Key Success Factors for Startups in the Airline Industry

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by

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Preface

This master thesis marks the end of my time as a student in Delft and at the Delft University of Technology. I feel very privileged for the opportunities I encountered and all the things I was able to do both on academic and extracurricular level. I started my time in Delft as a bachelor student at the faculty of Aerospace Engineering, there I had the opportunity to develop strong analytical skills and a thorough problem solving mindset. By the end of my bachelor and after an interesting internship at Thomas Cook Airlines in the UK, I felt that it was time to broaden my academic horizon and I chose for the master program Management of Technology. During this program I discovered a broad range of interesting entrepreneurial and business subjects, which were very complementary to my engineering background from Aerospace Engineering.

This master thesis felt like the final piece, as the research topic connects my engineering background, my passion for aviation and my interest in entrepreneurship. Therefore, this master thesis not only concludes my student time, but also provides a reflection of my personal interests.

I would like to thank a few people in particular who supported me, not only throughout this master thesis, but my complete time as a student in Delft. First of all, my family and friends, who were there during the past years and in particular my father for his endless support during my student time. Furthermore, I would like to thank my first supervisor Dap Hartmann for his professional guidance of my master thesis and inspiring me about entrepreneurship during his lectures. I would like to thank Robert Verburg and Sicco Santema for their academic knowledge and insights in the airline industry and startups. Lastly, I would like to thank Frank Jansen from the Netherlands Aerospace Group (NAG), who was the external advisor to this research, a special thank you for your industry insights and feedback.

I hope you enjoy your reading.

Ruben Michaux
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Executive Summary

The airline industry has experienced enormous growth over the past decades, providing the opportunity to travel and explore new countries to more people than ever before. The enormous growth and serious drop in prices has created an ecosystem of very large airline groups and increasing consolidations of companies forced by very low profit margins. The airline environment can be conservative and innovation processes can be relatively slow, therefore startups can be an interesting and valuable sources of innovation for the airline industry. The survival rate of startups in general is very low and sources indicate that the airline industry is even more challenging for startups.

Therefore, the objective of this research is to investigate the key success factors for startups in the airline industry and identify a strategy to exploit the key success factor successfully. The final objective of this research is to gain a better understanding of the success factors and find a strategy for startups to successfully exploit the key success factor. This should lead to an increased survival rates for startups in the airline industry and more efficient innovation. The results can than be used by multiple stakeholders such as airlines, incubators, startups and investors to better tailor their strategies and policies.

The research has been split in two phases, phase one and phase two respectively. Both phases use a qualitative analysis, due to the type of relationships investigated and the data available. For both phases the data are collected using semi-structured interviews. Phase one of the research, is an exploratory research into the key success factors for the startups in the airline industry. The goal is to identify industry specific factors and not general success factors for startups. Therefore, the first research subquestion investigates what the characteristics of this industry are as perceived by the startups. These characteristics provide a first indication of the causes for certain success factors and among other factors defined which factors were key for startups this industry.

Phase two of the research focuses on the success factor financial resources, as this factor was selected from phase one. The results from phase one indicated that the strongest relationship was found for this success factor and that all the interviewed startups provided a similar cause for this factor, making the factor financial resources the primary focus of the second phase. During the second phase, research subquestion three was aimed at finding the root causes of this factor and subquestion four to estimate the impact of the Covid-19 crisis on this factor. The Covid-19 crisis started to develop at full speed during the data collection period of the research, due to the serious impact in this industry, it was decided that it was necessary to include this factor for the research to be relevant. Then finally, the answers to the four subquestions and additional interview observations lead to the answer to the main research question i.e. ”How can startups in the airline industry successfully exploit the key success factor?”. As a last step in the research, the final results have been validated by the interview participants themselves as well as by independent experts in the industry.

The results of the first phase of the research identify five key success factors for startups in the airline industry, which are related to distinctive dynamics in this industry. The five factors are financial resources, supply chain integration, industry experience, product innovation and R&D alliances. For the factors supply chain integration and R&D alliances a non-homogeneous relationship was found between the factor and the startup performance. Meaning that the positive relationship was only valid for a subset of the sample. Supply chain integration was mainly important for the hardware startups and R&D alliances depends on the type of innovation the startup offers. The more innovative, the more important the factor R&D alliances becomes. For the other three factors, homogeneous results were found and no subsets in the sample have been identified. It was found that financial resources is important due to the long cycle times for product development, causing startups to need relatively high amounts of funding for a longer period. Furthermore, industry experience was an important factor, which could lower the barrier to entry and help to decrease cycle times significantly. A similar result

has been found for the factor product innovation, the degree of innovation was used to lower the barrier to entry and get a seat at the table in the airline industry. From the research results, it was clear that these five factors have an important influence on the performance of a startup in the airline industry.

As the results of the first phase indicated the strongest relationship for the factor financial resources and a clear cause related to a distinctive characteristic in the airline industry was indicated by all interview respondents, this factor was selected for the second phase of the research. All the participants indicated that the success factor financial resources in this industry is very important and more important than for startups in other industries, because of the long cycle times for product development in this industry. The cycle times refer to the different times of the new product development process that have been named such as development time, testing time and time for commercialisation. Subquestion three focused on finding the root causes for these long cycle times and root causes across five different categories have been identified: cultural, organisational, operational, safety and other. Some aspects found here are the conservative and risk-averse culture inside airlines, a bureaucratic and functional organisational structure and the operability requirements of some critical processes which run 24/7. Furthermore, other root causes are the safety culture such as a highly regulated environment and extensive certification procedures. The last root cause is related to the long-term contracts airlines have with suppliers, creating waiting time for startups before opportunities are available.

Research subquestion four was aimed at identifying the impact of the Covid-19 crisis on the relationship identified earlier. It was found that most startups are impacted by the Covid-19 crisis, but they still have a remarkably positive attitude towards the crisis. The majority of the startups expects to see an increased customer need for automation and digitisation. Some expect to see faster decision processes, influencing one of the most important causes for the long cycle times and challenging funding environment identified earlier. A different impact has been found for early stage startups and later stage startups. The latter have been more severely impacted as they are more dependent on revenue streams. Startups reported that revenues have decreased and development projects have been paused or completely stopped.

Considering the results from the success factors, the causes and effects, three strategies have been identified for a successful exploitation of the main success factor, financial resources. These strategies form the answer to the main research question. Every strategy is aimed at a different aspect of the causes for the long cycle times. The first strategy presents actions to decrease cycle times, the second strategy to avoid the long cycle times and the third strategy to adjust the funding to the long cycle times. The strategies are not mutually exclusive and startups are advised to combine actions across the three different strategies to be maximally efficient in the exploitation of the factor financial resources.

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List of Abbreviations

Abbreviation	Meaning
AI	Artificial Intelligence
CEO	Chief Executive Officer
COO	Chief Operations Officer
EV	External Venturing
HQ	Head Quarter
IATA	Information Technology
IT	Information Technology
KPI	Key Performance Indicator
LCC	Low Cost Carrier
MOT	Management of Technology
MRQ	Main Research Question
MVP	Minimum Viable Product
NAG	Netherlands Aerospace Group
NPD	New Product Development
NTV	New Technology Venture
R&D	Research and Development
ROI	Return on Investment
ROIC	Return on Invested Capital
SSI	Semi-Structured Interviews
SQ	(Research) Subquestion
TRL	Technology Readiness Level
VC	Venture Capital

1 Introduction

1.1. Background

In the beginning of the 20th century the first airlines were founded in European countries and the United States. The founding of these airlines created a complete new way of travelling for humankind namely air travel. Destination that were not reachable before or took months to reach, were now reachable in a single day. This revolution has connected our world in a unprecedented way. The large and accelerating growth of the airline industry since the 1950's has facilitated economic growth, world trade and tourism for billions of people around the world. It has provided enormous opportunities to countless people and it made our world significantly 'smaller' today compared to about 70 years ago. The airline industry has been an enabler for globalisation in many different industries (Dilrukshi, 2017).

The last decades, air travel has evolved from a luxury product for the happy few to a commodity for most persons in the world, even in developing countries. Airline ticket prices have decreased significantly in the last decades, the fares decreased by about 50 % since 1978 (Thompson, 2013). The large growth is still continuing, the International Air Transportation Agency (IATA) has predicted a compounded annual growth rate of about 3.5 % and a possible doubling of the number of passengers by 2037 to 7 billion or more depending on the economic scenario (IATA, 2018).

Despite the enormous growth and economic prosperity due to the airline industry, the industry has been in a major transformation process throughout its history and this is still in full development. Following the deregulation of the airline industry, major shocks and consolidations in the US in the 2000's, similar trends are unfolding in Europe at this moment (Maul and Spear, 2018) (Cook, 1996). Airlines are forced to cooperate with other airlines in alliance such as SkyTeam, Star Alliance or IAG (The Economist, 2019). These consolidations have become necessary and inevitable for many airlines as the profit margins decreased and most airlines are lacking the necessary financial resources to invest (Maul and Spear, 2018). In 2017 the airline industry on average had a 3.9% profit margin as percentage of the revenue and return on invested capital (ROIC) of 8.6% (KPMG, 2019). More recent bankruptcies of large airlines such as Air Berlin or Monarch and smaller ones such as VLM and Cobalt Air, demonstrate that this process is still ongoing.

The processes of consolidations was already ongoing, when early in 2020 the Covid-19 crisis hit the airline industry very hard. The full impact of the crisis is, at the time of this research, not yet known in full detail, but almost all major airlines worldwide have been grounded for weeks. The number of flights in April 2020 decreased worldwide by 80% compared to the baseline level in January 2020 Pearce (2020a). The airline industry is expected to recover from this crisis the coming years, but impact is expected until 2025 until the normal growth path is resumed Pearce (2020b). This crisis is therefore expected to definitely challenge some assumptions, trends and relations described in this research. This crisis might accelerate some innovation process, it can create new opportunities as well as challenges for entrepreneurs.

This combination of a large growth in passenger amounts and dropping ticket prices have pushed airlines towards more efficiency gains and a continuous cutting in service levels. All these evolutions are at play in a very rigid and conservative industry, which is characterised by strong regulations and standardisation, this makes the airlines business extremely challenging (Wensveen, 2010). It might be necessary for the airline industry to attract new sources of innovation, find new revenue streams and reinvent their business models (Franke, 2007). A major transition like this one, will require external sources of innovations, a concept called open innovation (Thieme, 2017) (Weiblen and Chesbrough, 2015). In open innovation systems, inflows and outflows of knowledge will be used to accelerate internal innovation.

One of the most effective ways to attract external sources of innovations for large companies is via external venturing (Usman and Vanhaverbeke, 2017). In this way, a cooperation is created between an established firm and a startup. Sometimes, the established firm also invests in the startup. In return, the startup develops a new technology or product for the firm. In this way, both the startup and established firm can benefit from the cooperation. This research will focus on how startups can introduce innovations successfully in the airline industry. The concept of external venturing is extensively described in literature and some literature on extenal venturing in the airline industry is presented in the work of van der Veer (2017) and Bolomey (2017). This research will mainly consider the startup point of view. It has been observed that many startups fail during their first year of exisitence or do not succeeed in establishing a vialble business model. This will be further elaborated on in the problem definition in the next section.

1.2. Problem Definition

The previous section provided an overview of the challenging environment in the airline industry and how startups can play a role to bring innovation to this industry. The last decades airlines have been running cost-saving program after cost-saving program to remain competitive in industry where ticket prices are under constant pressure, especially from LCC's such as Ryanair or EasyJet. The need for innovation as a new source of competitive advantage has become more omnipresent in the airline industry Franke (2007). Airlines often lack the internal capabilities to innovate, therefore startups can become increasingly important the next years.

When looking at the failure rates for startups they are as high as 90%, although exact numbers vary per industry and exact numbers for the airline industry are difficult to obtain, this indicates that failure rates are high for all industries Patel (2015). Startup failures are in general very costly, not only are investors losing their money, also time and resources invested in the company are lost, these can also be non-financial assets such as experience gained inside the company and time invested by founders and employees. To make the external venturing process in the airline industry efficient it is crucial to avoid to many failures and get a clear picture of what makes startups successful. A proper understanding of these factors can avoid too big losses with regards to money and time invested in the company. Therefore, it is necessary to develop a better understanding of the most important success factors for startups in the airline industry and the causes and effects of these respective factors, which leads to the research questions introduced in the next section.

The current problem is twofold, first of all, it is necessary to understand which factors are the most important for the success of startups in the airline industry and secondly, it is necessary to develop a better understanding of these factors. Therefore the research has been split in two phases, the first phase consists of an exploratory research into the most important success factors for startups in the airline industry, while in the second phase a more detailed analysis of the most important factor will be performed.

In the middle of this research, the Covid-19 crisis developed at full speed and struck the airline industry very hard. Airlines all over the world grounded their planes from Mach 2020 and the following months, leading to existential threats for these companies. Revenue decreases are estimated to be up to -70% for the second quarter of 2020 Pearce (2020c). Considering the enormous impact of this crisis on the

airline industry and considering the effects on this research, it was decided that this fact should be included in this research for the research to remain relevant. As the crisis was still at the beginning, the research presents only a first estimation of the impact of the Covid-19 crisis on most important success factor.

1.3. Research Objective

The objective of this research is to develop a strategy for startups in the airline industry on how to exploit the most important success factor in order to increase startup survival rates. This will be done by developing a framework with the key success factors which influence the performance of startups in the airline industry and a detailed framework of the most important success factor. The information on the relationships and causes of these success factors and the startup performance can be used by a broad range of stakeholders such as airlines, incubators, investors and startups themselves. To obtain this objective, the research has been split in two consecutive phases, in the first phase the objective is to identify the most important success factors and in the second phase second the objective is to analyse this factor in more detail.

The first first phase consists of an exploratory research which will identify the key success factors for startups in the airline industry. The goal of this research is to identify the most important success factors which influence the performance of startups in the airline industry. The goal is not to identify generic success factors but to identify the factors which are specifically more important in this industry and so, which can be linked to characteristics in this industry. The relations between the success factors, causes and the startup performance will be collected in one final framework.

In the second phase, the most important factor from the analysis in the first phase will be analysed in more detail. The objective is to find how this factor influences the survival of startups in the airline industry and what the causes of this factor are with regards to the characteristics of the airline industry. Finally, the objective is to provide a strategy for startups to maximally exploit the key success factor, in order to increase survival rates for startups in the airline industry.

1.4. Research Question

From the research objective stated above, the main research question (MRQ) and the research subquestions (SQ) have been derived. Before the MRQ could be answered, four subquestions have to be considered, which finally lead to the answer to the MRQ. In the chapter 2 the knowledge gap leading to the precise definition of this research question will be explained in more detail. The main research questions will be presented, followed by subquestions one until four. The main research question is aimed at identifying how startups in the airline industry can successfully exploit the key success factor.

Main Research Question:
How can startups in the airline industry successfully exploit the key success factor?

As no literature was present about the success factors for startups in this specific industry, the first phase of the research focused on determining the key success factors in this industry. The first phase consisted of an exploratory research into the characteristics of the airline industry, as experienced by the startups and identifying the key success factors, which could be related to these characteristics. No literature existed on the characteristics of the airline industry for startups and this information was considered crucial to identify and understand the key success factors for startups in this industry. Therefore, research subquestion one (SQ1) focuses on the characteristics of the airline industry for startups and subquestion two (SQ2) on the key success factors.

Subquestion 1:
What are the distinctive characteristics of the airline industry for startups?

Subquestion 2:
What are the key success factors for startups in the airline industry?

From the first phase of the research, the most important success factor for startups in the airline industry will be selected. This factor will then be analysed in more detail in the subsequent phases. A more detailed explanation of the selection of one key success factor will be presented in chapter 3.

In the next phase of the research, phase 2, the research focused on only one key success factor, mainly due to time constraints and research scoping. Research subquestion three (SQ3) focuses on the root causes of this success factor and subquestion four (SQ4) on the impact of the Covid-19 crisis on this success factor. This leads to the following research subquestions and finally the main research question:

Subquestion 3:
What are the root causes for the key success factor for startups in the airline industry?

Subquestion 4:
What is the impact of the Covid-19 crisis on the key success factor?

1.5. Research Scope

In this section the research scope of the research will be presented. This research scope provides definitions of the terms used in the research questions. This should provide a clear, unambiguous interpretation of the research questions. Furthermore, other elements have been included, which determines the boundaries of this research i.e. what is included and excluded.

The definitions presented in this sections are provided for clarity reasons, as an overview of the boundaries. Several of these concepts will be discussed elaborately in chapter 2.

Startup
”Emerging business entities during their early development and growth with exploitation of technologies and transforming such technologies into new products or services for rapid business growth and development.” This definitions is adopted from Song et al. (2007) and will be further explained in chapter 2.

Success
Santisteban and Mauricio (2017) ”A successful startup is considered a new company that offers products and/or services capable of being well received in the market, looking for a repeatable, profitable and scalable business model,generating jobs or manage to transform the way people do things.”

Airline Industry
The airline industry can be considered as a part of the aviation industry. Where the aviation industry is the whole of industry branches involved in the manufacturing, maintenance and operation of air transportation. The airline industry is the branch which focuses on the operations of the transportation of passengers and cargo by air. For the startups selected for this research this means they have airlines as their main customers and they have a technology or product which is specifically designed for airline operations. So only startups that operate business-to-business (B2B) are included. This division has been made to ensure that the factors discovered are really related to the the airline industry and not general factors. This business area should ensure the specific character of the airline industry.

Business Area
As indicated above, only startups which are active in an operational business are are included in the scope of this research. E.g. business areas can be ground handling, fuel management, crew planning, etc. This means more generic business areas such as finance or HR are excluded. The main goal of this criteria is to ensure that specific airline industry characteristics are identified.

To summarise, the following criteria for the selection of the startups were used:

- Startup, according to definition of NTV
- Business to Business

- Product/Technology specifically for the airline industry
- Active in an operational business area (ground handling, crew planning, etc)

1.6. Report Outline

This master thesis report consists of six chapters, the full report outline can be found in Figure 1.1. The report starts starts with this chapter, chapter one, as an introduction to the research. Next, the literature review is presented in chapter two. Several subjects related to the research subject have been included in this literature review to present a broad overview of the state-of-art knowledge on which this research is based. Next, the research methods are presented in chapter three, including a detailed research flow diagram. These first three chapters contain the background information, academic context and research design for the master thesis project.

Figure 1.1: Report Outline

In chapter four, the research results are presented, this chapters contains only the factual observations from the research. In chapter five, the discussion, the results will be analysed. In this chapter the data from the results will be interpreted, leading to the the discovering of trends and generalisations. The final conclusions of this research are presented in chapter 6, this includes an answer to the research questions. In chapter 7 a critical reflection on the research will be provided, including some recommendations for further research.

The research outline can be found in Figure 1.2, the research outline and report outline are slightly differently organised. The research has been structured in two phases, which can be seen in Figure 1.2. Both chapter 4 and chapter 5 contain research phase 1 and 2. It has been chosen not to present the research according to the research flow, i.e. phase 1 and 2, but to group the results and discussion of phases one and two. The Figure 1.2 only contains a broad overview of the research, a more detailed research flow diagram can be found in Figure 3.1.

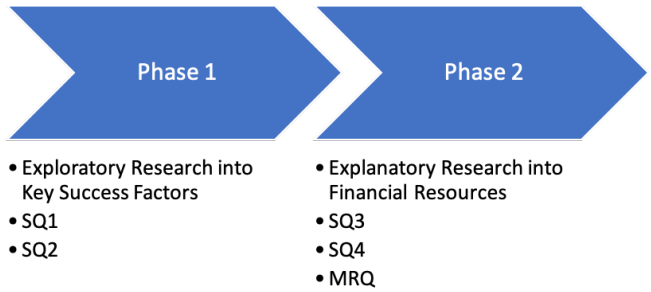

Figure 1.2: Research Outline

2

Literature Review

This literature review provides an overview of the relevant work performed in the context of success factors for startups in the airline industry. It covers a range of topics which are related to the research topic. These topics are necessary to understand the wider context and background in which the startups are operating. The literature review will start with a review of the literature on the definition and categorisation of startups. Next, the literature review provides an overview of the airline industry and major trends the last decades. This creates a better understanding of the environment and dynamics in which the startups operate. Furthermore, the literature review will cover the most important aspects regarding innovation and external venturing, which provides a theoretical basis for the research. Finally, the literature review ends with the current literature and insights on success factors for startups, which forms the basis for this research. For some literature sources there was some overlap between the categories as presented here, then the most suitable category has been chosen.

2.1. Methodology and Outline

First the literature review methodology will be explained, followed by an outline of the literature review chapter.

2.1.1. Methodology

The literature review has been split in four parts, with each a different topic relevant to the research. For each topic a separate literature review was performed, some of the literature found was also relevant for another topic and vice versa. As a reference document ot conduct the literature review Rowley and Slack (2004) has been used. This documents provides an overview of the different steps in the literature review process as well as detailed information regarding each step. For each step, this guide has been consulted as reference. One of the important aspects used from Rowley and Slack (2004) is the critical evaluation of sources, a critical checklist is presented to evaluate each type of sources. E.g. for web sources the checklist contains items such as check the intended audience, updated frequency and what is the claimed authority or expertise. These type of checklists have been considered for the selected sources further in the research.

