

Lund University
Master Thesis

**Managing Risks Posed on the Supply Chain of
a Small Startup in Expansion**
a project for Suntribe AB

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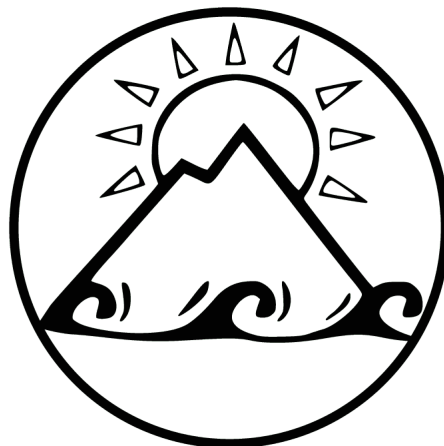
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Abstract

Nine out of ten startups fail, and out of the 10% succeeding startups, most face at least one near death experience along their way (Marmer et al., 2011). However, there is a lack of empirical research regarding what risks with supply chain implications a startup should be aware of. The purpose of this study is therefore to identify and classify the most relevant risks related to the supply chain of a small cosmetics company. The study is based on a single case study of Suntribe AB, a small cosmetics company founded in 2017, and the empirical data is gathered through unstructured and semi structured interviews as well as a survey. A theoretical framework is based on a thorough literature study with the scope of Risk + Supply chain + Startup. From this study, a risk model is developed, containing of 60 risks to consider. The risk model can be used as a discussion foundation to help businesses identify and rank risks, and to direct their focus towards the most prominent ones. The study concluded the eight most prominent risks for Suntribe AB namely as: *logistics provider fails to meet demands, change of lead time, cyber attack, disruption of delivery due to single source, gap between payment terms and required investments, not enough financial backers/partners, experiencing a lack of resources, and poor conflict resolution*. To help Suntribe mitigate these risks, mitigation strategies were presented in the end of the analysis section.

Keywords: startup, start up, start-up, scaleup, scale up, scale-up, expansion, risk, supply chain, Suntribe, cosmetics.

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Adina Nyström and Ebba Roos

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1 Introduction

Risks are present everywhere, in every step of our personal and professional lives. Risks are encountered and managed in every part of our day-to-day business (Rao and Goldsby, 2009), from the first day until the last. They can be mitigated through identification, assessment, and planning (Manuj and Mentzer, 2008).

The number of startup companies is growing, and according to Marmer et al. (2011) nine out of ten startups fail. The main reason for failure is not due to competing parties, which may be what first comes to an entrepreneur's mind, but due to self-destruction. Out of the 10% of successful startups, most face at least one near-death experience along the way. Most entrepreneurs have little knowledge of what to put their main focus on, and therefore their focus is often diluted or misplaced (Marmer et al., 2011). Ellegaard (2008) portrays the entrepreneurs as risk takers, and highlights the adoption of the exact mix of practises to provide security to be essential. According to Marmer et al. (2011), the most common reasons for startups' decline in performance is premature scaling. Premature scaling is a result of expanding one dimension of the operation until it is out of sync with the rest (Marmer et al., 2011). Ellegaard (2008) stresses the necessity of different levels of expertise and resources to successfully manage supply chain risks.

1.1 Problem Formulation

Moore (2001) states that the most critical moment for a firm is when moving from the early market towards the mainstream market. This is due to the differing goals in the consumer segments early market and mainstream market. A startup going into their first major expansive phase, towards the mainstream market, will be exposed to multiple and varying risks. Some risks will pass unnoticed, with minimal to no impact, while others will have higher impact and possibly disrupt operations. This project aims to categorize the risks posed to startup companies, pinpoint the risk with highest probability and impact, and recommend risk mitigation strategies.

1.2 Purpose of Study & Research Question

The purpose of this project is to identify, classify, and mitigate the most relevant risks related to the supply chain of a small cosmetics company during an expansion.

In order to fulfill the purpose, the following research questions will be investigated and answered during the study:

Research Question 1: Which are the most important risks, with supply chain implications, for a startup during their first major expansive phase?

Research Question 2: What can startups do to mitigate these risks?

1.3 The Company

Suntribe AB is a company from Lund with the mission of contributing to change. They intend to do this by becoming the natural, worry-free alternative to conventional sunscreens. The company was founded by three students during their master program in Entrepreneurship and Innovation at Lund university in 2017. The Suntribe AB office is located at Ideon in Lund, in the startup hub called Venture Lab. Suntribe AB’s product range consists of 21 stock keeping units (SKUs) and they have a quite complex setup when it comes to customers. They have their own B2C channel (web shop), B2C through Amazon, and B2B channels for retailers and larger distributors. They have one production facility, located in Lithuania, which is responsible to source the product ingredients. Suntribe AB source all other raw materials (packaging, labels, etc.) which originates from European manufacturers, with a few exceptions in China.

Suntribe AB describes their products by the words: purposeful, safe, verified, effective, and up to date. The quality of their products are certified with numerous ISO-standards, and to verify their work towards sustainability, most products are also certified with either COSMOS Organic or EcoCert. (Suntribe, n.d.[a])

The three co founders share the tasks according to Table 1.1, however, a part of Suntribe AB’s philosophy is that all founding members should be capable of performing all core operations. This is done to ensure transparency within the organisation, to avoid functional silos, and to avoid potential interruptions caused by short term absence of a founder.

Table 1.1: Roles and responsibilities of the co founders of Suntribe AB

Role	Responsibilities
Chairman of the Board	finances, accounting, business strategies, 50% of the B2B sales, and content creation
CEO	operations, legal & compliance, Amazon, 50% of the B2B sales
Head of Design and IT	labels, prints, brochures, order sheets, technical details, website, e-shop

Suntribe AB strongly believes in transparency, meaning that anyone can access information about policies and strategies regarding: production, quality, ingredients, product development, labels & printed materials, sunscreen certifications, and shipping & logistics (Suntribe, n.d.[a]).

Suntribe AB’s products are directed towards everyone, as they say on their website ”We believe in happy natural sunscreens with no question marks attached, for us and everyone else – adrenaline seeking surfers, laid-back beachgoers, kids, working moms, grandpas, grandmas and weekend hikers. To put natural products on your skin should not be only

for a select few, it's for everyone" (Suntribe, n.d.[b]). To raise awareness and increase the population of conscious consumers they continuously share research and news about skincare, SPF, environmental sustainability, health, and lifestyle on their social media platforms and blog.

The company is negotiating with large distributors in Europe, in alignment with their expansion strategy. The planned expansion, from a turnover of 2.5 MSEK to 100 MSEK in approximately five years, will force the company to face some challenges and potentially put heavy strain on their current supply chain.

1.4 Focus and Limitations

Since this project has been initiated by Suntribe AB, with a goal to help them identify future risks with implications on their supply chain, the scope of this study will be linked to Suntribe AB and their supply chain. Suntribe AB is a startup, and therefore the focus of this study is mainly regarding risks posed on startups with global supply chains. The results of this study will subsequently be generalized in the greatest possible extent to help other companies in similar environments. Since this is a master thesis, there is a time limit of 20 weeks to perform the study. The area of research has been narrowed down to enable the study to be completed within the given time period.

2 Methodology

This section investigates different philosophies of science, ending with the philosophy used in this project. Thereafter the method of case studies is explained as well as the theory behind different data collection methods. The section ends by describing the chosen data collection approach.

2.1 Project Initiation

Christensen and Miguel (2018) and Forza (2002) argue that creating a credible study entails having a rigid research design, meaning: clear definitions, a clearly defined unit of analysis, and a well-grounded analytical approach. These components, included in the planning phase (Brewerton and Millward, 2001) are used to ensure that the measurements used are valid and that the researchers stay on path throughout the study (Carmines and Zeller, 1979). Keeping this in mind, it is important to note that, as Brewerton and Millward (2001) describe, the process of initiating a research project is iterative and cyclical. Meaning that the steps (*planning, literature review, project proposal, and research questions*) might have to be revisited after initial completion due to new insights (Brewerton and Millward, 2001).

Table 2.1: Four types of research purposes (Robson, 2002)

Type of Research	Purpose
Exploratory	Seek new insights at early stage of research, ask questions, investigate a phenomenon in new settings, generate hypothesis and ideas for future research. Typically with flexible designs.
Descriptive	Portray a person, event or situation of phenomenon. Requires extensive previous knowledge of the situation. Flexible and/or fixed design.
Explanatory	Seek explanation of a situation or a problem, often in the form of casual relationships. To explain patterns relating to and identify relationships for the phenomenon. Flexible or fixed design.
Emancipatory	To create opportunities and willingness to engage in social action, flexible design.

Part of creating a research design is knowing what purpose the study has, as seen in Table 2.1 the type of research differs depending on the study's purpose. Robson (2002) describes the need to stay flexible when labelling the research to reduce the risk of incorrect categorizing and restrict the execution of the research. Therefore, labelling in this sense will not be done. Sapsford (2006) suggests to consider questions like *what's the problem? What kind of answer am I looking for? What kind of answer might lead from*

the question to the answer? What kind of evidence will I need to sustain the argument? How will the information be collected and from whom? and How to evidence the validity of the research? before proceeding with the research.

2.2 Philosophy of Science

There is a multitude of ways to go about conducting research, they can be more or less suitable depending on what type of research is being conducted (Saunders, Lewis, and Thornhill, 2007, Chapter 4). This section will explore different research philosophies and approaches to answer research questions, followed by the intended approach of this study.

Qualitative methods or data are according to Cambridge Business English Dictionary (2020a) something that reflects soft values such as opinions and feelings, they are due to this subjectivity not easily measured or compared. **Quantitative** methods or data are however the opposite, as they are easily translated into objective values such as numbers and amounts (Cambridge Business English Dictionary, 2020b).

Deductive research is the act of testing theory through field verification (Saunders, Lewis, and Thornhill, 2007, Chapter 4). When starting a project with a deductive approach, the first step is always to build an extensive body of theory to learn more about the subject and create a hypothesis regarding the studied phenomenon. This hypothesis is then rigorously tested through well structured quantitative methods to ensure reliability through replicability. The relation between chosen variables is explained and some generalization about the findings can be made. Due to the nature of this approach, it is preferable to use when there is an abundance of sources, when there are time constraints to the study, and when some conclusion about the phenomena needs to be drawn. (Saunders, Lewis, and Thornhill, 2007; Dudovskiy, 2019)

An **inductive** research approach is suitable if one is aiming to investigate why a phenomenon occurs, rather than describing the phenomenon itself (Saunders, Lewis, and Thornhill, 2007, Chapter 4). An inductive research project starts with data collection from multiple sources, often qualitative such as interviews with open-ended questions. The data is used to describe the phenomena from different perspectives. The results are then analyzed and used to describe how this phenomena may have occurred, often creating a process model. (Saunders, Lewis, and Thornhill, 2007, Chapter 4)

Independent of which approach is chosen it is crucial to ensure credibility of the study, obtaining truthful results through objectivity (Christensen and Miguel, 2018; Kirk and M. L. Miller, 1986; Forza, 2002). Kirk and M. L. Miller (1986) argue that the only reason for a reader to accept the results of a study without objectivity is if they feel authoritarian respect for the author, which is not an indication that the result of the study is true. Conducting an objective study requires reliability and validity, simultaneously (Kirk and M. L. Miller, 1986). **Reliability** is a concept that relates to how consistent a measure, test or experiment is (Carmines and Zeller, 1979; Forza, 2002; Brewerton

and Millward, 2001), meaning that it is not affected by accidental circumstances (Kirk and M. L. Miller, 1986). **Validity** on the other hand, is whether the test, survey or device actually measures what it is intended to (Carmines and Zeller, 1979; Forza, 2002; Brewerton and Millward, 2001). To illustrate the difference and relationship between reliability and validity Figure 2.1 can be helpful. It shows that for reliability, there is no real need for validity, but validity cannot exist without reliability (Kirk and M. L. Miller, 1986).

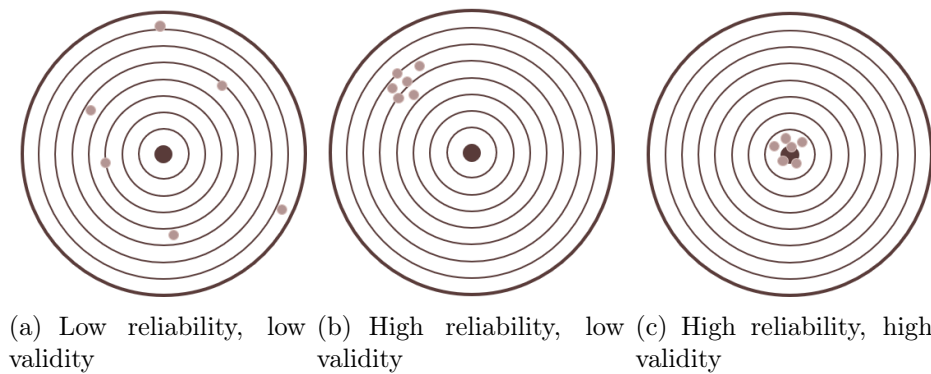


Figure 2.1: Illustration of how the concepts of reliability and validity relates to "hitting the mark". Source: inspired by (Carmines and Zeller, 1979)

There are different ways to test reliability, for example performing the same type of observation multiple times and obtaining the same results (Kirk and M. L. Miller, 1986; Carmines and Zeller, 1979; Robson, 2002), however as Kirk and M. L. Miller (1986, p. 41) state: "Americans, for example, reliably respond to the question, "How are you?" with the knee-jerk "Fine." The reliability of this answer does not make it useful data about how Americans are". Another type of reliability test is to perform a retest after a specified period of time, which builds upon a hypothesis that the measurement will not change although the world around it changes (Kirk and M. L. Miller, 1986). However, if the researcher is analyzing risks and giving them an "potential impact" value as well as ranking them, the value might change throughout time but the ranking may not, meaning the ranking is reliable (Carmines and Zeller, 1979).

Validity can also be tested, for example by relating a test to theory; if the empirical data of the test does not differ from the theoretical construct then you have construct validity (Forza, 2002). It is therefore necessary to have a thorough theoretical base to perform this type of validity test, Carmines and Zeller (1979) say: "construct validity is concerned with the extent to which a particular measure relates to other measures consistent with theoretically derived hypotheses concerning the concepts (or constructs) that are being measured" (Carmines and Zeller, 1979, p.23).

Another way to ensure a reliable and valid research is according to Yin (2003) to triangulate the use of data, to use multiple sources and data-gathering techniques to confirm or establish a fact or theory (Given, 2008). There are different types of triangulation

to use, for example: data triangulation, investor triangulation, theory triangulation, or methodological triangulation (Patton, 1997, cited by Yin, 2003, p. 98).

Benbasat, Goldstein, and Mead (1987) suggest to take a careful look at the research questions to define the **unit of analysis** since the research questions often indicate an appropriate unit of analysis. They also mention that how the study will be used for generalization will give a hint of what the unit of analysis should be. It could, for example, be based on individuals, groups or entire organizations (Benbasat, Goldstein, and Mead, 1987).

Our philosophy

The research path will be as shown in Figure 2.2; the phenomena of risk will first be studied through literature, creating a general theoretical framework. The theoretical framework will yield a formal theory, model, for startup risks affecting the supply chain. This model will then be challenged and further adapted through a single case study of Suntribe AB. The data gathered will initially be qualitative through an interview about risk perception with Suntribe AB, and then quantitative through letting Suntribe AB rank risks with measurable values, one (1) to seven (7) as suggested by Ornstein (2013). The collected data will then be analyzed and compared to theory in order to create a credible, general model for supply chain related risks for startup companies facing their first major expansion. The unit of analysis will be risks for startup firms that affects the supply chain, which will be presented as Suntribe risks 2020.

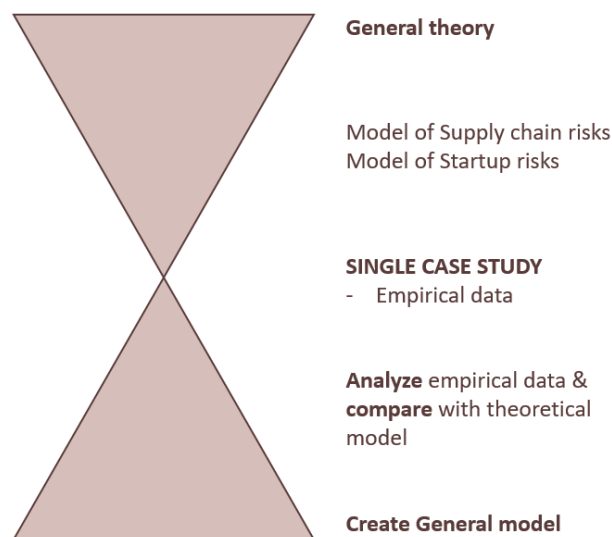


Figure 2.2: Project outline, visualized as a hourglass. Source: Own

2.3 Case Study

Case studies are used both by academics and in practice to develop new theory, testing, and refinement, and to answer questions such as *Why?* and *How?* (Voss, Tsikriktsis, and Frohlich, 2002; Benbasat, Goldstein, and Mead, 1987; Meredith, 1998; Yin, 2003). Robson (2002, p. 178) describes a case study as "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence". In general there are two ways to perform a case study, according to Yin (2003, chapter 2); single and multiple case studies, which are shortly described in Table 2.2.

