University of Huddersfield Repository

Stone, Tobias

AN EXAMINATION OF STARTUP ACCELERATORS USING SOCIAL NETWORK THEORY

Original Citation

Stone, Tobias (2018) AN EXAMINATION OF STARTUP ACCELERATORS USING SOCIAL NETWORK THEORY. Doctoral thesis, University of Huddersfield.

This version is available at http://eprints.hud.ac.uk/id/eprint/34731/

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: E.mailbox@hud.ac.uk.

http://eprints.hud.ac.uk/

AN EXAMINATION OF STARTUP ACCELERATORS USING SOCIAL NETWORK THEORY

TOBIAS STONE

A thesis submitted to the University of Huddersfield

in partial fulfilment of the requirements

for the degree of Doctor of Philosophy

The University of Huddersfield

October 2018

COPYRIGHT STATEMENT

i. The author of this thesis (including any appendices and/or schedules to this thesis) owns any copyright in it (the "Copyright") and he has given The University of Huddersfield the right to use such Copyright for any administrative, promotional, educational and/or teaching purposes.

ii. Copies of this thesis, either in full or in extracts, may be made only in accordance with the regulations of the University Library. Details of these regulations may be obtained from the Librarian. This page must form part of any such copies made. Postgraduate Research Degrees: Guidelines for the submission of work for examination

iii. The ownership of any patents, designs, trademarks and any and all other intellectual property rights except for the Copyright (the "Intellectual Property Rights") and any reproductions of copyright works, for example graphs and tables ("Reproductions"), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property Rights and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property Rights and/or Reproductions.

"it is hardly possible to overrate the value . . . of placing human beings in contact with persons dissimilar to themselves, and with modes of thought and action unlike those with which they are familiar. Such communication has always been, and is peculiarly in the present age, one of the primary sources of progress."

- John Stuart Mills, 1848

My thanks to…

Prof. Andrew Ball, University of Huddersfield, for encouraging me to start this PhD, and for ensuring I finished it.

Prof. Liz Towns-Andrews, University of Huddersfield, for her constant encouragement, wise and insightful supervision, and for believing in it when I did not.

My Wife and Parents.

Lucy Inkster, Lucija Matic, and Federico Naccarato, the EyeFocus Management team, for their work and passion in creating and running EyeFocus Accelerator.

All the startups, associates, and mentors of EyeFocus Accelerator.

Bayer Health Care, Zeiss AG, Peppermint Venture Partners, and Bosch India for sponsoring EyeFocus Accelerator.

EyeFocus Accelerator, February 2015, Berlin

TABLE OF CONTENTS

ABSTRACT

This thesis combines a literature review and a case study in order to examine startup accelerators as social networks. The literature review looks at two distinct bodies of research; the first on Social Network Theory, in order to create a framework within which to describe an accelerator as a social network, the second on startup accelerators in order to understand their structure and evolution as business support programs. The case study uses EyeFocus Accelerator, founded by this researcher, to test some of the ideas formulated from the literature.

The literature demonstrates that accelerators are social networks, and the dynamics between the different actors in those networks can be explained and defined using the vocabulary and concepts of Social Network Theory. This describes the structure of the accelerator network, and how such a network is able to reward people with Social Capital, which is observed in this thesis to be the currency of accelerators.

Consequently, the unique nature of the research in this thesis is to describe accelerators using the language and concepts of Social Network Theory, providing new insights into how and why accelerators work.

This understanding identifies that value in accelerators lies in their ability to facilitate the flow of non-redundant information, and to provide early access to this information. Creating this value also enables accelerators to withdraw access to that value as a threat of sanction against bad actors.

Other aspects of the social network structure and behaviour of accelerators are examined, including the tendency of weak ties and non-redundancy of information to decay over time, suggesting that this may explain the typical fixed term of most accelerators.

Combined, this theory leads to an accelerator being described as a dynamic social network with a high level of closure at the core, set within a weak network architecture, with many weak ties, and consequently many bridging ties. It is policed using link reciprocity, and its currency is Social Capital. The skill used to operate in this network involves having complex role and status sets.

GLOSSARY OF TERMS

Accelerator

A fixed term program that delivers support to a cohort of startups

Accelerator Manager

The person or team that run an accelerator

Actor

In the context of Social Network Theory an actor is an individual or entity within a social network fitting the position of a node, where nodes are connected by ties to form networks

Angel Investor

An individual who makes investments into startups

Angelist.co

A website listing jobs and investment opportunities relating to startups

Aravind

A world leading eye-care hospital and research facility in India

Crunchbase.com

An online database of people and companies in the startup sector

Demo day

An event at the end of an accelerator program during which the cohort pitch their startups to an audience, usually of investors and mentors

F6S.com

A website that lists accelerators and manages their online application processes

Founder

Someone who has established a startup

Incubation

The process of supporting early stage businesses

Incubator

A building that rents out desks and office space along with some business support activities

Institut de la Vision

A leading French institute promoting eye-care research and innovation, based in Paris

Lean Startup

An innovation approach based on the writing of Eric Ries, which sees rapid iterations defined by testing and refining a product

Linkedin.com

A professional online networking website

Link Reciprocity

The process of rewarding co-operators by giving them more ties into a network, and sanctioning bad actors by cutting their ties into a network

Mentor

Within an accelerator, a mentor is someone who offers their time for free to support startups with advice, knowledge, and contacts

Moorfields Eye Hospital

A leading ophthalmology hospital in London, UK

NDA

Non-disclosure agreement; a type of legal contract

NESTA

National Endowment for Science, Technology, and the Arts; a British organisation that has carried out extensive research into accelerators

Node

A point in a network, connected by ties

Norms

The rules and customs developed by a social network

Ophthalmology Today

A leading publication about Ophthalmology

Rainmaking Loft

A co-working space in Berlin in which startups and freelancers rent desks and small offices

RNIB

The Royal National Institute for Blind People; the UK's leading charity for blind and visually impaired people

Seed-db.com

An online list of accelerators

Seedranking.com

A website ranking accelerators on an annual basis

SME

Small and medium enterprise

Social Capital

The currency of social networks; the social equivalent to economic or human capital

Social Enterprise

A company that is established to realise social outcomes rather than just to make money

Social Network

A network of people connected through varying types of social ties

Startup

An early stage company that aims to be disruptive and grow quickly

Startup Bootcamp

One of Europe's leading accelerator companies

Strong Tie

A close friend or contact with whom there are multiple mutual connections

Tech

A shorthand for a sector or business type that uses technology in an innovative way

TechCrunch

A web blog that is the leading source of news and information about startups and the tech sector

Venture Capital Investor (VC)

A fund that makes investments into startups

VOIP

Voice over IP; a form of internet based calling, such as Skype or Google Hangout

Wayra

An accelerator run by communications company, Telefonica

Weak Network Architecture

A network in which there are many people who are not highly connected

Weak Tie

An acquaintance with whom there are few or no mutual connections

Y Combinator

The first accelerator, launched by Paul Graham in 2005

CHAPTER 1. INTRODUCTION

This chapter introduces the concepts of a startup accelerator and Social Network Theory. The chapter also introduces other core themes, and explains the aims, outcomes, approach, and structure of the thesis.

1.1 A STARTUP ACCELERATOR IS A SOCIAL NETWORK

This thesis examines startup accelerators through the lens of Social Network Theory. The researcher set up and ran an accelerator, EyeFocus, and prior to that was involved in mentoring at numerous other accelerators in Europe. The thesis seeks to understand a number of peculiar characteristics of accelerators the researcher experienced whilst working with accelerators. This included why mentors volunteer their time for free, helping the startups develop their business, and helping the accelerator make more successful investments, and why the startups trust the mentors and explain in detail what they are doing, without asking them to sign an NDA. These aspects of accelerators are unusual compared to other areas of business activity, where people charge money for providing their expertise, and require contracts before sharing sensitive business details.

This research applies Social Network Theory to understanding these questions in order to examine and describe the specific type of social network that makes up an accelerator. It was observed in practice by the researcher that the startup sector is highly networked, and that accelerators appear to play an important part in connecting people within the wider tech ecosystem. The role of 'weak ties' in supporting innovation suggested that answers to these questions lay in the network structure of accelerators, which led the researcher to turn to Social Network Theory to understand better why accelerators function as they do, and have these peculiar characteristics.

This thesis will therefore use the language and concepts of Social Network Theory to examine startup accelerators. The premise of the exercise is that a startup accelerator is a social network, being a group of people. Whilst accelerators are seen primarily as business incubation programs, the reasons they are able to achieve these outcomes can be examined by understanding the underlying structure of the social network peculiar to an accelerator.

To approach this hypothesis, the thesis will first carry out reviews of the literature relating to Social Network Theory and to startup accelerators. The former will provide an overview of the key concepts and vocabulary that will be used to describe and examine an accelerator. The latter will review the inception, evolution, and growing diversity of accelerators, and to what extent they have been the subject of academic research.

The following chapters will examine findings and interpretations from examining accelerators through the lens of Social Network Theory, and then use insights from this exercise to inform the design of EyeFocus Accelerator, which will act as a case study for this thesis.

The insights from the case study, combined with findings from the theoretical research, will lead to findings and conclusions about how accelerators should be understood, designed, and evaluated in the future.

The intention is that this will allow a better understanding of what roles the different stakeholders in an accelerator play in relation to each other, and to the social network that underlies an accelerator.

1.1.1 What is a startup accelerator?

In 2005 Paul Graham, an American entrepreneur and investor, established the first accelerator program, Y Combinator (see 2.3.1.1). He decided to invest small sums of money in a cohort of tech entrepreneurs and support them as a group to develop their concepts. His intention was to create an efficiency by investing on the same terms into a cohort, and to be able to offer them the same support at one time. This was instead of acting like an angel investor and investing individually in each company, with separate terms and negotiations, and then supporting each company on an individual basis.

Since then, the concept of startup accelerators has spread from the US to Europe, and become a global phenomenon (see 2.3.1.1). Within academia, the study of accelerators is relatively new, and therefore lacks large data sets or longitudinal studies (see 2.3.1.2). This makes it difficult to evaluate definitively whether they work or not, and to reach a single definition of an accelerator. As will be examined in the literature review, academics have continued to struggle with this lack of data, or clarity about what an accelerator is.

Within this thesis, defining an accelerator forms a core part of the literature review (see 2.5) in order to provide a working definition for the following chapters. It also forms part of the conclusion, at which point a new definition is proposed based on the findings of this thesis. The literature review traces the evolution of accelerators from Y Combinator through to the three typologies of program (see 2.3.3.5) established by Pauwels et al (2015), which demonstrate how the first accelerator model developed into a range of program types with different aims and approaches but similar underlying characteristics.

However, what remains a constant throughout the discussion of accelerators is that they are programs intended to accelerate the development of early stage companies. As will be examined, an accelerator is a fixed term program that usually lasts three months, though can run for up to 12 months (see 2.3.2.4). An accelerator provides a combination of education, mentoring, and networking (see 2.3.2.4). It does so in a way that creates efficiencies for those delivering and receiving the value it creates by forming a cohort of participants (Tarani 2010; see 2.3.2.4). This cohort functions like a class in a university, allowing one lesson to be delivered to a group of startups at once, rather than individually multiple times. It also creates a focus of attention for the other stakeholders that form an ecosystem around the accelerator, offering them the opportunity to meet a validated group of startups at once, rather than having to find and meet them all individually (see 2.3.2.4).

In this respect, the accelerator performs a function for the wider ecosystem in which it exists by selecting the best startups from a larger group of applicants, and convening

them in one space so that investors, corporates, and others can meet them. It also selects and convenes a group of mentors, who provide advice, knowledge, and new contacts to the startups to help them develop (see 2.3.3.3).

A defining feature of accelerators is this use of mentors to support the cohort (see 2.3.3.1). Mentors are typically not paid (Frimodig & Torkkeli 2013), and represent a diverse network, with a broad range of knowledge and experience.

Accelerators are typically funded by investors, corporations, or government agencies, in order to support innovation, source investments, or identify new innovations. They create returns in the form of economic development, investment returns, or disruptive innovation and new technologies (see 2.3.3.6).

Despite the considerable increase in types of accelerators, and other organisations that incorrectly identify themselves as accelerators (see 1.1.1), a generic answer to the question of what an accelerator is would be that an accelerator is typically a 3 month program with a cohort of 8-10 startups, supported by investors or corporates, and with a large, diverse group of mentors (see 2.4.1).

1.1.2 Defining a startup

A discussion about accelerators also involves discussing startups; the cohorts in accelerators are usually made up of startups, and accelerators are also referred to as 'startup accelerators.'

Therefore, in order to discuss accelerators, the definition of a startup is examined in 2.3.2.1. The term is widely used in the technology and innovation sector to refer to early stage companies. While SMEs are defined primarily by size, startups are defined also by aspiration and approach.

The European Commission (2018) definition of an SME is based on headcount and balance sheet, with a Small Enterprise being a company with fewer than 50 employees, and a turnover of less than 10m Euros, and a Medium Sized enterprise being a company with fewer that 250 employees, and a turnover of less than 50m Euros. They observe that SMEs represent 99% of companies in the European Union.

Forbes Magazine (Robehmed, 2013) addressed the question of what a startup is, reflecting that it is partly a state of mind. They suggest it is not about the specific age of the company, and could be 5 years old but probably not 10 years old, according to Paul Graham, founder of Y Combinator. It is not about the size either, because startups can be worth hundreds of millions of dollars. It is about the expectation when the startup is founded that it will do something different, be disruptive, and grow large. This is the main differentiator from an SME.

In the context of this thesis and this discussion about accelerators, 'startup' will be used as a shorthand for any company or entity in the cohort of an accelerator program. As accelerators have developed and evolved, not all the companies or individuals in an accelerator program will in fact be a startup as defined above (see 2.3.2.4). Some may be individuals with early stage ideas, others may be academics, or more developed companies. What they are likely to have in common still is an aspiration to grow quickly and to be accelerated, rather than to develop organically over a longer period of time.

The purpose of this thesis is to examine accelerators, not startups. To try to define accurately in each context precisely every type of participant in an accelerator, including individuals, social enterprises, later stage companies, etc. would distract from the core purpose of this thesis, so the term 'startup' will be used to mean any participant in an accelerator. This will facilitate a more efficient discussion of accelerators. Therefore, within this thesis, whilst the definition of a startup will be examined in the literature review (see 2.3.1.1), the term 'startup' will thereafter be used as a shorthand term to describe a participant in an accelerator program.

1.1.3 Incubation and Incubators

The casual and inaccurate use of the terms *incubator*, *incubation,* and *accelerator,* can cause confusion when discussing accelerators, as they are often used interchangeably by those who do not understand the distinction between them. To create clarity within this thesis, this point forms a section of the literature review (see 2.3.2). Incubation is the process of supporting an early stage company to improve its chances of surviving into a more developed business (see 2.3.2.3).

An Incubator is a building that rents space to companies along with some degree of support, often consisting of subsidised rent or business advice (see 2.3.2.2). An accelerator is a specific approach to providing incubation as a process, and can be run within an incubator. However, an accelerator is not an incubator. This is explained in the literature review, which demonstrates that an accelerator is a program, and an incubator is a building. An accelerator can therefore run within an incubator, but not vice versa (see 2.3.2).

1.1.4. EyeFocus Accelerator

EyeFocus Accelerator will be examined in this thesis as a case study in which some of the findings of the literature review were examined and tested. EyeFocus is a business that was established by this researcher in 2015, and was based in Berlin. It applied the accelerator concept to the ophthalmology sector, and was the first accelerator to focus

just on eye-care. It was sponsored by pharmaceutical company Bayer Healthcare, optics company Zeiss, a niche venture capital firm, Peppermint Venture Partners, and Bosch India. EyeFocus ran two accelerator programs, the first of which forms the case study for this thesis.

As will be observed throughout the thesis (see 4.4.3), EyeFocus was designed to be a mainstream startup accelerator firmly rooted in the European startup ecosystem (see 4.6), but one which was unique in offering a very narrow sectoral focus. It also consciously set out to build and support an eye-care innovation ecosystem, and therefore is a case study of how accelerators can support the building of innovation ecosystems (see 3.2.10).

1.2 THE ROLE OF SOCIAL NETWORK THEORY IN EXAMINING ACCELERATORS

The hypothesis of this thesis is that an accelerator is a social network because they consist of actors linked by ties, as described by Social Network Theory (see 3.2.1). In the language of accelerators, those actors can be categorised using terms such as *mentors* and *startups*. In the language of Social Network Theory, they are strong, weak, and bridging ties, and the ways in which they interact can be described in terms of Social Capital, norms, and link reciprocity (see 3.2).

The thesis will bring together these concepts to formulate a description of an accelerator in social network terms that provides a description of the underlying social dynamics that make up the network which is an accelerator. As such, it should provide greater insight into how an accelerator functions, and why the specific structure of the social network that underpins accelerators is able to deliver the support and benefits expected (see 3.2).

Based on this analysis, this thesis will argue that accelerators accumulate value in the form of Social Capital as a consequence of being connectors within social networks, and then confer their Social Capital on the startups in their cohorts to support and protect them (see 3.2.6). These startups might otherwise have very little Social Capital of their own because they are invariably new and young. Without something to give back, they are in a weak position to ask for favours from those around them. By conferring its accumulated Social Capital on its cohort, the accelerator gives the startups a higher status within the network, and something with which to return favours. They are then equipped to ask for support from mentors and the other stakeholders in an accelerator (see 3.2).

The Social Capital identified here consists of the accelerator's ability to source and share novel and non-redundant information, and give those who co-operate with it early access to this novel information. (see Lin (1999); 2.2.3.3) That is shown in Social Network Theory to give an advantage to people, and therefore forms the value offering of the accelerator. Having value embedded in its social network, in the form of privileged access to information, affords the accelerator the ability to reward people

who co-operate with access to that resource, but also to remove access from bad actors, as a means of sanction.

In a weak network architecture with dense ties a lot of people are variously connected to each other multiple times. This makes it easy for an accelerator to communicate reputation widely, which again is a tool in rewarding and sanctioning people in that network. This is described in Social Network Theory as link reciprocity, and the rules of the accelerator are its norms. This structure allows the accelerator to threaten sanction and to reward co-operators by giving or retracting ties into its network, which enables it to support and protect its startups (see 2.2.3.4).

Consequently, Social Network Theory will describe how accelerators create value and support startups, using the behaviours within a specific social network structure.

1.3 RESEARCH APPROACH

In order to explain the behaviours of an accelerator using Social Network Theory, it is necessary to understand what an accelerator is and to be equipped with the core concepts and vocabulary from Social Network Theory in order to examine an accelerator within this framework.

The approach of this research is therefore to carry out a review of key literature relating to Social Network Theory and to accelerators (see Chapter 2). In both instances, it is

necessary to remain focussed on the core thesis, and not become distracted by the much broader topics of Social Network Theory and of accelerators and innovation programming in general.

The literature will produce theories that can be used to inform the design of accelerators and where possible and relevant, these will inform the design of EyeFocus Accelerator (see Chapter 4). How theory translates into practice will be examined within EyeFocus as a case study, as well as examining some of the concepts introduced by this thesis in more depth within a live accelerator program (see Chapter 5).

It is relevant to acknowledge that EyeFocus was primarily a business, not a research project, so the research had to be fitted around the primary concerns of the business. However, because this researcher was also the owner of EyeFocus, it was possible to gain access to a greater degree of information about the program, and to allow the theory from this thesis to inform emergent strategies within the program as it was running.

The thesis therefore mixes desk research with practical experimentation and qualitative research, as will be discussed further in the section on methodology (see 1.9).

1.4 APPROACH TO THE LITERATURE REVIEW

The review of Social Network Theory literature was at risk of becoming complicated because the topic is well established and has been the subject of extensive research. This thesis is not about Social Network Theory, but applies it to the subject of accelerators, therefore the review had to be kept within the confines of the thesis and is purposefully not a review of the entire Social Network Theory discipline.

The review is therefore focussed on providing the necessary vocabulary with which to describe an accelerator, to provide an understanding of the key concepts in Social Network Theory, and to outline some of the most relevant theoreticians in that discipline in order to lay a broad enough foundation of knowledge within which to contextualise this specific study of accelerators. It is arranged by subject, with the intention of introducing each topic separately, gradually bringing in more facets until the full set of concepts and vocabulary has been presented in order to be used later to explore and explain accelerators. The review identifies seminal works and key figures in this discipline, in particular Mark Granovetter, Ronald Burt, and Rose Coser, who have created the core concepts around which much of the other work has developed and will be referenced throughout the literature.

The review of literature on accelerators examines the core texts on this subject, and introduces the key researchers in the discipline who have shaped the concepts and vocabulary to date. The vocabulary is important in order to be able to describe an accelerator. Whilst the discipline is still relatively new, and has not been the subject of

as much research as other more established disciplines (see 2.3.1.2), it is necessary to have a vocabulary that is universally understood in order to describe concepts consistently and comparatively. The review traces the evolution of this vocabulary and provides an accepted definition of an accelerator for the purposes of this research. Part of the literature review on accelerators is presented chronologically (see 2.3.2.3) in order to show how both accelerators and the study of accelerators has evolved over a relatively short period of time. The chronological approach shows how ideas have developed, and also shows how the academic discipline has evolved. The chronological approach also shows how some ideas have remained constant over time, tracing a consistent thread through the literature, whilst other ideas have evolved or been added to the understanding of accelerators as they developed.

Certain works have been seminal in understanding accelerators, and the chronological approach shows how these works, in particular Christiansen (2009) and Miller & Bound (2011) have influenced thought about accelerators as it has developed, whilst Pauwels et al (2015) helped move the single definition on into a series of typologies which better describe the different roles an accelerator can play (see 2.3.3.5).

Because the review examines two different disciplines, it is necessarily divided into two parts and is longer than might be expected in a thesis of this type.

1.5 SCOPE OF THE RESEARCH

Eisenhardt (1989) observed that it is important to stay within the scope of a research project in order to avoid becoming overwhelmed by the available insights and outputs, especially when the data does not yet form a mature and organised data set.
Both aspects of this research were at risk of unnecessary and unintentional complexity (Lehmann 2013). With Social Network Theory the risk was that the discipline is mature, complex, and the subject of wide range of research and literature. It was therefore necessary to avoid being drawn into lengthy debates about very specific aspects of the theory, and instead attempt to identify broadly accepted definitions and concepts that are relevant to task required of them in this thesis.

With accelerators, the opposite situation created a similar risk, in that accelerators are a rapidly developing, global business sector in which definitions and concepts are relatively fluid and changing constantly, so it was necessary to commit to some core concepts and definitions, and to avoid being drawn into lengthy comparisons with other accelerators, or with incubators. This research is focussed on a single case study, so the broad context was identified in the literature review, and then the research itself remained focussed just on EyeFocus Accelerator.

Consequently, this thesis does not examine other accelerators in detail, and does not duplicate existing work in defining new typologies, (e.g. Pauwels, Clarysse, Wright, & Van Hove 2015) creating lists of accelerators (e.g. Cohen 2013, Lehman 2013, Miller & Bound 2011), or making comparisons between accelerators. This has been addressed

by others, as outlined in the literature review (see 2.3.1.1), and is also notoriously difficult both because the number of accelerators is constantly changing, and because more and more organisations are describing themselves as 'accelerators' whilst not meeting the criteria generally accepted by experts in this field (Feder & Hochberg 2014).

Attempting to rank accelerators, either as a 'complete list' or just the top 10, 20, etc. in a region or sector is also difficult because so many variables could be judged and because so little information is available. The value of such rankings remains questionable (Miller & Bound 2011). The fact that most accelerators have no obligation to publish results, and do not have the resources to produce extensive analyses of their activities combines with the speed at which accelerators are moving to make it hard to tie down any definitive lists or meaningful rankings (Fehder & Hochberg 2014; Hochberg 2015; Bone, Allen, & Haley 2017; and see 2.3.1.1).

Therefore, this thesis will not attempt to produce any lists, rankings, or judgement on existing and past programs. Such work has been carried out as the core focus of other academic work and to attempt it as a small part of a broader thesis would not produce any valuable or novel findings. However, examining such work in the literature review is important to create a context within which this thesis will explore more specific questions, and just one accelerator.

1.6 FINDINGS AND CONCLUSIONS

The findings of the literature review and observations the EyeFocus case study are brought together to form conclusions which inform accelerator design.

The findings explain the role Social Capital has in forming accelerator networks (see 6.2.1), and in policing their norms (see 6.2.3). They also explain how accelerators can build and maintain ecosystems (see 6.2.5), and challenge whether accelerators should invest in startups as a matter of course (see 6.2.6; 7.2.5). They also examine where value resides within the accelerator network and how that value is transferred to the various stakeholders (see 6.2.11; 7.2.10). The role of decay in networks, which describes how ties dissolve over time, weak ties become strong ties, and consequently non-redundancy of information decays as well is also examined. It is proposed as a possible reason for the timeframe of programs, suggesting that after 3 months it becomes hard to source new information and ties from the network built around the accelerator, as weak ties and non-redundancy decay (see 7.2.9).

Innovations by EyeFocus, in particular the creation of Associates as a secondary way of joining the cohort, are examined and evaluated, suggesting that accelerators can benefit by creating larger and more varied cohorts, without necessarily using investment potential as the primary filter in the selection process (see 6.2.8; 7.2.5).

The role of Social Capital in accelerators is woven into this discussion, in particular examining how mentors are rewarded, and how this enables link reciprocity to police the norms of the accelerator instead of contracts and NDAs (see 6.2.3; 7.2.2; 7.2.7).

These conclusions lead to a number of recommendations for future research (see 7.3).

1.7 ORGANISATION OF THE THESIS

Following this Introduction, Chapter 2 presents a review of literature from two separate disciplines. Part one examines Social Network Theory, and part two examines Accelerators.

Chapter 3 presents interpretations and findings from the literature review, which bring together the observations from the two disciplines into theory that is then applied to the understanding and design of accelerators.

Chapter 4 explores further how this can be applied in practical terms to accelerator design, and in particular to the design of EyeFocus Accelerator, which acts as a case study for this thesis.

Chapter 5 presents observations from having applied the theory in practice, examining where it translated well and where the reality of the business did not correspond with the theory.

Chapter 6 examines the outcomes of this process, combining the theory from Chapter 4 and the practical observations from Chapter 5 into a series of findings relating to the design of accelerators.

Chapter 7 draws conclusions from these findings, which inform how the theory produced in this exercise can inform the understanding and design of accelerators.

This exercise also led to recommendations for future research, which have arisen from this research, and some of which fell outside the scope or expertise of this thesis.

The Appendix presents a detailed overview of EyeFocus Accelerator, which can be used to add context to the research.

1.8 AIMS & OBJECTIVES

The aims of this thesis fall into two areas. The first, theoretical part of the thesis aims to use the concepts of Social Network Theory to describe and understand accelerators, and develop findings that can inform the way an accelerator is designed and implemented. The second, practical part of the thesis is to explore these ideas within the context of a real accelerator, EyeFocus, offering a live case study in which to examine theory in practice, and from which to gather new findings and conclusions that can be used in this and future research, and in the design of accelerators.

The aims and objectives of this research are:

1.8.1 Aims

1. To use a literature review to identify the aspects of Social Network Theory that can be used to describe a startup accelerator.
2. To provide a summary of the main academic literature about accelerators.
3. To apply this theory to the design of EyeFocus accelerator in order to examine it in situ.
4. To use this exercise to reach conclusions on how accelerators should be designed and run in the future.
5. To create a definition of an accelerator based on Social Network Theory which can inform the design and execution of future accelerators.

1.8.2 Objectives

To review the literature about Social Network Theory in order to:

a. better understand the wider context of Social Network Theory in which this thesis sits
b. define the vocabulary with which to describe the aspects of Social Network Theory relevant to accelerators
c. understand the wider discipline of Social Network Theory and its relationship to innovation and entrepreneurship

To review the literature about accelerators in order to:

a. understand the evolution of startup accelerators

b. create an historical context in which to position the thesis, and EyeFocus Accelerator
c. define the core aspects of an accelerator and the accepted terminology used to describe them
d. identify existing practice in running accelerators
e. define an accelerator for the purposes of this thesis

To use the findings of the literature review to inform the design of EyeFocus Accelerator, in order to:

a. provide a case study for this thesis in which hypotheses can be tested and examined in situ
b. lead to conclusions that contribute to the knowledge about how better to describe and understand accelerators, and therefore how better to design and implement them

Based on the outcomes of this exercise, to:

a. make recommendations about how Social Network Theory should inform the design of accelerators
b. to provide a definition of an accelerator based on this research to inform the design and execution of future accelerators
c. make recommendations for future research on this topic

1.9 METHODOLOGY

This thesis combines desk research and case study research, in the form of the literature review and the case study. The literature review examines two different disciplines, which are brought together to reach new understandings about the social network structure of startup accelerators. The case study examines some of these ideas in situ, and tests some of the theory in practice. To achieve this, the thesis first explores the literature relating to Social Network Theory, and then the literature explaining and describing accelerators. The literature review is followed by a chapter which combines the concepts and theories from both disciplines to apply them specifically to the design of startup accelerators, and to EyeFocus in particular. This offers an opportunity to examine both how the theory translates into a real-life case study, and to test some of the ideas.

This exercise leads to a final summary of concepts that have emerged from the research, and from these recommendations for future accelerator design.

1.9.1 Investigator's Role

The role of the author is important in understanding the context of research. In this case, the author is both an academic and entrepreneur, and both the examiner of and the lead actor in the case study. As founder of EyeFocus, the researcher was embedded within the activity being researched, and was both making observations from that

vantage point, and was influenced immediately by such observations. In that respect, the research impacted on the subject in real time, which is unusual, but also aims to counter the observation by Bone et al. (2017) that most academic research in this field has a 'limited shelf life' due to the speed at which the sector is developing. The approach is inevitably phenomenological, and emergent, being based in the real-life activity of the researcher as an entrepreneur, and led in many cases by the events being studied. This leads to a greater emphasis on qualitative research within this study because the research was constantly influenced by the activities of the business and making changes accordingly during the research period, rather than making a statistical analysis of data accumulated and then studied after the fact.

Because the subject of this research is a business, which itself supported other businesses, it is also the case that some of the data and observations cannot be discussed openly or in full detail because they are commercially sensitive. This particularly includes precise financial agreements between parties, costs, and email exchanges between parties.

1.9.2 Case Study Methodology

The primary source of novel data and live observations for this research is the qualitative and quantitative outputs from the business activities of EyeFocus Accelerator. EyeFocus therefore provided a case study for this research.

Eisenhardt (1989) observed that case study research focusses on understanding phenomena within a specific setting, and can involve multiple, or in this instance a single case. They usually combine data collection methods that include both quantitative and qualitative inputs, including observations.

In keeping with her theory, the selection of the case study was clearly defined by the nature of the research, being about the single specific case of EyeFocus Accelerator, so no methodology was required in the selection of the case for the study. She further argues that case study research can be used to provide description, test theory, or generate theory. In this context the thesis addresses all three, first describing accelerators and Social Network Theory, then testing theories in practice, and finally generating theory in the form of wider proposals for future accelerators.

This approach to research mirrors the 'exploratory case study' approach used by Hoffman & Radojevich-Kelley (2012) in addressing the inability to carry out extensive quantitative research due to the lack of large data sets, both for accelerators in general, and specifically for EyeFocus. Tarani (2010) also argues in favour of case study approach due to the limited literature in this field. The research therefore relies more on qualitative than quantitative data.

The case study was developed in phases. Firstly, the literature review established the context, and identified broadly accepted definitions and descriptors of key phenomena and concepts. Having established the vocabulary with which to discuss the two concepts

of Social Network Theory and accelerators, the second phase was to establish the theories to be examined in the practice of EyeFocus Accelerator.

The execution of the EyeFocus Accelerator, which forms the core of the business activity and the case study research, provided opportunities for qualitative and quantitative data collection, and to test some core theories. After the program, data was gathered, analysed, and ultimately conclusions were drawn. These conclusions occurred concurrently within the context of the academic research, and of the business itself.

1.9.3 Data Collection

As with similar work by Cohen (2013), data was collected from a variety of sources including emails, informal conversations, field observations, and the day to day activity of the accelerator, including management meetings, mentoring sessions, and informal discussion with the key stakeholders involved (mentors, staff, and startup teams). Data and evidence, in this thesis, is the outputs of the EyeFocus Accelerator business, including internal working documents and other evidence. Due to the confidential nature of aspects of the business, not all of this could be disclosed in this research. Due to the breadth of activity of the business, and the narrow focus of the research, not all of it was relevant to this thesis.

Also reflecting the research carried out by Cohen (2013), given the nature of the discussions and their context in non-academic, social, or business situations, not all of

the interactions that informed both this thesis and the business were recorded or transcribed, and some were semi-structured or thematic, rather than formal, and therefore form part of the empirical research that informs this thesis.

The semi-structured interviews form qualitative insights into the opinions and attitudes of those involved with the accelerator, and inform the other quantitative data taken from questionnaires and accelerator outputs.

The qualitative data comes from a number of sources. Exploratory interviews with various stakeholders involved in the startup and accelerator sector took place in the lead up to this research, and during the research period. These included the author's experience as a mentor at other accelerators in Europe, an advisor to startups, and informal discussions with other people running accelerators.

Multiple data collection methods were employed, in keeping with theory on case study research (Eisenhardt 1989). Empirical observations are used throughout, being an inevitable outcome of such an immersive process as running a business whilst researching it. Quantitative data is used to find patterns not immediately clear from the qualitative inputs, and to support qualitative and empirical observations (Eisenhardt 1989).

The research adopted a flexible and opportunistic approach to data collection. There were defined periods of data collection, for example at the beginning and end of the

EyeFocus program when the business used questionnaires to gather information, and there was ongoing data collection throughout the lifetime of the business.

In this instance, data collection and theory-testing happened organically as it was the result of a live case study (an ongoing business). The data collection and analysis were taking place for two concurrent purposes, the first being the business which is the subject of this research, and the second being the research itself. Consequently, some of this analysis happened quickly and within a business environment, and was formalised into research at a later date.

In keeping with Eisenhardt's (1989) theory on case study research, this thesis consequently resulted from a multi-faceted and iterative process combining overlapping phases of research, activity, and experimentation, and using empirical evidence, qualitative, and quantitative data. There has been the constant threat of being swamped by data and losing a sense of focus from the richness of outputs that the case study created. This richness in qualitative evidence is in some cases matched by a relative sparseness in quantitative data.

1.9.4 Research Limitations

Action research around a case study had benefits, for example allowing the research to be reflected in the activity of the case study, and that activity then to inform the research back again.

However, it creates limitations as well. The most notable limitation with this research was the challenge of being both the researcher of a business, and the person running that business at the same time. Because the business had the funding, and was supporting the research, the business had to take priority over the research, both relating to decisions about the direction of either, and because time had to be prioritised for the business over the research. If the business had failed it would have undermined the research, but without the research the business could still succeed.

Being a case study involving live businesses, namely the startups on the program, restricted how some of the data gathered could be used in the research. Discussions of the startups in the research could not be allowed to damage the businesses in anyway, which remain ongoing after the episode of activity being studied. This relates to commercially sensitive data, but also to reflections that might in some way damage the businesses reputationally in their future.

Furthermore, working with a large pharmaceutical company, in particular, raised issues because such companies are very tightly regulated, which impacts on how information about their involvement with EyeFocus could be discussed openly in this thesis.

Related to these three points, some of the data collected during the program was either incomplete because it had been gathered quickly during fast moving periods of business activity, or became less valuable once it had been anonymised.

Many of these limitations echo observations by researchers whose work on accelerators is examined in the literature review, who found that accelerators rarely have the resource to gather large data sets from the programs they are running. This proved to be the case with EyeFocus. As outlined in the section on future research (see 7.3), it would be valuable in the future to see full time researchers embedded in accelerators to gather data and carry out research in order to overcome these limitations.

CHAPTER 2. LITERATURE REVIEW

The literature review is broken into two sections. The first looks at the extensive literature on Social Network Theory, focussing the review on topics and theory that will provide a framework with which to examine startup accelerators as social networks. The second section reviews the research into accelerators, plotting its development since 2009, and using this to create a working definition of an accelerator for the purposes of this research.

2.1 INTRODUCTION

The first part of this chapter will examine the literature on Social Network Theory to define the vocabulary with which to describe and analyse accelerators as social networks. The second part of the chapter will examine the literature on accelerators. These are described variously as business incubation programs, businesses in their own right, and occasionally in terms of their social network. The approach of most of the literature is to see accelerators in terms of what they do and how they do it. This thesis will take that approach further, combining it with Social Network Theory to examine *why* they function as they do, and which aspects of their being social networks supports that.

Whilst the literature review will examine broadly the available research into startup accelerators, it will also restrict itself to remain within the bounds of this thesis. The thesis requires the literature review to explain what accelerators are, and in particular to provide a definition that can be used for the purposes of this research. Understanding the history and development of accelerators is relevant, and it is also important to see how academic research, and other writing, on this topic has evolved to date. However, this thesis does not seek to evaluate specific accelerators or provide any lists of accelerators, as that is addressed in literature referenced in the review, and is beyond the scope of this research.

2.2 SOCIAL NETWORK THEORY LITERATURE REVIEW

2.2.1 SOCIAL NETWORKS

It is necessary to establish the core theories of Social Network Theory, and to establish a vocabulary from the discipline with which then to describe an accelerator. By referencing some of the definitive papers on the topic, this part of the literature review aims to ensure that the core principles are well covered, providing a foundation for the following chapters of the thesis. Social Network Theory is a large and mature topic which cannot be covered fully in this thesis, not being the core topic of the research. In particular, the works of Granovetter, Burt, and Coleman, which are discussed below, form large bodies of work on their own, and have generated an even larger volume of secondary research and analysis. This part of the literature review will remain limited to introducing their core theories, and addressing some of the secondary research in order to give the reader enough understanding of Social Network Theory for the purposes of examining accelerators.

2.2.1.1 What is a Social Network?

Borgatti & Halgin (2011) observed that the term 'social network' has developed to mean anything from a private club to a website and can therefore lead to some confusion.

They describe a network as "a set of actors or nodes along with a set of ties of a specified type…that link them." These ties connect via shared points to link nodes that are not directly linked themselves, the nodes being individuals, or actors in the network. Unlike groups, networks do not have natural boundaries, and they do not need to be connected internally. These disconnected parts of the network can become connected over time, meaning networks are fluid and ever changing.

2.2.1.2 Six Degrees, or Small World Theory

An early examination of social networks by Travers and Milgram (1969) looked at the lengths of the paths between individuals, and the question of the probability of any two randomly selected individuals knowing each other, or how many acquaintances might connect them in a chain of people. They went on to examine more specifically the cluster consisting of people in the USA, with around 200 million nodes, interconnected by a complex web of connections. They hypothesised that individuals should all be connected to each other by at least one chain of various lengths or pathways.

They set out to explore this hypothesis, seeking to understand the probable mean and median number of intermediaries between any two given people. This became the well-known 'Six Degrees' experiment. They challenged people to pass a document addressed to an individual to someone they thought might be closer to that named individual, and then counted the number of steps the document took to reach the person. In this first

experiment to evaluate chain length 29% (64 of the 296 initial documents) reached the intended person. The mean number of steps the document took was 5.4.

Six Degrees of Separation also became known as the Small World phenomena, which describes the idea that everyone is connected to everyone else through six degrees of separation or fewer. The body of work on the topic is examined by Sebastian Schnettler (2009), where he traces writing from initial research in 1958 through to 2009. He identifies three dimensions of small-world theory; structural dimensions, process dimensions, and psychological dimensions.

Schnettler explains that the structural aspect looks at how many pairs of people are connected by a third person and how many by a chain of 2, 3, 4 or more people. Process looks at what kind of actions can be set in motion by these connections in a social network, and what forms of information passed along chains; and the efficacy over different lengths of chain. This looks at the role networks have in communicating ideas, innovation, information and the effect of different types and distances of relationship in achieving this. The work in this area explores what people understand of their own networks and wider social structures, and how they go about manoeuvring through them.

Schnettler observes that very little is required to render small worlds from large social clusters; just a few highly-connected individuals who create short-cuts across the network. These people are referred to as bridging weak ties, and they link sub clusters in a wider ecosystem.

2.2.1.3 The Strength of Weak Ties

Taking the Small World Theory further, the type of connections within a network, and in particular those used to travel across networks, were described as Weak and Strong ties by Mark Granovetter, in *The Strength of Weak Ties* (1973). He defined weak ties as contacts that are less likely to be 'socially involved' with each other than strong tie contacts, or close friends. Consequently, he observed that a network of acquaintances, or weak ties, will be a low-density network where many of the potential relationships have yet to be made. However, a strong tie network of close friends is likely to be highly connected, where most people know each other. The early research by Granovetter (1973) demonstrated that people were more likely to hear about new job opportunities though acquaintances (weak ties) than through close friends (strong ties) because acquaintances are more likely to be privy to information that is not known already by an actor or their close friends.

The theory of weak ties was developed in relation to finding jobs but in the wider social network theory it also describes the spread of diseases, proliferation of ideas, and evolution of species, thus it is ubiquitous across organic structures (Borgatti & Halgin 2011).

The real-world equivalent that Granovetter explores is the concept of a person, A, who has a very strong network of close friends, most of whom know each other as well as A. At the same time, B has an equivalent strong network of close friends. Within these two networks there is a lot of duplication, and very little novelty. What A knows and shares

with a few friends rapidly spreads around her network because everyone knows everyone. Information spreads exponentially because what A tells to 3 people gets told by them to 3 people each, and from there to 3 more people. As most of these people are connected, the information rapidly becomes redundant, in that everyone has already heard it. The same applies to B's network.

When A and B meet each other, they are not only creating the value of sharing what each of them individually knows, be it knowledge, skills, or access, but they are also creating a bridge between their two much larger, but closed networks. A and B are weak ties; acquaintances with very little duplication between their networks and knowledge (Granovetter 2012) and they have the potential to bring new ideas, information, and people to their own network. By doing this they have a value to the others, and by connecting these two networks they create value (Borgatti & Halgin 2011).

Granovetter (1973, 1983, 2012) argues that people are socially disadvantaged if they do not have weak tie networks, and bridges out of their own strong tie network of close friends and family. Such people do not have access to information and knowledge that exists outside their immediate network, and this may affect their ability to hear about job opportunities (Granovetter, 1973). When applied to innovation, it means they are isolated from information about problems that need solutions, solutions to problems, and opportunities (Granovetter 2012).

2.2.1.4 Structural Holes

Burt (1992) developed Granovetter's original theory (1973, 1983) on the 'strength of weak ties' by arguing that the real value in weak ties lies in when they bridge between networks, and therefore become the conduits of knowledge, information, and value between those networks. Individuals who bridge what Burt calls 'structural holes' between networks act socially in the same way as a single bridge across a river between two trading communities, and therefore create value both for the communities and consequently for themselves.

Burt (2004) sets out to explore how 'brokerage provides Social Capital.' Summing up the theory that has underpinned much of the thinking within this thesis, he writes:

> "Opinion and behaviour are more homogeneous within than between groups, so people connected across groups are more familiar with alternative ways of thinking and behaving. Brokerage across the structural holes between groups provides a vision of options otherwise unseen, which is the mechanism by which brokerage becomes Social Capital."

His research examined the social networks of managers within a large American electronics company and concluded that those who bridge 'structural holes' within the company's networks are more likely to succeed, both in terms of promotion and reward, and in terms of having ideas accepted rather than dismissed. His hypothesis is that people who stand near and bridge structural holes in a social network are more

likely to have good ideas and to benefit from these, because they are exposed to different ways of thinking, and consequently have greater influence.

Reflecting Granovetter (1973), Burt (2004) argued that ideas are more homogenous within strong tie networks, so people who have weak ties and bridge into other networks will have access to more variable options (different ideas and behaviours) from which to synthesise new ideas.

Granovetter (2012) further explained that the stronger the tie between two people, the more overlap there will be in their social networks. Examining this theory, Friedkin (1980) concluded that local bridges between networks tend to be via people who are weak ties, because strong ties 'encourage triadic closure,' meaning that two people who are strongly connected are more likely already to know their mutual contacts – if A knows C, and B knows C, it is more likely that A and B will also know each other via C.

Granovetter (2012) concludes from this that his argument about the importance of weak ties does not mean that all weak ties are valuable, only those that serve as bridges between strong tie networks are of special value. It is possible that many weak ties do not become bridges, and are therefore not valuable within this context, however he asserts that strong ties are unlikely to bridge, and most bridges will be weak ties.

Borgatti & Halgin (2011) conclude that this concept supposes that if bridges are the source of novel information, and only weak ties bridge, then weak ties are the best route to novel information.

Borgatti & Halgin (2011) go on to explore Burt's theory of structural holes alongside Granovetter's Strength of Weak Ties theory. In Structural Hole theory, they observe that the focus is on individuals and how they connect to the others in their network. If an individual is connected to others who are themselves all inter-connected, it is unlikely that any of these individual will be party to any novel information not also shared already with the others in the network. However, if an individual is connected to distinct and separated clusters within a network, then that individual will be exposed to non-redundant information not available to the others in the network.

They conclude from this that access to new, non-redundant information positions an individual to be more valuable in the wider network, and more likely to come up with good ideas based on the fusion and novel use of this non-redundant information. Burt (2004) refers to a person with multiple structural holes in their network as having non-redundant ties, whereas Granovetter (2012) describes this as someone having more bridges, and argues they will by definition be weak ties. Burt sees the strength of a tie as reflecting the extent of non-redundancy, in that over time, and once a bridge is established, the non-redundancy 'decays' as information flows through it, and the tie becomes stronger, and with more redundancy (Borgatti & Halgin 2011).

Borgatti & Halgin (2011) call this set of theories 'flow theory' because they rely on an underlying function of the network described as being a conduit of information and value which 'flows' through the links and bridges between the nodes. The flow of information to and between individuals is affected by their distance from each other, position in the network, and embeddedness – how many mutual contacts they have

with other nodes. This will affect how rapidly they receive novel information, and how many times they receive it (redundancy).

Within networks, Borgatti & Halgin (2011) refer to the difference between state-type and event-type social ties. The former are non-transitory types of relationship (familial, workplace) which may change, or end, over time but have a continuous state within that timeframe. Event-type ties are transactional and transient, being the way two ties engage (a conversation, business transaction). These can be measured in terms of frequency over time, quality, and outcome. Both of these ties facilitate 'flow' between nodes, which is the transmittance of things like ideas, knowledge, goods.

Rost (2010) challenges the focus above on weak ties as key in innovation, arguing that weak ties have no value without strong ties, but strong ties have some value without weak ties because strong ties support each other, and can help realise the value of weak ties, whereas weak ties together lack the social cohesion and trust to realise the value of the non-redundant information they enjoy. Therefore, Rost argues, a network which combines strong ties with a high level of closure in the core cluster and a large number of weak bridging ties to other clusters are the most creative. Taking this further, Adler & Kwon (2002) propose that "weak ties facilitate the cost-effective search for codifiable information and strong ties facilitate transfer of complex information and tacit knowledge."

2.2.1.5 The role of role-sets

Within this exploration of weak and strong ties and the position people have in networks, it is valuable to understand the way they interact, and the social skills they both require and develop to function effectively in this context. Rose Coser (1975) explores the concept of role-sets and their place in the development of individualism in modern society, which explains how individuals need to segment their behaviour to suit different social situations. This variety of social interactions form a core part of an accelerator, as will be demonstrated in the second part of this literature review.

Role-set theory explores the complexity of social interactions, depending on the time and place, the person, and the circumstances of the engagement. The interaction of status and complex 'role-sets' are explained by Coser using the analogy of a medical student. 'Medical Student' is a single status, but one which has many roles in relation to others; that of student to teacher, doctor to nurse, student to other student, doctor to patient, and an array of other role-sets within the wider medical ecosystem.

As well as 'role-sets,' there also exist 'status-sets,' in which the individual is engaging with people of differing status, and 'status-sequence' in which the status position changes over time. These concepts apply well to startups, and to the tech sector more generally, for example to the social journey an individual makes as they travel from startup founder with no money, to founder of a funded startup, a startup that has been sold, and potentially into being an investor. This journey can happen quickly, and accordingly role-set and status-set change rapidly (status-sequence).

