, the question of addressable and suitable funding sources is essential and the implications on the fundraising process are profound. As business angels might be able to provide sufficient capital and smart money in an uncomplicated form in earlier phases of a startup, venture capital typically provides the ticket sizes and background structures for later stage rounds while implementing an extensive process for generating and filtering deal-flow and showing extensive requirements towards contracting and rights in various areas. This chapter provided the necessary background information to understand why this is the case and consider this extended complexity when choosing investors to approach for the financing efforts.

4 Accelerators and Incubators

After having covered the financing component of a SES in different forms in the previous chapter, this chapter examines the very interesting component of accelerator and incubator programs. Following the example of a few very early programs, different models of such programs have spread rapidly around the globe in recent years and support millions of founders in different areas every year. This chapter provides a basic overview over the basic definitions, goals, program structures and impact and benefits of such programs for founders and early stage startups.

4.1 Definition

As many formal programs supporting startups are created around the globe every day and innovation drives not only the startups supported but also these programs and organisations, it is fairly hard to strictly classify existing programs into accelerators or incubators buckets. Being aware of the variety of different programs and their characteristics, this chapter aims towards providing a good basic definition for the terms accelerators and incubators. This is required to further elaborating on the main common characteristics and differences as well as example of existing example programs to provide the basic foundation for understanding existing programs which might state mixtures between the two stereotypical models or differ partially regarding certain characteristics.

4.1.1 Accelerator

A accelerator program is commonly referred to as as cohort based programs of limited duration, in which early stage startup companies are provided with seed capital, mentorship, business network and relevant education in exchange for equity. To ensure a high intensity of the support, participating companies usually move into a dedicated office space for the duration of the program. As discussed in more detail later, the business model of an accelerator is purely based on increase in company value and later realisation of it through exit scenarios. Therefore the success of the program is (besides other factors) highly dependent on the value that the program itself can add for the startup company. Therefore we see strong tendencies for specialisation and focus in the area of accelerators, where specific programs orient all of their value adding components towards one or a

group of verticals they can best add value for or make the most sense according to macroeconomic conditions. Accelerator programs traditionally end with an event (usually referred to as *Demo Day*), where the participating startups are presented to investors, journalists and other parts of the local and greater ecosystem. [Cohen and Hochberg, 2014]

4.1.2 Incubator

A startup incubator is commonly referred to as a program, in which early stage startup companies receive office space and supportive administrative service (as well as mentorship in some cases) for a predefined fee. So startup companies are paying to be part of the program without the program becoming a shareholder in the company. Incubator programs are usually (93% of programs [Cohen, 2013]) non-profit with the goal of supporting startup companies in early phases. A significantly high share of programs (around 30% [Cohen, 2013]) are associated with universities or research organisations. Besides many possible motivations for creating and running such programs, early support for research spin-offs therefore states a clear goal for many of these programs [Cohen, 2013].

4.2 Comparing Accelerators and Incubators

While there are clear definitions for a startup accelerator, it is in it's basic principles very closely related to so called startup incubators. Even though, the programs are very closely related in many different ways, there are clear and distinct differences between the two in various dimensions.

The following elaborates on the distinct differences between this form of early stage startup support and typical accelerator programs as discussed in this chapter. It has to be noted, that very small structural or procedural differences in the two approaches can have profound impact on a participating startups. Therefore, here described small differences in the structure or process can have great impact on the progress of a venture. The main differences between incubator and accelerators can be defined in the following dimensions: [Cohen, 2013]

a) **Duration**: One of the most obvious differences between the two types of programs states the duration of the program. While incubator programs tend to last for a duration between one and five years, accelerator programs in most cases have a program duration of three months. This relatively small change profoundly affects the startup in several different ways. Firstly, this short duration significantly reduces the codependence between the startup and the program from one another. Further, this reduced duration forces the venture to work extremely intensive on the essential topics related to the company in order to make progress and either succeed or fail very fast. Instead of having several months or even years in a program, the participating

startups must work very hard to benefit from the program the most. Finally, the short duration urges the startups to face market forces and according dynamics such as customers, investors or competitors earlier as they graduate. It has to be noted that none of these effects increasing the probability of startup success, but rather just accelerates the process of reaching a certain level of validation of failing in executing an idea.

a) **Cohorts**: In contrast to incubators, participants enter accelerator programs in groups known as *Cohorts*. So a cohort enters the program at the same time, shares a intense working and learning phase in the program and graduates together. This has profound impact on the relationships and bonds between companies in the cohort. Startups motivate and support each other by making connections, sharing experience or helping out with small operational tasks. While incubator programs encourage relationships between participating companies it can be observed that these very generally loose.