In order to perform an objective case study, Voss, Tsikriktsis, and Frohlich (2002) explain that the research requires substantial time, skilled interviewers, and care, to accurately draw general conclusions from the collected data. No experimental controls or manipulations shall be used, and the methods and tools could include both quantitative and qualitative approaches (Meredith, 1998). In order to decide whether a case study is appropriate or not, Benbasat, Goldstein, and Mead (1987) suggest to consider the four questions *Can the phenomenon of interest be studied outside its natural setting? Must the study focus on contemporary events? Is control or manipulation of subjects or events necessary? Does the phenomenon of interest have an established theoretical base?*

When performing a case study, Benbasat, Goldstein, and Mead (1987) suggest to collect data from at least two different sources, whereas Yin (2003, Chapter 4) emphasizes to use as many as possible. According to Yin (2003, Chapter 4), there are six different types of sources: documentation, archival records, interviews, direct observations, participant observations, and physical artifacts. It can be difficult to estimate when to stop gathering data for the case and be satisfied with the already conducted research. Voss, Tsikriktsis, and Frohlich (2002) suggests to cease with the theoretical and empirical investigations when there is still time to ensure that deadlines are met.

Table 2.2: Different types of case studies, (Voss, Tsikriktsis, and Frohlich, 2002)

Type of Case	Advantages & Disadvantages
Single case	<p>Advantages: Greater depth</p> <p>Disadvantages: Limits the generalizability of conclusions. Exaggeration of easily accessible data and biases from misjudging the relation of a single event.</p>
Multiple case	<p>Advantages: External validity. Help guard against observer bias.</p> <p>Disadvantages: Less depth per case. Requires more resources.</p>

2.4 Data Collection

This section will describe the different methods of data gathering used in this study.

2.4.1 Literature Review

There are multiple databases containing academic resources such as journals and articles available for students at *Lund Tekniska Högskola (LTH)*, one of which is Emerald. As suggested by Rowley and Slack (2004) and Brewerton and Millward (2001) a site should preferably be maintained by an academic or governmental institution to ensure its credibility. Emerald Publishing was founded 1967 and describes itself as "A global publisher linking research and practice", they manage a portfolio of over 300 journals, 2 500 books and 1 500 cases (Emerald Publishing, 2020). Rowley and Slack (2004) suggest Emerald as an excellent database to use while performing the initial search for literature. Emerald has some built-in features, for example "sort by relevance". Simon Bilevych, Customer Support Executive at Emerald Publishing, explains the feature in an e-mail conversation as follows: the results are sorted by the number of times each search term occurs in the article (or in a specified part, eg. keyword or abstract), where an occurrence in the title weighs more than an occurrence in the main text (S Bilevych, 2020, personal communication, February 24th).

Table 2.3: Four strategies to perform literature search (Rowley and Slack, 2004)

Search Strategy	Description
Pearl growing	Start with a few articles, continue the search by using suitable terms used in these articles to retrieve new documents.
Brief search	A quick way to gain a starting point is to retrieve a few articles in the subject as a foundation.
Building blocks	Using synonyms and related terms to widen the search. A comprehensive and extensive way of performing a literature search, sometimes a slow-moving process.
Successive fractions	Reducing a large set of documents into a manageable amount by proceeding with internal searches within an already identified set of documents.

Rowley (2012) presents four strategies to perform a literature search, see Table 2.3. When evaluating resources, the authors shall be recognized experts within their field to ensure the quality and credibility of their work (Rowley and Slack, 2004; Brewerton and Millward, 2001). The purpose conducting the study and of publishing the material is important to consider to avoid cases where the author is biased in terms of selection and presentation of information (Brewerton and Millward, 2001). How the author uses references is another way to evaluate the quality and reliability of a document (Rowley and Slack, 2004), e.g. good books typically include a bibliography or list of reference to

validate their content (Rowley and Slack, 2004). Some studies have a "shelf-life", meaning they lose relevance after some time has passed, it is therefore relevant to investigate the publishing date before using the content in a report (Brewerton and Millward, 2001). Another way to distinguish the credibility of literature is if the article has been peer reviewed or not (Runeson and Höst, 2009; Robson, 2002).

2.4.2 Interview

Interviews can be structured, unstructured, or semi-structured (Brewerton and Millward, 2001; Robson, 2002). The advantages and disadvantages differ between the types, as presented in Table 2.4. Interviews can be used to understand attitudes, experiences, processes, behaviours, or predictions when gaining insights and/or collecting "facts" (Rowley, 2012). In order to conduct a well-organized interview, the interviewer is expected to be good at asking questions and to be a good listener (Yin, 2003). Robson (2002) expresses how many interviewers talk too much. The interviewer also needs to be adaptive and flexible, to see new situations as opportunities instead of threats, the interviewer should have a firm grasp of the issues being studied, and last but not least: the interviewer should be unbiased by preconceived notions (Yin, 2003).

Table 2.4: Different ways to perform interviews. (Brewerton and Millward, 2001)

Type of Interview	Advantages & Disadvantages
Structured: <i>Preset questions in a fixed order</i>	Advantages: Data is easily quantified and guaranteed to cover the desired research area. Interviewee can help explain uncertainties to respondent. Disadvantages: Does not allow further exploration into further areas of interest
Unstructured: <i>Questions and their order are not fixed.</i>	Advantages: Choice to go where the information seems fruitful, can ask the interviewee to evolve the answers where necessary. Disadvantages: Not as quantifiable, less of depth in exploration, difficult to compare and integrate (Rowley, 2012).
Semi-Structured: <i>Mix of the structured and unstructured interview</i>	Advantages: Both fixed-choice and open ended questions. Has the choice to go deeper into certain interesting areas if necessary. Disadvantages: Risk of spending too much time on a single subject, risk of losing control over the interviewee, reduction in reliability and quantifiability since the approach might differ.

An interview should preferably last for longer than 30 minutes, but not much more than one hour since the interviewee's willingness to participate is likely reduced the longer the interview is expected to last (Robson, 2002).

Interviews can be divided into several phases (Robson, 2002; Runeson and Höst, 2009), one of the first is to present the objectives of the interview and ask questions which are simple to answer, to make the respondent feel comfortable. When possible tensions have been cleared up the next phase can start, which may include personal and sensitive questions. Runeson and Höst (2009) stress the importance to obtain a climate of trust before introducing these subjects. Rowley (2012) underlines the usefulness of interviews when there is insufficient knowledge to conduct a questionnaire, and when the interviewees are more keen to participate in an interview than in other data gathering methods. The use of non-verbal communications can give hints and possibly change the meaning of some responses (Robson, 2002), unique for physical interviews. Rowley (2012) suggests to avoid questions that are: leading or have implicit assumptions, includes two questions in one, invites for a yes/no answer, are to vague or general, or are invasive.

2.4.3 Survey

A survey helps to describe a population and according to Sapsford (2006), it counts and describes *what is out there*. The purpose of research shall be closely connected with the questions in a survey questionnaire, questions like *how many?*, *who?*, *where?*, and *when?* are often the used to understand the relative proportion of respondents with a certain belief (Robson, 2002). Prior to survey research design, the researcher has to establish a theoretical model with relevant variables, linkages between them, explanations to perform the research, and boundary conditions (Rowley and Slack, 2004). There are many different ways to perform a survey (Forza, 2002; Robson, 2002), the most commonly used are presented in Table 2.5 together with the advantages and disadvantages of each.

Sapsford (2006) suggests to consider questions like *is research feasible in all these circumstances?*, *is survey research the right way to approach the problem, to get the kind of answers that are required?* and *is a survey feasible here - would it yield valid conclusions?*. Which population the survey is supposed to represent is an early design decision according to (Robson, 2002), which will distinguish the appropriateness of the survey research. Robson (2002, p. 241) describes: "the survey questions should be designed to help achieve the goals of the research and, in particular, to answer the research questions". The respondents task is to understand the question and answer it accurately, exhaustive, mutually exclusive, and on a single dimension.

Surveys can have open or closed questions (Robson, 2002; Ornstein, 2013; Runeson and Höst, 2009). The open questions have slightly lower response rates, while the closed ones give no more insight than the direct answer (Ornstein, 2013). A self completion survey means no interaction with the interviewer (Forza, 2002). Therefore, it is essential to make a pilot of the interview and let colleagues and other experts in field ensure the survey

Table 2.5: Different ways to perform a survey (Forza, 2002; Robson, 2002)

Types of Surveys	Advantages & Disadvantages
Self-completion: <i>Physical form is often sent by mail, filled in independently by respondent and mailed back to researcher.</i>	Advantages: Cost effective, no time constraints, ensures anonymity, authoritative impression, reduces interviewer bias, completed at respondents convenience. Disadvantages: Lower response rate, involve longer time periods, affected by self selection, lack of interviewer involvement and open ended questions, lower complexity on questions
Telephone survey: <i>Telephonist reads the questions out loud for the respondents and gathers the answers.</i>	Advantages: Fast data collection, cost efficient, ensures anonymity, large scale accessibility, ensures instructions are followed Disadvantages: Less control over interview situation, less credibility, lack of visual materials
Face-to-Face Survey: <i>Similar to a face-to-face interview.</i>	Advantages: Flexible in sequences, details, and explanation, opportunity for complex questions, higher response rate, increased confidence, complex questions and questionnaires is OK. Disadvantages: High costs, interview bias, unwilling participation, greater stress (for both), less anonymity.

will be understood by the respondents (Brewerton and Millward, 2001). Forza (2002) emphasizes the probability that the respondent might not be at the same academical level as the researcher and that there is a need to make a pilot of the survey. The survey is often not distributed to academics, hence, a pilot for the suggested segment shall be performed (Sapsford, 2006; Forza, 2002). Numerical, or other, scales can be useful in combination with closed questions, commonly used are five, seven, or nine point scales (Ornstein, 2013).

2.5 Our Approach

The phenomena studied in this project are the risks posed to a startup during their first major expansion, in other words when the startup turns into a scaleup. To decide the appropriateness of a case study the questions suggested by Benbasat, Goldstein, and Mead (1987) were considered: the general risks could be studied outside the natural setting, but since startups are different from the average firm (Grimaldi, Quinto, and Rippa, 2013), a study outside a startup setting would not cover all relevant risks. Control and manipulation is assumed unnecessary to perform the study, since the goal is to observe the *as is* and to give recommendations for future actions. The theoretical resources regarding the phenomenon are not considered enough to cover the research questions in

this project, therefore a case study is considered relevant. The resource insufficiency is clarified in the literature search methodology, further down in this section.

Due to the time limit and the scope, this project consists of a single case study of Suntribe AB and the risks they, as a startup, face. The empirically attained knowledge was compared to the theoretical framework in Section 3 in order to develop a general model containing risks that startups similar to Suntribe AB face. An initial semi-structured telephone-interview with one of the founders of Suntribe AB, was conducted with the goal to gain knowledge of the nodes of the supply chain of Suntribe.

Emerald has been the primary platform to perform the search for literature. The older articles and classics has been found mainly through the database JSTOR, which according to Lund University libraries (2020) contains complete archives of scientific papers, articles, and journals from early years, making it a good source for the type of scholarly articles sought after in this paper.

Rowley and Slack (2004) described four different literature search strategies, presented in Table 2.3. A brief search is described as a good way to initiate the process (Rowley and Slack, 2004). This strategy was used in the start of this study, with the search terms derived from the purpose: *risk, startup, supply chain, scaleup, and expansion*. Synonyms have been used to broaden the search in line with the search strategy building blocks. The combinations of search terms, the number of results and the number of articles deemed relevant and further investigated are summarized in Table 2.6. When scanning through the results of the search, title and/or keywords were reviewed to decide their relevance. When the relevant titles or keywords did not appear for 10-15 articles, the scanning of the results ceased. This worked due to the previously mentioned *relevance system* of Emerald. When selecting which of the relevant articles to study more thoroughly, the abstract, table of contents, and conclusions were investigated. The articles which still seemed relevant were further scrutinized and used to create the theoretical framework of this paper in line with the suggestions by Brewerton and Millward (2001). These articles were then used to track down the "classics", similar to the pearl growing strategy, as recommended by both Rowley and Slack (2004) and Brewerton and Millward (2001). Brewerton and Millward (2001) underline not to search for the "holy grail" of literature due to the small chance of success in doing so.

The initial search for results containing the words *risk AND (start up) AND (supply chain)* yielded over 15 000 results. When scanning the 100 pieces of literature deemed most relevant by *Emerald*, 18 titles and/or keywords seemed useful at first glance. From this selection, eight (8) articles were chosen for further analysis. However, none of the articles place in the sought after intersection; seven (7) out of the eight (8) do not mention startups or even small to medium enterprises, SMEs, and the one that does, Ellegaard (2008), only talks about supply risks. To manage this problem, new searches were conducted examining the intersection between *supply chain & risk* and between *startup & risk*. All searches followed the same agenda as described above, and the details from each search can be seen in Table 2.6.

Table 2.6: Search terms and their results, the results is subsequently used for pearl growing and building blocks.

Search term	Results in total	Relevant of scanned	Chosen of relevant
1. Risk AND Supply Chain AND Start up	15 000	18 of 100	8 of 18
2. Risk AND Supply Chain AND Expansion	4 000	7 of 50	3 of 7
3. Risk AND Supply Chain	27 000	11 of 300	11 of 11
4. Risk AND Start up	77 000	7 of 50	4 of 7
5. Risk AND Scale up	69 000	4 of 50	1 of 4
6. Scale up OR Scaleup OR Scale-Up	130 000	3 of 50	2 of 3

The search of *risk AND (start up)* yielded over 77 000 results, seven (7) out of the first 50 were deemed relevant, and four interesting enough to study deeper. To broaden the search, and include scaleups, a search containing of *risk AND (scale up)* and *scaleup* (in all of its forms) were conducted, results of this search and others can be seen in Table 2.6.

There is a plenitude of articles studying risks in relation to supply chains, a quick search in the database *Emerald* for *(supply chain) AND risk* produced over 27 000 results, seen in Table 2.6. Due to the *relevance system* that *Emerald* has in place, all articles found in search one (1) can also be found within the top 300 results of search three (3).

Some of the articles and books used are course literature from courses previously taken by the authors. All have been evaluated according to the checklists presented by Brewerton and Millward (2001) to ensure their credibility.

After finishing the literature review, two lists of risks were produced. One containing risks related to general supply chains, and one specific for startups. Thereafter, a semi-structured interview with each of the founders was held through the videoconferencing tool Zoom. These interviews' focus was on the risks the founders perceive most relevant for their business, resulting in a third list of risks. Together, the three lists resulted in the risk model.

The risks in this model was ranked by the authors based on impact and probability, where the concept of impact is divided into seven (7) drivers (*financial, quality, image, disruptions, physical harm, time and external knowledge*). These drivers are considered binary, either they are relevant for a certain risk, or not. The sum of the relevant impact drivers were multiplied with the estimated probability, resulting in a total risk score facilitating the ranking. The probability was said to be on a scale from zero (0) to three (3), where three (3) is very probable and one (1) is improbable. If a risk was assigned the probability zero (0), it was due to its complete irrelevance. The most important risks

were selected by evaluating the sum of impacts, total risk score (based on the ranking made by the authors), and if the risk was mentioned especially often (three times or more) during interviews. The goal was to produce a list containing the 20 most important risks for Suntribe AB in their current state. More than 20 risks made the initial cut, so some were deselected in regards to low total risk score (low probability score) as long as they were not mentioned by Suntribe AB more than three (3) times.

Thereafter, a survey was sent out to the founders. However, before the survey was distributed, the authors conducted a pilot test with a student colleague and a survey expert, to ensure its user friendliness. In the survey, the three founders of Suntribe AB were asked to rank the impact of each risk individually. The impact was measured on a scale from one (1) to seven (7), see example in Table 2.7. Their answers were then analyzed and visualized in graphs and diagrams to highlight differences and similarities. The median and extremes of the answers were visualized in a diagram as a way to easily compare the results.

The global circumstances have changed due to the current pandemic (caused by the virus Covid-19), for individuals as well as businesses. For this reason the authors also asked the founders of Suntribe AB to rate the impact the pandemic has had (or currently have) on their business as well as their personal lives, as entrepreneurs. The rating was done by using percent, where 0% represented *no impact* and 100% meant that *everything is affected*.

Table 2.7: An illustration of how the importance of risks were organized in the survey

If Risk X occurs, what level of impact would it have for Suntribe AB, right now?							
0	1	2	3	4	5	6	7
<i>I don't know</i>	<i>not important</i>		<i>somewhat important</i>			<i>very important</i>	

The risks brought up by Suntribe AB's founders in the interviews were compared to the ones obtained in the theoretical framework. Moreover the theoretically based ranking made by the authors was also compared with the ranking made by the founders. Potential differences were analyzed and discussed rigorously in terms of impact, probability, and risk management from a startup/scaleup perspective. A complete risk model containing the risks mentioned by theory and the ones from the data gathering with Suntribe AB was developed. This risk model can be used by businesses to identify and rank risks, by creating a structured forum for discussion.