In summing up a broad body of work in sociology from Marx to Merton, and referencing this to Granovetter's work on weak and strong ties, Coser refers to his phrase 'the weakness of strong ties.' She argues that people in closed communities, rich in strong ties and lacking weak ties, are not exposed to many people different to themselves socially or in status. These are networks of 'simple' role-sets and status-sets, where there is little variety. This lack of variety does not create situations that are socially challenging, and in which an individual can learn the social skills to negotiate these social challenges. These lessons are crucial in manoeuvring through complex social networks, and in particular for bridging up (status) and out (role).

Coser (1975) observes that when the word 'parochial' is used to describe someone's limited thinking or understanding of ideas, it is a geographical or social classification, being of someone from a simple or rural social context. A connection is being made between intellectual limitations and the lack of a person's wider social networks, and consequently their limited exposure to people of differing and challenging world views. She argues that having generic, simple social interactions with similar people requires less intellectual effort than having to adapt one's ideas and responses to a diverse set of people with differing, challenging, and conflicting viewpoints.

A particular part of Coser's text warrants quotation here. Despite being written in 1975, and therefore pre-dating startup accelerators it describes what is happening in a startup accelerator with remarkable accuracy, thus suggesting that the theory of role-sets is important in this study:

> "in a complex role-set, individuals are more likely to be confronted with incompatible expectations. Where this is the case, they are required to reflect upon an appropriate course of action in relation to their status position. They must decide whether to abide strictly by the rules or to reinterpret or even defy them, and weigh each decision in relation to their own purposes of action and the purposes of others. This calls for innovation, sometimes in the form of violation of custom and hierarchical modes… it also forces a certain measure of flexibility, as differences are "ironed out," through negotiation and compromise, through a social process that forces each participant to take into account the vantage point of the other person." (Coser 1975,)

Coser goes on to suggest that in social networks, subordinates, or people of low social status, are expected to conform to behavioural and social norms. A social structure that allows for flexibility over conformity is more complex, requiring individuals to account for more variables in expectation and reaction from different role-sets and status-sets.

Coser explains how this spreads into language use, because an understanding of the differentiation of the self from others leads to a realisation that more complex language is needed to explain ideas. She argues that when we realise people are different to ourselves, we have to use language more carefully to express ourselves accurately, and when this applies to a diverse group of people, all different, then there is further pressure to make language even clearer.

She shows that this 'Cognitive Flexibility' is the ability to see things from the perspective of other people, based on having had exposure to a wide diversity of people over time. Being trapped inside a dense, strong tie network inhibits the development of cognitive flexibility.

This leads to Coser observing that complex socialisation in diverse societies requires, and develops, the ability to imagine the perspective of other people in order to adapt ways to engage appropriately, and to deal with the potential conflicts these differing approaches and ideas create, yet also retaining a clear notion of oneself. This is the necessary skill set to build, manage, and benefit from a complex social network, and therefore is an important factor for accelerators.

2.2.2 SOCIAL CAPITAL

This section will examine what Social Capital is and how it manifests within social networks, in particular how it leads to higher levels of trust, and how it affects the value of particular social network structures, and their behaviour. Lin (1999) suggests that Social Capital refers to gains made by an individual or group as a result of the interaction between actors in a social network. This capital is not economic or human capital and being part of a social network is therefore described as Social Capital.

2.2.2.1 Definition of Social Capital

The meaning and effects of 'Social Capital' are not clearly defined (Portes 2000). Consequently, there exist a broad range of definitions, or attempts to define Social Capital, but there is no clear consensus for the conceptualisation of Social Capital (Bjørnskov & Sønderskov 2012).

Coleman (1988) describes three forms of capital in relation to each other. Physical capital is created by adapting materials to form tools that can be used to produce things, and thereby create value. Human capital is created by adapting a person, through education and training, to give them skills and capabilities that enable them to act in new ways, and thereby create value. Consequently, Social Capital, as an extension of this logic, is where changes in relations between people enable them to act in new ways and create value. It is less tangible than either physical or human capital because the value resides in the relations between people. Social Capital facilitates the creation of value, just as physical and human capital do, because a network within which there is greater trust is able to achieve more.

The concept of Social Capital has many different and related definitions and aspects, some of these are outlined below to illustrate the variety of thought on the subject:

- Lin (1999) suggests that "Social Capital is captured from embedded resources in social networks," and that Social Capital is the "investment in social relations with expected returns." He further (2001) defines 'capital' as "an investment of

resources with expected returns in the marketplace." This theory is expanded in the context of Social Capital by describing that "capital is captured in social relations."

- Coleman (1988) suggests that a unique feature of Social Capital is that those who generate it usually only capture a small part of its benefit, which leads to underinvestment in Social Capital because the returns are apparently low.

- Bjørnskov & Sønderskov (2012) suggest that Social Capital has potential value because it provides individuals the chance to access information and resources in their social network.

- Adler & Kwon (2002) suggest that Social Capital is the resource available to actors as result of their place within their social network. This can include market relations, hierarchical relations, social relations. They further discuss whether Social Capital is in fact a form of capital, arguing that it is a "long-lived asset" which can be developed with an expectation of future benefit. Therefore, it has and holds value that can be expended. By investing in building links to other networks, individuals and groups can increase their access to knowledge, ideas, power, resources, and other advantages. By investing in developing stronger internal relations, groups can increase their ability to operate together to build value.

- Audretsch, Aldridge, & Sanders (2011) define Social Capital as the goodwill "available to individuals or groups" which emerges from the "influence and solidarity" it affords actors. To them, Social Capital resides in social structures, and is a long-term asset one can invest in. It requires management and maintenance and can be used in the place of other forms of capital.

- Orlowski & Wicker (2015) identify that Social Capital improves the return on investment in physical and human capital and is a multifaceted concept. It includes the connectedness of people (their networks) and trust as core elements. This trust at the core of Social Capital can be broken down into inter-personal trust, institutional trust, and trustworthiness. Social Capital "refers to features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions."

- Davidsson & Benson (2003) observe how human capital theory suggests that knowledge allows people to be better at identifying and exploiting new opportunities, but they challenge this, arguing that greater accumulation of human capital, in the form of formal education, may make someone more risk averse. They suggest that a reason that immigrants often engage more in entrepreneurial activity is that their human capital – formal education – is not equally recognised in their new environment, so they are encouraged to take more risk. They suggest that Social Capital provides nascent entrepreneurs with a "wider frame of reference" from which to develop new ideas, and a greater ability to extract benefits from their social networks.

These definitions can be interpreted as suggesting that Social Capital resides in networks and is the outcome of interactions between actors within and between networks. It is heavily tied to trust and can be reflected in influence and power. Social Capital forms the return on investments made in networks, or the realisation of resources embedded in networks. Social Capital is the currency used in networks, and the bond that holds networks together and allows them to function effectively.

2.2.2.2 Trust and Social Capital

Trust is an important factor in internal Social Capital within an organisation, leading to greater support and cooperation between individuals (Yeng, Tseng, & Wang 2015).

Coleman (1988) explores how different types of social structure facilitate trust in the form of Social Capital. The concept of 'closure' within networks defines where the actors are all interconnected. If A is connected with B, and separately with C, A can defy a norm in relation to B without C finding out. If B and C are also connected, A is now subject to sanction from B and C for harming either of them, and is therefore more likely to abide by a norm adopted by all three of them. This closure in a network is called triadic closure.

In this respect, Coleman identified three forms of Social Capital. Obligations and expectations depend on trustworthiness within the social network; the ability of the

social network to facilitate information-flow; and the presence of both norms and sanctions for breaching those norms.

He discusses this in the context of rotating credit associations in emerging economies, where a high degree of 'trustworthiness' between the members of the group allows them to group funds, and lend them to individuals in the group. The close social structure, or triadic closure, make it difficult to abscond with the money; norms of behaviour and effective sanctions, and visibility across the network of anyone who violates those norms, means that the system works well, and therefore has strong Social Capital.

Coleman (1988, 1990) further argues that Social Capital is strengthened in closed networks where norms are understood, and social mechanisms for reward and punishment are in place. This leads to greater trust. Social Capital, in this context, is therefore weaker in less consolidated networks because violations of norms are more likely to go un-noticed, or un-punished. Coleman's approach sees Social Capital as the relationships between people that accrue 'credit slips' for actions carried out for other people. In effect, this is 'doing favours,' and expecting favours back in return. Trust is required for an individual to be confident that someone will return such a favour (Rost 2010).

Coleman (1988) interprets Granovetter's (1985) view on embeddedness as giving a social aspect to a utilitarian view of the economist, arguing that the social structures are not just formed for a single economic function, but also take into consideration past and

future interactions, leading to trust, closeness, and other returns on an engagement which in turn may affect the purely economic functions of a social network. He therefore defines Social Capital as consisting of some aspect of a social structure, facilitating actions of actors (whether individuals or corporate) within that social structure. Social Capital is unique as a form of capital in that it exists entirely within the social structures, between and amongst actors in the network.

2.2.2.3 Bridging and Bonding Social Capital

In this context, Adler & Kwon (2002) argue that 'bridging' forms of Social Capital refer to the relations outside the actor's core network, or their external relations, whereas 'bonding' forms of Social Capital refer to the internal ties within a group. Therefore 'Social Capital' can refer to the value in an actor's bridging links to other actors or networks. It can equally refer to the trust that holds together a community, society, network, or group.

This difference between the approaches of Burt, who defines Social Capital as residing in the bridging of structural holes, and Coleman who identifies Social Capital as residing in network closure, are discussed by Adler & Kwon (2002), who conclude that both network closure and structural holes can create value depending on the context, specifically what the actor is looking to achieve.

Rost (2010) concludes that Burt and Coleman's alternative views of Social Capital complement each other, suggesting that individuals who combine strong network ties with weak network architectures produce the most innovative solutions. She goes on to argue that the difference between Coleman and Burt's view on networks, and in particular on Social Capital, is that one looks at the relationship of individuals across the network, and the other looks at the position of the individual and the structure of the network.

Within this understanding, Rost argues that strong ties lead to innovation because they become social mechanisms for knowledge recognition and realisation of innovative ideas. When these strong ties are combined with weak network architecture, which has access to some structural holes, and enough peripheral network positions and therefore access to bridging weak ties, it adds the benefits of information flow, and access to knowledge and ideas. She concludes that people with strong ties who are embedded in weak network architecture are most likely both to have innovative ideas and be able to realise them.

Granovetter (2005) confirms this by explaining that social networks lead to economic outcomes for three main reasons. Firstly, he argues that social networks affect both the flow of information and also that trust within the network allows people to verify or qualify the information. Secondly, he points to the role social networks have in amplifying the reward or punishment for interactions and behaviour within a network. Thirdly, he argues that trust emerges from within networks, and defines 'trust' as being

a belief that others will behave in a way that may be contrary to their immediate best interest, but in the interest of other actors in the network.

2.2.2.4 The value of Social Capital

Orlowski & Wicker (2015) observe that defining the monetary value of Social Capital is made difficult because it has no accepted exchange value with money and is generally intangible. Audretsch et al. (2011) also argue that Social Capital cannot be measured or quantified in the same way as other forms of capital, and that because it resides in relationships it cannot be owned by a single actor.

Adler & Kwon (2002) argue that a key benefit of Social Capital is information, and the quality, relevance, and freshness of that information. Other benefits include influence, control, and power. This second set of benefits can express itself both in people to whom multiple favours are owed, and who can therefore influence those around them for their own benefit or that of someone they choose to support. Another benefit of Social Capital can be seen in someone who bridges structural holes, and in doing so exerts power because they can choose who benefits from the bridges they build. These forms of power can benefit groups that distil them collectively, allowing them to 'get things done' more effectively, thus creating value for the group.

Adler & Kwon agree that Social Capital can be converted into other forms of capital, for example using one's position in a social network to gain economic capital. They observe

that economic capital is most liquid, and therefore easiest to convert into human or Social Capital (e.g. paying for an education, or buying someone lunch), whereas Social Capital is the least liquid and hardest to convert. There is no simple mechanism whereby Social Capital can be converted into other forms of capital in the same way that financial capital can be used to pay for something.

They affirm, however, that Social Capital can be used as a substitute or complement to other forms of capital. For example, strong networks can be used to reach people faster, saving time and money, and can be used to raise financial capital, or to take a product to market. Social Capital, in the form of trust, also affects the cost of things impacted by risk, such as lending, because that risk can be assessed more easily using Social Capital, which provides the ability to access deeper and broader knowledge about an individual or opportunity from which to evaluate its risk.

Granovetter (2005) refers to Lin (2001) in defining Social Capital as, for example, where a prospective employer and employee prefer to find out about each other via a trusted actor in a network. In this context, social networks and Social Capital are more efficient than a recruitment agency because they exist already as part of a person's wider activities and interactions, whereas a recruitment agency will spend time and money to build such a network.

Therefore, whilst Social Capital cannot be quantified in direct relation to other forms of capital it can be converted into economic and human capital. It can also be accrued and 'spent' to create other forms of capital. However, Social Capital resides and is created

from the links between actors in a network, and therefore cannot exist without the context of multiple actors in a network environment.

2.2.2.5 The risks associated with Social Capital

Whilst Social Capital has so far been explored in the context of its benefits, and as a positive outcome of social networks, it can also have risks and the potential for negative outcomes.

These risks are explored by Adler & Kwon (2002) who argue that they primarily relate to the cost of building and maintaining Social Capital within networks, when realising and converting that Social Capital is difficult. A simple risk is not getting an adequate return on the investment, but also that the work involved distracts from other important activities, for example earning economic capital.

A related argument put forward by Granovetter (2005) is that building and maintaining close network ties (strong ties) is expensive, whereas maintaining weak ties is easier and more efficient. As strong ties bring redundant information, and weak ties bring non-redundant information, the risk of building and maintaining a broad, strong tie network is that it is costly and high in redundancy.

Adler & Kwon also describe the risks posed by Social Capital of becoming too embedded in a network, leading to a lack of non-redundant information flows, and at a group level

a lack of new ideas resulting in parochialism and inertia. Too much Social Capital, represented by overly strong network ties, can also lead to a sense of over-obligation within the group, and friendships that are too close to allow more opportunistic interactions. This can ultimately lead to corruption, conspiracy theories, and other negative behaviour by a group, where excessive Social Capital results in loyalty to strong ties taking precedence over beneficial behaviour, and overriding adherence to the norms of the wider weak tie community. They conclude that too much Social Capital is seen to lead to too much network closure, so Social Capital has a risk when it becomes too strong.

Taken further, Adler & Kwon explain that groups which have low internal bonding ties, and low external bridging ties will suffer from low Social Capital, whereas those with high levels of internal and external ties will enjoy strong Social Capital and the associated advantages. This approach suggests Social Capital risks exist in networks with high internal links and low external ties, or high external with low internal ties.

They suggest that networks with high internal links and low external links risk isolation and a tendency towards not receiving conflicting sources of information, combined with norms that encourage people to 'toe the line' rather than challenge negative behaviours. This creates a tendency towards information bubbles, conspiracies, and corruption. Networks with high external and low internal ties risk developing strong access to new and conflicting ideas, and therefore a potential for innovation, but no internal Social Capital to provide the trust and cooperation needed to act on it.

Adler & Kwon conclude that this analysis also depends on the content of the ties in these networks, whereby the two tendencies described can result in a force for good or bad outcomes depending on what information is travelling across the internal or external ties, and on the underlying culture. Isolated networks can create a downward force, where false information and ideas go unchallenged, creating a negative spiral, or they can end up creating the stable social platform from which members of the group can reach out to other networks.

2.2.3 THE BEHAVIOUR OF SOCIAL NETWORKS

The description of social network structures combined with an understanding of Social Capital enables an examination of behaviour within social networks, including social norms, and how these are policed.

2.2.3.1 Norms

Societies all have norms. They are the accepted social rules that a connected group of people agree upon. They may be codified, in the form of laws, or a constitution, but originate as and can remain as unwritten, even unspoken rules. Norms are an important part of behaviour within social networks, accounting for how they self-regulate, and defining the levels of trust and co-operation, or Social Capital within the network. Norms are clearer and easier to enforce in a dense network, which is one in

which there are multiple possible connections between nodes and triadic closure, as outlined above (see 2.2.1.4). Information travels more quickly through such networks, and consequently reward and sanction, especially in terms of reputation, spread rapidly and widely. Norms are policed. Individuals who conform to norms are rewarded by the network, and those who break with them are sanctioned. The precise form of reward and sanction varies according to the society or network (Granovetter 2005).

2.2.3.2 Cooperation and reciprocity

Fowler & Christakis (2008) research the spread of ideas and emotions through social networks. They used data from the Framingham Heart Study, a 20-year longitudinal social study, to explore how happiness spreads across social networks. They concluded that happiness spreads across networks through a variety of ties, and that it clusters in groups, and can extend by up to three degrees through the network. They went on to show how other concepts, like depression and loneliness, also spread by up to three degrees through social networks, using social ties. This sets the context for understanding how concepts like co-operation also spread through networks.

Harrison, Sciberras & James (2011) specifically explored cooperation in social networks. Their experiment with human networks demonstrated that cooperation is most productive when individuals can expect direct or indirect reciprocity in the future or are aware of sanctions imposed on non-co-operators. Reputation in the network increases the chances of cooperation again because it increases the likelihood of either

reward or sanction in the future. Social connectivity, or the place in the network structure of a particular actor, also affects the probability and frequency of interaction, and the exchange of information. They identify that if an actor is highly connected within the network, then cooperating with them is more likely to result in reward, or not doing so in sanction.

In their experiment, they sought to test the investment in cooperation in a human social network by getting individuals to carry out tasks that had a clear physical cost to the actor, but a benefit to another actor in the network. They identified that social proximity within the network increased cooperative investment, and that some individuals were willing to expend more effort for the benefit of their close social ties than on themselves or their close genetic ties. They concluded this is because strong social ties are different to strong genetic ties, whereas an individual would expect a relative to act to support them, with non-genetic ties there may be a desire to increase the chance of reciprocity by over-compensating their support as it cannot be taken for granted.

Through their experiment, Harrison et al. (2011) showed that social proximity in a human social network acts in the same way as biological relatedness in a simpler animal social network, and that people who are more cooperative are more likely to cluster in networks.

2.2.3.3. Embeddedness and tie decay

Granovetter (1985) proposes that co-operation and reciprocity are behavioural norms that are embedded in social networks, and that the behaviour and institutions examined in neoclassical utilitarian economics are far from being self-interested and isolated from social influence, as suggested by economists, and instead are highly affected by ongoing social relations and therefore not operating independently of them.

He thus combines economics and sociology and suggests that most behaviour is embedded in networks, and therefore influenced by social outcomes and inter-relationships. In particular, he suggests that behaviour such as expending effort to benefit others, that is apparently non-rational as viewed from an economics perspective, becomes rational when viewed sociologically as a function of embeddedness, and therefore complying with social norms, and responsive to social outcomes like status, approval, or sanction.

Burt (1999) argues that embeddedness is also a factor in the decay of networks, which describes the tendency of relationships to weaken and dissolve over time. He further observes (2001) that the rate of decay is affected by multiple factors, and is slowed in part by people being connected indirectly through many third parties, or being highly embedded. He posits that building such attachment should happen as early as possible and should be embedded in other types of social relations, for example involving spouses, friends, and relatives, not just the individual, and should stray into social

engagement, not just topic or work related. A higher level of embeddedness will lead to a slower rate of decay.

Lin (1999) offers three further reasons why embedded resources in a social network will produce value. Firstly, they give access to the flow of information. In an imperfect market, an individual's position in the network can increase their access to information not readily, or quickly, available to others, thus giving them an advantage. Secondly, position in the social network can afford an individual some degree of power or influence. This can relate to the decision-making of others, or any other outcomes over which this influence creates greater value for the actor or its associates. Thirdly, Lin points to how the position of an actor in the network, and their relationship to others can afford them social credentials in the eyes of others. This value derives from the interaction between actors in social networks and is therefore their Social Capital.

2.2.3.4 Link Reciprocity

The literature has thus far examined the interrelationship between Social Capital and co-operation, showing that reciprocity is a key factor in social networks and Social Capital (see 2.2.3.2). Rand, Arbesman, & Christakis (2011) argue that in evolutionary game theory reciprocity is generally examined in the context of occurring between two actors. In this context an actor can reciprocate the action of another actor, either by cooperating or not based on their previous action. They suggest that this notion is harder to explore in groups, but they argue that "strategic tie formation and dissolution"

in a dynamic social network allows actors not only to respond to cooperation or lack thereof in others by equivalent actions, but also to respond through the formation or dissolution of ties between that actor and their network.

Consequently, if an actor in the network does not cooperate, that tie with them is dissolved, excluding them from the group. If an actor does cooperate, their behaviour can be rewarded both with reciprocal cooperation, but also with formation of social ties into the network. The result is a network which can refresh rapidly, can constantly bring in co-operators, and exclude non-co-operators (Rand et al. 2011). Harrison et al (2011) suggest this explains that co-operators tend to cluster as a result of link reciprocity.

Rand, et al. describe how dynamic networks, where ties are created and dissolved in response to behaviours, can amplify clustering of certain behaviours or attitudes, creating an advantage within the network for constructive behaviour. Ties in social networks are dynamic, in that they are created and terminated in response to people's actions and behaviours, becoming an effective means by which behaviour is sanctioned or rewarded. Link reciprocity therefore means that the networks of co-operators grow rapidly, and those of non-co-operators shrink accordingly. Link reciprocity is therefore the means by which norms are policed in dynamic social networks.

2.2.4 SUMMARY: SOCIAL NETWORK THEORY

This first part of the literature review has explored the fundamental concepts in Social Network Theory, and shown how value resides in networks in the form of Social Capital. The behaviour of social networks is influenced by these structures and rewarded through Social Capital. In particular, co-operators cluster in networks, supported by link reciprocity, which rewards them with further ties, and at the same time expels those who do not co-operate, or who are bad actors.

The extent to which an actor is embedded within a network affects their access to information, and consequently their power and influence. All of this is the Social Capital they derive from their position and behaviour in the network, but can be converted to economic or human capital when those benefits are reflected in their commercial activities.

Therefore, Social Capital can be a substitute for other forms of capital because it can be converted as a result of the benefit it brings within a social network. It can consequently be used to reward people, and threat of withdrawal can be used to sanction them.

Within the structure of a social network, bridging ties give access to new information and ways of thinking, and bridging ties are usually weak ties. However, strong ties allow people to get things done effectively, and enjoy greater trust because they are more likely to return favours over time. Therefore, a mixture of strong ties and weak ties creates the ideal social structure by which to access new ideas and act on them to create

benefit. In order to manoeuvre through this rich social landscape, individuals require complex role and status sets in order to relate to people unlike them, and to express their ideas to a variety of other actors.

This describes the social network structures that are the foundation of accelerators, which are not only business support programs, but also networks of actors connected by ties, engaging in complex social interactions.

2.3 ACCELERATOR LITERATURE REVIEW

2.3.1 WHAT AN ACCELERATOR IS

Miller & Bound (2011) suggest that a valuable approach to understanding the value of accelerators is to explore the alternatives available to startups, and by doing so begin with understanding what accelerators are not. They argue that bank loans, government grants, and paying for space in an incubator are all less attractive than an accelerator package, in particular being slow, making it harder to scale, and being more expensive.

As examined in more depth below (see 2.3.2.2) they point out that accelerators are not incubators, which are buildings that rent out desks, but are a form of incubation, which is a form of support for an early stage company. It could be argued that many early stage companies that get accepted into accelerators could not join an incubator because they do not have the funding to pay for rent or other services.

Hallen, Bingham, & Cohen (2016) explain that accelerators help startups overcome the 'liabilities of newness,' which Frimodig (2012) describes as their competence and equity gap. To achieve this they offer strategic support, helping startups grow faster, and raise money more effectively. They are also intended to provide private equity and venture capital investors a source of higher quality startups that have a lower mortality rate (Sharma, Joshi, & Shukla 2014).

Accelerators were born into the unique business environment of the tech sector, which is unusually open and collaborative. Mentors offer advice for free, startups share office spaces and talk openly about their businesses. In most circumstances NDAs are frowned upon or considered unnecessary, certainly with startups. They have developed out of this sector to encompass many sectors, but the traditions and core concepts have remained (Miller & Bound 2011).

This is the framework and context within which accelerators exist. The literature review now traces their development and evolution, exploring these and other themes in more detail.

2.3.1.1 Emergence and growth of accelerators

Almost all accelerators are derivations of Y Combinator, which established the concept in 2005 (Christiansen 2009). The founder of Y Combinator, Paul Graham, first invested a small amount of money in eight startups after giving a talk to the Harvard Computer Society in which he advised the budding entrepreneurs to seek angel investment from wealthy, successful entrepreneurs who had founded tech companies themselves (Lee, 2006; Cohen 2013).

He found that by having invested into a group of founders, all of whom were inexperienced, the advice and education they needed could be delivered to the whole group at once, which was more efficient (Cohen 2013). This group of startups grew into

some successful companies, including Loopt, which was acquired for about $43M by Green Dot (Cohen 2013). These successful sales, or exits, created a return on the investment made by Graham, suggesting that this model of investing in batches had merit.

Hoffman & Radojevich-Kelley (2012) explain how the concept then developed, and in particular took off after 2008, when the recession diminished the amount of funding previously available to startups, especially angel investing and bank loans. They suggest the growth of accelerators was in part due to this decline in alternative funding, making accelerators more attractive to startups. Hathaway (2016) estimates a 50% annual increase in their numbers from 2008 to 2014.

Cohen (2013) observed that there is no official list of accelerators, and as new ones are launching so often any such list would soon become out of date. When she compiled her own database, she identified (in 2013) up to 300 programs in five continents, which had supported 2500 startups, and helped them raise around $1.8bn.

She observed that it is difficult to count accelerators or chart their growth definitively. Other sources that have tried to do this produce a confused picture. A year after Cohen created her list, Fehder & Hochberg (2014) estimated there were anything from 300 to over 2000 programs in six continents. Miller & Stacey (2014) referenced the main online database of accelerators, Seed–db.com, as listing 136 programs worldwide which had supported 2,038 companies and helped them raise $1.5 billion. Shane (2015) refers to the website, Angelist.com, as listing 467 accelerators. Hallen et al (2016) suggested

that since 2005, over 6000 startups had participated in one of 650 programs, and raised around $13bn, taking their information again from Seed-db.com.

Bone et al. (2017) also referred to Seed-db.com, identifying 224 accelerators globally, 18 of which had closed or merged. Geographically, 139 were in North America, and 57 in Europe, and the rest scattered in other continents. Bone et al. (2017) discuss EyeFocus Accelerator, but Seed-db.com does not list it, which shows that the data on accelerators is not comprehensive or current at any given point or in any given source.

In 2014, reflecting how the motivation and funding for accelerators had evolved from Paul Graham's investing model of an accelerator, Fehder & Hochberg (2014) reported that local governments and founders were motivated by using accelerators to trigger the local startup ecosystem in their city or region.

As well as the recession of 2008 creating a need for different ways to finance startups, the other reason for the growth in accelerators is linked to the reduced cost of setting up a tech company, and testing ideas and products. During the dot.com boom, technology companies required very large sums of money to create new software or hardware, but the development of technology, and better understanding of processes like Lean Startup means that startups could now make meaningful progress with relatively small amounts of money and time (Fehder & Hochberg 2014; Pauwels et al. 2015).

Hochberg (2015) showed that the spread of accelerators in the US was across the country, rather than clustering around traditional tech hubs like Silicon Valley. Whereas in the UK, Fox (2014) reported that 61% of programs in the UK were based in London and referenced what were then early efforts by the government to encourage a wider spread of programs outside London.

As the concept of accelerators evolved into different variants, Bone et al. (2017) reported 205 incubators, 163 accelerators, and 11 pre-accelerators, 7 virtual accelerators, and 4 virtual incubators in the UK. Several maker spaces, co-working spaces, and venture capital funds did not meet the criteria of either an accelerator or incubator, despite describing themselves as such. This shows how much the concept of an accelerator has developed since its inception, and how it has triggered other types of incubation processes and business models around the ecosystems which have been built.

Reflecting the tendency for accelerators to be based within larger ecosystems, Bone et al. (2017) also observed that half of UK accelerators were in London, whilst incubators were evenly distributed across the UK. This confirms the idea that will be examined in this thesis that accelerators can be ecosystem builders but need a wider ecosystem around them. Bone et al. (2017) also reported that businesses travelled a shorter distance to participate in incubators than they did for accelerators.

2.3.1.2 The lack of research into accelerators

A theme running through the literature is that there has been relatively little research into accelerators. By examining the literature chronologically, it is possible to see how observations have changed over time and how research into accelerators has evolved and developed. This section of the literature review will examine the evolution of accelerator thinking over time. Christiansen (2009) cited a lack of 'serious literature' about accelerators, despite there being plenty written about them in the popular press.

In 2010, Tarani (2010) suggested that little research had been carried out into accelerators, and that most of the available literature was from magazines, websites, and by organisations concerned with innovation and entrepreneurship, such as NESTA and the Kaufman Foundation. These, he argued, mainly explored how to build accelerators, but did not explore the underlying processes in detail.

Two years later, Hoffman & Radojevich-Kelley (2012) observed that the data they were studying was only two years old, making it a difficult topic to form the basis of extensive scientific research. Frimodig (2012) found that whilst there had been extensive research into business incubation, less attention had been paid to accelerators.

In 2013, Caley (2013) continued this argument, citing that over 250 articles on incubators had been published in peer-reviewed journals, whilst nothing similar had been found on accelerators. Like Tarani in 2010, Caley also found that available research material mainly consisted of reports by think-tanks and governments,

dissertations, and media articles. Cohen (2013) concluded that accelerators were an important subject for academic research, but as yet were under-studied.

The lack of peer-reviewed literature was also observed by Lehmann (2013), in particular that no scientific study had been made into corporate accelerators. He primarily referred to Christiansen (2009) and van Huijgevoort (2012) as a resource for his own research, and reached the conclusion that most of the research and writing on the topic of accelerators was, to date, just descriptive rather than analytical.

This last point is of interest and is developed further in the literature. Frimodig & Torkkeli (2013) specifically point out that not enough research had been carried out on the acceleration process.

In 2014, Kim & Wagman observed that despite the significant role that accelerators were now playing in entrepreneurial financing, they had still received very little attention in academic research. Fehder & Hochberg (2014) added that accelerators were proliferating, but there was limited evidence in research of the 'efficacy and role' of the programs. They suggested this was partly due to an absence of large scale datasets. In an observation that is important to this thesis and other research, they concluded that researchers do not have access to much information about accelerator programs, such as the companies entering and exiting, and the startups that apply but are rejected. They suggest one reason is that accelerators are often startups themselves, so they do not have the resource or incentive to track data in a way necessary for thorough academic research.

Hochberg (2015) continued a year later to suggest that with the increase in public and private money now being committed to accelerators it was necessary to find ways to evaluate their wider effect on regional ecosystems and entrepreneurial activity more generally, going on to argue that this had not been achieved in the literature mainly due to a lack of available data.

Whilst this was in part because the phenomenon was still considered to be quite new, Hochberg (2015) again suggested that accelerators rarely had the capacity to gather and track data to an extent that would be necessary for large-scale studies. He added that as the market had developed, accelerators had become transient, and some of them did not exist long enough to carry out long term studies into the companies they accelerated.

Again, in 2015 Pauwels et al. argued that the literature to date had been primarily descriptive. And in 2016 Hathaway (2016) observed that accelerators have received a great deal of attention but little scrutiny.

Eleven years after Y Combinator, and seven years after Christiansen's first paper, Hallen et al. (2016) were still concluding that there is 'surprisingly' little research into the effectiveness of accelerators. This troubled them because they found that accelerators were by now advertising for startups with the promise that they would accelerate their businesses, but still there was no real evidence to support this claim.

The point that there is a large amount of research into incubators, but very little into accelerators was again made by Eveleens, van Rijnsoever, & Niesten (2016), and

Hathaway (2016) also argued that there had been little systematic research into the impact of accelerators. Specifically, Barba (2016) pointed out that what is missing is any continuous research, leading to a lack of data on the performance, methodologies, and strategy of accelerators as they have evolved. She suggested this is partly due to accelerator founders not wanting to share this information.

This argument would make sense: whilst they might appear to be subjects for study in the eyes of academics, most accelerators are to their founders competing private businesses, so they would be unwilling to share what they might view as their competitive advantage, or outcomes that would impact on their reputation.

By 2017, very little appeared to have changed since Christiansen and Tarani formed their opinions in 2009 and 2010. Gonzalez-Uribe & Leatherbee (2017) pointed to a lack of 'rigorous evidence' about the effect of accelerators. Bone et al. (2017) warned their readers that accelerators had evolved 'dramatically' over a decade, and that by then new programs were launching 'almost weekly.' They observed that this meant the 'shelf-life' of any study into the topic would therefore be limited.

This author believes that this last point perhaps goes some way to explain the apparent disconnect between academic researchers and accelerator founders. In effect, accelerator businesses may have been evolving too quickly for academic literature to keep up. Consequently, academic research may have been perceived to be of little value to those running accelerators, because it was out of date by the time it was published. This would leave accelerator founders and managers less incentivised to work closely

with researchers. Consequently, the nature of the research, in particular the tone of work like that by Bone et al. (2017) is clearly aimed at policy makers rather than accelerator practitioners.

In 2017, Bone et al. still maintained that the sector was young, and stated that "empirical data needed to thoroughly evaluate the success of accelerator programs and their graduates does not yet exist," so there is little proven research into best practice.

This thesis comes at the end of a period of developing academic interest in accelerators, but one during which a relatively small body of work has developed mainly aimed at describing accelerators. There is some analysis, and many lists and rankings, but no large data sets or long-term studies which exist for their evaluation. This thesis therefore focusses on EyeFocus Accelerator, as a case study, to contribute to the wider body of research, rather than seeking to replicate or add to the existing lists and rankings.

2.3.2 DEFINITIONS

The examination thus far of the historical evolution of accelerators and the extent of research into this topic gives a context in which to explore in more depth the definition of an accelerator, and the other related concepts of a startup, and incubation.

2.3.2.1 Definition of a Startup

This thesis, and any discussion about accelerators, refers to 'startups.' The word 'startup' can cause as much confusion and disagreement as the word 'accelerator,' perhaps indicative of both still being relatively new and constantly changing concepts. A startup was shown to differ from an SME in part due to the attitude and ambition of a startup (see 1.1.2).

Hoffman & Radojevich-Kelley (2012) add to this that a startup is distinct in operating in an uncertain and difficult context, and bringing something new, and potentially disruptive to the market.

Bone et al. (2017) suggest that the young company will also have a specific growth ambition, namely to grow, or scale, quickly and rapidly, which is not exclusive to startups, but not ubiquitous to all SMEs. Startups typically have something new about them, be it a technology, business model, or market. The support startups need is therefore different to the support required by new small firms, or small firms in general.

Dee, Gill, Weinberg, & Mctavish (2015), writing for NESTA, go further to make the sub distinction that a pre-startup can consist of entrepreneurs with an un-tested idea, which can also be called 'idea stage.' They define a startup as a company that is in the process of being set up, while an 'early stage venture' may be pre-profit, but with some form of early traction.

Another approach to defining 'startup' is in exploring what they do not have, and therefore what they need from an accelerator. Isabelle (2013) observed that startups generally apply to accelerators when they have multiple needs, rather than just needing mentoring, or just needing capital. This is a reflection of their lack of knowledge and experience, so in turn the definition could include a company with an incomplete team, or a team with incomplete knowledge.

Given the very wide, and subjective, definitions of a 'startup,' many of which are created for specific purposes, for the purposes of this research, a startup will be taken to refer to any company or entity that is part of an accelerator cohort. This allows for the fact that in contemporary accelerators, participant companies may be social ventures, more developed businesses, or even quite developed companies, as well as individual founders, new teams, or more classic early stage technology companies.

2.3.2.2 Incubators are not accelerators

Much as it is necessary to define 'startup' in order to discuss accelerators, it is also necessary to differentiate accelerators from incubators, and therefore to define the terms 'incubator,' and 'incubation,' so they can be distinguished from an accelerator. Hochberg expresses frustration, which is shared by this author, at accelerators that call themselves incubators and incubators that call themselves accelerators (Fehder & Hochberg 2014; Cohen & Hochberg 2014). These terms are casually used interchangeably, which is both inaccurate, and causes confusion.

This thesis will not focus in depth on defining incubators or comparing them to accelerators, as this has been well covered in the existing literature (Miller & Bound 2011; Cohen 2013) and is not the focus of this thesis. However, it is relevant to clarify the distinction between them in order to carry forward this particular examination of accelerators.

Pauwels et al. (2015) state that incubators were the antecedents of accelerators, and accelerators may have evolved as a response to incubators. The first business incubator was established in 1959 in New York, by 1995 there were 600 in the US alone (van Huijgevoort 2012). While incubators are the historical predecessors of accelerators, Hoffman & Radojevich-Kelley (2012) conclude that there is no evidence that those creating accelerators studied incubators for guidance.

This author understands that the primary distinction between incubators and accelerators is that an incubator is a building, and an accelerator is a program, so an accelerator could run inside an incubator, but not vice versa. However, the business model is different as well. Incubators are real estate ventures offering startups office space at a reduced rent. They also lack cohorts, with companies arriving and leaving on a continuous basis. Fehder & Hochberg (2014) suggest that incubators are seen to shelter early stage companies from 'the harsh realities of the world' while accelerators push startups out quickly to find out if they will survive or fail.

Another difference between accelerators and both incubators and angel groups is the cohort formed by accelerators, which brings benefits by clustering interesting startups

together and encouraging, in return, investors to cluster around them (Fehder & Hochberg 2014).

Unlike business incubators, van Huijgevoort (2012) observes that accelerators offer a larger number, and higher quality of mentors, and create a boot-camp environment that puts startups under pressure. Accelerators also focus heavily on facilitating access to future investors, in a way not typically done by incubators, or at least not to such an extent.

Christiansen (2009) saw accelerators as being generally less reliant on government funding, and therefore more flexible, fast moving, and commercially focussed than incubators. This was further supported by Bone et al. (2017) which found that all incubators in the UK received government funding, which was not the case for accelerators.

Another key distinction is around investment and equity. Christiansen (2009) observed that incubators generally do not take equity in their tenant companies, whereas accelerators typically do take equity. Therefore, the relationship between an incubator and a startup is typically that of tenant and landlord, whereas with an accelerator and startup it is investor and investee.

Frimodig & Torkkeli (2013) suggested it is an interesting distinction that when accelerators offer office space, they do so as part of an investment package, in return for equity, rather than in return for rent.

All of this means that the alignment of interests between an accelerator and startup are totally different to those between an incubator and tenant. Consequently, incubators are sometimes criticised for offering life-support to companies (Miller & Bound 2011). The argument being that incubators risk keeping startups alive in order to retain them as paying tenants, whereas accelerators are designed to accelerate either success or failure because they are supporting them financially as investors. Helping a bad startup fail quickly is an important service, saving the founder time, money, and pain, and allowing for funding to be reallocated to companies on a more likely route to success. For this reason, Pauwels et al. (2015) argue that accelerators need to maintain their tradition of having a short, fast program, or if it is longer then still having a beginning and end to that program, otherwise they too fall into the trap of incubating early stage companies that would otherwise fail in the harsh outside world.

2.3.2.3 Definition of Incubation as a process

Having seen that an 'incubator' is a building, and a type of business, 'incubation' is a process, and one which can happen in a variety of environments; incubators are physical spaces, incubation is a wide range of support (Bone et al. 2017).

Incubation is a process to help early stage companies, and accelerators are an iteration of the incubation process. Accelerators may run within incubators, but incubators, whilst offering incubation, are not accelerators (Pauwels et al. 2015).

Incubators accept companies one at a time, rather than in cohorts, and allow them to stay for an undefined period of time. Accelerators are different in that they generally take equity in the startups, accept them in cohorts, and only for a limited period of time, which starts and ends concurrently for the whole cohort.

2.3.2.4 Definition of an Accelerator

This literature review has so far demonstrated that an accelerator is not an incubator, (see 2.3.2.2) and that it is not the same as angel investment, bank lending, and other forms of support for early stage ventures, (see 2.3.1) but is a form of incubation (see 2.3.2.3). This review now examines the definition of an accelerator within the literature.

The definition of 'accelerator' has changed over time as the concept has evolved. To show this evolution, the literature will again here be reviewed chronologically, charting both the growing understanding of what an accelerator is and does, but also showing how the underlying principle has not really changed since Y Combinator. Two papers have been instrumental in defining the accelerator, and these two definitions lie at the heart of the discussion and description of accelerators in the literature. Christiansen (2009), and Miller & Bound (2011) laid the foundations on which other definitions have been built. Tracing this discussion through the literature chronologically also shows more generally how research into accelerators has developed since 2009, with the number of papers and depth of research increasing gradually each year.

In 2009 Christiansen wrote the first detailed paper on accelerators, called 'Copying Y Combinator,' when the accelerator concept was only 4 years old, and just taking off. In it he analysed what Y Combinator was doing, referring also to the other early US accelerator, TechStars, and tried to refine this into a blueprint for others founding accelerators. The concept was beginning to be copied, hence the name of his paper.
In his analysis, he concluded that accelerators are different from both seed investing and business incubators. To be classified as an accelerator, the program should include funding, a cohort of small teams as participants, a defined period of support, education, networking, but the offer of office space and a demo day , or closing event where startups pitch to investors, were not fundamental to his definition.

Christiansen excluded from his definition any programs that offered seed investment without a structured education program, or an education program without seed funding or financial support. He also excluded from his research, and his definition, programs founded by Venture Capital (VC) funds and consortia of investors. He observed that Y Combinator and TechStars were both founded by angel investors, who did not necessarily have the resources to become follow on investors in their accelerated companies. He suggested that when a VC backed accelerator does not make a follow-on investment in one of its companies, despite having the financial ability to do so, this can send a 'danger signal' to other investors, thus damaging the future prospects of the company. This is not the case for angel investors who do not have such resources.

A year later, Tarani (2010) observed that it was understood that the small amount of financial support, given as an equity investment, was to enable the team to pay for their

living expenses whilst attending the program, rather than being intended as a pure equity investment.

He also observed that the 12 week program, with the pressure of the demo day at the end, was used to create a sense of urgency and pressure on the startup founders. He also explored the unique feature of cohorts within accelerators, suggesting these are 'classes of startups,' which brings efficiencies to the support of early stage businesses. The efficiency of the cohort approach made it possible to deliver intensive education and support during this period.

Tarani interviewed Jon Bradford, founder of Springboard accelerator in the UK, and arguably the person who introduced accelerators from the US to the UK and Europe. Bradford explained the value of the cohort in terms of the efficiency it creates, suggesting that people go to networking events in the hope of meeting relevant people. Experts are approached individually by startup founders seeking advice. The accelerator gathers those founders, who need contacts and advice, into a cohort. It then gathers the experts and other contacts into a group of mentors, and facilitates them meeting in an efficient manner. When done well, Bradford argued, a cohort of 10 or more founders can each meet 10 mentors in one day, which is clearly a uniquely efficient proposition. Bradford refers to this as "forced serendipity."

In 2011, the definition was developed and refined further by Miller & Bound (2011), who laid the foundations for most future definitions and discussions of accelerators. They concluded that an accelerator had the following five features:

1. “Open and competitive application process
2. Pre-seed investment, usually for equity
3. Focus on small teams, not individual founders
4. A defined time frame of education and intensive mentoring
5. Cohorts of startups rather than individual companies”

Miller & Bound also observed the growth of social venture accelerators, such as Bethnal Green Ventures in London, addressing the rise in interest of impact investing from the investor perspective, and a desire by startup founders to address social problems with a startup approach rather than the traditional grant funded charity. The accelerator model was therefore adapted to address this combined market of investors and founders, using the same principles of mentoring, cohorts, and intensive programs.

Continuing the argument made by Tarani (2010) about efficiencies of the cohort, Frimodig (2012) observed that accelerators were mainly founded by entrepreneurs and were seen as a means to address the “competence and equity gap” of startups. By acting more broadly as a connector in the entrepreneurial ecosystem they were understood to create value beyond just that for the people directly involved, such as investors and startups.

Hoffman & Radojevich-Kelley (2012) defined an accelerator as being groups of people who bring business experience to support nascent firms, to help them survive the earliest stages of their development. This support, they explained, can include office space, mentorship, networking, knowledge, and expertise. The definition taking shape, 3

years after Christiansen's strict criteria, was becoming less prescriptive, reflecting the wider variety of accelerators now in the market.

Hoffman & Radojevich-Kelley (2012) examined a key aspect of accelerators, being the educational component of their activities. They explored both the extent to which the education is part of what defines an accelerator, and how that education is delivered. Accelerators help build the team around the startup, challenge the idea, and support with prototyping through to product development. The accelerator provides an intensive program, similar to a boot-camp, and is therefore different to conventional entrepreneurship education.

This comparison with conventional entrepreneurship education, at universities for example, was explored further by Cohen (2013), who suggested that accelerators offer entrepreneurship education whilst accelerating the development of an early venture. She referred to them as 'modern incubators' that offer seed financing, mentorship, and education, and referred to Miller & Bound (2011) for her definition of an accelerator.

She adapted this definition based on her own interviews with industry professionals, reaching a definition that accelerators provide entrepreneurship education to a cohort of early stage ventures, who enter and leave the program at the same time. These two factors, the education combined with the cohort, she argued, distinguish the accelerator from incubators and angel investors, both of which engage with startups on an ad hoc basis, one at a time.

Whereas Christiansen (2009) was looking at just one program, by the time Cohen (2013) was examining the accelerator market, she focused on 9 programs. She identified a far wider range of variables between the programs, ranging from the amount they invest, the size of cohort, and the specific areas of business they address, though nearly all the programs she examined culminated in demo day s, which are events at which the startups pitch to a room of investors for further funding. Cohen examined the role a demo day plays along with the set timeframe of an accelerator. She concluded that the strict timeline and concept of a graduation date, when the startups have to leave the accelerator, reduces the risk of co-dependency between startups and accelerators, and forces the startups into the selection process of the market.

Echoing the growing focus on the efficient transfer of knowledge from mentors to founders, and the more structured educational component, Frimodig & Torkkeli (2013) concluded that "knowledge is the most valuable resource of an accelerator," along with the ability to transfer that knowledge to the startups.

Frimodig and Torkkeli (2013) conclude that a range of programs can be classified as accelerators, including:

- Pre-seed accelerators
- Seed accelerators (startup accelerators)
- Business accelerators
- Corporate accelerators

Building on Miller and Bound's definition of 2011, Miller and Stacey (2014) explored the business models of accelerators, which 9 years after Y Combinator was launched had evolved into a variety of approaches. They concluded that the business model can include programs that are entirely grant funded, those set up along the same model as venture capital funds, with an investment group and associated management and performance fees, and those supported by corporate sponsors.

Bliemel et al. (2014) looked more at the efficiencies of accelerators, observing that most accelerators employ very few people, and as with university degrees, offering a program to a cohort creates an economy of scale, allowing advice only to be delivered once. They also observed that the cohort element encourages founders to support each other, rather than just wait to be educated passively, both through peer support, but also through peer pressure to perform.

Reflecting further how the growth in accelerators made it harder to create a single definition, Pauwels et al. (2015) looked further at how accelerators were defined in relation to incubators, focussing on the way they translated knowledge, or offered intangible support to startups, rather than the tangible support offered by incubators in the form of office space in as a defining characteristic. They added that the short time frame of accelerators, rather than long and ongoing incubation support, and equity investment, were still defining aspects of an accelerator.

They drew attention to the mentoring aspect of accelerators, suggesting that a key difference with previous incubation models is carefully facilitated mentoring, managed

by the accelerator managers. This is in addition to a curriculum of education which varies from program to program, but typically includes quick insights into key knowledge areas for a new entrepreneur, such as finance, intellectual property (IP) law, and marketing.

Exploring the now diverse types of accelerators, they observed that a wider definition allowed for an equally wider set of indicators by which to measure and judge accelerator outcomes. Allowing for them to have a broader set of aims and outcomes means that they can be judged to have succeeded according to different measures, such as local economic development, introduction of an entrepreneurial mind-set to a formerly conventional and risk-averse culture, and coordination of a previously disorganised and unconnected ecosystem. Policy makers, supporters of accelerators, and investors should, they suggested, understand this broader nuance between accelerators in order to be able to judge them appropriately and see the value that they may be creating which is not recognised if they are all judged on investment outcomes alone.