a) **Business Model**: An additional difference between the two types of programs is the business model. Accelerators typically execute an investment in the participating company in exchange for an equity stake in it alongside the participation in the program itself. Executives or founders of accelerators tend to be entrepreneurs or investors themselves and often provide further funding themselves. These share their first hand experience in their own ventures or portfolio companies with the startup and are often help in a variety of situations due to their own experience. Due to the fact that the accelerator or involved parties are shareholders in the participating companies, the incentives and motivations of founders and portfolio companies are very tightly aligned. In contrast to this, incubators are typically publicly held and managed by professional (hired) managers. Incubators operate on a compensation based business model and usually don't hold equity in a company. While accelerators aim toward rapidly increasing the value of their portfolio companies in the context of a future exit, the main business model of incubators is based on service fees by the participating companies.

a) **Selection**: A further difference, as a direct result of the limited program duration, is the selection process of participants. While startups are accepted to an incubator program on a regular basis, accelerators have set up a distinct and highly selective application process at defined moments in time. Further, accelerators usually actively implement marketing measures in order to drive *deal-flow* in terms of applications to this process. The selection process itself is highly selective and top-tier accelerator programs only accept a very small fraction of applications.

a) **Education**: Typically, both incubators and accelerators offer educational seminars or courses to train participants in specific areas relevant for their entrepreneurial success. These educational measures cover topics such as fundraising, search-engine optimisation, KPI tracking and measuring or hiring strategies and best practises. In an incubator, these educational measures are typically performed by outside companies such as lawyers, consultants or agencies. The compensation for these services is based on a fee charged to the participants. Research shows, that ventures in an incubator tend to not participate in such events. In contrast, educational

measures are an integral part of the value added by accelerator programs. These seminars, talks or workshops are offered to the participating companies for free, as the value added directly aligns with the business model of the accelerator. In addition to external experts and guests, talks are also given by founders or the accelerator programs or alumni founders of the program and personal workshop sessions with participating companies are quite common.

a) **Mentorship**: Mentorship is another essential value added by accelerator programs. In contrast to incubators, where mentorship (if at all) is provided in a very informal and opportunistic manner, accelerators typically provide a formal process for how to connect portfolio companies and mentors. Even though this value is added in almost any program, the form of how this takes place varies greatly. Some program offer pre-scheduled meetings with a large quantity of mentors, while others only offer to connect certain mentors to the startup on demand. While support provided through mentorship can have great impact for startups, extensive mentorship meetings can also be very time consuming and distract entrepreneurs from other (and probably more important) tasks. Therefore, opinions and processes regarding providing mentorship for companies in the context of accelerator programs vary greatly.

Figure 30 illustrates those key differences (and others) between accelerators and incubators. It further puts the two in perspective to the role and characteristics of value that angel investors add. This comparison seems very appropriate, since angel investors often implicitly provide many of the above described functions highly dependent on the angel investor herself.

	Incubators	Angel Investors	Accelerators
Duration	1 to 5 years	Ongoing	3 months
Cohorts	No	No	Yes
Business Model	Rent; non-profit	Investment	Investment, can also be non-profit
Selection	Non-competitive	Competitive, ongoing	Competitive, cyclical
Venture Stage	Early, or late	Early	Early
Education	Ad hoc, human resources, legal, etc.	None	Seminars
Mentorship	Minimal, tactical	As needed, by investor	Intense, by self and others
Venture location	On site	Off site	On site

Figure 30: Overview over the key differences between accelerators, accelerators and angel investors. [Cohen, 2013]

4.2.1 Conclusion

Beyond providing a very basic definition of the terms, this chapter has shown basic characteristics and differences between startup incubator and startup accelerator programs. Even though current and future programs might greatly vary, this provides some clear distinction between programs facilitating the above describe characteristics. When looking at the landscape of different programs, it can be seen that activity and the level of development of accelerator programs is far higher compared to incubators. While incubators tend to be associated with other organisations (corporations, universities etc.) and grow based on efforts of these organisations, we see a tremendous growth in the number of accelerator programs and the startups going through one of these. The number of only US based startup accelerator programs has grown over 50% year over year between 2008 (close to the start of the first accelerator of it's kind) and 2015 and have reached 172 programs by 2015. These programs have funded over 5000 US based companies from 2005 to 2015 and these companies went on to raise 19.5B$ is funding. [Hathaway, 2016b]

These dimensions show what great impact accelerator programs have and that the activity and growth (and probably also the hype around them) outperforms those of usual incubators. Therefore, the remainder of this chapter focuses on startup accelerators and their characteristics.