3 Theoretical Framework

This paper will analyze the risks a startup company might face during their first major expansion, more specifically risks that have direct consequences for their supply chain. To stay within the focal area, the analysis will be conducted in the intersection between these three concepts, see Figure 3.1. As mentioned in Section 2.5, the search for literature in the intersection of *risk*, *supply chain* and *startup* was not fruitful. Therefore the theoretical framework will be built based on the intersections between both *risk* & *supply chain* and *risk* & *startup*. The information found in these intersections will act as a base for a framework specialized for startups who wants to manage risks during an expansion.

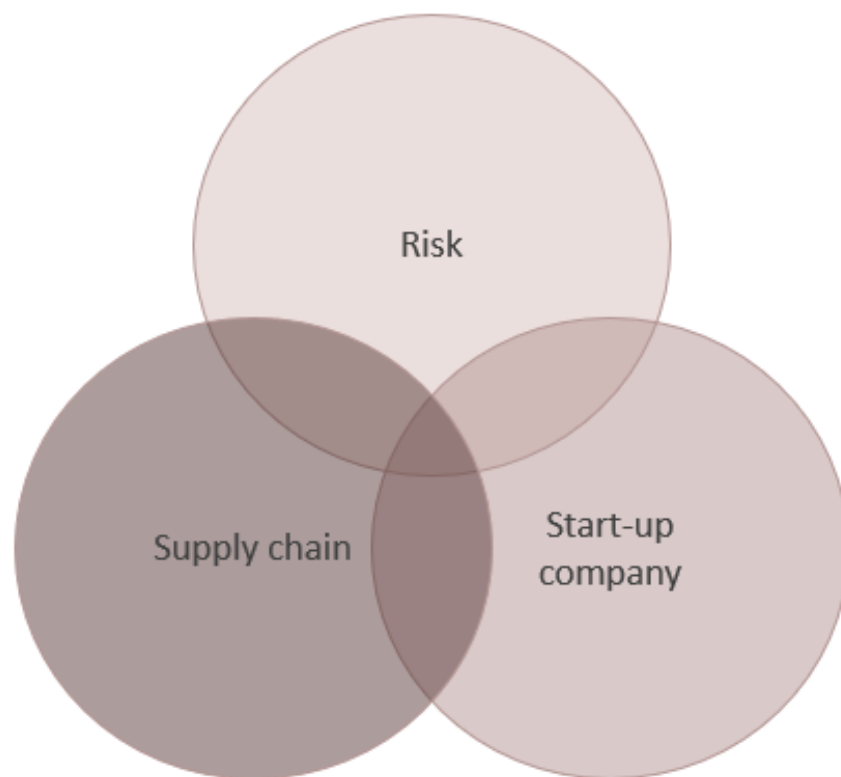


Figure 3.1: A Venn diagram visualizing the scope of the project. Source: Own

To ensure consistency throughout the report, definitions from literature regarding the three concepts will be analyzed, resulting in one clear definition for each concept. When the relevant concepts have been defined, the framework of each intersection will be presented. At last, the two frameworks will be compared, the risks will be ranked, the gained knowledge and insights found in literature will be used to create a third, combined, risk framework.

3.1 Risk

There are many ways to consider risks as shown in Table 3.1. A majority of the authors of the investigated literature define risk as something negative, or undesirable (Cambridge Academic Content Dictionary, 2020a; Lowrance, 1980; Mitchell, 1999; Mitchell, 1995; Caldwell et al., 2013; Weele, 2010), whereas the remaining authors discuss risk in terms regarding variation of outcomes (K. D. Miller, 1992; Markowitz, 1952; March and Shapira, 1987) or uncertainty (Rao and Goldsby, 2009). However, uncertainty is difficult to quantify which makes it problematic to manage. Omera and Burnes (2007) discuss the difference between risk and uncertainty and come to the conclusion that risk *needs* to be measurable whereas uncertainty does not. To address the measurability it might be wise to look at risks as referring to a quantifiable loss (eg. financial) which, as shown in Table 3.1 many researchers on the subject do. Impact regarding supply chain risks are described by Jüttner, Peck, and Christopher (2003) as disruptions to information, material and product flows, which of course has financial consequences.

Table 3.1: Definitions of Risk

Definitions of Risk	Author (year, page)
To do something or to enter a situation where there is a possibility of being hurt or of a loss or defeat.	Cambridge Academic Content Dictionary (2020a)
[...] risk as a compound measure of the probability and magnitude of adverse effect.	Lowrance (1980, p. 6)
Risk refers to variation in corporate outcomes or performance that cannot be forecast ex ante.	K. D. Miller (1992, p. 311)
Risk is, therefore, defined as a subjectively-determined expectation of loss; the greater the probability of this loss, the greater the risk thought to exist for an individual.	Mitchell (1999, p. 168)
The risk concept contains different types of loss and the risk of any particular type of loss is a combination of the probability of that loss P (Loss,) and the significance of that loss to the individual or organization, I (Loss,). Therefore: Risk = P(Loss) × I(Loss).	Mitchell (1995, p. 116)
The concepts "yield" and "risk" appear frequently in financial writings. Usually if the term "yield" were replaced by "expected yield" or "expected return," and "risk" by "variance of return," little change of apparent meaning would result.	Markowitz (1952, p. 89)

Continued on next page

Table 3.1 – *Continued from previous page*

Definitions of Risk	Author (year, page)
In classical decision theory, risk is most commonly conceived as reflecting variation in the distribution of possible outcomes, their likelihoods, and their subjective values.	March and Shapira (1987, p. 1404)
Risk can be broadly defined as a chance of danger, damage, loss, injury or any other undesired consequences.	Caldwell et al. (2013, p. 52)
Risks are assessed based on two criteria: (1) the negative impact on the company’s financial performance or operations and (2) the likelihood with which the risk factor probably would occur.	Weele (2010, p. 428)
Exposure to a premise, the outcome of which is uncertain.	Rao and Goldsby (2009, p. 100)
Risk can be broadly defined as a chance of danger, damage, loss, injury or any other undesired consequences.	Caldwell et al. (2013, p. 52)
The amount that would be lost (i.e., that which is at stake) if the consequences of the act were not favourable, and the individual’s subjective feeling or degree of certainty that the consequences will be unfavourable.	Cox (1967, p. 37)

As can be seen in the definitions, risk is about more than the outcome or effect of an event, it is also about the probability or likelihood of said event taking place (Cambridge Academic Content Dictionary, 2020a; Lowrance, 1980; Mitchell, 1999; Mitchell, 1995; March and Shapira, 1987; Weele, 2010). It seems intuitive that it is extremely difficult to calculate the probability of an event occurring during a specific time, in a specific place, and in a certain way. Keller and Al-Madhari (1996) make a point of highlighting this challenge by saying that “such predictions are properly the province of astrologers, other fortune tellers and possibly politicians; they are definitely not the province of risk managers” (Keller and Al-Madhari, 1996, p. 19). It could be useful to use other ways than a calculated percentage to express probability, using a scale from low to high for example (Weele, 2010; Jüttner, Peck, and Christopher, 2003; Simons, 1999). Simons (1999) has developed a calculator to analyze the likelihood of risks towards a franchise or strategy, it lets the user rank the pressure on the company from nine (9) points divided into three categories: growth, culture, and information management, on a scale from one (1) to five (5). Adding all nine (9) values produces a result that indicates whether the company is in the *safety zone*, *caution zone*, or in the *danger zone*. However, most authors in the subject of risk refer to probability without mentioning how it is calculated or expressed (Ellegaard, 2008; Rao and Goldsby, 2009), which may be because it differs between risks. Smallman (1996) argues that non-numeric forecasting (qualitative measures) is a key

ingredient towards a more holistic way of managing risks.

In this paper risk is defined as: "an event that might occur with a certain probability, resulting in a loss (sales, stock, trust, and so on) for the company". This definition is derived to fit into the risk matrix, Figure 3.2; where one axis considers the negative impact of an event on a company's performance, or operations, from a financial perspective. The other axis considers the probability of the event occurring (Weele, 2010, p. 427).

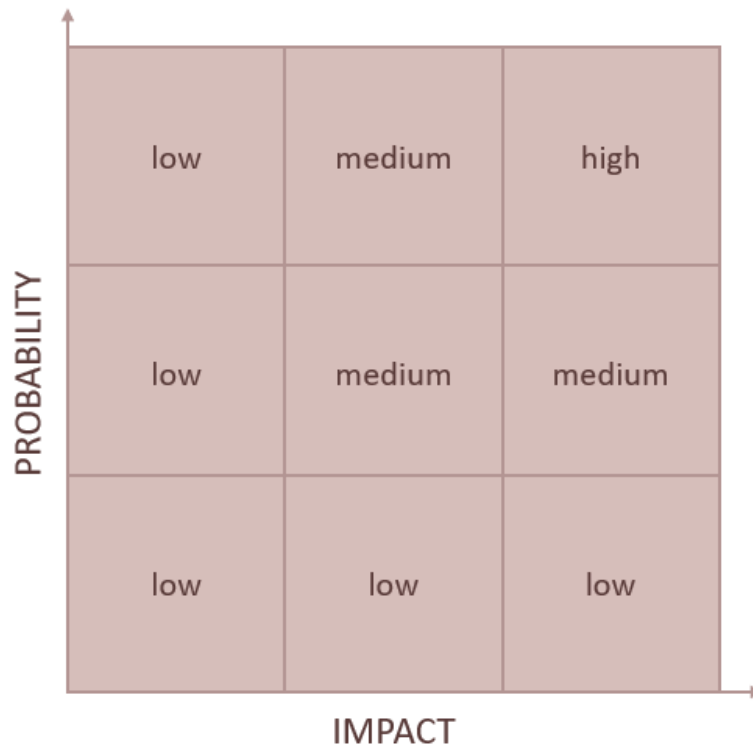


Figure 3.2: Matrix classifying risk based on impact and probability. Source: inspired by (Weele, 2010, p. 188)

3.2 Supply Chain

There is a plethora of articles containing the words *supply chain*, as can be seen in Table 2.6, and one could argue that there are equally as many interpretations and definitions. In this article, eight (8) of these definitions will be examined, resulting in a definition fitting for the purpose of the study.

One part of defining a supply chain is through the reach of different flows. It is common to express that the flow ends with customers, either undefined or interpreted as the final consumers, end users (Cambridge Advanced Learner's Dictionary & Thesaurus, 2020; Mentzer et al., 2001; Weele, 2010; La Londe Bernard and Masters James, 1994; Foster, 2013; Aitken, 1998). Mentzer et al. (2001) discuss three different types of supply chain; direct, extended, and ultimate. The direct supply chain reaches the immediate customer,

the extended adds one more customer layer, and the ultimate reaches to the end consumer, making it very clear what the scope of the referred supply chain is. Including customers in the supply chain definition is crucial since they provide the potential revenue for the focal company, by purchasing a product or service (Weele, 2010; Chopra and Meindl, 2013). From the definitions in Table 3.2 it is not clear where the supply chain starts, some begin with the producers (Cambridge Advanced Learner's Dictionary & Thesaurus, 2020; Weele, 2010; La Londe Bernard and Masters James, 1994; Chopra and Meindl, 2013), others include entities handling raw material (Foster, 2013) or suppliers (Aitken, 1998). Mentzer et al. (2001) define the start of the flow, similar to the end, dependant on referred SC complexity using the terms ultimate supplier or direct supplier. The more entities involved in the definition, the more accurate picture or responsibilities and distribution of risks (Mentzer et al., 2001). However, it naturally becomes more complicated to analyze. It seems as if the number of organizations involved in the supply chain can vary depending on what type of business is being conducted, but the minimum amount of organisations can be argued to be three (3) (Mentzer et al., 2001); a supplier, the focal company, and a customer. An important note to make is that depending on from which perspective the supply chain is viewed or which supply chain is being looked at, the same organizations will have different functions; for example, the company might be a customer in one supply chain and a supplier in another (Mentzer et al., 2001).

The supply chain flows brought up in the definitions by Mentzer et al. (2001), Chopra and Meindl (2013), Foster (2013), and Aitken (1998) are information flows, material flows, financial flows, and as Aitken (1998) is alone to mention; process flows. Following the flows from an ultimate supplier to the ultimate customer, one would see that the flows pass through many activities such as: product development, marketing, and distribution. These activities are therefore also part of the supply chain.(Chopra and Meindl, 2013; La Londe Bernard and Masters James, 1994)

This paper will define supply chain according to Chopra and Meindl (2013), similar to the definition of the ultimate supply chain, since this view provides insight into less apparent risks that the supply chain might face. The definition is as follows: "A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service"(Chopra and Meindl, 2013, p.1). This definition gives the holistic and comprehensive view sought after in the study.

Table 3.2: Definitions of Supply Chain

Definitions of Supply Chain	Author (year, page)
The system of people and organizations that are involved in getting a product from the place where it is made to customers.	Cambridge Advanced Learner's Dictionary & Thesaurus (2020)
A set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer.	Mentzer et al. (2001, p. 4)
A series of companies (links) in which the consecutive stages of production of an economic product take place, from primary producer to final consumer.	Weele (2010, p. 429)
Normally, several independent firms are involved in manufacturing a product and placing it in the hands of the end user. [...] The set of firms which pass these materials forward can be referred to as a supply chain. [...] supply chains for technologically complex products may involve scores or hundreds of firms.	La Londe Bernard and Masters James (1994, p. 38)
A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service.	Chopra and Meindl (2013, p. 1)
There are process flows, information flows, material flows, and flows of funds. Each of these flows has to operate effectively, efficiently, and with outstanding quality. Like a river, we refer to upstream flows and downstream flows. The sums of these flows comprise the supply chain.	Foster (2013, p. 2)
These include upstream processes relating to our dealing with suppliers—negotiating, selecting, and improving supplier performance—and downstream processes—delivering products and services and serving customers.	Foster (2013, p. 2)

Continued on next page

Table 3.2 – Continued from previous page

Definitions of Supply Chain	Author (year, page)
A network of connected and interdependent organisations mutually and cooperatively working together to control, manage and improve the flow of materials and information from suppliers to end users.	Aitken (1998, p. 67)

3.3 Supply Chain Risks

Identifying risks posed on the supply chain is the first step in risk management (Christopher and H. Lee, 2004; Sam, 2014; Pels and Engelseth, 2009). To facilitate the management, a simple framework is constructed. This framework will categorize risks and connect them to their drivers, since the driver often indicates how the risk should be managed (Jüttner, Peck, and Christopher, 2003). There is a plenitude of suggestions of how to categorize risks, however, categorizing them by internal, external, and networking risks is a reoccurring trend in literature (Lin and Zhou, 2011; Jüttner, Peck, and Christopher, 2003; Christopher and Peck, 2004). This way of categorizing risks is intuitive since there is minimal confusion regarding what is internal, external or networking risks (Christopher and Peck, 2004; Lin and Zhou, 2011), whereas the categories can be quite similar in other definitions. For example Ghoshal (1987) categorizes risks as *macroeconomic*, *policy*, *competitive*, and *resource risks*, where macroeconomic and policy are only differentiated by the latter being controllable and the first not (Ghoshal, 1987). The conceptual research framework, including all risks, is shown in Figure 3.3.

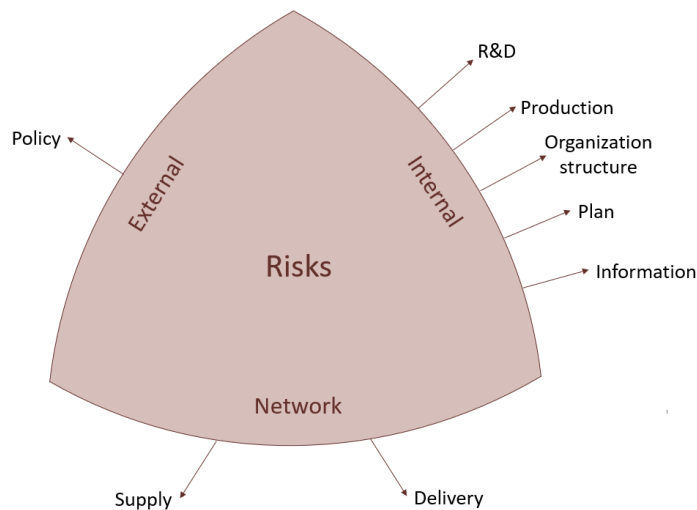


Figure 3.3: Categories of risks. Source: inspired by Lin and Zhou (2011, p. 164)

Internal risks are encircling and affecting the operations directly connected to the management decisions regarding R&D, production, organizations structure, planning, and

information (Lin and Zhou, 2011). The networking risks are risks associated with supply chain, such as supply and delivery (Christopher and Peck, 2004) or the interactions between the nodes in the supply chain (Jüttner, Peck, and Christopher, 2003). External risks are risks connected to the macro-environment which could affect the whole supply chain, for instance political actions, contagious diseases, or environment-related actions such as earthquakes or extreme weather (Jüttner, Peck, and Christopher, 2003). These eight subcategories of internal, external and network risks are, in this paper, viewed as drivers for risk. In Table B.1 the most common and relevant risks are presented in relation to their respective driver and category.