By 2015, the measure of success explored by Christiansen, which was almost entirely around investment returns, no longer applied to the more complex market, especially in Europe, where not all accelerators were set up for the purpose solely of being deal flow makers. Pauwels et al. (2015) suggested that this specific investment model accelerator could only work in dense ecosystems like Silicon Valley. They criticised policy makers for wrongly expecting what they call 'welfare stimulators,' or accelerators set up to achieve goals more around economic development to have the same outputs as deal-

flow maker programs, being those just designed solely to create returns on investment into startups.

Continuing this theme, Hathaway (2016) was able to reflect that accelerators had become a popular part of the regional growth infrastructure. He argued that four aspects of accelerators differentiated them from other economic growth activities; a fixed term program, the cohort, mentors, and the demo day . This is still essentially the definition of Christiansen (2009) and Miller & Bound (2011). Despite this, he found that fewer than one third of the 700 organisations he reviewed in the US that self-identified as an accelerator actually fitted his, or Cohen's (2013) definition of an accelerator, demonstrating that the proliferation of accelerators had not helped refine the wider understanding of what they were.

Reflecting previous insights into the efficiency of programs, he suggested that whilst 'learning by doing' is inevitable, it is also slow and inefficient. Accelerators aim to condense years' worth of learning into a few months. An accelerator focusses a lot of activity onto a defined group of people, in one place, in a condensed time, so also exposes various ecosystem actors to each other in a dynamic and open environment (Hathaway 2016).

Brunet et al. (2016) suggested it is becoming harder, rather than easier to define precisely what an accelerator is, because the evolution of new models of accelerators creates more breadth in what *accelerator* can mean, and because the line between accelerators, incubators, and early stage funds is becoming more blurred. Of the 193

accelerators they reviewed, 30% described themselves as combining aspects of accelerator, incubator, venture capital fund, and/or angel group, therefore having evolved away from the clearer and precise definitions of Christiansen (2009) and Miller & Bound (2011).

Concurring with this, Bone et al. (2017) suggest that the word still has a 'broad definition' in the startup community and that as the model is still developing the definition is hard to tie down definitively. They see the common aspects between accelerators and incubators as being training, mentoring, business support, and selection by merit.

Their research identified 163 accelerators active in the UK, which they suggest was more than estimated or expected. On average, they support cohorts of 16 companies, over a time period of just over 6 months. Mentoring is the most common form of support, offered by 85% of the programs. Funding is offered by 61%, which averaged £39,000 per startup. 46% of the accelerators took equity and the average equity taken was 7%.

Based on this research, and these findings, Bone et al. (2017) adapted the definition of Christiansen (2009), Miller & Bound (2011) to define an accelerator as:

- A program with a fixed duration of 3-12 months
- Taking equity rather than fees
- Most likely provides seed funding
- Offers services as a primary resource, rather than physical space

- Accepts startups in cohorts
- Offers mentorship and training
- Focusses on teams rather than single founders
- Highly selective program from an open application process

Bone et al. (2017) also defined an accelerator by saying what it is not, which includes Angel Networks, Co-Working Spaces, Entrepreneurship courses, hackathons, and maker spaces, seed funds, and other forms of mentoring schemes.

This section has reviewed how the literature has attempted to define an accelerator between Christiansen in 2009 and Bone et al. in 2017. The review has shown how these definitions have developed over time, reflecting how accelerators have evolved away from the Y Combinator model, through TechStars, to the proliferation of accelerators reviewed in recent years.

What these definitions have in common, and have maintained throughout this evolution is that accelerators are different to the other support available for startups, and that they are fixed-term programs consisting of cohorts of startups, accepted through a selection process, and offered mentoring, training, and networks. They generally do not charge fees, instead taking equity, often in return for a small investment.

2.3.3 WHAT AN ACCELERATOR DOES

Having examined what an accelerator is, this section goes on to look at what an accelerator does. This reflects the definitions in the previous section, which focus on mentoring, education, and networking as core features of an accelerator.

2.3.3.1 The Role of Mentors

A key element and distinguishing characteristic of accelerators is mentoring. Mentors are experts who provide advice and guidance to the startups in the program. Mentors are often also the investors but are not uniquely investors. Alongside the startups, the mentors are another key stakeholder group (Lehmann 2013).

Frimodig (2012), in defining the strategy accelerators take to fill the competence and equity gap of startups, concludes that the people with knowledge surrounding the accelerator are of great importance, and this 'intellectual capital' is embedded in the "mentors' human capital."

The need for a large and diverse mentor network was explained in practical terms by Paul Graham (2011), who wrote:

> "different startups need such different things, so you need a lot of people to supply each startup with what they need most"

Hallen et.al (2016) referred to mentoring as 'indirect learning' and have suggested that research into accelerators has not drawn conclusions on whether it is beneficial. Understanding the value of mentoring is complicated due to the many other influencing factors that could affect the progress of startups in an accelerator. They concluded that mentoring is a "key mechanism" by which accelerators "casually impact venture development," and acknowledged it could be beneficial to founders in challenging cognitive biases, and filling knowledge gaps quickly, as opposed to learning by experimentation. By contrast, Bone et al. (2017) concluded that mentoring, and the network provided by the mentors, is one of the most valuable elements of an accelerator.

Frimodig & Torkkeli (2013) add that a feature of mentoring is that mentors typically work for free. Their motivation should not be payment for their time, but instead access to deal flow, learning, networking, and 'giving back.'

2.3.3.2 Finding and managing Mentors

The most comprehensive study of mentoring in accelerators was carried out by Cohen (2013). She found that an important function of an accelerator is to build a mentor network and manage the interaction between mentors and startups. Typically, it is not the job of startups to manage their own engagement with mentors. By doing this as part of the core activity, the accelerator creates an efficiency for the startups if it plans and manages the mentor interactions, allowing an intense period of rapid mentoring that

they would otherwise have to spend a lot of time and resource arranging. It also creates some degree of commitment from startups who might otherwise elect not to meet mentors and to focus on development of products, which may in fact be the wrong products.

Cohen (2013) found that when accelerators source and manage the mentor interactions, they absorb the 'learning-coordination' cost for the startups, creating an efficiency by arranging, for example, one mentor to meet eight startups, rather than eight startups arranging for one mentor to have eight meetings. Cohen found that on average, startups had 55 more mentor meetings when the meetings were coordinated by the accelerator than when they were organised by the startups themselves.

Frimodig & Torkkeli (2013) agreed that the ability of accelerators to find and manage mentors, and thereby deliver knowledge and contacts quickly, is an important factor in structuring an accelerator. They suggested that accelerators act like gears between large, slow moving cogs, and fast spinning cogs in a machine. Startups need everything very quickly, where industry and academia tend to move very slowly.

Christiansen (2009) explained how accelerators attract mentors by gathering a critical mass of startups, which in turn attracts high quality mentors. This presents a paradox at the outset of a new accelerator, in that an accelerator with good mentors will attract good startups, and one with good startups will attract good mentors. Creating the initial appeal for one without the other already in place can be challenging.

Alongside experts, and potentially mentors from a corporate backer, Miller & Bound (2011) observed that investors mentor at accelerators in order to carry out due diligence into the companies. Mentoring is a very different dynamic to being pitched for money, allowing the investors to see how the team works together, how the product has developed over time, and how they adapt to lessons and mistakes.

This approach to "learning from others" (Cohen 2013) means that companies on accelerator programs can learn from mentors and their cohort without having to accumulate experience over time, which is more efficient and inexpensive compared to accumulating knowledge first-hand, over time.

In particular, the difference between explicit knowledge and tacit knowledge is an important factor in the benefit of mentoring. Cohen observed that the accelerator directors and mentors transferred what they learned had worked in the past, so the startups could act on those lessons without having to experience them directly. Frimodig & Torkkeli (2013) continued this point, observing that tacit knowledge is gained from experience, and is embedded in people, whereas explicit, or acquired knowledge is documented and easier to source and transfer. Explicit knowledge can be viewed simply as information, whereas tacit knowledge can take the form of wisdom. It is this latter type of knowledge that accelerators aim to find and transfer to new founders via mentoring, who by definition lack tacit knowledge.

Different approaches are taken to mentoring, but that favoured by the most traditional accelerators, and explored by Cohen (2013) involves a period of what she called

"mentor overload," when founders are exposed to a large number of mentors over a short time. The founders receive conflicting feedback on product and implementation whilst pausing the implementation due to the time pressure of the mentoring. Over time, Cohen reported that the conflicting feedback was confusing, but began to crystallise as it was reviewed with further mentors towards the end of this period. Ultimately, founders began to break down their preconceptions about their businesses and strategy and started to find common themes between apparently contradictory mentor feedback.

Referring to one accelerator in her study, Cohen recorded 740 meetings with a total of 140 mentors in 19 days, averaging 64 meetings between founders and mentors, from which 80% of the founders reported receiving conflicting advice.

The importance of this intensive period of mentoring is that startups spend this time receiving and processing advice and carrying feedback from one mentor session into the next, to test and challenge it. When mentoring was carried out slowly, over a longer period of time, Cohen (2013) found that startups iterated between these meetings rather than holding off product development until they had accumulated a large volume of feedback. They had a higher failure rate, with 60% of startups failing shortly after the program, suggesting that they had benefitted less from the learning outcomes of this different approach to mentoring.

The diverse feedback and "mentor overload" over a short time allowed founders to find commonalities in the feedback from amongst the contradictory advice because it was

absorbed so intensively over a condensed period, whereas founders who had less frequent mentoring from fewer mentors were not able to identify what was good from bad advice. This caused them to act on advice, build products, iterate, and then fail continuously. In effect, the speed of input experienced during mentor overload allowed the teams to process, digest, and bounce back inputs to the next mentor, speeding up the develop-iterate-fail loop into a short period of time, emerging with the final iteration which they then developed later. This made them more likely to succeed (Cohen 2013).

Accelerators which provided "mentor overload" saw the startups engage in intensive pivoting between different strategies during this period, then a commitment to one strategy at the end of that phase of the program. Cohen argues that this contradicts the conventional approaches of Lean Startup (Ries 2011) which argues for ongoing pivoting and testing, and in fact in the startups in the top performing accelerators in her study rarely made pivots after the initial intensive mentoring period.

Cohen (2013) further stated that founders said they had trouble explaining what they do to mentors, but over the intense "mentor overload" period they invariably ended up explaining their business multiple times in one day. This in itself was important training, fine tuning how the startup is described, and in doing so how they understood their business. The founders she studied also related how they would notice particular parts of their pitch catch the attention of mentors, so they were able to refine the pitch rapidly over multiple mentoring sessions.

Cohen (2013) concluded that her data favoured the learning achieved by founders in programs that started with "mentor dating," and allowed those interactions to develop organically, over programs that assigned mentors from the outset. One accelerator Cohen studied assigned mentors and then encouraged those mentors to have regular meetings with several startups, which the startups had to organise. Consequently, the startups had fewer overall mentor meetings during the three-month program.

Mentoring is therefore a fundamental part of an accelerator. It can be concluded from the literature that without mentoring, a program is not an accelerator, as this is the main method of transferring tacit knowledge to the startups quickly.

2.3.3.3 The Role of Cohorts

Having a clearly defined cohort ties into the role accelerators have in sourcing and selecting startups. The cohort is formed at the end of a selection process, so being part of that cohort has status attached to it. The cohort becomes something the accelerator can advertise to potential mentors and investors.

Cohen (2013) discusses the synchronisation of learning by virtue of a coordinated program having a cohort of startups working together. She was surprised to observe cohorts sharing knowledge rather than competing. She also found that 'cohort peers' were beneficial to the program because they raised the shared aspirations of the group and helped each other to close performance gaps between the startups. This behaviour

is a reflection of how the reputation of the whole cohort impacts on each individual company. If the cohort is viewed positively, the accelerator will attract better mentors, more investors, and media coverage, so the cohort members are incentivised to support each other to this end.

Cohen (2013) also observed that as well as raising aspirations, the cohort has the effect of bringing over-confident founders down to a more realistic level by comparison with the startups and founders in the cohort.

Bliemel et al. (2014) added that cohorts offer an efficiency of scale, up to a point, which allows accelerators to carry out due diligence, invest, and manage networking, mentoring, and presentation of their cohort to investors in a way not possible for angels investing on a case-by-case basis. They suggest though that if cohorts grow too large, this efficiency breaks down.

2.3.3.4 Cohorts and weak tie networks

This thesis explores how an important aspect of the value mentors bring to accelerators is sharing their networks. However, networking is not restricted to mentors. In as much as an accelerator is an ecosystem builder, it is a hub that facilitates networking broadly within the given ecosystem. Networking is a core output and outcome of the accelerator, and also features the extended networks of the team running the accelerator, the cohort, partners, investors, and other stakeholders.

Hoffman & Radojevich-Kelley (2012) argued that the most widely cited advantage of participating at any level in an accelerator is networking. A key aspect of the networking is the way the accelerator structures the different groups of stakeholders into organised well-defined groups which are easier to work with to effect greater social network outcomes.

Christiansen (2009) observed that at the outset the network around an accelerator reflects the 'quality and quantity' of the personal network of the accelerator founder, but over time grows to reflect the quality of the startups that have come out of the program.

Eveleens et al (2016) reviewed the literature specifically on network-based incubation, being where incubators focus primarily on providing new networks over other forms of support. They evaluated the impact of this approach on startup performance, including looking at it through the lens of Social Capital theory. Whilst this thesis is consciously not looking at incubation, it is interested in social networks and Social Capital, so this particular research is relevant and of interest. Their conclusion about the findings of research into network-based incubation and Social Capital found that "incubation influences the structural dimension of Social Capital… by helping the startup to form relationships with other actors."

They argued that the networking element of a program brings intangible resources, such as "knowledge and legitimacy," and builds on observations that such intangible resources are of value to startups.

Eveleens et al. (2016) explained that this is caused by putting participants in close proximity to each other – in this case in an incubator. The shared space and events form a dense internal network with strong closure. Network-based incubation, as with accelerators, also involves an external network with which the startups connect, but also which is joined by the startups. They argued that the result is both closure within the internal network, and ultimately closure within the external network, closure being the development of multiple ties between different actors.

They identify, within incubators they studied, a similar dynamic to an accelerator, in which strong ties develop quickly between the startups within the incubator, and between the startups and the incubator manager. But then the manager creates the opportunity for the startups to develop weak ties by organising networking events and constantly refreshing the network around the core.

An interesting observation made from their research is that the increased Social Capital in terms of having a larger network, and in terms of becoming close to the program manager are seen to have positive outcomes on the startups performance, whereas the strong network closure between startups is not perceived as being of value, because startups find it hard to capitalise on this. They also argued that strong homophily between the startups – i.e. a cohort of very similar startups – is damaging because they may feel they are competing, whilst very little homophily is also less useful because they do not have enough overlapping knowledge or information to be useful. When the startups are 'somewhat similar' they are most able to support each other usefully (Eveleens et al 2016).

2.3.3.5 Building entrepreneurial ecosystems

This thesis will discuss the importance of ecosystems to accelerators. It is therefore necessary to examine ecosystems in the related literature, and to understand the way *ecosystem* is interpreted in this context.

Spigel (2017) defines an ecosystem as "the union of localized cultural outlooks, social networks, investment capital, universities, and active economic policies that create environments supportive of innovation-based ventures."

Within this definition, the ecosystem is larger than a social network, and may contain multiple smaller social networks. The ecosystem also differs from a social network by including other factors such as policy and infrastructure, which are not parts of a social network.

He goes on to explain that ecosystems are a form of network, in that they feature individuals or corporations linked by ties of various form. However, ecosystems go further and feature intangible, and non-actor aspects like culture, policy and education. A typical ecosystem might be a city which includes a university, co-working spaces, accelerators, incubators, investors, and the influence of government innovation policy, tax breaks for investors plus transport links to other ecosystems. These are not a social network or group, but each may contain one or more social networks with multiple interactions between these networks.

Spigel explained that the theories behind entrepreneurial ecosystems find their roots in the advantages of business clusters, which identified the value to firms of co-locating or clustering either around a region, or a technology or industry vertical, to enable them to share resources, knowledge, and attract labour. Entrepreneurial ecosystems differ from business clusters because clusters tend to co-locate firms that work in a similar industry or are part of a related supply chain, so they can share resources and knowledge about that sector. Entrepreneurial ecosystems, he suggests, are more likely to gather around a core technology rather than a common market or client.

Entrepreneurial ecosystems tend to focus on the early stage of businesses, and their common needs in terms of finance, support, and advice, and resources common to the entrepreneurship process. Clusters tend to focus on commonalities relevant to companies of all size and age, but in a specific industry sector (Spigel 2017). Entrepreneurial ecosystems have become recognised as tools which can support economic development, innovation, and social change (Harrington 2017).

Harrington goes on to explain that developing entrepreneurs is the building block from which venture development, and then economic development stem. For economic development, especially in modern-facing sectors such as technology, it is important to have a ready and ongoing supply of entrepreneurs, who can find problems, develop solutions, scale into startups, and from there into businesses that grow into receiving venture funding and creating revenues. Entrepreneurs can be developed through a wide range of actions, including within formal education, alongside education, and within a business environment.

Efforts to stimulate and develop entrepreneurship in an ecosystem require a lighter touch than other related aspects, like economic development. Harrington (2017) states that entrepreneurial ecosystems require a degree of "chaos, serendipity, and fluidity."

Stangler & Bell-Masterson (2015) argued that an entrepreneurial ecosystem needs to be measured by its outputs, not just its inputs. At a regional level, inputs are metrics such as research funding, available investment, new startups, events etc. They propose four indicators by which to measure the performance of an ecosystem: density, fluidity, connectivity, and diversity.

Fluidity is the "population flux, labour market reallocation, and high-growth firms." Density is defined as the number of young firms per 1000 people, the share of employment in those new and young firms, and the density of specific sectors, like tech. Diversity includes, 'multiple economic specializations', social mobility, and immigration. Because ecosystems are, or should be, constantly evolving, they argued that these factors needed to be tracked continually over time, not in a snapshot.

This understanding of ecosystems gives a context within which to discuss accelerators. Indeed, as will be discussed throughout the thesis, one of the typologies for accelerators developed by Pauwels et al. (2015) was that of "ecosystem builder," the full set of typologies being:

- "Ecosystem Builder: Matching customers with start-ups and build corporate ecosystem."
- "Deal-Flow Maker: Identification of investment opportunities for investors."

- "Welfare Stimulator: Stimulation of start-up activity and economic development."

This typology focussed on the "ecosystem builder" being established by a corporate, and aiming to help startups navigate through the internal structures of future corporate clients or investors. Pauwels et al. (2015) observed that the "ecosystem builder" and "welfare stimulator" are mainly prevalent in Europe, whereas the US was dominated by the "deal-flow maker."

Christiansen (2009) also referred to the role accelerators play in creating an ecosystem, citing it as a common reason for people founding them. He cited TechStars in Boulder, Colorado, which was the subject of Brad Feld's book, Startup Communities (Feld 2012), which described how to approach building an ecosystem, and the role an accelerator can play in this.

Whereas the concept of an "ecosystem builder" accelerator was defined by Pauwels. et al. (2015) as building ecosystems of innovators around Corporates, Hoffman & Radojevich-Kelley (2012) had also coined the term "welfare stimulator" to describe an accelerator which receives public funding and is focussed primarily on supporting the growth of entrepreneurship and networks in a given context. Practically speaking, both are building ecosystems of innovators, one at a local or regional level, the other around a corporate or sector. This distinction will become relevant to this thesis, as EyeFocus became seen as an ecosystem builder, catalysing the eye-care innovation ecosystem.

This was done around several corporates, as outlined by Pauwels et.al (2015), but also for the wider good of the sector, in a way that reflects the welfare stimulator model.

Lehmann (2013) explored the then relatively new concept of the corporate accelerator. He defined this as a program that has received "significant and public support" from an incumbent corporation. The support includes funding, but also encompasses access to resources, networks within and through the corporate, and public endorsement by the corporate.

He observed that in this model, the Accelerator Manager retained full control over the program content and delivery, and the sponsors only had limited influence over who was selected onto the program. However, the sponsorship helped the program differentiate itself. Whereas with a fully corporate run program, the program itself is run by managers from the corporate rather than by entrepreneurs, giving it a very different character. He observed that (in 2013), the majority of accelerators in Germany were corporate programs, including Deutsche Telekom AG, Telefonica A.S. and ProSiebenSat1 Media AG, and Axel Springer.

Bliemel et al. (2014) observed that some commercial accelerators were seen to start out with a more altruistic approach to building a wider ecosystem, but had a longer-term plan to realise a return on that early work by becoming embedded at the heart of that ecosystem.

Specifically, the ecosystem builder typology defined by Pauwels et al. (2015) was based on accelerators established by companies such as Microsoft and Accenture, in order to extend their networks. By connecting together their company, some of their lead customers, and startups, they aimed to build an ecosystem of new activity around their company, ultimately leading to new business. These ecosystem builders actively involved executives from the corporate in the running of the program, for example in selecting participants. This means that startups selected are expected to benefit the corporate. Mentors are also sourced from within the corporate, either exclusively or alongside external mentors.

Miller & Bound (2011) recognised that as ecosystem builders, accelerators can play an important role in a sector or region as a convening power, bringing together different stakeholders who might otherwise not meet.

Bliemel et al. (2014) observed that as the role of accelerators in building ecosystems developed, and conversely the need of ecosystems for accelerators to succeed, the lines between the ecosystem and the accelerator started to blur, and it became widely understood that startups need ecosystems to succeed, just as ecosystems benefit from accelerators. Whilst accelerators benefit ecosystems by acting as a convener, they need ecosystems in order to source the stakeholders who are the ingredients for a good accelerator, namely the corporates, mentors, and investors.

Miller & Bound (2011) observed that a specific feature of a strong ecosystem around an accelerator is that it enables the accelerator to protect startups from the many threats they face in their early days, from predatory investors to companies stealing their IP. By

belonging to an accelerator, which is a well-connected network within the wider ecosystem, the risk of sanction to anyone harming a startup is far greater because of the ability to cause widespread reputational damage to that individual or entity. A startup alone may not be able to cause reputational damage to a bad actor, but an accelerator, with its large network of investors, high-status actors, and mentors can communicate reputation and therefore confers on the startup in its cohort the benefit of that ability, and in doing so, protects it.

Reflecting the role accelerators developed within their wider ecosystems Brunet et al (2016) concluded that accelerators have evolved into "far more than simple business-service providers or investment vehicles," now playing an important role in the private and public sectors. As such, they suggested that, accelerators play a key role in the wider startup ecosystem and deserved proper support by policymakers.

2.3.3.6 The role of a selection process to form cohorts

Hochberg (2015) observed that accelerators are expected to demonstrate the 'best in class' of a larger list of startups, and can be used as deal flow aggregators for investors. For corporates, they can also find and convene the best startups that might benefit the corporate. Arguably, Y Combinator established this as a principle with some early successes, including their successful investments in Reddit (2005), Scribd (2006), and Dropbox (2007), all of which were sold for considerable profits. Kim & Wagman (2014) concluded that this suggested that accelerators are good at screening future

investments, and the small size of the cohorts allows them to refine a cohort down to the best startups available.

However, they observed that as Y Combinator grew in size, and cohorts increased in number, investors have suggested that they are more hesitant to invest in companies at demo day . By 2012, the cohort consisted of 80 startups, which may have changed perception of the efficacy of the screening process. This suggests a conflict between a successful accelerator's desire to grow, and the perceived value in remaining highly selective (Kim & Wagman 2014).

Frimodig & Torkkeli (2013) concur that identification of strong startups is a factor in the success of an accelerator. For a for-profit deal-flow maker accelerator, finding strong teams, with scalable, global products and businesses is important. So, the approach to sourcing and selecting participants is important.

Hoffman & Radojevich-Kelley (2012) add to this that accelerator founders also focus on their ability to make a difference to startups in deciding which to accept onto the program, favouring those where the program can offer support that will lead to tangible progress by the end of the program. Pauwels et al. (2015) observed that an ecosystem builder established or backed by a corporate would typically see the corporate involved in this process, though this creates a potential conflict whereby the corporate's executives select primarily around what might benefit the corporate, rather than would benefit the accelerator, or wider ecosystem.

They concluded that accelerators are therefore seen as providing a selection and filtering role, whether that is for investors, for the benefit of a corporate, or to attract good talent to an ecosystem. To achieve this, accelerators develop rigorous selection processes, often in multiple stages, and with input from third parties through this process. Their perceived value is in attracting a wide range of applicants, processing those applications to select only the best, though with the development of underlying business models, 'best' can mean whatever will benefit the backers of the program, and meet its stated aims. For many accelerators it is important that this process is visible to the ecosystem, with external advisors involved, as this validates the claim later that their cohort is the best in class.

2.3.3.7 Focussed Accelerators

This thesis will examine the development of EyeFocus Accelerator, which was an ultra-focussed accelerator program. The intention was that a very focussed accelerator, addressing a very narrow vertical, would offer benefits to the stakeholders. The benefit of a very focussed program developed in the literature from the outset. Christiansen (2009) concluded that there is "a huge potential in focusing a startup accelerator programme on a particular vertical," predicting the development of the market towards more focussed programs.

Six years later, Pauwels et al. (2015) observed that programs were indeed increasingly focussing on a specific theme rather than being generic. Barba (2016) concluded that

vertical programs have the advantage of being able to offer specialised and expert mentoring and support.

This is further explained by Bone et al. (2017), who observed that as the top programs grew in strength and reach, the competition to attract the best founders and companies became harder for other programs. Frimodig & Torkkeli (2013) concluded that vertical focus may become one precondition for success of accelerators due to the increasing number of programs, and therefore greater competition across the sector. They suggested a very focussed program may give the accelerator stronger differentiation in a more crowded market.

In their research, Bone et al. (2017) referred to EyeFocus Accelerator as an example of an accelerator where the specialism is not just 'digital' or 'healthcare' but crosses the technology or business vertical. They list EyeFocus Accelerator alongside the Female Propeller for High Fliers in Dublin, which targets female founders, arguing that this type of focus is not just about a type of business (digital, healthcare, early stage, late stage) but about a unifying common theme that includes a wide range of business types.

They further argued that the development of vertical accelerators came about in order to achieve a variety of objectives, including establishing a core competence in order to attract startups. As the market grew, claiming to offer support to all types of startups became difficult for all but the best and largest programs, so offering very specific support and networks in one vertical allowed new programs to compete in the more crowded marketplace. Vertical programs are also a result of the greater involvement of

corporates in accelerators, where the focus reflects the core expertise and interest of the corporate.

Brunet et al (2016) concluded that vertical programs bring greater value to their startups by having more specifically qualified management teams, a larger group of mentors from that relevant industry vertical, and closer ties to corporates that form the route to market for the startups.

2.3.4 ACCELERATORS AS INVESTORS

2.3.4.1 Investment

As exemplified in the research carried out by Christiansen (2009) the early, traditional, accelerators invested in the startups on their program. The investment is relevant in different ways for the different stakeholders associated with the accelerator. For startups, it provides funding for the founders to cover their living costs during the program, and therefore not be distracted by earning money elsewhere. For the accelerator it offers a way to realise a return on the money they invest in running the program, and for investors it allows them to become involved in the board of a startup very early on, with a view to making later rounds of investment.

The investment is referred to as a 'stipend' by Hochberg (2015), and while it is in return for equity, she argues it should be seen as part of a package of value, including mentoring, education, office space, and brand association.

Christiansen (2009) argued in favour of accelerators investing in the startups as it brings the accelerator's incentives in line with those of the startups. Both parties want the startup to succeed, to raise more money, and to exit. This is similar to an angel investor's incentives, but different to an incubator, which is incentivised to keep the startup as a tenant.

Bliemel et al. (2014) observed that an aspect of investing that differentiates accelerators from angel investors is that angels tend to make investments on a case-by-case basis, carrying out extensive due diligence and term sheet negotiations for each deal. Accelerators, however, focus on an average of 10 deals at any given time, standardising the term sheet, and funnelling the due diligence into an application process for the program. They suggest that this allows accelerators to make more investments more quickly.

In examining accelerator investments, Hallen et.al (2016) found the average investment by accelerators into startups was $26,000 for an average of 6% equity in the startup, referencing www.seedrankings.com, but acknowledging that the amounts had risen between the time of the study and its publication, supporting the observation by Bone et al. in 2017 that research had trouble keeping up with accelerators (see 1.9.1). Hathaway (2016) found that between 2005-2015, 172 US based accelerators invested a

median of $100,000 in over 5000 US based startups. Bone et al. (2017) found that the investment in UK accelerators ranged from £10,000-£50,000.

Exploring further the attraction of this approach to investing, Shane (2015) pointed to the problem investors face when trying to diversify their investments, and to access deals at an earlier stage. In particular suggesting that conventional angel and VC investors are not suited to finding, processing, and investing in large numbers of startups, and that the cost of sourcing and carrying out due diligence is prohibitive. He observed that accelerators resolve this problem because they have the structure, process, and brand in place to find and sort larger numbers of startups, providing a benefit to other investors and to corporates.

Hochberg (2015) adds that accelerators are a leaner type of organisation, and their fund structures are less complicated than a conventional VC investor, so they can make a larger number of smaller investments more quickly than a larger fund.

This translates into the larger investors both coming into the initial investment group formed by the accelerator and positioning themselves as follow-on investors into the startups graduating from the program (Shane 2015). The investors quite often either do not expect to see a return on their accelerator investment or are not making that investment just for the return (Hochberg 2015). The aim of investing in an accelerator is more usually to get an oversight of the startups and deal flow, and an opportunity to carry out slower and more in-depth due diligence in the startups by mentoring them (Shane 2015).

Fehder & Hochberg (2014) pointed out that investors can become involved not only by investing into the accelerator 'fund' itself, but also as mentors. Mentoring allows investors to get to know the startups, and the demo day brings investors to the location because of the efficiency of meeting the clustered startups all at once. They observed that investors also arranged meetings with other startups near the accelerator if they travelled in for a demo day or mentoring sessions, with the benefit of their involvement spreading more widely into the ecosystem.

Consequently, Hochberg (2015) found that the arrival of an accelerator in a given location tended to increase the proportion of local investment made into earlier stage companies, and therefore the investment aspect of accelerators has a positive impact on the wider ecosystem. By connecting angel investors around the accelerator, and promoting the idea of angel investing, the accelerator improves the culture of investing, across the ecosystem, so this benefit is not restricted to those startups in the program.

2.3.4.2 Does accelerator investing work?

In the typical investment model accelerator, or deal-flow maker, Hochberg (2015) argued that investors either do not expect to see a return on their investment into the accelerator fund at all, or not for some time. He found that a typical early stage investment would take over 9 years to realise a return, and that accelerators which cannot invest in follow-on rounds become too diluted to make a viable return over the longer term.

In aiming to understand how returns on accelerator investments may work, Christiansen (2009) put forward a simple financial model to explore the viability of investing by accelerators. He based it on an investment of $20,000 for 5% equity spread over 20 companies, so a total investment of $400,000. He assumed one company exits with a $100m valuation, earning the accelerator $500,000, then 5 companies exit at $10m, 5 companies break even, and 10 companies fail and bring no return. Based on this calculation, the accelerator returns $1.4m on its investment of $400,000. At the time of writing, he was able to suggest that both Y Combinator and TechStars were already starting to prove this model.

Hathaway (2016) found that the companies he studied raised $19.5 billion between 2005-2015, representing an average of over $3.7m each, which he suggested points to the investor model of accelerator succeeding, and having strong prospects for the future. However, this author considers that averaging money raised across a number of startups produce misleading conclusions as to the benefit of accelerators to startups. As Christiansen's figures suggest, in reality most startups fail, and only a few have large exits. Averaging money raised might give the impression that most startups raised a moderate amount of investment, which would be inaccurate if in fact very few had raised large amounts, and most had raised little or no money.

Lehman (2013) pointed to anecdotal evidence and data reported by accelerators and startups, which therefore may suffer from a bias of reporting, which suggests that 60-70% of startups in accelerators attracted follow-on funding. However, as accelerators are investors in the startups, they require big wins to offset the losses of the under-

performing, or failing startups. He therefore concludes that an exit is the only real measure of success, being when the accelerator realises a return on its investment.

Supporting this view, Pauwels et al. (2015) concluded that deal-flow makers are only likely to succeed with a pure investment business model if they are located in very dense ecosystems like Silicon Valley. This concern was first predicted by Christiansen (2009) and transpired to be accurate.

In examining the questions around accelerator investing, Kim & Wagman (2014) argued that a potential obstacle in understanding whether the deal-flow maker model works is that traditional deal-flow maker accelerators only make a profit when their portfolio firms raise further investment. This may incentivise them to be selective in the information they disclose about their portfolio, with a bias towards positive information in order to help the company raise money and the accelerator to exit their investment.

Another concern with deal-flow makers and signalling was first raised by Christiansen (2009), who cautioned that when an accelerator is solely funded by a VC firm with considerable available funds, if the accelerator does not make a follow-on investment into a startup on their program it sends a danger signal to other investors. For this reason, he suggested startups avoid such programs. The same could apply to accelerators that have evolved into seed funds, and many of the European accelerators which received European Investment Fund grants for follow-on investing. These accelerators consequently have the resources to make follow-on investments and send danger signals if they do not (Hochberg 2015).

Another potential problem with deal-flow makers is that some startups see them primarily as investors, rather than support programs that also offer a stipend. Bliemel et al. (2014) cautioned that this can lead to them undervaluing the mentoring, networking, and co-location, and not becoming actively involved members of the program. It is also a problem because the value of the financial investment alone is not then perceived to justify the equity stake being asked by the program, which reflects the whole package of value. The author of this thesis has also observed that it is important for programs to demonstrate that equity is in return for funding, support, office space, and a combined package of benefits in order to avoid negotiating with startups who try to reduce the amount of equity they give up.

The investment model should be judged both by whether it produces a return for the investors, and whether it benefits the startups. Gonzalez-Uribe & Leatherbee (2017) found that the funding provided by accelerators is not on its own a factor in the future success of startups on accelerator programs, but that the "entrepreneurial capital," and related features of the program combined with funding are key for a successful outcome. This supports the argument above that neither party should focus solely on the investment being provided.

Cohen (2013) suggested that more research is needed to determine whether accelerators work as an investment vehicle, and Bone et al. (2017) argued that it is not clear whether most venture backed accelerators will ever break even, and suggest that most will not. Furthermore, they suggest, with the growth in accelerators and increased competition for good quality startups, the venture-backed model will become more

difficult as more accelerators chase a finite group of high quality startups that are capable of delivering a return on investment.

Brunet et al (2016) found that due to the difficulty for accelerators to succeed as a business from the return on investments made into the cohort alone, fewer programs are focussing on investment as their main form of income. They found that (in 2016) only 62% of accelerators were pursuing the investment business model, and this approach was declining. They identified just 52 reported exits in their research of startup investments, suggesting that this route is not bringing in enough revenue to support accelerators. As a consequence, they found that 35.8% of accelerators in Europe received some form of public funding. The main sources of revenue for accelerators were corporate sponsorship (32%), with exit of startup investments representing just 8%. However, the accelerators reviewed predicted the share of revenue from exits would rise to 32% in the future, presumably reflecting that they had not yet seen many exits but assumed more as the startups matured.

Golomb (2015) suggested that whilst the top tier accelerators can work, lesser accelerators would end up accepting the startups which leading accelerators reject. Consequently, they will struggle to profit if their business model is investment outcomes alone. The founders on these programs come away with excellent educational benefits and networks and will probably succeed in a future startup, but the accelerator would fail to benefit from this. He argued that the rapid growth in accelerators saw programs established by people who did not have enough experience as entrepreneurs setting up and scaling technology companies, or finding and funding the best startups as

investors. He anticipated that the rapid explosion of accelerators, most of which he thought would fail, would be looked back upon as a learning phase out of which a new way to educate entrepreneurs would emerge.

Clearly investment was the main catalyst for the birth of startup accelerators (Christiansen 2009, Tarani 2010), but as they have evolved, and spread beyond the main startup clusters that have enough investors in the ecosystem to make that model work, investment has become less important.

Fehder & Hochberg (2014) concluded that accelerators have a role in encouraging the emergence of local angel and VC communities, which in turn helps support the development of greater entrepreneurial activity. Therefore, investment activity and outcomes should in fact be measured across the whole ecosystem, not just in relation to the startups on the program.

Startups still require funding, in the form of the 'stipend' as it was originally designed, and many stakeholders funding accelerators are looking for a return on their investment. However, as it is becoming clear that accelerators can do more than just create a return on investment, other outcomes are becoming key performance indicators, such as economic development and sourcing innovation. Equally, accelerators are looking to other forms of income that is more stable and predictable than investing, such as sponsorship, grants, and fees from corporates to run a program. It appears from the literature that under the right circumstances, investing into startups in an accelerator can still lead to returns, but this no longer applies to all accelerators.

Therefore, in terms of defining an accelerator, investing should no longer be seen as a mandatory activity for a program to be considered an accelerator, and should not be the only, or the main measure by which a program is judged.

2.3.4.3 Evaluating other outcomes

This examination of investment outcomes, and the suggestion that other outcomes should also be valued suggests that evaluating whether accelerators work poses many challenges. It is difficult to make meaningful comparative studies between startups that did and did not attend programs because no two startups are the same. Various studies (e.g. Hochberg 2015), have looked at the success of accelerated startups in raising further investment compared to those which did so without the support of a program. However, the author of this thesis argues that ascribing to the accelerator whether a startup raises, for example $1m or does not, or does so more quickly, seems too specific a measure for something that is so complex and nuanced as a disruptive new business.

Bone et al. (2017) acknowledged that there is no agreed set of criteria for measuring the performance of accelerators, but posited that commonly used metrics include:

- The number of applicants to a program
- The number of startups supported by the program
- How much further investment the startups raised
- The survival rate of the startups
- The number of people employed by the startups

They observed that as not all accelerators have the same goals, it is hard to find a common set of metrics to measure success. They recognised the value of measuring impact on the founder not just the venture, and whether social impact should be measured as well as just financial outcomes.

Looking at the wider impact of accelerators, Fehder & Hochberg (2014) examined the effect of accelerators on their regional entrepreneurial ecosystems specifically relating to the availability of seed and early stage venture capital funding. They carried out a comparative analysis of US Metropolitan Statistical Areas (MSAs) that have an accelerator with similar areas that do not. They compared these MSAs from 2005-2012 and found that a new accelerator was associated with an 104% increase in the number of seed and early stage VC investments made that year, and a 97% increase in the number of investors active in the region. They proposed that this was not just due to direct investment into accelerator startups, but also to the way an accelerator attracts investors to engage with the wider ecosystem and promotes an investment culture.

The research by Pauwels et al. (2015) identified that accelerators in Europe specifically fall into different typologies, with different aims and objectives. They argued that accelerators should not be evaluated using the single criterion of investment raised, but instead new criteria needed to be developed that acknowledge the distinction between a deal-flow maker, ecosystem builder, and welfare stimulator. Only the deal-flow maker should be judged using the traditional criteria relating to investment outcomes. The other types of accelerator need a more refined set of KPIs, including impact on the ecosystem, on the corporate and government funders, and on the wider economy.

2.3.4.4 Obstacles to evaluation of accelerators

The literature has shown that it is not clear how to evaluate accelerators, and that simply judging them on investment returns risks overlooking other valuable outcomes or judging them on the wrong criteria. However, there are many obstacles to evaluating their outcomes, and that observation is woven into the discussion in this chapter. One reason is identified by Bone et al. (2017), who found that as many accelerators are startups themselves, they often do not have the time or resources to engage in complicated measuring and reporting, so there is a dearth of data on outcomes across the sector.

Kim & Wagman (2014) also found that the difficulty in evaluating accelerators is aggravated by the lack of available information. They looked at the incentives accelerators have to disclose only partial information about their portfolios, and to supress negative information. This partial disclosure may also tie in with incentives to exit portfolio investments early. They cautioned that accelerators can cause 'valuation bubbles' for startups, and other misleading data and signalling because of their natural internal bias.

By contrast to these arguments, Bliemel et al. (2014) proposed that it is in fact simple to measure the success of accelerators, because the only metric that matters is follow-on funding. Analysing smaller operational metrics is misguided because accelerators are not there to make marginal changes to startups. However, their conclusion predated the research by Pauwels et al. (2015) and with the benefit of their more detailed

categorisation of accelerators should be seen only to apply to deal-flow makers that set out primarily to achieve investment outcomes.

However, this observation assumes that the only stakeholders interested in outcomes are the startups, investors, and the accelerator manager, being the three parties that would benefit from follow-on investments or exits. Bone et al. (2017) examined in more depth the motivations of people founding accelerators and suggested that the aims of the accelerator should define how outcomes should be measured. They suggest that, despite the proliferation of accelerators, by the time of their report, there was still relatively little evidence about what works, and in particular whether accelerators create success or select for success. The bias of evidence, as referenced above by Kim & Wagman (2014), makes for a very complicated set of criteria that are hard to measure given the lack of available data sets, and the potential biases in that data.

Another problem with the data and how it is analysed can be observed in the report by Fox (2014) for Telefonica, where data is broken into averages, yet startups by nature are rarely average. Startups are generally expected to grow exponentially or fail. She found, for example, that 17 programs had supported 1655 startups which went on to raise £112.83m. She then proposed that this worked out as an average of £68,176. Whilst in London 10 programs had supported 279 startups, which raised £46.3m, or an average of £165.949. It is not clear how useful such average numbers are when presumably they do not reflect the reality of the startups. In reality it is likely that a small number of the startups raised a large proportion of the money, whilst many raised small amounts, and most failed.

As Bone et al. (2017) observed in their research, to evaluate the effectiveness of accelerators would require a comparison of the same metrics across different programs, and with a control set of non-accelerated startups. Neither exist, because accelerators are not all the same, and therefore do not have easily comparable data points. Startups are also so different that trying to find a control group against which to compare accelerated startups would run into the same problem.

Not only are startups different to each other, but also the factors that decide their success are so various. Such a comparison would have to take into account the team's education and past experience, their networks, the location of the startup, the sector, and much more. Ultimately, Bone et al. (2017) conceded that it is not possible to evaluate whether accelerators create success, or select for it. Equally, Bliemel et al. (2014) pointed out that measuring the survival of startups graduating from accelerators is a weak metric because it should also be deemed a successful outcome of an accelerator to help a startup fail quickly, freeing up the founder and team to pursue a better startup, and preventing investors from losing more money.

They further add that there is another problem when discussing average outcomes on startups from a wide range of accelerators. This is due to the possibility that any positive effect of the top accelerators on their startups is diluted by the negative effect of the larger number of average or bad accelerators on their cohorts, creating a flat average where one cancels out the other.

Bone et al. (2017) went on to observe that examining the state of the accelerated startups 2-3 years after they graduate is too soon to ascertain whether they have become a success, and to calculate the wider impact on the ecosystem around them. There is a dearth of longitudinal data due to the relative newness of the sector.

Frimodig & Torkkeli (2013) proposed that the approach of evaluating accelerators by follow-on funding raised by their startups does not accurately reflect 'success' because startups that raise money may fail, and startups that do not raise money may succeed. Therefore, this measure is possibly more of a marketing tool, to attract future startups into the program. They suggested that a true indicator for a for-profit accelerator should be its own Return on Investment (ROI) after 5-10 years. However, this would restrict any attempt to measure progress before then, and therefore limit how accelerators raise funding and attract startups in the short and medium term.

Bliemel et al. (2014) add to the doubts over using follow-on funding as a metric of success asking whether in the longer term is it better for a startup to become profitable and self-sustaining, or to keep raising multiple rounds of investment? It is not clear whether the current phase of startups, especially in Silicon Valley, that have raised very large rounds of investment in fact represent a bubble, so this question cannot yet be answered.

Concentrating the discussion into other forms of funding, such as government grants, and how this can be justified, Bone et al. (2017) argued that the difficulty in evaluating outcomes makes it hard to assess whether public funding of accelerators is an

appropriate use of resources, and whether there is a long term economic impact from, for example, attracting foreign startups to the city or country. This point relating to the deployment of public money is also explored by Bliemel et al (2014) who concluded that the metric of job creation, common in public sector evaluation, is not a good way to measure the benefit of accelerators because startups typically operate on a lean budget and automate or outsource functions rather than employ people.

2.3.4.5 Non-investment outcomes

Observations by Fehder & Hochberg (2014) suggested that accelerators do bring a benefit to the wider ecosystem. They found that the increase in investment amounts, numbers of investors and investee companies in an ecosystem with an accelerator that they identified in their research, showed that the presence of an accelerator increases interest in the ecosystem from nearby investor groups, rather than from new outside investors entering the market. They proposed that the increased investments into startups from the wider ecosystem as well as into graduates of the accelerator, indicated that the presence of the accelerator positively affected investment across the region and not just within the accelerator. However, the benefit is specific to the sector that is the focus of the accelerator, rather than more widely across other sectors too.

The type of program being evaluated also impacts the level of benefit. Hathaway (2016) identified a clear distinction in outcomes between startups that enter the top programs, and startups that enter lesser programs. The top programs noticeably accelerated the startups' ability to raise money, exit, and gain customers, whereas he found that lesser

accelerators do not have any impact, or even impede the startups. He also found that startups that receive funding from accelerators are more likely to raise further funding, be acquired, or fail, sooner than startups that raised money from leading angel investor groups. He argued that this distinction is important, and the emphasis is on outcomes happening 'sooner' rather than what the outcome is, confirming that helping a bad startup fail quickly is also a positive outcome. The implication is that startups that are backed by angel investors lack the subjective feedback and advice of those in accelerators and may therefore be kept alive longer than is beneficial.

Hathaway (2016) concluded that the learning in accelerators is of genuine value to the startups, which suggests that the benefit to the startups on a program is not restricted to credential signalling to future investors, or selection bias. Echoing this finding, in examining how these other outcomes are supported, Frimodig & Torkkeli (2013) proposed three preconditions for a successful accelerator. First, access to deep and tacit knowledge sources. Second, the ability to transfer that knowledge effectively. For this to work, they argue that the accelerator has to know how to transfer the knowledge effectively, but also startups have to have the desire for knowledge, and the humility to accept advice from the mentors, acknowledging that they do not already have all the knowledge and experience they require.

Thirdly, they suggested that the ownership of the accelerator is important in defining whether it can succeed. Their observation was that if the owner is subject to rules, restrictions, bureaucracy or internal organisational culture from a supporting corporate

this could inhibit the owner's ability to execute in the style and speed expected of an accelerator.

Beyond the impact of an accelerator on its startups, and the investors associated with it, an accelerator can also be judged by the impact it has on the wider ecosystem around it. Hochberg (2015) argued that accelerators may have a positive effect on outcomes for all startups in an ecosystem, including those not on the accelerator program. Fehder and Hochberg (2014) found that an accelerator can lead to an increase in startups being developed in a region, and they can act as network aggregators across an ecosystem by organising open events like demo day s, networking events, and involving mentors. Bliemel et al. (2014) added that accelerators facilitate their startups to connect other stakeholders in the ecosystem, so overall having the effect of creating multiple new network connections across the ecosystem, and in particular cross-sector connections that may not otherwise traverse typical hierarchies and sectoral divisions.

However, Hochberg (2015) observed that it can be hard to know whether an accelerator attracted investment to a region, and then developed the entrepreneurial ecosystem, or whether the underlying policy preferences that led to the accelerator also led to the attraction of investment and improved ecosystem.

Given the suggestion that accelerators help develop the ecosystem, and in particular entrepreneurship, venture creation, and angel investment, the question of whether accelerators could be used as economic development tools in regions not already strong in tech entrepreneurship was explored by Miller & Bound (2011). They suggested that

examples like The Difference Engine, in North East England, indicate that accelerators may be an efficient way to create new businesses and jobs, but in these lower density ecosystems would need to be supported with public money to make up for the lack of private sector funding in the earlier stage ecosystem.