Finally, based on Rowley and Slack (2004) the following general procedure has been established to perform the literature review of each part:

1. Define key words and search queries for the topic
2. Using search engines such as Google Scholar and Google the results were found
3. Scan the first pages of the results to identify most promising results
4. Read abstracts of most promising results
5. Save content in source managing software and provide short description of topic and content

6. Analyse overview of the sources, select most relevant results
7. Detailed analyses of the selected results
8. Check for other sources

Via this method, an extensive literature list was created with sources containing a broad range of topics. Some of sources seemed not so relevant at the time of saving, but proved to be useful in later stages of the research. Via this literature overview, it was possible to review sources about subjects that arised throughout the research, so the literature review became an iterative process during the research.

2.1.2. Outline

The literature review outline can be found in Figure 2.1. Each block in the diagram represents a section of the literature review and a topic related to the research topic which has been reviewed. Special attention has been given to the literature review of the success factors, as this is the basis of the this research. The other sections, has been more supportive to this research.

Figure 2.1: Literature Review Outline

2.2. Startups

This section contains all necessary background information concerning the concept of a startups, not only a definition will be provided but also more background about startup phases and the definition of success will be provided. This section starts with a general definition for a startup, followed by a review on the literature of technology entrepreneurship, which leads to the definition of a New Technology Venture (NTV). Furthermore, this section presents background information on the startup phases and a definition of success. these subtopics have been discussed by many sources in literature, this section aims at providing a concise overview of these concepts to provide the basis for the remainder of the master thesis report in which these concepts or often used.

2.2.1. Startup Definition

The concept of a startup is a very broad concept and is used by people to denote very different types of companies in different development phases, business areas and sizes. To have a solid basis for the rest of the research it is important to establish a clear definition and scope of how a startup is defined in this research. This section starts with general definition of startups used in popular sources, to provide an overview of how broad range of interpretation the concept of a startup can have. The definition will be further specified in the next two paragraphs when the concepts of technology entrepreneurship and NTV's will be introduced.

As a first starting point, popular sources such as Grant (2020) and McGowan (2018) have been used to get a feeling of the concepts. Several definitions are presented in these sources such as:

"*A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty.*" - Eric Ries - Entrepreneur and Author The Lean Startup

"A startup is the living embodiment of a founder's dream," - Wil Schroter - Co-Founder and CEO Startups.co

Some elements to which often is referred in these more popular sources are items such as: small business, rapid growth and early phases of development. Although the definitions presented here provide a feeling of what a startup is, the definitions are rather philosophical and not immediately suited

for application in this research. Therefore, a more precise definition of technology entrepreneurship is discussed in the next section. An overview of the literature sources consulted can be found in Table 2.1.

Table 2.1: Literature Review - Startups

Publication	Title/Description of Content
Spender et al. (2017)	Startups and open innovation: a review of the literature
Ries (2016)	What is a Startup?
Blank (2010)	What's a startup? First Principles
McGowan (2018)	What is a Startup Company, Anyway?
Ries (2012)	The lean startup methodology

2.2.2. Technology Entrepreneurship

As the definitions above are still broad concepts, it is necessary to specify the definition of a startup further. This is done by introducing the concept of technology entrepreneurship. As the research is conducted as part of the master program Management of Technology at the Delft University of Technology, clearly a focus on technology entrepreneurship is a logic scope and provides a clear connection with the master program. Therefore, the research will have a focus on startups which belongs to the category of technology entrepreneurship. This concept is defined by Bailetti (2012b). Bailetti defines technology entrepreneurship as follows:

"Technology entrepreneurship is an investment in a project that assembles and deploys specialised individuals and heterogeneous assets that are intricately related to advances in scientific and technological knowledge for the purpose of creating and capturing value for a firm."

The definition of Bailetti is based on four different elements (Bailetti, 2012b) :

1. Ultimate outcomes. Value creation and capture are identified as two outcomes of technology entrepreneurship because the sources that create value and the sources that capture value may not be the same over the long run.

2. Target of the ultimate outcomes. The firm is identified as the target organisation for which value is created and captured.

3. Mechanism used to deliver the ultimate outcomes. Investment in a project is the mechanism mobilised to create and capture value. A project is a stock of resources (i.e., specialised individuals and heterogeneous assets) committed to deliver the two ultimate outcome types for a period of time.

4. Interdependence of this mechanism with scientific and technological advances. The individuals involved in a project influence and are influenced by advances in relevant scientific and technology knowledge. The project exploits or explores scientific and technology knowledge. External and internal individuals and organisations co-produce the project's outputs.

Throughout this research, when referring to entrepreneurship or entrepreneurs, always this definition of technology entrepreneurship is meant. For convenience, the terms entrepreneurship and technology entrepreneurship are used alternating.

2.2.3. New Technology Venture

Applying the broader concept of technology entrepreneurship and what it means for the definition of a startup leads to the introduction of the concept New Technology Venture (NTV). The concept of NTV's can be defined as:

"Emerging business entities during their early development and growth with exploitation of technologies and transforming such technologies into new products or services for rapid business growth and

development." - IGI Global

So the criteria for a company to be qualified as a NTV:

- Early development phase
- Exploitation of technology
- Bringing a new product or service to the market
- Rapid business growth

The concept is especially important for this research as it is used in Song et al. (2007). This research is the basis for the selection of the success factors, which will be explained in more detail in the following sections. Song et al. (2007) uses the terms: new, adolescent, young, emergent and high technology, technology-intensive and technology-based to describe NTVs.

From the literature review it has been found that different maximum age settings are used for NTV's. Ages ranges from 6 years up to 15 years. As most sources are situated around 6 to 8 year. For this research a maximum of 10 years will be used, because indications exists that the airline industry is slower and therefore startup might need more time to develop and grow.

2.2.4. Startup Phases

Startups exist in all kinds of sizes, ages and growth phases. A categorisation of the startup phases is a more rather complex item than it might look. Many different sources use different type of categorisations, all based on different aspects. The work of Santisteban and Mauricio (2017) provides a clear overview of the different phases used by different authors. For similar phases, different authors use different descriptions such as (Santisteban and Mauricio, 2017) :

- Incubation/Seed/Emergence
- Early/Young
- Growing/Post-incubation/Early growth Mature/Expansion

In Figure 2.2 the different phases from Santisteban and Mauricio (2017) can be seen. An exact definition of the categorisations and an elaborate discussion of the literature would be a research topic on its own and is considered outside the scope of this research. For this research an important distinction has been made between early stage and later stage startups. This straightforward division is sufficient for a thorough analysis of research topic. For the research, the following terms characterise the early and later stage startups:

- Early stage (seed&early): mainly in the product development phase and testing; first revenue may be generated, but its not substantial, mostly depending on funding sources
- Later stage (growth&expansion): solid revenue streams have been established, multiple products have been sold to multiple customers, product development is in a final phase

The seed and early phase as presented in Figure 2.2 are included in "early stage" and growth and expansion from the same figure are included in the "later stage" for this research.

Figure 2.2: Startup Phases - adapted from Santisteban and Mauricio (2017)

Table 2.2: Definitions of Success - adapted from Santisteban and Mauricio (2017)

Definition	Reference
Success is defined by the number of jobs the company has generated.	March-Chordà (2004)
It is given by its share in the market and the size of the customers.	Van Gelderen et al. (2005)
It is the growth of sales and profitability, which has to be similar or higher than the industry average.	Lemes et al. (2010)
Success in the entrepreneurial ecosystem is that they buy or get you to go public.	Hyder and Lussier (2016)
It is having a business that allows you to live the way you want. Some employers want to avoid working for someone else.	Chirjevskis and Dvortsova (2012)
It is the achievement of the goals and objectives of the company and also as a measure of good management.	Thanh (2015)
Success is in creating something that truly contributes to improving the lives of others.	Sulayman et al. (2014)
It is the good financial performance of the company.	Spiegel et al. (2016)

2.2.5. Definition of Success

From the literature review, it is clear that an universal definition of success for startups does not exist. Different sources in the literature define success in various ways, using different parameters. In Santisteban and Mauricio (2017) an overview of the different definitions of success is presented, this can be found in Table 2.2. The Table 2.2 demonstrates the different interpretations of success, some authors consider the economic results of the company as a parameter for success, while others take a more personal approach and look at the personal fulfilment or some other from a investor point of view. The literature review of Santisteban and Mauricio (2017) discusses the different aspects such as the growth aspect present in most definitions and concludes with the following definition for success:

"A successful startup is considered a new company that offers products and/or services capable of being well received in the market, looking for a repeatable, profitable and scalable business model, generating jobs or manage to transform the way people do things."

Throughout this research, the definition of Santisteban and Mauricio (2017) for success will be used. This definition is considered as a very complete definition, i.e. including different aspects such as profitability and successful product development and implementation. The latter is related to innovation and technology, which forms an important aspects considered in this research due to the connection with the MOT program and Delft University of Technology.

With respect to the earlier categorisation of startups into early and later stage, also the success definition will be slightly adjusted with respect to the startup stage. For early stage startups the success definition will focus more on the successful product development and market acceptance and less on the profitability aspect. For later stage startups, the aspect of profitability and scalabiltiy becomes increasingly important in the definition of success used in this research.

2.3. Airline Industry

To understand the success factors for startups operating in the airline industry, it is important to have a clear overview of the whole industry and to understand its specific characteristics and dynamics. First of all, it is necessary to define what is meant with the airline industry. For the research a broad interpretation was used i.e. all aspects related to the functioning and operation of an airline business.

Due to the nature of the industry, many operational aspects are intertwined with the airport operations. Airport business and airline business are often very closely related, often employees performing the same job are at some place employed by the airline and at other places by the airport. Therefore every activity directly related to the operation of the airline, is also included in the research, meaning e.g. baggage handling, which is for example dependent on the local situation. So with regards to the startups this split is not always easy to make, as indicated by multiple interviewees in chapter 4. Another

aspects of this close relation for startups is that costs and benefits of their products or innovations are sometimes not for the same party, making it more challenging to bring the innovation to the market.

2.3.1. Definition

The airline industry is a branch of the aviation industry. While the aviation industry is a broader term used to describe all activities related to manufacturing, maintenance and operations of air traffic, the airline specifically focuses on the operations of aircraft for transporting passengers and cargo by air.

For this research, it was important that the startups considered had airlines as their main target customer and developed a product directly related to airline operations. As airport and airline operations and costs are closely connected and often intertwined, this definition should not be interpreted too narrow. Which party is paying which costs depends on local situations, for example in the baggage handling process this is not always organised the same way. As who pays the product determines who is the customer for the startup, this effect has been taken into account. It could create the situation that in one airport layout the startup would be in the scope of the research, while at another it would be outside the scope. Clearly, that would not make sense, therefore, it has been considered if it could be the airline and if it is specifically related to the airline operations.

2.3.2. Trends and Characteristics

The majority of this literature review has been conducted before the Covid-19 crisis, therefore the majority of the trends and developments presented here might not be valid in the short term, can be postponed or might not occur at all anymore. Therefore, the situation below presents the situation before Covid-19 and specific Covid-19 impact will be discussed in a separate section.

To understand the dynamics of the environment in which the startups operate, it was considered highly relevant to study the airline industry as such. Analysing the airline industry, would provide a better understanding of the ecosystem and why some success factors might be more or less important. An overview of the sources consulted can be found in Table 2.3.

The airline industry is characterised by very low profit margins. The last decade profitability was restoring and was one of the most profitable decades in recent history for the industry. This low profitability indicates the company structure: it is mainly focused on efficiency and cost-savings. This is not an environment in which there is naturally a lot of room for innovation. Not only because of the relatively limited budgets available, but also due to operational and safety requirements for example. The topic of innovation is treated in multiple sources such as Rothkopf and Wald (2011), Palmer (2019) and Driesen (2019). All sources indicate the difficulty of innovation in the airline industry is some way and indicate a multitude of causes.

To summarise, the key trends identified from literature:

- Rise of Low Cost Carriers (LCC): This also affected to business models of Full-Service Carriers, forced to lower ticket prices and service levels
- Very small or negative profit margins, improved last decade
- Consolidations on global level: The process is largely finalised in the US, but still ongoing in the EU
- Strong growth numbers in emerging economies

Throughout the last decades, airlines have been forced to cooperate in large alliances. This results in worldwide only three alliances: Star Alliance, Oneworld and SkyTeam Mazareanu (2019). The alliances started to form in the 1990's and the process of mergers is still ongoing. This indicates the increasing globalisation of the industry and need for cooperation.

Table 2.3: Literature Airline Industry

Publication	Title/Description of content
Rothkopf and Wald (2011)	Innovation in commoditized services: A study in the passenger airline industry
Dobravsky (2019b)	Why airports don't like startups and vice versa - Travel & Mobility Tech
Palmer (2019)	How airlines collaborate with startups to solve your holiday hell | Sifted
Driesen (2019)	Deze Nederlandse is Head of innovation bij Vueling Airlines
Cento (2008)	Characteristics of the Airline Industry
Satair (2019)	The top 10 risks the aviation industry is facing
Macdonald (2017)	Annual Analyses of the EU Air Transport Market
de Juniac (2019)	IATA - Director General's Report on the Air Transport Industry, AGM 2019, Seoul
IATA (2019)	IATA - Slowing Demand and Rising Costs Squeeze Airline Profits
KPMG (2019)	The State of the Aviation Industry | Aviation Report
Whitelegg (2000)	AVIATION: the social, economic and environmental impact of flying
Hamill (1993)	Competitive strategies in the world airline industry
Franke and John (2011)	What comes next after recession? – Airline industry scenarios and potential end games
Wensveen (2010)	The airline industry: trends, challenges, strategies
Riwo-Abudho et al. (2013)	Key success factors in airlines: Overcoming the challenges
Ustaömer et al. (2015)	The Effect of Joint Ventures on Airline Competition: The Case of American Airlines, British Airways and Iberia Joint Business
Franke (2007)	Innovation: The winning formula to regain profitability in aviation?

2.3.3. Covid-19

The literature available on the Covid-19 crisis was still limited at the time of writing. The majority of the analysis and sources reported about the major devastating economic impact of the crisis. The main sources used in this analysis are from IATA, Pearce (2020a) and a more long term analysis of Pearce (2020b).

According to these sources, major airlines around the worl have been grounded for weeks, causing the number of flight operations to decrease as much as 80% over a month period. The unprecedented scale of this crisis will change the airline industry, the question remains how. At the time of writing, this is still highly unclear.

2.4. External Venturing

The concept of external venturing is not the core of this research, however it was considered relavant to provde a basic understanding of the concept of open innovation external venturing. This are proven ways to provide innovation in corporates and are a way for startups to cooperate with airlines. It was considered that understanding these dynamics, would increase the understanding of the success factors for startups. An overview of the sources which have been consulted can be found in Table 2.4.

The concept of open innovation, where innovation comes from external sources outside of the corporates is described in Weiblen and Chesbrough (2015) and Mocker et al. (2015) and Chesbrough (2003). The concept of open innovation is illustrated by Figure 2.3.

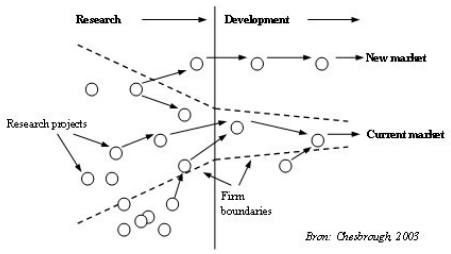

Figure 2.3: Open Innovation - Adapted from Chesbrough (2003)

Especially due the nature of the airline companies, as described in the previous section, the concept of open innovation can be interesting for airline to consider to become more innovative.

Table 2.4: Literature Innovation Strategies

Publication	Title/Description of content
Li (2001)	How does new venture strategy matter in the environment-performance relationship?
Freeman and Engel (2007)	Models of Innovation: Startups and Mature Corporations
Usman and Vanhaverbeke (2017)	How start-ups successfully organize and manage open innovation with large companies
Mocker et al. (2015)	Winning Together A Guide To successful Corporate-Startup Collaboration
Weiblen and Chesbrough (2015)	Engaging with Startups to Enhance Corporate Innovation
Galloway et al. (2017)	Exploring the innovation strategies of young firms: Corporate venture capital and venture capital impact on alliance innovation strategy
Miles and Covin (2002)	Exploring the Practice of Corporate Venturing: Some Common Forms and Their Organizational Implications
Kohler (2016)	Corporate accelerators: Building bridges between corporations and startups
Eckert et al. (2009)	Innovation partnerships: Startup and established company cooperation
Chesbrough (2002)	Making Sense of Corporate Venture Capital
Lerner (2013)	Corporate Venturing

2.5. Success Factors for Startups

This sections will provide an overview and reflection on the literature of success factors for startups. The section starts with an overview and discussion of the literature, followed by a more detailed discussion on the factors themselves and concludes with a paragraph on the success factor financial resources.

2.5.1. Meta-Analyses

The literature on the success factors for startups was very extensive, many sources have been found on a wide range of topics regarding types of startups and types of success factors. An overview of the the selected literature can be found in Table 2.5. Due to the availability of such a wide range of sources discovered during a first literature search, it has been chosen to focus mainly on two articles, providing a meta-analysis of the literature available for success factors. The work of Santisteban and Mauricio (2017) and Song et al. (2007) have been the main focus of this part of the literature review. As both sources provide a broad overview of the subject and discuss various aspects, this has been selected as the starting point. Moreover, the sources mentioned in these overview articles, provided more detailed information and a guideline for the further literature review on this subject.

The work of Santisteban and Mauricio (2017) is very complete and provides a good starting point, however, the disadvantage of this work is that it focuses on information technology (IT) startups. The type of success factors might be very different for IT startups compared to startups with hardware products, therefore, the success factors and analysis of have been carefully interpreted. For example, for hardware startups factors with regards to supply chain might be important and not present in the work of Santisteban and Mauricio (2017). Therefore, the work of Song et al. (2007) has been the main reference for the universal success factors, as it is not limited to only IT startups. This meta-analysis did not limit itself to only a specific business area and provides therefore a more general overview compared to recent meta-analysis which most of them are for specific businesses such as Santisteban and Mauricio (2017). The disadvantage of Song et al. (2007) is that this research is older and may not include the latest insights and knowledge with regards to success factors.

An important conclusion of the this literature review is that there has been no specific literature found on the success factors for startups in the airline industry. Which demonstrates the knowledge gap investigated in this research.

Next to the this important meta-analysis also a lot of research has been performed on the reasons why startups fail, obviously this is closely related to the success factors. Research such as Patel (2015) and Clominson (2020) provide more insights in the reasons for failures of startups.

Table 2.5: Literature Success Factors Startups

Publication	Title/Description of content
Song et al. (2007)	Success Factors in New Ventures: A Meta-analysis*
Watson et al. (1998)	Small business start-ups: Success factors and support implications
Kim et al. (2018)	Critical Success Factors of a Design Startup Business
Groenewegen and De Langen (2012)	Critical Success Factors of the Survival of Start-Ups with a Radical Innovation
Bailetti (2012a)	What technology startups must get right to globalise early and rapidly
Santisteban and Mauricio (2017)	Systematic literature review of critical success factors of information technology startups
Kakati (2003)	Success criteria in high-tech new ventures
Patel (2015)	90% Of Startups Fail: Here's What You Need To Know About The 10%
Clominson (2020)	The Ultimate Startup Failure Rate Report [2020]

2.5.2. Universal Success Factors

The meta-analysis presented in the Song et al. (2007) has identified 24 success factors across a broad range of publications. The 24 success factors have been divided in three categories:

- Market & Opportunity
- Entrepreneurial team
- Resources

The results of the meta-analysis of Song et al. (2007) have been split three categories:

- 8 Universal success factors: homogeneous positive significant factors correlated with NTV performance
- 11 heterogeneous success factors: the correlation with NTV performance depends on the situation
- 5 non-significant success factors: no significant effect on NTV performance

Only 8 of the 24 success factors could be identified as universal success factors for startups, meaning they are homogeneous and positively related to venture performance. The success factors can be found in Table 2.6. These 8 universal success factors are considered as the starting point for this research, as they have the strongest indication to be of importance for startups in the airline industry. Furthermore, the research of Song et al. (2007) indicated that of the 11 heterogeneous factors, for 3 of the factors indications were found that moderators would exists, influencing the importance of these three success factors. As these three factors form a group of special interest and a moderating variable might be present in the airline industry for these startups, these three success factors have been included as well in the research. The non-significant factors have been excluded from the research, because there has been no indications these factors would be more important for startups in the airline industry.

The pre-selection of the success factors first by Song et al. (2007) and afterwards a further selection of the most promising factors for this research excludes some factors that might be important for startups in the airline industry. Due to constraints in time and resources of the research it was however necessary to make a further selection of the success factors for the research and to ensure a clear scope for the research. It was considered that the selected factors would provide the best opportunity in finding important success factors. This selection of success factors creates one of the major limitations of the research and recommendations for further research, discussed further in chapter 6. An overview of the selected factors has been presented in Table 2.6 with their respective categories and definitions.

From Table 2.6, it can be seen that most success factors belong to the category resources and only two factors belong to category Entrepreneurial team and two to Market opportunity. This is a results of the results found in the research of Song et al. (2007). The factor market scope, i.e. the variety in customers and customer segments has been of special attention in this research. Because the research focused on only one industry i.e. the airline industry, the market scope for all the startups has been similar. This factor is therefore been included in the airline industry characteristics part of the research rather than the success factors. The airline characteristics provided a clearer and detailed picture of this factor.