3.4 Startup

Businesses belonging to the world of startups, are just that: starting up. Six (6) definitions of startups can be seen in Table 3.3, they all have slightly different takes on the concept. However, that a startup is a young or new company seems quite clear (Cambridge Academic Content Dictionary, 2020b; European Startup Network, 2019; Luger and Koo, 2005; Fernando G. and Emanuele, 2017). The definition of a *young* or *few-year-old* company can be said to be under five (5) years old according to European Startup Network (2019), which seems reasonable.

The main objective of a startup is to break into the market by creating a scalable business model (European Startup Network, 2019; Blank, 2010). Since they are independent, not connected to an existing firm, (Luger and Koo, 2005) the stakes are high and they have everything to loose (Fernando G. and Emanuele, 2017). Cook (n.d.) highlights the startup mentality, how it plays a large roll in making a new business into a startup. It can be argued that the excitement and sense of possibility mentioned by Cook (n.d.) is created by the innovative, and rapid growth aspects of a startup, as defined by European Startup Network (2019).

By consolidating the different interpretations in Table 3.3, the definition for a startup used in this paper will be "A small, recently developed, firm with a solution to build a bridge between the gap of customer need and supply. They have an innovative approach and a team mentality, whilst striving towards a rapid growth, facing challenges due to uncertainty, lack of resources, and time as they appear".

Table 3.3: Definitions of Startup

Definitions of Startup	Author (year, page)
A new business, or the activities involved in starting a new business.	Cambridge Academic Content Dictionary (2020b)

Continued on next page

Table 3.3 – *Continued from previous page*

Definitions of Startup	Author (year, page)
[...] an independent, organisation, which is younger than five years and is aimed at creating, improving and expanding a scalable, innovative, technology-enabled product with high and rapid growth.	European Startup Network (2019)
A start-up can be defined as a business entity: which did not exist before during a given time period (new), which starts hiring at least one paid employee during the given time period (active), and which is neither a subsidiary nor a branch of an existing firm (independent).	Luger and Koo (2005, p. 19)
A few-year-old business which is not yet established in the industry and in the market and could more easily fail.	Fernando G. and Emanuele (2017, p. 53)
A startup is an organization formed to search for a repeatable and scalable business model.	Blank (2010)
You can either think about it in terms of the actual business or you can focus on the spirit and mentality. Literally, a start-up is a new, emerging business. [...] It's difficult to say a start-up is definitively one thing or another, except for highlighting that the ability to change and be different is the essence of a start-up. The energy, excitement and sense of possibility runs throughout start-ups, as well as a feeling that anything could happen.	Cook (n.d. Sec. 1)

3.5 Scaleup

According to the definition of startup used in this study, a company cannot remain one forever since it includes that the company is *recently developed*. The definition also includes *rapid growth*, which leads the startup into the new state called *scaleup*. As R. Brown and Mason (2017) discuss different entrepreneurial ecosystems (such as incubators and accelerators) they argue that it is too limiting to only talk about startups since a company's needs changes as they evolve. As a startup develop into a scaleup, they need to take paths that lead them towards other actors and into new interactions (R. Brown and Mason, 2017). There are very few definitions to be found regarding scaleups, as can be seen in Table 3.4. This is supported by Guilherme Fowler A. (2019), that argues that the current literature does not contain a precise definition yet. However, it can be said that every scaleup is a high growth firm, which can be defined as "any firm that has, for an observable and fundamental period, an accelerated cycle of growth and wealth creation" (Guilherme Fowler A., 2019, p.102). In this definition growth relates both to the cost reduction through economies of scale but also through being valued enough to

raise prices without losing customers (Guilherme Fowler A., 2019).

Onetti (2014) argues that scaleups are specific to high-technology markets, however, through disruptive business models they can also be found in consumer oriented markets according to R. Brown and Mason (2017). This argument is aligned with Scale Up Nation (2020) since they also emphasize the entrepreneurial aspects of the firm, and not the market or field. For this article the definition of scaleups will be similar to the definition by Onetti (2014), with the removal of the words *”specific to high-technology markets”*. To make the word growth more inclusive, in accordance with Guilherme Fowler A. (2019), the word *and* will be replaced with *or*, rendering the definition as follows: *”A development-stage business that is looking to grow in terms of market access, revenues, or number of employees, adding value by identifying and realizing win-win opportunities for collaboration with established companies.”*

Table 3.4: Definitions of Scaleup

Definitions of Scaleup	Author (year, page)
A development-stage business, specific to high-technology markets, that is looking to grow in terms of market access, revenues, and number of employees, adding value by identifying and realizing win-win opportunities for collaboration with established companies.	Onetti, 2014
An entrepreneurial venture that has achieved product-market fit and now faces either the “second valley of death” or exponential growth.	Scale Up Nation (2020)

3.6 Startup Risks

That most risks concerning traditional enterprises also apply to startups seems intuitive since they operate in the same, or similar, settings. However, there are certain aspects that differentiate startups from other types of businesses. A few characteristic themes presented by Giardino et al. (2014) can be seen in Table 3.5. These differences entails risks that are specific for startups, which will be discussed in this section.

Table 3.5: Recurrent themes for startups. Source: (Giardino et al., 2014, p.1-2)

Theme	Description
Lack of resources	The economical and human resources are very limited.
Highly reactive	Startups need to react to changes in market, product features, competition, people, and finance very quickly.

Continued on next page

Table 3.5 – *Continued from previous page*

Theme	Description
Innovation	The highly competitive environment (startup ecosystem) requires exploration of highly innovative market segments.
Uncertainty	The environment (startup ecosystem) entails high uncertainty from a market, product feature, competition, people, and finance perspective.
Rapidly evolving	Startups aim to grow and scale rapidly.
Time pressure	Fast product releases and high pressure to perform on given dates (demo days, investors' request).
Third party dependency	Heavy reliance on external resources due to previously mentioned lack.
Small team	The team initially consist of only a few founders.
One product	The company's activities revolve around one product/service (initially).
Low-experienced team	Usually the team members have less than five (5) years of experience and are newly graduated students.
New company	The company has recently been created.
Full organization	Usually founder-centric companies, meaning everyone has big responsibilities with no need of high management.
Highly risky	Significantly high failure rate.
Not self-sustained	Requires external funding (venture capitalists, angel investments, personal funds, loans, etc.).
Little working experience	The organizational culture in initially not present.

Startup risks can be included in the term entrepreneurial risks, since startups are run by entrepreneurs (Teberga and Oliva, 2018; Johansson, 2010). However, not all entrepreneurial businesses are startups, as they could, for example, be a branch within an established company (Skarzynski and Schaedler, 2010). Skarzynski and Schaedler (2010) address entrepreneurial risks within four categories, namely: *customer demand*, *product or technology development*, *profitability of the business model*, and *competitor response or product obsolescence*. These categories seem intuitive and easy to comprehend, however do not fit all startup related risks and are therefore not considered suitable for this paper. Steinberg et al. (2004) suggest four more comprehensive categories used in a risk management framework, *operations*, *reporting*, *strategic*, and *compliance*, where the risks in the first two are potentially influenced by external factors and the latter are internally

controllable. This is in line with the categories used in Section 3.3, where the categories *External*, *Internal*, and *Network* were used. It therefore seems fitting to use the same categories for this section.

A compilation of relevant risks was created by looking at the risks brought forward in literature regarding new enterprises (SMEs, startups, or scaleups) with this paper's definition of startup in mind, see Table B.2. As can be seen, all risks are in the categories *internal* and *network*, in this case the word internal refers to the startup ecosystem (the environment surrounding and supporting the founders/organization) for comparability with traditional enterprises. This is reasonable since, as mentioned, the external factors such as wars and diseases are not specific for startups.

3.7 Risk Framework

To compare and rank the risks, the perceived probability, P , is multiplied with the perceived impact, I . The product is representing the overall risk perception, $Risk = \sum I_x \cdot P$. The perceived impact is calculated as the sum of all impacts, $\sum I_x = I_F + I_Q + I_I + I_D + I_{Ph} + I_K$.

This method is inspired by the risk matrix of Weele (2010) and the way Mitchell (1995) calculated risk. These calculations can be used to compare and rank the identified risks. The impact is derived from the perceptions of risks, presented by Jacoby and Kaplan (1972), Garvin (1984), Tang (2006), Singh, Garg, and Deshmukh (2008) and Roselius (1971). Descriptions of the impacts are presented in Table 3.6.

This system provides a clear overview of the relevance of the risks that an enterprise might face. Fulfilling the first step in risk management; identification. The complete risk model with instructions is presented in Table C.2 in Appendix B.

Table 3.6: The potential impacts of risks, categorized

Impact category	Description
Financial Impact, F	Loss of financial assets, either due to product/service not functioning or due to large costs to ensure the conditions is kept (Jacoby and Kaplan, 1972)
Quality, Q	Not meeting the quality expectation of the customer. Can be product-based, user-based, manufacturing-based, and value-based (Garvin, 1984, cited by Foster, 2013, pp. 3–4)
Company Image, I	The product/service disagrees with the self image or self concept of the customer (Jacoby and Kaplan, 1972)

Continued on next page

Table 3.6 – *Continued from previous page*

Theme	Description
Disruptions, D	Material flow disruption can be caused by man-made and natural disasters (Tang, 2006)
Physical Harm, Ph	The product is not safe, might inflict physical harm such as injuries or disease (Jacoby and Kaplan, 1972)
Time, T	Loss of time resources to get the product/service functioning again (Roselius, 1971)
External knowledge, K	Lack of experience is one reason for failure (Singh, Garg, and Deshmukh, 2008). This impact is whether external knowledge, such as consultants or services will be needed or not.

3.8 Risk Management Strategies

Ellegaard (2008) argues that there are three components associated with managing risks; the first being *information gathering* with the purpose of identifying possible risks, since it is near impossible managing the unknown. The following two steps are where the value adding mitigation work begins, namely with *probability and effect reduction*. In many of the studied articles the researchers discuss risk management in terms of identification, assessment, and mitigation (Christopher and H. Lee, 2004; Jüttner, Peck, and Christopher, 2003; Sam, 2014; Pels and Engelseth, 2009; Waters, 2011; Teberga and Oliva, 2018), whereas Teberga and Oliva (2018) names it as identifying, analyzing and treating the risks. However, it has been observed that small companies often prioritize probability reduction rather than collecting information to avoid risks such as political disturbances and lack of competitive strength through new technology (Ellegaard, 2008; Vaaland Terje and Heide, 2007).

The process of risk identification is different depending on what type of risk one is looking for; possible qualitative and quantitative risks from sub-contractors can be identified by checklists and close contact with industrial associations (Svensson, 2000), whereas political and policy risks can be identified by being up to date with the political climate (Rao and Goldsby, 2009) by for example reading the news.

To reduce probability and effect of an identified risk, more specifics about the risk is required, this is called risk assessment (Jüttner, Peck, and Christopher, 2003; Manuj and Mentzer, 2008). This is done by considering, for example, potential losses, probability, impact, consequences, or worst possible scenario of the risk occurring (Zsidisin and Ellram, 2003; Weele, 2010). These can be evaluated by decision analysis, case studies, and perception (Manuj and Mentzer, 2008). A decision analysis is for example when the risks are measured and compared by multiplying probability with impact for each scenario of the risk (Mitchell, 1995). In this case it is important to develop a method for quantifying

impact, which a significant amount of managers find impossible due to the multidimensional nature of most risks (Mitchell, 1995). Case studies are good for comparing risks of multiple firms and the actual consequences of them occurring (Robson, 2002). Perception based risk analysis is when managers are asked to estimate risks. This is not a precise tool, but it does give a qualitative view of what is perceived as a risk, which might help understand managerial decisions better (Manuj and Mentzer, 2008).

Table 3.7: Supply chain types and risk management strategies. Source: (Manuj and Mentzer, 2008)

		Demand Uncertainty	
		Low	High
Supply Uncertainty	Low	Efficient Supply Chain <i>Focus on Cost Efficiency</i> Postponement Single Sourcing	Responsive Supply Chain <i>Focus on responsiveness and Flexibility</i> Postponement
	High	Risk Hedging Supply Chain <i>Focus on Pooling and Sharing Risks</i> Multiple Sourcing Transferring/Sharing Risk Hedging	Agile Supply Chain <i>Focus on Responsiveness and Hedging Risks</i> Hedging

When the assessment of the risk is complete, different strategies can be implemented to reduce the probability and effect of them. The strategies presented by Manuj and Mentzer (2008) are *avoidance, postponement, speculation, hedging, control, sharing/transferring risks, and security*, as can be seen in Table 3.7. H. L. Lee (2002) proposed to divide risks according to supply and demand uncertainty, whereas Tang (2006) talks about disruption or operational risks. Manuj and Mentzer (2008) elaborated on the framework by H. L. Lee (2002) by coupling the risks to the risk management strategies above.

4 Findings/Empirical Data

In this section, the results from the two interview sessions and survey will be presented. The gathered information will thereafter be used in the analysis section.

4.1 Getting to Know the Company

The initial interview was held with the Chairman of the Board, and Suntribe AB founder. The topics discussed were about company roles, strategies and guidelines, communication, and supply chain, see interview guide in Appendix A.1.

Company roles

The company has three founders and three main roles:

- CEO - responsible for operations, legal & compliance, Amazon, and half of the B2B sales (divided by country)
- Chairman of the Board - responsible for finances, accounting, strategy, half of the B2B sales (divided by country), and content creation such as photography and videos
- Head of Design and IT - responsible for product design (such as prints, labels, brochures, order sheets, technical details etc.) and communications through design (such as website, e-shop, IT)

Guidelines

Suntribe AB follows three main guidelines to ensure that the business develops in the desired direction and that disruptions in daily activities are minimized. The guidelines are as follows:

- Never produce products containing unnecessary ingredients.
- Stay transparent, *everything* should be on the website.
- All founders should be able to perform all tasks and cover for each other within reason.

Communication

Suntribe AB does not have an ERP system of their own, all communication regarding orders is through emails containing excel templates. To share other information or communicate more directly, they use phone calls and video conferencing tools, as well as emails. Their logistics provider and Amazon, both have ERP systems and platforms that Suntribe AB use, however, all claims from both entities are handled outside of these systems.

Supply Chain

Suntribe AB's supply chain has been divided in two different parts due to practical reasons. The first part, Figure 4.1, is regarding packaging materials and customers, whereas the second part, Figure 4.2, is regarding product ingredients and the production facility. To get a geographical overview, a map containing the location of suppliers, warehouses, and manufacturer has been produced and can be seen in Figure 4.3.

Most packaging materials are transported by trucks, but packaging materials from foreign countries such as Israel and China are transported by sea or air, depending on the size and weight of the shipment. Geographical distance and mode of transport clearly impact the lead time, as packaging materials sourced within the EU mostly have lead times between 1-2 weeks and the sugarcane tubes from Israel have a lead time of 6-8 weeks, see Figure 4.1. Suntribe AB source their packaging materials two (2) or three (3) times per year to reach quantities leading to economies of scale. When their production quantities increase in the future, they plan to source more frequently. The labels are designed to be compliant in all countries where Suntribe AB's products are sold, this to reduce the number of SKUs. However, this strategy has not always been successful, leading to double handling while relabelling the products in stock.

Suntribe AB source most packaging materials themselves, while their manufacturer is responsible to source the aluminum tubes and the ingredients according to the recipes provided by Suntribe AB. The manufacturer is already sourcing many of these ingredients for the other products which they produce, and they are therefore in a better position to negotiate (such as economy of scale). Suntribe AB is not aware of which suppliers are used to source the ingredients, this is due to the policy of the manufacturer. The manufacturer have this policy to avoid that their customers start sourcing their ingredients themselves. The manufacturer do, however, share from which country the ingredients are sourced, and provide the correct documentation to prove all regulations are followed. Due to the manufacturer's policy of not disclosing their suppliers, the founders of Suntribe AB could not provide the authors with the country of origin for all their ingredients. Since the purpose of this study was not to map their entire supply chain, a decision was made to leave these six (6) countries of origins as unknown. As can be seen in Figure 4.2, most of the ingredients are sourced from multiple suppliers. All ingredients are chosen to ensure reliability in production, i.e. the founders assures that there is little to no risk of disruptions in production due to lack of ingredients. Since Suntribe AB has no responsibility of procuring the ingredients, they do not have insights in modes of transport, lead times, etc. for these. Suntribe AB is deemed to share production plans three (3) months ahead, which indicates that the lead time to source some of the ingredients is long.

Suntribe AB produce their products a few times per year, once before the season starts in February/March, and once in May when the season has started and there are some indications of how the sales will turn out for the season. They need to produce at least 200 items per batch, and if they produce more than 2 000 items/SKU, they get a discount from the manufacturer. Some of the ingredients have lead times up to three months,

and the procurement is based on the production plan, increasing the need for correct forecasting. The sales increased by 500% in 2019 compared to 2018, which implies that there is a need to stay flexible to meet future demand uncertainties.

Suntribe AB decided to invest in a machine to seal their aluminum tubes in the early months of 2020, an investment equally shared with the manufacturer. This investment is a way for Suntribe AB to show their devotion for their manufacturer, and to support their means of a long collaboration. The machine is only supposed to be used for the products of Suntribe AB.

Although Suntribe AB is a cosmetics company, they have SKUs that are non-cosmetic such as surf ponchos and t-shirts. They also need to source other materials such as point-of-display's, cotton bags for packing bundles, and brochures. These items have been excluded from the study since they are not related to the core activities, produced in very low quantities, and therefore negligible from a risk perspective (Weele, 2010, p. 164).

