



# Criteria for ERP Selection

Tailored to Tampere Scale-ups Engaged with  
Manufacturing

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BACHELOR'S THESIS  
April 2024

Bachelor of Business Administration  
International Business

## ABSTRACT

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Bachelor of Business Administration  
International Business

INDIAMARA CLAUDINO & SHIRLEY TRIGOSO NAVARRETE:  
Criteria for ERP Selection  
Tailored to Tampere Scale-ups Engaged with Manufacturing

Bachelor's thesis 85 pages, appendices 20 pages  
April 2024

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Despite the growing significance of Enterprise Resource Planning (ERP) systems in business operations, there is a notable gap in ERP literature addressing the needs and challenges of emerging businesses during the ERP system selection process. Hence, this thesis qualitative research focuses on the ERP system selection process, aiming at the creation of suitable ERP system selection criteria tailored to Tampere scale-ups engaged with manufacturing.

The qualitative approach of this research is based on theoretical insights about startups' lifecycle growth stage, Tampere scale-ups' characteristics, SCM's role in the growth stage, and the ERP selection process. The foundational grasp on these topics guides the integration of interviews and a survey with Tampere scale-ups, in addition to a stakeholder analysis of the Tampere startup ecosystem. These investigative techniques enable the establishment of scale-ups' internal situation, identification of SCM's challenges, and an overview of parties relevant to scale-ups' growth towards expansion. The results revealed that Tampere scale-ups manage operations and resources for growth with an emphasis on Research and Development (R&D) and operations based on customer-specific KPIs with a predominance of financial metrics. Furthermore, it identified SCM's challenges related to issues in supplier relationships and regulatory constraints. In the external environment of Tampere scale-ups, financial and technological support highlights the most accessible stakeholders whose support has the highest impact on scale-ups' growth towards expansion.

The criteria recommended for selecting ERP systems tailored to Tampere scale-ups emphasise R&D facilitation, SCM visibility, and financial assistance. These criteria align with Tampere scale-ups' internal and external environment dynamic by addressing the challenges with scalability, profitability, and innovation development. Consequently, this research reduces the knowledge gap in how scale-ups affect ERP selection processes, highlighting the importance of addressing specific growth needs and operational adjustments due to the complexities of supply chain operations under high uncertainty circumstances.

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Keywords: Enterprise resource planning (ERP) system, supply chain management (SCM), supply chain, startups, Tampere scale-ups, growth stage.

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**ABBREVIATIONS AND TERMS**

TAMK	Tampere University of Applied Sciences
ERP	Entreprise Resource Management
SCM	Supply Chain Management
RMQ	Research Main Question
RSQ(s)	Research Sub-question(s)
Q&A	Questions and Answers
IQ	Interview question
KPI(s)	Key Performance Indicator(s)
IC	Interview case
R&D	Research and Development

## 1 INTRODUCTION

This chapter presents the thesis topic within the background followed by the contextualization of the research. The research question and sub-questions are complemented by this research scope, objective, and purpose guiding the thesis structure which is briefly presented.

### 1.1 Research background

In recent years, companies have heavily invested in adopting and integrating Enterprise Resource Planning (ERP) systems (Grabot & Botta-Genoulaz 2005, 507-509). As an important supply chain management (SCM) subset, ERP systems are comprehensive software tools utilized by organizations to efficiently manage core operations across their entire business (Ganesh, Mohapatra, Anbuudayasankar & Sivakumar 2014, 7-8). The implementation of ERP systems is complex and requires an extensive process prior to integration, from which 40-60% of ERP implementation projects fail to be accomplished (Ratkevicius, Ratkevicius & Skyrius 2012). Most of the failures of ERP system integrations are associated with the inappropriate choice of the system and it is correlated to the selection process (Aloini, Dulmin & Mininno 2007). To avoid unsuitable selection, it is important to align the company's objectives for the ERP system, underscoring the significance of the process prior to ERP implementation (May, Dhillon & Caldeira 2013).

The integration process of ERP systems involves several phases and the earliest is the most crucial phase. The faulty selection will most likely drive to failure, "if there is no fit, there is no success" (Haddara 2014). Additionally, the challenges in selecting an ERP system do not stem from the insufficiency of options available in the market, but rather concerning the wide array of ERP systems to choose from (Grandjean 2010, as cited in Molnar, Szabo & Benczur 2013, 39-40). As noted by Falk genannt Boch 2023 (4-16), startups in the growth stage influence the ERP selection process as the organizational context indicates the vision and long-term roadmap of the organization, aspects which have a strong influence on ERP adoption. However, there is a lack of ERP literature that addresses startups, more specifically, scale-ups. To elaborate, startups refer to emerging companies

in the market in which progress is comprehended in various stages (Passaro, Quinto, Rippa & Thomas 2016, 2). While scale-ups are startups in rapid development that are expanding their market (Falk genannt Boch 2023).

## 1.2 Research context

In Tampere, scale-up companies contribute to the local startup ecosystem and are proven to represent a driving force behind the Tampere area's economic growth, innovation, and technological development. Consequently, in 2023, Business Tampere has begun the revitalization of the startup ecosystem based on collaboration and knowledge-sharing. The initiative involves a network of collaborative connections and supportive infrastructure aimed at promoting entrepreneurship. An essential aspect within the ecosystem is the centered efforts by Business Tampere in collaboration with the development of tailored services for scale-up companies. (Stenroos 2023.)

In contrast, Tampere startups identified as scale-ups are confronted with multifaced challenges concerning strategic decision-making, continuous growth, and scalability. Additionally, it is in the growth stage where there is the highest failure rate as there is an increasing requirement for resource adjustment due to rapid growth. (Stenroos 2023.) These observations are comprehensible as startup operations become more complex within scale-up growth. Hence, scale-ups require constant development, resource planning and integration of suitable tools adjusted to their increasing complexity and operations growth. (Falk genannt Boch 2023, 5.)

It is established that rapid-growth startups must handle increasing amounts of production. As scale-ups grow, production costs increase, and it affects the complexity of operations, resource allocation, and management. Due to the potential for rapid changes, it is essential that scale-ups' supply chain is flexible and is capable of matching market demand. The development of a suitable SCM from early-stages provides scale-ups with the ability to adjust their operations based on current demand or possible disruptions along the supply chain. An effective SCM can help scale-ups to lean manufacturing by streamlining operations, forecasting demand, and catering inventory. Moreover, with an

effective SCM, scale-ups can establish competitive advantages, differentiating themselves from the competition and increasing their presence in the market. (Landgren 2020, 20-27.)

### 1.3 Research questions

This thesis addresses the gap in ERP literature that consider scale-ups in the ERP selection process. Due to the significance of scale-ups to Tampere, this study focuses specifically on Tampere based scale-ups engaged with manufacturing. The main research question (RMQ) is:

*RMQ: What is the suitable criteria for choosing an ERP system tailored to Tampere scale-ups?*

To ensure a detailed and focused exploration of the research topic without overlooking the Tampere startup ecosystem and taking into consideration that ERP systems are a subset component of SCM, the main research question is supported by the following research sub-questions (RSQs):

*RSQ1. How do scale-ups in Tampere manage their operations and resources for growth?*

*RSQ2. What are the distinct operational SCM challenges in scale-ups in Tampere?*

*RSQ3. What parties in the Tampere startup ecosystem are relevant to scale-ups' growth?*

The RSQs address scale-ups' internal factors relevant to the process of ERP selection while overseeing external parties within the Tampere startup ecosystem that can support growth. Hence, RSQ1 focuses on outlining the current situation of Tampere scale-ups' operations and resource management as the contextualization of the operational situation enables the understanding of the internal circumstances of scale-ups in Tampere. Upon RSQ1, RSQ2 aims to provide insights into scale-ups' SCM challenges while facing growth and

expansion, the identification allows the recognition of struggles faced by scale-ups in Tampere along supply chain operations. To ensure that external parties within the Tampere startup ecosystem are not neglected, RSQ3 acknowledges proactive parties that can offer support to scale-ups' growth towards expansion, thus, addressing the external environment from which Tampere scale-ups can leverage support and collaboration. The interconnection of the RSQs findings enables a holistic understanding of the internal operational context, SCM challenges, and external support to scale-ups in the Tampere startup ecosystem. Considering these aspects ensures the creation of a suitable criteria for ERP selection that is aligned to Tampere scale-ups, thus increasing the likelihood of these companies selecting an ERP system that supports their unique needs and facilitates growth.

#### **1.4 Thesis scope, objective, and purpose**

The thesis scope consists of scale-ups within the Tampere startup ecosystem that engage in tangible product manufacturing, therefore involving supply chain operations. The research specifically investigates scale-ups' operations and resource management, SCM challenges, and the involvement of the Tampere startup ecosystem in scale-ups' growth towards expansion. The objective of covering internal and external factors is to develop a suitable set of criteria for selecting ERP systems tailored to Tampere startups in the growth stage. These criteria aim to guide and facilitate the decision-making process in selecting a fitting ERP system aligned with Tampere scale-ups' business dynamic. The purpose of the research is to reduce the shortfall of knowledge regarding the impact of scale-ups' on the ERP selection process by targeting Tampere scale-ups engaged with manufacturing.

To reach the thesis objective and purpose within the scope, the research relies on an extensive qualitative approach combining primary and secondary research techniques targeting startups categorized as scale-ups in the Tampere area. The approach integrates interviews and a survey with scale-ups engaged with manufacturing and a stakeholder analysis of the Tampere startup ecosystem. These investigative techniques enable the gain of direct insights from the thesis research group, outlining SCM activities while contrasting to the external

environment represented by the Tampere startup ecosystem. By integrating both primary and secondary research techniques, the findings contribute to the following key areas:

1. Establishment of scale-ups engaged with manufacturing's situation
2. Identification of SCM operational challenges
3. Overview of parties relevant to scale-ups' growth towards expansion

It is relevant to highlight that this research does not cover the actual selection of ERP systems, nor the implementation process. The interpretation of these findings enables the RSQs to be answered and the criteria for ERP system selection tailored to Tampere startups in the growth stage to be obtained. Hence, research findings contribute to the process prior to the actual acquisition of the ERP system.

## **1.5 Thesis structure**

The initial phase of the research is the deductive approach as the research questions are derived of the theoretical foundation from the research background and context. The questions guide this thesis literature review influencing the thesis methodology for data collection and analysis. Therefore, this thesis employs hybrid research merging a deductive and an inductive approach. The aim of a broad review of relevant theories is to gain foundational knowledge to support this thesis' primary research. Subsequently, the thesis transitions to an inductive approach which seeks to provide new perspective and understanding to the foundational insights gathered in the initial phase.

This hybrid approach influences the thesis structure (Figure 1) highlighting the key elements of this research. To elaborate, the introduction provides the foundational background of the research topic complemented by the literature review in chapter two. The relevance of theories and key findings from theoretical research is deepened within the sections below in chapter two, thus providing a comprehensive correlation of theories to this thesis research. In chapter three, it is introduced the qualitative research methodology which incorporates primary and secondary research techniques, the chapter expands on data analyses and considerations regarding the methodology. Chapter four is dedicated to the

findings and interpretation of the results from data collection methods, enabling this thesis' RSQs to be answered. Despite the multiple methods of data gathering, the data analyses' findings are corroborated through data triangulation in chapter five, providing the answer to this thesis' RMQ. The last chapter of the thesis, chapter six, emphasizes the key findings of the research correlating to the literature presented in chapter two. Furthermore, chapter six includes research limitations and recommendations for future research.

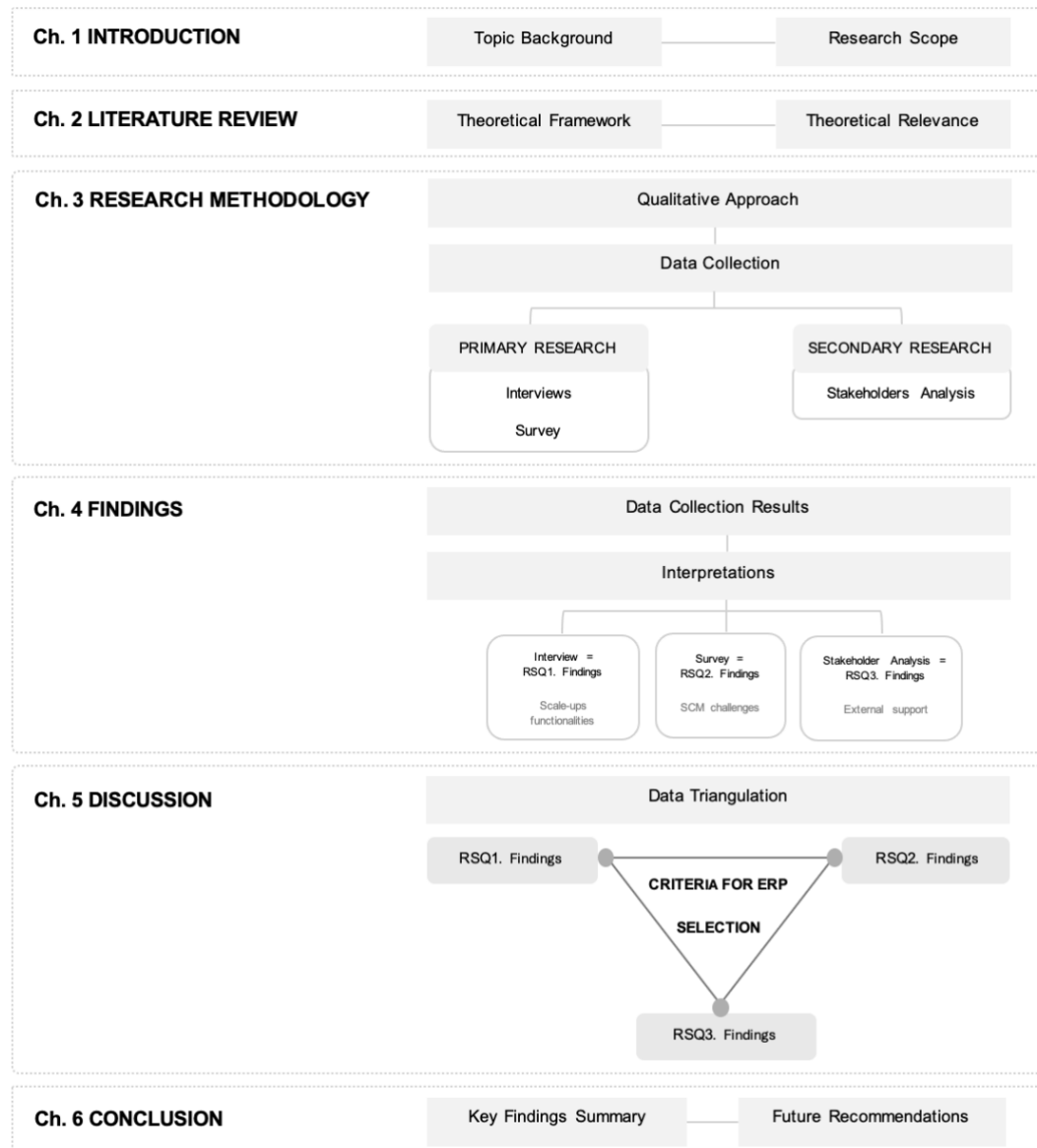


FIGURE 1. Thesis structure with research elements per chapter.

## **2 LITERATURE REVIEW**

The literature review chapter provides an overview of existing literature related to startups' growth stage, Tampere scale-ups' characteristics, SCM's role in growth stage startups, and the ERP selection process. The theoretical framework enables the understanding of the concepts guiding and supporting this thesis research. Further, the literature relevance synthesizes the theoretical framework findings, highlighting the significance of theories to the research topic while identifying the contribution of existing literature to this thesis research methodology.