4.3 Accelerators

After having discussed the basic characteristics of an accelerator program and it's differences to an incubator, this chapter now describes these accelerator in more detail from different angels. More specific, the acceleration process (phases of the accelerator program), it's structure as well as different classification dimensions are discussed. As for previous chapters, it needs to be noted that certain aspects might vary greatly between different existing accelerator programs. This chapter provides a summary of commonly shared characteristics and attempt to classify existing programs according to differences in existing programs.

4.3.1 Dimensions and Impact

Since the reasons for focusing on startup accelerators in this chapter is it's popularity, success, growth and impact, it appears natural to start the deep-dive into this topic by looking at the growth and impact startup accelerators have shown since their existence less than ten years ago.

Growth in U.S.-based accelerators—as it did for startups, early-stage capital, and venture investment more broadly—really took off after 2008. They grew from 16 programs that year to 27 in 2009 and to 49 in 2010, before eventually reaching 170 programs in 2014 and holding mostly

steady. All told, the number of American accelerators increased an average of 50 percent each year between 2008 and 2014. [Hathaway, 2016b]

Firstly, as described before, the number of startup accelerator programs around the world has grown tremendously since the beginning. In the US alone, there are now over 172 startup accelerator programs nationwide. The growth of startup accelerator programs in the US really started to took off in 2008, when the number of programs grew from 16 (2008) to 170 programs in 2014 at an increase of 50% between 2008 and 2014. Figure 31 illustrates this growth of the number of startup accelerator programs in the US from 2005 to 2015. [Hathaway, 2016b]
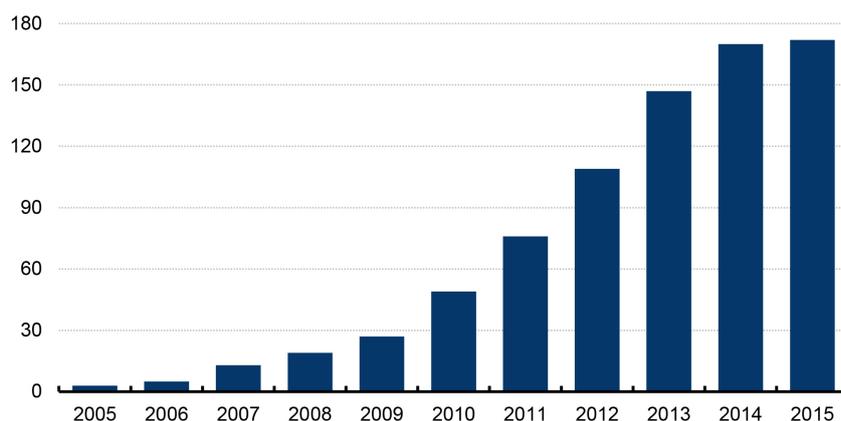

Figure 31: Growth of startup accelerator programs in the us from 2005 to 2015. [Hathaway, 2016b]

Worldwide, *Seed-DB* (a website listing and ranking startup accelerators) currently lists 235 (only the most well known) startup accelerator programs worldwide and states that 5693 startups have been accelerated in those so far [Christiansen, 2016].

In terms of funding, the US based startup accelerator programs have invested in over 5000 startups at a medium investment size of 100k$. These companies moved on to raise over 19.5B$ in total funding from various risk capital sources at an average valuation of 90M$. These numbers clearly reflect the impact accelerator programs have on startup ecosystems in the US and around the globe. Figure 32 illustrates the proportions between accelerator and follow-up funding of accelerated startup companies and puts the value added in perspective. Further, we see a significant rise regarding these numbers, as in 2015 alone, the average valuation for further funding rounds of these startups was 196M$ (30M$ mediam). Even considering the factors of hype around tech startups and irrational deduction and dimension of valuations, this clearly shows that the significantly increasing number of startup accelerators and accelerated companies greatly influences the further fundraising process of these companies in a positive manner. [Hathaway, 2016b]