Table 2.6: Success Factors from Meta-Analysis

	Category	Factor	Definition
Homog.	Market & Opportunity	Market Scope	Variety in customers and customer segments, their geographic range, and the number of products
	Entrepreneurial Team	Industry Experience	Experience of the firm's management team in related industries and markets
	Entrepreneurial Team	Marketing Experience	Experience of the firm's management team in marketing
	Resources	Financial Resources	Level of financial assets of the firm
	Resources	Firm Age	Number of years a firm has been in existence
	Resources	Patent Protection	Availability of firm's patents protecting product or process technology
	Resources	Size of Founding Team	Size of the management team of the firm
	Resources	Supply Chain Integration	A firm's cooperation across different levels of the value-added chain (e.g., suppliers, distribution channel agents, or customers)
Heterog.	Resources	R&D Alliances	The firm's use of R&D cooperative arrangements; for NTVs they also correspond to horizontal alliances
	Resources	Firm Type	The type of a firm's ownership (corporate ventures or independent ventures)
	Market & Opportunity	Product Innovation	Degree to which new ventures develop and introduce new products or services

2.5.3. Success Factor Financial Resources

Phase one of the research indicated that the factor financial resources was of major importance for the performance of startups in the airline industry. Therefore, after phase one, a concise literature review of this factor has been conducted in more detail, which will be presented in this section.

An overview of the relevant sources can be found in Table 2.7. The various sources indicate that the financial resources of startups has been widely researched. A multitude of sources have been found regarding the funding sources, structures and influence on the startups. As the factor turned out to be of major importance, the first part of the literature review on financial resources focused on establishing a clear picture of what financial resources are, the terminology used and possible factors that could be important for the startups in the airline industry.

Table 2.7: Literature Review - Factor Financial Resources

Source	Title/Description of content
Manigart and Struyf (1997)	Financing High Technology Startups In Belgium: An Explorative Study
Kim and Heshmati (2010)	Analysis of Korean IT startups' initial public offering and their post-IPO performance
Pan and Yang (2019)	Financial development and the geographies of startup cities: evidence from China
Mann and Sanyal (2012)	Financial Structure of Startup Firms: Role of Assets, Information and Entrepreneur
Davila et al. (2003)	Venture capital financing and the growth of startup firms

The work of Manigart and Struyf (1997) provides an overview of the different funding sources startups use and the related phases. The study focused on the situation in Belgium, and found that the results are comparable to results found in American and British studies. This is especially interesting as it turns out that the sample used in this research, is more focused towards people and/or startups situated in the Netherlands. The largely overlapping results between those countries at least provide a first indication that the situation with regards to financial resources for startups is similar across countries in Europe and the US. It has been found that startups mainly use own resources of the founders and banks are the primary source for early stage startups, when measures by number or startups using those sources. Furthermore, VC's provide the largest amounts of money to startups. Furthermore, the research found that the funding structure of startups is largely guided by some luck, indicating some randomness in the funding structures.

The research of Davila et al. (2003) discusses the aspect of timing in the funding and participation of VC's. Although the research only considers VC funding an no other sources, the aspect of having the right timing in the funding process is an interesting aspect to be considered and proved to be especially important for startups in the airline industry, characterised by the long cycle times. The work explains

the relationship between VC funding and the growth of a startups in more detail and demonstrates the importance of adequate funding at the right timing. Furthermore, it provides a recommendation regarding streamlining the funding process between startups and investors and argues that it would benefit both parties. This aspect is something which was of special interest during the research.

While the previous literature researched financial resources in more detail, more overview of financial resources as a success factor was required for this research. The meta-analysis performed by Santisteban and Mauricio (2017) provides a good overview of the literature regarding this factor, but as noted before, it was only focused at IT startups. Nevertheless, this can provide a good indication of the factor financial resources. It was found in Santisteban and Mauricio (2017) that the lack of financing was one of the main reasons for entrepreneurs to stop their business activities, prove was found in Van Gelderen et al. (2005), Song et al. (2007) and other sources. Indicating again the absolute importance of financial resources as a success factor. The research of Santisteban and Mauricio (2017) indicate that ”financial resources are one of the most important resources known as key requirement for the performance of the startup. Therefore, we think a long term sufficient financing is a previous condition for the survival and sustainable growth of the startup.”.

2.6. Related MSc Thesis Research at TU Delft

As one of the starting points of the literature review, the repository of the TU Delft has been consulted. Research in the areas of all the topics discussed has been searched i.e. startups, external venturing, innovation, airline industry, aviation. The terms have been used separately and combined to identify relevant research areas of interest. Four master thesis have been identified which are relevant to this research. Only two of them are specifically related to the airline industry or aviation industry, the other two are more generic studies not specific for a industry. The work of van der Veer (2017) and Bolomey (2017) focus both on the airline or aviation industry, both researchers investigated external venturing and so the relationship between corporates and startups. Although, this is a different point of view compared to this research, some insights still have been valuable.

The work of Camelo Martinez (2019) is a quantitative research into success predictors for Dutch startups. This research considers similar success factors as researched in this master thesis, but is not specific for the airline industry. The work of Thieme (2017) has been used in an early phase of the research to better understand the dynamics between corporates and startups,

Table 2.8: Literature Review - Relevant TU Research

Source	Title/Description of content
Thieme (2017)	The strategic use of corporate-startup engagement
Bolomey (2017)	External venturing in the Dutch Aviation industry
Camelo Martinez (2019)	Startup Success Prediction in the Dutch Startup Ecosystem
van der Veer (2017)	Strategic Decision Framework of external venturing as innovation strategy for airlines

2.7. Conclusions and Knowledge Gap

The literature review has covered a broad range of topics, necessary to understand the context of this research. Extensive literature sources have been found providing detailed analysis of the airline industry. However, none of the sources has approached the characteristics of the airline industry from the point of view of startups specifically.

Success factors for startups is a widely discussed topic, with strong relationships discovered between factors and startup performance. However, startups exists in all kinds of types, sizes and are active in a wide range of industries. Some industries have very particular dynamics which might alter the importance of some success factors. Very few specific research has been found on the success factors for startups in the airline industry. Most of the sources were covering a broader industry such as the aviation industry or had different perspectives e.g. from corporate point of view.

3

Research Methodology

In the previous chapter, the research objective and research questions were already introduced. This chapter will focus on how the research has been performed, namely the research methods. The chapter starts with an explanation of the general research type in section 3.1 and continues with an overview of the research approach and the research flow diagram in section 3.2. Furthermore, the chapter will provide a detailed explanation of the semi-structured interviews, which has been the main data collection method in this research.

The methodology of the literature review has already been explained in more detail in chapter 2 and is therefore not included in this chapter.

3.1. Research Type

The research has been split in two phases, phase one and two respectively. Each phase can be characterised by its own research type, based on Bhattacherjee (2012) and Verschuren and Doorewaard (2010). As the two consecutive phases in the research have their own objective, a different categorisation is given to each phase.

According to Bhattacherjee (2012), he first phase of the research can be categorised as an exploratory research. The work of Bhattacherjee (2012) defines the goal of an exploratory research as:

- Scope out the magnitude of a particular phenomenon
- Generate some initial ideas about that phenomenon

The goal of the first phase is to get an initial idea of the key success factors for the startups in the airline industry. The goal is to find specific success factors, which are related to certain characteristics in this industry. As there is no previous research in this area, this first phase of the research can be categorised as an exploratory research to get an initial idea about these success factors and provide an indication for further research.

An explanatory research is defined as a research that seeks explanations of the observed phenomenon and which seeks answers to why and how types of questions (Bhattacherjee, 2012). The second phase of the research can be categorised as an explanatory research, as it seeks answers to the question why the key success factor observed in the first phase is important in the airline industry. The second phase of the research seeks explanations for the observations in the first phase. Furthermore, the second phase seeks an answer to the question how the Covid-19 crisis impacts this success factor.

Considering the type of relations that will be studied and the complexity and nature of these mutual relations, a qualitative data collection and analysis has been selected as prescribed in Verschuren and Doorewaard (2010). Both phases one and two use a qualitative data analysis to support the conclusions.

3.2. Research Approach

A full overview of the research flow can be found in Figure 3.1. This represents the flow of the research from the start at the top of the diagram until the end at the bottom of the diagram. The main parts in the research approach will be discussed in more detail in subsection 3.2.1 and in subsection 3.2.2.

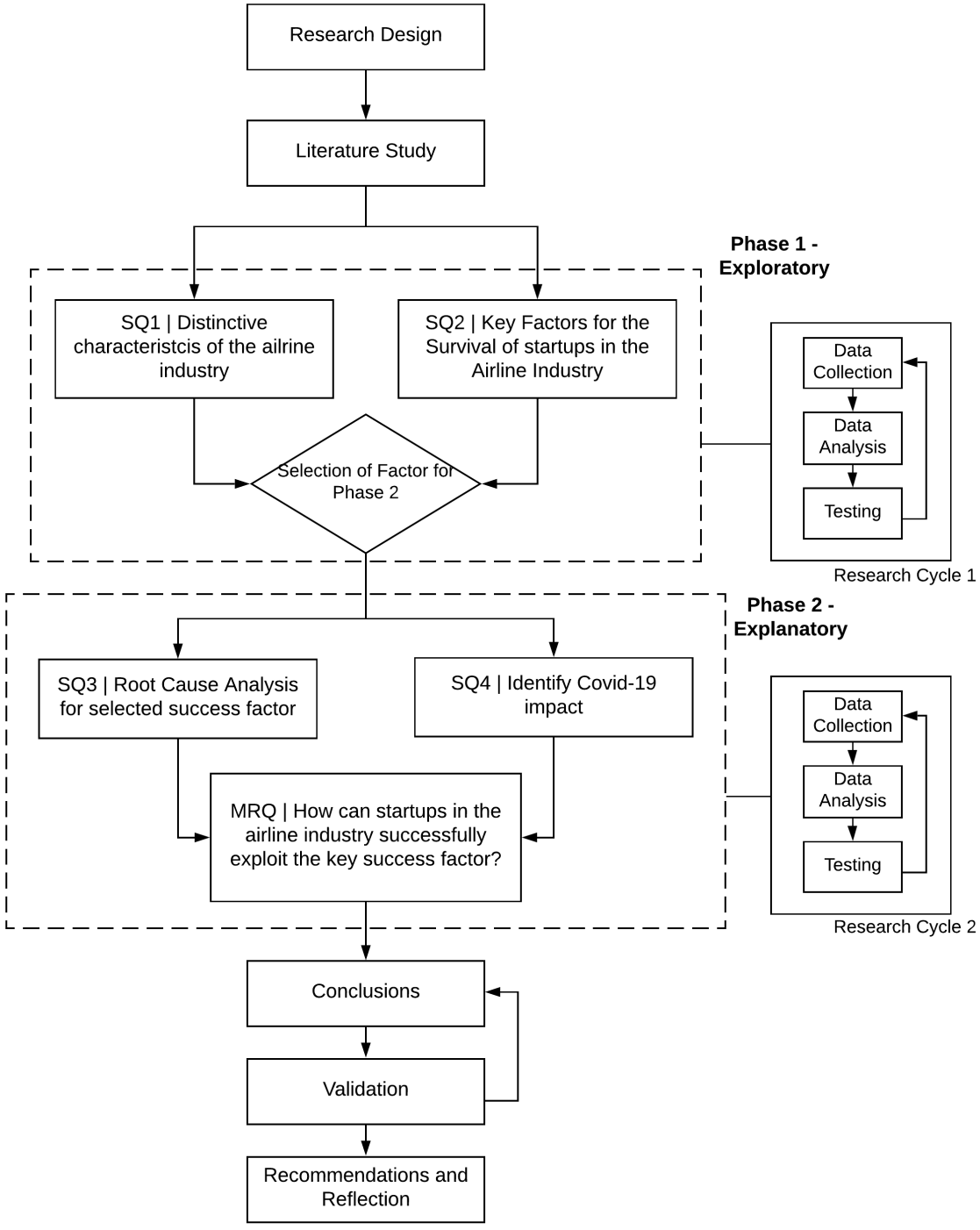

Figure 3.1: Research Flow Diagram

The research has been organised consistently with Verschuren and Doorewaard (2010) and de Reuver (2019). The first step in Figure 3.1 consists of the research design itself. This step consists of deter-

mining the research topic, research objective and research questions. The subsequent step is the literature review of the current state-of-art knowledge and literature about the selected topics. This literature review leads to the definition of the knowledge gap and the exact research questions. These first two steps are represented as a linear process, with two consecutive steps for simplicity. However, these steps have been an iterative process of obtaining new knowledge and insights and redefining and specifying the research questions.

The next step in the research was the core of the research consisting of phase one and two, both will be explained in more detail in the subsequent paragraphs. Each phase of the research consisted of its own research cycle as can be seen in Figure 3.1. The research cycle consists of the elementary research design block: data collection, analysis and testing. After phase one and two, the final research conclusions has been drafted and the conclusions have be validated by the interviewees and independent experts. Finally, the research concludes with recommendations for further research and a reflection on the research performed including the research limitations.

3.2.1. Phase 1

Phase one of the research is defined as an exploratory research in the previous section, as explored the most important success factors for startups in the airline industry. The objective of the research was to identify the key success factors that are specific for this industry. The goal was not to discover any generic success factor, as already extensive literature is available on generic success factors. Therefore, the first phase of the research starts with the creation of an overview of the characteristics of the airline industry. This provides an overview of how startups perceive the airline industry and creates a first indication of what affects the startups. These results will in a later phase of the research form the basis to find the root causes of the key success factor. Identifying the characteristics of the airline industry will be subject of the first research subquestion (SQ1).

Based on the literature review a selection of a broad range of success factors will be made, these success factors will be the focus of the research. These pre-selected success factors have been chosen because extensive literature is available on the generic success factors for startups. The pre-selected success factors are aimed at providing a clear scope for the research. While the research in this phase focuses on this pre-selected success factors, additional or new success factors have not been excluded beforehand. Participants were always given the opportunity at the start and end of the interviews to provide new success factors. As the research would like to focus on the pre-selected success factors, but would not exclude any other important factors if they would appear during the interviews, semi-structured interviews have been chosen as data collection method. These provide sufficient guidance to produce results within the scope of this research, but leave sufficient room during the interview to discover any additional factor if this would appear relevant. Identifying the key success factors for startups in the airline is the subject of research subquestion two (SQ2).

Both phases one and two consist of one iteration the research cycle. The research cycle consists of three fundamental steps: data collection, analysis and validation. Semi-structured interviews have been selected as the most suitable data collection method, this will be explained in more detail when the phases one and two are explained in more detail. As next step in the research cycle, the data have been analysed and preliminary conclusions have been formed and validated in later interviews. More detailed information about the data collection method will be presented in section 3.3.

Finally, at the end of phase one of the research, a list of key success factors for startups in the airline industry will be presented and a framework will present the relationship between the factors and the startup performance. At the end of this phase, one of the key success factors will be selected to be the subject of the second phase of the research. This second phase will investigate the root causes of this key success factor in more detail.

3.2.2. Phase 2

Phase two of the research focused on the key success factor selected in phase one. The second phase will started an investigation into the root causes of this success factor, related to the characteristics in the airline industry as defined in subquestion one. The root cause analysis of this factor are aimed

at providing a better understanding of the success factor and how it is related to the performance of the startup. The root cause analysis of the main success factor is the subject of research subquestion three (SQ3).

Next, during the research the Covid-19 crisis started to enrol at full pace and struck the airline industry hard in early 2020. Due to appearance of this additional factor and the expected consequences of this crisis, it has been chosen that this factor had to be included in the research. Although, still many impacts of the crisis were still unknown at the time of the data collection, it was considered as an important factor which would influence the airline industry significantly for year to come, therefore for the research to remain relevant this factor was included in the analysis. Research subquestion four (SQ4), will therefore focus on how the covid-19 crisis impacts this success factor and its relation to startup performance.

This finally leads to the main research question, which can be answered based on analysis of the results of the four foregoing research subquestion and additional data obtained. The knowledge of the key success factor, the causes of this factor and the impact of the covid-19 crisis will provide the basis to formulate a strategy for startups to successfully exploit the key success factor for startups in the airline industry. The main research question seeks an answer on the question how startups can successfully exploit the key success factor. The objective is to develop a strategy and propose actions which lead to a successful use of the success factor.

3.3. Data collection method: Semi-Structured Interviews

The data collection step is the core of the research and forms the basis for the analysis and subsequent conclusions of the research. Therefore, the careful execution of this step is important to produce useful and relevant results. As introduced in the previous section, the main data collection method for phase one and two of the research are semi-structured interviews (SSI's). A detailed argumentation of why these data collection methods are suited for each phase has been presented in the sections above. This section will not only focus on why SSI's have been chosen but will also provide an explanation on how the SSI's have been set up and executed.

The research cycle of each phase consists of a data collection step, namely conduction the semi-structured interviews. These semi-structured interviews consist of a mix of open and closed question and are suited for this type of qualitative research, due to the nature of the relations and factors which are investigated. The semi-structured interviews have been selected as most suitable method, as they provide sufficient focus and steering to the interviews to provide results within the predefined scope of the research, while at the same time they allow to discover new factors and relations during the interviews. The first phase of the research focused on certain pre-selected success factors, while they were the main focus of the research, the appearance of new factor was not excluded. It would have been possible that new factors arised during the interviews which were not part of the pre-selected list. In the second phase of the research, the semi-structured interviews were chosen for a similar reason, as they could provide the required balance between focus and openness towards discovering additional root causes in subquestion three for example. Furthermore, with regards to subquestion 4, the possible impacts of the covid-19 crisis would have been a too broad subject. The subquestion was aimed at the impact of the Covid-19 crisis specifically in the area of the success factor. The SSI's allowed to focus on the impact in certain areas of interest while still leaving sufficient space to discover new impacts.

As a guideline to set up these interviews, Adams (2015) has been used. The use of SSI's has several advantages and disadvantages according to literature. The semi-structured interviews can be time-consuming to conduct, can be labour intensive for the interviewer to prepare, conduct and analyse and they also require some interviewer sophistication to be conducted in an appropriate way Adams (2015). These disadvantages have been taken into considerations while designing the SSI's, for example being realistic in the amount of interviews that could be conducted given the limited amount of time and resources available. SSI's are especially suited for situation where open-ended questions may require some follow-up questions or when the interviewer might want to elaborate on independent thoughts an individual Adams (2015).

The design of the SSI's consists of multiple parts, as described by Adams (2015). Each step will be explained in a separate paragraph in the next sections. The three main steps are:

1. Selecting Respondents
2. Drafting Questions and the Interview Guide
3. Interview Preparation

3.3.1. Selecting Respondents

Selecting the respondents and determining the right sample was key to be able to formulate relevant conclusions. In selecting the respondents several factors had to be considered, the theoretical most suitable sample of participants, might be not the practical executable for example. From previous experience, it was also clear that response rates can be fairly low, not all contacted persons were able or willing to sacrifice about 1 hour of their precious time to support a master thesis research. These type of practical limitations form an important aspect of the limitations of this research as discussed in chapter 6. Considering the possible low response rates, a contact strategy was developed to contact organisations in order of interest for the interviews.

The following sequence was determined as strategy for the selection of respondents:

1. Accelerators and Incubators in the airline industry
2. Individual Startups in the airline industry
3. Organisations in the airline industry and startup environment

As first group of contacts, the accelerators and incubator directly related to the airline industry were contacted. This group was contacted as first target group, because they were expected to have a better overview of the whole airline industry. The people in these incubators have seen multiple startup failures and successes in the industry of interest, so it was expected that these could be an interesting starting point of the interviews. It was expected that these could provide better trends and generalisations compared to individual startups. An overview of the airline incubators and accelerators can be found in Table 3.1, this table is based on Palmer (2019).

Table 3.1: Airline Startup Incubators and Accelerators

Incubator/Accelerator	Related Airline (Group)
Hangar 51	IAG (British Airways)
Intelak	Emirates
ACCELERATE@IATA	IATA
Part of the Founders Factory accelerator	EasyJet
SIA Accelerator Programme	Singapore Airlines
BigBlank	Air France-KLM

Response rates from the airline incubators turned out to be very low, despite multiple efforts via multiple channels, very few persons were willing to cooperate in the research. Only one respondent has participated in the interviews. This interview has been used to test the interview guide, refine the formulation of the questions and indicate the direction of the next interviews.

As it turned out that response rates from the first step in the research strategy were too low, the second group of contacts was contacted, as presented in the strategy above. This second batch of contacts consisted of individual startups in the airline industry. Determining which startups are included and excluded has been an ongoing process. The criteria for the startups selected can be summarised as:

- Qualify as NTV
- Product specifically developed for the airline industry

- B2B
- Having airlines and/or airport as customer
- Business area related to airline operations

Startups which have been excluded:

- Startups focused on airport offerings (food, mobility,..)
- Startups focused on passenger experience

The goal of the criteria above was to create a homogeneous group of respondents, regarding type of startups and business area, but have diversity in age, size and type of products. As startups exist in all possible shapes available, a clear scope was necessary to be able to draw useful conclusions. The list of startups that qualified for these criteria has been created by consolidating multiple sources. Many of these sources already are a pre-selection of startups with specific profiles. One of the major sources of startup contact information with the specific goals has been Dobravsky (2019a) and Garcia (2019). These startup lists in itself are a subset of startups available in the airline or aviation industry.

As third step in the research strategy, organisations which were not the main target group for this research have been approached, such as Yes!Delft or the Netherlands Aerospace Group (NAG). These organisations were not the main target for interview participation directly, but the purpose was to identify useful contacts. One respondent was selected via this third channel.

A full list of contacted parties can be found in **??**. An overview of the interviewees can be found in Table 3.2 and more details about the organisations the interviewees represented can be found in Table 3.3.