### **2.1 Theoretical framework**

Theoretical material has a substantive role in research frameworks, serving as lenses from and through which research is carried out. By defining the theoretical framework, the theories enable the understanding of specific aspects relevant to be taken into consideration within the research topic. (Anfara & Mertz 2006, 15-16.) In this research, the theoretical insights regarding the startups' lifecycle with a focus on the growth stage are crucial to acknowledging the circumstances of startups. This acknowledgement is further correlated to Tampere scale-ups' characteristics, enhancing the contextualization of this thesis research target group. The robust understanding of SCM's role in the growth stage and ERP selection process delineate the elements influencing this thesis approach to the research topic. Hence, the theoretical framework establishes the touchpoints explored further in this thesis, ensuring a foundational comprehension of the aspects taken into consideration for the execution of this thesis research.

#### **2.1.1 Startups' lifecycle – the growth stage**

According to Appelo (2019, 7-10), the lifecycle of a startup refers to several stages a new organization undergoes for the development of a business idea. The lack of understanding of the lifecycle stages is one of the main reasons emerging businesses fail. Each startup lifecycle development stage presents specific objectives under a distinct purpose, aiming for business growth while solidifying the company. Depending on the stage within the lifecycle, startup

organizations face distinct challenges due to contextual and structural characteristics associated with that specific phase.

It is relevant to comprehend that although there are various definitions in the literature about startups' development stages. The terminology and categorization varies, however the common understanding is that success is subjective depending on the

It is important to understand that, despite the various definitions and terminologies used in literature to describe the development stages of startups, there is a common understanding that success is subjective and depends on the specific stage of development (Lovrinčević 2022). The broad perspective by Marmer, Herrmann, Dogrultan & Berman (N.d., 10), identifies that startups are developing under high uncertainty conditions. Startups in early development stages are searching for product/market fit, also known as early-stages startups. In contrast, startups in late development stages are pursuing scalability and growth. The growth phase is a subsidiary of the startup's lifecycle late-stages. This phase is considered the maturity stage of the company, where startups become productive and profitable with a focus on scaling operations and meeting market demand. (Paschen 2017.)

Achieving growth is crucial for startups' success, where growth must be controlled to keep sustained expansion for long-term success, this may imply resisting internal and external pressure for growth. Growth can be miscontrolled due to three reasons:

- The first is about not reaching the necessary growth stage,
- The second is not being capable of sustaining growth once is achieved,
- The third reason is growing too rapidly

The last reason can lead to problems such as a decrease in quality, loss of control, and financial strain. In summary, startup growth must ensure sustainability in the long run through management despite the positive side of growth such as an increase in attention, market share and acquisition power. Growing too fast can lead to negative consequences. (Beverly 2017, 178-201.)

Successful startups prioritize results and customer satisfaction which requires business development at a rapid speed. In contrast, scaling a startup requires business model adjustments, creativity, skills and adaptability. To avoid scaling up too fast before having a proper product-market fit, startups must enable rapid and healthy operational scale-up through the team. To succeed, it is important to attract and retain talent, build resilience in the founding team, and keep constant awareness of the core values. (McKinsey Digital 2020.)

### **2.1.2 Tampere scale-ups' characteristics**

In the broader perspective of Tampere startups, at the Startup Headmap Europe report (DEEP Ecosystems 2023, 58-72) within Europe's most popular startup cities, Tampere is ranked as the third city in Europe where founders are born. It is highlighted that technical knowledge is crucial for the development of innovation, within that aspect Tampere has the largest per capita pool of STEM students (science, technology, engineering and math) and is second with university-linked founders per 10,000 inhabitants. It is identified under the strategy of accelerating startups, that 60% of Tampere startup founders have an engineering degree or tech skills. In the report, it is mentioned that having tech skills enhances investment prospects and increases the chance of the local hub to benefit from engineering startups in the future. According to the latest Tampere region startup & scaleup funnel March report (Siik & Kyckling 2024), the Tampere startup ecosystem has 230 members in 10 segments from which 46 are scale-ups in the growth stage and 33 in the expansion phase. Considering the scale-ups in the growth stage, 32 are identified within the tech industry with sector and target audience under adjustment. Consequently, one of the main characteristics of Tampere scale-ups is the constant development of products or services aiming to meet demand and penetrate new markets.

To further elaborate, the term "scale-up" refers to organizations that have surpassed the early-stages of the startup lifecycle (Autio et al. 2007, as cited by Falk genannt Boch 2023). Appelo (2019, 9) affirms that "when the business model is validated, the startup turns into a scale-up" where the emerging business is at the growth stage. In the Tampere startup ecosystem, scale-ups are viewed as a "grownup startup" within the late-stages of the startup lifecycle and advancing

towards expansion (Figure 2). It is highlighted that the scale-up stage is reached only if growth is accomplished, that is, only if strong market demand is met. Hence, an upward ramification of the figure in terms of new customers, recurring customers, and billing is expected at this stage (Siik & Kyckling 2024). The predominant factor is profitability and requires the organization's resource adjustment. It is also in this stage, where there is the highest failure rate due to the consequences implied by the rapid growth with gain of revenue correlated to resource adjustments' needs.

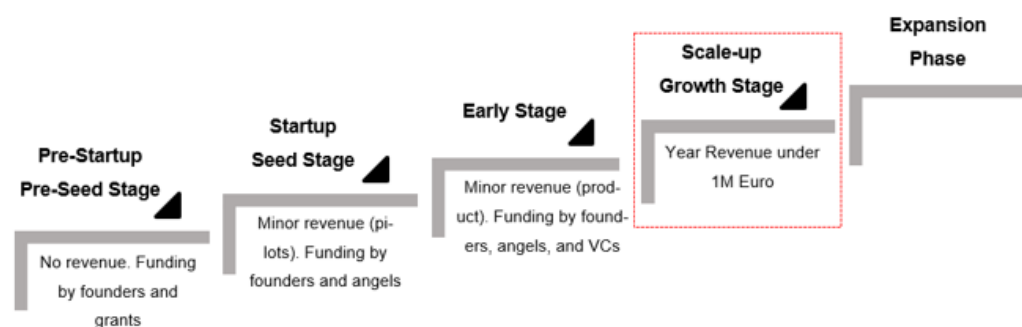


FIGURE 2. Tampere region startup & scale-up funnel (Siik & Kyckling 2024).

To further understand the contextual and structural characteristics of Tampere scale-ups, Business Tampere emphasizes scale-up characteristics as start-up organizations with a defined but adjustable business model suitable for growth with a systematic operational structure. In other words, scale-ups have a scalable product or service innovation with an organized operational model which involves a defined core team that has clear roles and responsibilities. (Business Tampere n.d..)

### 2.1.3 SCM's role in the growth stage

The SCM term encapsulates the management and coordination of all the operations enabling the functionality of an organization (Chopra & Meindl 2016, 13-30). SCM encompasses the control of the entire operations in a business, overseeing the overall flow of products, services, and data from raw materials from suppliers' factories to the end users. It aims to maximize efficiency, enhance quality, improve customer satisfaction, increase flexibility, and manage risks,

acting as the backbone of a business (Lu 2011, 8-16). It is important to understand that SCM aims to streamline and ensure an efficient flow of the products or services provided by an organization (Chopra & Meindl 2016, 13-30). According to Mentzer et al. (2001, 7-8), SCM comprehends the range of activities in the supply chain of an organization and its overall operations, interconnecting with the different areas along supply chain operations, covering everything from sourcing to logistic management, as visualized in Figure 3. Depending on the uncertainties in a company's situation, supply chain strategies are required to be adjusted. More specifically, companies with innovative products and unstable supply chain processes face significant challenges and ought to adopt supply chain strategies that prioritize adjustment and adaptation. (Lee 2002 cited in Landgren 2020, 22.)

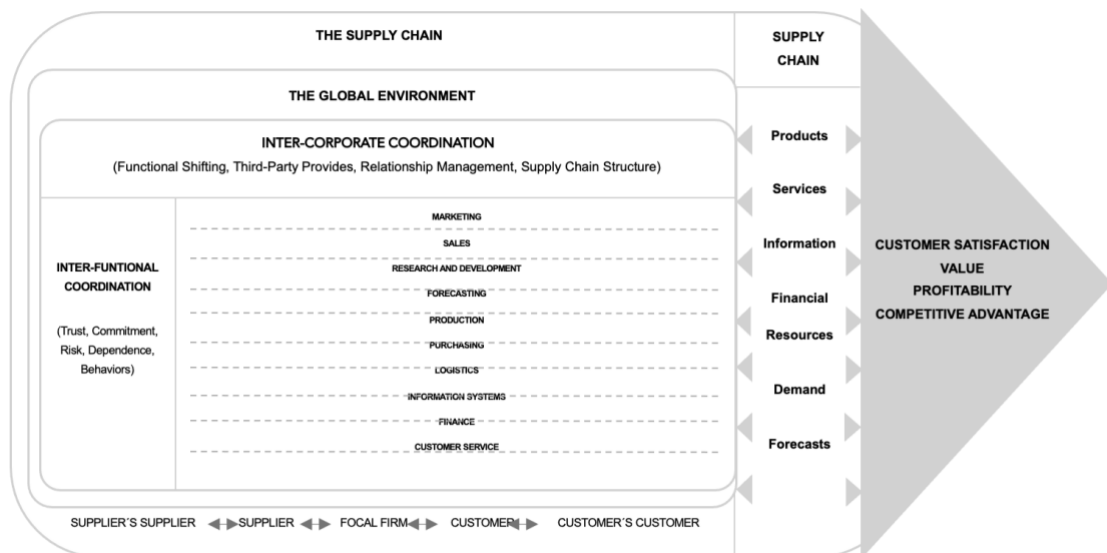


FIGURE 3. Supply chain management conceptualization model (Mentzer et al. 2001).

Based on Chopra & Meindl (2016, 13-30), the primary goals drawn in supply chain management are included:

- The enhancement of efficiency and customer satisfaction
- Cost reduction
- Optimization of quality and reliability
- Increase of flexibility and responsiveness
- Acquisition of competitive advantages

As noted by Chopra & Meindl (2016, 1-30) and Landgren (2020, 20-27), these goals are achieved by SCM, through effective integration and communication of the various elements along the supply chain. SCM's goals are key factors defining the success or failure of a firm, therefore the development of a suitable SCM is crucial to emerging organizations.

There is still a lack of understanding to ensure that the supply chain does not become a constraint for startups. Where startups' supply chain is commonly a bottleneck with challenges in production, operations, sourcing or delivery (Hasan 2019 cited by Wagner 2021). To sustain and allow startups' growth, supply chain capabilities and resources are fundamental aspects (Amedofu, Asamoah & Agyei-Owusu 2019). A common dilemma for startups regarding supply chain management is the allocation of capital to improve supply chain efficiency and reduce costs in contrast to retaining capital to reduce the likelihood of bankruptcy (Tanrisever, Erzurumlu & Joglekar 2009). According to Tatikonda, Terjesen, Patel & Parida 2013, it is recommended that startups in early development stages reserve working capital through high inventory turns, while late-stage startups, especially the ones in the growth phase, focus on investment for scaling up production. In startups heading to the expansion stage, SCM is a decisive factor for the organization's success. To understand the impact of SCM on scale-ups, it is necessary to identify common challenges or limitations they may face when implementing SCM practices. Additionally, considering the given supply chain management fundamentals, SCM's primary objectives help in understanding its relevance for organizations, especially those in rapid growth stage. Bringing further insights into how SCM can address scale-ups' supply chain operations limitations or challenges. A well-supported SCM can help the mitigation of these disruptions and enhance rapid growth for startups. (Landgren 2020, 20-27.)

#### **2.1.4 ERP selection process**

ERP systems are business tools that provide a precise view of the entire operational flow along the supply chain (Ganesh, Mohapatra, Anbuudayasankar & Sivakumar 2014, 1-3). ERP is a significant factor within SCM flow, scalability and effectiveness, acting as the network of a firm, linking the supply chain operations (Tongsuksai, Mathrani & Taskin 2019). The significance of ERP

systems in enhancing SCM performance underscores the key role of ERP software adoption as a tool to reinforce the SCM of an organization. ERP is a cross-functional database supporting organizations in the enhancement of core operations and serves “the operational and decision-making needs” in a company. Hence, ERP systems interconnect the multiple modules in which the company dissects their supply chain operations (Figure 4), enabling the effective sharing of information across the organization. (Bradford 2015.)

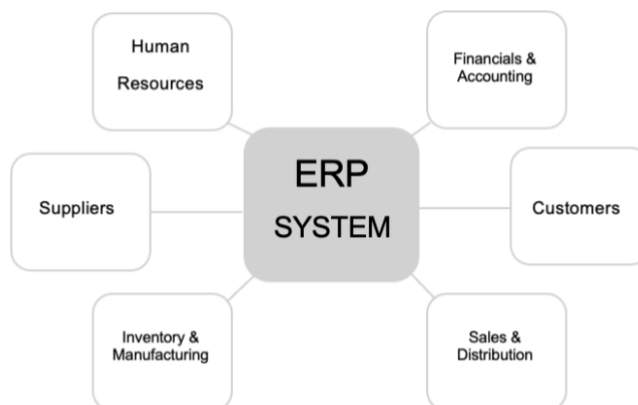


FIGURE 4. ERP system overview (Mabert et al. 2001, as cited by Falk genannt Boch 2023).

The implementation process of an ERP system is complex and has major impacts on business performance (Parr & Shanks 2000, as cited by Wong, Chau, Davison & Scarbrough 2005). The selection of an unsuitable ERP system leads to a higher failure rate in ERP integration. To reduce the potential risk of software mismatch is important to carefully select and evaluate ERP systems in consideration of business operations, aims, and objectives. (Wong, Chau, Davison & Scarbrough 2005.). To elaborate on the ERP selection process, Stefanou 2000 developed the framework presented in Figure 5 which illustrates the several approaches regarding ERP selection, The framework visualizes the phases prior to ERP selection and highlights the aspects that ought to be considered for a suitable ERP system acquisition decision. (Stefanou 2000, as cited by Haddara 2014.)

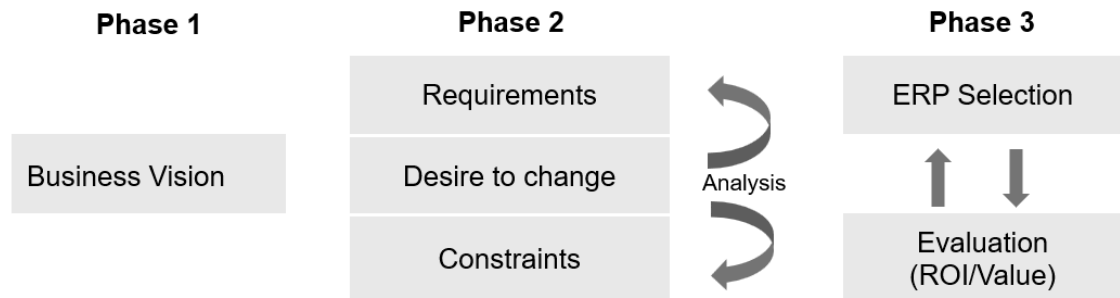


FIGURE 5. ERP selection framework (Stefanou 2000, as cited by Haddara 2014).

## 2.2 Literature relevance

Based on the theoretical foundation, it is possible to establish the correlation of the key findings to this thesis research. The main theoretical takeaways from chapter 2.1.1 complement chapter 2.1.2 as illustrated in Figure 6. It provides a broader view of startups' lifecycle growth stage which aligns with the characteristics identified in Tampere scale-ups. The main insights from these theoretical concepts provide a fundamental understanding of startups, more specifically scale-ups. This foundational grasp enables basic comprehension needed to deeper into the specifics of Tampere scale-ups' operational situation, which is addressed by RSQ1. Hence, the aspects regarding growth, particularly operational scalability and capability to meet strong market demand influence this thesis primary research's interviews which are elaborated in chapter 3.3.1.