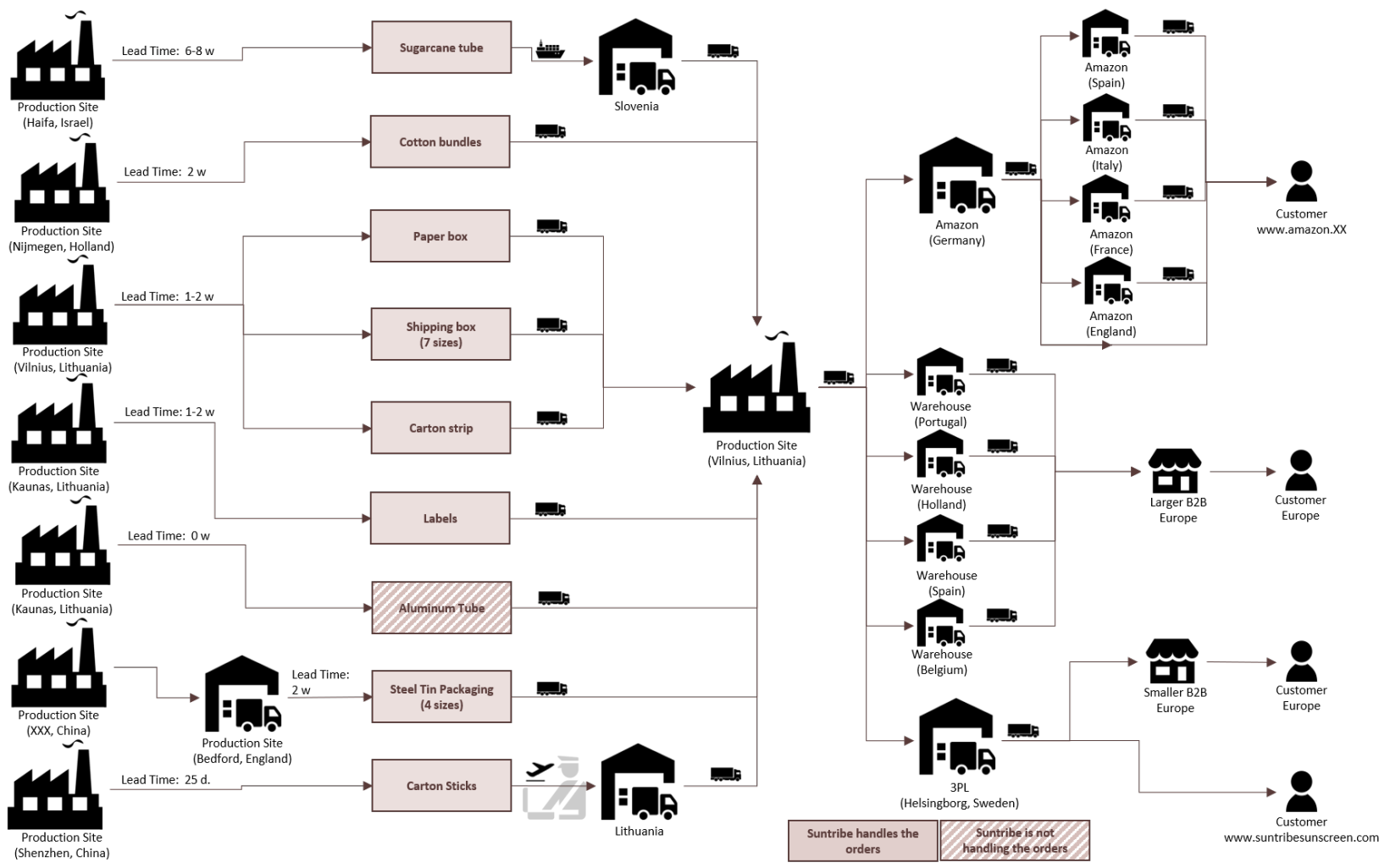


Figure 4.1: Supply chain map of packaging materials

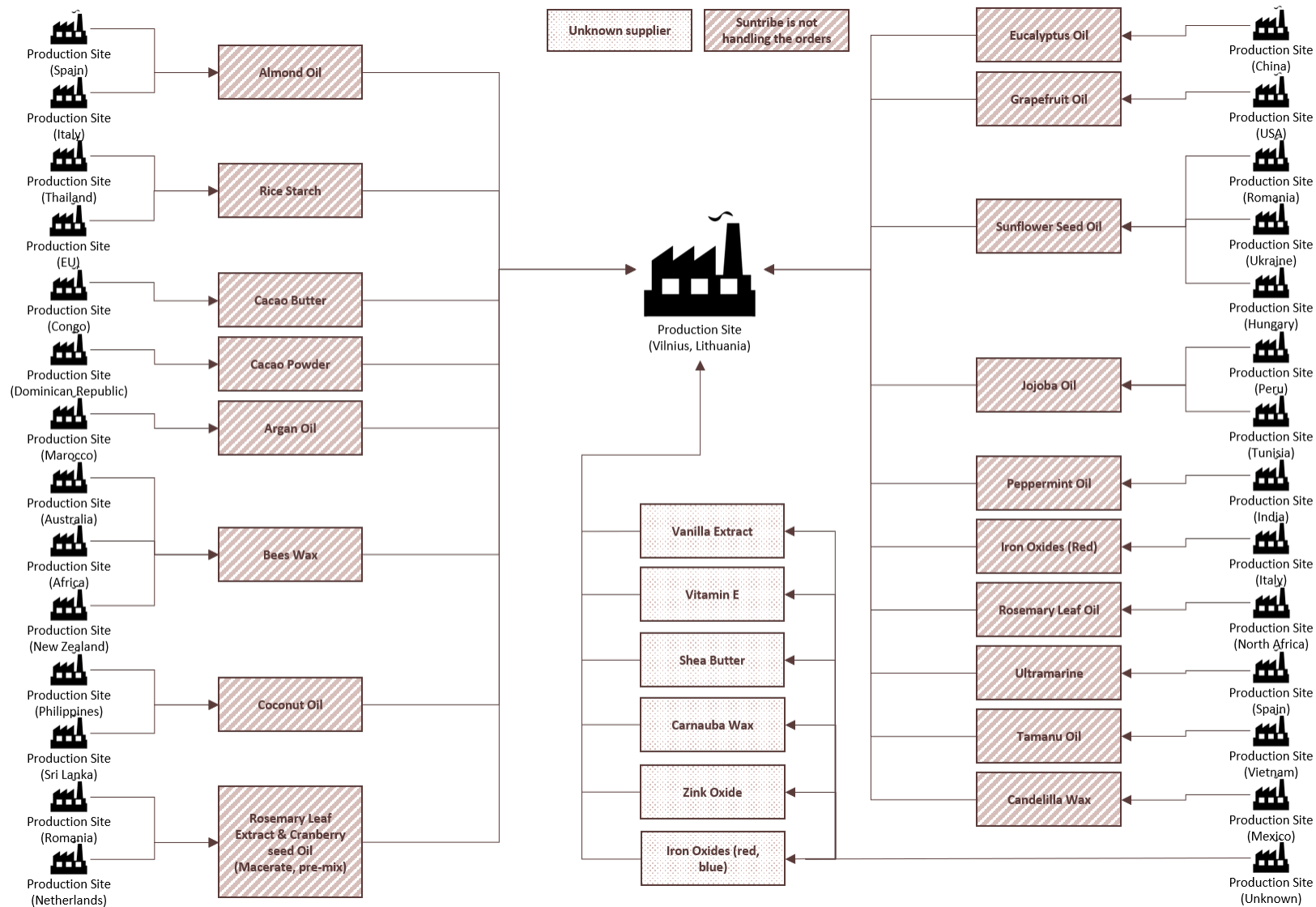


Figure 4.2: Supply chain map of ingredients

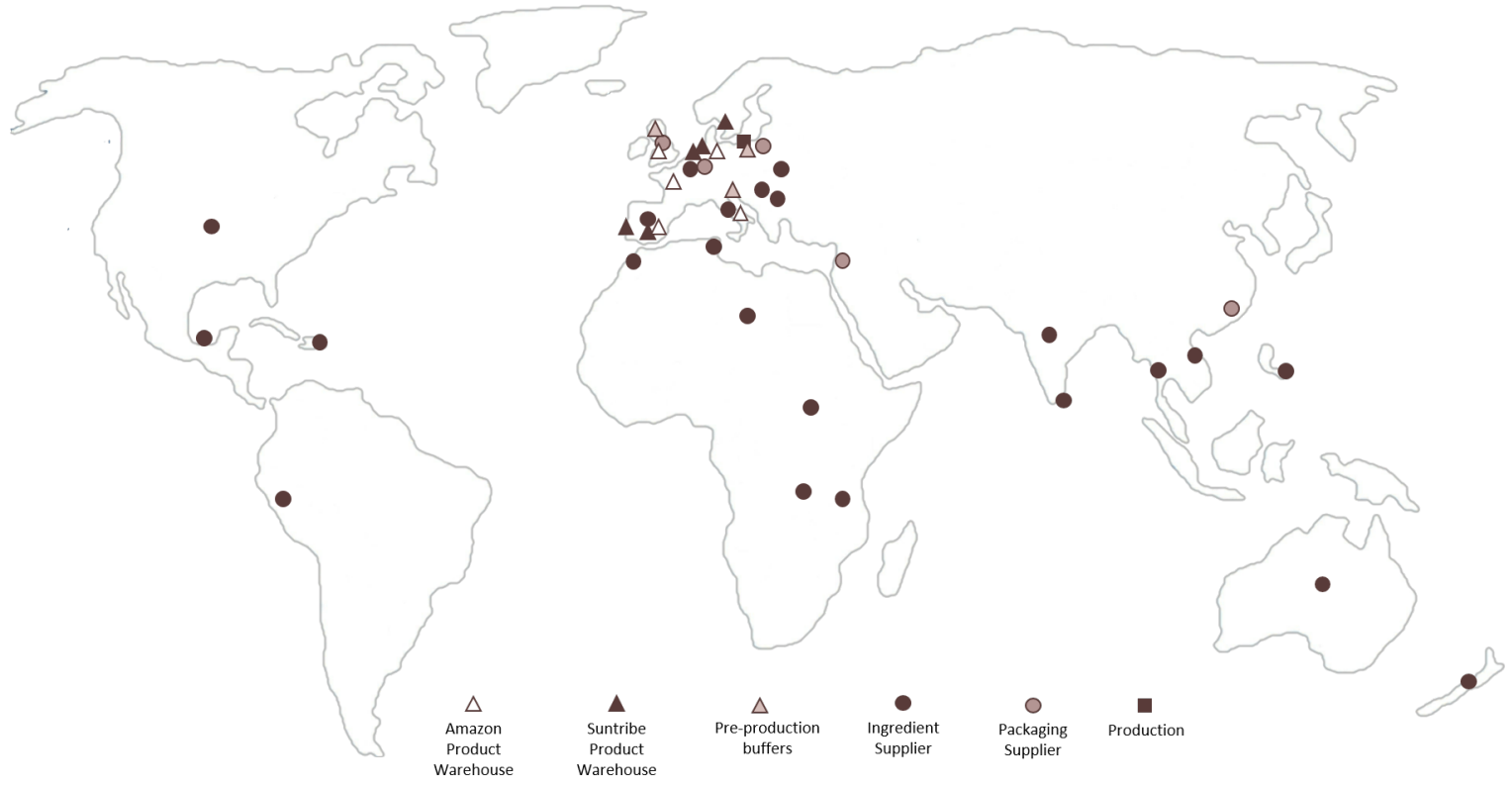


Figure 4.3: Supply chain map

4.2 Startup Founder’s Risk Perception and Thoughts

This section is based upon the unstructured, individual interviews made with each of the co-founders. The interview guidelines can be seen in Appendix A.2.

4.2.1 Possible Areas of Risk Impact

When the team was asked about where a risk could have an impact, they answered as follows:

- Finances, reputation, supply chain disruptions
- Finances, operations, reputation
- Finances, competence (loss of)

4.2.2 Identified Risks

The risks identified by the Suntribe AB team, that were not already introduced in the theoretical framework (Section 3 presented in Appendix B), can be seen in Table 4.1. Table 4.2 was created to visualize how often certain risks were mentioned, to help evaluate which risks belong in the top 20.

Table 4.1: Risks from the interviews with Suntribe, which is not covered by theory

Category	Driver	Risk (Suntribe)
External	Policy	Unexpected auditing/investigation Publication of negative news Sudden quotation changes
	Disaster	Unexpected property damage
Internal	Plan	Unfavorable contracts
	Information	Making mistakes
	Organization structure	Personal crisis Poor incentive alignment and expectations
	R&D	Developing product while scaling Malfunctioning products
Network	Supply	Disruptions of delivery due to limited earthly resources
	Delivery	Competitor win market share

Table 4.2: The risks mentioned multiple times, and the number of times they were mentioned during the interviews.

Risk	#
Rules and regulation changes	7
Change of lead time	4
Competitor win market share	4
Inadequate or breaking contracts	3
Logistics provider fails to meet demands	3
Poor conflict resolution	3

4.2.3 Existing Mitigation Strategies

When Suntribe AB discusses risks internally, it is mostly related to the daily challenges. The purpose of discussing risks is to maintain daily operations and to make well grounded decisions. However, the company has some strategies in place to minimize certain risks.

Competitor Win Market Share

All team members agree that imitators taking over their market share pose a significant risk. To manage this risk, the team has put large focus on branding from the beginning. By creating a well-known brand with products that are more attractive, both regarding image and usage, than their potential imitators, Suntribe AB's founders believe that they can maintain and increase their market share.

Suppliers Breaking Lead Time Promises

Suntribe AB has experience of their suppliers of packaging materials frequently taking a longer time to deliver than agreed. Most often it applies to suppliers far away with different business cultures, such as in China. The team hedges for this risk by planning for a longer lead time, sometimes double, than agreed. This is not always successful, it happens that the hedging is still insufficient, but the implications are smaller since the gap between expected delivery and actual delivery is less than that of agreed delivery and actual delivery.

Rules and Regulation Changes

External policy changes such as: *change in ingredient regulations, change in packaging regulations, change in tax and import regulations, sudden political decisions, and laws and regulation changes* are hard to plan for. To manage these risks, Suntribe AB's founders do their best to stay updated by following relevant news and reading proposals for EU regulations. By staying up to date regarding business and the state of the world, they expect to have a longer horizon to prepare for changes and their potential impacts. The team at Suntribe AB has also chosen to only deal with markets within the European

Union to minimize risks regarding the import and export of goods. This truly facilitates dealings with customs and other legalities. The exceptions to this rule, customers who are outside of the EU, are obliged to take full responsibility for the import of the goods.

Logistics Provider Fails to Meet Demands

To mitigate the risk of something happening to a sales channel, for example that Amazon only deliver essential products, or a logistics provider for some reason fails to provide satisfactory service, it is crucial to not *put all eggs in one basket*. Therefore, Suntribe AB has multiple sales channels and reach multiple markets; B2B and B2C through web shop, stores, distributors, and Amazon. This strategy also takes *change of consumer behaviour* into account, assuming that consumers on all markets don't act the same.

Compliance Failure

To minimize the risk of having products stuck in customs due to compliance failure, often related to paperwork, Suntribe AB chooses to have most of their customers located within the EU. Originally they expected to sell everywhere from Sri Lanka to Sweden, but after many hurdles decided that the ease of exporting/importing within the EU was to prefer. However, they are not reluctant to customers located outside of the EU. If those customers are willing to take on ownership of the goods from the point of order, meaning letting the customers be responsible for their own import of the goods, Suntribe AB welcomes them as a customer.

Organizational Risks

The many organizational risks, such as *personal crisis, poor incentive alignment and expectations, poor conflict resolution*, and *remote workforce does not live up to standards* are mitigated by having a teamwork-focus. For Suntribe AB this entails having clear strategies and policies regarding decision making, using collaboration tools and platforms, and conducting weekly meetings.

4.3 Risks Ranked by Authors

The probability rating and the estimated factors that would have an impact are ranked by the authors of this report, with their current knowledge of Suntribe AB (from interviews) and all theory from this study in mind. The ranking followed the methodology, see Section 2.5, resulting in the 20 most prominent risks for Suntribe AB, see Table 4.3. The full risk model can be seen in Appendix C.

Table 4.3: The 20 most prominent risks for Suntribe AB, to be investigated further, in no specific order.

	Risk
1	Malfunctioning products
2	Lack of quality control
3	Delays in execution (strategic planning/organizational development)
4	Compliance failure
5	Cyber attack
6	Upstream supply chain violating human rights
7	Competitor win market share
8	Inaccurate forecasting
9	Developing product while scaling
10	Disruption of delivery due to single source
11	Unfavorable contracts
12	Inadequate or breaking contracts
13	Logistics provider fails to meet demands
14	Products/services does not meet customer needs
15	Poor conflict resolution
16	Rules and regulation changes
17	Not enough financial backers/partners
18	Experiencing a lack of resources
19	Gap between payment terms and required investments
20	Change of lead time

4.4 Risks Ranked by Founders Based on Perception

The results from the survey can be seen in Figure 4.4 and Figure 4.5. The full survey with instructions can be seen in Appendix D.