Table 3.2: Overview of interview participants

Phase	Date	Name	Function	Company
Phase 1	25-02-2020	Simone van Neerven	Head of Innovation	Hangar51/Vueling
	17-03-2020	Max Diez	Co-Founder	Assaia
	17-03-2020	Borry Vrieling	Founder	Eezeetags
	18-03-2020	Martin Kaduc	Co-Founder	Kambr
	18-03-2020	Rico Barandun	Head of Strategy	Elenium
	20-03-2020	Jonas Bargum	Business Development Manager	BBHS
	24-03-2020	Dejan Borota	Co-Founder	Mainblades
	25-03-2020	Rolf van de Velde	CEO	Undagrid
Phase 2	22-04-2020	Borry Vrieling	Founder	Eezeetags
	23-04-2020	Ewout Maaskant	Director	Eye On Air
	24-04-2020	Martin Kaduc	Co-Founder	Kambr
	27-04-2020	Jonas Bargum	Business Development Manager	BBHS
	27-04-2020	Rico Barandun	Head of Strategy	Elenium
	28-04-2020	Max Diez	Co-Founder	Assaia
	06-05-2020	Rolf van de Velde	CEO	Undagrid

3.3.2. Drafting Questions and the Interview Guide

The next step in the preparation of the semi-structured interviews was the drafting of the questions and setting up a clear interview guide. The interview guide was set up to be the guide for the interviewer and was not shared beforehand with the participants. The guidelines of Adams (2015) were followed to set up the interview guide. A separate interview guide was prepared for each phase, to meet the specific research objectives of the respective phase. The full interview guide can be found in Appendix A and

Table 3.3: Overview Interviewed Companies

Company	Company Type	Type	Business Area	HQ Location	Founding Year
Assaia	Startup	Software	Ops Planning	Swiss	2018
BBHS	Startup	Hardware	Baggage	Denmark	2013
Eezeetags	Startup	Hardware	Baggage	The Netherlands	2013
Elenium	Startup	Hardware	Baggage & other	Australia	2014
Eye on air	Startup	Hardware	Safety	The Netherlands	2013
Hangar51/Vueling	Airline/ Incubator	NA	NA	Spain	NA
Kambr	Startup	Software	Revenue Mang.	US	2019
Mainblades	Startup	Hardware	Maintenance	The Netherlands	2017
Undagrid	Startup	Hardware	Ground Ops.	The Netherlands	2014

Appendix B.

The interview process had the following structure::

1. Introduction of interviewer
2. Introduction of interview topic and structure
3. Ask for consent to record and process data
4. Interview Questions
5. Final remarks and closure

This was drafted according the guidelines of Adams (2015) to first let the interviewee get comfortable with the interview setting and interviewer. Furthermore, the interview questions from point 4, had their own flow to ensure reliable results.
The interview questions from step four, as presented above, were drafted with the following flow:

1. Open-ended question at start to ask about their unbiased opinion about the most important success factors
2. Questions about the selected success factors from literature and and the importance of each factor for startups in the airline industry
3. Open-ended questions about characteristics of the airline industry and (if applicable) how they were connected to the success factors

During phase one of the interviews, the interviewees were asked to rank the relative importance of a success factor in the airline industry according to the following scale:

- Not Important
- Less Important
- Moderately Important
- Important
- Very Important

The scale provided, together with the explanation and non-verbal information, a first indication on how important the success factor was for the startups in the airline industry. The participants were asked to judge how important a certain factor was for startups in the airline industry relatively to for startups active in other industries.

3.3.3. Interview Preparation

Next to the drafting of the interview questions, also the actual interviews had to be prepared carefully to obtain reliable results.

Setting

When the research was set up, the goal was to perform as many interviews as possible in a face to face setting. Face to face settings were believed to provide the most information, such as non-verbal communication in the form of e.g. attitude and body language. However, at the time the first interviews were conducted, the Covid-19 crisis started to develop at full speed in early 2020 and non-physical interviews were considered as the preferred method. This caused all interviews to be conducted via online meetings via platform such as Zoom, Skype or via regular phone connection. When possible a video interview was preferred, to ensure to capture as much non-verbal information as possible.

Interview Length

The interview guides for phase one and two were drafted such that the interviews would not last longer than 1 hour maximum, which was considered to be the maximum time an interviewee would be prepared to sacrifice to participate in the interview. It was estimated that longer interviews would make the barrier to participate too high and would lead to fewer respondents. For the first phase, the interview guide was drafted to have a total length of 45 minutes, which would allow some margin at the end for additional questions. For the second interview guide, a shorter interview guide was drafted. First of all, due to the much more specific questions and clearer scope it was possible to have fewer questions. Secondly, because most participants already participated in the first round, less introduction was required at the start of the interview. The interview time will be limited to approximately 45 minutes up to 1 hour. This should allow to collect sufficient information while ensuring that the barrier to participate is not too high.

Testing

Before the interviews started, a test round was conducted with a knowledgeable person in the field. This test round was used to assess the formulation and clarity of the questions, the interview built-up and the total length. Some minor changes were applied to the formulation of the question and to the introduction provided.

3.4. Data Analysis and Synthesis

The data collected during the semi-structured interviews both during phase one and two of the research had to be collected and analysed. This process was done in several different steps. Firstly, during the interviews notes were made of the most important concepts discussed and provide an overview of the key elements mentioned during the interview. All interviews were recorded either with video or only audio. Within one day after the interview the recordings were watched or listened again and translated into more detailed notes. After several interviews patterns started to appear and information was labelled to certain topics. Finally, when all the interviews were conducted, the observations were collected per topic using the labelled structure and an overview of the observations per topic was created. This information was then represented more graphically using either tables or frameworks, these could than be annotated with relationships and causalities. To summarise, the process consisted of the following activities:

1. Make first notes during interview
2. Complete notes while listening/watching second time to recordings
3. Label information to recurring topics/themes
4. Collect and summarise information per topic
5. Make graphical representation of observations per topic
6. Annotate with relations and causalities

3.5. Validation

Validation was an ongoing process in this research, a testing step was included at the end of each research cycle. The preliminary conclusions and relations discovered were tested in this step. The results of the interviews in the first phase have been validated in the interviews in the second phase. This two phase approach created the opportunity to have an extensive validation of the results of the first phase of the research, as the second phase was a consequence of the results of the first phase.

The results of the second phase of the research and the overall conclusions of the research have been validated by startups who participated in the interviews and independent experts which were not involved in the research, but have an extensive experience in the airline industry and/or entrepreneurship.

Table 3.4: Experts for Validation

Name	Function	Company	Relevant info/experience
Simone van Neerven	Head of Innovation	Vueling	Experienced innovator
Manu Larose	Head of HR W. Region	TUI fly	Experienced board member in the airline industry
Martin Kaduc	Co-Founder	Kambr	Entrepreneur
Rico Baradun	Head of Strategy	Elenium	Broad experience in the airline industry (SITA)
Max Diez	Co-Founder	Assaia	Entrepreneur

4

Research Results

This chapter will present a factual representation of the research results. It consists of an overview of the observations during the data collection part of the research, it does not consists of a further analysis. The analysis of trends, patterns and generalisations observed in the data will be presented in chapter 5.

This chapter has been split in two parts, according to the same structure used in the research flow diagram presented in Figure 3.1. This chapter starts with section 4.1, where the results of the first phase of the research will be presented, which was an exploratory research into the key success factors for startups in the airline industry. This section is aimed at providing an answer to research subquestions one and two.

In section 4.2 the results of the second phase of the research, namely an explanatory research into the success factor financial resources will be presented. The selection of the factor financial resources will be discussed in detail in chapter 5, as this is an interpretation of the results and not strictly a representation of the observations.

4.1. Phase 1: Exploratory Research into Success Factors for startups in the airline industry

This section presents the results of the semi-structured interviews, which was the main data collection method for this research. The interviews of the first phase were aimed at collecting data to provide an answer to subquestions one and two, as presented in Figure 3.1. Subquestion one seeks to identify the characteristics of the airline industry, as perceived by startups and subquestion two is designed to identify the key success factors for startups in the airline industry. The results for subquestion one can be found in subsection 4.1.1 and for subquestion two in subsection 4.1.2.

The combination of the most important success factors for startups in the airline industry and the characteristics of this industry, is designed to provide a first overview of the business environment for startups and to select the key success factor for phase two of the research, as explained in more detail in chapter 3.

The 10 success factors presented in the subsequent sections were preselected based on literature, as presented in chapter 2. These 10 success factors are the core focus of the interviews conducted in phase one, however, the interviewees were given the opportunity to suggest additional success factors at the beginning and end of the interviews in the form of an open question. This set up was used to capture the unbiased view of the interviewees at the beginning.

For the first phase of the research, 8 interviews were conducted, with 7 different startups and 1 expert. The expert interview was the first interview conducted and the only one which was not a startup. Therefore, the results of the expert interview have been used as a first indication of the research results at a

start and later as a validation of the results of the interviews with the startups. The expert interview is therefore not included in the regular results, but in the validation section.

4.1.1. Characteristics of the Airline industry

The research objective for phase 1 was to determine the key success factors specifically for the airline industry. To gain a better understanding of the industry dynamics and to better determine whether the success factors are generic success factors for startups or are industry specific for the airline industry, an exploratory research into the characteristics of the airline industry was conducted. The results presented in this section consist of the part of the same semi-structured interviews about the characteristics. This results in this section are aimed at providing an answer to research subquestion one.

Characteristics

During the interview session, the interviewees were asked about how they experience the airline industry in the form of open questions. The questions were aimed at identifying which characteristics are especially important for the startups in this industry. The goal was to establish an overview of the business environment in which the startups operate. The results concerning the characteristics of the airline industry can be found in Table 4.1. The results have been grouped per characteristics and the characteristics have been grouped in 3 categories namely, business related aspects, operational aspects and ecosystem aspects. The business level category concerns aspects of individual airlines, while the ecosystem category focuses on the system above airlines or between several airlines. How these characteristics can be connected to the success factors for startups will be discussed in chapter 5.

Table 4.1: Results - Airline Characteristics

Category	Airline Characteristic	No. Sources
Business	Low profitability	1 startup
	Risk averse	4 startups
	Conservative	4 startups
	Long cycle times	7 startups
Operations	24/7 operations	2 startups
	Safety oriented	3 startups
Ecosystem	Large organisations, B2G	1 startup
	Global	2 startups
	Limited no. customers/suppliers worldwide	4 startups
	Complex, many stakeholders	5 startups
	Connected	3 startups

It has to be noted that the amount of sources does not necessarily indicate whether a factor is more or less valid for the airline industry, but can be interpreted as how important some factors are for startups in the airline industry. All seven interviewed startups recognise that the airline industry is characterised by long and sometimes very long cycle times. Different startups indicate several times and causes for this, e.g. startups indicate development times, sale times, lead times, procurement times,.. These have all been bundled and reported in long cycle times, meaning that startups have to wait long between the development of a product and the revenue of the product, which will be an important aspect in the further analysis of the success factor financial resources in the remainder of the research.

With respect to business related aspects four startups mention that airline are rather risk-averse, one of these startups mentions that people inside airline are ”anxious to make mistakes” and related this to the safety culture. Also four startups mention that they think the airline industry is rather conservative, they mention things such as ”traditional” and ”old-fashioned”. Although both concepts are related, they are not the exactly same. Conservative was more related to the general attitude of companies and their employees, while risk-averse was more related to the safety aspect. Both characteristics have

four sources, 3 of the sources have indicated both characteristics.

At the level of airline operations, startups mentioned two important characteristics. Firstly, airlines have (almost) 24/7 operations that have to keep running at all time. Airline do not accept any downtime of the processes, as this is often very expensive. This has major implications for the product development of startups, which will be discussed further in the research. Secondly, airlines are very safety oriented, this is on different levels such as health and safety of employees, passenger safety with respect to security and safety and integrity of the aircraft itself. One startup also mentioned the regulatory aspect, which has been grouped in this factor.

At the ecosystem level, four of the interviewed startups mentioned that the airline industry is characterised by a limited number of customers and suppliers. They referred to the idea that the airline industry is a ”small world” despite its global presence. Although, startups mention there are a limited number of customers and suppliers, five of the interviewed startups indicate they think there are many stakeholders in this industry, creating a complex environment to operate. Airlines in general are quite large organisations and one startup compared doing business with airlines as a ”business-to-government” situation. The startups explained that process can be bureaucratic and the organisational structure is very hierarchical. When referring to the ”small world” concept, three of the interviewed startups also mentioned that the people inside this industry often know each other very well, they are strongly connected. Startups mention that often the people within airlines work a long time in the same business area, e.g. baggage handling and they know the colleagues from other airline in the same departments there and know the suppliers very well.

Perceived Difficulty

As part of the research into the characteristics of the airline industry, the participants were asked about how difficult they perceive operating a startups in this industry. It was found that 3 of the startups think the airline industry is much more difficult, three think it is more difficult and one startup mentioned it is equally difficult as other industries. An overview of the results can be found in Table 4.2.

Table 4.2: Results - Perceived Difficulty

No. Sources	Difficulty
3 startups	Much more difficult
3 startups	More difficult
1 startup	Equally difficult

During this question, it was observed that most startups were rather pessimistic about operating in the airline industry. Some startups reported that they ”would not do it again, would reconsider (another industry)”. The general tone during this part of the interview was remarkable, the startups indicated they feel like the airline industry is very challenging to start a business.

It must be noted that this part of the interviews was conducted before the full development of the Covid-19 crisis early 2020, so this has not been of major influence during for the results.

Activity in other Industries

When the startups were asked if there company was also active in other industries, six out of seven startups reported they were only active in the airline industry. Only one startup was active in multiple industries, as they were first active in another industry and used their product knowledge from the other industry in the airline industry to expand their business. Their product was a so-called spillover effect from another industry.

Subsequently, the startups not active in other industries were asked why they were not active in other industries. Five out of the six startups not active in other industries reported ”focus” as their main reason

to not consider other industries at this point. Startups referred to the complexity of the airline industry when explaining they need to maintain a certain focus on one industry to be successful. One of the startups not active in another industry, mentioned they would actively consider other industries in the future.

In general the startups mentioned the following reasons for operating in the airline industry

- Best product market fit for their product
- Best market opportunity/potential
- Because prior experience of founders/team members in this industry

4.1.2. Success Factors

The results of the interviews will be presented per success factor and the factors are presented in the same sequence as presented during the semi-structured interviews to the participants. When the importance of a success factor is mentioned, this is always the relative importance for startups in the airline industry compared to startups in other industries. This means that the importance indicates whether a factor is more or less important for startups in this specific industry. The objective was not to measure general success factors, but determine specific success factors for startups in this industry, hence relative importance.

For every factor, first the results of the scale question are presented, in this question participants were asked to rank the importance on a five point scale from ”not important” to ”very important”, as explained in detail in chapter 3. Furthermore, the major observations from the conversations are presented.

Industry Experience

The factor industry experience is covering the aspect of the founding team or management team, depending on the structure of the startup, having prior experience in the airline industry. Subject of the research was if the interviewed startups had prior experience and if they thought this would be more or less important for startups in the airline industry. The results of the scale question can be found in Table 4.3.

Table 4.3: Results - Factor Industry Experience

No. Sources	Results
3 startups	Very important
2 startups	Important
1 startup	Moderately important
1 startup	Not important

The majority of the startups indicated that industry experience is moderately to very important for startups in the airline industry, as can be observed in Table 4.3. Three startups even indicated this factor is very important in their view. Furthermore, the startup which indicated that this factor is not important, mentioned during the interview that ”you can also attract this knowledge if you need it”.

Startups indicated that this factor was ”crucial” and ”very important”. When asked why, different startups indicated that industry experience is needed to lower the barrier to entry. Startups mentioned that ”it is difficult to enter without experience”, ”you have to know who to speak to (inside airlines)” and the airline industry uses ”specific lingo that you need to know”.

It was observed that 2 startups who did not have prior industry experience, attracted employees with more industry experience in early phases. One of the startups mentioned the advantage of not having prior industry experience: ”this allows us to look at problems and solutions with a fresh pair of eyes”.

One of the startups, who did not possess prior industry experience in the founding team, also did not attract people with industry experience, but chose to gain the experience along the way. Although,

the different strategy, this startup recognised during the interview the importance of having industry experience and qualified it as ”very important”.

Furthermore, it was observed that the startups with founders with prior industry experience think this industry experience is more important and startups without people with industry experience think this is less important. A correlation was observed between their own startup organisation and the importance they indicate a factor has according to them.

Marketing Experience

The factor marketing experience was aimed at investigating the importance of having prior marketing experience in the founding team or management team for startups in the airline industry. This is comparable to the previous factor industry experience, but regarding a different aspect of the founding team (or management team, depending on startup structure). The results of the scale question for the factor marketing experience can be found in Table 4.4.

Table 4.4: Results - Factor Marketing Experience

No. Sources	Results
2 startups	Very important
2 startups	Important
1 startup	Moderately important
1 startup	Less important
1 startup	Not important

Four of the seven interviewed startups think marketing experience is important to very important for startups in the airline industry. When asked why, two of these startups reported that it is especially important to have knowledge about the general process of marketing a product or service. The startups were not referring to specifically more or less important for the airline industry.

One of the startups mentioned that having marketing experience is less important in the airline industry, as the airline industry consists of a relatively limited amount of customers and suppliers. The startup referred to the idea that the industry is ”one big family”, meaning that many of the prominent persons in certain business areas know each other. The startup indicated that the airline industry is a ”small world” and having a network might be more useful than having extensive marketing skills.

Four of the startups who value marketing experience as important to very important, explicitly mentioned during the interview that they possess people with extensive marketing experience. One interviewee already founded his fifth company and one company specifically attracted a founder with prior marketing experience.

During one of the interviews, a startup argued that marketing experience is less important during the early phases and becomes less important during later phases. It becomes more important as the startup has to accelerate growth they mentioned. This startup attracted someone with more marketing experience two years after the founding.

One startup discussed the global presence of the airline industry as a factor having influence on the success factor marketing experience. The startup argued that, as the industry is very global, this requires startups to market products instantly all over the world, making it more challenging and costly. For example, startups have to deal with international travel, meaning higher costs and dealing with different languages and cultures.

Financial Resources

The factor financial resources concerns the influence of all kinds of financial assets a startup possess. The financial assets can be of various origins such as government subsidies, private investments, busi-

ness angels or venture capital funds. This list is non-exhaustive. Financial resources are one of the resources a startup can possess next to for example human resources. The results of the scale question regarding the importance of this factor for startups in this industry can be found in Table 4.5.

Table 4.5: Results - Factor Financial Resources

No. Sources	Results
5 startups	Very important
1 startups	Important
1 startup	Less important

Six out of seven startups indicated the factor financial resources is important to very important according to them. Next to the the clear necessity of having financial resources for a startup in general, the majority of the startups indicated that they think that it is more important for startups in the airline industry compared to other industries. When asked why, five of the startups referred to the exceptional long cycle times the startups have to deal with. Various startups refer to different times such as lead times, sale times, development times. Startups were using different terms to indicate the long time between the development of the product and the start of the revenues. Next to the different terminology used, the times also indicated different causes, which will be elaborated on in the discussion part in chapter 5.

The startups indicated that these longer cycle times in the industry can take up to several years, which is no exception in this industry. Sale cycles of 24 months were reported as ”fast”. The startups indicated various reasons for these long cycle times such as a ”conservative industry”, ”risk-averse” and ”highly regulated”. Furthermore, several startups who have products in critical processes for airlines such as baggage handling, indicated that there ”was no room for trial and error”. They argued that these critical operations of an airline have to continue running 24/7 and airline do not accept them to be hindered by a new product or innovation. This causes startups in the airline industry to have to develop and test products to a much further extend compared to other industries. Although, the latter is only indicated by startups active in the critical processes in the industry. All startups referred to very industry specific processes and dynamics regarding the reasons for the importance of this factor.

The majority of the startups indicated that they think that these long cycle times lead to longer so-called ”runways” for startups in the airline industry. Runway refers to the amount of months that is left before startups runs out of money.

Firm Age

The factor firm age considers the importance of the years a firms has been in existence for the performance of the venture. The results of this factor’s scale question can be found in Table 4.6.

Table 4.6: Results - Factor Firm Age

No. Sources	Results
4 startups	Moderately important
1 startup	Less important
2 startups	Not important

Four of the interviewed startups indicated that the firm age factor was moderately important, as important as in other industries. Three startups indicated that they think that firm age is less important or not important for startups in the airline industry. From the four startups that rated this factor as moderately important, three of them referred to the credibility of the company while explaining why this factor was moderately important according to them. As they indicated that firm age might be a measure for credibility, some startups explained that the credibility of the founders or management team is more

important and not necessarily related to the firm age.

It was observed that the majority of the interviews shifted to the topic of credibility when this factor was discussed. Furthermore, while the factor was about the company and the age of the company itself, the majority of the startups started to talk about the human resources of the founders or management team. One startup even indicated that the age of the founders is more relevant and ”age 40 is the sweet spot (to start a company)”.

One startup indicated they were completely new and were young and did not notice any negative effects of this in the airline industry. Another startup mentioned that airlines might worry about the young age of a company in terms of long-term sustainability of the company, again, which can be connected to the credibility of the company and founders.

Patent Protection

The factor patent protection considers the effect of the availability of patents to protect a company’s technological product or process. The results of the scale question regarding the importance can be found in Table 4.7.