Lastly, great examples for great and successful companies which have been accelerated at some point in their lifetime state an indicator for success and impact of these programs. Besides the large
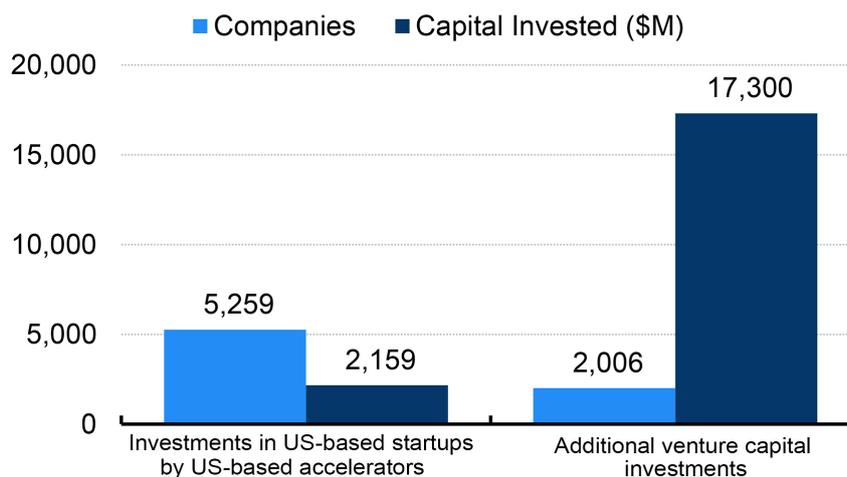
Figure 32: Overview over the funding provided by US startup accelerator programs and follow on investments through other risk capital sources. [Hathaway, 2016b]

majority of tremendously successful companies not passing this bar, famous accelerator alumnis being valuated above 1M$ include startups like Dropbox, Airbnb, Stripe or Zenefits. [Insights, 2016]

4.3.2 History

Startup accelerators turn out to be a surprisingly young form of program and phenomenon as the first program of it's kind, *YCombinator*, was initially established no earlier than 2005. Before looking at the internal structure, ideas and processes of an accelerator, this chapter takes a look at the history of first programs and how and why they came into existence.

The first startup accelerator of it's kind, YCombinator, was created in 2005 by Paul Graham, Jessica Livingston, Trevor Blackwell and Robert Morris with two programs on the east- (1st batch) and west-coast of the United States. Paul Graham had previously founded the company *Viaweb* and made money from it's acquisition by Yahoo in 1998. The initial program was based on the idea to do things differently from traditional venture capital firms in dimensions such as: making many small investments, investing in very young entrepreneurs, investing in founders with engineering backgrounds etc. [Graham, 2012]. The initial program was set up as a *Summer Founders Program*, where students were addressed with the offer of an alternative to traditional summer jobs. Instead of working during their summer holidays, the program offered those students a seed investment and support in a company, they could found with their friends. The first batch of the program was set up and included companies like *Reddit* or *TextPayMe* [YCombinator, 2016b]. The second batch of the program was set up in Mountain View (California) and in 2009, YCombinator announced that the program would entirely move to Silicon Valley. [Graham, 2012]

In parallel (started slightly later) to the developments of YCombinator, the startup accelerator *Techstars* was founded in 2006 in Boulder (Colorado) by David Cohen, Brad Feld, David Brown and Jared Polis. The idea behind Techstars arose from the unsatisfactory situation founder David Cohen found in doing angel investments and the resulting relation between him and founders. Cohen's vision for a better way of performing these investments, turned out to become Techstars later and contained the following unique components [Feld, 2012]:

- **Mentor Driven:** Cohen believed, that such a program should be driven by mentorship, where experienced entrepreneurs acts as mentors for participating founders in the program. This is based on the theory, that founders learn best and most from the experience of other founders and that experienced and successful founders like to give back and pay forward to the community without seeing any direct benefits.

- **Community:** The program was initially designed heavily around community. On one side, the program itself was supposed to heavily focus on the community of founders, mentors and anyone else involved in Techstars. On the other hand, Techstars heavily relied on the support of the community in form of mentors, investors etc. to make it possible and add the targeted value.

- **Long-Term View:** As Cohen had planned to spend the rest of his life in the community in Boulder, he envisioned Techstars as having a long-term positive impact on the local startup ecosystem.

The first batch of Techstars started in Summer of 2007 in Boulder and participating startups of this batch included *FiltrBox* and *Brightkite* [Techstars, 2016]. Today, *Techstars* is one of the globally leading accelerator programs with programs in many cities and partnerships with many global players and innovators in different verticals.