They suggested that finding the right balance for public sector support is a challenge. If accelerators are fully paid for, or even run by public sector organisations, there is a risk that they become disconnected from the investment community and the most innovative ventures. Miller & Bound (2011) concluded that any public-sector investment should be matched with private sector money, whether that be investment or corporate sponsorship, in order to ensure strong ties to the private sector. Despite this potential for public sector involvement in accelerators, and their role in regional economic development, there is still very little data or research into this topic.

2.4 DEFINITION OF AN ACCELERATOR

In proceeding to discuss accelerators in the context of Social Network Theory it is necessary to develop a working definition of an accelerator as the foundation of this research. The literature has produced several definitions, and a number of other factors that define accelerators. The main definitions identified as part of the literature review are:

1. Miller & Bound (2011) (see 2.3.2.4)

- Open and competitive application process
- Pre-seed investment, usually for equity
- Focus on small teams, not individual founders
- A defined time frame of education and intensive mentoring
- Cohorts of startups rather than individual companies

2. Frimodig and Torkkeli (2013) (see 2.3.2.4) concluded that a range of programs can be classified as accelerators, including:

- Pre-seed accelerators
- Seed accelerators (startup accelerators)
- Business accelerators
- Corporate accelerators

3. Bone et al. (2017) (see 2.3.2.4)

- A program with a fixed duration of 3-12 months
- Taking equity rather than fees
- Most likely provides seed funding
- Offers services as a primary resource, rather than physical space
- Accepts startups in cohorts
- Offers mentorship and training
- Focusses on teams rather than single founders
- Highly selective program from an open application process

2.4.1 Definition of an accelerator as a business support program

The three definitions outlined above can be combined to bring together their common themes and define the core characteristics of an accelerator as follows:

- A fixed term program, usually 3 months, and up to 12 months
- Can be for pre-seed, seed, or more developed businesses
- These form a cohort, made up of what for convenience can be referred to as 'startups'
- Startups apply through a selective application process
- May make a small investment for equity
- Does not charge fees from the participants
- Provides office space for free, as part of a wider value offering
- Offers training and mentoring

2.5 SUMMARY: ACCELERATORS

This second part of the literature review explored the literature relating to accelerators. It showed how accelerators have evolved from Y Combinator, founded in 2005, to a wide array of programs.

A continuing theme of the literature was both the lack of research into accelerators, and the lack of large data sets accumulated over long periods of time. This latter being a

reason for the former, and itself caused partly due to a lack incentive or resources for accelerators to gather and publish detailed data about their programs.

However, several definitions of accelerators have been agreed upon by those researching the topic, including those by Christiansen (2009, Miller & Bound (2011), and Bone et al. (2017). These concur that an accelerator is a program to support startups, which has a fixed term and delivers value to a cohort of startups at one time. Mentors are the main way in which knowledge is transferred, and accelerators neither pay mentors nor charge the startups, finding their revenue in other avenues such as investment returns, sponsorship, or other funding.

A selection process is important because it creates a best in class cohort of startups. The selection and validation process carried out by the accelerator is an incentive for mentors, investors, and corporates to gather around the program and support it. It was perceived that accelerators are more efficient at sourcing and filtering startups, validating their cohort in a way that is more efficient for the other stakeholders than trying to do this themselves.

Efficiency was identified as a key feature of accelerators, with parallels drawn between them and universities in the way they deliver an education to a class of startups rather than individually. Efficiencies are also created by convening all the stakeholders in one place for a short period of activity, allowing individual investors or mentors to meet a validated cohort of startups. Equally, they create efficiency for startups in their cohort

by building a network of investors, mentors, and corporates that they can meet rapidly in a short period of time.

Whilst the first accelerators were primarily what is termed deal-flow makers, investing in batches of startups to create a portfolio of early stage investments, later accelerators have used the same structure to promote economic development, to build ecosystems of innovators around corporates, and to achieve other outcomes.

The literature review also identified that the investment model on which accelerators were founded may not work for accelerators that are not established in dynamic ecosystems with a large community of investors and innovators.

The importance of ecosystems was further discussed in relation to how accelerators can act as a junction between different stakeholders in an ecosystem, and thus connect them together. As such, accelerators are seen to need ecosystems from which to source their startups and mentors, but also can help to build and sustain ecosystems through their open events, networking, and by attracting new investors and startups to that ecosystem.

The literature suggested that as accelerators proliferated, they would find it harder to compete with each other due to a limited source of good quality startups. New accelerators, without the reputation and network of the incumbents, would struggle to attract talent. Therefore, it was suggested accelerators would need to become more

focussed on specific topics, sectors, or technologies to be able to offer value in that particular space.

The difficulty in evaluating the outcomes of accelerators was discussed in the literature, with some arguing that they should primarily be judged on investment outcomes or return on investment for the accelerator. Others suggested that a broader range of outcomes should be evaluated.

Finally, the review brought together the definitions of an accelerator to create a working definition of an accelerator that will be used in the next part of this research.

CHAPTER 3. INTERPRETATION OF FINDINGS FROM THE LITERATURE REVIEW

Having reviewed the literature to build a framework within which to examine accelerators as social networks, this chapter brings together the theory and concepts from both parts of that review to form findings about accelerators based on Social Network Theory.

3.1 INTRODUCTION

The hypothesis being proposed in this thesis is that accelerators should be understood and examined as social networks. If a social network is a series of nodes linked by ties, and an accelerator is a group of people connected by social links, then an accelerator is a social network. If an accelerator is a social network, then it can be described according to Social Network Theory.

The literature review identified core theories from Social Network Theory that explain the structure of and dynamics within networks. It also identified the aspects of incubation and innovation programming that are specific to startup accelerators. In this chapter, these are brought together to examine in more depth how aspects of Social Network Theory can explain the characteristics of accelerators, and how this provides a greater insight into why accelerators typically have a specific network structure and characteristics of social engagements between their stakeholders.

This thesis proposes that describing an accelerator as a social network offers greater insight into how it creates value for the various stakeholders, how it rewards people for supporting it, and how it sanctions those who do not comply with its socially communicated rules. This framework also explains the need for the various participants to interact with people different to them in background, expertise, and status, supporting the need for the accelerator network to be highly diverse.

3.2 FINDINGS

3.2.1 Accelerators are social networks

In developing a theoretical framework from the literature with which to examine accelerators, a definition of an accelerator encompassing ideal network structures, behaviours, and innovation support systems was set out (see 2.4.1).

In 2.2.1.4, it was argued that the most creative and productive network structure is one that has strong ties with a high level of closure at the core, surrounded by a large number of weak bridging ties, which creates an efficient and powerful ability to find and qualify information, and the internal trust and effectiveness to translate that into outcomes (Adler & Kwon 2002). Rost (2010) observed that people with strong ties who are embedded in weak network architecture are most likely to have both innovative ideas and to be able to realise them. Davidsson & Benson (2003) observed that Social Capital and weak tie networks can expose nascent founders to new perspectives and contexts for their ideas, helping develop a solution to fit a more complete market view (see 2.2.2.1).

This demonstrates the advantage of groups that have high levels of internal bonding ties combined with high levels of external bridging ties, because they can both access and benefit from non-redundant information. This implies that networks with high internal links and low external ties, or high external with low internal ties are not well positioned to succeed in relation to innovation (see 2.2.2.5). This observation should

inform the precise design of an accelerator to ensure it builds the type of network structure that supports both accessing new ideas, and being able to translate them into outcomes.

A comparison of the description of an accelerator taken from the literature review (see 2.4.1), and this description of the type of network that encourages innovation, suggests that an accelerator naturally forms this type of network structure. They have high levels of internal bonding, in the form of the management team and cohort, and high levels of external bridging ties in the shape of the mentor network. This creates the trust to translate ideas, and the weak network architecture to find non-redundant information, in the shape of opportunities, networks, and feedback via the mentors, partners, and sponsors.

3.2.2 Weak and Strong ties leading to value in an accelerator

Observing that an accelerator reflects the description of a social network structure that best leads to innovative outcomes (see 3.2.1) suggests that weak and bridging ties, as well as Social Capital will play important roles in accelerators.

Adler & Kwon (2002) observed that investing in building weak ties, or links to other networks, increases access to knowledge, ideas, and influence. Investing in the development of strong ties, or stronger internal relations within the network, increases the ability of the group to work together and realise value from the weak ties (see

2.2.2.1). They referred to these internal and external ties as 'bridging' and 'bonding' Social Capital (see 2.2.2.3).

This is reflected in the way an accelerator cohort and management team are the strong internal network, rich in 'bonding' Social Capital whilst the mentors and wider ecosystem represent the weak ties, or 'bridging' Social Capital.

Therefore, a successful accelerator consists of a weak network architecture, rich in both bonding and bridging Social Capital, the latter of which is represented by bridging ties, which will be weak ties, according to Granovetter (2012) who concluded that that strong ties are unlikely to bridge, and most bridges will be weak ties (see 2.2.1.4).

The importance of bridging Social Capital or weak bridging ties also reflects Burt's (2004) theory about Structural Holes, which demonstrated that people who stand near and bridge structural holes in networks are more likely to have good ideas because they are exposed to alternative ways of thinking. As a result, they also have greater influence, so are more likely to see those ideas adopted (See 2.2.1.4). By forming networks with weak network architecture and multiple weak ties, accelerators bridge structural holes and bring the advantages discussed by Burt to their cohort, and to the other stakeholders involved.

Borgatti & Halgin (2011) went on to argue (see 2.2.1.4) that if bridges are the source of novel information, and only weak ties bridge, then weak ties are the best route to novel information, concluding that someone bridging structural holes will be exposed to non-

redundant information not available to the others in the network (see 2.2.1.4). They concluded from this that access to new, non-redundant information positions an individual to be more valuable in the wider network. This also explains how accelerators create a valuable position within their wider ecosystem, because they bridge structural holes and become a source of non-redundant information, which is a source of value in social networks.

Accelerators therefore develop a specific social network structure that supports innovation, and creates value for the various stakeholders by bridging structural holes and becoming a source of non-redundant information. This is an outcome of the specific network structure of an accelerator, suggesting that accelerator design needs to reflect this knowledge.

3.2.3 Social Capital in accelerator networks

If the engagement between the ties in the social network of an accelerator is of such importance, it is inevitable that Social Capital will play a role in how these engagements are rewarded and policed. This is supported by Orlowski & Wicker (2015), who wrote that Social Capital "refers to features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions" (see 2.2.2.1).

Coleman (1988) identified three forms of Social Capital (see 2.2.2.1), which reflect the value in an accelerator. These are summarised as:

1. the expectations of return based on trustworthiness within the network;
2. the ability of the social network to facilitate the flow of information;
3. and the role of norms and the ability to police those norms.

These three aspects of Social Capital explain the dynamics of an accelerator, whereby people co-operate with a view to some form of return, which might be social validation or access to non-redundant information, rather than just an economic return, like being paid. This co-operation and internal trust encourages the flow of information, in particular the ability to source non-redundant information and validate it, which equates to a form of value to others. This particular structure of the network around an accelerator also consequently supports the establishment and communication of norms, and the ability to police these with link reciprocity (see 2.3.3.2).

This is supported by Coleman's (1988, 1990) conclusion (see 2.2.2.2) that Social Capital is strengthened in closed networks because norms are understood, and they have the social mechanisms for reward and sanction. This leads to greater trust, suggesting that in this context Social Capital can widely be interpreted as *trust.* This explains the high levels of trust observed in accelerators, for example by Miller & Bound (2011) (see 2.3.1), as residing in the closed core of the accelerator, which is rich in bonding Social Capital. This core is the cohort and management team, and whoever else is closely involved with the establishment and running of the program.

The way in which trust and value becomes useful to the specific outcomes of an accelerator lie in the observation (see 2.2.2.4) of Adler & Kwon (2002) who stated that a

factor of Social Capital in a network is that a reward for generating and validating valuable information is, in effect, a favour owed to those with whom that value is shared. These 'favours' can be used to benefit themselves or someone else that an actor chooses to support.

This forms the basis of the proposition in this thesis that an accelerator accumulates Social Capital and then confers it on its cohort. By building a network which is high in trust and facilitates the flow of non-redundant, validated information, the accelerator accumulates Social Capital that it can use to reward co-operation from other high-value actors. It can then decide what to ask for in return for sharing that value, which in this case is the support of the startups in its cohort.

This is important because this thesis proposes that the startups themselves lack the Social Capital required to engage with high-level actors who are rich in tacit knowledge and ties. Accelerators accumulate a much higher level of Social Capital, which they can then use to reward stakeholders for supporting their startups.

This takes many forms, but is primarily the role the accelerator plays in creating efficiencies and value. For example, by creating a small, validated cohort from a large number of startups offers a more efficient mechanism for a high-value actor to meet the startups. Furthermore, the accelerator can reward co-operation socially, for example through endorsement of social credentials to mentors, and by making high level connections between the mentors and with the sponsors and investors.

This was summarised in the literature review by Adler & Kwon (2002), who observed that "these forms of power can benefit groups that distil them collectively, allowing them to 'get things done' more effectively, thus creating value for the group" (See 2.2.2.4).

3.2.4 Accelerators cluster co-operators to create economic outcomes

Accelerators are therefore clearly building networks that reward co-operation in order to create value for the stakeholders involved. The way an accelerator encourages co-operation is reflected in the observation made by Harrison et al (2011) (see 2.2.3.2) that cooperating with an actor who is highly connected in a network increases the chance of reward, or of sanction for not cooperating, because that actor is able to spread reputation more effectively. They went on to conclude that this goes some way to explain why cooperative people tend to cluster in networks. As an accelerator is highly connected within its wider ecosystem and sits at the heart of its own network, it is in a stronger position to reward those who co-operate with it, which contrasts with an individual startup.

This is supported by Granovetter (2005), who explained how this ability to cluster co-operative actors leads to economic outcomes (see 2.2.2.3). He observed that social networks create economic outcomes by encouraging the flow of information, over bridging ties, and using the trust that resides in the network, in the form of the Social

Capital and strong ties, to validate or qualify that information. They support this function by being able to reward or sanction behaviour using link reciprocity (see 2.2.3.4).

Combined, these features lead to the actors within the accelerator behaving in a way that may reward the network, or other actors, rather than themselves. This is due to the expectation that 'trust' creates reciprocity, or a return on investment later in time, as Social Capital can retain value over time and be expended later (see 2.2.2.1).

This apparently non-rational form of behaviour, whereby an actor may expend effort to benefit others rather than himself, is a consequence of embeddedness within a network, reflecting an expectation of social outcomes like status and approval, or a risk of sanction (see 2.2.3.3). This further explains the economically irrational behaviour in accelerators whereby actors, such as mentors, give their time, knowledge, and contacts for free to assist the startups. It also supports the argument in this thesis that accelerators should be viewed primarily as social networks, rather than being analysed just as business support programs. The main mechanism whereby mentors are incentivised and rewarded is Social Capital, an outcome of the accelerator being a social network.

3.2.5 Value can be used to reward or sanction

Equipped with this explanation of how the specific type of social network that makes up an accelerator facilitates outcomes and how value resides within the accelerator social

network in the form of Social Capital provides further insight into how they create value.

It has been shown how an accelerator is of value to actors because it facilitates the flow of non-redundant information, and is rich in weak ties and therefore offers novel ties as another form of value. It has also been shown that an accelerator is a dynamic social network embedded in a weak network architecture, meaning it can communicate reputation effectively across a large ecosystem Therefore, its value can be used to reward co-operators, and conversely withholding or withdrawing it can be used as a threat of sanction. This link reciprocity was shown to be a means of policing dynamic networks (see 2.2.3.4).

This suggests that a well-structured network, rich in bridging and bonding Social Capital, embedded within a weak network architecture, is well placed to use link reciprocity to reward co-operation and police its norms.

3.2.6 Protecting startups, and link reciprocity

The description of link reciprocity, and the way in which an accelerator can confer its Social Capital on its cohort, (see 3.2.3) explains the observation by Miller & Bound (2011) that accelerators can protect their startups. (see 2.3.3.5) They described this as being a function of the strong ecosystem around the accelerator making it easier for the startup to threaten reputational damage to bad actors, and this is explained in depth by

Social Network Theory. The structure of the accelerator's social network, combined with the value residing within its Social Capital, allows it to reward and sanction actors using link reciprocity, and therefore offer value to its startups in the form of protection. This observation informs accelerator design by demonstrating that an accelerator should protect its startups via construction of a specific network structures using Social Capital and link reciprocity.

3.2.7 Building Cohorts to create efficiencies

Another key feature of accelerators described in the literature is that they form cohorts, and this creates efficiencies in how they deliver value to stakeholders. Cohorts create efficiency of scale (see 2.3.2.4), allowing the accelerator to deliver training and education, as well as to organise mentoring efficiently, reflecting how universities teach to classes rather than individuals. Furthermore, Bliemel et.al (2014) observed that accelerators employ very few people (see 2.3.2.4) and therefore deliver their value in a way that is cost-effective compared to other approaches.

The other aspect of the efficiency created by an accelerator was explained by Hathaway (2016) in how it transfers tacit knowledge from mentors to startups and in doing so condenses years' worth of their knowledge gained through experience onto a focussed group of people in a single place, and in a short period of time (see 2.3.2.4).

Cohen (2013) explained how the accelerator absorbs this "learning-coordination" cost

by arranging for the group of mentors to engage with the cohort. This is more efficient than each startup engaging directly with each mentor. She found that when accelerators facilitated mentoring, the startups had more mentoring sessions (see 2.3.3.2), but the coordination effort undertaken by an accelerator also benefits the mentors, sponsors, investors and corporates because they gain the value of meeting a validated cohort of startups.

3.2.8 Creating value through a startup selection process

A key aspect of the efficiency and value of creating a cohort lies in the selection process, which provides an efficiency to other stakeholders by finding and convening a best in class of startups. Accelerators are expected to carry out a rigorous selection process to create a cohort that is demonstrably the best in class (see 2.3.3.6). This refers back to the explanation of how an accelerator creates value, and consequently accrues Social Capital through the facilitation of early access to novel and non-redundant information (see 3.2.3). The search and selection process takes time and resources, the end product of which is therefore of greater value to stakeholders than undertaking this effort themselves.

The importance of the selection process is not only explained in practical terms of sourcing investments or new innovation, it actually underpins the way in which an accelerator builds Social Capital, and is therefore able to reward and sanction actors using link reciprocity. In return for co-operating, mentors gain access to this valuable

resource. Corporates and investors may pay, in the form of sponsorship, to access the cohort. Being a gatekeeper to this source of high-value, novel information, positions the accelerator to be able to ask favours of the ecosystem, and to threaten sanction by withdrawing or withholding access to that resource.

3.2.9 Using Social Capital to build a mentor network

Having demonstrated how the accelerator accumulates Social Capital, and can use it to reward co-operation, explains the resource used by accelerators to recruit and incentivise mentors. As identified previously, mentors are a defining aspect of accelerators, and create value for the startups, and efficiencies in how tacit knowledge is transferred (see 2.3.3.1).

Paul Graham (2011) stated that startups need a very diverse group of mentors to address their knowledge and network gaps (see 2.3.3.1). Frimodig & Torkkeli (2013) observed that mentors generally work for free (see 2.3.3.1). The description here about how accelerators create value suggests that mentors are paid with Social Capital, which takes the shape of access to non-redundant information, new ties, and social validation.

This is supported by Bjørnskov & Sønderskov (2012), who argued that Social Capital has potential value because it gives access to information and resources in a social network. Adler & Kwon (2002) also suggested that Social Capital could be developed with an expectation of future benefit and therefore holds value that can be expended

later. Audretsch et al. (2011) recognised that Social Capital could be used in place of other forms of capital. In this way it becomes an asset that can be used, in this instance, to pay mentors. (see 2.2.2.1).

Mentors not only work for free, but typically without signing NDAs (Miller & Bound 2001; see 2.3.1) This ties the conclusion that they are primarily rewarded with Social Capital into the suggestion that they are policed using link reciprocity. If they are incentivised and rewarded with information and ties, and through social validation, then the threat of cutting these off, and of damaging their reputation, is an effective threat of sanction against them behaving as bad actors, and replaces the need for NDAs.

Understanding how mentors are rewarded and policed in this way should inform the design of accelerators to ensure that the network structure and program design most effectively supports the use of Social Capital to reward co-operation by mentors, and is able to use link reciprocity to sanction them.

Therefore, if an accelerator does not sit within a weak network architecture, and is not rich in bridging and bonding Social Capital, it will struggle to reward mentors. The risk will be that mentors either lose interest and do not offer enough value to the cohort, or that the mentors may harm the startups because they do not fear any sanction. Trying to counter this by paying mentors and asking them to sign contracts will confuse experienced mentors, who are used to engaging in a way familiar with accelerators. It will change the dynamic from a complex social interaction that is mutually beneficial,

and embedded within social relations, to a less complex transactional engagement in which they are paid consultants under sanction from contracts.

3.2.10 The role of accelerators as ecosystem builders

This chapter has so far shown how accelerators form a particular social network structure, and are rich in both bridging and bonding Social Capital. This makes them powerful connectors within an ecosystem, because they accumulate value that encourages actors to co-operate with them, and can therefore reward co-operation. By facilitating the flow of non-redundant, validated information, for example through the selection process, but also the weak tie network they build around them, they are valuable to multiple different stakeholders, and consequently can catalyse connectivity within an ecosystem.

This leads to the suggestion that accelerators both need ecosystems and can build them. They need them in order to source resources such as startups, mentors, investors, and partners. Also, in order to be useful to the startups, these networks need to be large and varied (see 2.3.3.1). The wider ecosystem also represents the weak network architecture within which they are able to exercise link reciprocity in order to police their norms.

Accelerators can build ecosystems because they become repositories of Social Capital, making them attractive to different stakeholders to engage with them. The interplay

between startups, mentors, corporates, and investors is intrinsically cross-sectoral, positioning the accelerator as a bridge between actors from different areas and of different status in the ecosystem.

3.2.11 EyeFocus building an ecosystem in eye-care

The role accelerators can play in convening ecosystems informed how EyeFocus sought to build an 'eye-care innovation' ecosystem. In doing so it set about connecting a wide array of stakeholders involved in eye-care innovation. To describe this activity this thesis develops the accelerator typology introduced by Pauwels et al. (2015) of an "ecosystem builder," (see 2.3.3.4) which was defined as an accelerator building ecosystems of innovators around Corporates. This definition is considered alongside that of Hoffman & Radojevich-Kelley (2012) who used "welfare stimulator" (see 2.3.3.5) to describe an accelerator with public funding focussed on supporting the development of entrepreneurship and innovation networks.

Practically speaking, both are building ecosystems of innovators, one at a local or regional level, the other around a corporate or sector. EyeFocus Accelerator is considered by this author, as an ecosystem builder because it built what is here described as the 'eyecare innovation ecosystem.' This was built around several corporates, reflecting the definition by Pauwels et.al (2015), but also for the wider good of the sector, in a way that reflects the welfare stimulator model of Hoffman & Radojevich-Kelley.

EyeFocus also partially reflected Lehmann's (2013) definition of a 'corporate accelerator' (see 2.3.3.5) in that it was funded by and closely associated with a corporate. However, the example given by Lehmann was of accelerators being established by and for corporates, whereas EyeFocus was an independent business that approached the corporates after being established.

Describing EyeFocus as an ecosystem builder is further supported by Miller & Bound (2011) who argued that an ecosystem builder accelerator can have a role in a sector or region of convening stakeholders who might otherwise not meet. Bliemel et al. (2014) also argued that an accelerator can act as a network aggregator across an ecosystem, especially as a result of the open events they run, such as demo day s, networking, and mentoring meetings (see 2.3.3.5).

EyeFocus connected stakeholders who might otherwise not meet, and created value for the wider ecosystem, as well as building an ecosystem around a corporate. It is therefore proposed here to call it an ecosystem builder, with that definition being a compilation of those outlined above, and a development of Pauwels et al. (2015).

Being an ecosystem builder influences the aims and outcomes of the accelerator, as they therefore extend beyond those of a deal-flow maker, and incorporate a broader set of criteria, as will be examined further below.

Consequently, this thesis understands that the concept of an 'ecosystem' applies to the wider context in which accelerators exist. It is something that the accelerator can

contribute towards building, and within which the accelerator can act as a central focus and connector. Furthermore, for more advanced accelerators, and especially deal-flow accelerators, an ecosystem is required from which to source mentors and investors, so the two are intrinsically interdependent.

Whilst Pauwels et al. (2015) referred to an accelerator building an ecosystem around a corporate when they coined the phrase "ecosystem builder," for the purpose of this research, and as will be demonstrated from it, the concept is here taken to mean an accelerator that consciously sets out to build an ecosystem in a sector which is disjointed and poorly connected.

The accelerator consequently acts as convenor, bridging between stakeholders in the ecosystem that might otherwise struggle to communicate and cooperate, such as startups and corporations, Non Governmental Organisations (NGOs), and universities. Therefore, the accelerator aims to leave the ecosystem better connected and more efficient as a result of its activities, spreading benefit well beyond the traditional key stakeholders of startup, investor, and accelerator founder.

3.2.12 Sharing Social Capital as an ecosystem builder

This interpretation of the role an accelerator plays in the wider ecosystem is supported in Social Network Theory by the suggestion that those who generate Social Capital rarely reap all of its benefits, because it resides in the ties between nodes, not within a

single node (see 2.2.2.1). By building and supporting ecosystems, accelerators generate Social Capital that benefits the whole accelerator network and wider ecosystem, not just the cohort, manager, or financial supporter of the program (see 3.2.12).

This leads accelerators to have an inevitable role as ecosystem builders, because they build value that lies in the ties between the nodes of its network, and which uses Social Capital to reward actors. Therefore, it necessarily has to build an ecosystem within which its own Social Capital resides, as that Social Capital cannot just reside within the accelerator but is a function of the accelerator's relationship with other actors in the ecosystem.

An example of this dynamic is the observation by Fehder & Hochberg (2014) that accelerators encourage the emergence of local angel and VC communities, and stimulate their wider investment activity (see 2.3.4.2) beyond just the accelerator's cohort. Therefore, a consequence of an accelerator attracting investors to the cohort is that those investors become more active across the ecosystem and invest in other startups too, which becomes an inevitable biproduct of the value the accelerator is creating for its own benefit, reflecting the sharing of Social Capital outlined above (see 3.2.12).

Consequently, accelerator design should assume that much of the value it creates will not directly benefit the accelerator, or its backers. This should be explained to the other stakeholders in terms of its place in an ecosystem, and the function of Social Capital that value created for others will increase the ability of the accelerator to generate value over time for itself and the stakeholders it benefits directly.

3.2.13 Managing redundancy and decay

As was examined in 2.2.1.4, non-redundancy decays over time as information flows between weak ties, and as a result they become stronger, or dissolve. Decay here describes the tendency of relationships to weaken over time (see 2.2.3.3). Consequently, two things are predicted to happen to weak ties. Either they weaken and dissolve, and the newly introduced people do not pursue their relationship, or they become strong ties and cease to be a bridge over which non-redundant information can flow. Within the context of an accelerator, it is desirable for the cohort to form close relationships so they can support each other, during the program and in the future. However, it is not desirable for the mentor network to become a strong tie network in relation to the cohort otherwise the non-redundancy of its information and ties will decay (see 2.2.2.3).

Therefore, theory suggests that as an accelerator program runs, the large amount of non-redundancy built into the newly introduced weak tie network of mentors and cohort will decay as information flows over it, and eventually the information will cease to be non-redundant.

Addressing the desire to form a highly embedded and close cohort (see 2.2.3.3), Burt (1999) showed how a high level of embeddedness in which actors are connected indirectly through many third parties can slow the way in which relationships weaken, or decay, naturally over time (see 2.2.2.3). He suggested that building this attachment with the actors should happen as early as possible, and be embedded in other types of

social relations because a higher level of embeddedness will lead to a slower rate of decay.

Referring in this case to an incubator, (see 2.3.3.4) Eveleens et al. (2016) also explained that this is achieved by putting participants in close proximity to each other. The shared space and events form a dense internal network with strong closure between the cohort and managers. This will support the ability of the incubator or accelerator network to develop and communicate norms, and to 'get things done' (see 3.2.3).

The design of accelerator programs should therefore encourage network closure within the cohort and management team early in the program, both through group activities like training and informal activities such as meals and visits, and by inviting the friends and family of the cohort to extra-curricular events, as proposed by Burt (Burt 1999; see 2.2.3.3).

However, while it is positive to encourage the cohort to become strong ties quickly, the tendency of the value of weak ties to decline over time as non-redundancy decays poses a problem to an accelerator when related to the mentors. If an accelerator network is not dynamic, then it is inevitable that over time all the actors will meet, will exchange their novel information, and will gradually see an increase in the redundancy of information and ties being exchanged within the network, or the decay of non-redundancy (see 2.2.14). Triadic closure will increase as actors meet each other and make multiple connections. The startups in the cohort will gradually cease to receive

information or ties that are non-redundant and will therefore see the value of the accelerator reduce accordingly.

Therefore, it is not only important to build a weak tie network around an accelerator, but to plan to refresh this network constantly in order to maintain its ability to deliver non-redundant information, and therefore value. Equally, this dynamic aspect of the network supports link reciprocity, which would also diminish if ties are not being constantly formed or dissolved.

3.2.14 The impact of non-redundancy decay on program length

Apart from reflecting how an accelerator needs to design and manage its network, the question of non-redundancy decay also influences the question of how long a program should last, and supports the argument that it needs to be time-limited.

To keep a network constantly refreshing over time is challenging over time, because new weak ties will gradually evolve into strong ties, or dissolve. To do this indefinitely poses a challenge most likely beyond the capacity of an accelerator, especially one with limited resources. Furthermore, any ecosystem will eventually reduce in its ability constantly to provide new actors to a dynamic network. This thesis proposes that even the most perfectly structured accelerator will, over time, see non-redundancy decay and embeddedness increase as the actors in the accelerator social network increase the

number of mutual ties they have and the amount of information flowing through the network.

At this point the nature of the network changes, and it ceases to be what this thesis proposes is the social network specific to an accelerator (see 3.2.1). Friedkin (1980) supports this assumption, observing that bridges between networks are between weak ties because strong ties tend to form triadic closure, whereby people who are closely connected are likely to know each other's contacts as well as each other so have already eliminated structural holes within their more embedded network.

An accelerator network, primarily being the mentors and cohort, will develop triadic closure over time as the weak ties share their ties repeatedly with different actors. This then suggests that accelerators need to ensure there is a high degree of non-redundancy in the network they build from the outset. If a group of mentors are all recruited from the same source, for example an organisation or corporation, the speed at which redundancy will develop for the cohort will be much faster, because there will be high levels of triadic closure already between those mentors as they are colleagues, sharing multiple ties and knowledge from within their organisation.

Therefore, accelerators need to build mentor networks that not only represent weak ties to the cohort, but also to each other. This will delay the decay of non-redundancy within the whole network, as the likelihood of any given mentor providing the same information or new ties as another mentor is reduced. This also creates greater Social

Capital for the mentors, as meeting each other, not just the cohort, will generate more value for them.

This understanding of decay in networks also informs the discussion about the length of accelerator programs. The literature demonstrated that programs are typically 3 months long, though can last up to 12 months (see 2.3.2.4). There are many practical reasons for programs being 12 weeks. One is simply that accelerators are copying Y Combinator, which was structured to run over a university summer holiday (Christiansen 2009). Other factors include cost, and the ability of an accelerator management team and cohort to sustain a bootcamp style of programming, with aspects like mentor overload (see 2.3.3.2), for any longer than 12 weeks.

However, Social Network Theory adds another aspect to this discussion, suggesting that around 12 weeks may be an optimum timeframe before which the decay of non-redundant information begins to set in, which would diminish the value of the program to all of its stakeholders. It is possible, therefore, that the 3 month program is the natural length of time for an accelerator network before embeddedness diminishes its ability to facilitate the flow of non-redundant information over an ever decaying pool of weak ties.

3.2.15 Pitch training and developing role-sets

Connected with the way in which accelerators sit within ecosystems and build weak tie networks with low redundancy is their role in developing role-sets, which is a product of the startups engaging with this diverse network.

The literature examined the work of Rose Coser (see 2.2.1.5) to explain how accelerators add value to their cohort by developing their ability to engage with a wide variety of people, and why accelerators typically focus so much time on pitch training. Learning to pitch is the skill of explaining a startup to an individual or audience quickly and succinctly. Startups typically pitch at Demo day s, usually in 2-5 minutes and with a limited number of slides.

Coser referred to 'cognitive flexibility' (see 2.2.1.5) to describe the skill of seeing the world from the perspective of many different people. This is understood here to describe the skill developed both through mentoring and pitch training. Coser (1975) wrote:

> "When others are understood to be different from oneself, a thought must be more clearly articulated into speech. And when the others are known to differ among themselves, the speech, to be understood by all, must be even more carefully elaborated."

This describes why a diverse mentor network is important, why pitch training is a core activity, and why accelerators focus on developing the role and status sets of their

cohort. Startups have to find a way to communicate their product or business to a very broad audience, ranging from investors to customers. These represent different role and status sets, and the term 'cognitive flexibility,' describes well the skill developed by startups during the multiple engagements with mentors and other stakeholders in the accelerator.

This insight should inform the design of accelerators by emphasising that they have a role in developing the participant's role sets, and in understanding the value of cognitive flexibility. The importance of complex role-sets identified in the literature suggests this should be a core focus of accelerator programs, rather than an incidental biproduct. Understanding the theory underlying pitch training suggests that it is far more than an exercise in communication and presentation, and is in fact a core part of their intellectual and social development as a result of the accelerator program.

3.2.16 The pros and cons of investing in the cohort

The discussion in the literature review about how accelerators are evaluated focussed heavily on investment returns and outcomes (see 2.3.4.2). Christiansen (2009) provided calculations to show how a deal-flow maker can generate a return through investment, and Bliemel et al. (2014) argued that the only measure of an accelerator's success should be investment returns (see 2.3.4.4).

Further into the chronology of the literature, as the accelerator concept evolved, and developed into different typologies (see 2.3.3.5), investment became increasingly less important both to the definition and the activity of an accelerator. Pauwels et al. (2015) suggested that the investment model, or deal-flow maker, is unlikely to work outside of a few very large ecosystems (see 2.3.4.2).

It is evident that as accelerators have developed into programs with multiple and varying aims and objectives, investing has become less important as a primary factor in cohort selection, and in the evaluation of accelerator outcomes. If a program is primarily aiming to stimulate innovation, develop an ecosystem, or address a technical problem for a corporate, then investing into the startups may result in accepting the wrong startups for those purposes, or rejecting startups that might suit the aims of the accelerator.

This thesis will argue that investment creates a number of filters in the selection of a cohort that either may impose artificial limitations on which startups are accepted, or may preclude other outcomes (see 7.2.5).

Furthermore, as Golomb (2015) proposed, accelerators based primarily around investment outcomes may struggle financially if those returns are not successful (see 2.3.4.2). As accelerator funding has developed to incorporate sponsorship, grants, and other sources, investing has become less important.

However, it remains the case that for a residential program of several months, the startups may need funding to pay for their costs, so some form of funding would be required and must be considered if investment is not part of a program.

3.2.17 Definition of an accelerator as a social network

The literature has described the best network structure to support innovation (see 3.2.1) and in doing so begins to describe an accelerator in terms from Social Network Theory. It suggests that the most creative and productive network structure is one that has strong ties with a high level of closure at the core, surrounded by a large number of weak bridging ties, which creates an efficient and powerful ability to find and qualify information, and the internal trust and effectiveness to translate that into outcomes (Adler & Kwon 2002, Rost 2010; see 3.2.1).

Rost (2010) further explained this by concluding that people with strong ties who are embedded in weak network architecture are most likely both to have innovative ideas and be able to realise them. Social Capital and weak tie networks can expose nascent founders to new perspectives and contexts for their ideas, helping develop a solution to fit a more complete market view (Davidsson & Benson 2003; see 2.2.1.4).

This also reflects Coleman's (1988) three forms of Social Capital:

> "Obligations and expectations depend on trustworthiness within the social network; the ability of the social network to facilitate information-flow; and the presence of both norms and sanctions for breaching those norms." (see 2.2.2.2)

The accelerator network can be policed using link reciprocity by virtue of being a dynamic network with high degrees of density across a large weak network architecture, and being rich in social capital (see 3.2.6). In this way, it can communicate reputation both as a reward or sanction, and because it bridges structural holes and facilitates the flow of novel information, it rewards actors with early access to novel information, social credentials, and new ties.

The skill used to operate in this network involves having complex role and status sets. The selection process to create a best in class cohort produces the internal value that enables link reciprocity. The network needs to start out very rich in weak ties and non-redundancy because these will inevitably decay as the accelerator connects these ties over time (see 3.2.14).

3.3 SUMMARY

This chapter examined how accelerators create value by bridging structural holes in social networks. They accumulate Social Capital by building a social network rich in bridging and bonding Social Capital, which allows them to become a resource for valuable information, and to be trusted to reward people who co-operate with them.

They reward people with non-redundant information, novel ties, and social validation. Being highly connected within their network, and the wider ecosystem, enables the accelerator both to reward and sanction people in this way, but also leaves people

confident they will be so rewarded or sanctioned because both parties are able to spread reputation effectively.

Creating a dense network core, consisting of the cohort and managers, within a weak network architecture, being the wider ecosystem, and being a dynamic network that brings in and pushes out people rapidly, allows it to use link reciprocity to police its norms. Those norms are developed and communicated by the dense core.

This suggests that the selection process, which creates a validated group of startups is actually a source of the Social Capital the accelerator then uses to support and protect those startups.

Social Capital was recognised as a replacement for economic capital as a reward, and can be understood to have a future benefit to the holder - it can be accrued and deployed to achieve outcomes. This suggests accelerators accrue Social Capital and then expend it later on behalf of their startups. In this way they confer their status and Social Capital on the startups, enabling them to ask high-status actors for advice and support.

The value in an accelerator that results from its social network therefore relies on weak ties and non-redundancy, but these were shown to decay over time as triadic closure and embeddedness increase once people meet frequently and share their knowledge and contacts. This decay function risks undermining the value an accelerator can offer, and also therefore its ability to police norms with link reciprocity.

It was suggested that this may explain why programs are generally 3 months long, though such a proposition would require extensive further research. However, it is clear that the decay function means any accelerator network will gradually tend towards strong ties and redundancy, at which point it would naturally cease to be an accelerator in nature.

Consequently, accelerators should be designed with this decay function in mind, ensuring that the mentor network and cohort start off with a high level of weak ties, in order to postpone the inevitable transition into strong ties and redundancy.

Social Network Theory, in particular role-sets and cognitive flexibility were also shown to play a fundamental part in accelerators, represented by the skill the startups gain by engaging with a diverse mentor group, and in developing their pitches.

Finally, investment was examined, concluding that not all accelerators should invest in startups in the way a deal-flow maker situated in an advanced ecosystem might do. Investing forces the selection process to focus primarily on whether the startups can achieve investment returns, which may obscure other outcomes that would be more relevant to other types of accelerator.

CHAPTER 4. CASE STUDY - APPLYING THESE FINDINGS TO ACCELERATOR DESIGN

The findings from the previous chapter led to theory about how accelerators work as social networks. This chapter takes this theory and creates practical suggestions about how this theory should inform the design of accelerators, and applies the theory to EyeFocus Accelerator, which provides a case study for this thesis.

4.1 INTRODUCTION

This chapter translates the insights from the previous chapter into theory that informs the design of accelerators, and in particular to EyeFocus Accelerator. Where findings from the literature have led to observations about the behaviour of accelerators, and how they can be influenced by these findings this is now turned into practical recommendations for accelerator design. Then in the following chapter, having used some of these findings to inform the design of EyeFocus, this case study will inform insights into how they translated from theory into practice.

4.2 ACCELERATORS AS SOCIAL NETWORKS

This thesis argues that an accelerator is a social network, and that the benefits of accelerators, such as business support or identifying innovation, are an outcome of their being a social network, rather than the social network element being an outcome of the business support program.

Once an accelerator is understood to be primarily a social network then the role of Social Capital, weak ties, and link reciprocity can be recognised as fundamental rather than incidental, as outlined in the Social Network Theory definition of an accelerator reached in 3.2.17.

Consequently, in designing an accelerator, these foundations are the best place to start. The different sets of actors should be defined and understood from the outset; who they are, and where they come from in the ecosystem. How do they interact with each other? What do they each have to offer, and want in return? How will they be found, and incentivised to join the program?

4.2.1 Weak and strong ties; cohort and mentors

The importance of bridging and bonding Social Capital, and weak and strong ties was discussed in 3.2.2, concluding that the cohort and management team form the strong internal ties, rich in bonding Social Capital, whilst the mentors are the primary source of weak ties and bridging Social Capital.

The theory thereby emphasises the importance of the mentors for an accelerator. They are not just performing a function of knowledge transfer, but are the primary means to structure the weak network architecture and bridging ties. This means they play a role in creating the type of network that can be policed using link reciprocity, and alongside the cohort create the value embedded in the network in the form of non-redundant information and bridging Social Capital. This observation provides a greater insight into the way a mentor network should be structured, and recruited. The examination of Social Capital as a resource (see 3.2.3) also explains how mentors should be rewarded for their involvement, and explained why they are rarely paid, or sign NDAs (see 3.2.9 and 2.3.3.1).

This will inform how an accelerator should structure the mentor network (see below, 4.3), and how mentors should be rewarded (see below 4.5.2). It also points to the importance of developing strong closure and bonding Social Capital within the Cohort (see 3.2.12), and with the accelerator management team early in the program, as discussed in more depth below in 4.4.

4.2.2 Weak network architecture and bridging ties; diversity of mentors

The theory points to the need for mentor group to be diverse. If the mentors are all strong ties, they will bring novel information to the startups initially, but the non-redundancy will decay very quickly (see 3.2.13) due to the triadic closure within the mentor group, in that they all know each other and share common knowledge. This will soon become apparent to the startups who would begin to receive the same knowledge and contacts repeatedly from the mentors.

The weak network architecture created by a diverse group of mentors gives the accelerator a higher chance of sourcing novel, non-redundant information and ties. The theory of Six Degrees (see 2.2.1.2) points to the way a large, diverse group of mentors will bring other potential contacts much closer to the startups than a small, dense network of mentors with fewer bridging ties.

The impact of this understanding on accelerator design, and on the formation of EyeFocus Accelerator is discussed further below in 4.3.3, where this theory explains why the mentor network needs to be sourced through weak and bridging ties, not just from the immediate network of the accelerator founders and sponsors.

4.2.3 Facilitating link reciprocity

This diversity also supports link reciprocity, and therefore the ability of the accelerator to police norms and enforce rules. Incorporating actors from across an ecosystem facilitates the communication of reputation widely, and a diverse and dynamic network, and in which value is embedded through bridging Social Capital, all support link reciprocity. Therefore, it is important that the mentor network, being the main source of weak ties, is diverse not just to satisfy the need of the startups for a wide range of expertise (see 2.3.3.1), but also to support the way in which the accelerator polices its norms (see 3.2.6).

This has a clear impact on the design of an accelerator, supporting the wider argument that the mentor network needs to be diverse, but also that the whole network around the accelerator needs diversity and weak ties. This is particularly relevant when an accelerator is supported by one or more sponsors, as discussed further below in 4.3.3.

Without the specific network structure that supports link reciprocity, the accelerator will be less able to enforce norms, and therefore to protect its startups (see 3.2.6).

4.2.4 Value creation through non-redundant information in the cohort and mentors

The previous chapter referred to the way in which an accelerator creates value by facilitating the flow of non-redundant information (see 3.2.5). Corresponding with this, a primary source of novel information in an accelerator consists of the cohort of startups. As was explored in 2.2.1.4, having early access to novel information is a source of value in a social network, therefore mentors gain value by being the first to meet the startups, and by exploring their companies in depth through mentoring prior to them pitching to investors or clients. This privileged access to the startups is a direct means by which the mentors are rewarded for co-operating with the accelerator, and represents Social Capital that can be translated into economic capital (business opportunities) and human capital (becoming better informed, and therefore educated).

As well as the flow of information benefitting and rewarding the mentors, the flow of tacit knowledge from the mentors to the startups is the primary value proposition to the cohort from the accelerator (see 2.3.2.4, and 3.2.7), so this needs to be considered when structuring a mentor group to ensure they have a wide range of tacit knowledge as a resource for the accelerator to offer the cohort.

Combined, these sources of knowledge and ties also form the main value for the investors, corporates or other supporters of the accelerator. The cohort and the mentors are repositories of novel information and ties, and the way the mentors increase the value of the cohort also creates value for the investors and accelerator manager, and backer of the accelerator.

Therefore, in designing an accelerator, it should be understood that the main form of value it creates is early access to novel, non-redundant information. This value moves in all directions, with the value residing in all the different stakeholder groups in relation to each other, not just in the cohort. Designing an accelerator needs to test where the value resides and ensure each stakeholder group is both providing and receiving this value (see 3.2.5, and 3.2.8).

The theory therefore informs the design of accelerators by demonstrating where the value resides, and how it is used to reward each stakeholder group, as discussed further below in 4.5.3.

4.3 MENTORING

In particular, this understanding of the way in which value resides in the different stakeholder groups should inform how mentors are recruited and managed. The theory has indicated that mentors are rewarded with early access to novel information, but also that they are a repository of tacit knowledge and ties, which are also forms of value for the cohort and to the other mentors and stakeholders.

The mentor group therefore needs to be formed and managed in such a way that it reflects this theory.

4.3.1 Mentor recruitment for EyeFocus Accelerator

Translating this theory into practice, understanding the best structure of a mentor group informed how EyeFocus set about recruiting mentors. It was clear that the program would require a mentor group that is large, diverse, and balanced between general tech and eye-care, and was global.

As identified by Christiansen (2009), good mentors attract good startups, and good startups attract good mentors (see 2.3.3.2). For a new accelerator this creates a problem, as it has neither. Christiansen (2009) observed that the network around an accelerator starts out reflecting the 'quality and quantity' of the personal network of the accelerator founder, but over time grows to reflect the quality of the startups that have come out of the program (see 2.3.3.4). With no prior cohort to attract the mentors, the accelerator founders inevitably start with their own strong ties, building out the mentor network in layers, with each layer acting as validation to the next less socially close layer. In this respect, they are using their Social Capital to begin the process, which in turn builds Social Capital into the program so the search can extend beyond their own immediate networks (See 3.2.9).

The strategy adopted by EyeFocus therefore involved approaching very close contacts, who were strong ties, to form the initial core of mentors. The sponsors would also be asked to contribute mentors, and gradually the program would build a reasonable number of mentors. With this validation, in the form of the first mentors associated with the program, it would become possible to reach out further to weaker ties, and over

bridging ties, and ultimately to strangers with no ties to the network. The partners and mentors were also asked to propose other mentors from their networks, who were also weak ties or strangers, thus using the weak network structure evolving around the accelerator.

This approach not only reflects the need to build up Social Capital in order to attract mentors, but also consciously builds a weak network architecture around the accelerator that is rich in bridging capital because the mentors are not all directly known to the founders, or to the other mentors.

This network structure of a dense, strong tie core, with weak ties, and bridging ties also supports the use of link reciprocity to police norms, as it can communicate reputation effectively.

4.3.2 Mentor Selection

The literature and following discussion clearly emphasises that mentor selection is an important factor for an accelerator in that mentors need to be diverse, co-operators, and people who will understand and respect the norms of the accelerator (see 2.3.3.1).

This informed EyeFocus from the outset. As the method to recruit mentors began with strong ties and worked out to the edges of the accelerator's immediate social network, it was easier to assume that the early mentors would fit the purpose as they were

personally known to the managers. However, once mentors were being recruited via bridging ties, and even direct approaches from strangers to the accelerator, more care needed to be taken to ensure mentors would fit the norms and culture of the program.

When approaching mentors from the startup sector it was assumed most of them had mentored before and would understand what was expected of them. However, because EyeFocus was also working with its corporate sponsors, and with the eye-care sector, selecting mentors had to take into account that a number of them might not know what they were being asked to do, and may not be suitable for this very specific form of interaction.