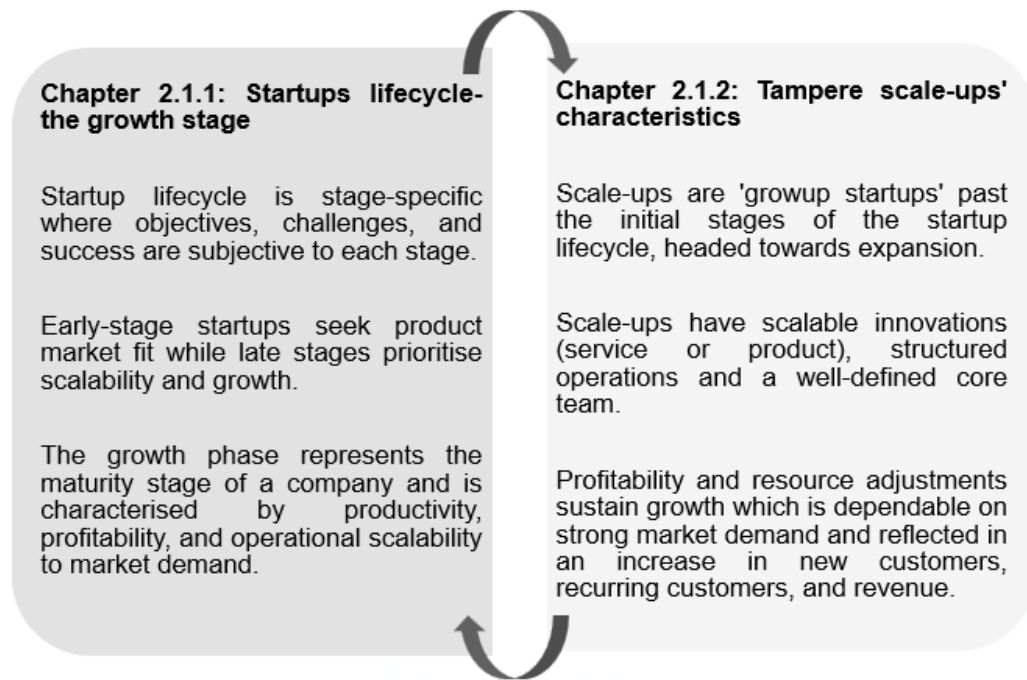


FIGURE 6. Theoretical findings' correlation: chapter 2.1.1 and chapter 2.1.2.

Furthermore, SCM theories from chapter 2.1.3 complement chapter 2.1.4 about the ERP selection process by highlighting the SCM role enables the emphasis of the ERP system and its selection process' significance to organizational needs and objectives (Figure 7 ). The further explanation of the ERP selection process validates RSQ1 and RSQ2 by elaborating on the relevance of understanding the operational situation and SCM challenges. The insights regarding the SCM conceptualization model outline the factors considered for the identification of SCM challenges, which resonates with RSQ2's aim to identify Tampere scale-ups' SCM challenges. Consequently, elements from the theoretical insights about SCM goals' significance for scale-ups' growth success such as efficiency, costs, quality and flexibility are considered in the development of this thesis primary research's survey which is elaborated in chapter 3.3.2.

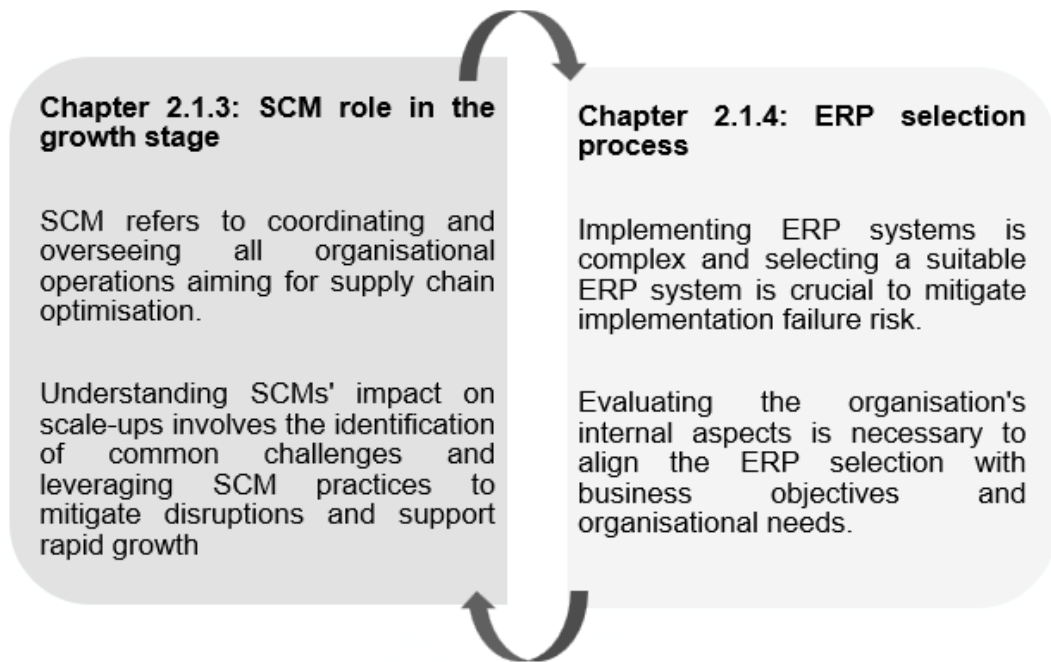


FIGURE 7. Theoretical findings' correlation: chapter 2.1.3 and chapter 2.1.4.

As mentioned at the beginning of this chapter, the theoretical review influences this thesis methodology for the RSQs answers and the creation of the ERP system criteria tailored to Tampere scale-ups. However, it is important to highlight that none of the theories within the chapter focuses on RSQ3 as the approach to answer the question is based on secondary research, thus, executed entirely through secondary sources research.

### **3 RESEARCH METHODOLOGY**

This chapter elaborates on this thesis qualitative research approach and the primary and secondary methods for data collection, emphasizing the sampling strategy. As this thesis incorporates different investigative techniques, the justification of each technique is highlighted through correlation to the RSQs while pinpointing the significance to this thesis research's purpose. Furthermore, the chapter discusses the data analysis approach leading to the considerations concerning the methodology.

#### **3.1 Research approach**

The qualitative research approach “emphasizes words rather than quantification in the collection and analysis of data”. The approach enables the correlation of theory and research for its execution, it is crucial to comprehend the reflection of the subjects in the research, empathizing with the subjects' reflections regarding the issue. To fully provide the perspective of the subjects involved with the research, the investigative techniques within the qualitative research approach must provide in-depth descriptive detail within the reporting of the findings. In doing so, qualitative research facilitates the identification of patterns and key factors associated with the research, simultaneously highlighting the relevance of context for analysis. (Bryman 2016, 374-396.) This thesis qualitative approach enables a deeper understating of Tampere scale-ups engaged with the manufacturing of tangible product, thus, crucial for comprehending aspects for the creation of an ERP selection criteria tailored to Tampere scale-ups. By focusing on descriptive detail, the qualitative research facilitates the identification of patterns and key factors associated with this thesis research's topic.

To the execution of this thesis qualitative research, the approach integrates primary and secondary research methods involving different techniques for data collection and analysis which are elaborated in chapter 3.3. The combination of both methods is justified by the need to comprehensively investigate scale-ups' operations, resource management, SCM challenges, and the Tampere startup ecosystem's involvement in scale-ups' growth. The corroboration of techniques and tools for data collection and reporting contributes to a deeper understanding

of Tampere scale-ups, enabling the development of suitable criteria for ERP system selection tailored to these scale-ups. Additionally, it allows the research to address the research gap in ERP literature and enhance decision-making processes for scale-ups.

### **3.2 Research and sampling strategy**

The integration of primary and secondary investigative techniques in qualitative research is a robust approach to data collection and analysis generating and providing relevant insights while ensuring reliability and credibility in the research process (Merriam & Tisdell 2015). In this thesis, the systematic and dynamic combination of investigative techniques is integrated due to the different focus of primary and secondary research. The primary research investigates the internal circumstances of Tampere scale-ups focusing on the operational situation and SCM challenges. In contrast, the secondary research focuses on Tampere scale-ups' external environment, aiming to identify parties within the Tampere startup ecosystem relevant to Tampere scale-ups' growth. By utilizing primary research to address internal aspects and secondary research to examine external factors, the qualitative research approach addresses this thesis' RSQs, this is further detailed in chapter 3.3 onwards. Hence, crucial to the accomplishment of this thesis aim to develop suitable criteria for ERP selection tailored to Tampere scale-ups.

According to Moser & Korstejens 2018, the qualitative methodological approach should follow a sampling strategy, implying the purposeful selection of situations, contexts, and participants who can provide relevant data to the research topic. The sampling choice should be suitable to the methods integrated into the research, thus, ensuring the relevance of data to the research and enhancing the credibility and trustworthiness of qualitative research findings. This thesis's primary research sampling strategy leverages purposeful sampling by targeting Tampere scale-ups engaged in tangible product manufacturing, therefore incorporating supply chain operations. To ensure diversity within the sample, a maximum variation sampling approach is utilized, thus, the insights from scale-ups from various industries are taken into consideration. The purposeful sampling with maximum variation allows the understanding of operational circumstances

and SCM challenges across different industries within the Tampere startup ecosystem's scale-ups.

This thesis' sampling strategy represented in Figure 8 shows the sampling process displaying the size and industries of this thesis' target group. As illustrated, the first step sources the data from the Tampere startup ecosystem, including information on startups' lifecycle stages. Subsequently, it is pinpointed the growth stage of Tampere startups' lifecycle, where Tampere scale-ups are categorized. Lastly, Tampere scale-ups are narrowed down to scale-ups engaged with tangible product manufacturing. Based on Business Tampere 2024 March reporting of Tampere Startups in the growth stage (Siik & Kyckling 2024) in appendix 1, it is identified 46 scale-ups from various industries in Tampere, from which 19 are engaged with the manufacturing of tangible product.

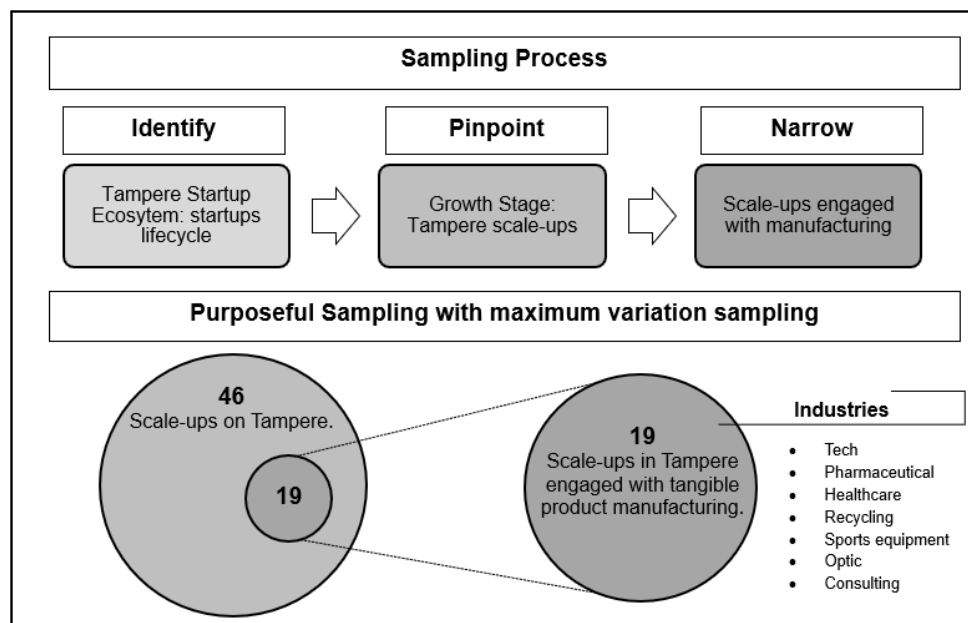


FIGURE 8. Sampling strategy.

This sampling strategy applies exclusively to the primary research, as the secondary research is based on online data sourcing from Business Tampere. As contextualized in this thesis' introduction (chapter 1.2), Business Tampere serves as the central hub for startups in the Tampere region. By leveraging data and insights from Business Tampere, the secondary research ensures the understanding of the local startup ecosystem dynamic addressing specifically scale-ups in Tampere.

### 3.3 Primary research data collection methods

Primary research conveys the collection of “firsthand” data to answer a specific question or hypothesis developed in a study (Driscoll 2011, 153-155). As noted by Bryman (2016, 40-71), primary data is key for further exploration across fields, reinforcing validation and reliability through direct evidence gained from data collection methods such as interviews or surveys utilized in research. As a result, the primary research data collection of this thesis (Figure 9) aims to provide data for an in-depth understanding of the operational situation and SCM challenges faced by Tampere scale-ups engaged with the manufacturing. Interviews are conducted as the first section of the primary research, subsequently complemented by a survey aiming to provide a robust collection of data for the analysis leading to the findings of the RSQ1 and RSQ2. Interviews and a survey are executed as the primary data collection pursuing insights regarding scale-ups’ operational scalability and capability to meet market demand and their SCM challenges’ aspects.

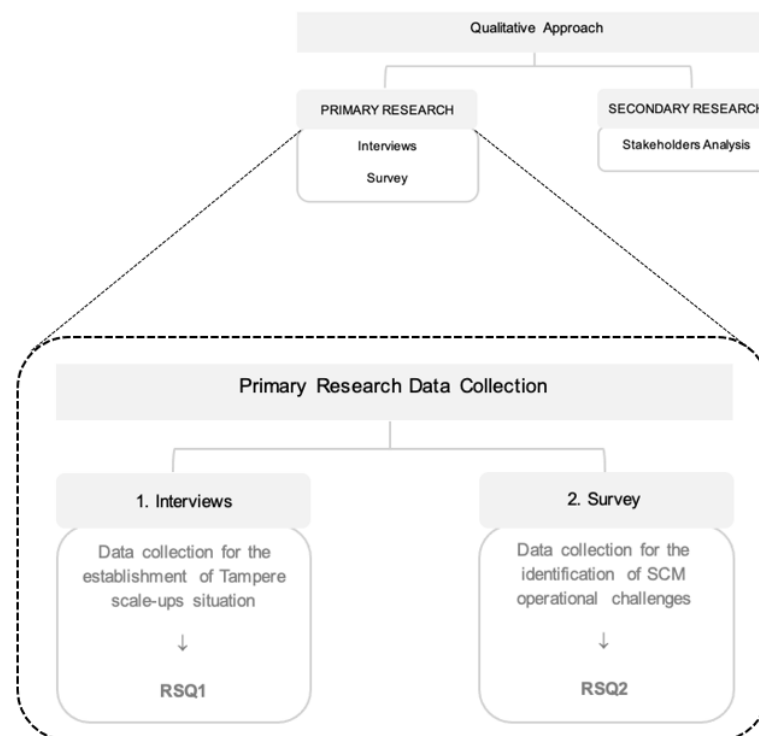


FIGURE 9. Primary research data collection.

### 3.3.1 Interviews

Interviews are a method that enables the compilation of in-depth information from the direct subject of a determinate context, topic or situation (Bryman 2016, 466-467). Due to its flexibility and complexity allowing a deeper exploration of a research nature, this method is widely utilized in qualitative research (Driscoll 2011, 153-155). Therefore, semi-structured interviews are executed as the initial section of the primary research to collect data about Tampere scale-ups engaged with manufacturing's internal management dynamic. This enables the establishment of scale-ups' operational situation, addressing RSQ1 on identifying how scale-ups in Tampere manage their operations and resources for growth. The semi-structured interviews conducted in this primary research aim to gather direct evidence from this thesis' research group's perspective resonating with the purpose of creating an ERP system selection criteria tailored to Tampere scale-ups.