Table 4.7: Results - Factor Patent Protection

No. Sources	Results
2 startups	Important
2 startups	Moderately Important
2 startups	Less important
1 startup	Not important

Four startups rate this factor as moderately important to important and three startups rated this factor as less important to not important. It was observed that startups with hardware products rated this factor as more important than startups with software products. Furthermore, it was noted that out of the four companies that ranked patent protection as (moderately) important, three out of four were in the possession of a patent, had a patent pending or could exclusively use one via a third party. On the other side, it was observed that from the three companies that value patent protections as less or not important, two out of thee did not have any patent protection.

Two of the startups mentioned during the interview that they think patent protection is less important in early startup phases, but becomes more important in later phases, mainly to protect technology from competitors.

Two startups discussed during the interview that they think patent protection is less important in the airline industry, due to the high barrier to entry. They argued that this high barrier to entry provides some protection to new entrants and that patents are therefore less valuable. Another reason startups discussed why they think patent protection is less important is because patent protection is difficult to enforce. To enforce patents, often expensive lawsuits have to be started, which is impossible for most startups.

One startup mentioned that the possession of a patent was in particular important for them in the process of finding funding. They reported that they mainly used the patent as a marketing tool, rather than to shield off their technology.

Another observation a startup mentioned was the geographical difference in the importance of patent protection. The startup discussed that having a patent is more important, hence more valuable, in the US compared to the Netherlands.

Size of founding team

The next factor which was part of the research was the size of the founding team, meaning the size of the management team at the time of the founding. The results of the first question of the interview can be found in Table 4.8.

Table 4.8: Results - Factor Size of Founding Team

No. Sources	Results
2 startups	Very Important
2 startups	Moderately Important
2 startups	Less important
1 startup	Not important

Two startups ranked this factor as very important, two as moderately important, meaning as important as in other industries and finally three startups reported that this factor is less important or not important. Four out of seven startups interviewed mention that they consider a founding team of three to four persons as ideal.

Two of the startups indicate that starting a startup with only one person is ”insane” and that they do it ”never alone”. On the other side, one startup argues alone is better as another person could slow down the process.

During the interviews it was observed that startups especially think that having different backgrounds and having complementary skills in the founding team is important. In five out of seven interviews startups indicated this diversity in the founding team as the main reason for having multiple founders. It was observed that the size of founding team was merely a means to meet the objective of having a diverse founding team.

Supply Chain Integration

This factor focuses on the firm's cooperation with different levels in the supply chain such as suppliers, customers and distribution channels. The results for the factor supply chain integration can be found in Table 4.9.

Table 4.9: Results - Factor Supply Chain Integration

No. Sources	Results
1 startup	Very Important
4 startups	Important
2 startups	Not Applicable

For the majority of the interviewed startups, namely five out seven, this factor was important to very important. Two of the interviewed startups indicated they could not provide a relevant answer to this question, as their company did not have a significant supply chain, as they were in software development for example. These have been indicated as ”not applicable”, however, these can also be interpreted as ”not important” for their companies.

Three of the startups indicated that they started with supply chain integration very early in the process, e.g. during prototype development. They indicate that this helped them to speak to people with more relevant knowledge in the field and identify possible problems earlier in the process.

Firm Type

The factor firm types describes the effects of the firm type of ownership (so whether a startup is a corporate venture or an independent venture) on the venture performance. The results of the scale

question are presented in Table 4.10.

Table 4.10: Results - Factor Firm Type

No. Sources	Results
1 startup	Very Important
1 startup	Important
1 startup	Moderately Important
3 startups	Not Important
1 startup	Not Applicable

Two of the interviewed startups indicated that the firm type is an important or very important factor to them, one startup reported it is of moderate importance and three startups think the firm type is not an important success factor. One of the startups indicated they could not judge this factor properly, therefore this result is indicated as ”not applicable”.

Four out of the seven startups indicated during the interview that they were not convinced that the involvement of a corporate via corporate venturing would benefit their firm. The majority of the startups was at least hesitant regarding the involvement of a corporate or even negative towards involvement. During the interviews it was observed that the majority of the interviewees valued their independence more than the potential benefits from external venturing. One of the startups said it ”(external venturing) would hinder the success of the startup”, furthermore they clarified that ”it might block technology or products from competitors”.

Another startup indicated that this really depends on ”the freedom of the relationship”, the effect can be ”both ways, it has pros and cons”. It was observed that the interviews during this topic for the majority shifted towards an explanation of the importance of their independence for the success. The general tone of the interviews was quite critical towards corporate venturing.

The interviewed startups were all independent ventures, without involvement of a corporate. One startup, which was interviewed in the second phase of the research had an indirect involvement of a potential customer via an investment fund, however this startup was not part of the results for this phase of the research.

One startup had a different attitude with respect to the discussion above, they indicated that involvement of a corporate in the equity of the form can have a positive influence.

R&D Alliances

The subsequent factor covered in the interviews was the factor R&D alliances, this reflects the firm’s usage of cooperative arrangements for research and development activities. This can be cooperative arrangements with for example universities, research institutes or corporates. The results of the scale questions regarding the importance of this factor are summarised in Table 4.11.

Table 4.11: Results - Factor R&D Alliances

No. Sources	Results
4 startups	Very Important
1 startup	Important
2 startups	Less Important

Five out of the seven interviewed startups indicate that the R&D alliances are an important to very important factor for them. The other two startups indicated that this factor is less important according to them. During the interviews four startups indicated that this factor is very dependent on the type of innovation and product the startup is developing. They indicated that R&D alliances may be more important for more innovative products and technologies, this can be related to Technology Readiness

Levels (TRL) of the products.

The dependence on the type of product was especially demonstrated by one of the interviewees who indicated it was not important for their startup, but it was crucial for their sister company. The interviewee was in a unique position by having insight information and an overview of two different types of companies. The interviewee clearly described this relation between the importance of R&D alliances and the type of innovation, based on his two experiences.

Two of the interviewed startups indicated the factor R%D alliances was specifically important for them for the development of Artificial Intelligence (AI) tools. For the development of these AI tools, cooperations for research and development were very important.

Of the interviewed companies, two had a partnership with a university, one with an industry partner, one was in the process of setting up an alliance and one startup did not have any alliances. It was observed that not only the companies with already existing alliances, but also the companies without any alliances indicated that this factor is important.

Product Innovation

As last factor, the interviewees were asked about the factor product innovation. Product innovation is defined as factor as the degree to which ventures develop and introduce new products or services. A summary of the results with respect to the importance of the factor can be found in Table 4.12

Table 4.12: Results - Factor Product Innovation

No. Sources	Results
2 startups	Very Important
4 startups	Important
1 startup	Moderately Important

Two startups marked this factor as very important, four as important and one as moderately important. During the interviews the startups often referred to the concepts of incremental and disruptive innovations, providing a reference for the degree of innovation of their products.

Several startups described that it is necessary to take incremental steps in the airline industry, as the industry can not handle large disruptive innovation. The airlines are very large organisations with critical process and very safety oriented. The startups indicated that this environment is not suited for large disruptions. However, the startups also indicated that some degree of disruption is necessary, one startups describes it as ”promise disruption, but take incremental steps”.

Two of the interviewed startups explicitly mentioned their stepwise implementation method to cope with the industry specific dynamics. They mention that airlines are too big to handle disruption and need to ensure continuation of their operations at all time, so going for a large disruptive technology is too risky for them. Airlines need a slower adoption rate they argued.

Five of the interviewed startups indicated it is necessary to be disruptive to some extent ”to get into the industry” or ”to get a seat at the table (as a startup)”. Several startups indicated it is necessary for a startup to promise a 10 times better product, otherwise, it is difficult to get in the industry. It was observed that during several interviews the degree of innovation was used as way to overcome or lower the barrier to entry.

4.1.3. Key Success Factors and Selection of Factor for Phase 2

This chapter is only meant to provide a factual representation of the data collected during the interviews and not an interpretation of the data. However, to follow the research flow, it is important to mention that the factor financial resources has been selected for a further explanatory research in phase 2. The

full explanation of the selection process and criteria of these factor have been based on the results presented above and can be found in chapter 5.

4.2. Phase 2: Explanatory Research into Financial Resources

The second phase of the research focuses on the success factor financial resources. Based on the results from the first exploratory phase of the research, the factor financial resources will be studied in an explanatory research in the second phase. The results presented in this section are aimed at finding an answer to the main research question, ”How can startups successfully exploit the key success factor in the airline industry?”. To answer the main research question, two subquestions will be investigated first, leading to the results for the main research question. Subquestion three and four will focus on the root causes for this factor and the Covid-19 impact. Finally, the results with respect to the strategies identified are presented.

For the second phase of the research, the data are also collected via semi-structured interviews as explained in more detail in chapter 3. The data presented in this section are a representation of the observations during seven different interviews. Six out of seven startups already participated in the first phase of the research and were interviewed a second time, one startup was new to the research.

4.2.1. Financial Data

Before the interview questions started some initial financial data were gathered to provide. This financial data provides background information on the sample space of the research and provides a context for the results presented later. The first data were collected via desk research and completed during the interview.

Most startups indicated that exact funding numbers and details about funding rounds are strictly confidential. They have been shared with the researcher, but could not be published in the results. Therefore, no specific data of individual startups are mentioned in this results section, but only generalisations and ranges of numbers.

From the interviewed startups, five had secured funding in the range 1-5 million EUR and 2 of the startups in the range 10-20 million EUR. The startups indicated during the interview that the time before the first revenue ranged from 2.5 years up to 5.5 years, with three of the startups had a time before first revenue around 3 years. Only one startup reported they were able to generate revenues after a few months, this startup adopted a different strategy compared to other startups. This startup focused on finding revenue opportunities fast and not on product development as the other startups did.

Table 4.13: Results - Funding Amount

No. Startups	Funding Amount
5	1-5 MEUR
2	10-20 MEUR

Regarding the funding sources, all the startups reported a broad range of different funding sources such as private investors, venture capital funds and different kinds of government subsidies or grants. Only one of the startups was fully financed by private resources of the founder.

4.2.2. Financial Resources Characteristics for Startups in the Airline Industry

The interviewed startups were asked about the characteristics with regards to the factor financial resources for startups in the airline industry. To objective was to identify what is specific in this industry and why financial resources are so important. This question was mainly set up as a validation of the results from the first phase of the interview and to ensure the basis for the second phase of the research. During the interviews all seven startups mentioned the long cycle time as the most important difference

with respect to other industries. They reported this as something very particular for the airline industry.

However, the startups were reporting all similar characteristics, the different startups mentioned different types of times:

- Sale times
- Lead times
- Implementation times
- Decision times
- Development times

Although the different times have different causes, they all have a similar effect on the factor financial resources for startups in the airline industry, this will be further elaborated in chapter 5.

4.2.3. Root Causes for Long Cycle Times

The results in this section are aimed at providing an answer to subquestion three, investigating the root causes for the success factor financial resources. As the startups reported that this factor was mainly caused by the long cycle times, a further research was conducted into the reasons for these long cycle times. The results are closely connected to the results observed earlier for the characteristics of the airline industry in general.

Table 4.14: Results - Causes Long Cycle Times

Category	Cause	No. Sources
Safety	Highly regulated	4 startups
	Long Certification procedures	2 startups
Operations	24/7 operations	3 startups
	Critical processes	2 startups
Culture	Conservative	5 startups
	Risk averse	4 startups
Organisational	Bureaucratic	1 startups
	Highly functional organisations	2 startups
Other	Long-term contracts with suppliers	2 startups

Four of the interviewed startups mention the safety aspect as one of the main factors which is slowing the startups down. Products in the airline industry are subject to many different regulations and dependent on the business area they need certification. Startups indicate that these certification processes can slow down the development times significantly and can be costly. It was observed that this is specifically for the development of hardware products, it differs significantly per business area.

Furthermore, three of the startups mention that the 24/7 operability of the airline industry is an important factor which causes the long cycle times. The startups argue that airlines do not accept any downtime, as this is very expensive. Therefore, before products can be implemented in (critical) processes, extensive development and testing is required. One of the startups indicate that ”errors are not accepted in this industry”. Airlines do not accept any distortion of the processes caused by innovation or new products installed. Startups indicate that this creates a risk-averse environment inside airline companies.

Another aspect mentioned during the interviews are the long term contracts with suppliers, two startups mention this as a factor causing some startups have to wait sometimes years before they have the opportunity to sell products.

Other aspects mentioned during the interviews are the global presence of the industry, startups have to deal with customers in other countries or continents, dealing for example with different time zones.

Furthermore, one startup indicates that airlines are very large companies, almost like Business-to-government environment. This often creates long and bureaucratic procurement processes, making the sale times relatively long in this industry.

4.2.4. Implications for Startups

During the interview, it was observed that some of the characteristics and causes mentioned had specific implications for the startups. Therefore, these implications have been reported separately in the results. These results are not specifically connected to a subquestions, but support answering the main research question i.e. finding a successful strategy.

Firstly, startups indicated effects regarding the marketing and distribution of their products, due to the global characteristics of the airline industry. Startups have to deal with marketing on a global scale, therefore often expensive business travel expenses to visit customers and suppliers and deal with them in other cultures and languages.

On the product level, startups report they can not easily build and test a minimum viable product (MVP) in this industry. Due to the operability requirements of critical processes of airlines, they have to ensure a product is fully tested and developed before installation. Although this differs per business area, e.g. this especially reported by startups in baggage handling, less by software startups, this is a phenomenon that most startups recognise.

Finally, regarding funding, startups experience relatively long runways and therefore they need relatively high amounts of funding, to survive this longer runway. Due to the longer runways and long time before a startup in the airline industry can make revenue, startups reported that they think that finding investors in this industry is harder. One of the startups reported that there is ”only a limited amount of investors who understand the dynamics of this industry, it is difficult to find the right investor”. Multiple startups mention that most VC’s are looking for returns withing three to four years, which is difficult for startups in the airline industry, regarding the long cycles.

4.2.5. Covid-19 Crisis Impact

The interviews were conducted when the Covid-19 crisis was in full development early 2020 and major airlines worldwide grounded their full fleets for several weeks. This clearly impacted the airline industry severely, therefore this factor was considered as highly relevant for the research. The results presented in the previous sections, represent the situation without the Covid-19 impact. The results presented in this section, represent a fist indication of the impacts of the Covid-19 crisis on the financial resources as a success factor and the different aspects discussed above. The interviews were conducted at the start of the crisis, therefore they are merely an estimate of the expected impact, this will be fully discussed in chapter 5.

First of all, two of the interviewed startups reported that at the time of the interview, it was too early for them to estimate the impacts for them, also in general startups mentioned that this was an early estimate.

Regarding revenue, early stage startups, which often do not have solid revenue streams did report limited impacts on their business. Some startups mentioned that development projects were stopped or paused. Later stage startups, who relied more on revenues, reported they were much more affected. The early stage startups mentioned impacts on more operational levels which will be discussed later, regarding funding none of the startups mentioned any changes regarding current funding deals.

Table 4.15: Results - Covid-19 Impact from Startup Perspective

Category	Impact	No. Sources
Financial	Revenue decrease/ Burn rate increase	2 startups
Internal	Increased development times	1 startup
External	Ongoing projects paused/stopped	2 startups
	Increased customer need for automation/digitisation	5 startups
	More difficult to contact customers	1 startup
Airline	Faster decision process	3 startups
	Faster technology adoption rate	1 startup
	Disruption of airline industry	1 startup

Due to the decrease in revenues, mainly for the later stage startups, the companies indicated that their burn rates drastically increased to cover ongoing costs and expenses. One of the startups reported that this might create significant problems, as their revenue streams stopped and they were in need for more cash and therefore looking for additional funding. While this startups also mentioned that they expect that attracting new funding sources will become more difficult.

Table 4.16: Results - Covid-19 Impact on Funding

No. Sources	Funding Impact
1 startup	Closed new round
3 startups	Expect new funding to be more difficult
2 startups	Impact mainly on angel investors, less on VC's
All	No impact on settled agreements

Next to negative effects, five of the interviewed startups indicated they also expect some positive impacts from the Covid-19 crisis. These five startups all reported they expect an increased customer need for automation or digitisation in the short-term. The startups expect that airlines will need new applications and products to cope with this crisis, creating new opportunities for startups. They indicated that it will depend on startups that are able to react quickly and capture these new needs to be successful. One of the interviewees expected this crisis to be a real "disruption" for the airline industry, explaining not only a change on the short-term, but an impact for the long-term.

Three of the interviewed startups indicated that they expect that cycle times can decrease now, as there is a more urgent need in some business areas. This increased need, will speed up decision processes for example. On the other hand, startups also indicated that external there might be a faster process, they expect the covid-19 crisis to slow down their internal processes e.g. development of products. Especially hardware startups indicated they expect negative impacts regarding the value chain, suppliers availability etc.

4.2.6. Strategies for Startups

Although a rather challenging business environment has been described in the results above, several strategies have been identified during the interviews on how startups can be successful on the level of financial resources. Several startups reported how they were dealing with the specifics regarding finding financial resources in this industry. Several actions have been identified and the results have been split in two categories. The first category of actions is aimed at decreasing the cycle times and so reduce required runway length for startups. The second category is aimed at matching the specific

financial situations of startups in this industry with suitable investments partners. The results are presented in Table 4.17.

Table 4.17: Results - Solution Strategies

Category	Solutions	No. Sources
Shorten cycle times	Use network to talk to the right person immediately	3 startups
	Respond agile, address niche markets with faster returns	1 startup
	Operate in non-crucial processes	1 startup
Finding right investors	Clearly communicate key KPI's	2 startups
	Long-run investors	3 startups

Firstly, startups mention that you can try to shorten the cycle times in order to reduce the required runway length, hence, required funding. Several solutions are being mentioned which all relate to having an extensive network in the airline industry. Startups report that by having a network they can address the different aspects which make the cycle times long. The cycle times, were previously defined as a summary of different times mentioned by startups such as development times, sale times, etc. Startups indicate that by having the right network, it can decrease the sales times drastically, as they can immediately speak to the persons who have the right authority levels. Contrary, when startups do not have the right contacts, they can get lost in the large organisations that airline most often are and it can take a long time before they arrive at the right person or department to pitch their product.

Startups also mention similar effects for talking to suppliers. Inside certain business areas in the airline industry, there are only a limited amount of experts in the field who have the required knowledge and often they are connected to a few suppliers with long term contracts.

While the first category consists of solutions to shorten cycle times, startups also reported solutions regarding a second category, namely finding suitable investors. Startups mentioned during the interviews that the amount of investors who understand the dynamics of the airline industry are limited. Startups indicated that being open about the key financial KPI's early in the process, this can prevent long conversations with investors who are actually not interested in this industry. One of the startups reported that being open in the communication is key for finding the right persons to talk to i.e. investors who are interested in this industry. It was observed that it is essential that investors understand that investing in a startup in the airline industry is an investment for the long run.

One of the startups used a somewhat different strategy, they addressed relatively small niche markets where they could find solutions quickly and generate revenues quickly. They reported they did not suffer that much from the same long cycle time issue, as they specifically targeted other opportunities.

5 Discussion

In this chapter the results, which have been presented in chapter 4 will be discussed. An analysis of the relationships, trends and causes of the observations will be provided. The chapter is organised consistently with chapter 4, it will start with a discussion of the results of phase one of the research, followed by a discussion of the results of phase two.

5.1. Phase 1: Exploratory Research into Success Factors for startups in the airline industry

The discussion of the observations of phase one will start with a general discussion on the observations of the various interviews on the success factors, next the results of every success factor will be discussed. The discussion will then zoom in on the five key success factors and how they are related to the characteristics of the airline industry. Finally, the discussion of this phase will conclude with a discussion on the selection of the success factor for phase two of the research.

First an overall discussion on the observations of the interviews on the success factors will be provided, followed by a detailed discussion on each success factor separately.

5.1.1. General discussion

One of the major patterns in the results on the relative importance of every success factor is the correlation between how important a startup ranked a success factor and how their own startup is organised. For example, for the factors marketing experience and industry experience, a correlation exists between how important they believe this factor is and the experience they have in their own startups. Startups with experienced people in marketing tend to value this factor higher than startups without experience. This can be either a consequence of the startups valueing certain factors more or less and therefore looking with people with certain skills. Or, on the other hand, it can also be that startups who perhaps by coincidence have people with marketing or industry experience tend to believe in their own success and see their way of working as the way to success. Either way, from the correlation it is not possible to conclude any causality in one way or the other.

Related to the correlation discussion above for several success factors, it was observed that in general startups are quite confident about their own way of working, dealing with problems and organisational structure. This can be a consequence of the startups who responded to the request for interviews. It is likely that startups who are confident and quite successful might be more willing to cooperate and share their knowledge.

Furthermore, from the results presented per success factor, not only what the startups were mentioning is important, but also other factors have to be analysed. During the interviews, it was observed that startups were way more talkative and convinced for some factors than for others. Some factors required more explanation or additional questions to retrieve useful information. Also this type of results have been analysed and is Incorporated in the selection of the key success factors.

5.1.2. Discussion per Success Factors

In this section the results per success factor will be discussed, analysing patterns and trends in the observations.

Industry Experience

From the observations, it is observed that most startups value industry experience as important, only one startup values it as not important, while all the other startups indicate this factor as moderately to very important. The only startup which ranked this factor as not important, can be considered as an outlier in the data. When analysing why the startup indicated this factor as not important, the startup mentioned that this knowledge can also be attracted externally. Therefore, this reaction is probably caused by the way the question was set up, as the question focused on whether this industry experience was important to posses in the management or founding team. However, the startup mentioned this is not important to have, during the rest of the interview the startup recognised this is still important to have as a startup, but does not need to be included in the management team or founding team.