4.3.3 Accelerator Types

As described in the next section, startup accelerators are a lot alike when it comes to aspects such as the process of the actual acceleration, rituals and events during the acceleration period or components and measures in place to support startups. Nevertheless, when creating a startup accelerator programs, there is a certain variety of parameters to consider (and focus on) having great impact on what the accelerator does and how it performs. While many factors can be considered, this chapter focuses on the following based on intensive comparison of different accelerator programs [Christiansen, 2016]:

4.3.3.1 Stage and Activity

Firstly, different startup accelerator programs focus on different stages of startups. While it generally only makes sense to accelerate seed-stage startups, the two main types of stages are early seed stage (pre product/market fit) and later seed stage (product/market fit). The first category of accelerators accept startups and projects in a very early stage, where product are often not yet built and companies are not incorporated. Some of these accelerators even accept projects with no functional prototype and focus their activity onto validating problems and how proposed solutions could solve those.

Example

As an example, three founders start working on a prototype of a bookkeeping software for bitcoin users. The project is only a few weeks old and the founders spent most of their time discussing potential problems users could have and how their solution could help them. They have talked to some users in their surrounding and formulated some hypothesis around the topic. Even though the team is very enthusiastic, the founders realise that they need support in finding the right product to built, know-how in how to build a company and network to find out whom to address with their solution. They apply for the accelerator program *EarlyAccel*, which focuses on early stage startups in the ideation phase and helps them to achieve early validation for their hypothesis. As the projects gets accepted into the accelerator, the program heavily focuses on deriving methods for early idea validation and getting as many opinions from potential customers as somehow possible. After a third of the program, the team has conducted a vast amount of interviews with potential customers and has been able to validate some assumptions. The team builds a first prototype and shows early traction. At demo day, the team presents their progress to investors.

On the other hand, later stage startup accelerators only accepts startups which are on the market already, and show validation of product/market fit and traction. In these accelerators, the focus lies on topics such as scaling certain distribution channels, efficient user acquisition or increasing revenue of existing customers.

Example

As an example for this type of accelerator, the company *EncTec* provides easy to use encryption software for the healthcare industry. Two years into the life of the startup, the initial product of the company has been fully developed and tested on the market. The company has managed to acquire seven major hospitals as their customers and generates a revenue of 75k$ per month. Even though business is going well, the startup struggles to grow as fast as they would like

to and promised their investors, since traditional outbound sales in this vertical turns out to be very time intensive and sales cycles are very long. Therefore, the startup contemplates joining an accelerator program to help them scale their business. The founders to research and come across the accelerator *LateAccel* focusing on later stage seed startups with a focus on distribution. The company joins the program and the accelerator offers highly intensive support in the form of mentoring from very experienced sales executives and online marketing experts. The company starts testing multiple different customer acquisition channels and sales strategies and identifies a new customer vertical of pharmaceutical companies. The whole team focuses on leveraging these new channels and can achieve exponential growth over the remaining time of the program. At demo day, the company has shown massive growth and can easily attract new investors to fund the scaling of their company.

As these two examples show, the focus on a specific stage also heavily affects the activities of most accelerators. There are accelerators which focus on growth and adjust their network, experience and even paid staff to deliver great expertise and value to participating startups, while other accelerators might focus on basic education and methodologies for early stage entrepreneurs. This focus is essential and greatly impacts the accelerator program.

As an example, the accelerator *500 Startups* in California, has very sharply focused itself on one topic: growth. This does not only affect the types of startups that are accepted or the mentors which are brought in, but the accelerator even has staff only dedicate towards helping participating startups with distribution and growth. This makes sense, since the actors involved in the accelerator program have identified that this is the area where their know-how and network can benefit startups the most.

4.3.3.2 Location

An often determining characteristic of startup accelerator is it's geographical region. Many accelerator programs are located in specific areas in order to be able to help participating startups with specific tasks bound to the local ecosystem. For instance, this might be to raise money from local investors, get access to specific early adopter markets, leverage the technology scene in a specific area or benefit from specific local macroeconomic conditions (legal situation, etc.).

4.3.3.3 Startup Focus

While the previously discussed focus lies on the stage of the startup and the therefore primarily important activities, the startup focus concentrates on what companies in terms of their type and

field are accepted to the program. Specifically, the focus lies on factors such as product type, addressed customers (B2C vs. B2B), target markets or distribution models. Based on these parameters, there exist the following two general types of accelerator programs:

a) **Horizontal Accelerators**: The horizontal type of accelerators typically don't restrict the startups they accept into their programs to a specific industry or vertical. Dependent on the program, such an accelerator will try to find synergies and interferences between startups addressing various different markets in various ways. For instance, a program might focus on supporting startups which address a very similar customer need in different areas. For instance, a program might focus on the primary customer need of aggregation of many different services of similar kind into one unifying application. Even though startups accepted to this program might address completely different industries, such as messaging and cloud storage, the common ground is based on the customer need. So one startup might aggregate different chat applications (WhatsApp, Telegram, Facebook Messenger etc.) into one application, which the other one provides a unique interface for accessing all users data on different cloud storage services. The key point here is, that the accelerator program can focus on similar problems and solutions at a sufficient level of abstraction and therefore provide support and required focus of resources across industries. Other examples for such common abstractions are media coverage required for distribution or physical manufacturing requirements/technologies.