The interviews are conducted online, via Google Meet and Microsoft Teams, aiming to reach five Tampere scale-ups engaged with the manufacturing of tangible product. Prior to the interview process, the participants are contacted by email message (appendix 2) which contains the following general information regarding the interview meeting:

- Brief introduction of the research topic
- Purpose of the email
- Research overview: objective and significance of the research
- Interview details: format, duration and confidentiality
- Consent request and response deadline
- Contact information: phone number and email

As a preliminary step, seeking to ensure the data protection of the interviews, once interviewee participation is confirmed, a confidential disclosure agreement (appendix 3) is sent to the participant's email for signing. To reduce bias and enhance data quality, the two interviewers alternate the observer and primary interviewer roles in each interview session. Allowing the collection of non-verbal cues and interactions through notes from the two interviewers' perspectives, minimizing the overlook of potential insights during each interview. Aiming to

capture all the data simultaneously to support the interviewers' notes and observations in the process, Otter AI and Google Teams transcripts are utilized as additional digital tools. Both platforms foster the efficiency and reliability of the insights collected in the interviews by generating automated notes and summarizing the data produced in the process.

According to Eriksson & Kovalainen (2008, 78-83), structuring interviews increases consistency, reliability and efficiency along the process. Therefore, this thesis interview's structure is defined in three phases, as follows:

1. Initial phase: brief introduction of the interviewers, including the information about the observations and recording being performed
2. Middle phase: dedicated to questions and answers (Q&A)
3. End phase: closing remarks

Aiming to establish the Tampere scale-ups' situation, thus collecting data to answer RSQ1, the interview questionnaire (appendix 4) investigates internal aspects regarding scale-ups' operational capacity and capability to meet strong market demand. To elaborate on how the interview questionnaire is organized by numerical order, Figure 10 illustrates the questionnaire structure visualization funnel, where five categories and four sub-categories represent an interview question (IQ). To identify Tampere scale-ups' operational situation, the pivotal functions and functionality needs categories aim to recognize the core functions and its requirements along with scale-ups' operations. To outline crucial resources falling under scale-ups' core functionalities, resource management is placed as the third category in the questionnaire. Subsequently, to examine further scale-ups' utilization of the resources simultaneously addressing its' constraints, usage resources and limitation of sources fall as the two sub-categories within the third category. Furthermore, seeking to determine key performance indicators (KPIs) of scale-ups' operations, reporting requirements are defined as the fourth category of the questionnaire. The fifth category aims to gain insights into scale-ups' scalability prospects and financial suitability to support growth. To further explore the financial situation of scale-ups to meet market variations, the fifth category is divided into two sub-categories, demand forecasting and demand variation.

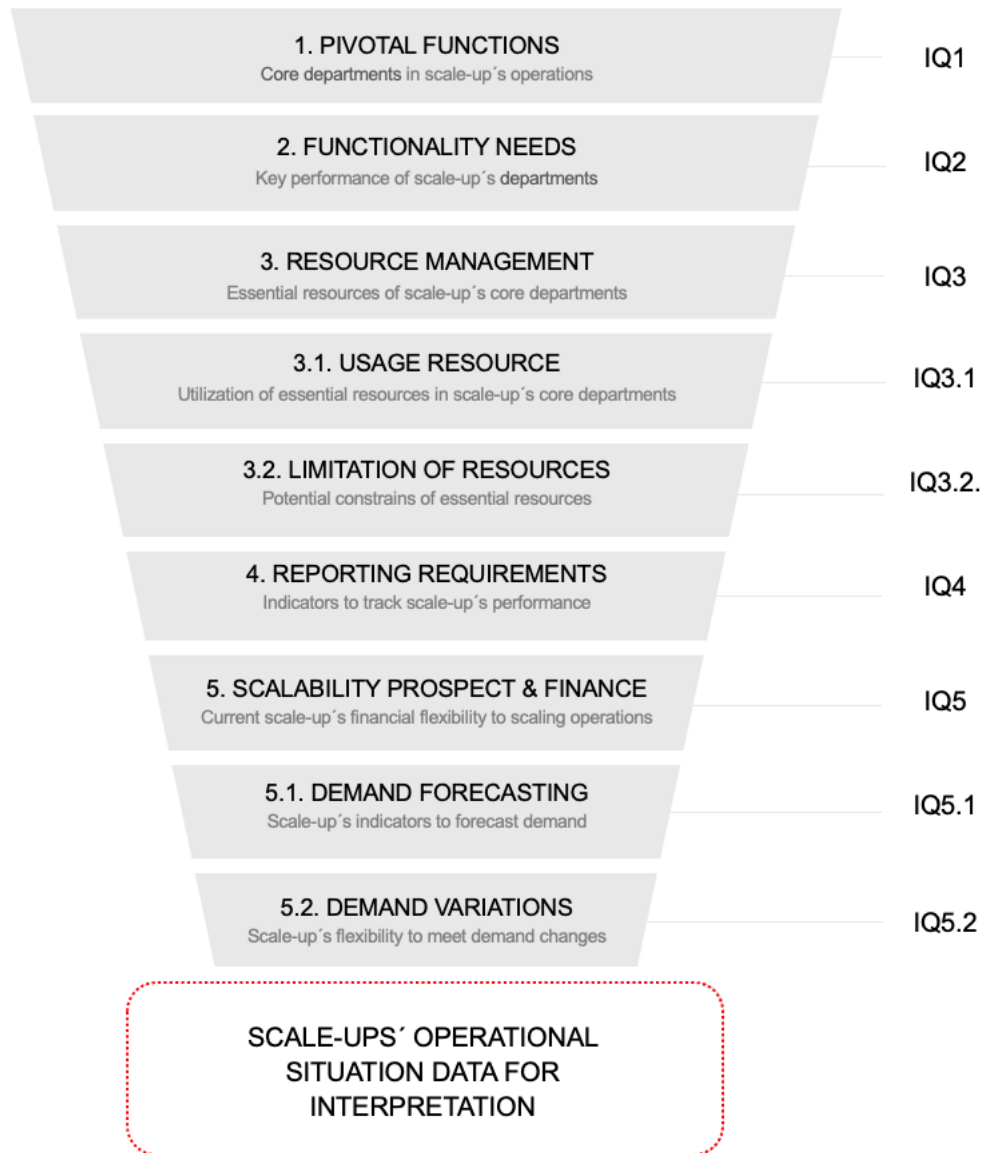


FIGURE 10. Interview questionnaire's numerical order funnel structure.

The semi-structured interviews investigate the internal operational dynamic of Tampere scale-ups engaged with the manufacturing of tangible product, integrating Otter AI and Google Meet's transcripts as digital tools for detailed reporting. By covering the core departments, essential resources, performance indicators, finances and capabilities to meet demand, the questionnaire structure enables the data collection for the establishment of Tampere scale-ups' operational situation. These aspects align with the theoretical framework outlined in chapter 2.1.1 and chapter 2.1.2 regarding startups' lifecycle growth stage and Tampere scale-ups' characteristics.

### 3.3.2 Survey

A survey is a method to compile specific data through a designed questionnaire addressed to the specific subject of a study (Patten 2017, 1-6). In qualitative research, surveys are utilized due to their flexibility and efficient format, enabling the reach of a wider audience for an in-depth exploration of a study (Creswell & Plano Clark 2017). Seeking to enhance the quality and depth of the data collection, a preliminary understanding of the questionnaire design is crucial in qualitative research (Creswell & Plano Clark 2017). This thesis incorporates a survey to enable the identification of Tampere scale-ups engaged with the manufacturing of tangible product's SCM challenges, addressing RSQ2. The recognition of Tampere scale-ups' SCM challenges provides indicators influencing the ERP selection process. This complements the data collection from the interviews by shifting the focus to SCM, ensuring that the ERP system selection criteria tailored to Tampere scale-ups incorporate ERP as a subset of SCM, as highlighted in this thesis' introduction (chapter 1.1).

The survey is executed electronically via Google Forms, contacting the 19 scale-ups engaged with the manufacturing of tangible product in the Tampere area. Initially, respondents are reached via email (appendix 5) with the following contextual information regarding the survey:

- Brief introduction of the survey selection
- Purpose of the survey
- Survey details: format, duration, participation deadline and survey link
- Contact information: phone number and email

According to Bryman (2016, 244), open-ended questions allow the collection of unanticipated aspects through unproposed questions, leading to the gathering of insights for the further exploration of a research nature. Hence, this thesis incorporates open-ended questions survey (appendix 6) which structure is illustrated in Figure 11, where the survey questionnaire is dissected into six sections with an introductory section. To cover the data protection of the survey, a disclaimer information (appendix 7) is added prior to the introductory section of the survey questionnaire. The introductory section aims to facilitate the identification of the survey respondents and understand the type of supply chain

utilized by Tampere scale-ups. Although the identification of the survey respondents does not enable correlation to the specific answers of the respondents in the subsequent sections, it allows to track retention of the target group within the sampling strategy. Further, seeking to identify SCM practices, the first section questions are concerning the supply chain network's core components, supply chain operations' KPIs, and constraints along logistics. The second section focuses on SCM's technologies and tools as well as the constraints and limitations concerning it. To outline common challenges along supply chain operations, the third section is aimed towards challenges and risks. Subsequently, the fourth section's purpose is to further examine supply chain operations' flexibility in adjusting to demand variations and scalability challenges. To conclude the survey questionnaire, the last section is for additional information to ensure the collection of any other data considered relevant to be mentioned by the respondents.

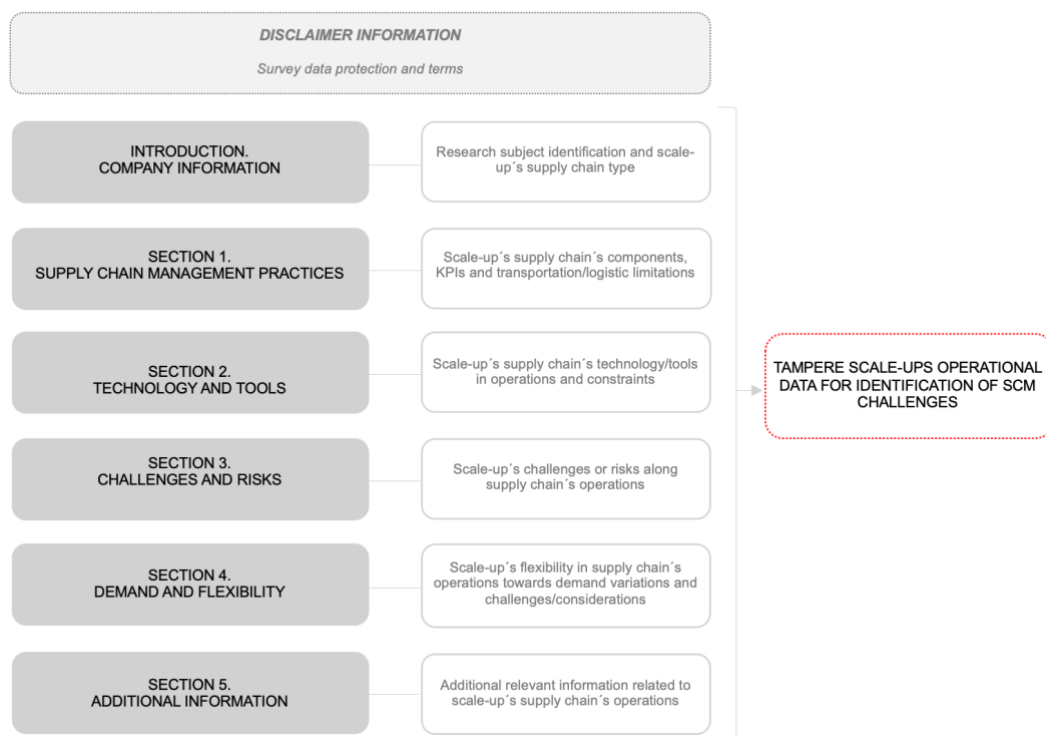


FIGURE 11. Open-ended survey questionnaire structure.

The open-ended survey questionnaire delves into aspects related to SCM, endorsing Tampere scale-ups engaged with the manufacturing of tangible product's operational situation. Simultaneously the method directs the research to Tampere scale-ups' SCM challenges. The survey gathers data for the

identification of SCM's operational challenges by pinpointing supply chain practices, technology and tools, challenges and risks, additionally to demand and flexibility. These sections comply with the theoretical framework factors highlighted in Figure 3 in chapter 2.1.3.

### 3.4 Primary research data analysis approach

Primary data endorses a focused analysis tailored to the specific needs of a research through current insight reflecting the situation in which the research is developed (Driscoll 2011, 157-158). This primary research data analysis involves a framework and thematic analysis approaches (Figure 12), aiming to conduct a suitable data analysis in accordance with the data collection methods. The framework approach is executed to address the interview method, followed by the thematic analysis which focuses on the survey data. Therefore, this thesis primary research data analysis fosters the synthetization of data, enabling the accomplishment of the RSQ1 and RSQ2 findings.

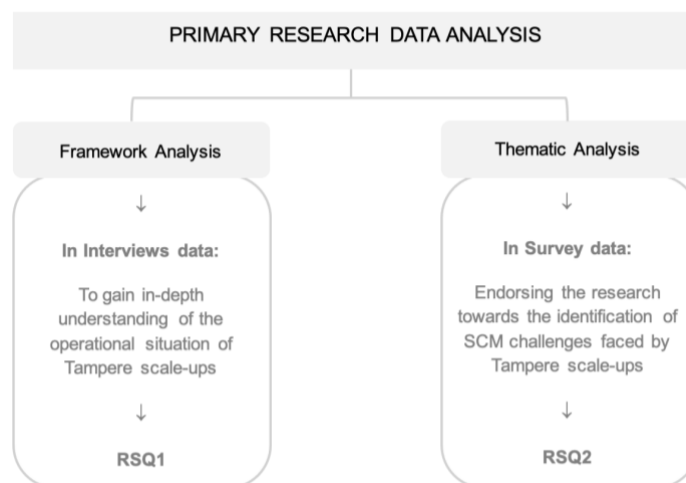


FIGURE 12. Primary research data analysis approach.

#### 3.4.1 Interviews

Framework approach is a "matrix-based method" utilized in the analysis of complex data, endorsing the comparison of different information in research contexts (Bryman 2016, 585). Serving as an analytic tool that facilitates the references of cross-data through predefined categories and sub-categories, this method is widely executed in qualitative research (Bryman 2016, 585). Aligning

with the interview’s data set, the detailed characteristic of the framework approach is to enable the in-depth exploration of narrow data (Ritchie, Lewis, McNaughton Nicholls & Ormston 2014, 776-827). Pursuing a structured synthetization for interviews data aiming to answer the RSQ1, the framework approach is employed, gaining further understanding regarding the operational situation of Tampere scale-ups engaged with manufacturing. By simplifying data to outline scale-ups’ operations and resource management, the framework approach provides internal insights for the creation of solid criteria for ERP system selection tailored to Tampere scale-ups.

To accomplish the framework approach, a matrix is designed prior to the analysis process where the structure funnel of the interview questionnaire (Figure 10) is represented as the matrix categories. Additionally, to endorse the correlation between categories, the numerical data indicated in the funnel structure (Figure 10) visualized chapter 3.3.1 is pointed at each category’s title, independently to the categories order in the matrix. Emerging sub-categories are incorporated into the matrix design, upon predefined patterns identified within the answers collected from each interview case (IC). As a result, the matrix (Table 1) is divided in five columns, comprehending the categories, sub-categories and the three interview cases displayed in execution order. To keep the interview participants’ anonymity, the interviewees are addressed as interview case 1, 2 and 3.

TABLE 1. Interviews data analysis matrix.