EyeFocus designed mentoring to be consistent with the norms and practices of the wider startup sector. Therefore, mentoring was anticipated mainly to involve short 20-30 minute sessions, and would expect a degree of trust and openness between startups and mentors. It was assumed that this may be quite an unfamiliar format to corporate or medical professionals who had not engaged in this way before. It was anticipated that some would interpret mentoring as involving ongoing, long periods of engagement, or requiring NDAs to be in place prior to discussions. As such, the approach to mentoring reflected the theory discussed above, both in relation to the norms of 'mentor overload' (Cohen 2013; see 2.3.3.2), and relying on trust over contracts (Miller & Bound 2011). This had to be communicated to mentors, and also informed the selection of mentors.

Selection of mentors was therefore based on the following considerations:

1. Had they mentored startups before, and therefore did they understand what mentoring in this context means?
2. They were excluded if they asked for payment, as this suggested they did not understand the norms around cooperation and creating Social Capital that benefits the wider ecosystem.
3. They needed to have either very strong networks, or some relevant knowledge to transfer to the startups, or both. But if they had neither they were unlikely to offer enough value to justify the time they would take from the startups for a mentoring session.
4. They needed to be comfortable with the fast nature of mentoring, generally 20-30 minute initial mentoring sessions. Those who felt they required hours, or multiple meetings, may be excluded because this was not in keeping with the style of an accelerator like EyeFocus.
5.

4.3.3 Retaining diversity in a niche or corporate accelerator

Structuring an accelerator in a very niche vertical, like eye-care, and with large corporate sponsors or partners, created a risk of building a network of mentors that consisted only of people from the eye-care sector, or only provided by the sponsors, which would, as suggested above (see 3.2.13), lead to more rapid decay function due to the duplication of knowledge and triadic closure between the mentors.

If this happened, then early in the program, the startups would find themselves receiving similar knowledge and advice, and similar introductions due to the homogenous nature of the corporate's dense internal network, and the nature of shared knowledge residing within the corporate.

In this instance, the accelerator would fail to provide the full breadth of access to education, networks, and information that is needed by startups, and is expected of an accelerator competing in the wider marketplace (see 2.3.3.1). This lack of diversity would also undermine the ability to use link reciprocity to enforce norms, as outlined in 4.2.3.

Based on this detailed understanding of mentoring, it was clear that EyeFocus needed to have a large group of mentors which was divided between eye-care industry specialists and tech sector generalists, and consisted of mentors from the sponsor companies, and also a diverse group of individuals from the wider ecosystem. This would address the assumption that all startups require some generic business support, regardless of their sector specialism, but that a focussed accelerator like EyeFocus also needed to offer unique access to eye-care specialists as well.

EyeFocus was therefore designed so that a balance was constantly sought between encouraging sponsors to provide mentors, and having too much representation from either one company or one sector. It was decided to limit the number of mentors from each sponsor to the main experts, or key executives, agreeing that any other individuals needed by the startups would be approached on a case by case basis during the

program. This ensured that the cohort had access to a very broad range of experts from the sponsor companies, but that the list of mentors promoted by EyeFocus was not dominated by a sector or company, and expressed the diverse mentor network EyeFocus had built.

As the sponsors provided senior executives, EyeFocus also sought out startup founders, and others who were at very different stages of their careers to balance the mentor group. There is a different set of benefits in a mentor at the peak of their career compared to one maybe 1-2 years ahead of the startup. Both have valuable lessons and contacts, so it was recognised as important that the mentor network did not only consist of high status actors. This also helps develop a wider range of role and status sets within the engagements arranged by the accelerator (see 2.2.15).

4.3.4 Managing mentors

In keeping with the findings of the literature review, it was evident that mentoring would involve a large number of rapid interactions between mentors and startups, reflecting the principle of mentor overload (Cohen 2013) so one member of the EyeFocus team was allocated the task of managing mentoring in the lead up to and for the duration of the accelerator.

Prior to the program launch, this work mainly involved approaching new mentors, and upon agreeing to be involved, chasing them for a biography and photo to put on the

website. This was important because the mentor biographies demonstrated visually the network being assembled by EyeFocus, and validated the program through association with the mentors. Having also understood that mentors are rewarded with Social Capital (see 4.5.2), presenting them on the EyeFocus website was part of this, giving them credentials by association with EyeFocus, the other mentors, and the sponsors.

During the program, a system was developed to manage who mentored which startups. It was important to ensure that all the mentors were asked to do at least one mentoring interaction, that none were asked for too much time, and that all the startups received the appropriate mentoring.

As well as managing the mentoring sessions, the EyeFocus team member was tasked with managing mentor relations. This involved processing feedback from mentors, following up offers to make introductions, and managing visits to EyeFocus by mentors, in some cases planning their travel, accommodation, and entertainment as guests of the program. It was decided that to protect the mentors, the cohorts were asked not to approach them directly without prior agreement, and generally to manage interactions either via EyeFocus, or with them involved. This avoided mentors being contacted by multiple startups at once, or being asked to contribute more time than they were comfortable with, reflecting the way Cohen (2013) observed how an accelerator reduces the "learning coordination" for the cohort (see 3.2.7), but extending that conclusion to creating the same benefit for the mentors.

Mentoring was scheduled in detail for the first 3-4 weeks of the program. The remainder of the program was left unplanned in order to allow mentoring to be organised as it was needed by the startups, and as mentors were available.

4.3.5 Mentor methodology

The concept of "mentor overload" (Cohen 2013) suggested that the main approach to mentoring would involve 'speed mentoring' sessions, whereby mentors or startups would sit at tables, and every 20-30 minutes would be rotated for the next session.

However, as EyeFocus was a program built around a topic rather than a geography, the mentors were not necessarily in Berlin. Therefore, further work was required to coordinate how to engage with mentors abroad, who either flew in for a short period, joined the group on visits elsewhere, or mentored online using a variety of tools, primarily Skype and Google Hangout.

It was understood that mentoring is not business consultancy and should be focussed more on providing a wide range of knowledge and contacts to the startups over a short period of time. This involved avoiding a program in which the startups meet a small number of mentors regularly over a longer period, in favour of the startups meeting as many mentors as possible briefly, to make a first contact which could follow up after the program.

This ensures the startups rapidly accumulate a new social network, and receive intensive and conflicting feedback, as outlined by Cohen (2013) during the short program, which they can build on after the program in more depth.

4.3.6 Mentor time commitment

In order to build a suitably diverse mentor network for EyeFocus it was decided that the basic ask of mentors would be kept as minimal as possible in order to avoid them saying no when invited to join the program. In particular, it was found that people who had not previously mentored at accelerators were concerned about the time commitment.

To address this, mentors were asked to commit a minimum of one hour at some point in the program, whilst also stressing that there was no upper limit to the time they could offer. It was hoped that this would make it possible to recruit some very senior people as mentors. It would then fall to the managers and startups to decide how best to use that hour.

This approach reflected an understanding that mentors are valuable as bridging ties as well as for their tacit knowledge. Whilst some might spend time with a startup sharing tacit knowledge, another might simply make a valuable introduction. Therefore, the amount of time committed was less important than having well connected people agree to join the core of the program as mentors.

4.3.7 Training for mentoring

In order to manage expectations, and express norms to those not already familiar with accelerator culture, guides for mentors and startups were produced and circulated. Training for startups was also scheduled at the beginning of the program to educate them on how to conduct themselves in mentoring sessions.

These guides were intended to ensure some degree of consistency in how mentoring was conducted, and to protect the reputation of the accelerator. The guides communicated the norms of the program, especially relating to mentoring (see 8.4).

4.4 THE ROLE OF COHORTS

A defining feature of an accelerator is the formation of a cohort of startups (see 2.4.1), rather than accepting participants on an ad hoc basis (Fehder & Hochberg 2014). The cohort creates an efficiency of scale, in which information and knowledge need only be shared once with the whole group, rather than multiple times with each startup. The cohort also creates a peer-support network for the startups (Bliemel et.al 2014). Belonging to a cohort that is the outcome of a selection process confers a status on the startups in an accelerator (see 4.5.1), something not generally the case with tenants in an incubator, or for startups on their own.

The cohort enables two sources of value in an accelerator. The first is this efficiency in being able to deliver education and mentoring more effectively (see 3.2.7), which is of value to the startups, and the second is by searching and filtering applicants to create a best in class, which translates in Social Network Theory terms to providing early access to novel non-redundant information (see 3.2.8), which benefits the mentors, sponsors, investors, and other stakeholders.

This thesis has also shown that a cohort is inevitable in order to run a fixed term program (see 2.3.3), so that all the participants join and leave at the same time as each other. Without a fixed term program, it would be hard to create a cohort, and without a cohort it would be hard to run a fixed term program, so the two are intrinsically linked, and together form a defining feature of accelerators, being a cohort of startups coming together for a fixed term program.

At a practical level, another efficiency created by a cohort joining a deal-flow maker program is the ability to carry out due diligence and invest in a group of startups with roughly the same documentation, terms, and investment closing date. Further into the program, it is also efficient to present a cohort of pre-selected investment opportunities to investors, or a portfolio of products to corporates (Bliemel et al. 2014).

4.4.1 Peer support

It is proposed here that startups in a cohort reflect the evolutionary behaviour which features behavioural imitation and cooperation in order to strengthen the survival of the group rather than just of the individual. In this way, they all work together to increase the chance of a single startup surviving. This thesis proposes that this behaviour is reflected in an accelerator because when one startup succeeds, the reputation of the cohort increases, which attracts beneficial stakeholders, like investors, to the accelerator as a whole (see 2.2.3.2).

This approach means that cohorts gain a reputation that is the result of their combined successes, so the cohort creates a healthy pressure for everyone to cooperate and assist each other (Cohen 2013).

4.4.2 Practical considerations for building cohorts

This theory should inform the formation of cohorts in a number of ways. Accelerators should plan not only to form a cohort, but also to organise activities that encourage embeddedness and the development of Social Capital within the cohort. This should result in a program that consciously brings the cohort together for more than just work events, and understands the longer-term value in the friendships and social interactions which run alongside the core programming, and which can delay decay function. Formation of friendships within a cohort should not be seen as an incidental outcome of

the accelerator, but a core aim, and the theory relating back to Burt (2009) gives clear guidance on how to achieve that (see 3.2.13).

4.4.3 Building the EyeFocus cohort

Having understood the importance of the cohort, it is clear that a focus for any accelerator should be to attract a strong cohort. This requires a branding and marketing exercise, and use of weak ties, to get the message out very widely so that startups not already known to the immediate network find out about the accelerator and apply. The brand and messaging will affect which companies apply.

The selection process also impacts on the formation of the cohort. The literature suggests that a cohort should be the result of a small number of startups being selected from a large group of applicants after a rigorous selection process (see 2.3.3.6). Consequently, the accelerator will have provided the valuable filtering process that creates value for the other stakeholders, and credentials for the startups.

Understanding both the value of the cohort, and the need for it to consist of novel startups found through multiple bridging and weak tie links should inform the branding of the program, and recruitment strategy, both of which combined are necessary to find and form the cohort.

4.4.4 Scouting for and finding startups

The theory indicated that EyeFocus needed to find a large number of eye-care startups and filter them into a smaller cohort through a selection process. Given that EyeFocus was operating in a sector that had not already been formed into a coherent ecosystem, this scouting process would have the added benefit of creating a wider survey of innovation in eye-care, which would be an asset for the various sponsors and partners.

It was estimated that a reasonable period of time was needed to scout for startups, followed by a selection process involving the sponsors, and then the announcement of which startups were accepted onto the program. A number of approaches were planned to find startups directly and to attract them to approach EyeFocus. From the perspective of Social Network Theory, it was useful to understand the role of strong ties, weak ties, and bridging ties in finding startups not already known to EyeFocus.

- Strong ties

  The first route to find startups was to contact people the team knew well, and to approach the sponsors and partners. This would allow EyeFocus to find and approach directly any startups they already knew. Any startups they recommended were more likely to respond to the approach, due to being introduced by a trusted contact.
- Weak ties

  The second route looked at weak ties, which might be mentors, or other people in the ecosystems in which EyeFocus was embedded, but not close contacts.

These could be approached directly or via the strong ties, but were likely still to be 1-2 degrees removed from the founders. This increased the reach of the network, but still within relatively close proximity to the EyeFocus team.

- Bridging ties

  In order to ensure that the cohort is truly diverse and consists of non-redundant information that is valuable to the sponsors, mentors, and partners, it is particularly necessary to recruit startups via bridging ties, across structural holes, which therefore means targeting networks not connected to the EyeFocus ecosystem at all.

To achieve this, weak ties were targeted, because bridging ties are usually weak ties (see 2.2.1.4). This required directly encouraging weak ties in the EyeFocus network to share information about EyeFocus with their weak ties, not just their strong ties, as might be instinctive. This approach was adopted because it would encourage the information to bridge out of the EyeFocus extended network into entirely new networks, be they in different geographies or sectors.

At this point the brand and message of EyeFocus becomes important, because the information that reaches people in no way connected to the EyeFocus network would carry little or no Social Capital and therefore be judged more superficially.
As part of this last strategy, EyeFocus employed the industry standard approach of using online accelerator and startup database websites, including F6S.com, Crunchbase.com, and Angelist.co. On these websites, EyeFocus created profiles so that startups could find them in searches for accelerators. EyeFocus also successfully sought

coverage about the program from Ophthalmology Today, and TechCrunch. The first being a publication for the eye-care sector, the second being the main publication of the startup sector.

4.4.5 Managing the application process

In order to form the final cohort, an application process is required. As discussed, this process validates the startups selected to join the cohort, creating perceived value in the accelerator. Typically, the sponsors of a program would want to be involved in this process, both to gain the benefit of seeing all the startups that apply, and in order to select companies of interest to them.

The F6S.com website was used by a number of accelerators to run their application process. It also serves as a database of accelerators that startups can search. It was decided to use F6S.com in order to standardise the application process, and to create a central database of applicants that would be easier to review. F6S.com also offered a collaboration feature, so that the sponsors on the selection committee would be able to log in directly and review the applications.

The intention was that all the applications would be received by a deadline, and then reviewed by the sponsors and accelerator team, again by a deadline, reducing down to a shortlist that would be offered a place on the program.

This whole process needed to be complete in time for those startups which had been offered places on the program to make the necessary arrangements to be in Berlin by the launch. This might include obtaining visas, finding accommodation, and securing funding from the accelerator and other sources.

Links to the F6S.com profile were included in all outgoing media and communications, and on the EyeFocus website and any startups found in a search were asked to apply there. The intention was both to create a manageable process, and to be following industry standard practice in order to position EyeFocus as a mainstream startup accelerator.

4.4.6 Aspects of the fixed term program

The formation of a cohort goes hand in hand with having a fixed term program, as each is necessary for the other. The fixed term has been shown to have two functions. Firstly, it is a practical aspect of an accelerator, facilitating the formation of a cohort and delivery of education in an efficient manner, secondly, as proposed in the previous chapter (see 3.2.14), it addresses the observation that over time non-redundancy will decay and embeddedness increase as the actors in the accelerator social network increase the number of mutual ties they have (see 3.2.3).

From this first, practical aspect, a fixed term program's launch date is a useful deadline with which to encourage sponsors to sign contracts, mentors to provide biographies, and startups both to apply and be in situ for the start of the program.

It may be argued that the decay function, and consequent development of a smaller group of strong ties with high embeddedness, is a long-term value outcome of an accelerator. This is represented by the close friends, advisors, and new team members a startup may acquire during a program. However, this changes the dynamic of the benefit from that of an accelerator into something else. As such, it is proposed that an accelerator program needs to end before this decay function sets in for it to maintain a consistent value-offering to its stakeholders (see 3.2.13).

Consequently, a program needs to be of a fixed term, and that term needs to end before too much decay function and embeddedness have developed. The literature does not suggest what such a term is, but does give some insight into the experience of previous accelerators.

The original three-month program introduced by Y Combinator was this length because it ran during the summer holiday, and was for people building a web application, which can be done relatively quickly (Christiansen 2009). As the concept developed into Europe, and away from Y Combinator, that emphasis on 3 months was retained, possibly more out of habit than choice. At the time of designing EyeFocus most accelerators were 3 months, so adopting this convention met the desire of EyeFocus to appear to be a conventional, mainstream accelerator.

Three months was also supported by empirical observation, and feedback from other accelerator managers and startups that had completed programs, that both found 12 weeks of intense bootcamp programming the maximum they could sustain. This reflects Cohen's "mentor overload" (see 2.3.3.2), suggesting that the program needs to run long enough to achieve an overload of feedback but not so long that it becomes detrimental.

A further practical reason for EyeFocus being 3 months was that the funding from the corporate sponsors was anticipated to stretch for about 3 months, with some time after to wind up the program. It was estimated that a 3 month program requires 9-12 months to plan, deliver, and wind up. It became apparent in the planning stages of EyeFocus that accelerators are expensive to run.

The base costs such as rent and staff combined with the cost of hosting events, catering, and other overheads result in a considerable financial cost for the accelerator company. Additionally, the participants in the program need to cover their cost of travel, accommodation, and other living costs for the duration of the program. It is intended that the investment into some of the startups contributes towards, or totally covers these costs for those who receive it, so it too is time-limited.

The decision to run for three months was therefore a result of a number of factors. However, this reflected a norm with accelerators of running 12 week programs, which may reflect an intrinsic understanding that after 12 weeks of mentoring and networking

the nature of the underlying social network changes, and the value of that specific form of interaction diminishes.

4.4.7 Program branding to attract startups and mentors

The theory discussed so far in determining the design of a program points to the need to brand an accelerator carefully to reflect a number of desired outcomes. If an accelerator seeks to build an ecosystem, bridge between different sectors, and appeal to previously unknown actors, then the branding needs to communicate the right message to these different stakeholders.

The brand will signal both to startups and mentors what to expect from the accelerator. The brand also goes some way to communicate the norms and culture of the program. Reflecting this, for EyeFocus a brand was developed that was consciously informal and was designed to appeal both to tech startups and the eye-care sector. There was a risk of being branded too strongly for either of these, and thus excluding half of the ecosystem the program wanted to attract. A very startup focussed brand would be off-putting to hospitals, corporations, and charities, whilst a typical ophthalmology sector brand risked not attracting startups.

The branding therefore tried to emphasise both the eye-care aspect of the program and the informality and open nature of a startup accelerator. To achieve that, the design and marketing material included a fun photo of a woman as an anchor photo, alongside a

logo that incorporated these aspects of the brand. These were used on the website and in marketing materials.

EYEFOCUS accelerator

Figure 1. Branding elements from EyeFocus Accelerator

Locating EyeFocus in Rainmaking Loft, and in Berlin were also branding decisions, communicating that EyeFocus was part of the startup sector but working in eye-care, rather than being part of the medical establishment or pharmaceutical industry trying to reach out into the startup sector.

The startup sector themed branding combined with that of the sponsors signalled that whilst based in the startup ecosystem, EyeFocus bridged strongly into the eye-care industry. The brand was therefore informed by Social Network Theory because it reflected the understanding of the type of diverse ecosystem EyeFocus wanted to build, and the role an accelerator has in bridging between sectors, rather than being aligned too strongly with just one.

Another part of the branding was to present the eye-care ecosystem EyeFocus was building visually, using partner and sponsor logos. This demonstrated easily that EyeFocus was highly connected within an ecosystem that it had built around the

accelerator. The logos were used in marketing materials as a visual expression of the EyeFocus network, which painted a picture to potential startups and mentors of the value they could derive from the network.

Figure 2. Infographic of eye-focus partners and sponsors

Consequently, the branding and positioning of EyeFocus reflected both an understanding of how accelerators sit within ecosystems, and the role they have in building and connecting them. The brand expressed that startups applying to the program would be in a familiar startup and tech environment, and that the program would offer unique value in connecting them to key stakeholders in the eye-care sector.

The visual branding also communicated to mentors and partners that their involvement would bring valuable ties within a number of networks, as well as the access to novel information afforded by the startups in the cohort.

4.5 SOCIAL CAPITAL IN ACCELERATOR DESIGN

4.5.1 Practical applications of Social Capital

The previous chapter observed that if an accelerator is a social network, then Social Capital will play an important part in defining and policing its trust, norms, and value (see 3.2.3). The trust facilitated by Social Capital supports the flow and validation of information, in which lies much of the value embedded within an accelerator, and enables policing of norms Social Capital is stronger in closed networks because norms are understood, and social mechanisms exist to reward and sanction. Weak network architecture allows the easy spread of reputation to police those norms. (see 3.2.3).

Accelerators reflect this structure, having the core of the cohort and management team to create and support norms, and then the dynamic weak network architecture provided by the mentors through which to police them with link reciprocity.
The previous chapter concluded that an accelerator accumulates Social Capital, in the sense of value embedded in a social network, by building a specific type of network that encourages the flow of non-redundant information, high levels of trust, and an ability to police norms so that co-operation is rewarded, and bad actors threatened with meaningful sanction. It then confers that Social Capital on its cohort, in effect rewarding others to support the startups in a way that the startups themselves could not do because alone they would lack adequate Social Capital (see 3.2.3).

Therefore, given the importance of Social Capital to accelerators, the design of an accelerator program, should constantly look at how it is building Social Capital, and how it is using Social Capital to reward people who support it. This is important because when an accelerator is viewed only as a business support program, without this understanding of Social Capital, there is a risk that it does not deliver the social rewards that are motivating the actors it wants to engage with. If mentors do not receive payment, but also do not receive social validation, ties, and novel information, it is assumed that they will either not engage, or will soon lose interest in the program.

Equally, without this understanding of Social Capital as a reward, threatening to withhold or withdraw that source of value cannot be used as sanction against bad actors through link reciprocity.

4.5.2 Social Capital to reward mentors

Social Capital has been shown to be the main form of reward for mentors (see 3.2.9). Ensuring that the mentors are rewarded in this way should inform the design of the program, in particular taking into account the following forms of reward:

- Reputation and social validation

  Mentors often list where they mentor on work profiles, such as Linkedin.com and are listed as mentors on accelerator websites. This demonstrates the value they perceive in being associated with the program. It is therefore important that

accelerators showcase their mentors properly to afford them this social validation and credential. This includes presenting them on the accelerator website, but also at events, and in other publicity materials.

- Tie Formation

  Mentors benefit from tie formation because they meet the startup founders, but also through meeting the other mentors, and actors that form the ecosystem around an accelerator. Therefore, mentoring is a way of increasing the mentor's exposure to weak ties and this tie formation is their reward for cooperative behaviour. Therefore, accelerators need to provide opportunities for mentors to meet more stakeholders than just the startups, and in particular to allow them to engage with the high-value actors involved with the program.

- Access to opportunities

  Early access to novel and non-redundant information is a defined form of value stemming from a network rich in Social Capital (see 3.2.3). Mentors are some of the first people to engage with startups in an accelerator, and therefore have early access to the new opportunities they may offer, be it investment or employment, or just insights about new products and technologies.

- Social credentials and influence

  Lin (1999) explained how embedded resources in a social network produce value. Accelerators are part of an imperfect market, in that information about very new technologies and businesses is not readily available to all actors.

> Therefore, because mentors gain access to information not available to others, their position in the social network affords them some degree of influence because they can bridge between startups and other actors who add value or who would derive value from such an introduction. Therefore, they are bridging structural holes and their position affords them social credentials and influence (see 2.2.2.4).

Overall, it is important that the design of the accelerator is one in which actors such as mentors can be confident that favours will be returned at some point in the future, reflecting Coleman's (1988) three forms of Social Capital (see 2.2.2.1 and 3.2.3). Providing this value in the form of Social Capital enables an accelerator to threaten to withdraw it as a form of sanction for not observing its norms. If there is no value, then tie dissolution, as part of link reciprocity, will not be an effective threat. In effect, the more value the accelerator creates for its mentors and other stakeholders, the safer it will become for its startups (see 3.2.6).

4.5.3 Social value through knowledge transfer

A form in which the value embedded in the mentor network is realised, and by which value is created for the cohort by the accelerator structuring a program, is through the transfer of knowledge through training and mentoring. This reflects 'flow theory' in Social Network Theory (see 2.2.1.4).

Accelerators provide an education in entrepreneurship, offering both acquired knowledge, which is taught in classes, and tacit knowledge which is provided by mentors. The tacit knowledge in particular is designed to accelerate their progress by sharing lessons others have learned over time, so the cohort do not have to learn everything through their own experience (Frimodig & Torkkeli, 2013, and see 3.2.7 and, 2.3.2.4).

Accelerators are designed to be very efficient in this transfer of knowledge, both by gathering and exploiting the expertise of a large mentor base, and by providing a unique education to a cohort of startups. This is more efficient than the alternative of each startup finding and employing experts and consultants on a case by case basis, or an education being provided just to one startup (Bliemel et.al 2014).
Therefore, the education and training component of the program is in fact an output of the Social Capital accrued by the accelerator in that it is delivered by the mentors, or paid trainers, using capital raised by the accelerator based on the value it has embedded within its network.

The importance of the education component informs the design of a program requiring that it should consist of structured education and mentoring in order for this value to be realised.

This informed the design of EyeFocus so that part of the timetable was reserved for taught courses, and that it was understood that these would be provided by paid educators rather than mentors. This identified the difference between acquired and

tacit knowledge, and the different role trainers and mentors have in transferring this to the startups. This balance should not be confused so that mentors are asked to provide structured training, or paid educators asked to mentor for free, as this would stray outside the bounds of the in-built reward system of the accelerator.

4.5.4 Syllabus design

The program design reflected the assumption by the management team that the cohort would require two elements of education curriculum. The first was seen as a core curriculum, consisting of information all the cohort would need, then the second phase might need to be tailored to the needs of specific startups. This particularly took into account the assumption that EyeFocus would most likely build a cohort where the common feature was eye-care, rather than the stage of the startup.

A syllabus of core skills was developed, with input from a variety of advisors. It was decided that core skills everyone needed before embarking on the program would be taught during an intensive first week of structured programming. This acquired knowledge would be taught by paid experts in a series of classes.

Pitch training was also introduced alongside the training curriculum in the first week, as it was considered essential that the startups could pitch their startup concisely and clearly from the outset. As well as understanding the importance of the taught component, the pitch training sessions reflected the understanding of 'cognitive

flexibility' (see 2.2.1.5), combined with an awareness of steps needed to prevent decay function in the core of the network (see 3.2.13). This manifested in the accelerator running multiple informal events in the early week, with meals shared, and the cohort encouraged to invite partners, spouses, and friends, but also that the early pitch training workshops were run with the whole cohort together, rather than individually, to encourage peer support.

After this intense first week of classes the program was designed to scale back rapidly the educational activities so that the startups had more time to work on their product and business, and to allow mentoring, visits to partners, and specific support customised to the needs of each participant.

Consequently, the first week of the program took the following form:

Week	Day	Date	Core Activities	Attendees
Week 1 Lean Startup	Week 1	16 Feb 15	First day: 09:00 - 10:00: Startups arrive 10:00 - 11:00: Welcome speech and Accelerator Orientation 11:00 - 12:00: Quick Pitch Exchange 12:00 - 13:00: Lunch 13:00 - 13:30: Co-working space tour and house rules 18:00-20:00: Partner visit	All Startups + Associates
	Tuesday	17 Feb 15	Pitch Training Workshop 13:00 Lunch Break Design Thinking Workshop 5:00-8:00 Bayer Launch Event	All Startups
	Wednesday	18 Feb 15	Lean Day 1: *Define Starting Point* 9:00-13:00: 1st block 13:00-13:30: *Lunch break* 13:30: 2nd block	All Startups + Associates
	Thursday	19 Feb 15	Lean Day 2: *Customer Development* 9:00-13:00: 1st block 13:00-13:30: Lunch break 13:30: 2nd block	All Startups + Associates
	Friday	20 Feb 15	Lean Day 3: *Experiment Framework* 9:00-13:00: 1st block 13:00-13:30: *Lunch break* 13:30-16:00: 2nd block 16:00 - 19:00: One-on-One coaching 20:00 - Official Launch Party	All Startups + Associates
	Saturday	21 Feb 15		
	Sunday	22 Feb 15		

Figure 3. Timetable for first week of EyeFocus

4.5.5 Developing role sets

As outlined in the previous chapter (see 3.2.16) accelerators should be aware of the part they play in the developing the role sets of their cohort. This is an outcome of the startups meeting a diverse group of mentors and other stakeholders, but can become a focus of the accelerator activity once it is understood that this is happening, and is of value.

Consequently, the education and mentoring, and the networking related activities are opportunities for the startups to learn how to interact with a wide variety of people of different backgrounds and relative status. This challenges them intellectually (see 3.2.16) and can develop their confidence and social skills in a way that will serve them later into life.

This author proposes that this benefit is also not just about addressing the needs of young founders. Senior executives or professors for example, may not have experience of engaging with people outside their network, so may also have role sets limited to the path of their career. Learning how to engage with startup founders, engineers, and venture capital investors is as much a useful education to a corporate executive as it is to a startup founder. The startup teams and other actors in the accelerator all mix with a far wider range of people, by age, status, ability, nationality, and background as a result of the unique convening aspect of an accelerator, and the diversity encouraged by a weak network architecture, so all are developing these skills through their involvement.

Complex role sets become a key social skill needed for the startups to take advantage of the Social Capital that the accelerator has conferred upon them, and is therefore an important part of an accelerator program. If understood by those designing programs, the importance of developing the role sets of the cohort should inform the program design, with more effort dedicated to explaining this, and to training them about how to respond to the different social situations they will encounter with their startup.

To assist this, the EyeFocus programming allocated time for workshops on how to engage with different stakeholders, and on how they operate. This would include asking the sponsors to explain how their companies work, and how to engage with them, and include some training prior to certain interactions to brief the startups on how to behave, and even how to dress if necessary for a specific engagement.

Instructing the cohort in how to behave and how to address people also protects the reputation of the accelerator, and imposes a degree of consistency on the presentation of the accelerator and cohort to other stakeholders. The management team regularly briefed the cohort as a group, or individually, to ensure they were prepared for meetings that ranged broadly, from physicians to investors, executives to other startup founders, and culturally from Californians to Germans.

Whilst much of this happens intrinsically within an accelerator, understanding the importance of role and status sets allows it to be factored into the program's activity with more focus and purpose, which in turn should create longer term value for the participants.

4.5.6 Pitch training

As identified in 3.2.15, pitch training is an extension of the development of role sets. A founder or startup needs to communicate aspects of a business to a very broad audience, from investors to customers, mentors to journalists, and this requires cognitive flexibility (see 2.2.15).

Pitch training teaches the startups both how to explain their startup very succinctly in a slide deck and in person, and then learn how to do this in front of an audience. However, pitch training also involves learning how to communicate ideas, learning how to present to an audience, and most of all requires startups to have a very clear understanding of their own business and product in order to present it succinctly.

Conventional mentoring to a large number of mentors over a short time, also means that the startups have to explain their startup repeatedly, gaining feedback, and learning quickly what does and does not work in terms of presentation. Pitching therefore helps develop an understanding of the business and necessary communication skills (see 2.3.3.2).

Whilst pitch training is common practice, as a means to present to investors, this thesis has used Social Network Theory to explain it as representing a training in cognitive flexibility, and consequently an extension of developing complex role sets (see 3.2.15).

In designing EyeFocus, the role of pitching and pitch training was already understood from observing other accelerators. However, the concepts outlined in this thesis suggest it is of far greater importance than previously understood. Consequently, EyeFocus structured pitch training into the beginning of the program, with at least one session before the startups met any of the mentors, partners, or sponsors.

Pitching was used throughout the program at the beginning of any engagements in order to communicate what the cohort was doing to a new audience. Before key events, such as the investor pitch at Bloomberg (see 8.1), intensive practice sessions were used to ensure the pitches were fluent and fresh.

4.5.7 Network density, norms, and trust

In discussing Social Capital in accelerators (see 3.2.3), another aspect of Social Network Theory relevant to the design of accelerators is network density. Granovetter (2005) argued that larger social networks have lower density, or multiple connections between nodes, because people have natural limitations on how many social ties they can maintain (see 2.2.1.3). However, it appears likely that a function of an accelerator is to enable higher density, or more active ties between nodes, in a larger network than any individual startup founder could maintain individually.

Granovetter (2005) explained that norms can be enforced more effectively in a dense network, where there are multiple connections between nodes so reputational

information can travel quickly and widely (see 2.2.3.1). This theory suggests that if a startup is connected to a bad actor, but not to any other startups who already know the bad actor, it is vulnerable both because it cannot validate its reputation, and cannot threaten sanction by reputational damage because it lacks multiple ties within the wider ecosystem. A startup on their own would not be able to maintain such a large and dense network, and is therefore vulnerable to people who might take advantage of it without the fear of reputational risk. Therefore, it is important to understand the role of an accelerator is to create a network, that is much larger, and with greater density, than a startup could do alone.

Within this large network that still has high density the accelerator is able to develop and communicate norms, which encourage the protection and support of the cohort. Therefore, it is also important to be conscious that the accelerator managers need to factor this function into the design of the accelerator. The theory suggests that developing the embeddedness of the cohort and management team would lead to stronger density at the core, which would encourage the establishment of norms, and would facilitate the ability to build a larger network around that core. This then allows link reciprocity to be used to police those norms, so the accelerator can protect the startups.

This also reflects back to Burt's (1999) theories about embeddedness and decay, in which he proposed that early social engagements including friends and family will create a higher level of embeddedness and lead to a slower rate of decay (see 2.2.3.3). Specifically relating to EyeFocus this informed the design of the program by

emphasising the importance both of informal social activities in the first week, and of inviting the cohort's friends and family to these events.

In terms of communicating norms, this thesis proposes that accelerators teach startups how to be startups by creating a consistency through the program that structures uniform engagements, for example in pitching, but also in how startups engage with mentors, investors, and other startups. These ways of engaging form the wider norms of behaviour, along with norms of culture, like trust, and co-operation (see 3.2.3).

This took the form in EyeFocus of guidelines for mentors and startups around how mentoring should be conducted (see 8.4) , and influenced the design and execution of the program so that the startups were informed of the norms they were expected to adopt whilst part of the EyeFocus cohort.

Accelerators can exclude and expel startups and founders who are disruptive or not engaging in the communal nature of the program, and the ecosystem effectively rewards those who do by supporting them. This is link reciprocity in action, and reflects the specific nature of the accelerator network, as described by Granovetter (2005) who explained that in a dense network, ideas about behavioural norms are encountered often, and discussed, moderated, and accepted. Also, that deviance from accepted norms is harder to hide, and communicated more widely through the network, and therefore more likely to be punished (see 2.2.3.1).

Accelerators are therefore in a strong position to develop norms, having a dense network at their core, and are able to communicate them through their weak network

architecture, and large dense network. This puts them in a strong position in the wider ecosystem to establish and propagate norms more generally, thereby encouraging the development of angel investing, entrepreneurship, trust, and co-operation, for example, as was observed in the literature review (see 2.3.4.1).

In practice, EyeFocus involved the startups in preparing for and running public facing events, so they shared the norms of the management team, and understood the brand they were part of.

4.5.9 Protecting Startups

This interplay of norms, a weak network architecture with a high degree of density, and the dynamic nature of the accelerator network has been shown to enable accelerators to protect their startups, primarily using link reciprocity (see 3.2.6). Startups benefit from being able to threaten a much higher risk of sanction by their association with the accelerator, which itself may be backed by higher status actors in the wider ecosystem. Therefore, the accelerator is both creating a network that can effectively police norms, and also conferring its social capital on the startups (see 3.2.6). This should inform the design of an accelerator by ensuring that it builds this network structure, and realises it has a role in protecting startups in this way.

This complex set of ideas that explain why accelerators work in terms of trust and cooperation can inform how they are designed. They suggest that the norms of the

accelerator should be expressed clearly to all stakeholders, and an accelerator needs to be designed to have a dynamic network with weak network architecture and multiple weak ties in order to be able to use reputation to police those norms through link reciprocity.

Whilst not all of this needs to be explained to the participants, it should be useful for the accelerator team to understand why people are cooperating, and how reputation can be used to encourage this and to sanction bad actors. It is also useful to be able to explain to other stakeholders, such as corporates and universities, precisely why the accelerator will not be employing NDAs and contracts, or be paying mentors.

EyeFocus integrated this understanding into the design of the program, in particular by building a large, weak tie network, but also in resisting calls from corporate lawyers, and university tech transfer offices to sign or issue NDAs. Mentors were not paid, but the program was designed in such a way as to share as much value as possible with them. This involved inviting them to most events, offering them desk space when they were visiting Berlin, and offering to make direct introductions for them to other actors in the EyeFocus network.

It was also incorporated into the design of EyeFocus that it would have multiple sponsors, and a network of partners, so that it was able to validate people through their reputations, and had the ability to communicate reputation back out to the ecosystem as a threat of sanction, supporting link reciprocity.

4.6 ACCELERATORS AND ECOSYSTEMS

The previous chapter explored how the literature explained the interplay between accelerators and ecosystems (see 3.2.10). It was suggested that accelerators need ecosystems from which to source mentors, startups, and other assets, but also that accelerators can build and maintain ecosystems (see 2.3.3.5). By running events and being open to new people, accelerators were shown to act as network aggregators across an ecosystem (see 2.3.4.5).

This research suggests that the way in which accelerators build value and accrue Social Capital makes them attractive to different stakeholders. The accelerator is a necessary and useful entity for investors, for corporate executives, and for startups, as it enjoys a relationship with them all that they may not have directly with each other.

Therefore, just as an accelerator needs to be embedded within an ecosystem to find the various stakeholders it needs in order to function well, it can help build or develop an ecosystem. It can leave the ecosystem better connected, having run an intensive period of events and interactions that involve connecting multiple actors. The literature supported this observation by demonstrating how Social Capital ends up being shared widely by those who generate it (see 3.2.12).

As a result, the author of this thesis proposes that an accelerator can create a large number of social interactions in a short period of time, often bringing together people and entities that would not otherwise meet. In this way, the accelerator can convene

and develop an ecosystem. In doing so it then strengthens its own position by being embedded in a more dynamic ecosystem, which can become a self-perpetuating cycle. This led to the suggestion that EyeFocus was an ecosystem builder, developing that definition from the typologies of Pauwels et al. (2015), and Hoffman & Radojevich-Kelley (2012) (see 3.2.11).

4.6.1 Becoming an ecosystem builder

To be an ecosystem builder, as defined in this thesis, informs a number of factors relating to the design of the accelerator. First, it must be ascertained whether the accelerator is launching within an already strong ecosystem, or whether it first needs to build an ecosystem within which to launch. In particular, this should influence decision making by large corporations or government agencies when looking to establish an accelerator. Such programs will not flourish if they are launched without an ecosystem around them, or if they remain contained within a closed network and are not open to a broad range of stakeholders from a wider ecosystem.

In designing EyeFocus, this theory influenced two aspects of the program. The first was the choice of where the accelerator would be located. This defines how much other related activity is already happening around the accelerator. Being based in a location that has other startups, activities, and an entrepreneurial culture provides an existing ecosystem within which to establish the accelerator. The second aspect related not to

the location, but to the sectoral ecosystem, in this case eye-care, raising the question of how to build an ecosystem around a topic, rather than just in a location.

To be a local or regional ecosystem builder influences where to run the program, but to build an ecosystem around a sector requires the program somehow to address a global network as well as exist within a local ecosystem. It was therefore clear that EyeFocus would need to be a global program, because the best companies working in eye-care were not also all in one location, but it would be helpful already to be located within a dynamic startup ecosystem, otherwise the program would have had to build both ecosystems. This strategy was developed as follows.

4.6.2 Choice of Location for EyeFocus: Berlin

The location of EyeFocus refers both to the choice of city and to the location within that city. It was preferable for EyeFocus to be in a city near relevant stakeholders, and where there was a startup ecosystem. In the case of EyeFocus, the lead sponsor, Bayer, was located in Berlin, and Berlin also had a flourishing startup ecosystem.

Berlin also had the distinct advantage of being possibly the cheapest major city in Europe with a substantial existing startup ecosystem. Feedback from startups, especially those from emerging economies, was that even with the funding provided by accelerators, it was sometimes not enough to cover the cost of relocating to expensive cities like London for an accelerator program.

Berlin therefore created advantages for EyeFocus that would make it easier to attract good startups and to work with its lead sponsor, and that it allowed both the accelerator and startups to achieve more for the finance available.

Having an existing startup ecosystem meant EyeFocus could co-host events, share resources, and invite that wider ecosystem to its own events. In this respect it would allow the cohort startups to mix with other startups, and have access to resources beyond the core program. Being within a larger existing startup ecosystem also meant that EyeFocus could adopt the norms of that ecosystem, making it easier to communicate and police its norms within the accelerator network itself.

4.6.3 Choice of Location: Rainmaking Loft

Reflecting the discussion in this chapter about the need to bridge, and maintain diversity, EyeFocus chose a well-known startup space as its base in Berlin, rather than a space heavily associated with eye-care. EyeFocus already had a strong relationship with Bayer and other eye-care companies, the challenge would be to attract startups to the program, so the brand and location should be attractive to them. Rainmaking Loft was at the time one of the leading startup co-working spaces in Berlin, and home to Startup Bootcamp Berlin, one of Europe's leading startup accelerators. Rainmaking Loft was expanding as a venue, and had a room in between the main accelerator space and the event room which was the right size for EyeFocus.

The perceived advantages of Rainmaking Loft were that it was centrally located, already a startup hub with other activities taking place in the building, and combined brands already recognised in the startup community. This assisted EyeFocus in further establishing that it was part of the mainstream startup ecosystem as well as being part of the Berlin startup sector and the eye-care sector.

Rainmaking Loft fitted the aims of EyeFocus well because it was already designed as a startup co-working space and accelerator location. Consequently, it was open-plan, with very few doors or walls. EyeFocus occupied a room in the middle of the building, in between the main co-working space and an event space. This meant people using the building constantly walked through the EyeFocus space, which corresponded with the desire to develop weak tie contacts beyond the immediate social network of EyeFocus because it opened up the opportunity for random new contacts to be made by the startups. The theory that supported this choice was useful in explaining to corporate stakeholders a decision they found counter-intuitive, coming from a sector that would expect a dedicated space with closed doors so that only EyeFocus participants would have access.

Rainmaking Loft also opened an adjoining café and bar which allowed EyeFocus and the cohort easily to invite people for informal meetings over coffee or cocktails. This again tied into the desire to keep interactions informal, and to have porous boundaries between the cohort, the accelerator network, and the wider ecosystem. The café bar area became a convening space for people from across the startup ecosystem in Berlin.

All of this made it easier to create a vibrant ecosystem around EyeFocus. A launch party in the bar area party was planned to be open to people invited by EyeFocus, to the other residents of Rainmaking Loft, to Startup Bootcamp, and also to keep the bar open to whoever was there. This again created porous and undefined boundaries between EyeFocus and the wider tech ecosystem, increasing the likelihood of serendipitous weak tie connections.

4.6.4 Program design for building an ecosystem

Understanding the role EyeFocus would play as an ecosystem builder made a significant impact on the design and launch of the program. It became clear that if EyeFocus could help convene and organise the eye-care sector into a more defined ecosystem it would benefit the whole ecosystem, not just EyeFocus and its participants. With the understanding that accelerators need dynamic ecosystems in order to succeed, and that accelerators can be ecosystem builders, it was assumed that if EyeFocus helped build an eye-care innovation ecosystem it would in turn benefit itself. This again reflects the observation (see 3.2.12) that those who generate Social Capital do not reap all of its benefits directly.

Therefore, the program was designed with an understanding that some of its activities may not directly benefit EyeFocus, its sponsors, or its cohort, but that the Social Capital it would generate through a more altruistic approach to developing the ecosystem would benefit them in the longer term.

EyeFocus was the only startup accelerator in the eye-care sector, so there was the opportunity for it to play a unique role, in particular as a convenor and as a disruptor. As a neutral network aggregator, EyeFocus was able to partner with almost any entity due to being independent, and not directly competing with anyone else. It was therefore able to extend its network into the charitable sector, academia, healthcare, and industry, as well as building a strong network in tech and startups. This gave it a unique ability to bridge between sectors and stakeholders, and therefore build a new ecosystem to the wider benefit of the eye-care sector.

Having helped convene this ecosystem, EyeFocus was in a stronger position to run its own program, and to offer more value to its stakeholders, including its sponsors, so this altruism with Social Capital in the form of being an ecosystem builder could be converted into economic capital in the longer term.

4.6.5 The role of partners in building an ecosystem

Whilst EyeFocus had several leading corporates as sponsors, and this provided a wealth of knowledge and networks to the cohort, it became clear that EyeFocus needed other stakeholders in the ecosystem to be part of the program to build a comprehensive ecosystem that was valuable to the cohort, mentors, and sponsors. However, it transpired that a number of valuable entities could not become sponsors e.g. universities, charities, and other non-corporate entities who would not typically sponsor a commercial activity like an accelerator. A method was needed to engage with

them without asking them to sponsor the program. It was decided to approach them and ask them to become partners.

The concept of 'partner' was left open to interpretation, purposefully not being too defined, so it could be adapted to whomever EyeFocus wanted to engage with. Partners were asked to share their logo in order to add validation to the program and help visualise the ecosystem EyeFocus had built. They were asked to propose a mentor, and to agree to some form of engagement during the program. That may be hosting an event, dialling into an online session with the cohort, promoting activities, or sharing their knowledge and resources. As the partners varied so much, from small local charities to major hospitals, there was no benefit in prescribing or standardising how the engagement might take shape.

As the partner network developed, the design of the program was planned to include 'partner events,' where the cohort would visit, or be visited by these partners. When visits were not possible, the engagements were carried out over Skype or Google Hangouts, so that geography did not obstruct engaging with these networks. These visits were intended to connect people so they could meet again in more depth, rather than trying to achieve too much from the first interaction.
Typically, a large part of the cohort would meet one or more people from the partner organisation, so it was unrealistic to try to factor multiple bilateral interactions into such a visit.

The intention was primarily that the startups would come away with the business cards of key people across the ecosystem, some of whom they may not actually need to meet again until later into the development of their business. This would be explained to both sides, so that the meetings were not judged on immediate outcomes.

Consequently, the partner network extended the reach into the ecosystem beyond the sponsors, and created a very diverse and global weak tie network. The partner network created value for the sponsors and mentors by widening the network EyeFocus connected and catalysed for the benefit of everyone involved.

This network was an essential part of building out the social network of EyeFocus, giving the startups direct access to key people in the wider ecosystem. It also formed a component of the weak tie network EyeFocus used to find startups and mentors beyond its own network.

Partnering very loosely with other entities that cannot provide sponsorship may be perceived as giving away value to those entities for free, but in fact benefits the accelerator because it embeds it within a stronger ecosystem, and earns it Social Capital as a result of sharing the value it creates with so many other stakeholders. This creates value that returns to the accelerator and cohort over time.

4.7 SUMMARY

This chapter began with the premise that an accelerator is a social network, as demonstrated in the previous two chapters. This led to an examination of how this understanding can inform the design of an accelerator, and of EyeFocus Accelerator in particular.

Understanding that an accelerator is a social network led to a focus on the role weak ties have in creating the weak network architecture described in 3.3 as important to the accelerator. This proliferation of weak and bridging ties, along with a high degree of Social Capital enables the accelerator to use link reciprocity to police its norms.

In particular, this allows it to protect the startups in its cohort and create value for the various stakeholders it attracts. That value was understood to lie within its ability to offer early access to novel information and non-redundant information and ties. These forms of value reside within networks and are therefore Social Capital.

This Social Capital, and the structure of the accelerator network was demonstrated to assist in both building a mentor network, and rewarding those mentors. The chapter discussed how mentors were managed, including proposing that it was better to ask for a minimum of 1 hour per mentor over the whole program, than to overload them with time commitments. This reflected understanding that their benefit lies not just in the knowledge they transfer through time spent mentoring, but also in the network bridges they bring to the accelerator. Therefore, a minimal commitment encourages more

valuable mentors to agree to join the network, without fear of being asked for too much time.

Cohorts, being the other key element of an accelerator, were discussed in detail, examining how the cohort is recruited, and how it should be pulled together into a tight group at the outset of the program in order to reduce decay over time, ensuring better peer-support between the startups and a more effective establishment of norms.

The need for a fixed term relates to having a cohort, as the participants cannot all begin the program at the same time if it does not have a fixed start date. It was suggested that the need for a fixed term, which is commonly three months, may relate to the speed of decay relating to non-redundant information. This supposes that there are a finite number of interactions the cohort and mentors can have before these weak tie connections develop into strong ties, reducing non-redundancy of the information available to both from each other.