It was remarkable that one of the startups mentioned that it also has advantages of not having industry experience, as one can look at problems with a fresh pair of eyes. Although, this does not need to contradict the finding that industry experience is important in this industry. Having some persons with industry experience in a startup does not exclude having completely new people on-board as well.

From the data it has been found that industry experience is crucial for the success of a startup, the startups who did not possess industry experience attracted this experience in early phases, which indicates the need for having experience people in the startup.

When asked why this factor is important, startups refer to several reasons which can be collected as ”having a network”. For the startups it is important to know exactly who to speak to inside an airline to limit cycle times. Furthermore, the people in the industry are very connected, often people inside one business area meet each other frequently at worldwide events and business fairs. Having someone with industry experience can lower the barrier to entry for startups and increase the chances of survival.

Marketing Experience

The results for the factor marketing experience are quite scattered, with five of the startups indicating it is moderately to very important and two startups indicating it its less to not important. Providing indications it is at least of some importance for a subset of startups. However, when the results are carefully analysed, the respondents who indicate this factor as important also indicate this is due to the importance of having experience with the general marketing process and activities. In general, the startups do not indicate very industry specific reasons for why they think this factor is more important. No indications can be found in the results that marketing experience is more important for startups in the airline industry.

Additionally, evidence can be found in the results which indicates that having marketing experience is even less important for startups in the airline industry compared to other industries. Startups in the airline industry are dealing with a business-to-business environment and with a relatively small amount of customers. Furthermore, startups indicate that airlines are very number driven, they want to see calculations on the returns, efficiency gains etc. Therefore, it may be less important for startups to have experience with classical marketing skills and processes, as this industry might behave differently. Above that, people seem very connected in this industry, which can decrease the importance of marketing even more. They may value trustworthiness and long-term relations more.

An interesting aspect from the results is that the airline industry is a very global industry and this affects the marketing activities of the startups. Startups have to market their products almost immediately in a global market, targeting people with different cultures and languages. This would suggest experience with this type of global marketing activities would be beneficial, however, no significant evidence could be found in the interview results to support this.

Many of the interviewed startups were early phase startups, in the development or testing phase of

their products or selling the first products to customers. Only two startups can be considered later stage or in the growth stage. This might influence the results for this factor, as there are indications that marketing becomes more important for the companies when they need rapid growth and quickly accelerate revenues. Therefore, the results might reflect more the situation for early stage startups.

Financial Resources

The majority of the startups indicated this factor as being important to very important for startups in the airline industry, only one indicated it as less important. Not only indicated the participants clearly the importance of this factor, they also gave very specific reasons why this factor is more important for startups in this industry. The airline industry has some very distinctive aspects that make this factor more important.

Obviously, possessing sufficient financial resources available is important for every startup, nonetheless the industry. However, when the startups were confronted with this statement, they provided solid arguments why this might be more important for startups in the airline industry, as can be seen in the results. The vast majority of the startups indicate that the main driver for this are the (very) long cycle times in this industry. The startups believe firmly that cycle times in this industry are above average, compared to startups operating in other industries. They indicate cycle times of up to several years. These cycle times cause the startups to depend on funding for a longer period and therefore, needing relatively high amounts of funding.

Interesting is the mismatch, which several startups report, between what most investment funds expect with respect to timings and return on investment and what startups can offer. This mismatch is an additional factor increasing the importance of financial resources for these startups.

It is remarkable that the results are very homogeneous, except for one startup, all startups recognise the importance of this success factor and above that, the reasons for this factor are related to something industry specific.

The outlier in the results, which indicated this factor is less important has been interviewed again in the second phase of the research. During this second interview, the respondent indicated that the different results was mainly caused by a misinterpretation then and the respondent agreed with the general findings.

Firm Age

From the results it can be concluded that this factor is only moderately important for startups. Most startups report it as moderately important and three of the interviewees indicate it is less to not important for startups in the airline industry. An aspect closely related to the firm age and mentioned during many interviews is the credibility of the startup and founders. The reasoning behind this is that higher firm age increases credibility, hence would be positively influence venture performance. However, from the results it can be seen that there is no direct relation between the firm age and its credibility. For example, a company can be started by very experienced and credible people, while the firm is very young or startups can also attract external people with more credibility in the industry. Therefore, these factors have to be considered separately.

Although from the results it seems as firm age does not severely impacts the performance of startups in the airline industry as such, it seems like credibility of the founders might be an aspect to consider further.

Of course, when success is defined solely as the survival of a company, the age is clearly connected to the success. However, from the interview results, no indications could be found that an older startup per definition would be more successful than a younger one.

Patent Protection

The results regarding the factor patent protection are scattered, they can be divided in two large groups. First of all, the startups with hardware products rated this factor in general as more important, while software startups rated this factor as less important or not important. This is for obvious reasons, as patents mainly provide protection for hardware startups.

Again, a strong connection is observed between the possession of a patent and how important startups perceive patent protection. Startups with patent protection ranked patent protection as more important. Furthermore, from the results no significant reasons could be found why patent protection would be more important in this industry. The startups could not indicate any industry specific causes for the importance. The causes indicated such as protecting technology from competitors and using patents as a marketing tool are also common in other industries.

The sample space of the interviews consisted of mainly early stage startups, which might influence the importance of this factor. From the results, there are indications that later stage startups value patent protection more, as they are dealing more closely with competitors. Hence, protecting their technology may be more important.

On the other hand, some causes could be identified why patent may be less important in the airline industry. The relatively high barrier to entry in the industry provides some protection against new entrants. Furthermore, the industry is very connected and builds on trust and long-term relationships, even more decreasing chances of new entrants.

Size of Founding Team

Four of the interviewed startups indicated that this factor is moderately to very important to them. However, from the reasons it is clear that the startups do not judge the size of the founding team, but more the diversity of the team. The line of reasoning behind the importance is that a startup needs multiple founders to have a diverse and complimentary team. Most startups estimate a founding team of three to four persons as ideal. In the results no indication can be found that this success factor has any specific reasons related to the characteristics for the airline industry. The importance and reasons in the results most likely reflect the general importance of having a diverse team in a startup, nonetheless the industry in which the startup is operating.

Supply Chain Integration

For all the startups answering this question this factor was important to very important. However, two of the startups indicated they could not provide an answer to this question as their startup did not have a significant supply chain. So, the results can be split between hardware and software startups, It was found that this factor is significantly more important for hardware products is way more important.

Looking at the causes for the importance of this factor, startups indicate industry specific reasons, namely they would like to decrease cycle times. By early cooperation with customers and suppliers, startups are able to shorten the product cycle times. Especially, because of the limited amount of customers and suppliers, this factor is of significant importance to startups in the airline industry. Only a few partners are available, when these are not supportive, chances of success decrease significantly.

Firm Type

The results for firm type are scattered, with three startups clearly indicating this factor is not important. While the startups provide a scattered view in the results, as the interviews progressed, they provided a way more homogeneous view on the independence of the company. The majority of the interviewed startups indicate that their freedom is important for the success. This actually contradicts the results presented from the scale question. This could be because startups at first instance did not understand the question fully or did not think about this earlier.

In general the negative attitude of most startups regarding external venturing is remarkable, many startups think this would negatively impact their company, or at least it is not clearly beneficial for their startup. This can possibly be explained by the fact that all the interviewed startups are independent

ventures. There might be clear reasons why they chose to be fully independent, so this must be taken into account when interpreting the results.

No industry specific reasons for this factor could be identified based on the results of the interviews.

R&D Alliances

The results for the factor R&D alliances can be split in two groups, five of the interviewed startups indicate this factor is important to very important, while two of the startups indicate this is less important according to them In the results. This division can be explained by the type of products the startups are offering. From the interview results it can be concluded that cooperation on the level of R&D is more important for startups which develop highly innovative products. Therefore, the factor R&D alliances is influenced by the last factor, product innovation. One of the interviewees was in a unique position, as the interviewee had overview of two different type of companies namely the startups where he was active and a sister company. The interviewee was able to confirm the results and division made earlier, providing strong indications for the result found.

Furthermore, two of the startups specifically indicate this is important for the development of AI tools, again confirming this split in the results.

Product Innovation

The interview results indicated that the factor product innovation is moderately to very important for all the startups. The results are remarkably homogeneous with respect to the other factors. From the results of the interviews, it can be seen that startups mainly indicate that a radical innovation is necessary to get a seat at the table in this industry. So, product innovation is used by the startups to overcome the barrier to entry. As the barrier to entry is relatively high in this industry, which emphasises the importance of this factor even more.

While all the startups indicated the factor product innovation is important to some extent, also many startups indicate that airlines are not ready for totally disruptive technologies. Several startups indicate they use a stepwise i.e. incremental approach to implement their disruptive innovations. This incremental innovations can be connected to the characteristics of the industry earlier defined as conservative and risk-averse, explaining why the stepwise approach is necessary. The importance of this factor is therefore connected with a distinctive characteristic of the airline industry and therefore a success factor of interest for the research.

Five Key Success Factors

The objective of this part of the research was to identify the key success factors for startups in the airline industry. So, the success factors which are important for the survival of a startup and have a clear connection to certain distinctive characteristics in the airline industry. The latter is to ensure the research focuses on specific success factor for the airline industry and not on general success factors for startups. The key success factors represent the strongest relations found between a factor and the startup success, so strongest positive relations found in the research. This was based on the relative importance the respondents attributed to the success factors and the specific reasons they provided for these factors.

Based on the criteria above, five key success factors have been identified from the results and discussion presented in the previous chapters. The five key factors identified for startups in the airline industry are financial resources, supply chain integration, industry experience, product innovation and R&D alliances. An overview of the five key success factors and relations can be found in the framework Figure 5.1.

First of all, financial resources has been selected due to the clear and homogeneous results indicating this is very important for the startups and that this is important due to a very specific reasons in the airline industry, namely the long cycle times. Furthermore, some additional indications have been found that the long cycle times were driven for industry specific reasons in the airline industry, which will be

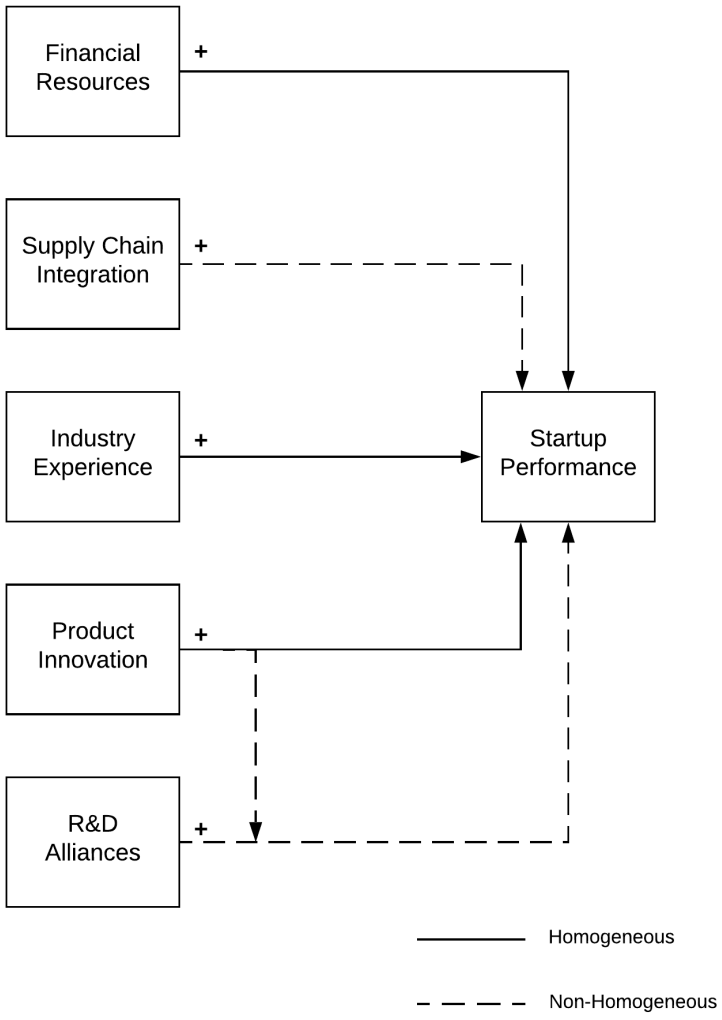

Figure 5.1: Framework Key Success Factors Startups Airline Industry

subject of the research in phase two.

Secondly, supply chain integration has been selected because it is important for all the startups with hardware products. When making this division between hardware and software startups, the results provide a clear indication this factor is of significant importance for the startups in the airline industry. The dotted line in Figure 5.1 indicates the effect of the factor is non-homogeneous, meaning only valid for a subgroup of the startups in the airline industry, namely hardware startups. Furthermore, also the underlying causes for this factor can be related to industry characteristics such as the limited amount of customers and suppliers and the importance of early connections to decrease cycle times.

Thirdly, industry experience is selected as a key success factor for startups in this industry, as it is indicated as at least important by all the startups. From the results, also indications can be found that having industry experience may be more important in this industry, as the airline industry is a very global and connected industry with a limited amount of customers and suppliers. The results indicate that having experience in this industry can help to overcome the barrier to entry.

As fourth factor, the results indicate that product innovation is an important factor for the startups in the airline industry. The homogeneous results indicate that this type of product innovation is important for any startup in this industry. Furthermore, the startups in this industry specifically need this innovation to overcome the relatively high barrier to entry in this industry. The product innovation does not only directly influence the startup performance, but also influences the impact of R&D alliances.

From the results it is clear that R&D alliances are especially important for the startups which have a very innovative product. So, the product innovation factor affects the importance of the factor R&D alliances. These R&D alliances are especially important for startups with very innovative products.

The division between key success factors and factors with less importance is not as straightforward and need some nuance. For the five factors selected here, relatively clear evidence of the importance has been found and an indication that the causes of the factors are related to specific characteristics of the airline industry. The five key factors represent the strongest positive relations found between factors and the success of startups, however this does not imply that the other factors which have been researched do not influence the startup performance at all.

5.1.3. Characteristics airline industry

The characteristics of the airline industry presented in Table 4.1, represent the different characteristics named by the various interviewees with an indication by how many interviewees the characteristic was named. The number of different interviewees mentioning a certain characteristic should be interpreted carefully. In how many different interviews the characteristic was mentioned can also indicate a subspace present in the sample space, such as hardware/software startups or early/later stage startups. Some characteristics might appear stronger for one subgroup than for another.

This number also does not provide an objective view of the airline industry as such, but merely represents how startups experience doing business in this industry and therefore which factors really impacts them. So, instead of airline characteristics, these can be interpreted as characteristics of the business environment for startups in the airline industry.

The question was an open question, which clarifies the large amount of different characteristics named and also explains why some characteristics seem related or similar. For example, the safety oriented operations and risk averse culture are connected, although it has been chosen to present this as two separate items in the results. During the interviews, several nuance differences were made between both. While risk averse culture has much broader implications for all levels of the airline industry, the safety oriented aspect was much more focused on operational processes.

5.1.4. Financial Resources as the key Success factor

The research in the second phase focused on one success factor, namely financial resources. An explanatory research was conducting seeking answers to why this factor was important and strategies for startups to exploit the factor. The success factor financial resources has been selected based on the results from the interviews in phase one of the research.

The main reasons for the selection of financial resources to be investigated in the second phase:

- Strongest relation between factor and startup success, based on the scale question and explanations of startups
- Homogeneous results for all startups in the sample
- Clear indications for industry specific causes
- The major cause of the factor is the mostly named characteristic by startups

So , the selection of this factor is based on the results of phase one of the research. The results indicate that for this factor, the most promising results can be found during an explanatory research. Time and resources available limit the detailed study of the other key success factors, but are recommended in further research.

5.1.5. Validation Phase 1

The validation of the results of phase one is conducted at the beginning of phase two. Therefore, the discussion presented here, refers back to the data presented in section 4.2.

All startups agreed on the reasoning that financial resources was the key factor. One startup which in the first round had indicated that the factor financial resources was less important compared to the results found from the other interviewees, indicated this was mainly based on a misinterpretations in the first phase. When the conclusions of the first phase were presented to this interviewee, the conclusions were recognisable for their startup.

This step has been an provisional validation of the preliminary conclusions of phase one, the final conclusions and results of the overall research were validated in separate interviews. As this validation consisted of the complete research, also the results of phase 1 are validated, more information can be found in section 5.2.

5.2. Phase 2: Explanatory Research into Financial Resources

The most important success factors has been identified in chapter 4, the following discussion will start from this success factors, discuss it causes based on the characteristics which were identified and finally the effects of the success factors on the performance of the startups in the airline industry.

5.2.1. Financial Data

The basic financial data were asked to check whether these data could clarify any trends or generalisations in the data during the further analysis. The startups have been split in two categories regarding the funding amount, the first category in the range 1-5 million EUR and the second category 10-20 million EUR. The first category contains the majority of the interviewed startups, while the last category only consists of two of the interviewed startups.

When considering the different rounds and funding sources, no significant differences can be found in the results. All the startups report similar funding sources and rounds. They all have a mixture of government, private and VC funding. Except for one startup, which was completely funded by private resources of the founder. For the further analysis, it was important that the startups had different sources, as it was clear that certain effects were more present for certain funding sources, which will be elaborated in the next paragraphs. The exact number of rounds and further funding details did not seem relevant for the remainder of the research.

5.2.2. Differences Financial Resources Airline Industry

The goal of this interview question was to identify what is so specific in finding financial resources for startups in the airline industry. What makes the factor so important according to the participants? This question was in the first place set up to validate the results found in phase one and to identify any other underlying funding characteristics in this airline industry. From the results, it can be seen that all the startups refer to the long times, in different terminology, but they all refer to the long time it takes to develop and sell a product in this industry. The line of reasoning of all the participants is that this long cycle times create the need for higher amounts of funding for a longer period, making finding financial resources more challenging in this industry.

The participants all mention different times, which in the end have the very similar effects for the startups, namely it takes long to develop and/or sell a product to airlines. Due to the similar effects on the startups, these times have been collected in the factor ”cycle times”. However, they have similar effects for the startups, it is important to find the root cause of each different time mentioned, to establish a clear overview, this will be further elaborated on in the root cause analysis in the next paragraph.
The results from the interviews provide strong indications that this is valid for all startups, regardless the type, size or products. As from this analysis it is clear that the long cycle times are the main driver of the importance of this success factor for startups in the airline industry, in the next step the root-causes of this long cycle times will be identified. The root-cause analysis is aimed at finding the causes leading to the longer cycle times in this industry, which therefore cause the importance of the success factor

financial resources in the airline industry. A graphical representation of the line of reasoning can be found in Figure 5.2,

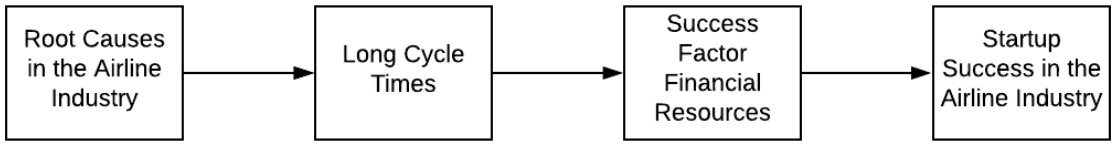

Figure 5.2: Root Cause Analysis Financial Resources

5.2.3. Root Causes and Implications

To understand what the root causes of the long cycle times are, first the generic New Product Development (NPD) process should be considered as presented in Figure 5.3. As explained earlier, the term ”cycle time” is a collection of the different times observed in the results and was used for analysis purposes. The cycle time covers the complete time for the new product development process and therefore includes several times such as development time and testing time. Every root cause from the analysis above, affects the cycle times on a different level. The different times mentioned during the interviewees can be connected to several stages in the new product development process. These times are mainly related to the development, testing and commercialisation phases, based on the process in Figure 5.3.

Figure 5.3: Generic New Product Development Process

The different times mentioned as cause for the long process are now connected to a specific phase in the NPD process. An overview of which phase belongs to which phase in the NPD can be found in Table 5.1.

Table 5.1: Related Product Development Phase to Interviewee Times

Time as mentioned by interviewees	Related product development phase
Development Time	Development
Implementation Time	Testing
Sale Time	Commercialisation
Lead Time	Commercialisation
Decision Time	Commercialisation

Now the times mentioned by the interviewees have been linked to specific phases in the product development process these in their turn can be linked to the different root causes. An overview of this root cause analysis can be found in Table 5.2.

5.2.4. Framework Financial Resources

Finally, as an overview of this section, the different relations described above and their effects can be summarised in a framework in Figure 5.4. The framework provides an overview of the different root

Table 5.2: Discussion - Root Cause Analysis

Category	Cause	Related Product Development Phase
Safety	Highly regulated	Development
	Long Certification procedures	Testing
Operations	24/7 operations	Testing
	Critical processes	Testing
Culture	Conservative	Commercialisation
	Risk averse	Commercialisation
Organisational	Bureaucratic	Commercialisation
	Highly functional organisations	Commercialisation
Other	Long-term contracts with suppliers	Commercialisation

causes for the long cycle times, which have been split in different categories. The effects of each root cause has been summarised as cycle time and not further split for clarity purposes of the framework. Finally, the long cycle times for the product development determine the major importance for the success factor financial resources for startups in this industry. Lastly, this factor financial resources has been found to be one of the key success factors determining the performance of a startup in the airline industry.