CATEGORIES	SUB-CATEGORIES	IC 1	IC 2	IC 3
PIVOTAL FUNCTIONS (1)	<p><i>To be defined upon patterns identified from interviews’ data collection</i></p>	<p><i>To be completed with the interviews’ data after sub-categories are incorporated</i></p>		
FUNCTIONALITY NEEDS (2)				
RESOURCE MANAGEMENT (3)				
USAGE RESOURCES (3.1)				
LIMITATION OF RESOURCES (3.2)				
REPORTING REQUIREMENTS (4)				
SCALABILITY PROSPECT AND FINANCE (5)				
DEMAND FORECASTING (5.1)				
DEMAND VARIATIONS (5.2)				

As defined by Roller & Lavrakas (2015, 38-39), there are six standardized steps followed in qualitative analysis wherewith the first step implicates the selection of the unit analysis pursued by the developing of unique codes. The third step is the coding of data followed by the identification of categories. Subsequently, the fifth step focuses on the identification of themes or patterns. Finally, the sixth step involves drawing interpretations and implications from the data. Taking into consideration these standardized steps, to gain a holistic understanding of the interviews data and finalize the matrix, this thesis condensed into four phases the framework analysis (Figure 13). The initial phase of the analytic process is dedicated to data familiarization. Aiming to identify the matrix sub-categories, the second phase of the process is comprehended by categoric framework allocation. The third phase of this process is represented by data specification, allocating the data to specify the sub-categorization. To culminate this analytic process, the data is mapped along the finalized matrix to outline and highlight the key findings.

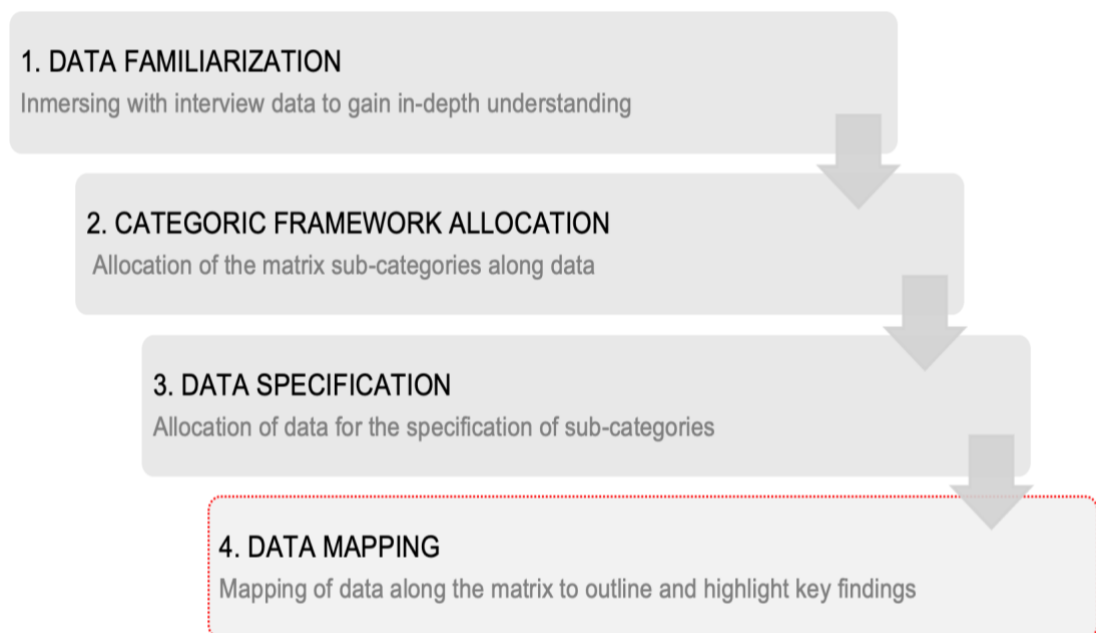


FIGURE 13. Interview data analytic process.

Adopting this framework process consolidates the data collection from the interview method. The results guide towards the interpretation of the internal

operational dynamic of Tampere scale-ups engaged with the manufacturing of tangible product, enabling RSQ1 to be answered in chapter 4.3.

### **3.4.2 Survey**

The thematic analysis is a streamlined analytic approach enabling the exploration of different aspects involved in a research nature. Due to its flexibility in facilitating the analysis of complex datasets through themes derived from emerging patterns, thematic analysis is commonly utilized in qualitative studies. While endorsing the further examination of various aspects of complex data, the flexible nature of the thematic analysis compiles the understanding of wider sets of data (Bryman 2016, 584-589). This thesis thematic approach is conducted to dissect, organize, and identify patterns within the survey data, enabling the answer to RSQ2. The approach facilitates the analysis of the survey's data, directing the research towards the identification of SCM's challenges faced by Tampere scale-ups engaged with manufacturing. By analysing the data from the survey's sections, the thematic approach allows the condensation and refinement of data for the creation of suitable ERP system selection criteria tailored to Tampere scale-ups.

As detailed by Bryman (2016, 587-588), the thematic analysis is comprehended in six general steps, in which the first steps focus on the reading of the materials to be analyzed followed by the coding of these materials. The third step entails the elaboration of the codes into themes and sub-themes, in compliance the fourth step involving the evaluation and labelling of the higher-order themes and sub-themes. Preliminarily, the fifth step examines links and connections between concepts in terms of features of the cases. To finalize, the sixth step involves the writing of the insights gathered in the previous step and the justification of the developed themes and sub-themes. Upon adjustments to these general steps, the thematic approach structured in this thesis' survey's data analysis into five phases (Figure 14). To acknowledge the survey insights, the first phase of the process is the division of sections based on the survey's questions. The second phase is the familiarization of data from the survey's answers. Addressing patterns upon features identified along the data, data codification is executed in the third phase of the process. Following the data codification, the fourth phase of the process comprehends by the thematization of data, where themes are

created and reviewed. Lastly, the interpretation of data based on thematization is executed in chapter 4.3.

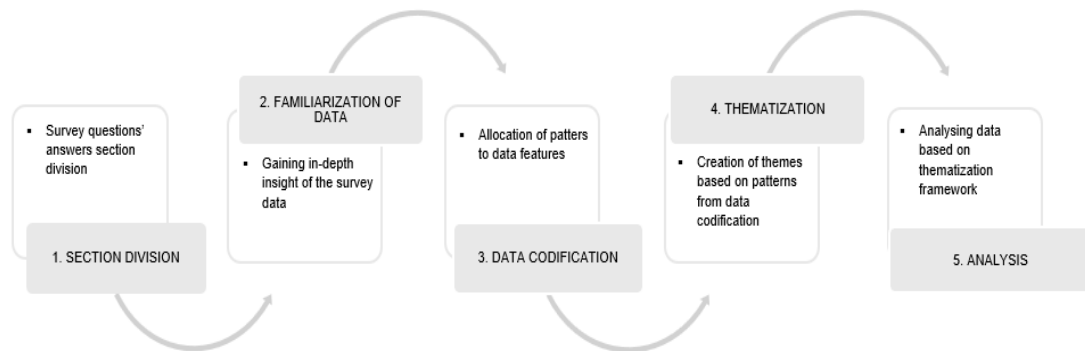


FIGURE 14. Survey data analytic process.

Utilizing this thematic process for the synthetization of the survey's data enables the interpretation and identification of Tampere scale-ups' SCM operational challenges' aspects. The findings provide further insights into Tampere scale-ups' internal operations, endorsing the interviews' findings about Tampere scale-ups' operational situation by linking to SCM's practices.

### 3.5 Secondary research data collection and analysis

Secondary research involves the systematically gathering and synthesization of existing data relevant to the research topic. This approach supports understanding of theoretical context of the research's subjects enabling new insights to be built upon previous knowledge (Patton 2015). In this thesis, the secondary research investigates Tampere scale-ups' external environment, overseeing the Tampere startup ecosystem. The approach is executed through a stakeholder analysis aiming to identify parties within the ecosystem relevant to the growth of Tampere scale-ups. The integration of scale-ups' external environment allows the correlation to this thesis research's contextualization (chapter 1.2), where it is identified the importance of scale-ups to the Tampere region. Furthermore, it highlights parties from which Tampere scale-ups can leverage support and collaboration for growth towards expansion. This aspect is taken into consideration for the creation of ERP selection criteria tailored to Tampere scale-ups, considering external businesses dynamics' potential support.

### 3.5.1 Stakeholder analysis

External stakeholders influence diverse aspects of organizations and shape the landscape impacting development and growth. Therefore, understanding external stakeholders is fundamental for strategic progress (Henisz 2014). The data from stakeholder analysis is compelled to enable the identification of key stakeholders and the assessment of stakeholders' interest, impact, influence and importance to the interested parties. Additionally, it may outline a stakeholder participation strategy where the stakeholder's involvement planning is drawn upon. (Rietbergen-McCracken & Narayan 1998, 72-87.) Through the identification and categorization of stakeholders, stakeholder analysis' findings provide the subject of main interest the foundation and strategy acknowledgement for the participation of relevant people, groups, or institutions to the achievement of a purpose (Rietbergen-McCracken & Narayan 1998). This research's stakeholder analysis acknowledges proactive stakeholders who Tampere scale-ups can leverage support and collaboration for growth. The analytic process of the stakeholder analysis does not cover stakeholders' involvement planning. The focus is directed to the creation of ERP system selection criteria tailored to Tampere scale-ups engaged with the manufacturing of tangible product. Therefore, the efforts are towards identifying parties within the Tampere startup ecosystem and assessing their interest, impact, influence and importance as collaborators of the Business Tampere initiative. Thus, the analysis addresses the RSQ3 by identifying the parties in the Tampere startup ecosystem relevant to scale-ups' growth towards expansion. The examination of the external environment contributes to the alignment of the ERP selection criteria with the broader ecosystem dynamic of Tampere scale-ups.

Schmeer (2000) highlights eight major steps to conduct a stakeholder analysis, in which the first step concerns the planning of the process followed by the definition of the analysis yield. The third step involves the identification of key stakeholders in accordance with the fourth step regarding the specification of the stakeholders' characteristics. Subsequently, the fifth and sixth steps are about visualization and analysis of findings. Lastly, the seventh and eighth steps are the findings' interpretation and purpose of use justification. This thesis research follows Schmeer's steps with adjustment through the phases:

- The first phase involves the two first steps, where the first step of the stakeholder analysis is defined by the process in Figure 15, which illustrates the main aspects of the steps in the following phases. The process has the analysis yield from data sourcing through online databases, reports, and publications from Business Tampere by keyword research

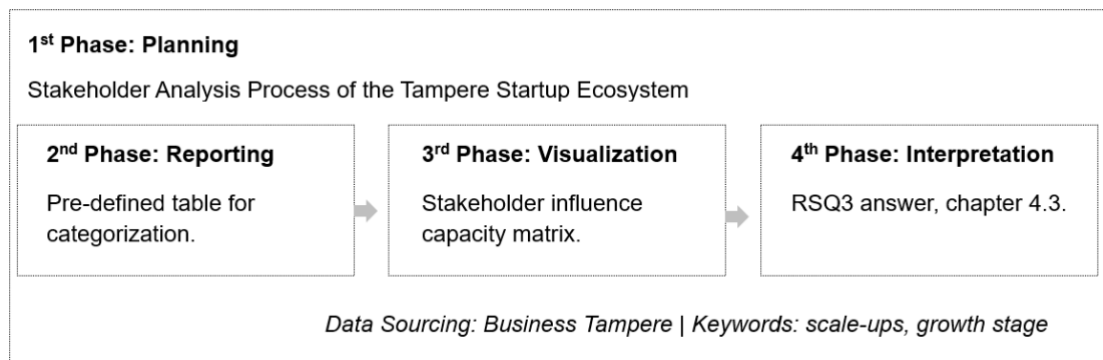


FIGURE 15. Stakeholder analysis process.

- The second phase has a pre-categorized table (Table 2) for data reporting, which is complemented by data imputed from the third and fourth steps. To elaborate, the table may be adjusted on the data from the third step which identifies the key stakeholders from the Tampere startup ecosystem that are collaborators of Business Tampere. To supplement specific information regarding these stakeholders, the fourth step provides the key stakeholders' characteristics, highlighting stakeholders' capabilities from which Tampere scale-ups can leverage support for growth

TABLE 2 . Stakeholder analysis data reporting.

KEY STAKEHOLDERS	CHARACTERISTICS	IMPACT   ACCESSIBILITY SPECIFICATION
<i>To be completed with findings from steps 3 and 4</i>		

- The third phase utilizes an adapted stakeholder influence capacity matrix (Figure 16). By categorizing the identified stakeholders' level of impact

which is based on their capabilities' influence relevant to Tampere scale-ups' growth. The collaborative partners of Business Tampere and any other relevant parties in the Tampere startup ecosystem are mapped onto the matrix considering their accessibility. Therefore, it is recognized key stakeholders' reachability. The matrix provides a visual representation of each stakeholder's accessibility and impact referent to Tampere scale-ups.

This matrix enables the identification of key stakeholders that present highly accessible support and key stakeholders that present constraints in their capabilities, thus limiting collaboration and support prospects for Tampere scale-ups. Highly accessible stakeholders with strong impact indicate stakeholders whose support is easy to access and the prospects of support or collaboration have a significant impact on scale-ups' growth. On the other hand, stakeholders with lower accessibility or impact are positioned in areas of lower priority, highlighting stakeholders considered less reachable and whose support or collaboration needs further efforts from scale-ups to achieve significant growth impact.



FIGURE 16. Stakeholders influence capacity matrix (adapted from Rietbergen-McCracken & Narayan 1998).

- The fourth phase is the interpretation of the stakeholder analysis' findings which answers the RSQ3. This phase is completed in chapter 4.3. as it is dependable on the completion of the previous phases.

This systematic approach for this thesis research's stakeholder analysis ensures that the secondary research from existing data sources synthesizes relevant insights from external factors relevant to Tampere scale-ups' development towards growth. The aim is to provide a holistic overview of the Tampere startup ecosystem and specify the key stakeholders' characteristics relevant to Tampere scale-ups.

### **3.6 Considerations**

Given the multi-approach methodology carried out in this research, adjustments within the execution of data collection ought to be implemented in the occurrence of obstacles or challenges. This mitigates potential oversights in the complex data collection and analysis process of this thesis research. It is relevant to emphasise that the qualitative approach with multiple investigative techniques suits this thesis research with correlation to each RSQ. Considering that each question aims to provide a different perspective on Tampere scale-ups' business dynamics, the cross-variation of methods facilitates the in-depth explorations of various internal and external factors.

Despite the complexity of data collection and analysis, the integration of triangulation ensures the credibility of the research findings. The corroboration of data interpretation augments this research's validity and reliability, reinforcing the accuracy of representation of the findings under exploration within the investigative techniques. Specifically, validity is increased through data triangulation as it allows a holistic interpretation of the multiple sourced findings with the convergence of the findings. Further, it strengthens the research's reliability by highlighting the consistency of the results, thus, grounding evidence and mitigating bias.

## **4 FINDINGS**

This chapter presents the results and findings from the data analysis approaches of the data collection methods covered in chapter 3. It addresses the challenges and adjustments during the execution of the research methodology. Further, the findings are presented in data interpretation, where this thesis' RSQs are answered upon the interpretation of the data analyses' results.

### **4.1 Primary research**

Throughout the execution of the primary research's data collection methods, scale-ups in Tampere engaged with tangible product manufacturing were contacted through other channels than the primarily planned in the data collection methodology (chapter 3.3). Despite the efforts to contact through other means, it did not achieve the intended goal of attaining participation. Consequently, the primary research synthesis, organization and interpretation follow the framework analyses with an inclusion of data supplement from a secondary source concerning the survey's results. Due to the theoretical background on Tampere scale-ups' characteristics in chapter 2.1.2, the analysis of the interviews proceeded as planned, however, the survey's analysis is complemented by secondary source's findings. Despite the adjustments to the survey analysis, this thesis primary research framework still allows for a comprehensive understanding of scale-ups' operational aspects. Consequently, enabling RSQ1 and RSQ2 to be addressed.