Branding of EyeFocus was examined in relation to building a cohort and attracting mentors, suggesting that the program needed to be branded to appeal to them, not to the corporates funding it. Demonstrating visually the network that the accelerator has built, through mentor biographies and partner logos on the website was observed to be an important factor in communicating to potential startups and mentors the social network of the accelerator.

Role-sets were identified as playing an important role in understanding the value accelerators create. Exposing the startups to a very wide range of role and status sets was perceived as an important part of their education in the program. Related to this, pitch training was explained in terms of developing cognitive flexibility.

The role EyeFocus could play in developing an ecosystem, and thereby becoming an 'ecosystem builder,' was discussed in terms of the program design, the choice of location, and the way in which partner organisations were used to help build out and connect that ecosystem.

Consequently, the analysis of accelerators using Social Network Theory contributed to the design of EyeFocus, and gave the founders a stronger understanding of the role the accelerator would play in developing an ecosystem and supporting the cohort. In the next chapter observations are made about how this theory translated in practice, and what lessons can be taken from that.

CHAPTER 5. OBSERVATIONS FROM RUNNING EYEFOCUS

After having run EyeFocus Accelerator, this chapter makes observations about how the theory proposed in Chapter 4 translated into practice during of the program.

5.1 INTRODUCTION

In this research the subject of the case study was being both run by and studied by the same person concurrently. This allowed the research to have greater access to the data, information, and workings of the business than if it had been studied either retrospectively, or by a third party.

This situation also allowed the researcher the unique opportunity to test ideas within the context of a live business, and to adopt emergent strategies both in the business and the research.

Whilst this has many benefits, one disadvantage was that the demands of the business had to take precedent over the needs of the research, rather than the research driving how the business was run. This was a commercial reality; a fast moving, early stage business had to do whatever was necessary to succeed commercially, and therefore could not be dictated by the needs of research.

However, EyeFocus provided a unique opportunity to run a research project immersed within a business, with each informing the other on an ongoing and emergent basis.

Whilst EyeFocus provided an opportunity to examine the theories discussed in this thesis within an active accelerator, there was not a perfect correspondence between the topics covered in the research and those examined in the business. The research and the business are two separate endeavours, with different aims, objectives and outcomes.

However, the business did allow for some of the theories explored in the previous chapter to be tested and examined more closely in a live business.

A description of each week's activities in EyeFocus Accelerator program is included in the Appendix (see 8.1) to add context to the discussion below.

5.2 ACCELERATORS AS SOCIAL NETWORKS

The description of an accelerator as a social network was examined earlier (see 3.2.1), and argued that the design of an accelerator should reflect this, in particular understanding the role of weak and strong ties, bridging ties, link reciprocity, and Social Capital.

Having used this theory, where appropriate, to inform the design of EyeFocus, it was possible to examine both how the Social Network Theory manifested itself in the accelerator, and how some of the theory translated into practice.

In particular, this chapter will explore the theory supporting the need for weak ties, mainly in the form of mentors, and how mentors are rewarded with Social Capital. It will also look at how Social Network Theory provided insights into where value is created in an accelerator, and how that value can be used in conjunction with a specific network structure to police norms using link reciprocity.

5.3 THE USE OF SOCIAL CAPITAL

This thesis has explored the proposal that Social Capital is the main currency of accelerators, being used to reward those who co-operate with it, in particular the mentors, and to police the norms of the accelerator (see 3.2.3). Social Capital is also the main value created by the social interactions facilitated by an accelerator, as it resides between the actors, and therefore is embedded within the network (see 2.2.2.4). This manifested itself in the design of EyeFocus in a number of ways, and can be examined in observations of the program.

5.3.1 Maintaining a dynamic network

A dynamic network is needed for effective link reciprocity, and therefore to protect the startups. To ensure this, the program continued to add new weak ties and contacts to its network throughout the program, rather than seeing that as a process that ended once the mentor group was built and the program launched (see 3.2.6).

It was also observed that over time network ties and non-redundancy decay, hence a fixed term program would aim to end before that decay negated the value the program creates in terms of non-redundancy (see 3.2.14).

This informed the design of the accelerator by indicating that the network it builds should be open to newcomers during the program, so it remains dynamic. It also

suggested that a weak network architecture strong in bridging Social Capital is required to enable the communication of reputation, and a dense core with strong bonding Social Capital, in the form of the cohort and managers, is required to establish norms (see 3.2.1).

In response to this, EyeFocus was designed so that most of the events it organised were open, encouraging new people to attend in order to keep the network dynamic. Mentors were encouraged to bring other people to the accelerator activities. When new people were evidently relevant to the program, they were invited to become mentors or Associates, so the network was never static. In this respect, both the cohort and mentor group remained fluid for the duration of the program, and were dynamic networks. People who did not engage became less involved, whilst new people were incorporated into the network, and those who were most co-operative were pulled closer into the network, all of which reflected link reciprocity in the management of the EyeFocus social network.

This enabled EyeFocus to introduce new sources of novel information and new weak ties later in the program when decay was visibly setting in. Furthermore, the creation of Associate status was a response to this dynamic, as it allowed EyeFocus to bring startups into the program at any point, even in the last weeks thus constantly introducing new non-redundant information sources for the benefit of the mentors and sponsors.

5.4 DEVELOPING ASSOCIATE STATUS

The introduction of a new category within the cohort was a major innovation of the program. It represented an emergent strategy, being a response to a variety of challenges that was fine-tuned as the program developed.

The majority of traditional accelerators examined in the literature had an application process that resulted in startups either being accepted or rejected. Those startups accepted commonly received investment, and then attended the program (see 2.3.3.6). This was the original intention with EyeFocus, and is explained further in the discussion of the application process (see 4.4.5). However, this binary approach, in which the majority of applicants are rejected, quickly emerged as unsuitable for a program that aimed to be an ecosystem builder, as defined in 3.2.11.

For an accelerator aiming to build a new ecosystem, attracting a large number of startups into that network it is building is a necessary outcome. Therefore, rejecting most of the startups that apply to be part of the accelerator appears to contradict that ambition.

Associate status first emerged as a response to an early application from a British Professor of Ophthalmology. He approached EyeFocus to discuss how he might become involved in the program to develop some technologies he had built. He was a professor of ophthalmology, a practicing consultant ophthalmologist, and was building iPad apps to help him work with his patients. He was a perfect candidate for the program, but he

said he could not attend a three-month program in Berlin due to his professional obligations, and due to having a family. In this respect he was not a typical of a startup founder in an accelerator, who would expect to move to a city for three months for an accelerator program.

This raised a number of issues for the EyeFocus team. Firstly, the applicants were clearly not all conventional startups, reflecting the unique nature of such a focussed program. Secondly, the traditional program design did not allow for these non-conventional applicants to become part of the ecosystem EyeFocus was building.

Soon after this, other companies which were not conventional accelerator startups, approached EyeFocus wanting to access the eye-care innovation network which EyeFocus had built. One was raising 1m Euros of investment, another considerably more, so both had no need for the small investment offered, and the equity EyeFocus was asking for of around 8% did not fit their valuation. The EyeFocus application process also attracted some applicants that were not yet fully formed companies, either being founders with an idea, or in the case of a team in Kenya, a startup that did not have the revenues to pay to come to Berlin and was not a viable investment for EyeFocus to fund them to attend the program.

All of these scenarios raised the question of how to interact with companies that were not going to be one of the core investments in the EyeFocus cohort. Typically, an accelerator would not accept companies that it could not invest in or that would not attend the program. However, it became increasingly clear that only a small proportion

of applicants would fit that criterion, whilst the others were still of interest to the sponsors and partners and were potentially valuable members of the eye-care innovation ecosystem EyeFocus was building.

Understanding that the value in EyeFocus lay in its ability to aggregate sources of novel information, it became clear that these non-conventional applicants should be incorporated into the EyeFocus cohort in some way (see 2.2.2.4).

For an accelerator to be an effective network aggregator it needs a variety of modes of engagement. In this context, the idea of accepting startups as 'Associates' emerged as a solution to the problem. Associate status was a simple invention that created a new category of participant, along with startup, mentor, and partner. This enabled EyeFocus to accept these applicants in a way that they could join the network and ecosystem in a formal capacity, benefit from the program, but not consume the program's financial resources, or even space in the building (which was as limited as the funding).

Associate status evolved to become defined as:

- Being part of the network and accepted into the cohort. This allowed companies to say they had been accepted onto EyeFocus, which in itself was a form of validation they valued.
- Having full access to the activities of the program at their own expense. This allowed them to attend events, dial into online talks and mentoring, to request mentoring sessions, and to visit the accelerator, but did not put pressure on the core funding of the program.

- They did not receive any funding or investment.
- They did not have to pay to be involved in the program.

Consequently, EyeFocus was not directly gaining any economic benefit from their involvement, but the decision was supported by the theory outlining how Social Capital needs to be shared more widely with the ecosystem (see 3.2.12) and how a stronger ecosystem would in turn benefit EyeFocus.

5.4.1 Benefits of Associate Status

As a result of the Associate status, EyeFocus was able to accept a total of 16 companies onto the program, rather than just the 8 startups that received funding and a place in the accelerator venue. This latter figure was defined by the limit on funding and space for full attendees, rather than any other limitations. In that respect, the figure of 8 startups did not reflect what was best for the program or the ecosystem, only what was possible financially, which is effectively an artificial limit in relation to the value being created by the program.

Associate status also meant it was possible to accept into the program more developed companies, very early stage founders, and social enterprises. This created a richer mix of companies on the program, and a more varied group of people from which synergies might develop, and who could support each other as a cohort.

Based on the theory discussed in the previous chapter (see 4.2.4) having more diversity within the cohort, and more sources of novel information makes the program more valuable to sponsors, partners, and mentors. The theory also suggested that by creating a cohort of greater value to the other stakeholders, EyeFocus was also able to create greater value for that cohort because it attracted more interest and engagement from mentors and partners.

Ultimately it became clear that having an application process that resulted in rejecting most of the applicants did not fit with the ambition of being an ecosystem builder. By creating a category that did not receive investment, the single deciding factor in an application process that previously focussed on investment alone could give way to a more varied approach, accepting some startups that were suitable investments, whilst also accepting others that were not but which had other reasons to be of value to the ecosystem EyeFocus was building.

5.5 MENTORING

The previous chapter described how an understanding of weak and bridging ties and Social Capital informed the mentor recruitment process. This aspect of the program saw the practice match the theory well within the EyeFocus program.

5.5.1 Finding Mentors

The previous chapter detailed how mentors would be recruited using strong ties, then weak ties, and bridging ties to reach further out into the ecosystem to find the best mentors (see 4.3.1). The practice matched the theory, with the first mentors approached being strong tie contacts of the accelerator team or sponsors. The first mentors agreed to join the program based primarily on their closeness to the founders or sponsors, and therefore a high degree of existing Social Capital.

With this core of mentors in place, the program had a degree of social validation, so it was possible to approach weaker ties, and ultimately strangers, by which time the existing mentors gave these new people enough confidence to agree to become a mentor as well. Once strangers were being approached, they were agreeing to mentor based on the Social Capital embedded within the network built by EyeFocus rather than any direct Social Capital between them and the founders.

This process was assisted by requesting that the sponsors and partners provided mentors as part of their involvement. This added high level industry figures, from leading companies. Having mentors from the sponsors was a crucial element of the program, because startups would in some cases apply specifically to develop a relationship with the sponsoring companies.

With a list of respected figures from the ophthalmology industry, the eye-care sector, and the startup sector, it became easier to recruit other mentors, and eventually reached a point that strangers were approaching EyeFocus requesting to become a

mentor. In some cases, people who applied were rejected, if it was felt that they did not bring suitable skills, or did not understand the ethos of mentoring.

Throughout this process, a balance was maintained between eye-care and startup sector mentors, reflecting the understanding that the cohort not only needed support in eye-care, but also may require generic business and tech support. This reflected the practical needs of the cohort, but also Social Network Theory relating to decay of ties and non-redundancy. If all the mentors were from interrelated organisations just within one part of the ecosystem EyeFocus was building, there would have been far greater closure within the mentor group. This would have led to more rapid decay of non-redundancy and diminishing of value for the cohort.

The mentor network (see 8.2) was displayed on the website, and this was understood to be a visualisation of the social network developed by EyeFocus, demonstrating the people, organisations, and skills the accelerator would offer to startups as part of the program. It was also the means by which EyeFocus gave social credentials to the mentors through their involvement in the program, representing the Social Capital with which they are rewarded.

5.5.2 Rewarding mentors

The previous chapters identified that mentors are rewarded with Social Capital, which is the main currency of an accelerator (see 4.5.2). This informed the design of EyeFocus by recommending that accelerator programs remain conscious of how they are rewarding the mentors, and ensuring they access adequate value to remain engaged.

Social Network Theory explained that this reward takes the form of social validation, early access to novel information and non-redundant ties (see 4.5.2). Understanding that mentors are rewarded for their support with Social Capital influenced how the accelerator interacted with its mentors. To support these outcomes, the mentors were consciously included in networking events, and rewarded with tie formation by helping them make useful new network contacts via the accelerator. It was important to communicate to them that the accelerator was willing to introduce them to the other mentors, sponsors, or partners as that was not a given.

To support the credentialing and social validation the accelerator needed to provide to the mentors, they were interviewed for blog posts, featured in social media posts, and generally promoted in a way that was intended to develop their Social Capital. This was a conscious strategy to ensure that mentors received value wherever possible in order to keep EyeFocus relevant to them, and to reflect the understanding that their co-operation was being reciprocated.

In discussion with mentors at the beginning and end of the program, many had initially said they were mentoring to 'give back,' but at the end listed new network contacts and opportunities as an outcome of mentoring. This suggests EyeFocus responded to the theory that mentors are rewarded with Social Capital, and ensured they received social benefits from their engagement with the program, even when they may not have anticipated it.

5.5.3 Organising Mentors

The literature suggested that when startups are left to arrange their own mentoring they have less mentoring, and it is therefore the role of the accelerator to facilitate mentoring (Cohen 2013; see 2.3.3.2).

It was therefore important for EyeFocus to take an active role in managing mentoring interactions. Despite planning in advance, the process of managing mentors needed to adapt to the program as lessons were learned.

The challenges involved:

1. Ensuring that all mentors had some mentoring sessions.
2. Ensuring that all startups met all the mentors they wanted to talk to.
3. Mapping which mentors could best support which startups.

4. Managing the fact that some mentors were visiting EyeFocus, some had to call in on Skype or Google Hangout, and others were available to meet when EyeFocus visited London or their organisation.
5. Managing the reality that the mentors, and some associates in the cohort were in multiple time zones, ranging from San Francisco and Nairobi to Berlin and Estonia. (For example, a partner abroad proposed an online mentoring session at 4am Berlin time).
6. Confronting the problem that every startup wanted to talk to the high-profile mentors, who themselves had least time for mentoring and were often less interested in speaking to all of the startups.

To manage this process a database was developed to track how many sessions each startup and mentor had done, and with whom, and to track easily who had talked to whom. This gave a basic ability to ensure that all the mentors, and all the startups had mentoring sessions.

In total, EyeFocus had 57 active mentors, and arranged 161 mentoring sessions during the 12 week program.

5.5.4 Mentoring methodology

EyeFocus was unusual because the specific focus on eye-care meant it could not also have a geographic focus. Other accelerators typically build a mentor group from the

people in the local ecosystem, or who visit it. EyeFocus built its mentor group from the most suitable people for the topics, regardless of where they were located. Consequently, the program had to be adapted to involve more online mentoring, and a wider variety of approaches to in person interactions.

The team experimented with and developed different ways to organise mentoring. These are presented here in order to share the lessons learned in this process. The various mentoring methods included:

Variations of in-person mentoring

1. Traditional speed mentoring, where a mentor sits at a table, and startups are rotated every 20 minutes to speak to them. This worked well when either one mentor was present at the accelerator, or when multiple mentors visited.
2. A mentor addressing a group of startups at once. This typically involved each startup giving a very quick pitch, then the mentor talking about their specialist topic, answering questions, and offering advice to startups based on their pitches or questions. This was effective particularly when a mentor did not have time to meet each startup.
3. Mentors only having meetings with selected startups based on specific interests of the mentor, or needs of the startup. This suited specialists, or mentors who either did not have time, or did not have the interest to meet every startup.

Variations of online mentoring

Online mentoring is less attractive than sitting at the same table as a mentor, and is more complicated to organise. However, given the global nature of EyeFocus, both in

terms of startups and mentors, online mentoring was necessary to engage with the whole ecosystem. A mentoring session online with someone in a different continent should create more possibilities of bridging ties into entirely new networks and ecosystems.

Without creating multiple options for mentoring, and by allowing both startups and mentors to join the program from abroad and engage online, EyeFocus was able to create more overall engagements, and build bridging ties into remote networks. Even if a mentor engaged only once with only one startup, that engagement represents novel information, and a tie into a network, both of which could in theory be shared by the whole cohort, or could be accessed again after the program. Therefore, having mentors abroad, and mentoring online created a higher probability of multiple bridging ties, which is good for the program.

EyeFocus primarily used the online VOIP services, Skype and Google Hangouts for online mentoring sessions. In one case, speaking to India, the mentor's organisation introduced a unique piece of software used just for that session.

Online mentoring represented an emergent strategy. The team did not set out expecting or intending to run much of the mentoring online. Two things changed this: the establishment of Associates, which meant that not all of the cohort were present in the accelerator venue; and the way the mentor network was developed using bridging ties and weak ties, rather than looking to find mentors just in Berlin, hence EyeFocus became global.

Lessons were learned as online mentoring was developed during the program, and these provide useful insights for other accelerators.

Online mentoring developed a number of variables to choose from, namely:

- Skype or Google Hangout
- One to one calls between a startup and mentor
- Mentors addressing a group present in one location
- Mentors addressing individuals and groups calling in from multiple locations
- Each individual using their own computer to connect into a call
- A group of startups using one camera and screen to speak to a mentor
- A variety of technology options, including built in or external cameras and microphones

Over time, various problems were encountered, and best practice emerged from the experience:

1. If the mentor and startup were given a time and left to call each other multiple things could go wrong, including technology not working (no sound, no video), or confusion over time zone differences, or just one party forgetting about the call. From this it became clear that each call had to be set up by an EyeFocus team member, who would typically call the startup first, check they were online and available, and check their sound and video before bringing the mentor into the call. This became very time consuming and a full-time job for the appointed team member.
2. When numerous people called in from different computers, Google Hangout would bring to the front the video of any caller making a noise. Therefore, it was

necessary to train the startups in advance of such calls to ensure their microphones were muted except when they were talking. Background noise was a constant problem.

3. When calling to countries with poor internet, poor sound and video quality became a problem. Pre-empting this and ensuring that the call used the best technology, and potentially did not include video helped avoid wasting the mentor's time fine-tuning the call once it had started.
4. The internal camera and microphone in many laptops was not sufficient for these calls, in particular when a group of startups gathered around one computer to call a mentor. Consequently, a professional microphone was purchased and used for group sessions.

At the beginning, it was surprising how many startups called in from noisy cafes or offices, or in one instance made a video call whilst driving a car. Another startup dialled into a video call from her kitchen, wearing pyjamas. Therefore, it was clear that training was necessary to get all the startups to a consistent standard when making calls. This included aspects like camera angle, lighting, use of microphones, and choice of location, all of which became part of the education offered by EyeFocus.

These various issues and challenges were addressed through experimentation. New equipment was purchased, and the techniques were improved. Through experience, best practice was established to enable online mentoring to become an important part of the program.

Based on experience, it was concluded that the best approach for online mentoring was to have a mentor call a group who were sitting at EyeFocus in Berlin. After some early failures, such calls were organised with the cohort sitting in a quiet room, using a large screen and professional microphone. The manager would then add other participants in different locations to the call. Once the cohort were online, and their microphones had been tested, everyone would mute their microphone, and the EyeFocus manager would bring in the mentor. The manager would coordinate the call, bringing startups in one at a time.

5.5.5 Mentoring outcomes

As discussed in the previous chapters (see 2.3.4.4), mapping outcomes of an accelerator, and in particular from mentoring, has a number of challenges.

1. Outcomes may not be attributed to the accelerator, especially when they are the result of multiple weak tie contacts that originated with an introduction by the accelerator. People do not always map their route through a network to be aware of where a contact originated.
2. Accelerators often do not have the internal resources to track every outcome. If these outcomes do not lead to financial returns, they may not deploy resources to track them. If their funding does not require it, they also may not have the incentive to track all outcomes.

3. Also discussed previously, many accelerators cease to operate once the program finishes. This means that even if there is a desire to track outcomes, there is no infrastructure to do this.

In this case practice matched this theory. EyeFocus made an effort to track mentoring outcomes during the program. This was easier with the startups present in the accelerator, and more difficult with the Associates. It was understood that many mentoring outcomes would not be reported to EyeFocus, or would materialise after the program had finished. The accelerator team were too busy running the program to pay too much attention to mapping outcomes, so this was not considered a priority compared to the immediate demands of the daily activities of the accelerator.

5.5.6 Summary: Mentoring

In practice, EyeFocus established that it is important that a very focussed accelerator still must have a very broad and varied network of mentors. In particular, that an accelerator close to a large corporate does not create a mentor group only from that corporate. In order to provide bridging ties, and non-redundant information, the mentors need to be a weak tie network in relation to each other, not just to the startups in order to prevent or delay decay.

EyeFocus established that a very focussed accelerator is unlikely to create a group of mentors in one location. The common feature between EyeFocus mentors was around topics: eye-care or tech, not location: Berlin, or Europe.

Therefore, traditional speed mentoring in the venue was supplemented with a variety of other approaches, including a complex set of online options ranging from individual calls to group calls. This enabled EyeFocus to introduce their cohort to the best people around the world, who could be both informative, bridging ties into entirely new networks, or just inspirational to the startups. Online mentoring was developed as an emergent strategy during the program, learning from early mistakes and mishaps. It also supported the involvement of Associates, who were not present in the accelerator venue.

This experience led to the observation that mentors should be understood as network ties not just repositories of knowledge. Therefore, a single, short engagement with a mentor may not bring much tacit knowledge or direct support to a startup, but counts as a new tie into that mentor's network, and brings value to the cohort as a novel tie rather than novel information.

5.6 PITCH TRAINING AND ROLE SETS

Rose Coser (1975) argued that people who do not mix with others who are different to themselves do not develop the social skills needed to operate within complex role and

status sets. She further suggested that developing complex role sets is challenging intellectually, requiring people to think about a situation from the perspective of someone else using their cognitive flexibility (see 2.2.15). Related to this, she argued that it required a similar development of skills and thought to communicate with a person different to oneself, and more so when communicating to multiple actors that are different to each other as well.

Development of cognitive flexibility as described by Coser was observed to correspond with the benefit of mentoring, and of pitch training (see 3.2.15). The discussion above suggested that the accelerator should see this as a core task, rather than an incidental outcome, and be aware that the interactions between the cohort and other stakeholders represents a component of the education aspect, teaching the startup founders how to engage with people from different cultures, commercial backgrounds, and status. It was suggested that developing the cohort's role sets becomes part of the accelerator program.

In practical terms, pitch training was recognised to have a more complex role than previously recognised. Not only is it training the startups to express their company clearly, and thereby also understand it more clearly, but it also reflects Coser's (1975) argument about the complex challenge of communicating an idea to people different to oneself, and more so to a group of people also different to each other, and by extension is a development of cognitive flexibility and complex role sets.

In EyeFocus, this activity was clearly understood. Being so global in nature, with startups and mentors from around the world, attention was paid to how the cohort should engage with the different people they met. The cohort had direct interactions with a very broad range of people, from other startup founders and accelerator managers, through to some of the most senior people in the tech and eye care sector, including investors, professors, and executives.

It became clear that the role the accelerator can play in developing role sets by convening ties from a weak network architecture of founders who are very different from each other also applied to other actors in the network, including people in senior positions within organisations that consist of closed, strong tie networks. These individuals also had very little experience, for example, engaging with very young startup founders.

This resulted in greater attention being paid to informing the different stakeholder groups about what to expect from each other. For example, the accelerator team developed a manual for the mentors, and carried out pre-program engagements with sponsors to explain how startups operated. This benefits the accelerator, ensuring a smoother set of engagements during the program, but should also be understood as a tangible outcome, leaving the ecosystem built around the accelerator better informed about each other, and therefore equipped with more complex role and status sets.

This approach involved the accelerator team spending time with the startups preparing them for different engagements, often briefing them on who they were going to meet,

and also how to behave and dress. This led to considerable changes in the way the cohort interacted with other stakeholders, suggesting that their role sets were being developed as a result.

5.7 ECOSYSTEMS

The previous chapters explored how accelerator design should reflect the importance of ecosystems. It was consequently suggested (see 4.6.1) that EyeFocus would need an ecosystem from which to source the various actors required for the type of social network that supports an accelerator, and in return would be able to convene and catalyse the eye-care innovation ecosystem.

As became clear when building out the partner and mentor network, a broad eye-care innovation ecosystem did not already exist. Smaller ecosystems existed, for example around clusters of activity, like the Institut de la Vision in Paris, and RNIB and Moorfields Hospital in London. A large, global, connected eye-care innovation ecosystem did not exist. EyeFocus therefore set about connecting with these ecosystems, and between them. It also bridged between them and the tech ecosystem to include the startup culture that supports innovation.

As such, EyeFocus evolved from a deal-flow maker, or corporate accelerator, into what is referred to in thesis as an ecosystem builder (see 4.6.1). This was both out of necessity, being the ecosystem in which EyeFocus needed to be embedded to achieve its

own goals, and an outcome, being the benefit it shared back with the ecosystem that supported it.

It became evident that being a new, independent entity that was not competing with any other entity, and which was transient so would not permanently occupy any of their space or compete for their funding, meant EyeFocus did not threaten other organisations positions, funding, or reputation. This enabled EyeFocus to become a junction between networks, ecosystems, and stakeholders. The logos infographic showing the program partners (see 4.4.8) is a visual example of the extent to which EyeFocus was able to connect global stakeholders in eye-care innovation in a relatively short time.

5.8 FIXED LENGTH, THREE MONTH PROGRAM

5.8.1 Choice of three months

This thesis has examined how a three-month program was chosen for EyeFocus because it was the industry standard for accelerators, and would therefore signal to startups that EyeFocus was part of the startup ecosystem. This choice was also informed by a number of other factors, including funding, and advice from other accelerators and startups that three months is the most people can cope with on an intensive bootcamp style program.

Social Network Theory also suggested that a program of around three months would be intense enough both to remain a dynamic network, and to offer mentor overload, but not so long that the network would start to see decay in the non-redundant information and ties (see 3.2.14).

This theory translated well into practice. Towards the end of the three-month program both the management team and startups were getting tired, as had been predicted. It became difficult to retain the pace of mentoring, partner visits, online sessions, networking, and social activities to maintain the cohesion of the cohort. Increasingly the cohort became less enthusiastic about attending events organised by the accelerator. Both the energy of the team, and the motivation of the cohort waned towards the end of the program, indicating that three months had been the correct length in terms of what is sustainable.

Furthermore, it took 2-3 weeks to create closure at the core of the accelerator, so that the cohort and management team were close enough to develop a shared culture and support each other. This was achieved well, and resulted in spontaneous evenings where the cohort cooked together at Rainmaking Loft, and saw partners and friends of the cohort visit the program from abroad, bringing people closer together socially, reflecting the proposals by Burt (2001) on how to encourage embeddedness in order to prevent decay (see 2.2.3.3).

EyeFocus managed to deliver non-redundant ties and information intensively during the first half of the program, and then less so as the activities slowed down. However,

three months proved to be an appropriate period during which most ties and information remained fresh and non-redundant. Most mentors and startups met once, which represents a non-redundant, or new contact, with new information. Had the program lasted longer, the list of mentors and startups who had not met would have come to a natural end, suggesting repeat meetings would have been necessary to continue a structured program. This would have introduced redundancy into the ties and knowledge being offered to the startups, which would have represented diminished value over time.

5.8.2 Being a fixed length program

This thesis argued for a fixed length program for a number of reasons (see 4.4.6). It is seen as a complement to a cohort, and something that differentiates an accelerator from an incubator. The fixed length had the added benefit of creating deadlines for the various stakeholders involved. The small EyeFocus team was faced with cajoling a large number of individuals and organisations into an intensive program of activity, which is challenging.

Having a defined start date, and 12 week window in which to be involved, helped the small team at EyeFocus to encourage the sponsors to sign agreements and provide mentors, for the startups to finalise their application and move to Berlin, and for the mentors to commit their time. It was observed from engaging with some more institutional partners that without a finite three-month window, they were inclined to

suggest dates for engagement many months into the future, or even in the following year.

The fixed length of the program therefore created a useful sense of urgency, without which it would have been very difficult to encourage so many actors to carry out their defined engagement in such a way that it created the intense bootcamp experience for the cohort. Without the fixed length it would have been impossible to assemble a cohort in Berlin and without which it would not have been possible to deliver the structured program, realise efficiencies, or create value.

5.9 COHORTS

In this thesis it has been proposed that cohorts are a fundamental part of an accelerator, complementing the fixed term program, and creating the ability to offer efficiencies to those involved. They also create the core of the network from which norms are agreed and communicated, and which creates Social Capital for the accelerator in the form of novel information, which can then be conferred back on the startups in the cohort (see 3.2.6).

In practice, this was proved correct. The cohort in EyeFocus reflected the theory that by gathering together a group of startups that is the best in class it attracts the attention of partners, mentors, and sponsors. This can be seen in the partners who gathered around EyeFocus (see 4.4.8), and from the mentor list (see 8.2).

The approach to forming the cohort took in two areas of theory. Firstly, the way the program was branded and marketed, and how the application and selection process was managed, and secondly in the way Burt (2001) discusses how to form close teams and avoid bridge decay (see 2.2.3.3).

Reflecting this last point, during the opening weeks of the program EyeFocus organised informal and social events for the cohort, having a team dinner, and encouraging the startups to work with the accelerator team to put on events together. This brought the cohort together and friendships were formed quickly.

The cohort also creates efficiencies for high status stakeholders because they can meet multiple startups in one meeting, and can deploy their value to that group in one session, rather than multiple times. This became clear in practice, as EyeFocus was able to arrange meetings or mentoring sessions with very senior individuals and organisations based on offering the opportunity to meet the cohort in one short session. It is considered evident that these high value contacts found time to meet the EyeFocus cohort precisely because EyeFocus had already invested the time and resource to find, filter, and organise the startups into a cohort.

This further supports the theory (see 4.2.4) that the accelerator creates value as a resource of novel, non-redundant information (see 3.2.5). The value of the cohort, representing Social Capital accumulated by EyeFocus, made it possible to meet high-status and high-value actors in the ecosystem.

5.9.1 Cohort recruitment

Having shown that the cohort was important, and that selecting a best in class cohort is part of the value the accelerator creates, this section describes how EyeFocus recruited its cohort. Recruitment was based on the concepts discussed in the previous chapter (see 4.4.3). This section explains what happened in practice, and how the process had to be adapted where the theory did not translate into practice as smoothly as anticipated. As described above (see 4.4.4) the selection process was managed on the website F6S.com, and with a formal process to involve the sponsors as a selection committee. The ambition was to have all applications received, filtered down to a shortlist, and then with the selection committee to make offers to the best of these, all within a pre-defined timetable leading up to the launch of the program.

This theory did not translate well in practice, encountering a number of unforeseen problems which resulted in emergent strategies to adapt the process.

5.9.2 Selection process: lessons

Before the formal application process opened, EyeFocus offered places to two startups already found through mentoring in other accelerators, via the strong tie network of the

EyeFocus founders. These two startups[1] both had charismatic founders, interesting products, and were graduates of StartupBootcamp accelerator in Copenhagen, and Buildit hardware accelerator in Estonia.

By offering them a place, it was possible to set a precedent of the sort of startup the program was seeking, and also validated the program by showing that graduates of established accelerators wanted to join EyeFocus.

EyeFocus then used the weak tie mentor network to promote the accelerator widely across the startup, healthcare, and eye-care sector. Pre-prepared text for emails and social media posts was sent to the mentors asking them to share it across their networks. This reflected a clear understanding that the mentors represented bridging ties able to bridge into other networks.

By carefully identifying individuals and organisations that had a broad reach into networks beyond EyeFocus's immediate network, and because EyeFocus was not competing with other entities, it was possible to create a brand and propagate that brand globally in multiple sectors, quickly, and inexpensively.

This approach succeeded in finding tens of companies to approach, and in attracting companies that approached EyeFocus. However, this was not adequate to create a large

[1] Mr Patch, and Blindsense (see 8.3)

enough number of applicants from which to argue that those selected were the best in class.

Therefore, one member of the EyeFocus team was focussed on searching for, approaching, and processing applications from startups. This involved searching the main startup databases, Crunchbase and Angelist, as well as looking for media stories about eye-care startups, and directly approaching other possible clusters of eye-care activity, such as the Institut de la Vision in Paris, and RNIB in the UK.

This created a momentum that increased exponentially until EyeFocus had found or been approached by more than one hundred startups. However, the exponential effect of information spreading through a network takes time, and this only reached scale as the start date of the program approached.

5.9.3 Problems with the application process

The theory discussed above lead to forming a structured application process, using F6S.com to manage the application process. Described by TechCrunch (Butcher 2017) as “a kind of social network for founders and startups to keep track of these programs,” F6S was used by leading accelerators, and at the time had 790 accelerators listed on the site.

F6S.com was intended to create a consistent data-set of applicants that would enable easier comparisons between them by the selection committee and would provide a convenient way to share this information with that committee. F6S.com allows members of a selection committee to review startups online, listing each person's feedback and scoring for the other selectors to see. However, F6S.com is also relatively hard to use, and requires an involved registration process for each user. It also encouraged the use of questionnaires with a large number of fields for applicants to complete.

Not all startups made their first contact with EyeFocus via the F6S.com application portal. Those which were introduced to the program or found by the team directly generally began their engagement with emails or a call. Some startups were being asked to send some basic information and a pitch deck by email, then to fill out a profile at F6S.com, others filled an F6S.com profile and were then asked to send a deck separately.

Some startups were beginning the F6S.com application process and leaving it unfinished. Because they had not entered their contact details it was not possible to bypass the system and contact them directly. Others were starting the process and not finishing it, but enough that they were contacted directly and then circumvented the system by sending the required information directly.

It was concluded that the F6S.com process was too cumbersome, requiring both too much information, and it was a further obstacle that the startups had to join the platform before they could apply. Many of the companies that contacted EyeFocus

directly already had a pitch deck prepared, and by the time they had met the EyeFocus team on Skype or in person, asking them to fill out so much information again on F6S.com seemed pedantic and inefficient for both parties. Equally, as EyeFocus was reaching out of the startup sector to more established medtech companies, to academics, and clinicians, F6S.com was clearly too unfamiliar for them to use.

F6S.com was also hard to work with for the selection committee. It either produced a very long PDF form with data about the startup, or required those evaluating the data to register and learn how to use a new platform before they could review the applications. Given that the selection committee were not from a tech background, and not already familiar with F6S.com, this made it difficult to manage what needed to be a fast selection process.

Ultimately the use of F6S.com was abandoned during the application period as it was bringing no perceived value, and was clearly putting some companies off completing their application.

In its place applicants were asked to fill out basic information in an online form via the company Survey Monkey, and to email a pitch deck. Those of interest were interviewed over Skype by the manager in the team responsible for recruitment, and then they were filtered into a shortlist, those companies were interviewed by one of the accelerator founders.

This process was quicker and easier, and produced a shortlist that was sent to the sponsors.

5.9.4 Problems with having a Selection committee

A requirement of the funding from the sponsors was that they would form a selection committee and be part of the selection process. This was welcomed by EyeFocus, as it would ensure that the accelerator selected companies that were interesting and useful for them, and also allowed them to veto any companies they felt might be considered to be competing with them or in some way unsuitable. They would also provide valuable industry insight when evaluating the applicant companies.

However, this created some unforeseen problems. Firstly, the original process using F6S.com either required the sponsors to register in order to access the applications, or for EyeFocus to print the very long forms F6S created, and potentially combine them with pitch decks and other information. This became hard to manage. It was clear the sponsors on the selection committee just wanted a short summary they could read quickly, in one case requesting a single spreadsheet in place of all the forms and pitch decks.

Secondly, as the funding had taken a long time to secure, this left a very short period to find and review the startups before the program started. Being busy senior executives in large corporations, the selection committee struggled to process the long and short list of startups quickly enough to meet the deadline by which EyeFocus needed the startups to be accepted on to the program, prior to its launch. A contributing factor was the confusion that had emerged in how the applications were handled, and the switch away from F6S.com.

Further to this, it was also found that the corporate members of the selection committee often had little understanding of the startups in question, so were not able to make informed decisions. This was partly due the fact that the information they received, in order to be on a manageable scale, did not offer enough detail, but also due to the very factor that inspired the program, which was their limited exposure to startups thus far and desire to learn more about them.

These problems were exacerbated by the reality that startups were applying and being accepted on an ad hoc basis, rather than according to the planned submission deadlines. The theory outlined above had suggested a final application date, a period to consider applicants, and then a date at which the successful applicants were informed. However, in reality the two first startups had been accepted very early on. Their founders were from Paraguay and Palestine, so both needed considerable time to secure visas, travel, and accommodation in Berlin prior to the launch of the program.

By contrast, other startups were applying the week before launch, and even into the early weeks of the program.

As EyeFocus grew as a network, incorporating more mentors, sponsors, partners, and those startups already accepted, its weak tie network grew. With each additional node, information about the program spread exponentially over these new bridging ties into new networks.

Consequently, awareness of the program increased exponentially in the lead up to and after the launch. As discussed throughout this thesis, a network that is rich in weak ties and Social Capital, and is positioned near to structural holes, is in a strong position to communicate novel information (see 3.2). The newly developed social network built by EyeFocus became such a network, and consequently the novel information flowing over the newly acquired bridging ties and propelled by the increasing levels of Social Capital embedded in that network, meant that more and more startups were hearing about EyeFocus and applying to join the program. It was also noticeable that the quality of these startups was increasing and applications did not stop even after the application process had formally closed or when the program was starting,

Eventually, during the first weeks of the program, EyeFocus was receiving emails from startups based at world class universities like Stanford, MIT, and Oxford, and other leading hubs of research or innovation. At this point the accelerator had already deployed its investment, and officially ended the selection process that involved the sponsors' committee.

The solution to this last problem was the adoption of Associate status (see 5.4) which could be deployed immediately in order to bring these startups into the cohort, so they became part of the ecosystem.

It was felt by everyone involved that the selection process had been chaotic and the theory on which it was based had not translated into practice at all well. The

requirements of the process changed as it developed and emergent strategies were required to be developed rapidly to adapt the process accordingly.

Ultimately, a simpler and faster process was developed. Also, the creation of Associate status rendered much of the application process redundant, making it easier to develop the cohort and increase the Social Capital of the program.

5.9.5 Companies rejected through the selection process

It is worth mentioning here the companies that were not accepted onto the program, as they are also relevant to a discussion of both the selection process and formation of the cohort. In total, thirty-seven companies were either considered and rejected by EyeFocus, or were given offers that they turned down. It is not possible to list the companies here, but the reasons for them not joining the program can be discussed.

A variety of reasons why companies did not engage with the program were identified. These included:

- Lack of interest; not able to see how it would help them. Presumably this was either a correct assumption, or a failure to understand what an accelerator could offer. These were mainly companies which had no previous experience of accelerators or the startup sector, and raises questions of how better to communicate the benefits of an accelerator, and quite how far from the startup world they can remain attractive.

- Being blocked by their university from engaging with an accelerator. This was mainly down to misconceptions by some university tech transfer offices about protecting IP, but also in some cases an incorrect sense that EyeFocus was competing with the university's tech transfer office. Some universities simply required too long to consider contracts, or in one case required EyeFocus to sign an NDA that would have made it impossible for the startup to attend the accelerator or meet mentors.
- A strange observation about different cultural approaches was that French companies insisted on NDAs before discussing anything with anyone, rendering it impossible for them to have a meaningful engagement with the accelerator or mentors. This appeared to be a pattern specific to French companies, and reflected a very different approach to confidentiality and trust.
- Other companies were simply too far away to engage with the program, such as one in Australia. The cost of coming to Berlin was too high and the time zone made it hard to meet online.

The fact that 37 companies did not join the cohort suggests that the selection process was effective in filtering applicants, and ensuring the cohort consisted of a best in class that would be of value to the mentors, sponsors, and partners.

5.9.6 Observations: Ecosystems and Cohorts

In the previous chapter, theory was used to inform how the startups would be found and selected onto the program. When tested in practice, this theory around how an application process should be designed fell short of the reality. In effect, EyeFocus was a startup, and therefore things happened very quickly, unpredictably, and required emergent strategies to cope with this. The very rigid planned application process was abandoned in favour of something that could function more quickly and fluidly.

The new application process reflected the realisation that EyeFocus did not need to gather so much information from startups to decide whether to accept or reject them, apart from those it was investing in. Even then, because the investment was being made by EyeFocus and not on behalf of third party investors, there was no requirement for reporting or due diligence beyond that deemed necessary by the founders, who were making the investment.

The recruitment process reflected well the understanding of weak, bridging ties, and of Social Capital. It also reflected the way in which social networks are known to spread information in an exponential manner, which reflected 'small world' theory (see 2.2.1.2). This led to the escalation of applications, and increase in quality of applications, towards and through the launch date of the program. In future it would be helpful to anticipate this and plan it into the lead up to the program.

The resulting emergent application process was simpler, with just an online form, applicants emailing relevant information, and a Skype call.

The introduction of Associates also changed the requirements of the application process. If a program assumes that most good applicants will be accepted as Associates, and only special cases will receive investment it would allow for a system in which all the good applicants could be accepted into the cohort quickly. Then on a case by case basis some startups could be offered investment. Those startups would be subject to a more rigorous selection process, but this could take place during the program.

Associate status still needs to be the result of a selection process in order to create the value discussed in 3.2.8, however it allows for all good applicants to be incorporated into the cohort, rather than an artificial limit being imposed by available funding.

5.10 RUNNING A FOCUSSED PROGRAM

The benefit of a focussed program was observed when it became clear that as there were no other global, independent accelerators addressing eye-care, startups that were far more developed, well-funded, or already in accelerators saw value in becoming part of the unique network EyeFocus was building through its accelerator.

It had also been predicted that the tight focus of the program meant EyeFocus was not directly competing with other accelerators, so in fact could cooperate with them. This

was proved to be the case by the first two startups joining the cohort, both of whom had been recommended by the accelerators that had already invested in them.

It was also predicted as part of this thesis that an accelerator would need to retain a broad network, even when very focussed on a sector. During the program it became clear that the eye-care startups in the EyeFocus cohort needed the same range of support and advice as other general startups, as well as additional specific eye-care related support. If the mentors and ecosystem had only focussed on eye-care then EyeFocus would have lacked the business, tech, and general startup support that is generic across sectors. The network would also have risked losing its characteristics of having a weak network architecture and many bridging ties, which was described as a defining characteristic of an accelerator (see 3.2.1). As outlined above (see 4.3.3), a conscious effort was made to ensure the mentors were balanced between eye-care and tech in general, and the branding was intended to convey this balance between the tech and ophthalmology sector.

The cohort and mentor network which EyeFocus built suggests that the choice to focus was successful. The program achieved more than might have been expected of a first-time generalist accelerator, finding 16 strong startups to join the program, and a broad and high-quality set of mentors (see 8.3 and 8.2).

5.11 LINK RECIPROCITY

In 4.5.7 and 4.5.9, link reciprocity was shown to be an outcome of the weak network architecture of an accelerator social network (see 3.3), and the Social Capital accrued by the accelerator. It is used to police norms, and therefore to protect the startups (see 4.5.9). It was argued that accelerators need to maintain the right network structure, and share Social Capital in order to be able to withhold it as a means of sanction. This was reflected in the design of the EyeFocus network, and in the way actors such as mentors were rewarded with novel information and ties (see 4.5.2).

During the running of the EyeFocus program there were no observed breaches of norms, despite there also being minimal use of contracts and NDAs. This suggests that the theory is correct in arguing that link reciprocity is an effective method of policing actors in a network like that of an accelerator, and that social sanction has more weight than legal sanction in deterring bad actors.

5.12 SUMMARY

The design of EyeFocus took into account insights from Social Network Theory which influenced both the way the EyeFocus network was structured, and the way the program was designed and delivered. In particular, understanding the role of Social Capital as a currency, and its connected role to link reciprocity informed how the stakeholders were rewarded for cooperating, and a focus on the network architecture.

It was understood that the network needed to remain dynamic, and retain a weak network architecture in order for norms and link reciprocity to be able to take the place of more traditional legal contracts and rules. This also helped delay the decay of ties and non-redundant information.

This understanding was reflected in the way the cohort was formed, with a focus on informal events at the beginning of the program to preclude bridge decay, and in the way mentors were invited to most events, so the program actively sought to reward them with new ties and knowledge.

Social Network Theory also informed the choice of location and duration of the program. Positioning the accelerator in an existing tech ecosystem, and ensuring the program was long enough to allow the cohort to gain new ties and knowledge, yet not so long that these became redundant.

The focus of the program fitted the predictions of Christiansen (2009), leading to a higher uptake in interest from both mentors and startups than industry experts had predicted a new program would achieve.

During the program it became clear that value lay in building an ecosystem, as a network aggregator. This altered many aspects of the program, most notably in the adoption of the Associate status for applicants, and in the way EyeFocus organised activities where other stakeholders benefitted more than EyeFocus itself, thus

developing the Social Capital of EyeFocus within its ecosystem, and further supporting its ability to confer that Social Capital on the cohort to support and protect them.

CHAPTER 6. INTERPRETATIONS AND FINDINGS

The previous chapter made observations about how the theory examined in Chapter 4 translated into practice during the running of EyeFocus Accelerator. This chapter explores those observations and reaches findings about how the theory should be interpreted and applied.

6.1 INTRODUCTION

To date, whilst some aspects of Social Network Theory have been involved in discussions of accelerators, they have primarily been researched as business support activities (e.g. Bone et al. 2017; see 2.4.1). In this thesis accelerators have been examined as social networks.

This has led to a definition of an accelerator that focusses on the social network structure and dynamics, rather than describing the business support activities (see 3.2.17).

This understanding of the accelerator as a social network points to a number of specific findings about how and why certain things happen in accelerators in particular, related to the specific network dynamics of an accelerator. These were explored in EyeFocus Accelerator, and led to findings discussed here.

6.2 FINDINGS RELATING TO ACCELERATOR BEHAVIOUR AND DESIGN

6.2.1 Social Capital explains why mentors mentor

The existing literature and practice explain why people offer to mentor for accelerators using empirical evidence. This suggests that people mentor because they want to 'give

something back,' that they enjoy supporting new entrepreneurs. They also mentor to learn what is new in a sector of innovation, and to benefit from the networking opportunities around accelerators (see 2.3.3.1).

In this thesis Social Network Theory has been used to examine mentoring in more detail. This offers an explanation based on the underlying aspects of the social interaction, described mainly in terms of Social Capital. Mentors gain a number of social outcomes that equate to the value (see 3.2.5 and 4.5.2) inherent in Social Capital:

1. Tie formation, namely new network contacts which equate to value by offering bridging ties to novel and non-redundant information (see 3.2.3)
2. Validation and social credentials through being selected by and associated with the accelerator, which is thus sharing its Social Capital and status
3. Early access to novel information in the form of innovations being created by the cohort

6.2.3 Link reciprocity explains why accelerators do not use NDAs

The use of link reciprocity does not just apply to mentors but also explains overall the way in which the norms of accelerator networks are policed. Miller & Bound (2011) observed that accelerators do not favour the use of NDAs, explaining this as a function of the accelerator's position within a wider ecosystem (see 2.3.1).

Understanding link reciprocity in accelerator social networks (see 4.2.3 and 5.11) gives a clearer explanation of why NDAs are not used, and why trust is a powerful force in accelerator networks. It is more than just a cultural norm, in fact being a specific function of the type of social network that forms an accelerator. A well-structured accelerator, as described in this thesis (see 4.2), is able to communicate reputation quickly and effectively across an ecosystem.