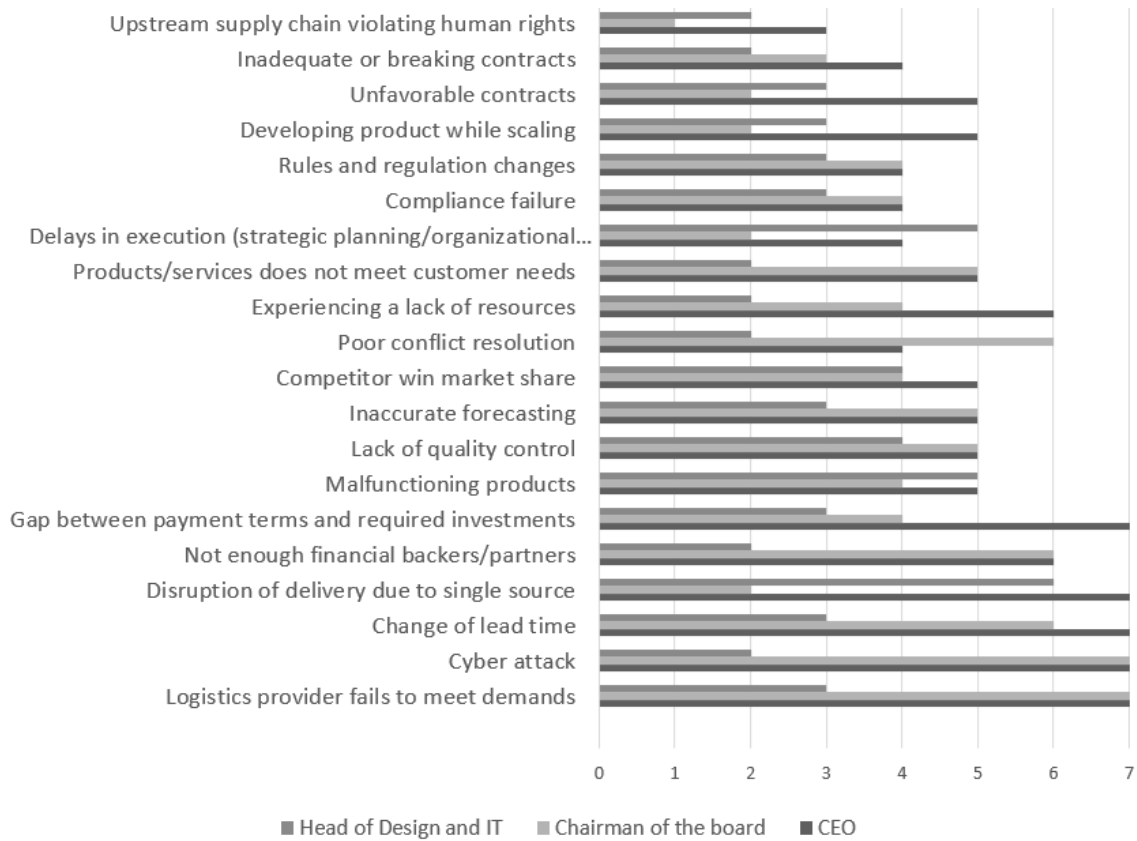


Figure 4.4: What level of impact would this risk have for Suntribe AB, right now?

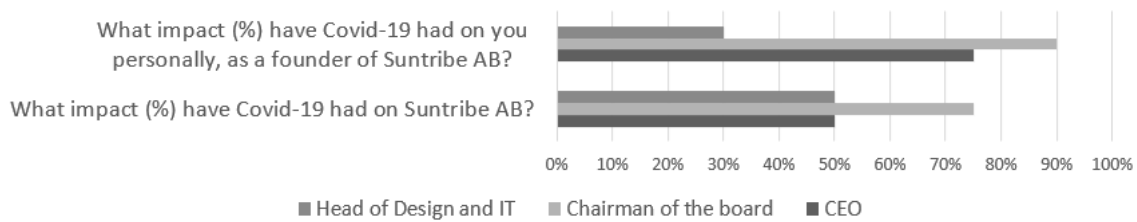


Figure 4.5: What level of impact have Covid-19 had on your business and personal life?

5 Analysis

In this section, the authors will analyze the data acquired and presented in Section 4. The analysis entails discussions regarding the direct supply chain implications of Suntribe AB's current setup, the team's risk perception in relation to theory and each other, areas of improvement for the risk ranking model, the most important risks for Suntribe AB right now, how to mitigate them, and finally, a discussion about the pandemic that has hit the globe in 2019/2020.

5.1 Supply Chain Implications

5.1.1 Geographical

As can be seen in the supply chain maps, Figures 4.1 to 4.3, Suntribe AB focus most of their supply chain activities in Europe. The exceptions are suppliers providing raw material for their products (ingredients) and some suppliers providing packaging. It is mentioned by Suntribe AB in Section 4.2.3 that this is a conscious choice to mitigate risks directly related to their supply chain.

Suppliers

Since most of Suntribe AB's packaging materials are imported within the EU, there is no need for custom clearance or customs duties (Swedish Agency for Economic and Regional Growth, 2020). This means that the risk *rules and regulation changes*, in regards to customs, is mitigated for these goods. It also means that the distances between the suppliers and the manufacturer are smaller, with fewer hurdles (customs), so the risk of *breaking lead time promises* is also somewhat mitigated. However, the suppliers of packaging in China increase the probability of risks occurring for Suntribe AB. As the team mentions, the lead times are long and often not kept regarding these suppliers, this could be due to the long distance between their manufacturer in Lithuania and China, the customs process, waiting time between the modes of transport changes, but also due to some cultural differences. Cultural differences regarding what is communicated, and how, in business might lead to misunderstandings and misaligned expectations (Jia and Rutherford, 2010). Avoiding using suppliers from outside of the EU would be the easiest solution to this problem. However, sometimes that is not possible and then the only options are to go with the far-away supplier, or to make R&D changes so that there is no longer a need for this specific product. Since Suntribe AB is consciously choosing semi-local or local suppliers in all other instances, it can be assumed that they simply could not find local suppliers of these specific products, and chose to use the Chinese supplier rather than change their packaging needs.

The ingredients used for Suntribe AB's products are sourced by their manufacturer, meaning Suntribe AB buys the finished products according to their own recipes, this is a good way to shift responsibilities away from the focal company. It can be seen in Figure 4.3 that the ingredients are sourced from all over the world, meaning that lead times are most probably long. Therefore it is reasonable to assume that large order quantities are

preferred, due to the long distance and economies of scale, quantities that Suntribe AB does not yet produce. There are also multiple customs to pass through, where there is a risk of cargo getting stuck due to physical checks, paper work issues, irregularities, and waiting time. There is also a potential delay while changing vehicle, this can be due to long lines, low availability of drivers, missing/lost paperwork, or due to physically losing the cargo. Therefore, it is a good strategy to let the cosmetics manufacturer source them, since they can procure larger quantities and have prior experience in this field.

Since Suntribe AB is outsourcing the responsibility of procuring ingredients to their manufacturer, they do not always know which supplier is used. This implies an increased risk of sourcing from a supplier which would not have been preferred if the team at Suntribe AB themselves were responsible for the sourcing. This requires that Suntribe AB trust their manufacturer to choose suppliers that enforces human rights and labour laws, and also that there are thorough contracts between the two.

With the virus Covid-19 spreading across the globe, whole countries, such as China, have gone on temporary lock down. This means that any companies relying on suppliers from certain places have faced serious problems obtaining their required products. This implies that having larger safety stocks and suppliers in countries that act under similar political and cultural policies, as where the focal company is active, might be more important than ever.

Customers

Due to similar reasons as above, the simplicity of transferring goods between borders in the EU, most of Suntribe AB's customers are within the EU. This also means that the distances are small, lead times are relatively short, and in case of a stock out in one warehouse they could theoretically fill orders from a different one.

Some of Suntribe AB's customers are located outside of the EU, to manage this in a simple way, Suntribe AB transfers the responsibility of exporting/importing the goods onto the customer. This way, it is up to the customer to deal with potential delays and custom issues. Normally this is done with the use of incoterms.

Regarding the current pandemic, it is beneficial to have customers on multiple markets since the consumer behaviour might not follow the same paths in all areas. Even if the travelling industry is on hold, there are still consumers in need of sunscreen. Some consumers might be unable or unwilling to buy cosmetics, and other might still be able and want to.

5.1.2 Modes of Transport

As mentioned previously, the manufacturer is responsible for sourcing ingredients, following the Suntribe AB recipe of sunscreen. But sourcing of packaging is of Suntribe AB's priority and responsibility. To reduce supply chain complexity, they have consciously chosen to source most packaging within the European Union. Suntribe AB use road transport within the continents, in alignment with what Jonsson and Mattsson (2016)

mentions in their book. The largest advantages of road transport is according to Jonsson and Mattsson (2016) the possibility of direct transportation from the manufacturer to the customer (door to door), the flexibility in time and route, and the possibility of reaching a wide geographical range. The other feasible alternative to road transport could be intermodal transports, which is when you use at least two modes of transport, e.g. rail for the main part of the route, and trucks to and from the freight yard. However, rail transport is most often used for transporting large quantities of bulky goods, since trains can pull heavy loads and handle multiple train cars. To transport via rail requires trucks transporting the goods to and from the rails. Since the trains leave according to a rigid schedule and there is always a risk of something happening to the truck or driver, there is a risk of missing departure times. So for Suntribe AB, with quite low volumes and small products, that can easily be transported on a truck, it does not make sense to use rail.

Some packaging for Suntribe AB is produced in China and moved by air freight, since the quantity and volume of these goods are relatively low it is cost effective. Air freight has lower lead times, therefore the capital connected to the inventory will be freed up quicker than during sea freight as would be the alternative. Sea freight from China to Rotterdam, one of the worlds busiest ports (ICONTAINERS, 2020), takes about 22-33 days excluding port to door delivery to the manufacturer in Vilnius (Cargo from China ltd., 2020b). Whereas airfreight never takes more than seven days, which does not necessarily include clearance and "to door"-delivery (Cargo from China ltd., 2020a). Since *gap between payment terms and required investments* is among the 20 most important risks for Suntribe AB, see Table 4.3, it seems reasonable to minimize inventory holding costs by having short lead times.

5.2 Differences in Risk Perception

While analyzing the empirical data some differences between theory and practice emerged, the entrepreneurs at Suntribe AB brought up risks not found in the theoretical framework. Differences between the entrepreneurs running Suntribe AB also occurred, their rankings differ from each other.

Between Theory and Entrepreneurs

The founders mentioned 12 risks which were not covered by the literature search made by the authors. The risks were evenly spread throughout all identified categories. Out of these risks, four (4) were considered more prominent according to the authors' rank, and therefore included in the list of top 20 risks. Among these risks were *making mistakes*, which was removed from the framework for reasons explained in Section 5.3.1, *developing product while scaling*, a risk that is a more specific variation of "premature scaling" and refers to the frequent changes and developments in product design/composition affecting already produced inventory. The other two risks that the interviews brought to light were *malfunctioning products*, and *unfavourable contracts*. Malfunctioning products is very similar to the startup risk "product fails test of time", however the latter refers to

the product itself and the former refers to products failing due to poor handling, or that they do not meet the demands during development. In the case for Suntribe AB this could be failing sun protection factor (SPF) tests. Unfavourable contracts is a risk that regard signing contracts with large distributors, such as Amazon and large cosmetics retailers. Suntribe AB's founders are concerned that they might loose control over their products, that they might choose the "wrong" distributor and therefore experience unfavourable brand perception changes and lost sales. This definition clearly differs from the other contract-related risks such as: gap between payment terms and required investments, logistics provider fails to meet demands, change of lead time, inadequate or breaking contracts. However, they are all very much connected and the implications can be fairly similar in the case of brand image, stock outs, and loss of sales. Another similarity between these four (4) risks and the risk of *unfavourable contracts* is that they are difficult to control. However, all of them can be mitigated by doing due diligence when choosing a collaboration partner and having sufficient safety stock.

It can be seen that these four (4) risks scored higher than their more general equivalent found in theory, this can be due to their specific nature making them easier to rank, see Section 5.3.1. It seems intuitive that theory would bring up more generally adaptable risks, as to let the reader/user define it according to what fits their needs. In some cases the risks might have been clearly defined for a specific study but the definition is lost/altered/generalized through adaptations and the creation of this model. This can be seen as a blessing and a curse; since the most important risk management tool is to identify and discuss risks within a company (Simons, 1999), the original definition does not matter too much, however, if the original definition is lost there might be some risks that completely falls off the company's radar.

Between the Co-Founders

The team's impact ranking can be compared in many different ways, one is to calculate the mean and standard deviation. Since the questionnaire was only distributed among the three founders, the mean and standard deviation is not validating how the *average entrepreneur* would rank these risks. Therefore, the median and extremes has been calculated instead. This gives a hint of the usefulness of the model and how similar the founders perceive the risks.

If each founders rankings are compared, it can be seen that the CEO ranked the risks within the interval of 3→7 and the Chairman of the Board within the full spectrum (1→7). The Head of Design and IT ranked the risks between 2→6, however, in this case 15 out of 20 risks scored less than four (4) points. This indicates that the team have different approaches to ranking, more or less restrained, meaning that the average of their results will be affected. To clarify these differences, and take them into account in the analysis, the standard deviation of all answers has been calculated.

The risks with the least differing answers were *lack of quality control*, *malfunctioning products*, *competitor wins market share*, *compliance failure*, and *rules and regulation changes*, placing in the middle of the ranking with the scores of 3→5, see Figure 5.1. These risks

were all mentioned during the interviews with the founders, i.e. risks they are already aware of and have had discussions about during their meetings. Looking at the risks with the highest median value, *logistics provider fails to meet demand*, *cyber attack*, *change of lead time*, *not enough financial backers*, and *disruption of delivery due to single source*, it can be noted that the difference in risk perception is high, see Figure 5.1. Meaning, one of the founders ranked these risks with low impact (1→3), while the other two ranked them as high (6 or 7). This implies the risks with the higher ranking, and large gap in perception, could be risks which the team has not discussed. The deviation could also be due to the three co-founders having varying responsibilities; both the CEO and the Chairman of the Board, for example, have supply chain responsibilities whereas the Head of Design and IT is the only one responsible for the website.

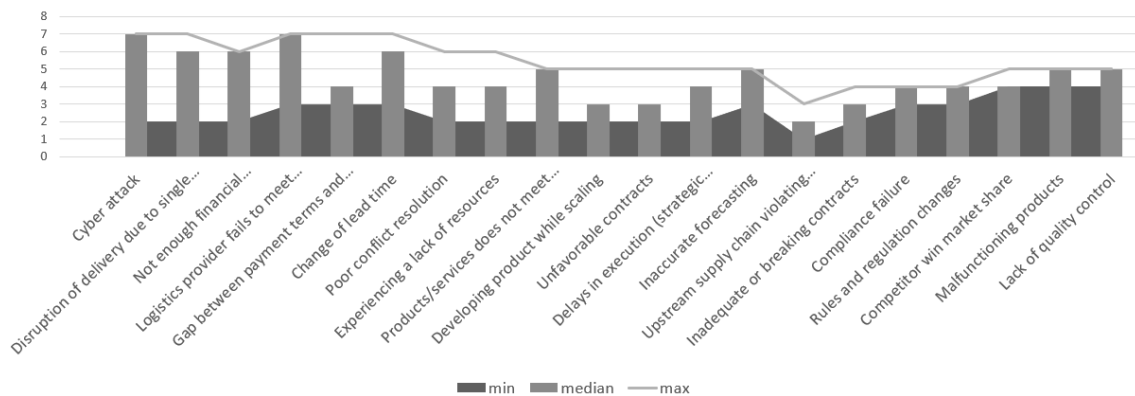


Figure 5.1: Visualizing the median and extreme results of the survey answers. The gap between the top and bottom curve shows the range of the answers.

During the interview the Head of Design and IT frequently brought up risks in the organizational structure category, such as teamwork, conflict resolution, and personal crisis. However, when they were asked to rank the risks *poor conflict resolution* was given a two (2) out of seven (7) by the Head of Design and IT. This could be due to a change in mood or mental state between the two different data gathering occasions, but it also indicates that some risks can be of high importance to the team members without them seeing it as having a large impact on the company as a whole. A discrepancy that can be avoided by discussing risks and their impact together in the team.

Another significant difference between the founders' ranking, is the one regarding *cyber attacks*. Both the Chairman of the Board and the CEO gave this risk a seven (7), the highest score, whereas the Head of Design and IT estimated that the impact of this risk was a two (2). This is obviously perceived as an important risk for the majority of the co-founders, however one would like to know why this difference is there. *Is the Head of Design and IT so certain of their security that cyber attacks pose little threat? Are the founder's perception of the value of their digital content wildly differing? Is there lacking communication within the team, leading to insecurities from the CEO and Chairman of the Board regarding cyber attacks?*

5.3 Improvements to the Risk Model

While the authors used the model, and whilst analyzing the empirical data, some flaws within the risk model were discovered.