a) **Vertical Accelerators:** In contrast to this, vertical accelerators are determined by a strong focus on only one vertical or industry. So the accelerator program only accepts startups addressing a specific market or even market segment or niche. This allows the program to focus resources on only this industry or leverage already existing strengths in that field. It is very common for such accelerators to partner up with other partner or corporates to provide the required know-how in a specific industry. For instance, the accelerator programs of *Techstars* or *Plug and Play*, two accelerator companies with many programs around the globe, partner with corporates around the world to create specialised accelerators. In these joint ventures, the accelerator companies provide the knowledge on how to create, run and improve an accelerator program, while the industry partner delivers the required know-how and network. Examples for such programs are the *Axel Springer Plug and Play Accelerator* in Berlin or the *Techstars Barclays Accelerator* in London.

The configuration of different values for those (and more) parameters basically define different types of startups. Even though a accurate classification would be much more complex and involve many more different factors, this gives an idea of factors and parameters commonly having great impact and determining basic shapes of the characteristics of startup accelerator programs.

4.3.4 Structure and Process

After having discussed different types of startup accelerators considering the external focus and strategic orientation, this section dives into some internal characteristics of accelerators. Even though different programs show variations of the described patterns, most commonly accelerators show great similarities concerning the internal acceleration process, as well as the programs internal structure.

The basic startup acceleration process can be aligned along the time dimension in the following rough stages based on a extensive comparison and analysis of different accelerator programs as well as interviews with participants, alumni and staff of existing accelerator programs: [YCombinator, 2016a] [Hathaway, 2016a] [Nesta, 2016] [Christiansen, 2016]:

4.3.4.1 Application

The whole process starts with the opening of an application phase. The startup accelerator has a defined application process for startups to go through. This process usually involves covering topics such as addressed problem and market, solution or team in an online application form. Very commonly, the programs also require an application video in which the founders present themselves and their company. The main goal of the accelerator program in this phase is to use various channels to increase the number and quality of applications to the program. Therefore, the program team usually highly leverages it's network in different startup ecosystems, visits and speaks at startup conferences or uses online marketing tools to increase attention and reach. The successful outcome of this phase is a very high number of applications and high quality of companies that apply for the program. [Hathaway, 2016a] [Christiansen, 2016]

Example

For this example, set's assume the startup *SociaTrail*, producing software to manage brand identities across different social media platforms. The startup is in it's final development phase towards it's MVP and sees early traction for it's open beta. The founders see great benefit in a participation in the *SaaScellerate* program, which is a Berlin based accelerator focusing on Saas solutions in the media space. The application phase for the accelerator is opened twice a year, and *SociaTrail* decides to apply. The founders fill out an online form, where they provide in-depth information about the problem they are solving, potential and existing customers, their solution, the overall market, the team etc. A special focus of the application lies on the team. So the founders need to provide detailed information about their background, previous experience and motivation for starting their company. The founders further provide an application video, where they introduce themselves and their product. As

the program resonates very well with founders and the accelerator team puts a huge effort into generating interest for the program through multiple channels, around 1000 other startups apply for *Saascellerate*. So the application phase closes with well over 1000 applications.

4.3.4.2 Selection

In this second phase, the accelerator team tries to sort out and reduce the number of applications based on predefined criteria and focus points. Dependent on the accelerator program, this process can be designed in different ways facilitating automation tools and usually a huge administrative effort from the accelerator staff and management. Usually, this process is organised in multiple rounds, where all the submitted applications are screened and sorted out in stages involving many phases of discussions on different levels. In later stages, it is very common to conduct further interviews with applicants over the phone or in person to get a deeper understanding of the stage, addressed problem, market, team etc. Very commonly, the last stage of this selection is represented by an in-person pitch followed by Q & A or longer interviews. After this phase, the chosen startups are offered the participation in the program. If the startup accepts this offer (usually including a term-sheet for the investment), the accelerator process itself can begin.