In the specific context of an accelerator, this means that if a bad actor damages a startup, all the mentors, all the other startups, the partners, sponsors, investors, and other stakeholders clustered around an accelerator will find out. This creates a higher risk of social sanction than could be threatened by a single startup in isolation. Accelerators can influence extensive tie dissolution (see 2.2.3.4) due to their position in an ecosystem, and can therefore deliver its function of protecting the startups in its cohort (see 3.2.6).

6.2.4 The importance of weak ties to accelerators

An underlying theme of this thesis has been the importance of weak ties, influenced by Granovetter's 'The Strength of Weak Ties' (see 2.2.1.3). Accelerators have been shown to use a weak network architecture rich in weak ties, some of which will be bridging ties, in order to bring non-redundant, novel information to the startups it is supporting (see 3.2.1). Such high-value novel information and contacts are accessed over bridging

ties, and bridging ties are usually weak ties, hence the accelerator is rich in bridging Social Capital (see 3.2.1).

This should inform accelerator design, which need to be consciously building weak tie networks, especially concerning their mentors which are the main potential source of weak and bridging ties. An accelerator without weak ties will lack value because it cannot access information that flows over bridging ties, and it will be limited in its ability to police norms with link reciprocity.

6.2.5 The importance of ecosystems

In the context of accelerators, the difference between an ecosystem and a network is that a network consists of nodes (people) and ties, while an ecosystem goes beyond people and entities, and includes such things as policy, culture, groups of knowledge such as universities, and infrastructure, for example flight connections (see 2.3.3.5). All of these things combined create the wider environment in which different social networks operate. Accelerators are particular social networks that sit within these ecosystems, connected to other social networks, and can be powerful catalysts in forming or maintaining ecosystems because of their unique nature and network structure (see 3.2.10).

Accelerators can act as network aggregators, convening stakeholders in an ecosystem, and creating value across the ecosystem by improving the flow of information, communicating norms, and encouraging innovation.

6.2.6 Investment versus ecosystem building

The literature review suggests that investing in cohorts via an accelerator as a deal-flow maker is not likely to be a good way to make money unless the accelerator is established in a very mature ecosystem with a strong investment community, and experienced groups of mentors (see 3.2.16).

The thesis further identified the value and necessity of accelerators building and supporting ecosystems (see 3.2.10). A conclusion from the experience running EyeFocus is that when an accelerator invests in the cohort, the criteria of the selection process inevitably focusses primarily on whether the applicants would be successful investments. This single criteria then obstructs other possible criteria for selection around what might benefit the ecosystem, or create other outcomes for the accelerator and its supporters. The risk is that this single investment criteria prevents an accelerator that is not purely a deal-flow maker from accepting startups that may form a valuable cohort capable of realising other outcomes (see 2.3.4.5).

6.2.7 How accelerators protect startups using Social Capital and link reciprocity

Startups are in general inherently vulnerable and it is a role of an accelerator to protect them (see 3.2.6). They lack experience, may not have the resources to protect themselves with contracts and litigation, and may lack the large social network through which to validate people, and through which to threaten reputational damage to people who harm them.

Miller & Bound (2011) observed in the literature that accelerators protect vulnerable startups. This thesis used Social Network Theory to explain this by observing that accelerators accrue Social Capital and status, and then confer both on the startups in their cohorts (see 3.2.6). Additionally, the precise social network mechanism by which that protection is enforced is link reciprocity (see 2.2.3.4).

It was also observed that an accelerator allows a startup to maintain higher density in a much larger network than it could manage on its own, hence the collective nature of the cohort, and its position alongside the accelerator allows the startups to operate in a larger network whilst maintaining the safety and trust of a densely connected network, (see 2.2.3.3).

This gives a much clearer explanation of the mechanism by which accelerators support startups. Once understood theoretically like this, accelerators should be more aware that they are expected to develop a high level of Social Capital within their ecosystem,

and then confer it on their startups. If they are not able to do both, they will fail to offer the full level of support the startups need.

Equally, if the accelerator is not actively rewarding the mentors with its Social Capital, the mentors are more likely to lose interest before the program is complete, and lack the threat of sanction, through link reciprocity, should they become bad actors in relation to the startups.

6.2.8 Associates

The discussion in 6.2.7 about the disadvantages of investing via accelerators led to a conclusion that accelerators not solely focussed on investment outcomes may benefit from admitting a wider variety of startups into the cohort and thereby realise a wider range of outcomes. EyeFocus addressed this by creating a second status for applicants, who were able to join the cohort as Associates (see 5.4). This was an emergent strategy that took shape during the program, and allowed EyeFocus to build a larger cohort, and to include companies that were not suitable to receive investment for a variety of reasons.

This supported the aim of being an ecosystem builder rather than a deal-flow maker, and increased the value EyeFocus was able to offer to the stakeholders around it in terms of novel information, based within a more varied cohort.

6.2.9 Mentoring online

It is acknowledged that the best opportunity for mentoring is to have a mentor and startup sitting together in the same location. However, online mentoring created opportunities to speak to world leaders in eye-care and tech, which simply would not have been possible without online mentoring. However, some of this was very hard to coordinate. Technically this approach required everyone to have a fast internet connection, good camera and microphone, and previous experience using Skype, or similar services such as Google Hangouts (see 6.2.9).

Despite the technical and logistical problems, which were significant at times, online mentoring was deemed a success. It allowed EyeFocus to run a truly global program and build a global ecosystem. It was very cost effective, as it eliminated many travel costs. Online mentoring allowed, for example, a team in Kenya to join mentoring sessions in Berlin, and enabled participants from around the world to meet and talk with influential and inspiring people.

A highpoint of the program, and good example of the benefit of this approach, was a call with Dr Thulasiraj Ravilla from Aravind Eye Hospital in India. Aravind is a world famous eye hospital, and Dr Ravilla an internationally acclaimed thought leader in eyecare. The cohort called in from multiple locations, and from EyeFocus in Berlin and were able to spend over an hour talking to Dr Ravilla, calling from his office in Madurai, India.

Figure 4. Online mentoring session with Dr Thulasiraj Ravilla, Executive Director of Aravind Eye Hospital in India, connecting startups sitting in Estonia, London, Berlin, and Armenia. A demonstration of how complex online mentoring enabled startups to meet globally recognised thought leaders.

This has clear benefit to the startups and participants, but also benefited EyeFocus as it established the profile of the Accelerator far beyond its own geographic base. For the startup teams, many of whom were not located in mainstream tech or eye-care ecosystems, being able to meet global thought leaders was inspiring, and formed part of the development of their role sets.

Mentoring online created opportunities for startups to speak to mentors regardless of their location. This allowed the accelerator to introduce specific knowledge, or bridge into specific locations in a way that would not be possible if it had relied entirely on a geographically limited group of mentors residing in the local ecosystem.

It was complicated, and required traditional mentoring techniques to be adapted, and new methods to be developed as the program was running. Whilst mentoring online posed challenges, and had drawbacks, overall it developed EyeFocus's ability to build a global ecosystem, and to promote innovation in eye-care across the sector.

6.2.10 Fixed Term programs and the decay of non-redundancy

The literature review identified that accelerator programs typically range from 3-12 months (see 2.3.2.4). It also discussed decay, whereby new weak tie relationships either weaken over time or become strong ties, and therefore the ability to generate a flow of non-redundant information also decays (see 2.2.3.3). It was observed in running EyeFocus that 3 months was the longest the cohort or management team could have maintained the schedule which marked EyeFocus out as an accelerator (see 5.8.1). This corresponds with the suggestion that after 3 months both the management team and cohort become tired after an intensive bootcamp program, but also supports the suggestion that decay of ties and non-redundancy sets in after 3 months.

Reflected in EyeFocus this took the form of it becoming increasingly difficult for the management team to find sources of novel information and ties for the cohort, and correspondingly the cohort becoming increasingly less interested in engaging with scheduled programming over working on their startups.

This all suggests that accelerator terms are around 3 months for reasons connected to the speed at which the non-redundancy in their weak tie network decays. As most mainstream accelerators have roughly similar cohort sizes (e.g. 7-15), and equally similar numbers of mentors (e.g. 50-100) then it is possible that decay happens at roughly the same speed, leaving them short of non-redundant information after around 3 months.

It is possible that there is a limit to the number of mentors a program can recruit and reasonably engage with in a given period of time. There are also a finite number of engagements that can be created between a fixed cohort and fixed number of mentors up to a point that each startup has met each mentor at least once. Those first meetings will be a weak tie engagement, but further meetings will gradually diminish the value the mentors can bring in terms of non-redundant information, and decay will set in. Other value will develop, but this is transitioning into the support and trust-based benefit of a strong tie, rather than the novelty of an accelerator output (Rost 2010; and see 2.2.1.4).

The statistical analysis of such a theory in any detail is beyond the scope of this research, and is recommended as a topic of future study (see 7.3.5), however it is an interpretation of the research that decay in the network might be a reason why so many accelerators last 3 months.

There may also be a natural limit of the extent to which an accelerator can keep its network dynamic over a period of time. If it builds a mentor network prior to launching, then facilitates mentoring sessions during the program, it would reach a point where

decay increases exponentially due to triadic closure, and the extent to which it would have to refresh the network with new mentors to counter this decay would ultimately translate to building a new mentor network and launching a new program.

This is a speculative assumption interpreting the research in this thesis. It would need to be supported by further research (see 7.3.5), but does suggest that an instinctive reflection of decay in social networks may have influenced the fixed term, and relatively short length of that term, in the development of accelerators.

6.2.11 Value resides in cohorts and non-redundant information

The literature review identified that cohorts are a core part of accelerators (see 2.3.3.3). Social Network Theory identified that the value in an accelerator lies in its ability to provide early access to novel, non-redundant information (see 3.2.3). Therefore, a great deal of the value in an accelerator resides in the cohort. This is increased by a vigorous selection process to form the cohort (see 3.2.8).

However, as this form of value resides in the novel information and ties embedded in the accelerator network, it must also reside in the mentor network, in the partners and sponsors, and in the wider ecosystem an accelerator can convene. In EyeFocus it was observed that mentors requested meetings with other mentors, and with the sponsors, and obtained value from these introductions, supporting the argument that accelerator managers should understand that the value of novel information does not only lie in the

cohort, but in the whole network. That value can move in all directions, and benefit all the stakeholders, and understanding this can be exploited to increase the Social Capital of the program.

A better understanding of where value lies within the accelerator when it is viewed as a social network should enable more of that value to be realised and shared across the network built by the accelerator, further increasing its own Social Capital.

6.2.12 Focussed programs

EyeFocus was a consequence of the dynamic predicted by Christiansen (2009), and observed by Bone et al. (2017), that accelerators would need to become more focussed in order to deliver value to their stakeholders, and to be able to compete in an ever more crowded market. It was established in order to explore the value of a highly focussed program, both to the cohort and to the ecosystem. It was also very focussed in order to avoid competing with other more established programs (see 2.3.3.7).

EyeFocus attracted a mentor network and cohort of startups that were equivalent in number to other mainstream accelerators, and feedback suggested they were both of a similar or higher quality. It also entered the mainstream in terms of being written about, and being listed as amongst the startup accelerators in Berlin, and in Europe (Bone et al. 2017).

This suggests the approach of addressing a very narrow sector was effective, and brought value to the wider tech and eye-care ecosystems.

6.2.13 Startup facing brand

It was proposed (see 4.4.7) that the accelerator brand needs to have outward appeal to startups, rather than inwards to the corporate sponsor. If the primary aim of an accelerator is to identify novel innovation and build a large weak tie network, it should be designed primarily to be attractive to those weak ties, not to the organisation that founded or is funding it. It should be a given that the founding or funding organisations are interested in the accelerator, so the public face should appeal not to them but to actors who are different to them, otherwise it will fail to attract new and valuable actors and to develop weak ties.

Again, this may run counter to the instinct of a program that is heavily dependent on a corporation which funds it so this needs to be explained and understood. The theory outlined in this thesis describes the social dynamics that underpin accelerators and make them work, and this should be used to explain why an accelerator should be designed to appeal to the startups and mentors who will bring the novel information and ties to the organisations supporting it.

To achieve this, corporates or other large entities funding accelerators need to understand that the accelerator should explicitly be freed from any requirements that

lead to it being designed to please the parent entity. However, it is important that the accelerator is properly socialised within organisations supporting it so there is suitable engagement with them, but this should be part of the initial planning rather than a primary requirement of the program design and branding.

6.2.14 The need to remain agile

It was clear that EyeFocus adopted a number of emergent strategies to address problems and capitalise on opportunities. It is clearly necessary for accelerators to remain agile and flexible. This is an important consideration when more accelerators are being established or funded by large corporates and government agencies. These both may want to see a finalised plan for the whole program prior to launch, but this would undermine the need and ability of accelerators to adapt and change, remain dynamic, and to support rapidly evolving early stage companies.

6.3 SUMMARY

These findings and interpretations demonstrate how the way an accelerator is designed can be adapted once it is examined primarily as a social network. This impacts on how people and companies are engaged with the program, and how value is understood to be created and shared. The need to retain a dynamic network rich in bridging and bonding ties translated back into practical outcomes through the development of the Associate status, and increased use of online mentoring.

Other areas in which the practical execution of the accelerator was influenced by theoretical insights include the greater focus on developing role-sets and cognitive flexibility, and the understanding of how Social Capital was being used to reward co-operation, and link reciprocity to threaten sanction against bad actors.

The network structure was shown to be important in creating the right type of social network to achieve the desired outcomes of the accelerator, in terms of facilitating the flow of non-redundant information and protecting startups.

CHAPTER 7. CONCLUSIONS AND FUTURE RESEARCH

This final chapter brings together the findings and interpretations from the previous chapters into a series of conclusions about accelerators based on having analysed them as social networks. These conclusions explain aspects of behaviour in accelerators and propose how this theory can be used to inform the design of accelerators in the future. The chapter also proposes future topics for research that were beyond the scope of this thesis.

7.1 INTRODUCTION

Returning to the aims and objectives stated in the introduction of this thesis, the first 3 aims were completed within the body of the thesis:

1. To use a literature review to identify the aspects of Social Network Theory that can be used to describe a startup accelerator.
2. To provide a summary of the main academic literature about accelerators.
3. To apply this theory to the design of EyeFocus accelerator in order to examine it in situ.

The last two aims are now addressed in this concluding chapter:

4. To use this exercise to reach conclusions on how accelerators should be run in the future.
5. To create a definition of an accelerator based on Social Network Theory which can inform the design and execution of future accelerators.

7.2 CONCLUSIONS

According to the approach taken by this thesis, an accelerator has been described as a specific form of social network (see 3.2.17). This enabled a discussion about accelerators that focusses on the underlying social network dynamics, rather than the elements of the business support program (see 2.4.1). This Social Network Theory approach to understanding an accelerator introduced the concepts from Social Network

Theory that have been used in this thesis to describe accelerators, and to inform the design of EyeFocus. These are now used to reach conclusions in this final chapter.

7.2.1 Social Capital as payment for mentors

The thesis explored the role that Social Capital plays in rewarding mentors (see 4.5.2), identifying that they primarily give their support to accelerators in return for value deriving from Social Capital.

Therefore, this understanding of mentoring should allow accelerators to be designed with a far more precise understanding of why people mentor, and therefore with more focus on supporting this, so mentors engage and stay engaged. The design of accelerators needs to reflect this understanding that they reward mentors with social validation, tie formation, and early access to novel information (see 4.5.3). As examined in the case study, to do this it is necessary to invite mentors to peripheral events, not just to mentoring sessions, and to ensure that the accelerator shares its contacts with them as well as with the cohort. This theory also explains why an accelerator should list their mentors on their website, and otherwise promote the mentors in a way that helps give them social credentials.

Reflecting this understanding of the motivation for mentors in the design and execution of programs should result both in more people wanting to mentor, and more mentors remaining interested throughout the duration of the program. Understanding the role of

Social Capital in rewarding mentoring also supports the explanation of how link reciprocity polices accelerator networks, replacing the need for NDAs. If tie formation, social validation, and novel information are the incentive for mentors to cooperate with an accelerator, then retracting these is a sanction.

7.2.2 The importance of link reciprocity to accelerators

Following on from this observation about sanction, the definition of an accelerator (see 3.3) explains how link reciprocity is used to police norms (see 4.2.3). The argument being made in this thesis is that reputational sanction carries more weight than the threat of being sued, or other forms of non-reputational sanction. This is a product of, and is dependent on, an accelerator having a weak network architecture and strong bonding Social Capital. It also relies on accelerators understanding if they are not generous with the value they create then they have nothing to threaten to withdraw, and they lose their ability to police norms.

Whilst the point is made in relation to NDAs, it has more implications. The context relating to NDAs is used to demonstrate the validity of link reciprocity, but it relates much more widely to how norms can take the place of rules, and social sanction can be used to police the complex and varied interactions that take places within an accelerator. This is intrinsically linked to how accelerators achieve an environment with high levels of trust, which are essential for mentoring and peer support.

Therefore, understanding link reciprocity should enable accelerator managers to ensure their network architecture is able to communicate reputation in this way. It also emphasises why it is necessary to share the value of an accelerator widely and reward co-operators, because this develops the Social Capital that is used to police its norms in the form of the accelerator's ability to grant or restrict access to that value.

It is also important in the design of accelerators because mentors who naturally understand this will be put off if they are asked to sign contracts, and those contracts will in most cases be very hard to enforce. Once trust, link reciprocity, and Social Capital are replaced by contracts, the whole nature of the social network underlying the accelerator is changed. It no longer uses Social Capital as its primary currency, and no longer champions trust within the network. This would undermine most of the other aspects of the accelerator, and rapidly such a program would rapidly cease to look, feel, or operate like a conventional accelerator.

7.2.3 Weak ties are important to accelerators

This thesis has focussed throughout on the role of weak ties and bridging ties to support innovation (see 2.2.1.3), and in the structure and design of accelerators in particular (see 3.2.2). Bridging ties are a source of novel information and it is mainly weak ties that can be bridging ties (see 2.2.1.4). Understanding the role of weak ties informed how EyeFocus went about finding startups and mentors, consciously using increasingly

the use of weak ties to bridge out of its own network to find new people not previously known to the managers (see 5.5.1).

Therefore, accelerator design should reflect the need to build a network rich in weak ties. This particularly relates to the mentors and to the cohort, but also to decisions shaping who the sponsors and partners of a program are.

Understanding weak ties is of particular relevance for programs started by corporations or government agencies, which risk building mentor networks only from their immediate, strong tie network with the majority of mentors sourced from their corporation, or only from within other government networks. This can be a result of risk aversion, wanting to retain a close group of vetted or known people perceived to be 'safe,' or because the organising entity itself lacks a diverse weak tie network.

Even if such a mentor group initially appears to a new cohort to consist of weak ties with novel information, simply because they have not met the people before, it will rapidly cease to offer the benefits of a diverse weak tie network and suffer from decay more quickly (see 2.2.3.3). A strong tie mentor network will have a high level of redundant information existing between the actors because they share similar contacts and knowledge. Therefore, the cohort will rapidly find themselves being offered the same information and introductions as they meet the different mentors.

Being able to explain the structure of a mentor group in terms of weak ties, and to explain why accelerators need weak ties should make it easier for accelerator managers to explain to funders and sponsors why a mentor group has to feature people from

outside their core networks, even if this means opening it up to people deemed to be less 'safe' because they are less well known, or even to be competitors.
Ironically, a larger network featuring more weak ties may feel riskier because it lacks a sense of being controllable and managed, but with more strangers and higher bridging Social Capital the network should become safer because norms and link reciprocity will take over from rules and control as a means of protection and sanction.
Therefore, if a program is backed or established by a single corporate or government agency it will be necessary to bring in other companies and organisations, either as co-sponsors or as partners in order to create the weak ties and weak network architecture needed for the cohort to benefit from the program as described in this thesis.

7.2.4 Ecosystems are important to accelerators

The author of this thesis has identified that accelerators need to exist within ecosystems and can support building and maintaining ecosystems (see 3.2.10).

This therefore suggests that if an existing ecosystem does not exist it will be hard to launch an accelerator. Consequently, work may be needed to connect the basic parts of an ecosystem first, which can then be used to prime the accelerator. Thereafter, the accelerator can help develop and sustain that ecosystem.

This was observed in running EyeFocus, which existed both within the tech and the eye-care ecosystems, and connected the two as a result (see 4.4.8). At the early planning

stage, it was decided to locate EyeFocus in Berlin, within the existing tech ecosystem. However, a coherent eye-care innovation ecosystem did not yet exist, so the program had to find and engage with a large number of partners and sponsors in order to create an ecosystem that could provide the mentors and weak ties required to create value for an eye-care specific cohort.

Plans for new accelerators should map out the ecosystem that exists around them, and the ecosystem it would need in order to offer enough support to its startups to justify their involvement with the program. If that ecosystem does not yet exist, work will be needed prior to the program to build out the ecosystem. Conversely, helping build and support the ecosystem is an added benefit of the program to those supporting it and should be expressed clearly to those who might support the accelerator.

7.2.5 Investment can obstruct ecosystem building

This thesis has explored the role and benefits of investing into startups via an accelerator (see 2.3.4), concluding that, in general, only deal-flow makers should use investment as their primary source of profit, and only then when they are based in very developed ecosystems (see 3.2.16). Investment was seen to have a powerful influence over the selection process of accelerators, and it was suggested that this can undermine efforts to achieve other outcomes, such as building an ecosystem or supporting social impact outcomes (see 6.2.6).

Reflecting this, the development of the Associate status in EyeFocus created the opportunity to accept into the cohort companies that were interesting and relevant to the sponsors and wider ecosystem but were not necessarily suitable companies for the very specific investment being offered by the program. This example demonstrated that there are other ways to recruit startups into a cohort which avoid investment being the primary filter.

If an accelerator is more interested in building an ecosystem, supporting social outcomes, developing wider economic or social outcomes, or identifying interesting innovation, then investment potential may be the wrong filter by which to select startups. Systematic investing on similar terms also puts off companies not directly interested in a small equity investment, or interested in giving away equity.

For an ecosystem builder accelerator, as defined in this thesis, it may be preferable to accept a larger number and wider range of participants into a cohort. Their relevance to the ecosystem, or other interests of the program may provide a more appropriate filter than investment potential. The selection process can then focus on creating a best in class cohort, which attracts the other stakeholders in the ecosystem more effectively than letting selection become dominated simply by an applicant's ability to realise a return on investment.

If the accelerator is not primarily a deal-flow maker, then it is therefore recommended that investment should be seen as optional, and dependent on the desired outcomes of the accelerator. It should be made on a case by case basis, and not be a requirement for participants to join the cohort.

7.2.6 Creating different categories within a cohort supports ecosystem building

Related to the discussion about whether an accelerator should invest, an emergent strategy that developed during EyeFocus was the creation of Associate status. This allowed a larger number and greater variety of companies to join the program, which increased the value in terms of non-redundant information and ecosystem building (see 6.2.8). In particular, it identified a means whereby startups could join the cohort without receiving investment.

Overall, the Associate strategy was a deemed a successful innovation. It enabled EyeFocus to avoid having to reject applicants simply because it had limited resources to invest, and allowed the program to form a more interesting and varied cohort, as a result of the ability to present more novel, non-redundant information to those who were cooperating with it. Therefore, by having a larger and more diverse cohort, still the outcome of a selection process, EyeFocus was able to offer more value.

Involving Associates to some extent changed the nature of the program away from looking like a traditional deal-flow maker accelerator, with a small cohort of companies that had received investment and were attending the program full time. In its place, there were a mix of companies, at very different stages of development. This impacted on, for example, the idea of a traditional demo day in which the cohort would all be pitching for investment. This mixed cohort would clearly be at very different stages, and requiring very different outcomes from something like a demo day .

Consequently, the program resulted in a more effective scouting exercise which identified the best in class eye-care innovators, with the focus being on eye-care rather than on their stage of development, financial position, or location. This was seen as beneficial for the sponsors, partners, and mentors, as well as for the cohort. For EyeFocus it also led to greater social impact outcomes, in that it was creating value for others (the Associates) without directly gaining value in return because it had not invested in the whole cohort. This was not considered a problem for the founders, but is a useful observation about the outcome of a change to the traditional format of the accelerator.

7.2.7 Accelerators protect startups using Social Capital and link reciprocity

This research identified that accelerators have a role in conferring status and Social Capital on the startups in their cohort (see 6.2.7), which along with the link reciprocity they develop due to their network structure, means they are able to protect the startups.

Understanding both this role, and how it is realised should inform accelerator design by examining whether that particular accelerator network will sit within a weak network architecture, and incorporate enough Social Capital that it can protect its startups in this way. Without being rich in Social Capital and therefore able to reward co-operators, it will lack the ability to police norms (see 7.2.2).

Being able to communicate this to startups as part of the value offering may also help explain the wider value of an accelerator, beyond the tangible aspects like finance and office space. Understanding and explaining this also helps establish clearer norms within the accelerator's network.

7.2.8 Online mentoring supports greater value creation and ecosystem building

5.5.4 and 6.2.9 examined how EyeFocus developed online mentoring as a core strategy in the program. This allowed the mentor network and wider ecosystem to consist of the best people, regardless of their location. This was observed to be particularly important when building an ecosystem around a very niche sector, like eye-care. In this case there were specific people and organisations without which the ecosystem would have been noticeably lacking, whereas in a generalist accelerator there are multiple actors who can fill general roles.

Online mentoring was shown to require a considerable amount of experimentation and effort on the part of the accelerator team. However, this experiment suggested that online mentoring considerably increases the ability of the accelerator to build a large weak tie network, supporting the many findings in this thesis about the importance and value of existing within a weak network architecture, and being rich in bridging ties (see 3.3).

One observation is that online mentoring is clearly not as preferable as mentoring sessions in person, and may reduce the extent of involvement by a mentor or partner. However, even if an online interaction only results in the transfer of one piece of useful information, or one network tie being established, this is a good enough outcome to support the approach. In particular, in terms of building an ecosystem and establishing weak ties, online mentoring could be argued to offer more value because the fact that the person is not physically present implies they are geographically distant, and therefore more likely to be a weak tie with potential to bridge into their immediate network and ecosystem.

7.2.9 Fixed term programs relate to the decay of non-redundancy

The discussion in 6.2.10 argued that a reason for fixed term programs is to address the problem of the decay of non-redundant information, whereby weak ties decay or become strong ties, and consequently the accelerator's potential to maintain a flow of non-redundant information declines. If this non-redundancy and novelty is the source of value in an accelerator, then over time decay diminishes the value to those involved in the accelerator.

It was proposed that decay in accelerator networks might explain why they tend to be 3 month programs (see 6.2.10). If the value created by an accelerator is embedded within the weak tie nature of its network, and consequent ability to facilitate the flow of non-redundant information, then as those weak ties decay, the value would diminish.

The other reasons for a program lasting 3 months were tied to available funding, and the ability of a cohort and management team to sustain a bootcamp style program for any longer. Both of these proved to be the case with EyeFocus.

EyeFocus gave insights into this set of ideas. Firstly, the funding raised corresponded with a program of 3 months. Secondly, it was the case that after about 2 months it became increasingly harder for the management team to generate value through novel interactions. Towards the end of the program, whilst it was not the case that every mentor had met every startup, it did appear that most interactions that were going to happen had already happened.

In particular this made it hard for the accelerator team to continue to create novelty on a regular basis, in the form of interactions that would generate new knowledge, contacts, or information. Increasingly, startups became less interested in attending activities organised by the accelerator, suggesting that the non-redundancy in the network built by EyeFocus was decaying for them, in that it was delivering less novel value. This supports the argument above that non-redundancy within a network of the average size of most accelerators has a time limit before it decays, which may be around 3 months.

This question requires more research that is beyond the scope of this thesis, but raises interesting questions around decay of ties and non-redundant information over time within a defined network (see 7.3.5).

7.2.10 Value resides in the cohort and non-redundant information

Understanding how value is created specifically by providing early access to novel, non-redundant information needs to inform how accelerators are designed. It forms part of the discussion above about decay and program length, because without this value the accelerator would gradually cease to offer the Social Capital outcomes that attract the various stakeholders.

This also informs how the various stakeholder groups of the accelerator are selected and structured, arguing that each should consciously be a source of novel information for the others. For this, the accelerator needs to strive for diversity wherever possible, and beware of groups of strong tie contacts.

Therefore, this informs accelerator design by pointing to the importance of creating a network that can generate novel and non-redundant information, both for the cohort from the mentors and partners, and for those stakeholders from within the cohort. Without this function, the accelerator will not be valuable to its stakeholders, even if it provides a useful education and training program.

Each aspect of the accelerator's network should therefore be examined to ensure it can achieve this outcome, and this is informed by other findings from this thesis relating to weak ties, and the network structure outlined above (see 3.3).

7.2.11 Focussed programs

The previous chapter examined how the literature had argued in favour of more focussed accelerator programs (see 6.2.12), and EyeFocus was established to test the effectiveness of a very focussed accelerator. Aims included running a program that was not competing with more established accelerators, and testing the idea that a very focussed program could offer benefits to the stakeholders.

EyeFocus demonstrated the potential of a very focussed accelerator in a number of ways. It built a new ecosystem that brought together eye-care startups, large ophthalmology organisations and companies, and the tech sector (see 4.4.8). This suggests that an accelerator is well suited to build ecosystems, but also that a very focussed accelerator can be a catalyst in connecting a niche industry vertical in which all the main stakeholders are easily identified and can be connected together in this way.

Another indication that this approach was successful was that startups joined EyeFocus Accelerator after having already completed other respected accelerator programs. This argues that the specific value EyeFocus offered was different to that of a generic accelerator, or a technology specific accelerator. In particular, this suggests that startups joined EyeFocus specifically to access the network it had built, having previously attended accelerators that specialised in, for example, hardware or mobile technology. This argues for different benefits from technology specific programs, which can offer support around the product, and vertical programs that can offer support

around market access, networks, and knowledge. They therefore complement each other rather than compete.

EyeFocus was referenced in the tech media alongside mainstream global and European accelerators (Bone et al. 2017), suggesting it managed to join their ranks, rather than competing at a disadvantage. The fact that so many startups (see 8.3), mentors (see 8.2), and partners (see 4.4.8) were involved with EyeFocus suggests they found it valuable.

Therefore, the experiment of EyeFocus, along with the findings of the literature review, argue in favour of establishing very focussed programs as a complement to the more established general accelerators, but also that very focussed programs should understand that the value they bring startups may be more about the network they build than with more general programs.

7.3 DEFINITION OF AN ACCELERATOR USING SOCIAL NETWORK THEORY

7.3.1 Detailed Definition

The thesis has so far developed two different definitions of an accelerator. The first was based on literature about accelerators and described what an accelerator does(see 2.4.1), the second introduced elements of Social Network Theory to describe the network structure and characteristics of an accelerator (see 3.2.17). These are brought together here to provide a final definition that reflects the accelerator as both a business support program and a social network.

Key aspects are outlined below:

- An accelerator is a fixed term program consisting of support provided to a cohort of startups primarily by mentors.
- The accelerator should consist of a dynamic network that has strong ties with a high level of closure, or density, at the core, set within a weak network architecture rich in weak and bridging ties.
- That core consists primarily of the cohort and management team. The high level of closure allows it to establish the accelerator's norms. These norms are communicated through the weak network architecture of the accelerator network.
- The cohort are recruited through a selection process to create a best in class that is validated by the accelerator. This pool of novel information becomes the value

embedded within the accelerator, as Social Capital, which is used to attract and reward the other stakeholders.

- The cohort allows the accelerator to create efficiencies in how support is delivered to the startups, and in how the startups are presented to the other stakeholders.
- The accelerator creates value by facilitating the flow of non-redundant information, and bridging structural holes. This value, being embedded within a social network is Social Capital.
- The accelerator network is rich in Social Capital, which translates into trust because its actors are confident of returns due to it being embedded in a weak network architecture that communicates reputation effectively.
- The other source of novel information, and the main source of weak ties, are the mentors, who are rewarded primarily with this Social Capital, in particular equating to social credentials, new ties, and early access to novel, non-redundant information.
- The accelerator supports and protects the cohort by conferring on them its Social Capital and status. This enables startups potentially weak in Social Capital and status to seek support from high-value actors in the network, who are subsequently rewarded with the Social Capital embedded within the accelerator's network.
- The high level of novel, non-redundant information and ties embedded within the accelerator's network are valuable to those engaging with it. Consequently, the norms of the accelerator can be policed using link reciprocity, whereby that

value can be withdrawn as a sanction. Tie formation is the accelerator's reward, rather than payment; tie dissolution is its sanction, rather than contract dispute.

- The accelerator network needs to start out rich in weak ties and non-redundancy because these will inevitably decay over time as the accelerator facilitates the flow of novel information over the structural holes it bridges. As it connects people together and they share information, tie decay will see some of those relationships dissolve, whilst others will form into strong ties, and non-redundancy will decay along with the weak ties.
- With less novel information to share, and therefore decreasing Social Capital, the accelerator becomes less able to police its norms effectively using link reciprocity because the threat of sanction through tie dissolution diminishes along with the reduction of novel information that flows over those ties. It will also have less Social Capital with which to reward people, so it will become progressively less valuable to its various stakeholders. This decay is a reason why the program has a fixed term, and potentially why so many accelerators run for 3 months.
- The skill used to operate in this network involves developing complex role and status sets because the network is diverse, and founders need to communicate their business to a wide range of people, including investors, employees, customers, and advisors. This is reflected in a focus on pitch training, which develops this skill and the founders' cognitive flexibility.

7.3.2 Shorter Definition

An accelerator is a fixed term program that supports a cohort of startups. It consists of a dynamic network that has strong ties with a high level of closure at the core, set within a weak network architecture rich in bridging ties. It creates value by facilitating the flow of non-redundant information across structural holes, using the weak ties in its network, who are primarily the mentors. These mentors are rewarded with Social Capital, which is the main currency of an accelerator, its value being embedded within its social network. The norms and rules of an accelerator are policed using link reciprocity, which relies upon the social network being dynamic and rich in Social Capital. In this way, the accelerator supports and protects its cohort by conferring upon them its own Social Capital and status. Over time, the ability of the accelerator to facilitate the flow of non-redundant information decays, and weak ties dissolve or become strong ties. With this decay in non-redundancy the value embedded within the accelerator declines, as does its ability to police norms through link reciprocity. At this point the program ends, and the cycle begins again with the next cohort.

7.3 FUTURE RESEARCH RECOMMENDATIONS

7.3.1 Longitudinal study of an accelerator

This research studied one accelerator for a relatively short period. This demonstrated the potential of researching accelerators live and in situ. It would clearly be valuable to research an accelerator program from the birth of the idea through to long after the program has closed, and through multiple programs, including monitoring the longer-term impact of the startups into the future.

This would require more resources than existed in EyeFocus or for this research thesis, potentially requiring a university to partner with an established accelerator company, with funding for a researcher to spend 9-12 months embedded within the accelerator company full time, and for this to be repeated over multiple years.

7.3.2 Greater overlap between academia and business

It would be attractive for more people to bridge academia and business in the ways explored in this thesis. It appears that very few of the people running accelerators are also involved in researching them, and equally few academics researching the topic are also employed professionals in this field. This gap between academia and business also runs the risk that academic research is effectively out of date by the time it is published,

and therefore does not influence the business of accelerators because the practitioners are already working on the next iteration of the business. Consequently, it is likely that the businesses inform the research, but the research does not inform the businesses. Ideally the research could inform accelerator design more than it does.

This partly reflects the point above, suggesting that academics are embedded within accelerators for the duration of their business cycle, also that research is processed and published fast enough to keep up with the rapid iteration of the accelerator business sector.

7.3.3 Larger data sets

The literature, and this thesis, observed that there is very little data about accelerators. Addressing this should become a joint effort between academia and business, with the former working more closely with accelerators, and the latter attempting to find ways to share data more readily. This cooperation would lead to a better understanding of what does and does not work, and how better to develop accelerators into the future. In particular there is a need for large data sets developed over longer periods of time.

7.3.4 Use of network mapping software

This research was carried out by an entrepreneur not a data scientist. Therefore, it does not feature any attempt to use mapping software to map the nodes and ties, and interactions of the social network built around EyeFocus.

It would contribute considerably to the understanding of accelerator outcomes to use software that can map and analyse social networks to track the interactions of an accelerator from its inception through to as long after it closes as possible. This will provide valuable insights into the types of interactions happening within the social network that is built, and identify when and how value is created.

As observed in this thesis, it is likely that many outcomes of bridging ties created by an accelerator will occur long after the program has finished, and therefore not be tracked. A longer-term study also involving network mapping software might be able to capture more of these outcomes, and also capture outcomes resulting from bridging ties developed over multiple degrees of separation in a network. This means if the accelerator introduces a startup to a mentor, who introduces a contact, who introduces a contact, who introduces a contact that leads to an outcome it might be possible to map that. Such outcomes are rarely observed as originating from the original introduction, or reported back to whoever made that introduction.

7.3.5 Understanding ideal timeframes

This thesis has suggested that there is a link between accelerators generally running for 3 months and the timeframe over which the number of mentors and number of startups engage once, and thereafter experience a decay in the non-redundant information those interactions produce.

It is likely that an accelerator needs to run for long enough for the core to develop a high level of closure. The program also has to last long enough for the cohort to make initial contacts with the mentors, and then for the mentors to make further introductions. This leads to the exponential effect that dramatically increases the scale of the cohort's networks.

However, at some point all the actors in this new network will have met, exchanged their non-redundant information, and decay will set in, seeing many of the connections deteriorate, whilst other weak ties will evolve into strong ties. At that point the accelerator ceases to offer non-redundancy to its stakeholders. What emerges is also beneficial, but in a way different to that of an accelerator. Close friendships, strong ties, and highly trusting networks are good for getting things done (see 2.2.2.4). But this network is no longer about novel information and non-redundancy, and is therefore no longer creating the value expected of an accelerator.

It would also be valuable to understand better the statistics that emerge when measuring the number of interactions between a cohort and a group of mentors over

time. How long does it take for an optimum number of interactions to happen, and at what point does value start to decrease?

It would be interesting for further research to try to define what these ideal timeframes are, and social network mapping software may be able to contribute to that. An evidence-based investigation into this question, based on mapping the networks that develop, and seeing how and when they transition from weak to strong tie, and cease to introduce non-redundant information would prove valuable to the future understanding of accelerators and other activities rooted in social networks.

7.3.6 More funding is required

Most of these recommendations primarily require funding more than they demand any novel expertise, so it would be interesting for the more affluent funders of accelerators, and for public sector funding in this space, to consider how such research could be built into accelerator budgets so they can work more closely with universities to shed more light on this still relatively new sector.

7.4 SUMMARY

This thesis has examined accelerators as business support programs, and then used Social Network Theory to understand the underlying structure and behaviour of accelerators as social networks. This research has identified that accelerators are in fact complex social networks that need to have the right structure and behaviours to deliver the practical outcomes sought from accelerators.

Based on the findings of this research, conclusions were able to form recommendations about how accelerators should be designed, pointing to the value in understanding the underlying social network, and the behaviours and dynamics embedded within that social network.

Further work is recommended in better understanding the nature of accelerator social networks, including mapping the networks using software, so outcomes can be more accurately tied to the structure of the social network.

Having an understanding of how Social Network Theory describes accelerators should enable those designing them to do so more effectively, ensuring that the accelerator is rich in weak ties and Social Capital, can police its norms using link reciprocity rather than contracts, continues to provide high levels of non-redundancy, and ends when that inevitably starts to decay.

8. APPENDIX

8.1 DESCRIPTION OF THE EYEFOCUS PROGRAM

This section presents a description of the EyeFocus accelerator program, along with evidence and data produced through the activity of developing and running the accelerator.

The chapter is intended to offer a descriptive narrative of the program, and to present some of the evidence it produced. Not all of the evidence and narrative is necessarily relevant for this thesis but is presented here also for the future study of accelerators, as outlined in the aims and objectives.

Within this chapter, some analysis is combined with the narrative in order to show the emergent strategies that evolved during the program. Where theory helped inform how the program was designed, emergent strategies adapted that design when the theory led in practice to unpredictable outcomes, as happens with a fast-moving business.

Figure 5. EyeFocus Accelerator team, mentors, and startups in Rainmaking Loft on launch day

EyeFocus Accelerator in summary:

- Identified over 90 startups around the world innovating in eye-care
- Engaged with startups from over 20 countries
- Supported 16 companies from 13 countries on the program
- Invested in or funded 5 companies
- Worked with 57 mentors from 18 different countries
- Organised 161 direct mentoring interactions
- Ran 44 partner events

Weekly Program Activities

This section describes the activities of the accelerator program, outlining both the curriculum and engagement with mentors, partners, and sponsors. This adds colour to the theory outlined above and is intended to give an insight that is more detailed and rich than a purely statistical analysis. It is intended that this section will give a context to the theory outlined in this thesis, but also provide a resource for future research.

Week 1 - Berlin Launch week

The first week of EyeFocus saw 11 startup teams from 10 countries flying in to Berlin for an intensive program of activities. This gathering of the cohort mixed startups attending the full program and associates, some of whom only attended for this first week. This reflects the aim to create closure within the core of the network, especially between the cohort and management team.

EyeFocus arranged a visit to Fraunhofer Institute, a program partner, who gave a presentation on intra ocular lenses and explained how the Institute could work with the startups to carry out research and development.

A private event was organized just for the lead sponsor, Bayer, with over 50 senior executives from Bayer Health Care Global, who flew in from around the world, and hosted by Dr Rafiq Hasan, Vice President and Global Head of Ophthalmology at Bayer, and Richard Condon, Business Unit Head, Specialty Medicine UK, Bayer. The 11 startup teams presented their concepts to the Bayer group. Bayer also had a chance to look

around Rainmaking Loft and learn about Berlin's leading startup co-working space. This formed part of a longer series of events at Bayer held in Berlin that week as part of their annual global meet up.

The week also included the core of the taught curriculum, with taught workshops on Lean Startup, Design Thinking, pitch training, and an introduction to the startups about the rest of the program. The week also included some intensive speed mentoring sessions, for which mentors had flow into Berlin from London and Paris.

At the end of the week EyeFocus held a public launch party at Rainmaking Loft. Invitees included EyeFocus mentors and partners, and people from the wider Berlin startup sector. The party was attended by sponsors and their employees along with around 80 guests from across the Berlin startup and healthcare sector. This was an unusual opportunity for EyeFocus sponsors to meet the wider Berlin digital health and startup ecosystem, reflecting the value attached to ecosystem building by the accelerator, and creating value as a junction between different stakeholder groups.

Week 2 – Berlin

Partner visit: OptecBB, mapping the optic scene in Berlin

Optech Berlin-Brandenburg is an industry group for companies and academics in the eye-care and optics sector from the Berlin-Brandenburg area. The EyeFocus cohort met 12 academics, startups and clinicians from the OptecBB network with an interest in eyecare. This session introduced EyeFocus to the founders of Frame Punk, a young Berlin-based startup focusing on producing eyewear using innovative methods, who

consequently moved into the accelerator space so EyeFocus could help them network into the startup and eye-care community. The event also identified a new mentor who joined the accelerator mentor group.

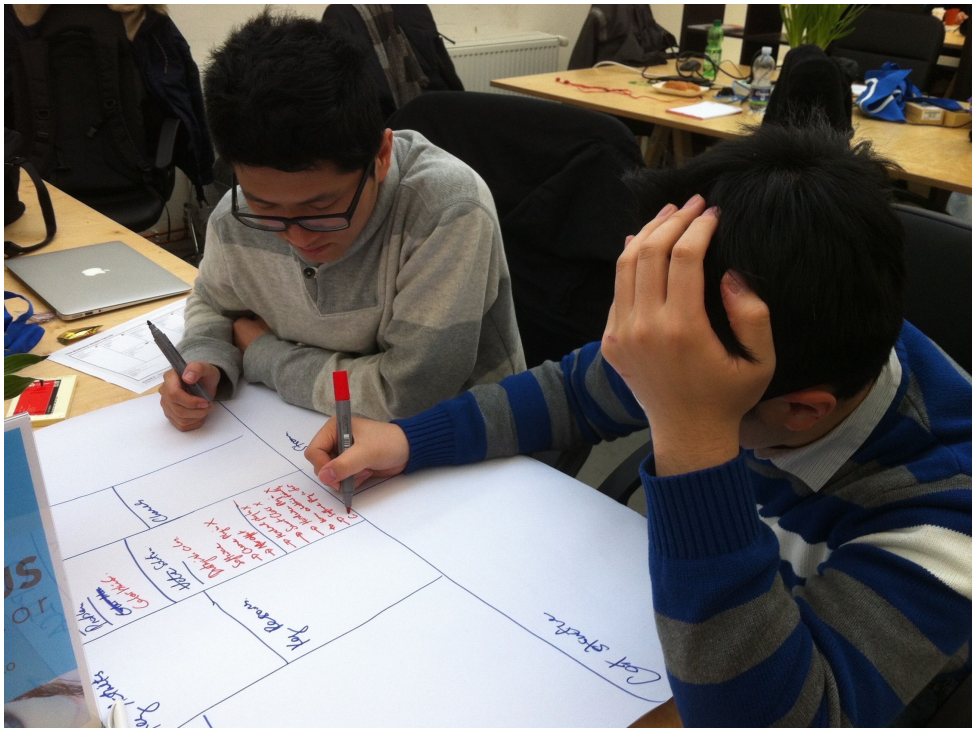


Figure 6. An associate team learning about Lean Canvas during a workshop

Goodpoint Fellows Workshop 1: finances

Marta Führich. MD of Goodpoint Fellows, and EyeFocus Mentor, offered to organise 3 workshops to teach the cohort how to manage their finances effectively. EyeFocus also invited other Rainmaking Loft tenants to attend the workshop, sharing the value with the wider startup community, and developing the Social Capital of EyeFocus.

Berlin Startup Consultants: accessing public funding

Darius Moeini, MD of Berlin Startups, gave the EyeFocus cohort a private session on the German and EU public funding landscape. This was of particular relevance to Mr Patch and Blindsense, who consequently both made applications to sources of German funding to help support their product development and keep their teams in Berlin.

Week 3 - Berlin

Visit to Zeiss, Berlin

EyeFocus arranged a half-day visit to Zeiss's headquarters for Surgical Ophthalmology in Berlin. The event was joined by Jan Willem de Cler, Senior Vice President Surgical Ophthalmology, to give an in-depth explanation of his department's priorities and how they handle innovation in a large corporate setting. The startups pitched to a group of Zeiss executives from across R&D, Ophthalmology, and other teams, who gave feedback on their products and how they might fit within the innovation agenda at Zeiss. The visit also included a tour of the factory facilities to learn about how intra ocular lenses are produced.

Opt Retina: Founders' stories

Mark Ruiz, CEO of Opt Retina, visited the accelerator to talk to EyeFocus startups about his experiences founding an eye-care technology startup, including some of the issues and frustrations he encountered along the way. Mark also provided individual mentoring to each of the startups.

Week 4 – Visiting London

The week in London was arranged early in the program in order to allow the cohort to meet people and have enough time in the program to follow up and engage with them. The aims of the visit were:

1. To present EyeFocus to the London startup and eye-care sectors
2. To arrange visits to key partners, and arrange mentoring sessions
3. To expose the startups to an important startup and eye-care ecosystem
4. To build out the weak tie networks of the startups in a different geography, so they were not restricted just to contacts in Berlin

KPMG tax & startups workshop

The week started off at Rainmaking Loft London, sister-location to EyeFocus's home in Berlin, where the startups met with tax, medtech and startup experts from KPMG's High Growth Tech Group. The cohort were given an overview of the London tech scene and how they can access support from KPMG. This was followed by a thorough grounding in UK tax law relevant to startups, as well as a Q&A. The session ended with one-to-one meetings between KPMG staff and startups, in which our companies could get more in-depth advice on how to operate within the UK.

Whilst at Rainmaking Loft, the cohort had a final pitch rehearsal for the investor event at Bloomberg that evening. Startups were told they had to attend this pitch training event or they would not be allowed to pitch to the investors later. This was to protect both EyeFocus, and the cohort, by ensuring the pitch standard was consistently high.