5.3.1 Risks can Have Multiple Outcomes

It has been noticed that some risks can result in varying scenarios, and they can be difficult to describe in few words. Therefore, the perception of the risk might be affected by perspective, imagination, and current emotional state when performing the ranking. For example the risk textitmaking mistakes, was mentioned in the interviews in relation to any kind of mistake made due to lack of experience, or human error. The implications of this risk can basically be any of the seven since the risk itself can result in a plethora of outcomes. For this reason, *making mistakes* was removed from the model. However, some risks that are still in the model can be interpreted in many ways and their outcomes vary greatly, that is why when using this framework, it is crucial that all users agree on how to define the risk and possible outcomes. Maybe the outcome changes depending on where in the development stage the company is, which is acceptable as long as the users are in agreement. Getting to an agreement requires that the topic is brought up for discussion during a structured meeting or workshop.

5.3.2 Scale for Ranking Probability and Impact

What is high probability? What is low probability? This is all perception based and dependant on the character and circumstances of the respondent. Subjective interpretations like these can be made more comparable by providing clear measures for probability, for example regarding occurrence; *the activity happens daily, monthly, once a year, or less than once a year*. The same way for impact, for example, a financial impact can be both loss of sales for a value less than 100 euros and the cost of a new production site. A disruption could be a minor disruption of an hour or lasting for a week, or month. Same goes for the time, work hours, it takes to manage a risk. Therefore it seems relevant to also provide a scale for the areas of impact. This could be *minor* → *major*, but it could also be on a scale from one (1) to seven (7), which provides a quantifiable value while also allowing small variations.

5.3.3 Catastrophe Factor

No matter how well one manages risks, there is always a chance of one risk completely changing the rules of the game. Most often, these are external risk such as wars, pandemics, natural disasters, or other crises. None of which made the top 20 list of most important risks. When the financial crisis of 2008 occurred, for example, the whole economy stopped; many banks went bankrupt leading, among other things, to difficulties in getting loans to finance investments, customers cancelling their orders due to uncertainty, whole production lines being put on hold (Ohlin, 2018). A financial crisis might be somewhat predictable, just like fires, earthquakes, hurricanes, and natural disasters in general.

However, even if the probable occurrence of one of these is established, it is still tricky to know exactly when and where, the extent of the impact, and how to best prepare (Wilkinson et al., 2018). These types of risks are perceived as a real threat especially with the ongoing climate crisis, so much so that the American Psychological Association has identified mental health issues directly related to the effects of the radical climate changes (Clayton, Manning, and Hodge, 2014). These threats might lead to new rules and regulations which may disrupt and change the behaviours of consumption, travelling, and general way of life. Meaning producing businesses, and of course other businesses as well, need to find a way to mitigate the impact of such "catastrophical" risks.

Covid-19's global effect came unexpected and seemed unimaginable for most people as well as businesses. However, many manufacturers have closed, people are in quarantine, businesses are not allowed to be run, and people are let go from their jobs in massive numbers (Jones, Palumbo, and D. Brown, 2020). When asking the founders of Suntribe AB about how they have been affected as a business, see Figure 4.5, they say that around 50% (one founder said 75%) of their business has been affected. However, when asking about how Corona has impacted their personal lives, as founders of Suntribe AB, the answers range from 30% to 90%. The same co-founder who answered 75% in the first question answered 90% in the last, implying that this person has invested themselves deeply in the company and have a more drastic view than the other team members. However, for two of the three founders the personal impact was higher than the impact on the business, which is an important aspect to consider when evaluating risks, companies are run by people with personal incentives. The differences in perception regarding this crisis implies that organizational risks such as *poor conflict resolution* are more important than ever to manage, even though they might not be the obvious focus.

To take the possibility of a massive disruption like this into account in the risk model, seems more important than ever. The risks with the highest impacts, disease, war, natural disasters, have been marked as Global Disruption Risks (GDR). Any GDR creates a domino effect, meaning other risks are changed from being risks with probabilities, into events occurring almost simultaneously. Even if a company has great risk management strategies, they might not be prepared for so many of the risks becoming events at once, about 50% see Table C.2, which is the reason behind the GDR affiliation labelling.

The effects of a GDR could lead to difficulties transporting goods, due to closed borders or lack of workforce, resulting in loss of sales and a decline in productivity. This can affect the consumer behaviour and potentially the global economy (Jones, Palumbo, and D. Brown, 2020). The risks that might occur in the case of a GDR have been evaluated by the authors (with personal experiences from Covid-19 in mind) and can be seen in Table C.2, marked with **red cell color**. The average of the founders' perception regarding the impact of Covid-19 was around 60%, considering both business and personal implications, see Figure 4.5. However, since the founders' answers differed with 25% (business impact) to 60% (personal impact) it seems relevant to compare their perception of the Covid-19 pandemics impact with their risk ranking. Looking at the founders' average impact rating on the risks that the authors affiliate with a GDR, it can be seen that they stand for 58%

of the total perceived impact of all risks combined, quite similar to what the founders perceived.

5.4 Most Important Risks

From the rankings of the founders, the most impactful risks were selected. These risks were selected based on if at least one of the founders considered the risk having a high impact, i.e. scored a six (6) or seven (7). The risks identified as especially impactful were *logistics provider fails to meet demands*, *change of lead time*, *cyber attack*, *disruption of delivery due to single source*, *gap between payment terms and required investments*, *not enough financial backers/partners*, *experiencing a lack of resources*, and *poor conflict resolution*. An interesting note is that these risks are the ones with the highest deviation from the median, implying that Suntribe AB could benefit from discussing these risks and put a mitigation strategy in place.

Three of these risks originates from the startup risk framework in Table B.2 (*gap between payment terms and required investments*, *not enough financial backers/partners*, and *experiencing a lack of resources*), the rest are supply chain risks, see Table B.1. However, Suntribe AB is scaling and will find themselves in other positions in the near future, meaning that the risks they face will change. Therefore it is crucial to continuously analyze risks and work on risk management.

It is likely that other businesses selling consumer products with similar size and turnover, would end up with similar "most important risks", since none of them relates to the specifics of the company.

5.5 Mitigation of Most Important Risks

During the interviews, supply uncertainties were discussed with all of the founders. Some focused more on disruptions of delivery due to limited earthly resources, while others were more focused on contracting and suppliers breaking lead-time promises. Despite these discussions, the founders agreed about not considering the supply uncertainties to be an issue. Suntribe AB's business is to produce sunscreen and everyday cosmetics, where sunscreen has a seasonal demand and the demand for everyday cosmetics is more stable. However, since Suntribe AB is in an expansive phase, it is difficult to predict how the demand will increase, leading to a higher demand uncertainty. If Table 3.7 is considered, Suntribe AB would place in the top right corner. Meaning, their supply chain should be responsive, if they were to shape their supply chain according to their uncertainties. The risk mitigation strategy for responsive supply chains, suggested by Manuj and Mentzer (2008), is to focus on responsiveness and flexibility, and to postpone as much as possible until the uncertainties have cleared. When their business is more established and the demand has (potentially) stabilized, they will probably slide towards the top left, i.e. benefit from an efficient supply chain, with focus on cost efficiency. With this in mind, the mitigation strategies for each of the most important risks will be further explained.

5.5.1 Logistics Provider Fails to Meet Demands

This risk entails that products and ingredients are not delivered as agreed, either to the production site, warehouses, or customers. There are many potential reasons as to why these agreements cannot be met, it could be an effect of a change of lead time, or that the product could not be produced for some reason. It could also be due to non functioning work force, sickness, labor disputes etc. This risk could be mitigated by having multiple partners that work in parallel with each other (Waters, 2011). Having multiple partners will increase reliability and reduce risk, if one link fails, there are others to pick up the slack (Waters, 2011). This solution might be difficult to get economically feasible for a small firm with a low material flow, but can be dealt with through collaborations and partnerships. Another solution is to simply lower ones demands, having a longer delivery window to customers, which is free of charge but might affect the customer perception of the brand.

5.5.2 Change of Lead Time

The main problem with change of lead times is that material might not be where it should when needed, prohibiting production to start for example. It could also mean that the finished products are not in the warehouse when they are supposed to be, resulting in stock outs. This is often a problem when businesses try to save money through reduction of inventory holding costs, by setting a smaller safety stock. To mitigate the impacts of change of lead times, it is important to find a safety stock level that balances the increased inventory holding costs and the cost of loss of sales due to stock outs. A downside with increasing safety stocks is that the managers might not have any incentive to look into the root cause of the problem if there are continuous issues with change of lead times (Waters, 2011). However, by having and analyzing KPIs related to lead time promises, this should not be a problem. The founders did not mention measuring any KPIs related to lead time promises during the interview sessions.

5.5.3 Cyber Attack

A cyber attack is difficult to prohibit, it can happen to anyone. If the team does not have knowledge of how to hedge for cyber attacks, it might be a good idea to hire a security specialist. Hiring consultants is often costly, however, and might not be feasible for a small company. So the best way to mitigate the risk of cyber attacks is to create as secure systems as possible with the help and knowledge available.

5.5.4 Disruption of Delivery due to Single Source

Single source means to source products or material from only one supplier. This would imply that if the single supplier cannot supply in a satisfactory manner, there will be a disruption in the material flow, possibly leading to stock outs. Waters (2011) suggests to mitigate this risk by using multiple sourcing, i.e. having multiple options to source one product. One way is to ensure no supplier account for more than a fixed percentage of the

focal company's revenue (Waters, 2011). One can also have a back-up plan, secondary supplier, in case of a disruption from the primary choice (Norrman and Jansson, 2004). Suntribe AB use single sourcing for all of their packaging. To ensure the availability of packaging material, it is recommended to at least have a secondary choice available. Either another type of packaging, or another supplier ready to deliver if needed. The ingredients are not Suntribe AB's responsibility to source, but it is their concern in case the sourcing do not work as planned. Therefore, it is recommended to discuss alternative suppliers with their manufacturer and ingredient-purchaser in cases deemed necessary.

5.5.5 Gap Between Payment Terms and Required Investments

Difficulties in getting the resources to cover all investments is something that one of the co-founders mentioned as an issue. Often this is due to differences in payment terms between customers and suppliers; the suppliers need payment before the focal company receives their payment from customers. A variation of this issue is not getting paid at all, which is a frequent problem for new firms to consider (Caldwell et al., 2013), but it is not discussed in this report.

Payment terms is an agreement stating when the suppliers shall be payed for their products, and when the customers pay for the product they have bought, e.g. before receiving or when the product has arrived. Without changing the payment terms, this risk can be mitigated by shortening the supply chain. This could imply shorter lead times, lower holding costs due to transports, meaning products can be sold faster and therefore increasing the cash flow. A shorter supply chain with fewer nodes also facilitates the handling of goods, possibly also leading to lower losses and damaged goods.

Another way to control the payment gap is to collaborate with partners and negotiate about the payment terms. Since startups are small they often stand for a low percentage of the partners revenue, meaning they usually don't have much bargaining power with larger players. This is likely to be one of the reasons why Suntribe AB has given the responsibility of sourcing the ingredients to their manufacturer. A potential benefit for Suntribe AB is regarding the payment terms they are required to fulfil in relation to the manufacturer. Since the two enterprises co-invested in a machine, it is likely that there is good faith and trust between the two, meaning that Suntribe AB potentially could renegotiate their payment terms to better fit their needs.

5.5.6 Not Enough Financial Backers or Partners

When starting up, the financial resources can be low. Battistella, De Toni, and Pessot (2017) suggest to attend community events, investor meetings, demo days etc. to make contacts and build a network. To join accelerator programs or being part of incubators that foster relationships and knowledge sharing can help with building networks and reaching new financial backers or partners (Davis et al., 2014). Suntribe AB is part of Venture Lab Lund, a startup hub, increasing their network, knowledge and support. It is

recommended to continue networking, and finding new partners to collaborate with.

5.5.7 Experiencing a Lack of Resources

Similar to *not enough financial backers/partners*, a lack of resources can be mitigated in a multitude of ways. Many of which are similar to the ones for financial support. Incubators help with the networks and getting contacts, both for financial reasons, inspiration, or knowledge (Davis et al., 2014). As Battistella, De Toni, and Pessot (2017) suggest, lack of knowledge can also be solved by hiring consultants as experts.

5.5.8 Poor Conflict Resolution

Avoiding conflicts are the of course the best way to avoid the risk of poor conflict resolution, one way to do it might be to focus on the climate surrounding the team, ensuring everyone is feeling psychological safety. Akan, Jack, and Mehta (2020) state that if members of a team feel psychologically safe, they are more likely to interact more openly by speaking up and engaging in collaborative learning. It is also said that this could increase team performance, satisfaction, and promote productivity (Akan, Jack, and Mehta, 2020). One way to ensure this type of safe environment is to appoint a happiness manager within the team.

When members of a team do not share common goals, conflicts are more likely to arise (Lin and Zhou, 2011). This can be due to lack of cooperation, or communication, (Federica and Massimo, 2006) meaning having differing knowledge and views within the firm. It is essential to create a conducive climate, where the employees feel safe to speak up, a climate of trust (Akan, Jack, and Mehta, 2020). By having reoccurring meetings with a clear agenda and a chairman who steers the conversation, to ensure relevant discussions and friendly tones, mutual respect within the team is more likely to be formed (Akan, Jack, and Mehta, 2020). To frequently share information, ask questions and share feedback is another way to ensure the common goals (Akan, Jack, and Mehta, 2020). It seems as if though Suntribe AB is attempting this through clear strategies and decision making policies, weekly meetings, and sharing information about their work in a clear manner on collaboration platforms. However, as Akan, Jack, and Mehta (2020) clearly state, the key ingredient is each team member's feeling of psychological safety and mutual respect, as well as sharing common goals.

6 Conclusion & Recommendations

Through extensive literature reviews, unstructured to semi structured interviews, survey data, and expert guidance from the faculty at Lunds Tekniska Högskola, the study has come to a conclusion.

To answer the research questions, *which are the most important risks, with supply chain implications, for a startup during their first major expansive phase?* and *what can startups do to mitigate these risks?*, a risk model created by the authors in this study was used to compile and evaluate risks through a case study. The model with instructions on usage can be seen in Table C.2.

The most important risks with supply chain impacts for a small cosmetics company in an expansive phase and recommendation on how to **mitigate these risks**, can be seen in table 6.1 in no specific order. How to best manage these risks depends on resources available and willingness. However, the authors have compiled some strategies that might help the focal company and businesses in similar positions.

Table 6.1: The most important risks, with supply chain implications, for a startup during their first major expansive phase and recommendations on how to mitigate them

Risk	Recommended Mitigation Strategies
Logistics provider fails to meet demands	Have multiple partners; collaborate or share transportation with others to fill trucks and reduce costs even though increasing the total distance. Longer delivery window to end customer.
Change of lead time	Analyze KPIs such as "Delivery reliability" and increase safety stock for critical items.
Cyber attack	Set up all needed technology to be as secure as possible, use help if possible.
Disruption of delivery due to single source	Use multiple suppliers or at least have a back-up plan if one would fail to meet demands.
Gap between payment terms and required investments	Negotiate with suppliers. Try to reduce the number of supply chain nodes.
Not enough financial backers/partners	Attend networking events, investor meetings, demo days etc to find partners.
Experiencing a lack of resources	Participate in incubator programs, hire consultants if key knowledge is not possible to gain in other ways.
Poor conflict resolution	Appoint a happiness manager, within the team, with the task to create a psychologically safe environment.

Strengths and Limitations

This project have focused mainly on identifying potential risks for Suntribe AB, and similar businesses, as well as how to mitigate these risks.

This study fills a gap in existing research, as mentioned in Section 2.5. With more startups emerging and supply chains increasing in complexity (increasing both probability and impact of risks) (Deloitte Touche Tohmatsu, 2003), it seems more relevant than ever to conduct studies in the intersection between risk, startup, and supply chain.

In this study, a risk model was created. This model is ready to be used by companies with limited knowledge, experience, or resources to spend on proactive planning such as supply chain risk management. It is the authors' beliefs that the model can provide a necessary discussion forum within the user's organization, that it can help mitigation work, and minimize the need to frequently change supply chain setups by providing useful insights from the beginning. This type of model can save a lot of time for a company with limited resources by providing structure and a compilation of risks, it minimizes losses due to unpreparedness for a certain risk, and it can function as a strategic tool to assess organizational development through risks.

To keep the risk model general, and available to use for more companies than Suntribe AB, the research has been quite broad. In addition to this, the responses from the survey has been thoroughly analyzed to ensure a model that both answers the first research question, about the most important risks, and can be used with valid results outside of this study.

However, the time to conduct the study was limited and there are areas that the authors consciously did not explore deeper. For example, the only metric displayed in the supply chain maps, is lead time regarding packaging material, see Figure 4.1. Other metrics that could have been useful to know about the suppliers are their free capacity, rejection rate, delivery reliability, transportation cost, transport unit, service level, safety stock, and lot size. Similar metrics regarding the warehouses could have come to use. These specifications were disregarded since they were not necessary to answer the research questions and the study was performed with strict time constraints.