#### **4.1.1 Interviews**

Along with the execution of the interviews' data collection method, a difficulty encountered was the challenge of securing interviewees. Despite the lack of participation, obtaining interviews with three out of five candidates, the interviews framework analysis is executed as planned as there is the theoretical foundation from chapter 2.1. The interview results are gathered from the analysis of the interview's notes and transcripts (appendix 8, 9 and 10) executed along the interview cases. The predefined nine categories of the matrix are complemented by 23 emerging sub-categories (appendix 11). Facilitating the identification of the

interviews data results, these sub-categories are developed upon the patterns identified during each interview case as established in chapter 3. 4.1.

In accordance with the matrix structure, the first category (Table 3) is represented by pivotal functions. This category is divided into four sub-categories, which include research and development (R&D), operations and compliance, marketing and sales, and others. As visualized in Table 3, interview case (IC) 1 and IC 2 identified operations with compliance, and marketing with sales as merged pivotal functions. Exceptionally, IC 3 which did not identified compliance as a pivotal function, however, pinpointed operations and organization. Additional pivotal functions are also allocated by IC 1, IC 2 and IC 3.

TABLE 3. Pivotal functions in interview cases - first matrix category.

CATEGORY	PIVOTAL FUNCTIONS (1)			
SUB-CATEGORIES	R&D	OPERATIONS AND COMPLIANCE	MARKETING AND SALES	OTHERS
<b>Interview Case (IC)</b>	IC 1, IC 2	IC 1, IC 2	IC 1, IC 2, IC 3	IC 1, IC 2, IC 3

The second category (Table 4) about functionality needs, all scale-ups' functionality needs required for pivotal functions' performance is related to the prospects in increasing company's value through their customer's base. It also outlines variations in the specifications regarding value due to the differing customer's base and business model adopted in IC 1, IC 2 and IC 3.

TABLE 4. Functionality needs in interview cases - second matrix category.

CATEGORY	FUNCTIONALITY NEEDS (2)		
INTERVIEW CASE	IC 1	IC 2	IC 3
<b>Specifications</b>	<ul style="list-style-type: none"> <li>Quality of customer case (company value increase through the quality over quantity in sales)</li> </ul>	<ul style="list-style-type: none"> <li>Customer value and efficiency (company value increase by meeting customers' demands)</li> </ul>	<ul style="list-style-type: none"> <li>Channel partners' value (company's value increase through channel partners' growth)</li> </ul>

Within the third category of the matrix (Table 5) represented by resource management, the sub-categories are structured in time, personnel, capital and others. Along this third category, personnel and capital are addressed as

essential resources predominant in the three interview cases. Complementary, due to the different business models of each interview case, other resource management are allocated in IC 1 and IC 3.

TABLE 5. Resource management in interview cases - third matrix category.

CATEGORY	RESOURCE MANAGEMENT (3)			
SUB-CATEGORIES	TIME	PERSONNEL	CAPITAL	OTHERS
<b>Interview Case (IC)</b>	IC 1, IC 2	IC 1, IC 2, IC 3	IC 1, IC 2, IC 3	IC 1, IC 3

Subsequently, in correlation with the third category of the matrix, the fourth category (Table 6) is represented by usage resources. Sub-categories are not identified in this category due to the specific data provided in each interview case, derived from the variation of business models in IC 1, IC 2 and IC 3.

TABLE 6. Usage resources in interview cases - fourth matrix category.

CATEGORY	USAGE RESOURCES (3.1)		
INTERVIEW CASE	IC 1	IC 2	IC 3
<b>Specifications</b>	<ul style="list-style-type: none"> <li>▪ Adjusted based on customer cases.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Based on quality management.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Marketing and expansion of channel parentships.</li> </ul>

The fifth category (Table 7) is represented by the limitation of resources and reproduced the four sub-categories comprehending the third category of the matrix. Along this category is highlighted the general limitations encountered in personnel and capital resources, by IC 1, IC 2 and IC 3. Further, autonomy and market scope - prospects are allocated as resource limitations in IC 3, due to the business model in this scale-up's case.

TABLE 7. Limitation of resources in interview cases - fifth matrix category.

CATEGORY	LIMITATION OF RESOURCES (3.2)			
SUB-CATEGORIES	TIME	PERSONNEL	CAPITAL	OTHERS
<b>Interview Case (IC)</b>	IC 1, IC 2	IC 1, IC 2, IC 3	IC 1, IC 2, IC 3	IC 3

In the sixth category of the matrix (Table 8) is represented by reporting requirements, the sub-categories are comprehended by financial metrics and

others. Within the sixth category is outlined the predominancy of financial metrics utilization as the tracking system of scale-ups' performance, in IC 1, IC 2 and IC 3.

TABLE 8. Reporting requirements in interview cases - sixth matrix category.

CATEGORY	REPORTING REQUIREMENTS (4)	
SUB-CATEGORIES	FINANCIAL METRICS	OTHERS
Interview Case (IC)	IC 1, IC 2, IC 3	IC 1, IC 2, IC 3

The seventh category of the matrix (Table 9) represents scalability's prospect and finance and it is divided into the sub-category yes and no. In this category is addressed by IC 1, IC 2 and IC 3, the lack of scalability presented within scale-ups' operations as a result of unstable financial situation.

TABLE 9. Scalability prospect and finance in interview cases - seventh matrix category.

CATEGORY	SCALABILITY PROSPECT AND FINANCE (5)	
SUB-CATEGORIES	YES	NO
Interview Case (IC)		IC 1, IC 2, IC 3

The preliminary category of the matrix (Table 10), the eighth category is represented by demand forecasting, outlining the different forecasting indicators executed in scale-ups, derived from the diverse business models in IC 1, IC 2 and IC 3.

TABLE 10. Demand forecasting in interview cases - eighth matrix category.

CATEGORY	DEMAND FORECASTING (5.1)		
INTERVIEW CASE	IC 1	IC 2	IC 3
Specifications	<ul style="list-style-type: none"> <li>▪ Customer acquisition rate - customer growth rate.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Contract agreements.</li> <li>▪ Identifying patterns.</li> <li>▪ Market penetration prospect.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Channel partners market data.</li> <li>▪ Channel partnership growth.</li> <li>▪ Lack of channel partner prospect.</li> </ul>

Lastly, the ninth category (Table 11) represents demand variations and it is comprehended by the sub-categories highly flexible, mid-high flexible and not

flexible. Throughout these three sub-categories is highlighted the different levels of flexibility in scale-ups' operations due to the business models of each IC.

TABLE 11. Demand variations in interview cases - ninth matrix category.

CATEGORY	DEMAND VARIATIONS (5.2)		
SUB-CATEGORIES	HIGHLY FLEXIBLE	MID-HIGH FLEXIBLE	NOT FLEXIBLE
Interview Case (IC)	IC 1	IC 3	IC 2

To formulate the answer for RSQ1, it is outlined the importance of product development, marketing and sales functions. Additionally, it is taken into consideration the predominancy of financial reporting indicators in Tampere scale-ups. Thus, the interpretation from these results establishes the situation of Tampere scale-ups engaged with the manufacture of tangible products, outlining these scale-ups' operational and resource management aspects.

#### 4.1.2 Survey

During the execution of the survey's data collection method, an obstacle was the challenge in obtaining participation for the survey completion from this thesis target scope, only six scale-ups participated in the survey. Due to the lack of participation and discrepancies from the obtained answers, the survey thematic analysis is completed with the supplement of secondary research on SCM challenges faced by startups. To elaborate, the survey framework analysis presented in chapter 3.4.2 is applied to the survey questionnaire's answers (appendix 12) and the table on SCM-related challenges along startup phases, cited by Wagner 2021 (appendix 13). The secondary research data complement amplifies the survey thematic analysis' results, addressing the themes regarding SCM's challenges aspects faced by Tampere scale-ups engaged with the manufacturing of tangible product.

Based on the data codification from the survey's answers is identified 11 themes referent to Tampere scale-ups' SCM operational dynamic. Previous to the first section of the survey's questionnaire leading to themes, scale-ups' supply chain

type is identified. From the six scale-ups, three have outsourced supply chain, while two have in-house and one has a hybrid supply chain (Figure 17).

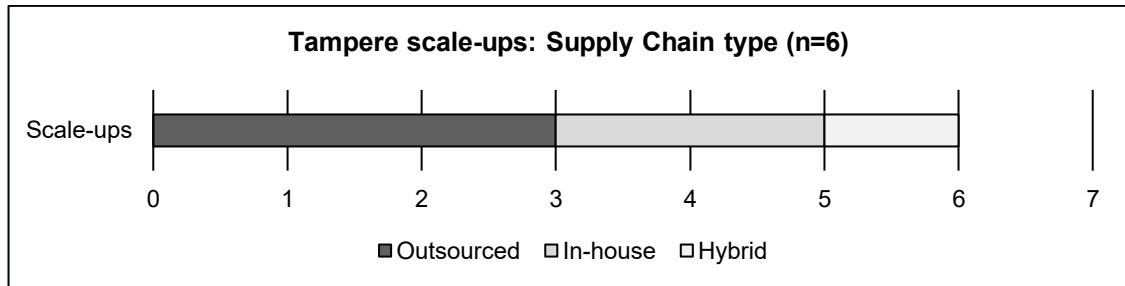


FIGURE 17. Tampere scale-ups engaged with manufacturing supply chain type.

In the supply chain practices section of the survey, scale-ups' answers highlight supply chain network components, supply chain operations KPI's, and supply chain limitations or constraints (Table 12). The codification of the answers' patterns provides four themes, recognizing the significance of aspects concerning external relationship, lead time, financial metrics, and operational considerations. In alignment with the results, the secondary research complements with specifics regarding the themes.

TABLE 12. Supply chain practices – first section's themes.

1.Section: Supply Chain Practices		
Questionnaire	Data codification	Themes
Supply chain network components (n=5)	- Supplier and manufacturing - Procurement and logistics	Complex external relationship
Supply chain operations KPIs (n=5)	- Delivery performance - Financial performance - Inventory management	Lead time Financial metrics
Supply chain limitations or constraints (n=5)	- Regulatory restrictions - Costs	Operational considerations
Secondary Research		
<ul style="list-style-type: none"> <li>- Leverage supplier management competences</li> <li>- Ensure rapid delivery, integrate suppliers for lead time reduction</li> <li>- Increase inventory turns to preserve working capital deployability</li> <li>- Engage with suppliers for lean practices and productivity</li> </ul>		

In the second section about SCM's technologies and tools, additionally to its' limitations, the themes pinpoint the diversity in tool utilization and limited constraints concerning tools' usage (Table 13). It is relevant to mention that two

scale-ups have mentioned no limitations with tools' usage. Furthermore, the secondary research contributes by relating SCM's challenges from the addition of SCM's technologies and tools to startups' operations.

TABLE 13. Technology and tools – second section's themes.

2.Section: Technology and Tools		
Questionnaire	Data codification	Themes
<i>SCM technology and tools (n=5)</i>	<ul style="list-style-type: none"> <li>- Customized software tools</li> <li>- Basic tools (Google, email, etc)</li> <li>- WMS (warehouse management systems)</li> <li>- Accounting tools</li> </ul>	<p>Diverse tools utilization</p> <p>Limited constraints</p>
<i>SCM technology and tools limitations (n=4)</i>	<ul style="list-style-type: none"> <li>- Resources limitations for adaptation</li> <li>- Manual processes</li> </ul>	
Secondary Research		
<ul style="list-style-type: none"> <li>- Ensure viable supply chain</li> <li>- Ensure viable operations</li> </ul>		

In the third section data codification (Table 14), the supply chain challenges and risks are linked to geographical issues and dependency on suppliers' operations. These themes are associated with the challenges in expanding channels of distribution and increasing supplier reliability.

TABLE 14. Challenges and risks – third section's themes.

3.Section: Challenges and Risks		
Questionnaire	Data codification	Themes
<i>Supply Chain challenges and risks (n=5)</i>	<ul style="list-style-type: none"> <li>- Intellectual property rights</li> <li>- Supply chain security</li> <li>- Loss of subcontractors</li> <li>- Supply shortage</li> </ul>	<p>Geopolitical risks</p> <p>Dependency on suppliers' operations</p>
Secondary Research		
<ul style="list-style-type: none"> <li>- Expand channels of distribution</li> <li>- Increase reliability</li> </ul>		

The demand and flexibility of supply chain operations establish difficult referent to variability on flexibility, lack of autonomy, and scalability based on complexities which are connected with scale-ups' dependence from various internal and

external factors (Table 15). The dependency leading to these themes is outlined in the secondary research with startups' SCM challenges on increasing customer base, increasing employee productivity to support greater unit output, and obtaining internal returns to support scaling up.

TABLE 15. Demand and flexibility – fourth section's themes.

4.Section: Demand and Flexibility		
Questionnaire	Data codification	Themes
<i>Supply chain flexibility (n=5)</i>	<ul style="list-style-type: none"> <li>- Dependable on product lifecycle</li> <li>- Dependable on suppliers' situations</li> </ul>	Variability on flexibility
<i>Supply chain scalability (n=5)</i>	<ul style="list-style-type: none"> <li>- Dependable on product customization</li> <li>- Dependable on workforce acquisition</li> <li>- Dependable on infrastructure expansion</li> <li>- Dependable on suppliers' reliability and capacity</li> </ul>	Lack of autonomy Scalability upon various complexities
Secondary Research		
<ul style="list-style-type: none"> <li>- Increase customer base</li> <li>- Increase employee productivity to support greater unit output</li> <li>- Obtain internal returns (greater gross margin) to support scale-up</li> </ul>		

Besides the themes from the survey questionnaire sections, the only relevant comment in the last section about additional information (Figure 18) raises awareness of the fact that single individuals may undertake various responsibilities within scale-ups' operations. Further, in the same comment, it is recognized that the answers by this respondent do not fully capture supply chain management aspects across different companies.

We are small start up and management of supply chain is one of "small millions things" one person does at our company. Don't take my answers as good description how companies does supply chain management.

FIGURE 18. Additional comments – last survey questionnaire section only comment.

Considering the results, it is recognized the aspects regarding Tampere scale-ups' SCM's challenges within internal and external environments. Consequently,

the interpretation from the results' thematization led to the answer of RSQ2, where it is identified the SCM's operational challenges of Tampere scale-ups engaged with manufacturing (chapter 4.3).

## **4.2 Secondary Research**

In the execution of the secondary research's data collection method, the data regarding parties in the Tampere startup ecosystem relevant for scale-ups' growth towards expansion were collected via Business Tampere as established in chapter 3.5. During this process, challenges regarding the data displayed within the Business Tampere website arose. Accordingly, the analytical process for the secondary research was directed by the pre-categorized table which due to its significance was modified. In consideration to the aim of this thesis secondary research to acknowledge key parties that can offer support to scale-ups' growth towards expansion, regardless of minimal modifications to the stakeholder analysis, the secondary research still endorses the answer to RSQ3.

### **4.2.1 Stakeholder analysis**

Throughout the stakeholder analysis sourcing of data, executed through Business Tampere website, two challenges were faced along the keyword research process, the misplacement of information and data shortage along the platform. Due to these challenges, all the information correlated to the topic was collected and organized in the pre-categorized table. This table was modified (appendix 14 and 15), on the analytical approach presented in chapter 3.5.1. The modifications were incorporated into the table to facilitate the stakeholders' identification, simultaneously endorsing the development of the stakeholders' influence capacity matrix for the execution of the stakeholder analysis' findings.

Based on the modified table, the key stakeholders are categorized into three sections, experts, organizations and institutions. Along the experts' category (Table 16) is outlined two business specialists and co-creators of the Startup Funnel, Tapio Siik and Teru Kyckling. Additionally, highlights Tapio Siik's correlation to funding support services.

TABLE 16. Key stakeholder experts for Tampere scale-ups.