Bloomberg pitching event

Bloomberg ran a small number of private startup pitch events for their investor network. EyeFocus was the subject of one of these evening events. The event attracted an audience of 25-30 investors, ranging from Angel to VC investors, and including some of the leading impact investment funds and advisors. The pitches received excellent feedback from attendees, including a VC partner who said these were the best pitches he had seen at a Bloomberg event. The pitching was followed by networking drinks, where the startups had the opportunity to discuss their products in more detail with guests.

The event was a valuable opportunity to showcase the work of EyeFocus startups to some of the UK's investors, as well as to network with the London tech investment community.

Professor Chris Dainty – Moorfields and UCL

EyeFocus spent a morning with mentor, Professor Chris Dainty, at Moorfields Eye Hospital and the Institute of Ophthalmology, UCL. Professor Dainty bridges academic, clinical, and commercial work in eye-care, being both a professor at the Institute of Ophthalmology, and working for Cambridge Consultants, one of the leading technical R&D.

At this event, the cohort pitched to give an overview of their businesses, and had in-depth discussions with Professor Dainty. The feedback each received was insightful and

practical, with many of the startups getting direct advice and contacts to take their projects forward.

Professor Dainty has particular expertise into mobile phone camera technology, which was invaluable for our startups developing diagnostic tools on mobile devices.

Moorfields Eye Hospital & University College London

EyeFocus startups met with senior figures from UCL, including UCL Medtech Accelerator, UCL Institute of Biomedical Engineering, UCL Business and UCL Consultants. The event gave an insight into some of the ways EyeFocus startups might collaborate with the university on research, projects, and funding opportunities, and the different organisations and sub-groups within UCL who can help with this.

Imperial Innovations pitching & panel discussion

EyeFocus visited Imperial Innovations at Imperial College London. This event saw the startups pitching to leading figures across Imperial Innovations, with representatives from the Ventures team, Imperial Create Labs, and startups within Imperial's accelerator. The event also provided an overview of the different innovation activities happening throughout Imperial College, and the various ways they interact with startups. The cohort were able to meet Imperial Ventures, one of the world's leading investors in healthcare innovation, along with a major eye-care startup they had recently invested in.

Seedrs, Capital Enterprise, and IDEA London

EyeFocus organised a workshop with startup equity crowdfunding company, Seedrs. The event was hosted at Idea London, with Capital Enterprise and was open to all London startups. Consequently, an added benefit was meeting new startup founders and other people from London's startup ecosystem. As a result of this open invitation, and an example of how it encourages weak tie networking opportunities, EyeFocus startup Mr Patch met one of the few Vision Therapists working in behavioural optometry, who went on to become a co-founder in her company.

RNIB visit

On the last day in London, EyeFocus visited RNIB (Royal National Institute for Blind People) one of the world's oldest and most renowned charities supporting people with sight problems, which provides support and advice to the two million people in the UK suffering sight loss.

EyeFocus teams gave pitches to and received feedback from the leading experts in sight loss services at RNIB. The event included a tour of RNIB's building and shop, providing a rare example of an office building designed primarily for blind people, and to see the types of products already on the market for blind and visually impaired people. This forged links between EyeFocus startups and RNIB or future engagement, product development, and networking.

Networking drinks party

On the last evening of the visit to London EyeFocus ran a drinks party at an art gallery in the East End, near Silicon Roundabout. The EyeFocus team, mentors, and cohort invited their friends and contacts from the London tech ecosystem. The event was designed to be open, and was promoted on various London tech newsletters, and through the EyeFocus network. This positioned EyeFocus within the London tech ecosystem, and created further weak tie networking opportunities.

Week 5 – Berlin

Goodpoint Fellows 2

Marta Führich joined EyeFocus for the second of her workshops designed specifically to support startup development and management. In this session, she focused on how to get investors on board and how to keep them, as well as how to choose the right people to support startups. The workshop furthered the startups' understanding on how to manage their finances.

Naked Angels Club

EyeFocus were invited to present to a group of Angel Investors. The session was organised by Tobias Wittich, Managing Director, Rainmaking Loft.

Week 6 - Berlin

Berlin Partners Workshop

Berlin Partners are Berlin's inward investment agency. Representatives of Berlin Partners covering e-health, medtech, and funding joined EyeFocus for a session

highlighting some of the ways Berlin Partners can help the startups relocating to Berlin after the program. Consequently, DB Glove arranged further meetings to talk about grants in Germany; Mr Patch was introduced to the Neuroscience department of Berlin Frei University; and Blindsense received help to apply for visas. This is an example of EyeFocus using its status and Social Capital to support startups. This meeting was more efficient for all involved than each startup having to find out about Berlin Partners.

Buildit Accelerator co-hosted event

EyeFocus hosted a delegation from Buildit Hardware Accelerator in Estonia for two days of workshops and events in collaboration with Berlin Hardware Accelerator. It is unusual for accelerators to work together in this way, but because EyeFocus was so vertically focused it was not competing with other accelerators and could therefore act as a neutral junction between them.

The events with Buildit were an opportunity for EyeFocus startups to interact with others working in the hardware space. The event attracted external mentors, workshops, and networking at the hardware startup space Betahaus, Rainmaking Loft, and over meals, thus increasing the weak tie network around EyeFocus.

During the event EyeFocus met a new startup, Batsuit, which was working on an eye care technology at Berlin Hardware Accelerator, and consequently joined EyeFocus as an Associate. During the first meetings, Batsuit met one of EyeFocus's visually impaired founders, and other experts, who helped the founder focus his product market fit.

Week 7 - Berlin

IoT Accelerate

EyeFocus supported a group of its startups to enter the IoT Accelerate competition in Berlin, taking place at Rainmaking Loft Berlin. The competition - sponsored by Google, Ericsson, and Application Developers Alliance - was highly competitive, but 3 of EyeFocus's teams competed and DB Glove as awarded the first prize, winning 20,000 Euro and a fully funded trips to several major conferences.

Impact Hub Anniversary Event

EyeFocus took the cohort to the one year anniversary celebration of Impact Hub Berlin, an innovation centre for social and sustainable entrepreneurs, and part of a global network of Impact Hubs. This was an important networking opportunity for EyeFocus startups, as most of them are working on social causes, so it was important for them to be plugged in to the Berlin social innovation scene.

Week 8 - Berlin

Startup Confessions

A group of EyeFocus startups were given complimentary tickets by EyeFocus partners Berlin Startup Consulting to the monthly event "Startup Confessions". The event is primarily a networking opportunity, with guests including startups, and experts across fundraising, tax & auditing, strategy, and beyond. The purpose is to support startups with advice and expertise to overcome any challenges they're facing, and is a key regular event in the Berlin entrepreneurship calendar.

Founders' Stories: Melissa Nicci

'Founder's stories' was developed in the EyeFocus program, inviting other founders to tell their story so EyeFocus startups could learn from these lessons. For this event, EyeFocus was joined by Melinda Nicci, Founder & CEO of Baby2Body. As an entrepreneur in the digital health industry, Melinda experienced similar challenges to those being faced by the startups: building a team, getting an MVP ready, marketing, and fundraising. Melissa was able to offer the teams significant insights into some of the key hurdles faced by early stage entrepreneurs.

IXDS Design Workshop

EyeFocus was joined by Berlin design agency IXDS for an in-depth workshop on user-centred service design. The startups were led through a series of exercises focussing on understanding the needs of their target user groups and analysing all aspects of service touch points. Using a tailored version of their Academy programme - normally run over the course of weeks with large multi-national companies - the IXDS team equipped the EyeFocus startup with practical tools to support the design process.

Week 9 - Berlin

European Health Innovators Networking Lunch

EyeFocus startups were invited to a health tech networking lunch co-organised by Tehnopol, an Estonia-based science & business park, home to over 180 companies which was visiting Berlin. Tehnopol was connected to EyeFocus via their founders and MDs. The lunch was a valuable opportunity for the startups to meet other

entrepreneurs working in the healthtech space, and to connect to some of the most exciting startups coming out of Estonia.

ConhIT Conference & Startup Showcase

EyeFocus were invited to participate in the annual Connecting Healthcare IT Conference 2015, a leading international health & technology conference. An EyeFocus Startup was invited to pitch in the Startup Showcase organised by Berlin Partner, a partner of EyeFocus.

Online session with Dr Thulasiraj Ravilla

A highpoint of the program, and a strong example of what an accelerator can achieve, was a video call with Dr Thulasiraj Ravilla, Executive Director of Aravind Eye Care System, and an acknowledged thought leader in eye-care innovation globally. Dr Ravilla had offered to mentor for EyeFocus, but is based in India. After considerable planning, a time was booked and special software shared in order for him to meet the EyeFocus teams online.

Eight EyeFocus startups joined the video conference, where Dr Ravilla gave an overview of his work, as well as some of the key innovations coming out of Aravind. Teams were given insights into the Indian eye-care market and how to ensure they create products with this huge market in mind. Startups also pitched to Dr Ravilla, and were given personal feedback on their products. After the call, several of the startups received detailed one-to-one follow up support from Dr Ravilla, who is advising them on the Indian market & the viability of their products in this region.

Aside from the knowledge and insights, it was a high point of the program to meet a world leader in eye-care innovation, offering inspiration to the teams. This was an example of EyeFocus using its high level of Social Capital in the wider eye-care ecosystem to create a direct link between startups and a world leader in his field.

Pro Retina

EyeFocus met representatives from Pro Retina, the German patient self-help group for people with retinal degeneration. The meeting introduced EyeFocus to some key contacts in Government and the Third Sector, including the Christopher Blind Mission, an NGO dedicated to the needs of blind people.

Week 10 - Berlin

Bhavin Shah, Behavioural Optometrist

Having met him at the London event with Seedrs, EyeFocus invited Dr Bhavin Shah, a behavioural optometrist to visit EyeFocus in Berlin. EyeFocus had kept aside a budget to fly in people of exceptional interest, and with this arranged for Dr Shah to come to Berlin for a night. He explained behavioural optometry, carried out mentoring, and joined the teams for dinner. Consequently, he became a co-founder of Mr Patch, where he used his expertise and contacts to help test and launch the product in the UK market.

Goodpoint Fellows 3

Marta Führich delivered her final workshop, tailored specifically to the support and development of EyeFocus startups. In this session, she focused on how to make sensible partnership decisions, and how to work with external consultants and organisations.

Founders' Stories with Max Ostermeier, CEO & co-founder of Implandata

Max Ostermeier visited EyeFocus to speak to the startups about his experience founding a successful eye-care startup. Max has a rich and varied background in entrepreneurship, and was able to offer EyeFocus teams focused advice on different sources of finance, managing teams, and expanding in Germany and Europe.

Week 11 - Berlin

Female Founders Networking Brunch

EyeFocus organised a women-only event for the female EyeFocus founders and other female founders and entrepreneurs in Berlin. EyeFocus had an unusually high proportion of women involved in all aspects of the programme - including 37% of the mentors, 6 founders, and more than half the management team. The event included entrepreneurs from Startup Institute, Uberchord, and Carmudi. It was an interesting opportunity to gain new contacts and perspectives from the tech world, and created new contacts for the EyeFocus founders. Using a non-sector theme for an event creates new weak tie links. In effect, women founders, or any similar theme, cuts horizontally across the usual sector verticals like healthcare or hardware, and introduces randomness in who comes to the event.

EyeFocus visits Nocti Vagus

The EyeFocus staff and cohort went for dinner at Nocti Vagus. The restaurant is staffed entirely by blind and partially sighted waiters, and customers eat in pitch darkness. The evening was a social event to develop the cohesion of the cohort, but was also a

powerful experience for the founders, most of whom are developing devices to make life better for people with sight loss but are not themselves visually impaired.

After discussion with some of the waiters, all of whom are blind, two of them visited EyeFocus to test and review some of the startups' prototypes. They spent an afternoon giving very detailed feedback on the products.

ATC Services workshop on startup tax

The startups were visited by a team from ATC Services, a tax and auditing company located in Berlin. The workshop aimed to make the German tax system more understandable within a startup context. The teams were able to receive advice on issues directly related to their companies and moving to Germany.

Greenlight Guru

EyeFocus teams were given a workshop by Greenlight Guru, a US company offering a cloud-based platform and consultancy services designed to help startups get over the hurdles of compliance and regulatory approval both in the US and Europe. They create a simple way of managing a set of fairly complex processes. The startups received crucial guidance on their regulatory concerns.

Week 12 - Berlin

IP/IT law workshop, Heussen Law

Marcus Hotze, a specialist IP and IT lawyer from law firm Heussen delivered a workshop on many of the common IP issues faced by startup companies in the tech

field. Startups were given detailed answers and support on areas such as patents, commercialisation, and IP issues.

Media & PR Workshop, Clarity PR

EyeFocus was visited by Linsey Fryatt, Managing Director of Clarity PR Germany. Linsey gave an informative workshop on how startups should approach the press to get the best coverage for their products, and startups left with a much greater understanding about how to gain exposure.

Visit from Croatian entrepreneurs

EyeFocus was visited by a group of Croatian entrepreneurs, as part of an EU-funded programme to support Balkan businesses to learn more about European innovation hubs. Around 15 entrepreneurs visited the space at Rainmaking Loft, and were given a detailed introduction on the Berlin startup scene, what accelerators do, and what EyeFocus is doing differently. The event was sharing some of the experience EyeFocus had developed, but also further extended the weak tie networks of the teams.

European Digital Health Summit

EyeFocus were invited to be part of the 2nd annual European Digital Health Summit "Molecules versus Bits & Bytes", which took place at Rainmaking Loft, Berlin, further demonstrating the value of the program being based there. Organised by TransAct Advisory Services, Egon Zehnder and Janssen Pharmaceuticals, the day brought together over 150 investors, corporates and startups, focusing specifically on the topic of digital health and medtech. The day was focused on networking, with many of the

startups making useful connections with people from across Europe's medtech scene, including investors.

An afternoon with Bosch India

EyeFocus hosted representatives from Bosch Eye Care Solutions, who visited from Bangalore, India. Bosch sponsored the trip to London in March, which enabled nine EyeFocus teams to visit the UK for a week of events. A group of EyeFocus startups pitched their products and demonstrated their work, and were given insights into eye-care in the growing India market, and some of the innovative work being carried out in this field by Bosch.

Week 13 - Berlin

Workshop on VC investment in digital health, XLHealth

XLHealth is a Berlin-based VC investor that focuses solely on digital health startups. Min-Sung Kim, Partner at XL Health, gave startups a thorough understanding of their investment focus and data in the digital health industry.

The startups had a rare insight from a specialist investor about how they judge investments, the criteria they use, and advice about how to improve their chances for success when approaching VCs.

M-Enabling Conference

A group of EyeFocus startups were invited to join a panel discussion at the M-Enabling conference taking place in Moscow, dialling in from Berlin. The discussion centred

around how new technologies can be used to help visually impaired people, and the opportunity helped promote the cohort and accelerator in the Russian ecosystem.

End of Programme Event

EyeFocus lead sponsor, Bayer HealthCare, hosted the end of programme event to mark the closing of the EyeFocus program. Guests heard extended pitches and reflections from six EyeFocus startups & associates, as well as a presentation from the EyeFocus team on how it set up and ran the programme.

The evening included several mentors and partners of EyeFocus, as well as representatives from the main program sponsors, Carl Zeiss AG, and Peppermint Venture Partners. The event was an opportunity for the startups to network with the sponsors, but also for the sponsors to mentor with each other.

Week 14 - Berlin

Despite the program having formally ended, the EyeFocus team and some of the startups remained in Rainmaking Loft for several more weeks. During this time, EyeFocus continued to organise some events and meetings.

US delegation from Cultural Vistas

EyeFocus was visited by a group of American college students, as part of a programme run by non-profit organization, Cultural Vistas. Twenty students and professors from the historically black colleges, Morehouse and Spelman, visited EyeFocus to learn more about opportunities to complete internships or work in Germany in the future. They

came from a wide range of STEM fields, including pre-med, engineering, psychology, mathematics, computer science, and biochemistry.

The EyeFocus team and startups gave participants exposure to companies in the healthcare industry as well as offer insights into the Berlin startup scene.

Week 15 - Berlin

Charité Entrepreneurship Summit - Demo day

During the program, EyeFocus explored what sort of final event would be most beneficial to the cohort, deciding not to organise a conventional demo day . The main reason was that it would be hard to fill a large room for a meaningful event when the EyeFocus network was global, and the Berlin startup sector would likely find a demo day just focussed on eye-care too specific. The value of demo day s was already being questioned by mainstream accelerators, and EyeFocus decided it would offer more value to join forces with an existing event, which already had an audience relevant to EyeFocus. Consequently, EyeFocus decided to co-sponsor the 8th annual Charité Entrepreneur Summit *"The Future of Healthcare".*

EyeFocus startups flew in from around Europe for this last event, reconvening the cohort which had already widely disbursed at the end of the program. Organised by Stiftung Charité, the summit brought together an audience from the healthcare sector, including academics, clinicians, startups, and investors, and looked at topics related to entrepreneurship & medicine, examining different ways that the two sectors

can intersect more effectively. The EyeFocus cohort did a final pitch session to a room full of healthcare investors, and joined in with a panel at the event.

8.2 MENTORS

For reference, and to demonstrate the network built by EyeFocus Accelerator, the following list shows most, but not all, of the mentors on the program. Some joined very late and were not included in the formal list. The list of mentors is a visual demonstration of the ecosystem EyeFocus built and was intended to show validation of the program by a broad group of people, but also to offer value to the mentors by promoting their involvement. It demonstrated to startups and others the Social Capital that these people invested into the program. The mentor list shows the different sectors represented by the mentors, and shows that the mentors consisted of people at all stages of their career, and from different layers in relevant hierarchies, from senior to junior.

THULASIRAJ RAVILLA

Executive Director, Aravind Eye Care System, Madurai, India

Thulasiraj and his team have mentored over 300 eye hospitals across the globe. He was listed among the 30 Most Influential People in Public Health.

DR RAFIQ HASAN

Vice President and Global Head of Ophthalmology at Bayer Health Care

Rafiq is Vice President and Global Head of Ophthalmology at Bayer Health Care.

LUDGER HEECK

Marketing Head for Specialty Medicine in Europe Bayer Health Care.

Ludger is the Marketing Head for Specialty Medicine in Europe at Bayer Healthcare.

MELISSA CHEN MONTES DE OCA

Associate Global Brand Manager, Ophthalmology, Bayer Health Care

Melissa is Associate Global Brand Manager of Ophthalmology at Bayer Healthcare.

DR KLAUS STOECKEMANN

Managing Partner & Co-Founder, Peppermint VenturePartners

Klaus is a former General Partner in the 3i Healthcare Venture Capital team

DR. MARKUS MÜSCHENICH

Co-Founder, Flying Health

Markus co-founded Flying Health, a German company builder and business developer for health startups.

DR SEBASTIAN SCHOEFER

High-Tech Gründerfonds

Investment Manager at High-Tech Gründerfonds Management

DR JOACHIM STORSBERG

Fraunhofer Institute

Head of the "Functional Medical Polymers" Department, Fraunhofer Institute

DR MARC GRAHL

Vice President Field of Business Routine Diagnostics at Zeiss

Marc is responsible to generate a whole product portfolio in the entry diagnostics segment. at Carl Zeiss Meditec AG.

DR KARLHEINZ REIN

Vice President, Product Marketing Cataract & Retina Surgery, Carl Zeiss Meditec AG

Karlheinz enjoys disrupting Medtec markets within Carl Zeiss Meditec AG.

DR JOHANNES H. KINDT

Senior Manager, Medical Innovations for the Carl Zeiss AG's Corporate Research Center

Johannes defines and drives R&D programs for Disruptive Innovations within Carl Zeiss Meditec.

HARSHA ANGERI

Senior GM & Lead, Strategy and Business Development, Bosch India

Harsha leads Strategy, M&A and New Business Incubation for Bosch in India. Harsha is driven by ground up building of emerging market focused businesses.

DR KATHRYN OWEN

Imperial Innovations, Imperial College, London

Kathryn is a Healthcare Ventures Associate at Imperial Innovations

SZABI STEINER

Associate Director, Institute of Biomedical Engineering, University College London

Szabi helps medtech businesses to connect with UCL academics and clinicians.

DR MICHELLE TEO

Founder of Made by Medics

Michelle is a medical doctor, Entrepreneur, and aspiring eye surgeon

DR ARAVIND SRINIVASAN, MS, MBA

Director of Projects, Aravind Eye Care System, Administrator, Aravind Eye Hospitals

Aravind has presented in numerous International Conferences about the "Aravind Model" of high volume, high quality, cost effective eye care.

RICHARD CONDON

Business Unit Head, Specialty Medicine UK, Bayer Health Care

Richard has a broad background in business development in the Pharmaceutical sector.

DR MATTHIAS KUSS

Strategy & Venturing department at Zeiss

Matthias is part of the Corporate Strategy & Venturing department at Zeiss.

DR ANNETTE SCHMIDT

Corporate Strategy & Venturing department at Zeiss

Annette is part of the Corporate Strategy & Venturing department at Zeiss

NICOLAS FRECH

M&A department at Zeiss

Nicolas is active in market screening of technology start-up companies as well as in analyzing and valuing their business plans for Zeiss.

NIAMH BRESLIN

Irish Development Agency

Niamh Breslin manages the Emerging Business portfolio for Europe with IDA Ireland.

SAM HOPKINS

Johns Hopkins Medicine

Sam Hopkins is a US-based healthcare technology researcher and entrepreneur.

MAX GURVITS

Entrepreneur and Investor

Max is an entrepreneur turned investor, based in Sofia, Bulgaria.

LESLIE HITCHCOCK

Events Director, TechCrunch

Leslie is based in Silicon Valley, and Events Director at TechCrunch.

JOSIPA MAJIĆ & ANA BURICA

Founders, Teddy the Guardian

Ana and Josipa are serial entrepreneurs who have successfully launched a digital health product in the last 18 months.

ALEKSANDER TÕNNISSON

Co-founder, CEO at Buildit Accelerator

Aleksander is co-founder and CEO at Buildit Hardware Accelerator

DAN YOUNG

CEO of DXY Solutions

Daniel Young made a career out of his passion for technology and design by founding DXY, a creative technology agency

DMITRI SARLE

CEO of ArcticStartup

Dmitri Sarle is the CEO of ArcticStartup, an independent technology blog

TRACY PRENTIS

Business consultant and executive coach

Tracy was a VP in SAP Labs in Silicon Valley and now works in India and the UK.

VITOR PAMPLONA

Founder and CTO at EyeNetra, Inc.

Vitor is a specialist on direct-to-consumer eye care diagnostics with focus on cellphone-based hardware add-ons.

ANNE KJÆR RIECHERT

Founder Berlin Peace Innovation Lab

Anne works in social affairs, innovation, and CSR.

ELINA ZHELEVA

Design Thinking Evangelist

Elina is a Design Thinking Evangelist

INGA CLAUSEN

Communications and PR Expert

Inga Clausen is an award winning Communications Expert, with a focus on PR, Brand Marketing and Content.

MARK RUIZ

CEO of Optretina

Mark Ruiz is CEO of Optretina, an eye-care startup based in Spain.

DR STEVEN RENWICK

Founder & CEO of Satago

Steven is an MBA graduate from Oxford University's Saïd Business School.

DR CATH WHEELER

Head of Clinical Operations, Medopad

Cath is Head of Clinical Operations at Medopad

KALIE MOORE

Marketing and PR expert

Kalie Moore is an expert in Big Data, Social Media, and Marketing

LEANDRO MARTÍNEZ-ZURITA JULIÀ

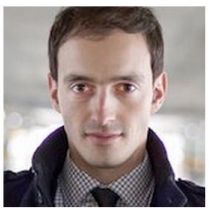
Tech Lawyer

Startup and healthcare lawyer

DR QUINTON FIVELMAN

CEO Q5 Group

Quinton is an innovation and commercialisation strategy expert



KUSHTRIM XHAKLI

Partner at Fast Europe Ventures

Partner at Fast Europe Ventures

ULRIKE ANDERS

Founder Health2.0 Berlin

User experience designer and design strategist and founder of Health 2.0 Berlin

TRAM NGUYEN-TRINH

Founder & CEO of VITAnLINK.

Tram helps digital health start-ups that want to expand in Europe.

8.3 STARTUPS AND ASSOCIATES

Below, for reference, is a full list of the startups and associates accepted onto the program.

8.3.1 Accepted into the cohort, with funding

Applicants accepted into EyeFocus as Startups (received funding and attended the program)

Mr Patch

Developed a mobile app that uses eye tracking technology to screen and monitor vision problems that affect reading and learning in primary school children. From Paraguay, and previously completed Startup Bootcamp accelerator in Copenhagen. Received investment from EyeFocus.

BlindSense

BlindSense produced a hand held digital Braille device that converted text on smart device screens into Braille that punched up onto the users' finger. From Palestine, previously completed Buildit Accelerator in Estonia. Received investment from EyeFocus.

Ocutrack

Up to 60% of children may be misdiagnosed with a learning disorder or ADD, when they actually have a vision problem. Current hardware and software technologies used for the diagnosis of eye-tracking problems are outdated, expensive, and not widely distributed. Ocutrack aimed to leverage existing mobile camera technology with the

power of scalable software to make eye-tracking available to more patients for less money.

Founded by an American optometrist, Joel Getty, who attended the first 6 weeks as Optometrist in Residence.

Aston Eye Tech

Aston Eytech is a spin-out of Aston University's world leading School of Optometry and Bio-Medical Engineering Department. The product range, based on 5 years R&D work by the academics, includes decision support software for optometrists using advanced mathematics and artificial intelligence to improve accuracy of diagnosis and to help them increase sales through more personalised product recommendations. A range of eye test instrumentation designed to be as effective but much more portable and affordable than conventional equipment. Received EyeFocus investment alongside other investors in a seed round.

Semu

Semu designed devices for visually impaired and blind people that enable them to use home automation systems to make their homes safer and more efficient. By connecting to pre-existing sensors, the central device gives audio feedback, allowing blind and visually impaired people to use existing technology to secure their homes. When leaving the house, the user presses a button on the wall and is told if a window is open or an electrical appliance is on, and can turn off appliances directly from the device.

The team from Estonia and received funding to attend EyeFocus to see if they could develop their early stage idea into a startup.

8.3.2 Accepted as Associates, without funding

Ocuplus

German company that developed intelligent software for desktops, smartphones, and tablets, as well as augmented reality glasses to allow visually impaired users to process information text encountered in daily life.

Difrotec

Difrotec offered an industrial solution for testing optics, with accuracy 100 times greater than is currently available on the market.

Their patented technology helps optics manufacturers use only one tool for quality assurance, rather than many. Difrotec had already achieved sales of 1m Euros, and joined EyeFocus to develop their market. From Estonia, where they also completed Buildit accelerator.

Project Ray

A mobile device for blind and visually impaired people, from Israel.

Tooteko

Developed in Italy, Tooteko built a wristband that sends alerts through vibrations or sounds. Tooteko also has a built-in NFC antenna which allows people to explore any 3D surface that has been tagged, by streaming audio content directly to their own smart device so they receive audio content connected to what they are touching.

Optica Technology

From Hong Kong, Optica Technology developed algorithms that help people who are colour blind to see colours properly. They have developed a phone app that changes the

colours on the phone, but more complex is a process to allow a 3D television to show a program that a normally sighted person can view alongside someone who is colour blind. The colour-blind person would wear 3D glasses that convert the image, so they can see the colours properly. The Optica team attended the first week of the program in Berlin, then continued virtually from Hong Kong.

Sourcio

Armenian Sourcio developed a mobile app called Eye Care Plus, a comprehensive vision testing and improvement app which helps prevent eye diseases with early identification; supports and improves vision through trainings; and raises eye health awareness. It also features direct ophthalmological consultancy through our collaboration with vision professionals.

Suricog

French company Suricog built an eye-tracking system within spectacle frames, which sits very close to the eye. This allows the eye to interact with any object looked at, in real time. This has multiple applications from optometry, through to controlling devices for people with mobility conditions.

Intact Healthcare

An Italian company that produced a variety of digital health hardware devices, they focussed on DB Glove, which helps deaf blind people interface with smart phones and communicate for the first time with other people who are not trained to speak specialist languages like Malosi. The founder moved to Berlin and attended the full EyeFocus program at his expense. Because the company was an early stage not-for-profit, he did not want investment funding.

App 4 Eyes

Based in Germany, this program detects and documents distortions (metamorphopsias) or visual field defects (scotomas) and illustrate any changes. The professional version also provides a graphical representation of changes.

Givevision

Give Vision is building the world's first real time video-to-audio wearable device, designed specifically for people affected by sight loss. Based in London, at Wayra accelerator, they became an associate at EyeFocus after meeting the team at an EyeFocus event in London.

BatSuite

Developing a glove with ultrasound, which transmits an impulse to the blind person. This enables the blind person to get a “picture “of the surrounding like a bat does. Part of Berlin Hardware Accelerator.

8.4 MENTORING GUIDE FOR STARTUPS

This guide was given to the cohort prior to mentoring beginning during EyeFocus

Accelerator.

Mentoring Guide - for Startups

Mentoring is one of the core aspects of any accelerator program, and we feel it is one of the most valuable. Not only is it a unique opportunity to network with influential experts across diverse fields, it is also a great chance to learn new skills, ask questions, and seek advice and expertise from people who understand a topic deeply. There are very few circumstances where people like this will so freely and openly offer you their time on a one-to-one basis, and it shouldn't be underestimated.

We have prepared this short guide to help you get the most of these time-limited sessions.

How to maximise the impact of your mentoring sessions

1. Before the Meeting

- Keep the EyeFocus team informed of ANY mentoring meeting you are having, however informal or quick. Please never contact mentors directly for a first session, this should always be organised by EyeFocus.
- Always research your mentor. Google them, read their biography on the EyeFocus website, find out their back story and experiences. Even people who at first seem less relevant may appear more interesting once you understand a bit more about them.
- Think about what you want from the session before it begins. Where possible, prepare some questions in advance. This doesn't have to involve a lot of work, and could just be a few bullet points jotted down. This will help guide your conversation, ensure it's heading in a useful direction, and hopefully get the information you want.
- Think about how you appear. This may often seem less important in a startup setting, but the way you present yourself still matters. If your mentor is from a more corporate background, you might want to think about dressing a little more formally that day. Think about the image you want to project.
- Bring your business card and remember to give it to your mentor!

- Have a clear pitch – you are not selling, but you need to summarise what you are doing and what you need very quickly to avoid wasting your session.
- Remember to talk about what you don't know, what you are missing, and what you need, rather than just saying how great your startup is. Mentors are there to help, not to be impressed.
- Be polite. You are getting their time for free. Always turn off your phone and close your laptop. Never, never check messages, or answer the phone in a mentoring session.
- NEVER BE LATE. In fact, be early. Lateness wastes your time, their time, and reflects badly on you and EyeFocus. NEVER BE LATE!

3. After the Meeting

- Speak to an EyeFocus team member about the mentoring session, even if it's just a quick email. We need to have an idea about how each mentoring session goes and keep track of who met who.
- Always follow up quickly. It's likely that your mentor is a busy person who meets a lot of people, so they might not remember you for long. Capitalise on that first meeting by following up on any actions immediately. This will also show them that you're reliable.
- Do what you say you'll do. It's amazing how many startups say they'll contact the mentor with information, or to remind them to follow up an introduction, and then forget.
- Always take notes!! Keep all your notes in Evernote. What did they say, who do they know, what actions did you agree? In Evernote you can search for this easily in the future.
- Keep track of who you met. They may not be useful now, but they could be important in the future.
- Remember you are building a personal network for your future.

Skype Mentoring

Skype mentoring will be an important element of the EyeFocus program, both for Startups and Associates. There are a lot of benefits to mentoring over Skype: it allows us to interact with a much broader range of fantastic mentors (many of them not based in Berlin), it means our associates can be supported from anywhere in the world, and it makes it easier to fit mentoring around busy lives.

The rules above should apply just as much to Skype mentoring - in fact, it's probably necessary to be even more organised, since clarity is very important when speaking remotely.

Here are some more tips specific to Skype mentoring:

- Check time differences: what time zone is your mentor in - when does that mean you're talking in Berlin time?

- Do you have their Skype address? This seems obvious, but make sure you know this beforehand, not 5 minutes before you're meant to be speaking! This will save time and avoid confusion.
- Are you in a quiet room, with good acoustics? Try to limit distractions.
- Make sure before you call that your microphone and speakers are working – do a test call to someone in EyeFocus to be sure.
- Turn off anything on your laptop that uses bandwidth to ensure a clear call.
- Once you have added a mentor on Skype, that doesn't mean you can write to them anytime afterwards. Only call or write when you fix an appointment, unless they ask you to.

9. BIBLIOGRAPHY

Adler, P. S., & Kwon, S. (2002). *Social Capital: Prospects for a New Concept*. The Academy of Management Review, 27(1), 17–40.

Athey, G., Glossop, C., & Harrison, B. (2007). *Innovation and the city: how innovation has developed in five city-regions*. NESTA.

Audretsch, D. B., Aldridge, T. T., & Sanders, M. (2011). *Social capital building and new business formation*. International Small Business Journal, 29(2), 152–169.

Barba, M. (2016). *Startup Accelerators models: The Nova SBE recommendation*. Nova School of Business & Economics.

Barrenhag, L., Fornell, A., Larsson, G., Mårdström, V., Westergård, V., & Wrackefeldt, S. (2012). *Accelerating Success: A Study of Seed Accelerators and Their Defining Characteristics*. Bachelor Thesis, Chalmers University of Technology.

Battistella, C., De Toni, A. F., & Pessot, E. (2017). *Open accelerators for start-ups success: a case study*. European Journal of Innovation Management, 20(1), 80–111.

Beverland, M., & Lindgreen, A. (2010). *What makes a good case study? A positivist review of qualitative case research*. Industrial Marketing Management, 39(1), 56–63.

Bjørnskov, C., & Sønderskov, K. M. (2013). *Is Social Capital a Good Concept?* Social Indicators Research, 114(3), 1225–1242.

Bliemel, M. J., Flores, R., de Klerk, S., Miles, M., Costas, B., & Monteiro, P. (2016). *The role and performance of accelerators in the Australian startup ecosystem*. UNSW Business School Research Paper No. 2016MGMT03.

Bone, J., Allen, O., Haley, C. (2017). *Business Incubators Accelerators UK report*. BEIS Research Papers, NESTA.

Borgatti, S. P., & Halgin, D. S. (2011). *On Network Theory*. Organization Science, 22, (5), 1168–1181.

Brown, D. W., & Konrad, a. M. (2001). *Granovetter Was Right: The Importance of Weak Ties to a Contemporary Job Search*. Group & Organization Management, 26(4), 434–462.

Burt, R. S. (2004). *Structural Holes and Good Ideas*. American Journal of Sociology, 110(2), 349–399.

Burt, R. S. (2001). *Structural Holes versus Network Closure as Social Capital*. Pre-print for a chapter in Social Capital: Theory and Research, edited by Nan Lin, Karen S. Cook, and R. S. Burt. Aldine de Gruyter, 2001.

Burt, R. S. (2001). *Attachment, Decay, and Social Network*. Pre-print of an article in the Journal of Organizational Behavior.

Burt, R. S. (2000). *The network structure of social capital*. Research in Organizational Behavior, 22, 345-423.

Burt, R. S. (1999). *Decay Functions*. Pre-print article for Social Networks, 22, 1–28, (2000).

Burt, R. S. (2002). *Bridge decay*. Social Networks, 24 (4), 333-363

Burt, R. S. (2003). *Social Origins of Good Ideas*. Working paper. Retrieved from https://doi.org/10.1353/jhi.1997.0041

Butcher, M (2017). *How to apply to all those accelerator programs? F6S.com is here to help.* Retrieved from https://techcrunch.com/2012/07/19/how-to-apply-for-all-those-accelerator-programs-f6s-com-is-here-to-help/

Cacioppo, J. T., Fowler, J. H., & Christakis, N. a. (2009). *Alone in the crowd: the structure and spread of loneliness in a large social network*. Journal of Personality and Social Psychology, 97(6), 977–991.

Caley, E. (2013). *Seeding Success: Canada's accelerators*. Published by MaRS Data Catalyst.

Christakis, N. A., & Fowler, J. H. (2007). *The collective dynamics of smoking in a large social network*. New England Journal of Medicine, 358(21), 2249-58.

Christiansen, J. D. (2009). *Copying Y Combinator: a Famework for developing Seed Accelerator Programmes.* MBA Dissertation, University of Cambridge.

Clarysse, B., Wright, M., & Hove, J. Van. (2015). *A Look Inside Accelerators: Building Businesses*. NESTA.

Cohen, S. (2013). *What Do Accelerators Do? Insights from Incubators and Angels*. Innovations, 8(3/4), 19–25.

Cohen, S. (2013). *How to accelerate learning: Entrepreneurial ventures participating in accelerator programs*. PhD Thesis, University of North Carolina at Chapel Hill.

Cohen, S., Fedher, D., & Hochberg, Y. (2014). *2014 Accelerator Rankings*. Published by Seed Accelerator Rankings Project.

Cohen, S., & Hochberg, Y. V. (2014). *Accelerating Startups: The Seed Accelerator Phenomenon*. Retrieved from http://seedrankings.com/pdf/seed-accelerator-phenomenon.pdf.

Davidsson, P., & Honig, B. (2003). *The role of social and human capital among nascent entrepreneurs.* Journal of Business Venturing, 18(3), 301–331.

Dee, N., Gill, D., Weinberg, C., & Mctavish, S. (2015). *Startup Support Programmes: What's the difference.* NESTA.

Dempwolf, C. S., Auer, J., & D'Ippolito, M. (2014). *Innovation Accelerators: Defining Characteristics Among Startup Assistance Organizations*. Small Business Administration, (October), 1–44.

Eisenhardt, K. (1989). *Building Theories from Case Study Research*. Academy of Management Review, 14(4), 532–550.

European Commission (2018), retrieved from: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en"

Eveleens, C. P., van Rijnsoever, F. J., & Niesten, E. M. M. I. (2016). *How network-based incubation helps start-up performance: a systematic review against the background of management theories*. Journal of Technology Transfer (42).

Farr, J. (2004). *Social Capital: A Conceptual History*. Political Theory, 32(1), 6–33.

Fehder, D. C., & Hochberg, Y. V. (2014). *Accelerators and the Regional Supply of Venture Capital Investment*. Retrieved from http://www.seedrankings.com/pdf/accelerators-and-regional-suppy-of-vc-investment.pdf

Feldman, M., & Zoller, T. D. (2012). *Dealmakers in Place: Social Capital Connections in Regional Entrepreneurial Economies*. Regional Studies, 46(1), 23–37.

Fishback, B., Gulbranson, C. a., Litan, R. E., Mitchell, L., & Porzig, M. a. (2007). *Finding Business "Idols": A New Model to Accelerate Start-Ups*. Retrieved from https://doi.org/10.2139/ssrn.1001926

Fowler, J. H., & Christakis, N. A. (2010). *Cooperative behavior cascades in human social networks*. Proceedings of the National Academy of Sciences, 107(12), 5334–5338.

Fowler, J. H., & Christakis, N. A. (2009). *Dynamic spread of happiness in a large social network: Longitudinal analysis over 20 years in the Framingham Heart Study*. British Medical Journal, 338, 1–13.

Fox, K. (2014). *The rise of the UK accelerator and incubator ecosystem.* Telefonica. Retreived from http://cdn.news.o2.co.uk.s3.amazonaws.com/wp-content/uploads/2014/12/Start-up-programme-report.pdf

Friedkin, N. (1980). *A test of structural features of granovetter's strength of weak ties theory.* Social Networks, 2(4), 411–422.

Frimodig, L. (2012). *Success Factors of Accelerators*. Master's Thesis, Lappeenranta University of Technology Faculty of Technology.

Frimodig, L., & Torkkeli, M. (2013). *Success Factors of Accelerators in New Venture Creation.* Paper Presented at XXIV ISPIM Conference – Innovating in Global Markets: Challenges for Sustainable Growth, (June).

Golomb, V. (2015). *Accelerators are the new business school,* Retrieved from https://techcrunch.com/2015/07/11/accelerators-are-the-new-business-school/

Graham, P. (2011). *Why Startup Hubs Work*. Collected Essays. Retrieved from http://www.paulgraham.com/articles.html

Granovetter, M. (1973). Granovetter - *Strength of Weak Ties*. American Journal of Sociology, 78(6), 1360–1380.

Granovetter, M. (1985). *Economic Action and Social Structure: The Problem of Embeddedness.* American Journal of Sociology, 91(3), 481–510.

Granovetter, M. (1983). *The Strength of Weak Ties: a network theory revisited*. Sociological Theory, 1, 201–233.

Granovetter, M. (2005). *The Impact of Social Structure on Economic Outcomes*. The Journal of Economic Perspectives, 19(1), 33–50.

Hackett, S. M., & Dilts, D. M. (2004). *A Systematic Review of Business Incubation Research.* The Journal of Technology Transfer, 29(1), 55–82.

Haley, C., Bone, J., Allen, O. (2017). *Incubators and accelerators: An updated directory for the UK*. NESTA.

Hallen, B. L., Bingham, C. B., & Cohen, S. (2014). *Do Accelerators Accelerate? A Study of Venture Accelerators as a Path to Success*. Academy of Management Proceedings, (1).

Harrington, K. (2017). *Entrepreneurial Ecosystem Momentum and Maturity; The Important Role of Entrepreneur Development Organizations and Their Activities.* Kauffman Foundation.

Harrison, F., Sciberras, J., & James, R. (2011). *Strength of social tie predicts cooperative investment in a human social network*. PLoS ONE, 6(3).

Hathaway, I. (2017). *Accelerating growth: Startup accelerator programs in the United States*. Retrieved from https://Www.Brookings.Edu/Research/Accelerating-Growth-Startup-Accelerator-Programs-in-the-United-States

Hochberg, Y. V. (2015). *Accelerating Entrepreneurs and Ecosystems : The Seed Accelerator.* Innovation Policy and the Economy, 16, 25–51.

Hoffman, D. L., & Radojevich-Kelley, N. (2012). *Analysis of Accelerator Companies : An Exploratory Case Study of their Programs , Processes , and Early Results*. Small Business Institute Journal, 8(2), 54–70.

Huijgevoort, T. Van. (2012). *The "Business Accelerator": Just a Different Name for a Business Incubator?* Utrecht School of Economics, Retrieved from https://www.Dutchincubator.Nl/Wp-Content/Uploads/Sites/5/49.Pdf.

Huyghe, A., Knockaert, M., Piva, E., & Wright, M. (2016). *Are researchers deliberately bypassing the technology transfer office? An analysis of TTO awareness*. Small Business Economics, 47(3), 589–607.

Ian Hathaway. (2016). *What Startup Accelerators Really Do*. Harvard Business Review, 7.

Isabelle, D. (2013). *Key Factors Affecting a Technology Entrepreneur's Choice of Incubator or Accelerator*. Technology Innovation Management Review, (February), 16–22.

Karimaa, J. (2012). *Open sourced seed accelerator as a facilitator of startup success*. Masters Thesis, Aalto University.

Kim, J. H., & Wagman, L. (2014). *Portfolio size and information disclosure: An analysis of startup accelerators*. Journal of Corporate Finance, 29, 520–534.

Kohler, T. (2016). *Corporate accelerators: Building bridges between corporations and startups.* Business Horizons, 59(3), 347–357.

Konczal, J. (2012). *Evaluating the Effects of Accelerators? Not So Fast*. Retrieved from Www.Forbes.Com/Sites/Kauffman/2012/08/08/Evaluating-the-Effects-of-Accelerators-Not-so-Fast/.

Levin, D. Z., & Cross, R. (2004). *The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer*. Management Science, 50(11), 1477–1490.

Lin, N. (1999). *Building a Network Theory of Social Capital*. Connections, 22(1).

Lin, N. (2001). *Social Capital: A Theory of Social structure and action*. New York: Cambridge University Press.

Maurer, I., & Ebers, M. (2006). *Dynamics of Social Capital and Their Performance Implications: Lessons from Biotechnology Start-ups*. Administrative Science Quarterly (Vol. 51).

Mill, John, S. (1909) *Principles of Political Economy with some of their Applications to Social Philosophy*. Longmans, Green and Co. III.17.14

Miller, P., & Bound, K. (2011). *The Startup Factories.* NESTA.

Miller, P., & Stacey, J. (2014). *Good Incubation*. NESTA.

Orlowski, J., & Wicker, P. (2015). *The monetary value of social capital.* Journal of Behavioral and Experimental Economics, 57, 26–36.

Partanen, J., Möller, K., Westerlund, M., Rajala, R., & Rajala, A. (2008). *Social capital in the growth of science-and-technology-based SMEs*. Industrial Marketing Management, 37(5), 513–522.

Pauwels, C., Clarysse, B., Wright, M., & Van Hove, J. (2015). *Understanding a new generation incubation model: The accelerator*. Technovation, 50–51, 13–24.

Portes, A. (2000). *The two meanings of social capital*. Sociological Forum, 15(1), 1–12.

Rand, D. G., Arbesman, S., & Christakis, N. a. (2011). *Dynamic social networks promote cooperation in experiments with humans*. Proceedings of the National Academy of Sciences of the United States of America, 108(48), 19193–19198.

Ravenswood, K. (2011). *Eisenhardt's impact on theory in case study research*. Journal of Business Research, 64(7), 680–686.

Regmi, K., Ahmed, S. A., & Quinn, M. (2015). *Data Driven Analysis of Startup Accelerators*. Universal Journal of Industrial and Business Management, 3(2), 54–57.

Robehmed, N., *What is a Startup?* Forbes Magazine. Retrieved from https://www.forbes.com/sites/natalierobehmed/2013/12/16/what-is-a-startup/#3a59fc624044

Roberts, I. (2014). *Accelerator Programmes - a practice guide*. NESTA.

Roberts, P. W., Lall, S., Baird, R., Eastman, E., Davidson, A., & Jacobson, A. (2016). *What's Working in Startup Acceleration - Insights from Fifteen Village Capital Programs*. Insights from Fifteen Village Capital Programs, (March), 43.

Rost, K. (2011). *The strength of strong ties in the creation of innovation*. Research Policy, 40(4), 588–604.

Schnettler, S. (2009). *A structured overview of 50 years of small-world research*. Social Networks, 31(3), 165–178.

Schwandt, T. A. (1996). *Qualitative data analysis: An expanded sourcebook.* Evaluation and Program Planning, 19(1), 106–107.

Shane, S. (2017). *Why the Number of Accelerators Is Accelerating.* Retrieved from https://Smallbiztrends.Com/2016/06/Business-Accelerators-Increasing.Html.

Spigel, B. (2017). *The Relational Organization of Entrepreneurial Ecosystems*. Entrepreneurship: Theory and Practice, 41(1), 49–72.

Stangler, D., & Bell-Masterson, J. (2015). *Measuring an entrepreneurial ecosystem.* Kauffman Foundation Research Series on City, Metro, and Regional Entrepreneurship. Retrieved from https://doi.org/10.2139/ssrn.2580336

Tarani, Y. (2010). *Startup Accelerator Programs, Processes and Characteristics of Accelerating Startups*. Masters Thesis, Leuphana Universität Lüneburg.

Tracy, S. J. (2010). *Qualitative Quality: Eight "Big-Tent" Criteria for Excellent Qualitative Research*. Qualitative Inquiry, 16(10), 837–851.

van Doorn, G. S., & Taborsky, M. (2011). *The evolution of generalized reciprocity on social interaction networks.* Evolution, 66(3), 651-664.

Watts, D. J. (2004). *The "New" Science of Networks*. Annual Review of Sociology, 30, 243–270.

Wright, K. B., & Miller, C. H. (2010). *A Measure of Weak-Tie/Strong-Tie Support Network Preference*. Communication Monographs, 77(4), 500–517.

Yen, Y.-F., Tseng, J.-F., & Wang, H.-K. (2015). *The effect of internal social capital on knowledge sharing.* Knowledge Management Research and Practice, 13(2), 214–224.

Yin, R. K. (1992). *The Case Study Method as a Tool for Doing Evaluation*. Current Sociology, 40(1), 121-137.

Yu, S. (2016). *How do accelerators impact the performance of high-technology ventures?* Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract-id=2503510

Zheng, X., Zhong, Y., Zeng, D., & Wang, F.-Y. (2012). *Social influence and spread dynamics in social networks.* Frontiers of Computer Science, 6(5), 611–620.