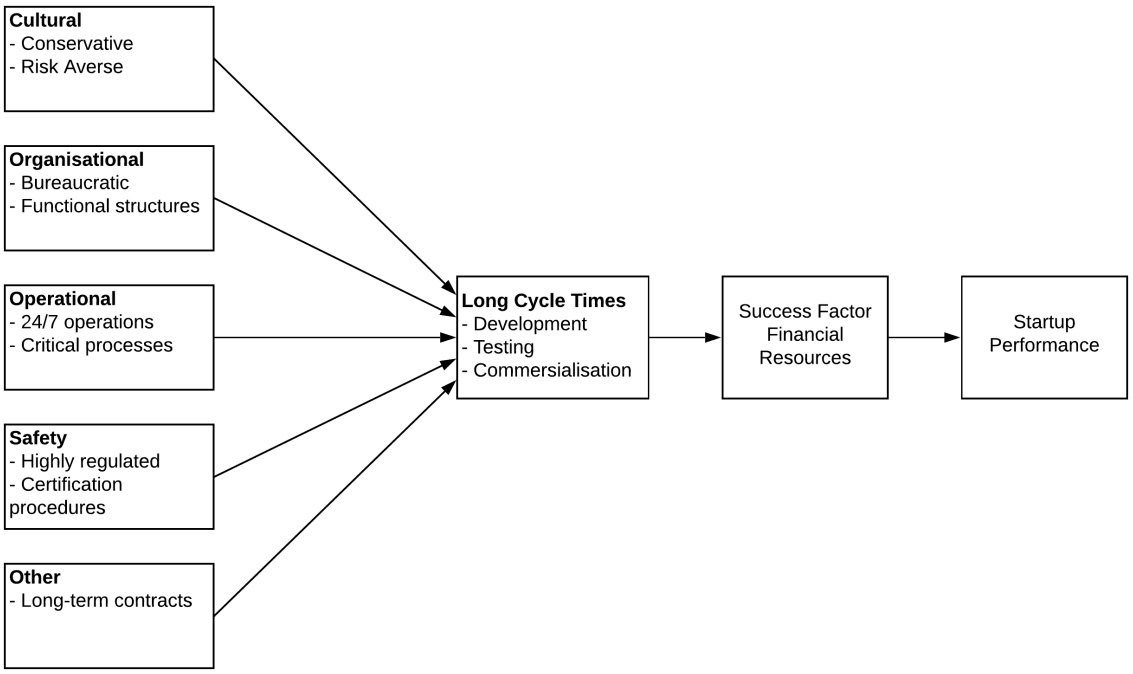

Figure 5.4: Framework Financial Resources

5.2.5. Covid-19 Impact

The relations as investigated above were without the impact of the Covid-19 crisis. As the research was conducted very early in the development of the Covid-19 crisis, it was too early to establish a clear picture of the full consequence of this crisis on the success factor financial resources and the relations

described above. Despite the difficulty of overseeing the full consequences at the time of writing, it was considered relevant and even necessary to provide a first estimation of the effects of the Covid-19 crisis in this research. The crisis was expected to influence the airline industry significantly and for a longer period. In most cases the interviewees experienced some initial effects of the crisis. Therefore the results presented are a first indication of what the impact of the crisis may be. The results represent expectations of startups and are merely forward looking instead of a research on the impacts afterwards. Therefore, the results have to be carefully interpreted given this uncertainty at the time of interviewing.

From the results a few trends emerge, first of all, the overall positive attitude of the startups was remarkable. Although the airline industry was very hard hit and some startups were experiencing serious impacts on their businesses, almost all the startups reported a positive outlook. Although recognising it might be hard for their business in the following months, the startups mainly indicated that they believe the crisis will lead to an increased customer need for automation and digitisation solutions. Startups also expected some innovation processes to get a boost by this crisis and expected new opportunities to arise. This positive attitude, can maybe partially be explained by the type op people active in startups, in general entrepreneurs may be more optimistic.

The interview results indicate that mainly later stage startups, who have solid revenue streams and directly sell products to airlines are the hardest hit by the crisis. As airlines stopped operations in early 2020, also their suppliers stopped selling their services and goods, creating a cascade effect. The more early stage startups often do not have significant revenue streams and depend more on external funding for survival. These early stage startups mainly have projects at airlines for the development and testing of their products instead of selling products. Some early stage startups reported difficulty in contacting the airlines or some projects that were paused or completely stopped. However, they are also impacted, this impact is at first instance less existential, as it impacts their solvability less. For later stage startups, solvability might be an existential threat in the short term.

5.2.6. Strategies for Startups

From the interview results, several ways to cope with the specific long cycle times in this industry have been identified. Several startups use different actions to mitigate the effects of the long cycle times. The solution strategies have been split in three main strategies namely, decrease the cycle times, avoid long cycle times or adjust funding to the long cycle times. For every solution strategy, possible actions are presented. An overview of the solution strategies can be found in Table 5.3.

Table 5.3: Solution Strategies for Startups

General Strategy	Actions
Decrease cycle times	Focus on non-critical processes Network: understand customer needs Cooperate with suppliers in early phase
Avoid long cycle times	Address urgent customer needs Look for niche markets Respond agile to new opportunities
Adjust funding to long cycle times	Find investors who understand industry dynamics Clear communication of industry KPI's

Decrease Cycle Times

The first strategy identified for startups to exploit the factor financial resources is to try to decrease the cycle times as much as possible. Startups try to influence several aspects which cause the long cycle times. Several actions have been found and some actions might be more suitable for some type of startup compared to other types of startups. One of the actions startups can do is focus on non-critical processes when developing a product for the airline industry. Developing products for non-critical products avoids a large amount of difficulties with regards to testing possibilities and also regarding the

certification and regulations aspects. This is mainly valid for hardware startups, they have to deal more with critical processes and regulation. As example, the failure of a baggage system is more critical for an airline than the failure or revenue management system. The first creates immediate downtime of the operations.

Another possible action to decrease the cycle time is having an extensive network in the airline industry. This network can enable startups to immediately speak to the right persons, i.e. the persons using the product and/or the managers responsible for the procurement. This can provide direct insights in the needs of all the stakeholders and can drastically influence the development time. For startups without this access to a network, it might take a long time before they can talk to the stakeholders, as airlines are large organisations and it is difficult to reach the right persons without a network inside.

Lastly, in the airline industry, for most products there is a fairly limited list of suppliers worldwide, due to e.g. regulations. Connecting to these suppliers in an early phase provides startups with more detailed knowledge of the current value offerings and can also stimulate cooperations between suppliers and the startup.

Avoid Long Cycle Times
Avoiding the long cycle times at all is of course an efficient way to mitigate the specific difficulties of this industry, but is clearly not always possible. For some products, this long cycle times are inherent to the type of product. Therefore, avoiding long cycle times is mainly focused on finding the products and niche markets in this industry which are not subject to the long cycle times. This can be for example products that are not regulated. One example is that startups could target specific small niche opportunities which are too small for the large companies active in the airline industry. Another one, also partially related to the Covid-19 crisis is the opportunity for startups to respond agile to new opportunities that arise in the industry. This crisis might give rise to urgent customer needs, increasing the speed of the process significantly. Often large corporates might be too large and too slow to efficiently respond to those new needs, so this might create interesting opportunities for startups.

Adjust Funding to Long Cycle Times
The last strategy, contrary to other two strategies presented, does not act on the level of the cycle time, but is aimed at mitigating the negative effects of the long cycle time in another way. The last strategy is based on the idea that long cycle times as such does not need to be a problem for a startup, as long as the funding of the startup is adjusted to these industry dynamics. As most VC's are looking for a return on investment of three to four years, this is often not possible in the airline industry. Some specific capital funds are operating in the airline industry and understand the dynamics of this industry, but most do not. The specific funds can be the first funds to target for startups. Furthermore, when speaking to capital funds or investors not familiar with the airline industry, startups should clearly communicate the KPI's of this industry.

When possible, a combination of actions from the three strategies presented will be the most successful to exploit the success factor to a maximum.

5.3. Discrepancies and Similarities with Existing Theory

The meta-analysis from Santisteban and Mauricio (2017) confirms the importance of the factor financial resources. The analysis even considers this factor more as a basic condition than a success factor, arguing that every startup needs financial resources for the survival. This is of course an obvious conclusion, however, it has been found that there are strong indications that the factor financial resources is more important in the airline industry and therefore the research does consider it as a success factor as defined earlier.

The research of Song et al. (2007) also indicates several success factors which have an heterogeneous influence on the venture performance. This research partially confirms the findings of the factors supply chain integration and R&D alliances.

The characteristics of the airline industry which have been identified in the research, largely coincide with the literature found on the airline industry such as in Cento (2008) and Wensveen (2010). The main discrepancy between the literature and the research is the point of view. Most literature sources consider it from an internal airline perspective, while this research takes the point of view from the startups. Because the research focused on the point of view from startups on the airline industry, the long cycle times appear as the most apparent characteristic, which is not explicitly identified in most literature sources.

5.4. Validation of the Final Results

The results of the first phase were already validated in between the first and second phase. The validation presented here consists of a new validation round, with the final results of the complete research, so including phase 1 and 2. Validation of the conclusions was done by a range of people from different parts of the industry, to ensure the different points of view were represented. Experts in the field of the airline industry and startup incubators have been consulted as well as people from startups themselves.

The final research conclusions were validated by the following persons:

- Martin Kaduc - Co-Founder Kamber
- Simone van Neerven - Former Head of Innovation Vueling and member Hanger51
- Rico Barandun - Head of Strategy Elenium
- Manu Larose - Head of HR TuiFly Western Region
- Max Diez - Co-Founder Assaia

The full transcripts of the validation have been included and can be found in Appendix C. In general most of the people confirmed the conclusions, they indicated they correspond to their experiences. Some startups indicated that some of the heterogeneous factors are not so important to them and confirming the homogeneous factors. This is a strong indications for the confirmation of the homogeneous/heterogeneous split in the success factors. The airline related characteristics were validated by two very experienced people in the airline industry and both recognised the characteristics described. Furthermore, also the startups indicated the success factors and reasoning was recognisable for them.

For the final validation step, failed startups were tried to reached. These were considered as a good validation point of view, as they were not successful. However, it proved to be too difficult to get in touch with the right people and find any previous founder who was willing to participate.

6

Conclusions

This chapter will present the final conclusion of the research. It will provide an answer to the research questions formulated in chapter 1 and will reflect on the research objective. The conclusions are based on the results as presented in chapter 4 and the discussion in chapter 5.

This chapter will start by formulating the conclusions for the main research question and the research subquestions. Next, this chapter will reflect on the broader implications of this research for the most important stakeholders.

6.1. Conclusions

First, the conclusions for the main research question will be presented, followed by the conclusions per subquestion. This is a sequence than the actual research flow, the research flow can be found in Figure 3.1.

6.1.1. Main Research Question

The Main Research Question was aimed at determining how startups in the airline industry can successfully exploit the key success factor. The key success factor was determined in the first phase of the research. From the first phase of the research, the success factor financial resources was selected as the most important success factor.

The Main Research Question:
How can startups in the airline industry successfully exploit the key success factor?

Three strategies have been identified to exploit the success factor financial resources successfully. The strategies have been based on the root causes for this success factor and every strategy deals with the root causes in a different way. The main reason for the importance of the the factor financial resources are the long cycle times in this industry. The full pattern of this relationships can be found in Figure 5.2. The first strategy is aimed at decreasing the cycle times, the second strategy at avoiding the long cycle times and the third strategy is aimed at adjusting the funding to the long cycle times. All three strategies have their own proposed actions for startups, this is presented in detail in Table 5.3.

To summarise, the three strategies are:

- Decrease Cycle Times
- Avoid Long Cycle Times
- Adjust Funding to Long Cycle Times

The first strategy consists of actions which try to decrease the cycle times as much as possible, in order to decrease the required runway length of the startups. Startups can focus on non-critical processes, avoiding long implementation and testing procedures. Furthermore, startups should engage

with the customer in an early stage, this can increase the understanding of the customer needs in an early phase and can avoid unnecessary delays. Talking to the right persons inside an airline is more challenging than one might expect and requires an excellent network in the industry. Another possible action is to cooperate with suppliers in an early phase, because in the airline industry only a limited number of suppliers is available and the key people are often interconnected worldwide.

The second strategy is aimed at avoiding the long cycle times as much as possible. This is mainly done by addressing specific niche market or customer needs where the long cycle times are not present. One can think of the Covid-19 crisis now, which creates urgent customer needs and it is up to startups to respond in an agile way to these new opportunities. As there are urgent needs, some causes of the long cycle times will be eliminated such as the long decision processes. It is clear that this strategy is of course not always possible for every startup, but mainly for startups in the ideation phase, when startups are creating new products or are considering new markets.

The last strategy consists of dealing with the long cycle times in the best way possible. The results indicate that only a limited amount of investors understand the airline industry dynamics. Therefore, it is important that startups, from the start, clearly communicate the KPI's of this industry i.e. they need relatively high amounts of funding for a longer period. This will avoid long conversations with investors which are actually not interested in this type of investment. Furthermore, some specific investors in this industry are present, which can be the first target.

Where possible, startups are advised to find a combination of actions across the three different strategies to address the challenges on different levels. The strategies are not mutually exclusive and startups are encouraged to find an integrated strategy which fits their business model.

6.1.2. Characteristics Airline Industry (SQ1)

Research subquestion one (SQ1) focused on the distinctive characteristics of the airline industry for startups.

Subquestion 1:
What are the distinctive characteristics of the airline industry for startups?

A wide range of characteristics have been found in the research, covering several aspects such as organisational, cultural and operational. The most apparent characteristic indicated by all the interviewed startups is that the airline industry is slow, pointing at the long cycle times for products. All the startups confirmed this characteristic was creating challenges for them, making this characteristic the most important with regards to impact on the startups. The full results for SQ1 can be found in Table 4.1. The results found in this research indicated the following main distinctive characteristics of the airline industry for startups:

- Long cycle times
- Complex, many stakeholders
- Risk averse
- Conservative
- Global

Remarkable was the in general negative attitude of the startups towards the airline industry. Many of the startups sketched a rather negative image of how the industry was operating and what kind of issues they had to deal with. The majority of the startups refers to the complexity of the industry, as the airline industry has many different stakeholders. Furthermore, multiple startups describe the airline industry as a global industry with people across airlines which are very connected. Certain business areas inside airlines have their own dynamics and often the key people from different airlines know each other very well, for example baggage handling is such a domain. That people are interconnected is also something that is reflected by the relatively limited number of customers and suppliers worldwide.

Considering the same example of baggage handling, only a few suppliers of the handling machinery exist worldwide, creating a very close network.

The characteristics described in this research mainly represent how startups experience the airline industry as a business environment. The identification of these characteristics was not the primary goal of the research, but served as a method to identify the causes of the success factors.

6.1.3. Key Success Factors (SQ2)

The second research subquestion is aimed at identifying the key success factors for startups in the airline industry. Meaning the success factors which are relatively more important for startups in this industry and have a clear cause which is related to one of the distinctive characteristics of the airline industry.

Subquestion 2:
What are the key success factors for startups in the airline industry?

The results for subquestion 2 indicate that five key success factors could be identified for startups in the airline industry, a full overview of the success factors and relations can be found in Figure 5.1. The five key success factors for startups in the airline industry identified in this research are:

- Financial Resources
- Supply Chain Integration
- Industry Experience
- Product Innovation
- R&D Alliances

The strongest relation was found for the factor financial resources, which was also caused by the characteristic named by all the startups i.e. the long cycle times. The long cycle times cause the startups to experience very specific funding conditions, such as needing funding for a relatively long period. Furthermore, it was found that the factor supply chain integration is mainly valid for hardware startups and not for software startups. For hardware startups in the airline industry it is key to cooperate with customers and suppliers in an early stage. Moreover, industry experience is an important factor for startups in this industry, as the industry is very global and at the same time the key people across different airlines are very connected.

Product innovation has been found to be a key success factor, which can help startups to lower the barrier to entry in the airline industry. So, more disruptive technologies can get startups a seat at the table. This factor also influences the importance of the relation of the factor R&D alliances. It has been found that R&D alliances becomes a more important factor if startups offer a more innovative technology. In particular for startups developing AI tools, the results indicated this factor can be very important.

6.1.4. Root Cause Analysis (SQ3)

Research subquestion three (SQ3) aims at finding the root causes for this long cycle times, connected to the airline industry characteristics.

Subquestion 3:
What are the root causes for the key success factor for startups in the airline industry?

The long cycle times have been identified as the main reason for the importance of the success factor financial resources in the airline industry. The long cycle times cause the startups to need relatively high amounts of funding and for a relatively long period. The root causes will look one level further, into the root causes for these long cycle times. An overview of the relationship between root causes and cycle times can be found in Figure 5.2. An overview of the root causes for the key success factor can

be found in Figure 5.4. The root causes have been split in five categories i.e. cultural, organisational, operational, safety and other. The main root causes are:

- Cultural
  - Conservative
  - Risk Averse
- Organisational
  - Bureaucratic
  - Functional Structures
- Operational
  - 24/7 operations
  - Critical processes
- Safety
  - Highly regulated
  - Certification procedures
- Other
  - Long-term contracts

One of the root causes often mentioned by startups is the culture inside airline companies. Startups describe the culture as risk-averse and conservative. This culture can cause long decision processes and procedures. This cultural aspect can be related to the safety aspect, as startups describe that the airline industry is very safety oriented. Furthermore, it was found that the 24/7 operability and some crucial process can be an important cause for the long cycle times. As third category, startups describe several organisational causes such as the hierarchical and functional structure in most airlines. This causes conflicting interests between departments inside an airline and prolonged decision processes. Lastly, another cause mentioned are the often long-term contracts between airlines and suppliers. Therefore, startups often have to wait up to multiple years before opportunities are available.

Furthermore, every root cause impacts the cycle time at a different level i.e. each one causes certain delays at a specific phase of in the new product development process. Cycle times are defined as the complete product development time, which includes development time, testing time and time to commercialise the product. Each root cause acts upon different and sometimes several of these cycle times, as presented in section 5.2.

6.1.5. Covid-19 Impact (SQ4)

The objective of subquestion four (SQ4) is to determine the impact of the Covid-19 crisis on the key success factor.

Subquestion 4:
What is the impact of the Covid-19 crisis on the key success factor?

The research was performed at an early stage of the Covid-19 crisis early in 2020, therefore the results are merely a representation of the expected impact of startups than a research on the effects already experienced. Although the crisis was still in full development, it was considered highly relevant to include this factor in the research, as this factor might change the airline industry significantly for a long period. The full results for subquestion four can be found in Table 4.15 and Table 4.16. The impacts are split in four categories i.e. financial, internal, external and airline. To summarise, the most important impacts identified in this research are:

- Increased customer need for automation/digitisation

- Faster decision process
- Revenue decrease/burn rate increase
- Ongoing projects paused/stopped

One of the most remarkable results is the in general positive attitude of most startups towards the crisis. Although they experience negative impacts, most of the startups also expect new opportunities to arise in the near future. Most startups indicated they see an increased customer need for automation and digitisation in the near future. Startups will need to respond agile to these new opportunities, to capture the benefits of it. Startups have the advantage of being able to act faster in comparison with large corporates, which should give rise to new opportunities for them. Some startups expect faster decision processes, which was one of the main causes of the long cycle times described before.

Furthermore, the results indicate that for many startups revenue has stopped and development or testing projects have been paused or cancelled. The results indicate that this affects later stage startups more than early stage, as later stage are more dependent on the revenue stream and early stage depend more on external funding. Liquidity problems might be existential for later stage startups, while early stage can survive easier on the current funding.

6.2. Implications for Stakeholders

The focus of this research was finding the key success factors for startups and providing strategies to exploit the key success factor successfully. The research was focused on the startup perspective, however the research can have wider implications for a range of stakeholders such as airlines, incubators and investors. This section focuses on the implications for the following stakeholders:

- Startups
- Airlines
- Incubators
- Investors

6.2.1. Startups

The startups can use the major conclusions presented in the previous sections to improve their performance, which should finally lead to better startup survival rates in the airline industry. Startups active in the airline industry or considering entering this industry can use some advises formulated in the next sections.

From the first phase of the research, five key success factors have been identified namely financial resources, supply chain integration, industry experience, product innovation and R&D alliances. Startups can use these five key success factors to focus their internal organisation and strategy around these five factors. For every one of the five success factors, the startups can determine a strategy to successfully exploit this factor and find specific actions required for their business model.

A more detailed strategy has been provided for the factor financial resources, this was the objective of the main research question. Three main strategies have been described with their own specific actions, as presented in Table 5.3. The three strategies consist of avoiding long cycle times, decreasing the long cycle times and adjusting the funding to the long cycle times. The strategies are not mutually exclusive and startups are encouraged to find an integrated way between multiple of the presented strategies and actions which fits their business model best. For example, startups are advised to both try to decrease cycle times as much as possible while at the same time trying to adjust the funding to the longer cycle times. More concrete, the startups can for example use their network and cooperate closely with airlines to decrease the cycle times, while on the other hand work together with investors who understand the specific dynamics of this industry i.e. the long cycle times.

Central to the conclusions of this research are the long cycle times in this industry. These long cycle times are the main cause for the importance of the success factor financial resources and was recognised unanimously by all the participants in the research. Also in the validation, strong evidence was found that these long cycle times are the key differentiator for startups in the airline industry, as can be seen in Figure 5.2. Startups operating in this industry should be aware of the consequence of these long cycle times on their business and the sustainability of their business models. Not only financially, but also on an organisational level for example. The long cycle times can also influence team dynamics, team members should be committed long term to the project and persistence is required.