EXPERTS		
KEY STAKEHOLDERS	EXPERTISE AND FUNCTIONS	IMPACT AND CONTRIBUTION SPECIFICATIONS
<b>Tapio Siik</b>	<ul style="list-style-type: none"> <li>▪ Financial advisor.</li> <li>▪ Developer of Startup Funnel.</li> <li>▪ Connected to Trade and Development Aid Helpdesk (service)</li> </ul>	→ Financial readiness.
<b>Teru Kyckling</b>	<ul style="list-style-type: none"> <li>▪ Senior Business Advisor, International Relations, Startups.</li> <li>▪ Developer of Startup Funnel.</li> </ul>	→ Growth support.

Under the organizations' category of the table (Table 17) is identified Hippo Enabler, Tartu Science Park, Norrköping Science Park, DIMECC and Demola, providing diverse levels of support to scale-ups. Along these five organizations, it is outlined Hippo Enabler, due to the offering of the HippoMeter tool and DIMECC, as a result of their services focus on R&D operations.

TABLE 17. Key stakeholders organizations for Tampere scale-ups.

ORGANIZATIONS		
KEY STAKEHOLDERS	EXPERTISE AND FUNCTIONS	IMPACT AND CONTRIBUTION SPECIFICATIONS
<b>Hippo Enabler</b>	<ul style="list-style-type: none"> <li>▪ Providing HippoMeter.</li> </ul>	→ Investors meetings readiness.
<b>Tartu Science Park</b>	<ul style="list-style-type: none"> <li>▪ Providing Scale-up Launchpad Program.</li> </ul>	→ Practical assistance for company's challenges to create more scaled growth.
<b>Norrköping Science Park</b>	<ul style="list-style-type: none"> <li>▪ Providing the Scale-up Launchpad Program.</li> </ul>	→ Practical assistance for company's challenges to create more scaled growth.
<b>DIMECC</b>	<ul style="list-style-type: none"> <li>▪ Provides a co-creation platform for digital transformations.</li> </ul>	→ Reduce entry time to market.
<b>Demola</b>	<ul style="list-style-type: none"> <li>▪ Collaboration with academic institutions to provide trend contextualization and demonstration services.</li> </ul>	→ Enhancing resiliency and strategic planning.

Lastly, under the institutions' category (Table 18) is allocated Platform 6 as the singular key stakeholder institution, presenting a startup community oriented to entrepreneur networking and guidance.

TABLE 18. Key stakeholders institutions for Tampere scale-ups.

INSTITUTIONS		
KEY STAKEHOLDERS	EXPERTISE AND FUNCTIONS	IMPACT AND CONTRIBUTION SPECIFICATIONS
Platform 6	<ul style="list-style-type: none"> <li>Community of startups, investors, advisors, partners and industry experts</li> </ul>	→ Improving access to capital, market and talent.

Subsequently, to the table completion, the stakeholders' influence capacity matrix (Figure 19) is finalized, allocating the identified stakeholders according to their level of relevancy. Highlighting Tapio Siik and Hippo Enabler as the highest accessible stakeholders whose support has the highest impact to Tampere scale-ups.

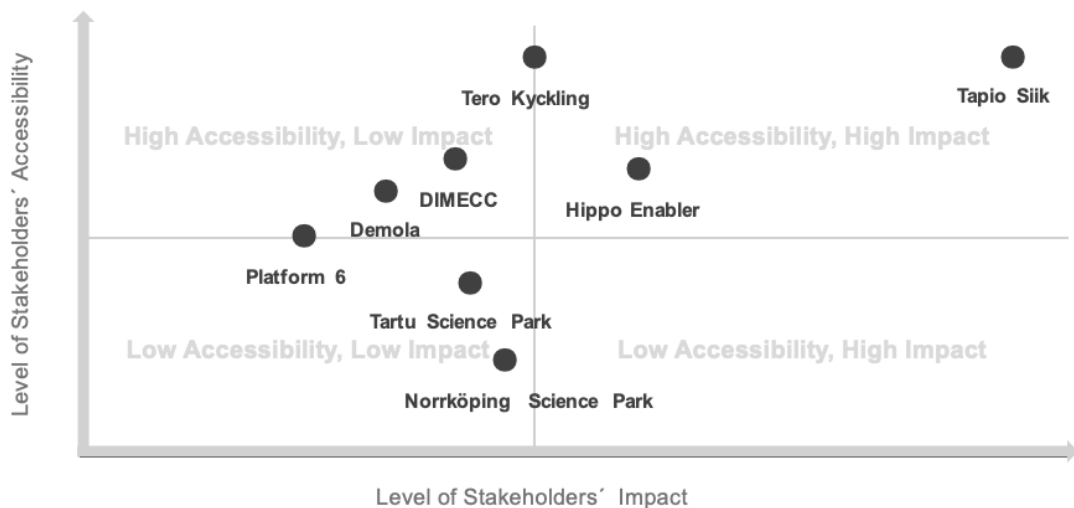


FIGURE 19. Stakeholders' influence capacity matrix (adapted from Rietbergen-McCracken & Narayan 1998).

Upon the merge of findings, it is identified different levels of key stakeholders within the Tampere startup ecosystem provide financial and technology oriented support to scale-ups, upon which is developed the answer for the RSQ3. As a result, the next chapter's interpretation is derived from these factors inducing the overview of parties relevant to scale-ups' growth towards expansion.

### 4.3 Data interpretation

In order to answer the RSQs of this thesis, it is executed the in-depth interpretation of the primary and secondary research's results. Responding to RSQ1 upon the interpretation from chapter 4.1.1. Furthermore, RSQ2 is based upon chapter 4.1.2, while RSQ3's answer is founded on chapter 4.2.1. The findings from the results enable the accomplishment of this thesis objectives in establishing the operational situation of Tampere scale-ups, identifying their SCM's operational challenges and outlining the relevant parties from the Tampere startup ecosystem relevant to Tampere scale-ups' growth towards expansion.

#### **4.3.1 RSQ1: How do scale-ups in Tampere manage their operations and resources for growth?**

Based on interviews' results, Tampere scale-ups engaged with the manufacturing of tangible product manage their operations and resources for growth upon on product development concerning R&D functions. This prioritization reflects the pivotal role of innovation as a competitive advantage fostering growth. Simultaneously highlighting scale-ups resource allocation emphasis to R&D function to guarantee their improvement and relevancy in the market. Furthermore, Tampere scale-ups operations are predominartly driven by their business models, which determine the approach taken in their operations management and resources.

In addition, Tampere scale-ups share similar core functions in the growth stage, which are operations, and marketing and sales, enhancing product and service offerings. The performance management of the core functionalities driving scale-ups' operations is tailored upon specific customer needs, influencing the setting of KPIs. It is relevant to highlight that the KPIs of these scale-ups are defined by product development through customer satisfaction. Consequently, customer-specific requirements lead to the enhancement of offerings to meet market demands. Therefore, resource management of core functionalities is derived from the KPIs, which are founded on customers' demands. Lastly, there is a predominance of financial metrics as a tracking measure of the company's performance, reflecting the significance of financial resilience towards growth.

To elaborate further along Tampere scale-ups resource management aspects, personnel and capital are emphasized and present significant challenges. Causing difficulties in finding the personnel required for specific tasks while outlining the significant value of recruiting upon the company's growth agenda. In contrast, financial constraints restrict operational management due to limitations of acquiring resources required to gain emerging market opportunities. Moreover, growth and market penetration are based on demand forecast, grounded on current market presence setting profitability and strategical growth planning. Affecting scale-ups' development and expansion, subsequently to operational scalability. Additionally, operation scalability in Tampere scale-ups varies on the business model adopted in the organization. Hence, flexibility varies are produced due to the lack of scalability and operational stability, emphasizing capital resources' uncertainty.

To conclude, the R&D function is pivotal for Tampere scale-ups due to their customer demand nature driving growth. However, Tampere scale-ups frequently face obstacles regarding personnel and capital limitations. These constraints hinder Tampere scale-ups' ability to meet market growth prospect opportunities simultaneously impacting their profitability. These limitations affect the capability to acquire the necessary resources for further R&D investment, influencing Tampere scale-ups' development and expansion efforts.

#### **4.3.2 RSQ2: What are the distinct operational SCM challenges in scale-ups in Tampere?**

Upon the survey results, there are four distinct operational SCM challenges faced by Tampere scale-ups engaged with the manufacturing of tangible products, recognized within internal and external environments. These four SCM challenges are comprehended in supplier relationships, regulatory and geopolitical constraints, operational barriers and responsiveness.

Supplier relationship challenges are derived from the balance between product design protection and security supply chain, in which loss of subcontractors significantly influence supply chain's reliability. In addition, dependency on the suppliers' operational capabilities and resource commitment defines the flexibility

and scalability constraints of Tampere scale-ups engaged with manufacturing. Additionally, regulatory and geopolitical constraint challenges are evident due to restrictions on sub-components and parts. Furthermore, geopolitical events induce a shortage of resources that may lead to potential disruptions along the supply chain's functionality. Presenting uncertainty along the supply chain of Tampere scale-ups.

There are also operational barriers due to inventory issues with seasonality and overstock affecting inventory management and operational planning. Influencing infrastructure requirements and skilled workforce acquisition, contributing to resource management challenges in Tampere scale-ups. Another challenge is responsiveness to demand fluctuations upon variability of operational flexibility, product life cycle dependency, suppliers' capabilities and reliability. Interfering with the capabilities to adapt to variations in market demand, pacing Tampere scale-ups' growth and thus, constraining their expansion.

#### **4.3.3 RSQ3: What parties in the Tampere startup ecosystem are relevant to scale-ups' growth?**

According to the stakeholder analysis' results, there are eight key stakeholders identified within the Tampere startup ecosystem, providing different levels of financial and technological support to scale-ups' growth. These key stakeholders providing support to Tampere scale-ups engaged with the manufacturing of tangible product are categorized among experts, organizations and institution groups. Identifying Tapio Siik, Tero Kyckling, Hiipo Enabler, Tartu Science Park, Norrköping Science Park, DIMECC, Demola and Platform 6 as the relevant parties to these scale-ups' growth.

Additionally, the services, tools and support provided by these stakeholders have a predominance of financial aid, R&D operations and networking opportunities, tailored to meet demands presented in Tampere scale-ups. Upon these, Tapio Siik and Hiipo Enabler stakeholders' relevancy is outlined due to their influence and critical financial support, endorsing scale-ups' operational funds, innovation and network expansion. Influencing key aspects of Tampere scale-ups' growth.

## 5 DISCUSSION

In this chapter, the corroboration of the qualitative research is executed through triangulation of the findings from the data analyses from the primary and secondary researches. Consequently, this chapter elaborates data triangulation process within this thesis qualitative research and presents the answer to this thesis RMQ, elaborating the criteria for ERP system selection tailored to scale-ups in Tampere.

### 5.1 Data triangulation

Triangulation aims to corroborate findings through multiple measures or sources while identifying inconsistencies or conflicts through the extended examination of research methodology. The approach enables the confirmation of findings from different sources, facilitating the understanding of conflicting results within the broader research context. Inconsistent findings contribute to the comprehension of insights from different perspectives. There are different types of triangulation, including data source, method, researcher, theory, and data type, the goal is to select complementary sources to provide a comprehensive understanding of the research topic. In summary, triangulation emphasizes the importance of collecting and verifying findings from multiple sources and methods throughout the research process, enabling the exploration of the research topic from different angles and ensuring the reliability and validity of the findings. (Miles, Huberman & Saldana 2019, 294.). To answer this thesis RMQ and create criteria for ERP selection tailored to Tampere scale-ups, triangulation is used based on the findings from the RSQs (Figure 20). These triangulation integrates the results from the primary research techniques (interviews and a survey) with the secondary research (stakeholder analysis).

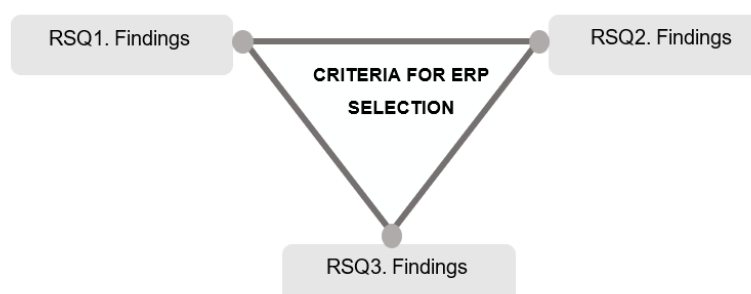


FIGURE 20. Data triangulation for the creation of ERP selection criteria.

According to Miles, Huberman & Saldana (2019, 225-227), variable-by-variable-matrix allows the correlation of variables from analyses, underlying specific interrelated aspects. Hence, a variable-by-variable-matrix is utilized for the codification and analysis of this thesis' qualitative research triangulation process (Figure 21). The execution of the variable-by-variable-matrix leads to the synthesis from the convergences and divergences identified based on the data codification of this thesis' interviews, survey, and stakeholder analysis findings. The convergence unifies the findings, identifying common alignment from scale-ups' internal and external environments. Conversely, the divergence pinpoints the discrepancies between internal and external factors addressing specific variables. Further, the synthesis in consideration of the establishment of the convergences and divergences enables the recognition of characteristics to be taken into account for the creation of the ERP system selection criteria tailored to Tampere scale-ups.

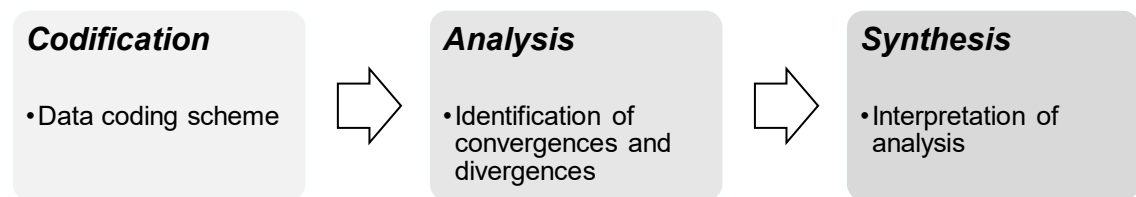


FIGURE 21. Data triangulation process.

Based on the codification by the variable-by-variable-matrix (appendix 16), it is identified four convergences and two divergences from the interviews, survey, and stakeholder analysis' findings (Figure 22). The most significant insight from the convergence of findings is the external and internal emphasis on R&D, highlighting the importance of innovation development for Tampere scale-ups' growth. Due to the internal and external predominance of financial aspects driving scale-ups' growth planning and operational decisions, financial resilience is defined as a crucial aspect for Tampere scale-ups' sustainability. Furthermore, external factors regarding supply chain and market demand influence scale-ups internal situation, increasing the uncertainty of Tampere scale-ups' capabilities. In contrast, the divergences identify a discrepancy between scale-ups' internal

issues with scale-ups' external environment stakeholders' efforts. There is a lack of alignment and integration, first concerning SCM challenges, which are not covered within external support efforts. Secondly, the impact of external networking expansion efforts is not addressed internally. These divergences suggest an inconsistency between Tampere scale-ups' internal and external environment, indicating a gap in the coordination of external initiatives and internal strategies.