A rigorous map entailing metrics would create a compilation of the flows, visualized and easily understood. Gardner and Cooper (2003) explains how mapping the supply chain helps to *link corporate strategy to its supply chain strategy*, as well as helping the manager to "visualize and identify areas in need of further analysis and show obvious inefficiencies" (Gardner and Cooper, 2003, p.39). These areas are often related to production planning (batch sizes), supplier management, and inventory management. Areas that are all affected during the expansion of Suntribe AB, and could benefit from rigorous analysis and expert recommendations to avoid premature scaling, and optimize revenue. However, the authors reasoned that going into detail on all these areas could result in multiple studies, discussed in Section 7, and the results of these might not prove valuable for Suntribe AB at the end of the study since they are changing their needs so rapidly. Adding to this

reasoning, the Covid-19 pandemic would not have made it possible to obtain relevant empirical data regarding these metrics.

A consequence of this decision is that the study does not seem to have as much supply chain focus as might have been expected at first. Some of the risks, *poor conflict resolution* for example, are purely organizational. However, in a small company like Suntribe AB a conflict could result in one party not fulfilling its duties. This can potentially impact partner relationships in the supply chain, as well as disrupt or delay parts of it, making these risks relevant from a supply chain perspective.

7 Future Research

The research done in this study is a start towards creating startup friendly and accessible frameworks. However, the authors still see a substantial need for more research about how to successfully shape a supply chain for small and innovative enterprises. This section will discuss potential future research regarding both the risk model and Suntribe AB.

To strengthen the credibility of the risk model, the authors would have preferred to test it on multiple enterprises, in varying phases and business areas. However, due to the time limitations for the study, this was not feasible. Additional testing would also entail further development of the scales used to rate probability and impact. Maybe there are different scales that work better in some scenarios than in others. One way to find out would be for the authors to observe teams using the model. This could also lead to the creation of a standardized workshop to ensure the most advantageous usage of the risk model. Again, this was not covered in the scope of the study.

The final step to truly incorporate risk management into supply chain management would be to incorporate the risk model in supply chain software. This way, risks could be automatically updated according to KPIs or changes in the supply chain, such as new suppliers. This also opens up for the potential to link the model to an artificial intelligence (AI) that keeps track of external changes, such as political environment or regulation proposals.

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Appendices

A Interview Guides

Following presents the different interview guides used to conduct the interviews in this project.

A.1 First Initial Interview

Interview guide for the initial semi-structured interview with the Chairman of the Board. Conducted the 27th of January.

Who should be our main contact for this project?

Which Platforms do you use for communicating with your partners?

What Strategy documents do you have?

How have you divided the work between the co-founders?

How does it work with Amazon?

Do you have a sourcing strategy?

Explain all nodes of the supply chain (production facilities, 3PL, warehouses)

Could you provide a complete ingredient list with country of origin?

What would you consider as your biggest threat?

A.2 Second Interview

Guidelines for semi-structured co-founder interviews. Conducted the 14th, 15th, and 16th of April.

Welcome the respondent, talk about life and make them feel welcome and comfortable. Explain the length the interview is expected to take, approximated as 1 hour.

Start by defining risks as it is defined in this project: "an event that might occur with a certain probability, resulting in a loss (sales, stock, trust, and so on) for the company".

Different risks impact different areas, what areas would you consider have an impact on risks? (Financial impact, disruptions, time, etc)

What risks would you consider as present for Suntribe as of now? Did you see this risk coming? Would you have prepared differently?

What other types of risks are you aware of?

If you look back at the beginning of Suntribe, which risks were on your mind back then?

How do you handle new situations? New distributors, suppliers etc?

How do you prepare to handle risks? Do you avoid them?

Think internal, what risks come to you mind? Internal risks are risks directly influencing your focal company, could be organization structure, planning, information, production and R&D for example.

What about external risks? Risks which are connected to the macro environment, such as political decisions, wars and diseases.

Networking risks, connected to demand and supply and risks connected to the supply chain, but not external and not internal.

B Risk Frameworks

B.1 Supply Chain Risks

Table B.1: Framework containing supply chain risks, drivers, and categories

Category	Driver	Risk (Author)
External	Policy	<p>Wars (Chopra and Sodhi, 2004; J. V. Blackhurst, Scheibe, and Johnson, 2008; Wagner and Bode, 2008)</p> <p>Labor disputes (Chopra and Sodhi, 2004; Wu, J. Blackhurst, and Chidambaram, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008; Wagner and Bode, 2008)</p> <p>Fluctuating exchange rate (Chopra and Sodhi, 2004; J. V. Blackhurst, Scheibe, and Johnson, 2008)</p> <p>Product obsolescence (Chopra and Sodhi, 2004; Federica and Massimo, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008)</p> <p>New technology malfunction (Wu, J. Blackhurst, and Chidambaram, 2006; Federica and Massimo, 2006)</p> <p>Rules and regulation changes (eg. customs)(Wu, J. Blackhurst, and Chidambaram, 2006; Federica and Massimo, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008; Wagner and Bode, 2008)</p> <p>Consumer demand volatility (Wu, J. Blackhurst, and Chidambaram, 2006; Federica and Massimo, 2006; Wagner and Bode, 2008)</p>
	Disaster	<p>Natural disasters (Chopra and Sodhi, 2004; Wu, J. Blackhurst, and Chidambaram, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008; Wagner and Bode, 2008)</p> <p>Diseases (Wu, J. Blackhurst, and Chidambaram, 2006; Wagner and Bode, 2008)</p>
Internal	Plan	<p>Innaccurate forecasting (Chopra and Sodhi, 2004; Wu, J. Blackhurst, and Chidambaram, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008; Lin and Zhou, 2011)</p> <p>Premature scaling (Lin and Zhou, 2011; Marmer et al., 2011)</p> <p>Misalignment of strategies (Lin and Zhou, 2011)</p> <p>Need for manual adjustment of scheduled production/process (Lin and Zhou, 2011)</p>

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Table B.1 – *Continued from previous page*

Category	Driver	Risk (Author)
	Information	Distorted information (J. V. Blackhurst, Scheibe, and Johnson, 2008; Wagner and Bode, 2008) Lack of visibility (J. V. Blackhurst, Scheibe, and Johnson, 2008) Cyber attack (Wu, J. Blackhurst, and Chidambaram, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008; Wagner and Bode, 2008)
	Organization Structure	Loss of knowledge (Wu, J. Blackhurst, and Chidambaram, 2006; Federica and Massimo, 2006; Simons, 1999) Poor conflict resolution (Federica and Massimo, 2006; Lin and Zhou, 2011)
	Production	Inadequate capacity (Wu, J. Blackhurst, and Chidambaram, 2006; Federica and Massimo, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008) Inadequate inventory management (Wu, J. Blackhurst, and Chidambaram, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008; Christopher and H. Lee, 2004) Inadequately flexible (Lin and Zhou, 2011) Unexpected change or additional cost (Lin and Zhou, 2011)
	R&D	Undesirable design (Wu, J. Blackhurst, and Chidambaram, 2006; Lin and Zhou, 2011) Manufacturability (Wu, J. Blackhurst, and Chidambaram, 2006)
Network	Supply	Lack of quality control (Chopra and Sodhi, 2004; Wu, J. Blackhurst, and Chidambaram, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008; Wagner and Bode, 2008; Lin and Zhou, 2011) Production near maximum capacity utilization (Chopra and Sodhi, 2004; Wu, J. Blackhurst, and Chidambaram, 2006) Poorly planned logistics processes (Wagner and Bode, 2008) Disruption of delivery due to single source (Chopra and Sodhi, 2004; Wu, J. Blackhurst, and Chidambaram, 2006; J. V. Blackhurst, Scheibe, and Johnson, 2008) Change of lead time (Lin and Zhou, 2011)

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Table B.1 – *Continued from previous page*

Category	Driver	Risk (Author)
		Inadequate or breaking contracts (Chopra and Sodhi, 2004; J. V. Blackhurst, Scheibe, and Johnson, 2008) Upstream supply chain violating human rights (Hoek et al., 2013; Schwartz, 2000)
	Delivery	Change of lead time (Lin and Zhou, 2011; Wu, J. Blackhurst, and Chidambaram, 2006; Wagner and Bode, 2008) Excessive handling (Chopra and Sodhi, 2004; J. V. Blackhurst, Scheibe, and Johnson, 2008) Logistics provider fails to meet demands (Lin and Zhou, 2011)

B.2 Startup Risks

Table B.2: Framework containing startup risks, drivers, and categories

Category	Driver	Risk (Author)	
Internal	Plan	Wrong pricing strategy (Skarzynski and Schaedler, 2010) Not enough financial backers/partners (Teberga and Oliva, 2018; Sipola, Puhakka, and Mainela, 2016; Battistella, De Toni, and Pessot, 2017) Insufficient environment/ inspirational partners (Teberga and Oliva, 2018; Sipola, Puhakka, and Mainela, 2016) Delays in execution (production or launch) (Teberga and Oliva, 2018)	
		Organization structure	Remote workforce does not live up to standards (Teberga and Oliva, 2018) Experiencing a lack of resources (Teberga and Oliva, 2018; Battistella, De Toni, and Pessot, 2017)
		R&D	Product fails test of time (Skarzynski and Schaedler, 2010) Production proves not scalable (Skarzynski and Schaedler, 2010)
		Information	Compliance failure (Teberga and Oliva, 2018) Absence of internal communication system (Teberga and Oliva, 2018)

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Table B.2 – *Continued from previous page*

Category	Driver	Risk (Author)
		Stolen or violated business idea/intellectual property (Sipola, Puhakka, and Mainela, 2016; Teberga and Oliva, 2018) Failure to properly report (Teberga and Oliva, 2018)
Network	Delivery	Unknown to the market when launching (Teberga and Oliva, 2018) Amount of customers/users not according to plan (Skarzynski and Schaedler, 2010) Product/service does not meet customer needs (Skarzynski and Schaedler, 2010; Sipola, Puhakka, and Mainela, 2016) Customers do not purchase due to switching cost (Skarzynski and Schaedler, 2010; Sipola, Puhakka, and Mainela, 2016)
	Supply	Gap between payment terms and required investments (Caldwell et al., 2013; Battistella, De Toni, and Pessot, 2017)

C Risk Ranking Model

The risk ranking model, Table C.2, is specifically designed by the authors, for companies in all stages to use when identifying and assessing the most prominent risks posed on their business. The model is preferably used every time the company has gone through large changes, or annually.

There are many ways to use the model; risks might be added or reformulated, and different scales than the one proposed to estimate impact and probability might be used. However, the following is the basic recommendation from the creators of the model.

The risk ranking model consists of a list of risks, and columns representing probability and seven (7) different impact areas, explained in Table C.1. To rank the risks it is crucial to first understand the risk in relation to your company, and then rate the probability and impact on a scale from 1-7, where seven (7) is *very probable* or *high impact*. The rows in the P-column (probability) that are colored, represents risks that might all happen at once in case of a general disruptive event, such as diseases or natural disasters (marked as GDR, general disruptive risk, in the model). The sum of impacts, $\sum I_x$, is calculated as $\sum I_x = I_F + I_Q + I_I + I_D + I_{Ph} + I_K$, and the total risk score is calculated as the probability multiplied with the impacts, $Risk = \sum I_x \cdot P$.

Recommendations on usage:

1. Assemble a cross-functional team (preferably no more than 5 people, to ensure constructive discussions), let everyone read through the risks and think about them individually - *what does this risk mean? what impact will it have?*
2. Call for a meeting to discuss these thoughts
3. The levels of the impact and probability scales are defined and agreed upon
4. The chairman presents their definitions of the risk, if there are other thoughts they can be aired. When the definition is established, the chairman presents their suggestions of probability and impact rating. Any opposing thoughts can be aired at this point, to ensure that the team is in agreement
5. Sum of impact is calculated, as well as the total risk score
6. The team goes through the result and propose management for the key risks in their areas
7. Management solutions are discussed as to not for functional silos. Responsibilities for creating more detailed plans and strategies are divided
8. The GDR is discussed and a plan for management is set

Table C.1: The potential impacts of risks, categorized

Impact category	Description
Financial Impact, F	Loss of financial assets, either due to product/service not functioning or due to large costs to ensure the conditions is kept (Jacoby and Kaplan, 1972)
Quality, Q	Not meeting the quality expectation of the customer. Can be product-based, user-based, manufacturing-based, and value-based (Garvin, 1984, cited by Foster, 2013, pp. 3–4)
Company Image, I	The product/service disagrees with the self image or self concept of the customer (Jacoby and Kaplan, 1972)
Disruptions, D	Material flow disruption can be caused by man-made and natural disasters (Tang, 2006)
Physical Harm, Ph	The product is not safe, might inflict physical harm such as injuries or disease (Jacoby and Kaplan, 1972)
Time, T	Loss of time resources to get the product/service functioning again (Roselius, 1971)
External knowledge, K	Lack of experience is one reason to failure (Singh, Garg, and Deshmukh, 2008). This impact is whether external knowledge, such as consultants or services will be needed or not.

Table C.2: Risk ranking model for businesses to use when evaluating the risks posed to their business and supply chain. The probability cells marked with **red** are part of the GDR-factor, see the instructions.

Category	Driver	Risk	P	F	Q	I	D	Ph	T	K	$\sum I_x$	$\sum I_x \cdot P$
External	Policy	Wars	GDR									
		Labor disputes										
		Fluctuating exchange rate										
		Product obsolescence										
		New technology malfunction										
		Rules and regulation changes (eg. customs)										
		Consumer demand volatility										
		Unexpected auditing/investigation										
		Publication of negative views										
		Sudden quotation changes										
	Disaster	Natural disasters	GDR									
		Diseases	GDR									
		Unexpected property damage										

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Table C.2 – Continued from previous page

Category	Driver	Risk	P	F	Q	I	D	Ph	T	K	$\sum I_x$	$\sum I_x \cdot P$
x Internal	Plan	Inaccurate forecasting										
		Premature scaling										
		Misalignment of strategies										
		Need for manual adjustment of scheduled production/process										
		Wrong pricing strategy										
		Not enough financial backers/partners										
		Insufficient environment/ inspirational partners										
		Delays in execution (production or launch)										
		Unfavorable contracts										
	Information	Distorted information										
		Lack of visibility										
		Cyber attack										
		Compliance failure										
		Absence of internal communication system										
		Stolen or violated business idea/intellectual property										
Failure to properly report												

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Table C.2 – Continued from previous page

Category	Driver	Risk	P	F	Q	I	D	Ph	T	K	$\sum I_x$	$\sum I_x \cdot P$	
ix.	Organization Structure	Loss of knowledge	■									■	
		Poor conflict resolution											
		Remote workforce does not live up to standards											
		Experiencing a lack of resources											
		Personal crisis											
		Poor incentive alignment and expectations											
	Production	Inadequate capacity											
		Inadequate inventory management											
		Inadequately flexible											
		Unexpected change or additional cost	■										
	R&D	Undesirable design											
		Manufacturability											
		Product fails test of time											
Production proves not scalable													
Developing product while scaling													
Malfunctioning products													
Network	Supply	Lack of quality control											
		Production near maximum capacity utilization	■										

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Table C.2 – Continued from previous page

Category	Driver	Risk	P	F	Q	I	D	Ph	T	K	$\sum I_x$	$\sum I_x \cdot P$
		Poorly planned logistics processes										
		Disruption of delivery due to single source										
		Change of lead time										
		Inadequate or breaking contracts										
		Upstream supply chain violating human rights										
		Gap between payment terms and required investments										
		Disruptions of delivery due to limited earthly resources										
	Delivery	Change of lead time										
		Excessive handling										
		Logistics provider fails to meet demands										
		Unknown to the market when launching										
		Amount of customers/users not according to plan										
		Product/service does not meet customer needs										
		Customers do not purchase due to switching cost										
		Competitor win market share										

D Survey: "What is risky in your business?"

Outline for the survey, distributed among the founders the 21st of April.

Definition of risk: an event that might occur with a certain probability, resulting in a loss (sales, stock, trust, and so on) for the company

TIME ESTIMATE: 10 minutes.

INSTRUCTIONS: In this questionnaire, you will be asked to rank the impact certain risks have on the business of Suntribe AB on a scale from one (1) to seven (7).

Do not hesitate to contact us in any case of uncertainties.

Regards
Adina & Ebba

Table D.1: The impact of all risks shall be ranked on a scale from one to seven.

	If Risk X occurs, what level of impact would it have for Suntribe AB, right now?	<i>low</i>		<i>medium</i>			<i>high</i>		Unknown
		1	2	3	4	5	6	7	
1	Malfunctioning products								
2	Lack of quality control								
3	Delays in execution (strategic planning/organizational development)								
4	Compliance failure								
5	Cyber attack								
6	Upstream supply chain violating human rights								
7	Competitor win market share								
8	Inaccurate forecasting								
9	Developing product while scaling								
10	Disruption of delivery due to single source								
11	Unfavorable contracts								
12	Inadequate or breaking contracts								
13	Logistics provider fails to meet demands								
14	Products/services does not meet customer needs								
15	Poor conflict resolution								
16	Rules and regulation changes								
17	Not enough financial backers/partners								
18	Experiencing a lack of resources								
19	Gap between payment terms and required investments								
20	Change of lead time								

Table D.2: Last, the founders answered questions about how Covid-19 have impacted their business- and personal lives.

And finally, could you please estimate, to the best of your ability:	
What impact (%) has Covid-19 had on Suntribe AB?	XX%
What impact (%) has Covid-19 had on you personally, as a founder of Suntribe AB?	XX%