Example

After many applications have been received, the staff of the accelerator starts to sort out potential startups. Firstly the accelerator has a clear focus on media-related startups and SaaS applications as well as subscription based business models and therefore startups not matching these basic criteria are sorted out. In the next phase, the team discusses the remaining applications and figures out if they believe in the targeted market and the severity of the problem as well as the ability of the team to execute the presented vision. By applying this process, the number of applicants can be reduced to around 70 startups which now compete for 10 available slots in the next program. The staff then conducts Skype interviews with the 70 teams to get to know the team. After these interviews, the team has reduced the applicants to 40 very promising startups. In the final phase, the program invites a member of each team to pitch in front of a selected jury to nominate the finalists. The jury consists of partners of the accelerator and selected mentors. The teams travel to Berlin, pitch their idea in front of the jury and takes part in a short Q&A session. After the personal pitching day, 12 startups are selected and sent an invitation to join the batch of the program (2 startups more than initially planned are invited, as not all of them are expected to accept the offer).

4.3.4.3 Onboarding

After the portfolio companies for a specific batch have been selected and have accepted the terms of the accelerator, the program itself can begin. As an essential part of the acceleration is the building of cohorts and the physical presence of startups at the accelerator site/offices, the onboarding phase deals with getting everyone arranged at the new location. Further, the process of the accelerator needs to be introduced and explained and the startups need to get to know their responsible person within the accelerator as well as each other. Typically, common events and activities (dinners, etc.) are scheduled for the onboarding phase so that the teams get to know each other more quickly. As a major asset of an acceleration program is formed by the cohort-community and founders helping each other out, this is essential for forming this community.

Example

As expected, only ten of the twelve invited startup accept the invitation and join the accelerator. As the term sheets are negotiated and signed, the teams move to Berlin and into the accelerator office. In the first days, the teams get to know each other and several events (such as dinners and a welcome party) help the teams to get to know each other. The acceleration process (daily stand-ups, weekly mentoring sessions, office-hours etc.) is introduced and startups get to know the new accelerator situation. After the few days of onboarding phase, the program gets going and pics up speed as soon as possible.

4.3.4.4 Acceleration

After the onboarding has completed, the acceleration itself begins. In this phase, the accelerator tries to support all the startups as good as possible with a variety of different instruments such as mentoring sessions with staff of the accelerator, mentorship from experienced outside mentors and experts, workshops on different topics, alumni network of the accelerator, network of the founders of the accelerators, partners and mentors or coaching sessions on presentation techniques or sales capabilities. As described before, the accelerator tries to support the startups in the most intense way, in order to manage to increase the value of their investment as quick as possible and make the startups ready for follow-up investments.

Example

As the onboarding has been completed, the program now fully starts and all activities start. The general week in the program consists of three fixed events every week: pitch training on Monday, mentoring session with external mentors and accelerator staff on Wednesday and a

workshop on varying topics on Friday. In between, the accelerator staff is always available to help the startups with occurring problems and the team brings in different partners and companies to meet the batch and make important connections. *SocialTrail* can really benefit from the program as it meets essential mentors and get's essential insights into sales for media companies and the methodology of validating their hypothesis. One of the founders is selected as the one in charge of pitching and fine-tunes their presentation towards investors needs.

4.3.4.5 Demo Day

The grand final of every accelerator program is stated by a big event called the *Demo Day*. This is the final moment of the accelerator, where all startups pitch to a large number of investors, journalists and other parts of the local and international ecosystem. The main goal of this event is to connect startups to potential investors and raise follow-up funding as well as to gain press coverage. Therefore, the event is usually combined with a networking event to make those connections. After the demo day, the formal part of the acceleration program is over and startups leave the accelerator, while the accelerator staff prepares for the next batch of startups.

Example

On the final day of the program, a big event with hundreds of local and international investors is arranged by the accelerator team. Each of the startups receives ten minutes to pitch their company and vision to investors as well as 5 minutes reserved for questions and answers by the audience. *SocialTrail* delivers a great pitch and great questions by the audience indicate interest and understanding of the solved problem. After all startups have pitched, a big evening event and after-show party is arranged, where the startups meet investors for in depth meetings. The founders of *SocialTrail* meet very interested investors and can make valuable connections inside the ecosystem. Follow-Up meetings are scheduled and the founders are getting way closer to a desired financing round.

4.3.4.6 Support of Portfolio Companies

The job of the accelerator typically does not end with the formal acceleration process, but goes on after the program. As the accelerator is an investor in the startups, it continuously tries to give support and help the company succeed. From introductions within their network to mentorship, feedback or follow-up funding, all is possible here.

Example

The support for *SocialTrail* does not stop with the demo day. Even though the teams moves back to their hometown and get's fairly disconnected from the other portfolio-companies and the accelerator team, the founders still maintain a strong connection to their investment manager within *SaaScellerate* and get occasional support in terms of introductions to potential investors and customers.