6.2.2. Airlines

The research has been written mainly from a startup perspective and the strategies presented have been designed to be implemented by startups. However, the information and insights in this research can also be used by airlines. As airlines are considered the key partner for startups, they can play a crucial role in helping and stimulating startup performance. Some concrete advises for the airline industry will be formulated in this section.

The framework with the five key success factors i.e. financial resources, supply chain integration, industry experience, product innovation and R&D alliances, as presented in Figure 5.1 can be used by airlines to understand which factors are important for the startup success. The airline industry is invited to critically review each of these five factors and to assess which of these factors they can influence and how. By creating more awareness of these success factors in the airline industry and the influence of these factors on the startup performance, airline employees can try to positively affect some factors or remove hurdles for startups by perhaps simple actions.

On a more detailed level, airlines can try to address the root causes for the long cycle times, as presented in Figure 5.4, such as functional structures or a conservative culture. Many of these root causes can be influenced by the airlines and some of the root causes may even be removed by the airlines. A proper understanding of these root causes by the airline management and actions to mitigate the negative effects for startups can drastically affect the startup survival rate in this industry. When airlines are more aware of the impact of the long cycle times on the startups and are better informed about the causes, it may create a more mutually beneficial relations between the startup and the airline company. Better understanding from both sides should improve the cooperation and make innovations easier in this industry.

Some concrete examples are the e.g. the long-term contracts airlines have with their suppliers. When airlines are better aware this can seriously hamper startup success, airlines can for example inform startups more openly about when business opportunities will arise. Another example of a root cause which airlines can help to remove are the functional structure inside airlines. Startups are often hampered by conflicting customer needs and interests across different departments inside airlines. This can be relatively easily solved by having top management involvement and making decisions at a higher level in the organisational such that the decision are not benefiting one department over another one, but are benefiting the airline company as a whole.

For every of the root causes mentioned in the framework, very similar actions would probably be possible by the airline companies. The airlines are therefore invited to carefully consider these root causes and evaluate the possible actions they could undertake to help startups being successful, which in the end also benefits the airline industry as higher startups survival rates are likely to stimulate innovation.

This research might help the airlines to better understand the dynamics of startups operating in this industry. It can help create awareness among airline employees about the success factors and how to remove some hurdles for startups. It can help remove some root causes for the long cycle times for startups, as airlines become more aware of the root causes. Furthermore, the research can help stimulate the innovation in airlines with the help of startups. Especially, considering the Covid-19 crisis and the opportunities that may be arising, this can create a mutually beneficial partnership.

6.2.3. Incubators

Next to the startups and airlines, also startup incubators can use the conclusions from this research. Incubators can be both specific airline related incubators such as Hangar51 and more generic tech incubators such as Yes!Delft. An overview of the airline specific incubators can be found in Table 3.1. For the more generic tech incubators, this information can be even more important, as they are less familiar with the specifics of the airline industry compared to incubators related to an airline company.

The incubators can use the five key success factors identified in this research to tailor their programs and policies around these five success factors. Furthermore, the incubators can focus in the selection procedure of startups on these five success factors. When a startup possesses multiple of these key success factors or knows how to exploit the factors, it may be an early indication for the success of the startup.

This research could inform incubators of the specifics for startups in the airline industry, but incubators can also use in their turn to inform startups who are intending to operate in this industry about the characteristics, the key success factors and strategies. For example, incubators can use the information on the long cycle time in this industry to manage expectations with founding teams.

Furthermore, when incubators want to successfully support startups in the airline industry, it may be useful to incorporate the longer cycle times in their programs and structure. Often programs are limited to a certain time and their is pressure from various stakeholders to deliver as fast as possible. Incubators should be aware that this is especially difficult in the airline industry. Incubators can for example extend their normal program lengths for startups in the airline industry to better adjust to their needs.

6.2.4. Investors

The last stakeholder group are the investors, this includes business angels, VC's, etc. Especially the conclusions with regards to the second phase of the research are relevant for investors considering to invest in startups in the airline industry. Investors should be aware of the long cycle times in this industry, this means that it may take longer than normal for investors to receive their return-on-investment. Also, due to the longer cycle times, relatively high amounts of funding are required, because startups need to sustain their burn rates for a longer period. When investors properly understand the dynamics in this industry and are aware of them, they can better assess an investment.

This should finally lead to a better match between the startups and the investors, such that only investors who are aware of the dynamics in this industry will invest in startups in this industry. This is closely related to the third general strategy as proposed in the conclusions i.e. adjust funding to the long cycle times.

7

Recommendations

This chapter presents a critical reflection on the research results and conclusions. The chapter will start by presenting a reflection and the limitations of the research in section 7.1, followed by recommendations for further research presented in section 7.2.

7.1. Reflection and Limitations of the Research

The research was designed considering the available time, resources and other practical considerations. The decisions guided by these considerations create certain limitations for the research, which will be analysed in this section. It is important to consider these limitations when interpreting the results.

7.1.1. Research Type - Qualitative and Exploratory Research

The research used qualitative data and is largely exploratory in nature. Both the qualitative and exploratory aspect create certain limitations for the research. Due to the qualitative data used in the research, the researcher and the readers of the research are subject to interpretation bias. The words and concepts used can have different meanings and interpretations to different people. This may not only influence the results and conclusions presented in this research, but it can also affect the interpretations different readers have of the results presented in this research. Partially, this effect has been counteracted by the explanations of the concepts in chapter 2, these provide an overview of the state of the art literature and definitions of the most important concepts.

The exploratory nature of the research on the other hand, caused the research to be very open-ended, especially in the first phase of the research. There were no prior indications of which success factors would be the most important for startups in the airline industry, therefore a wide range of results was possible. This was partially counteracted by using a predefined set of success factors from literature, although interviewees were still provided the opportunity to come up with additional success factors.

7.1.2. Research Design - Two Phase Approach

The research has been designed in two consecutive phases, the first phase was exploratory in nature, while the second phase was explanatory. This two phase approach was necessary due to the uncertain and and wide range of possible outcomes in the first phase. At the start of phase one, it was unclear if and how many key success factors could be identified. Therefore, considering the time and resources available for the research, only one success factor was considered for the second phase of the research. The selection of only one success factor for the second phase, clearly limits the conclusions of this research. A fully integrated and global strategy for startups in the airline industry was preferred as a result of this study, however, this proved to be unrealistic in the given time frame. For the stakeholders, an integral strategy, including all the five keys success factors would be more useful for the practical implementation. This would require an extensive study into the root causes of each of the key success factors, possibly some or multiple root causes would be overlapping, providing opportunities to develop a fully integrated strategy for startups in the airline industry on how to deal with these success factors

all together.

While the second phase of the research was the most interesting phase from an academic point of view, only limited time was available for this phase, due to the necessity of first gathering additional information on the first phase. This first phase of the research was necessary, due to the lacking information in the literature on success factors for startups in the airline industry. The time spent on the first phase was therefore not available for the second phase.

7.1.3. Sample of Respondents

The data were collected using multiple semi-structured interviews. These semi-structured interviews were conducted among a group of respondents and form the empirical basis for the results and conclusions of this research. The selection and composition of this sample of respondents is therefore crucial for the results produced and poses some major limitations for this research as well, which will be explained in the next paragraphs.

Sample Size

For the first phase of the research, eight interviews were conducted and for the second phase of the research seven interviews were conducted. In total, people from nine different companies were interviewed and most respondents who participated in the first phase, also participated in the second phase. The sample of respondents was established by contacting a group of 32 preselected startups. This group of preselected startups satisfied the criteria as defined in chapter 3. The response rates were low, around one out of four of the startups that were contacted were willing to cooperate in the research. Most startups did not respond, despite multiple effort to try to reach out to these parties via different channels and persons over multiple months.

This limited response rate led to a relatively small sample of respondents, which limits the generalisability of the results and conclusions of this research. Furthermore, the startups which responded and were willing to cooperate also do not represent a random sample of the startups in the airline industry. These startups can for example be more positive about their own achievements, be more positive towards the future as they would like to share their experiences. It is likely that startups struggling to survive will not be willing to participate in the research. Therefore, it is possible that this creates an automatic selection of respondents of more successful startups.

The large group of startups who were initially contacted were selected using the previously mentioned criteria and consisted of a random and mixed group of startups of different sizes, ages and business areas. However, because the startups which positively responded to the question of cooperation was only a random subset of this first group, the proper mix of size, age and business area could not be ensured completely.

It was considered to try to enlarge the group of respondents, but due to time constraints, this proved to be not feasible. Finding startups in the airline industry, which satisfied the criteria was a challenging task. Moreover, considering the low response rates, a large amount of contact details and startups had to be considered to lead to one interview participant. Therefore, despite multiple efforts, it was not possible to increase the sample size within the given time frame.

Geographical

The initial sample of startups who were contacted and asked to participate in the interviews consisted of a mixed and balanced sample with startups from three different continents i.e. Europe, US and Australia. However, it turned out that in the sample of respondents who were willing to participate, startups from the Netherlands were relatively over represented. From the nine startups who participated in the research, four of them were based in the Netherlands. Moreover, from the startups based in other locations, three of them had a clear connection with the Netherlands or the interviewee was Dutch and working in another country. This created a significant bias towards the situation in the Netherlands and this should be taken into account when interpreting the results. However, the airline industry is a very globalised industry with people often working in a very international environment and during

the interviews, none of the participants referred to specific situations in the Netherlands. The participants merely talked about the situation on a global level. From the interviews results, there are no indications that the conclusions would only be valid for the Netherlands, contrary, the results suggest the ecosystem is very similar across different parts of the Western world. Emerging markets have not been considered in this research and the results may differ significantly for these countries.

Non-response
When respondents were approached for the participation in the interviews, a large number of startups was not able or willing to participate. This can imply that the people who have positively responded might be more positive towards collaborating in academic research. They may be more willing to participate because their startups are more successful and they would like to share their experiences or they are quite confident about their way of working, which partially has been confirmed in the results. Startups which are struggling for survival probably do not have the required time for participation in this type of research.

Business Areas
Startups are active in all sort of business areas in the airline industry and some business areas might have very different dynamics than others, therefore a strict selection criteria for the startups were determined as presented in chapter 3. This selection was used to ensure the sample of startups would be sufficiently homogeneous and would satisfy our previously defined criteria of the airline industry. The strict selection has excluded a range of startups and it is unclear if the conclusions of this research are also valid for the startups which have been excluded. For example, startups active in the area of passenger experience have been excluded, but conclusions may be partially valid for this group of startups as well. It can be an interesting direction for further research, to enlarge the scope of the research and check if the conclusions are still valid for startups in similar business areas in the airline industry.

Many of the startups in the sample were active in hardware development, only a few were active in pure software development. As the results already indicated, there might be a significant difference in the importance of some success factors for hardware and software startups e.g. the factor supply chain integration. This division between hardware and software startups is something which should be further researched. Based on the limited sample size, it was not possible to adequately make generalisations of these differences between hardware and software startups.

7.1.4. Variations in Results
The large variations in the results are mainly observed in the results for the importance of the success factors in phase one of the research. For several success factors it seems like there is a clear division in how important a group of startups perceives a success factors i.e. they are divided in a group for which the factor is relatively important and another groups for which the factor is not important. For most success factors a logical explanation could be identified such as a division in the sample of respondents for example early/later stage startups or hardware/software startups. An elaborate discussion of the subgroups identified per success factor can be found in chapter 5. This subsets in the sample of respondents are an interesting aspect and can be the basis for further research. More homogeneous samples or more diverse sample could be studied in further research to identify even more precisely which success factors are valid for which specific subgroup of startups in the airline industry. A detailed analysis of the success factors per subgroup of startups was considered beyond the scope of this research.

7.1.5. Confirmation Bias
During the research it was observed that the interviewees often confirmed their own way of working or thinking, this is referred to as confirmation bias. The participants tend to confirm their preconceived beliefs. It was observed in the results that the respondents often ranked the success factors which they possessed in their own startups as important and the ones they did not possess in their startups

as less or not important. Very few startups indicated success factors which they did not possess as important. This is remarkable and indicates that most startups in the sample are quite convinced about their own way of working and how they are doing business. This observations also reveals an implicit assumptions that the interviewed startups consider themselves as successful and therefore is also true for this research.

7.1.6. Definition of Success and Success Factors

The precise definitions of success and success factors has been an iterative process in this research. Throughout the research process new insights were obtained and a new, refined definition of the concepts was developed. The final definition was established in a later stage of the research, which influenced the consistency of the success definition throughout all phases of the research. In retrospect, a more thorough study and analysis of this concept in an early phase would have positively influenced the research quality, however it has been tried to mitigate the effects and maximise consistency.

7.1.7. Preselection of Success Factors

The preselection of a certain set of success factors from literature forms an important limitations of the research. This can be categorised as a selection bias. The research focused on a predetermined set of success factors, this is especially important for the first phase of the research into the success factors for startups in the airline industry. This preselection was used due to time constraints, only a limited amount of success factors could be investigated during the interviews and therefore important success factors may have been excluded. However, this has been partially counteracted by the open-questions at the beginning and end of the interviews in phase one. These questions were aimed at finding additional factors and no indications have been found that major success factors have been excluded. Furthermore, the selection of only one factor in the second phase of the research forms a similar limitation to the research.

7.1.8. Validation

The validation was executed by a limited amount of persons, from which some also participated in the research. Finding independent experts who were able and willing to validate the conclusions of the research was a challenging and time-consuming process, this explains the limited number of experts found for the validation. However, the interviewees who also participated in the validation, performed the validation from their very extensive experience in the airline industry and startup ecosystem. The validation results obtained in this research, provide indications that the conclusions presented in this research represent the reality correctly. However, only a limited number of experts were consulted for the validation. Therefore, the validation is a major point of attention which could be studied in further research.

7.2. Recommendations for further research

The recommendations presented in this section are mainly based on the points of the reflection and limitations presented in section 7.1. Many points addressed above can be omitted in further research using the recommendations in this section.

First of all, the conclusions presented in this research can be expanded and validated. Considering the relatively small sample of respondents from only nine different companies, it would be useful to further validate the conclusions and provide stronger evidence. Furthermore, the conclusions might be refined and expanded based on a large sample of respondents. New root causes or even new success factors might appear.

Furthermore, the presented division in the results between hardware and software startups, can be further investigated. Separate research can be performed or a research focused on the differences between both types of startups. There are strong indications in this research that this split can be relevant for the results and conclusions. Therefore, large sample sizes would be advised for follow-up research with a variety of hardware and software startup to provide stronger evidence of the indications found in

this research.

Some of the root causes identified in this research have only one or two sources, which is very limited. Finding more sources and stronger evidence for this root causes would increase the validity of the research. The limited sources were partially caused by the open type of questions, creating more room for interpretation. However, the results were validated the results, providing a more solid basis for the root causes conclusions.

Specifically for phase one of the research, the research could be expanded by including the success factors which have been excluded in this research. The research started with a preselection of success factors from research. The preselection can be expanded to all 24 factors found in the literature review. This research could provide stronger evidence for the five key success factors identified.

Further research could use a much more narrow scope by focusing on solely these five key success factors. By scoping down to only five key success factors, it may be possible to develop more detailed strategies and actions for startups. The solution strategies at the end of phase two, can be further developed. Only a limited amount of actions are presented, it is very likely that with more research, more strategies and detailed actions can be identified to exploit the success factor successfully. Researches are highly encouraged to continue with these five key success factors and develop an integrated strategy for startups in the airline industry, covering all root causes of these key factors together. It is likely that multiple root causes of the key factors will be overlapping and that it will be possible to develop an overall strategy for startups in the airline industry.

As proven in this research, the sample of respondents is crucial for the results produces. Several biases and unbalances have been described in the sample used in this research. A larger and more balanced sample with regards business area, size, age and locations would be highly recommended. To validate the selection of the key success factors in phase one, it would be advisable to search for failed startups and investigate how these success factors played a role in the failure of the startups. This could potentially provide strong evidence for the key success factors, although this can require significantly more resources.

Furthermore, a study which compares the airline industry with other industries with similar characteristics can be useful. This might provide more insights on how this industry is really different or where it is rather similar, lessons learned from other industries can then be applied to the airline industry.

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A

Interview Guide Phase 1

This chapter provides an overview of the interview guide used during the first phase of the research. As the original document was only for personal use, this is a translation and summary of the actual interview guide, with for example adapted notations for clarity.

Introduction

- General Introduction about the research topic and objective Introduction of the interviewer
- Detailed information on the interview set up and structure
- Request consent for recording and use of data

Open Questions

What are the most important success factors according to you?
Why?

Questions about pre-selected success factors from literature

For every factor, the following questions were asked:

- Explain your experience with this factor in your startup
- How important is this factor for your startup (relatively to other industries) (scale provided)
- Why is it so important or not important?

Factors investigated:

- Industry Experience
- Marketing Experience
- Financial Resources
- Firm Age
- Patent Protection
- Size of Founding team
- Supply Chain Integration
- Firm Type
- R/D Alliances
- Product Innovation

Open Questions to provide the opportunity to mention additional factors and reconsider prioritisation of previous factors:

Are there any other critical success factors for your business?

What is top 3 of most important success factors?

Questions Airline Industry

Is your company active in any other industries than the airline industry?
Have you considered other industries for the same or another product/application of your product?
If so, why (not)?

How would you describe the airline industry? How do you experience doing business in the airline industry? [Characteristics]

How does doing business in the airline industry compares to doing business in other industries?
a. What are the differences? b. Why do you think they exist?

How difficult is it to do business in the airline industry compared to startups in other industries? (scale provided)

B

Interview Guide Phase 2

This chapter provides an overview of the interview guide used during the second phase of the research. As the original document was only for personal use, this is a translation and summary of the actual interview guide, with for example adapted notations for clarity.

Introduction

- General Introduction about the research topic and objective Introduction of the interviewer
- Detailed information on the interview set up and structure
- Request consent for recording and use of data
- Conclusions of first phase (if participated previously)

Validation

Presentation of the conclusions of the first phase.

Do you agree with the conclusions for the first phase of the research? Why (not)?

Information on Financial Resources

Basic Information about Financial Resources (anonymous analysis only)

1. Founding year:
2. Total Funding EUR:
3. Number of rounds:
4. Funding Source (gov/subsidies/PE/VC):
5. Time before first revenue:

Open Questions

Before first revenue: How did you experiences the Period before you made your first revenue? - How did you cover this period? - How hard was it to convince an investor? - Lessons learned?

What is different (characteristics) about finding financial resources for startups in the airline industry compared to other industries? - More or less financial capital compared to other industries? - Easier/harder to find the right funding for startups in the airline industry?

What are the causes of these characteristics named earlier in the airline industry?

Solutions: How do you adapt as a startup to this particular funding situation?

C

Transcripts of the Validation

Below are the literal transcripts of the validation of the final conclusions.

Martin Kaduc - Co-Founder Kambr
This looks great and is inline with my thoughts.

Simone van Neerven - Former Head of Innovation Vueling and Hanger51
ja ik herken me hier wel in !

Rico Baradun - Head of Strategy Elenium
Looks good. I agree with the key success factors on Page 4 – the homogeneous ones really make sense. The others are less important for us.
And also the key factor being the Financial Resources due to the long sales cycles makes sense.
All items on slide 8 make perfect sense and I can support.

So overall I think that covers well and I see that you got similar feedback from others.

Manu Larose - Head of HR TuiFly Western Region
Thanks for sharing your preliminary results. I have read through them with great interest.

As you rightly state, the development of new initiatives within the Aviation industry links into different success factors, each important from a stand-alone perspective, but jointly required to succeed in this highly competitive and regulated environment.

Looking at the different success factors in your report, I can confirm these are very much in line with what I would see in the Aviation industry. In my field of expertise, Human Resources, I can in particular comment on ensuring the project needs the right competent people to succeed.

Max Diez - Co-Founder Assaia
Very happy to see that you put the long cycle times in the centre of your results. It is definitely the most decisive (and dangerous!) aspect (especially because it can mean the end of the company's existence, either by bankruptcy or by unmotivated founders who had to endure too much dilution to raise sufficient funds to make it to the finish line).
I would add a few more aspects to the strategies slide (following my unstructured and unfiltered thoughts):

Sequencing: We collected a lot of observations over the last 2.5 years so that we currently believe that the adoption cycle in the aviation industry is similar to the prototypical adoption life cycle. Which means it's super important to make sure you talk to the right people – everyone may be excited about your new tech, but in fact there's only a limited number of people that have the courage to go through with an implementation. Thus, in order to generate transactions, it's important to focus your activities on

those innovation leaders. In the airport industry, everyone knows who they are (e.g. Abhi Chacko from Gatwick; Dave Wilson from Sea-Tac <– both of these airports are now our FIRST rollouts; Singapore-Changi). By sequencing like this you avoid spending resources on people that would only convert once the maturity of the product and/or organization and/or processes are higher (or, in other words, less uncertainty is involved). Looking back, we should have done more of this focus.

Limited-risk transactions: our first transaction with prospective customers is still a pilot project. It's closely defined and has a fixed price tag. This decreases the perceived risk, the joint project execution builds trust and the results can be used to champion the solution with all relevant stakeholders.

You already mention partnerships as a potential vector. I'd add memberships in industry associations (e.g. ACI business partnership costs 2k EUR per year for SMEs and gives more credibility), accelerators (e.g. Hangar 51 and PNP Travel), and competitions (e.g., we participated in competitions by IATA, ACI can now put their logo on everything we print).