Besides the consideration of the described process, one can also take a look at the general structure of an accelerator program in terms of the involved support components. The following components can be distinguished [http://metavallon.org, 2016] [Nesta, 2016] [Hochberg, 2016]:

- **Program Staff**: The team of the accelerator, especially the founders/GPs state a tremendous asset of each accelerator program and support the portfolio companies in an essential way. Members of the staff are usually the first contact person for support during and after the program and coordinate and channel other components.

- **Mentor Network**: Mentors are tremendously important for every accelerator program. Not only do they provide great support and advice as well as needed challenge for the startups, but also provide very good connection point into the local ecosystem and other important contacts. Many of the mentors will be founders or investors themselves and can therefore provide great help in virtually any phase and with any problem of the startup within their network.

- **Investor Network**: Besides mentors in a classical sense, the investor network is also very important and present in almost any accelerator program. Besides demo day, investors are commonly invited into the accelerator to meet startups, get to know founders and often perform investments before demo day.

- **Consultants and Trainers**: This component is usually most active in workshops and coaching. This way, the provide insights into different fields of expertise and can provide individual support after and during the acceleration.

- **Cohort**: A component that can not be underestimated is the community between startups in the accelerator program. Founders and employees of startups help and mentor each other and provide great sparing partners in various aspects. If startups are in similar phases, they might be facing very similar problems and challenges and so experiences and learnings can be shared.

- **Alumni**: Similarly to the community of cohort companies, the alumni startups that have previously graduated from the program form a community that can be leveraged by compa-

nies. Some programs strengthen this community by organising regular meet-ups and alumni
events for networking between alumni companies.

- **Local Ecosystem**: Finally, the local startup ecosystem of the accelerator plays an important
  role in accelerating startups. Not only does the ecosystem implicitly support the acceleration
  through investors, accelerator staff and investors, but being present in very good ecosystem
  also provides the accelerated startup with many new opportunities and network besides the
  accelerator itself.

5 Conclusion and Future Work

As this thesis has shown, modelling and understanding startups and ecosystems in which entrepreneurship develops and companies grow and succeed is essential to fostering this development. Further, successful startup ecosystems have a tremendous impact on economy and society and can transform many areas of our every day life for the better. The thesis has shown various ways of describing, modelling and understanding startup ecosystems and their basic characteristics from different perspectives. It further showed currently used method of rating and evaluating existing startup ecosystems. These methods are currently mainly based on rating the existing components of an ecosystem and therefore deriving a maturity degree for the whole system.

This thesis proposes a different approach towards evaluating such systems which heavily focuses on the network of components within the ecosystem as well as their development over time. This model, the *Startup Ecosystem Lifecycle Model*, evaluates a ecosystem by classifying components onto seven distinguished layers based on their type and assessing connections on the same and between different layers. Based on these two main criteria (namely *On-Layer-Connections* and *Inter-Layer-Connections*), the model describes different development stages of the ecosystem and derives characteristics for each stage based on case-studies of the development of existing ecosystems. The fundamental assumption beneath this model is that the defining characteristic for successful startup ecosystems are not the strength of certain components, but rather the network among existing components on the described dimensions. This thesis defines such a model and extensively discusses it's characteristics, weaknesses and strengths, differentiation to other models and value of conclusions drawn from it. Further, the thesis discussed case-studies of existing ecosystems and their historic development supporting the hypothesis and principles the model is based on.

Finally, this thesis picked out three specific and very impactful components of startup ecosystems for deeper consideration in the context of the introduced model: accelerators, incubators and venture capital. The thesis described these three components in detail and elaborated on their internal structure, functioning as well as implications and impact for a containing startup ecosystem and could therefore provide a great overview over how the ecosystem and different components internally form the basis of the proposed model for modelling and rating the ecosystem.

Based on the topics covered here, we see great potential for future work in this area as follows:

- Analysis and description of different other components in the context of the *SESLCM*.

- A system for automatic analysis and modelling of existing startup ecosystems based on existing social media and other information and classification according to the proposed model.

- System for automated classification of existing ecosystems.

- System and model for trajectory analysis of existing ecosystems based on the pro-

posed model.

- Verification or adaption of the proposed model based on further ecosystem example data.

- Extension of the model in terms of characteristics and stages.

- In-depth analysis of the impact of startup ecosystems and validation of the proposed model in this context.

- In-depth analysis on possible measures to foster the development of ecosystems in each of the stages.

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