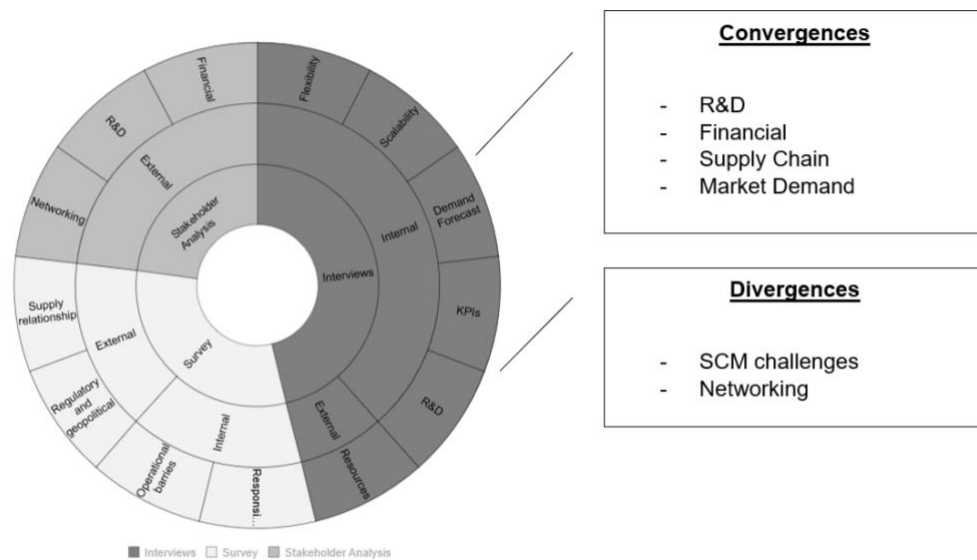


FIGURE 22. Variable-by-variable-matrix graphic representation.

The synthesis of convergences reveals the critical importance of both, internal and external, emphasis on R&D and financial aspects for driving growth and sustaining the operational capabilities of Tampere scale-ups. However, the identified divergencies raise a concern regarding the lack of alignment and integration between scale-ups' internal challenges and external stakeholders' efforts. This highlights a need for better coordination from external initiatives, supporting scale-ups' growth.

### 5.1.1 RMQ: What is the suitable criteria for choosing an ERP system tailored to scale-ups in Tampere?

Considering the triangulation findings, this research's recommended criteria for ERP system selection to scale-ups in Tampere prioritize the system's

functionality and usability (Figure 23). Since scale-ups face uncertainty across various aspects, the ERP system must be flexible and adaptable to respond effectively to changes in operational situations, strategy direction and market conditions. In alignment with Tampere scale-ups' needs for growth, the criteria emphasize R&D and SCM, where the ERP system ought to support and facilitate innovation development while enhancing supply chain visibility and efficiency. Furthermore, to support financial management and ensure sustainability, ERP system features are supposed to assist financial resilience progress, correlating to the predominance of financial aspects driving Tampere scale-ups' operational decisions.

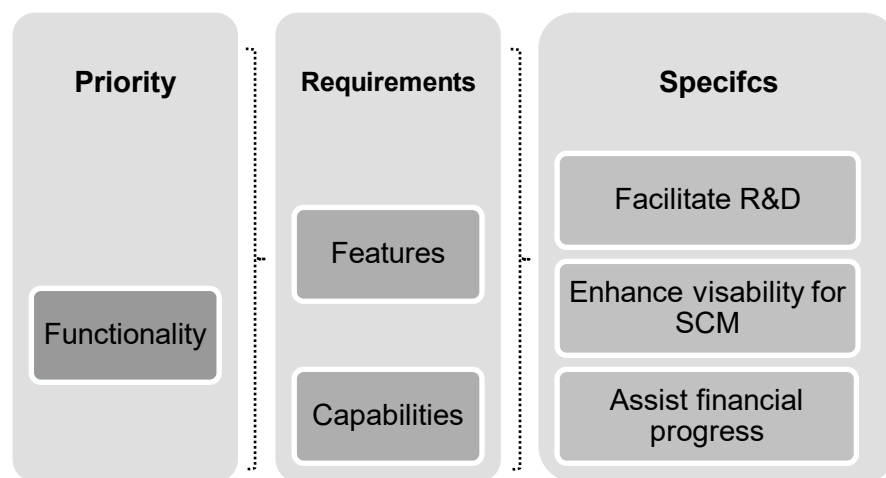


FIGURE 23. ERP system selection criteria's criterion factors tailored to scale-ups in Tampere.

To evaluate this selection criteria, the ERP system's functionality assessment focuses on the system's ability to meet the functional requirements' specifics in contrast to technical complexities. Therefore, flexibility and adaptability measurement relies on how well the ERP system can respond to changes, indicating the system's agility and responsiveness to dynamic environments.

## **6 CONCLUSION**

This chapter summarizes this thesis' findings with correlation to literature materials from this thesis' literature review chapter 2, outlining the significance of the results within the broader context of the research topic. Furthermore, the chapter highlights the limitations of the research and discloses recommendations for future research.

### **6.1 Summary of key findings**

The recommended criteria for ERP system selection address the insights and concerns regarding Tampere scale-ups which were highlighted by both the convergence and divergence findings from the interviews, survey, and stakeholder analysis. Hence, the criteria are R&D facilitation, SCM visibility, and financial assistance. Each criterion contributes to the acknowledgement of scale-ups' internal and external environments' common emphasis on R&D, the discrepancy between scale-ups' internal challenges, mitigating the need for integration of external initiatives, and the predominance of financial aspects driving scale-ups' growth. In correlation to the theoretical foundation provided by this thesis' literature review, Tampere scale-ups' operational situation findings align with startups' lifecycle growth stage. It validates Tampere scale-ups' characteristics, where it pinpointed the focus on scalability and profitability. However, there is also a significant emphasis on innovation development, justifying the need for constant operational's adjustments to sustain growth. The SCM's challenges faced by Tampere scale-ups mirror the complexities discussed in the literature regarding SCM's role in the growth stage. Reflecting how external factors directly impact scale-ups' ability to manage their supply chains effectively. Consequently, the criteria for choosing an ERP system tailored to Tampere scale-ups, as recommended in this thesis, illustrate the aspects of ERP system considered important to growth-oriented operations.

### **6.2 Significance of results**

The insights gained during this thesis' research to provide the criteria for ERP system selection tailored to Tampere scale-ups, reduce the shortfall of

knowledge regarding the impact of scale-ups on ERP systems' selection process. The correlation to the theoretical framework reflects the findings within the broader literature context. Ensuring a comprehensive understanding of scale-ups' internal and external factors that impact the ERP selection process. More specifically, this thesis' findings highlight Tampere scale-ups' priorities by addressing the aspects leading to scale-ups' needs. Consequently, it underscores the importance of addressing these needs according to startups' priorities within the growth stage.

### **6.3 Research limitations**

Despite the efforts conducted in this thesis to maintain systematic research, certain limitations were encountered along the accomplishment findings derived from the methodology. To demonstrate the transparency in which this thesis research is executed, the limitations are condensed into four groups:

- The researchers' capabilities and data validity: due to the reliance on automatic translation tools for the translation of online sources from the Finnish to the English language
- Sampling limitations: based on the low participation rates in interviews and the survey that increased the generalization of RSQ1 and RSQ2 findings
- Circumstances restrictions: due to the overlapping timing with the funding season for startups, scale-ups' availability was constrained. Consequently, affecting this thesis research group's participation in the study
- External validity: considering that the execution of the secondary research was solely based on the data from the Business Tampere website. Thus, restricting the stakeholder analysis findings to the broader insight of parties within the Tampere startup ecosystem relevant for scale-ups' growth.

### **6.4 Recommendations for future research**

In conclusion, the exploration of ERP selection criteria for Tampere scale-ups engaged with the manufacturing of tangible product is relevant to remark defined recommendations. Reflecting on the limitations and the findings of this thesis, it is suggested for future research falling under the same nature to assess the

criteria's feasibility. Furthermore, to further identify parties relevant to Tampere scale-ups' growth, it would be beneficial that future research amplify of external stakeholder analysis to a broader scope beyond the Tampere startup ecosystem. Lastly, to diminish the generalization of findings, it is advised to focus on a specific industry within Tampere scale-ups. As it would allow a more targeted exploration of the research for the facilitation of tailored strategies.

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## APPENDICES

### Appendix 1. Tampere Region Scale-up Funnel - Growth stage: Growth companies (Siik & Kyckling 2024)



## Appendix 2. Interviews Email Template

**Subject:** Thesis Research - Interview Invitation

Dear **[Recipient's Name]**,

I hope this email finds you well. We are two International Business students from TAMK, currently doing our bachelor's thesis. Our research focuses on scale-up companies within the Tampere startup ecosystem focusing on Supply Chain Management (SCM).

**Purpose of This Email:**

We are reaching out to invite you to participate in an interview as your experience and insights within the **[Recipient's Company Name]** - a scale-up located in the Tampere area.

**Research Overview:**

The research goal is to reduce the research gap regarding the impact of scale-ups on the Enterprise Resource Planning system (ERP) selection process and facilitate the decision-making in selecting a suitable system.

**Interview Details:**

- Format: the interview is conducted in English and executed online via Google Meetings (link is sent upon participation confirmation).
- Duration: The interview is expected to last approximately 30-45 minutes.

\*Confidentiality: We assure you that all responses will be treated with the utmost confidentiality, and any information provided will be used solely for academic purposes.

\*Consent: Your participation is entirely voluntary, and you may withdraw at any time without penalty.

**Response Deadline:**

Please let us know by Friday (08.03.2024) if you would be willing to participate in this research and we can discuss a time and date that suits your schedule. Your participation is highly appreciated.

**Contact Information:**

Should you have any questions or require further details, please do not hesitate to contact us through this email or at +358 45 31344021.

Thank you very much for considering this invitation. We look forward to discussing this further with you and hope to hear from you soon.

Best regards,

India and Shirley.

Indiamara Claudino | BBA in International Business -TAMK

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### Appendix 3. Interviews Confidential Disclosure Agreement Template

#### CONFIDENTIALITY DISCLOSURE AGREEMENT FOR BACHELOR'S THESIS INTERVIEW

Date: [dd.mm.yyyy]

This agreement is between Indiamara Claudino, Shirley Trigos Navarrete (referred to as "Interviewers") and [interviewee's Name] ("Interviewee").

##### PURPOSE OF THE INTERVIEW:

The interview is conducted to gather data for a bachelor's thesis to reduce the research gap regarding the impact of scale-ups on the Enterprise Resource Planning system (ERP) selection process and facilitate the decision-making in selecting a suitable system.

##### CONFIDENTIALITY:

- The Interviewers agree to keep all data shared during the interview strictly confidential. This means it will not share any specific details that could identify the Interviewee or their company without explicit permission.
- The data from the interview will be used in the Interviewers' thesis and related academic work, ensuring anonymity and confidentiality.

##### USE OF DATA:

- The data provided by the Interviewee will be used solely for academic purposes related to completing the bachelor's thesis.
- Identifiable data will be altered or omitted in the thesis and any presentations or publications related to it, ensuring the Interviewee's privacy.

##### AGREEMENT:

- This agreement starts on the date signed and continues indefinitely. The confidentiality promise does not expire.
- Either party can end this agreement with a written notice if needed, but the confidentiality promise remains in effect even after the agreement ends.

By signing this agreement, all parties agree to the terms described above.

**Interviewers' Signatures and date:**

**Interviewee's Signature and date:**

## Appendix 4. Interviews Questionnaire

- **TELL US ABOUT YOUR COMPANY**

- **CATEGORY 1: PIVOTAL FUNCTIONS**

What are the core functions/departments in your company?

- **CATEGORY 2: FUNTIONALITY NEEDS**

What are the key performance requirements of your functions/departments?

- **CATEGORY 3: RESOURCE MANAGEMENT**

What are the essential resources to your core functions/department?

- ➔ **SUB-CATEGORY 3.1.: USAGE RESOURCE**

How are you utilizing essential resources?

- ➔ **SUB-CATEGORY 3.2.: LIMITATION OF SOURCES**

Are there any constraints in essential resources utilization?

- **CATEGORY 4: REPORTING REQUIRIMENTS**

What do you keep track to know the company's performance? And why?

- **CATEGORY 5: SCALABILITY**

Does the company's current financing contribute to scaling operations? How and why?

- ➔ **SUB-CATEGORY 5.1.: FINANCE**

Do you have any indicators for forecasting demand? What?

- ➔ **SUB-CATEGORY 5.2.: DEMAND**

How flexible are your operations to meet demand variations/changes?

## Appendix 5. Survey Email Template

Dear [Subject's Name],

I hope this email finds you well. We are reaching out to invite you to participate in our online survey as your experience and insights within the [Company's Name] - a scale-up with a tangible product located in the Tampere area.

*\* If you are not a scale-up or do not have a tangible product please inform us.*

### **Purpose of the survey:**

The survey is conducted to gather data for a bachelor's thesis to reduce the research gap regarding the impact of scale-ups on the Enterprise Resource Planning system (ERP) selection process and facilitate the decision-making in selecting a suitable system.

### **Survey Details:**

- **Format:** The survey is conducted in English and executed online via Google Forms (link below)
- **Duration:** The survey takes approximately 8 minutes.
- **Deadline:** 05.04.2024 (Next Friday)

Your participation in this survey is highly appreciated!

SURVEY LINK: <https://forms.gle/k91iNMWYfi6cazoS8>

### **Contact Information:**

Should you have any questions or require further details, please do not hesitate to contact us through this email or at +358 45 31344021.

Thank you very much for your input.

Best regards,  
Shirley & India.

Shirley Navarrete | BBA in International Business -TAMK  
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## Appendix 6. Survey Open-ended Questionnaire - Structure Table

Theme	Questions
<p style="text-align: center;"><b>SCM Practices</b></p>	<p style="text-align: center;"><i>What are the main components of your supply chain network?</i></p>
	<p style="text-align: center;"><i>What are the key performance indicators (KPIs) used to evaluate your supply chain operations? Briefly explain why these indicators are important.</i></p>
	<p style="text-align: center;"><i>Are there any limitations or constraints related to transportation and logistics in your supply chain operations? Please provide brief explanations.</i></p>
<p style="text-align: center;"><b>Technology and Tools</b></p>	<p style="text-align: center;"><i>What technologies or tools does your company utilize for supply chain management?</i></p>
	<p style="text-align: center;"><i>Are there any limitations or constraints in the technology or tools currently used for supply chain management? Please provide brief explanations.</i></p>
<p style="text-align: center;"><b>Challenges and Risks</b></p>	<p style="text-align: center;"><i>What are the most significant challenges or risks your company faces in managing its supply chain operations? Please provide brief explanations.</i></p>
<p style="text-align: center;"><b>Demand and flexibility</b></p>	<p style="text-align: center;"><i>How flexible are your supply chain operations in responding to changes in demand?</i></p>
	<p style="text-align: center;"><i>What challenges or considerations do you encounter when scaling up your supply chain operations?</i></p>
<p style="text-align: center;"><b>Additional Comments</b></p>	<p style="text-align: center;"><i>Is there anything else you would like to share about your company's supply chain management challenges or experiences?</i></p>

## Appendix 7. Survey Questionnaire's Disclaimer

## Thesis Research- Tampere area Scale-ups

TAMK's International Business students are conducting research regarding the *supply chain operations of Tampere area startups in the growth stage (scale-ups)*.

**The survey will take about 8 min and your input is appreciated!**

**Survey Disclaimer:**

- **CONFIDENTIALITY:** The answers to this survey are anonymous and we do not keep any personal data (e.g. email address, name, etc).
  - **USE OF DATA:** By answering this survey, you will not be added to any marketing communication channel, therefore, you will not get any further messages regarding this survey.
- The results will be used for academic research purposes only.

**AGREEMENT: By proceeding you are agreeing with this survey's terms.**

## Appendix 8. IC1 - Transcript Summary Otter AI (ed.) 2024

In the first segment, Speaker 1 and Speaker 2 discussed the importance of key performance indicators (KPIs) for scaling operations. Speaker 2 emphasized the significance of KPIs such as turnover, number of projects, and profitability, which help the company understand its progress towards strategic targets. In the second segment, Speaker 1 and Speaker 2 discussed essential resources and strategies for managing resources and performance in software development companies. Speaker 2 emphasized the importance of tracking and analyzing data related to sales pipeline, customer segments, and lead size to optimize the sales process. Furthermore, Speaker 2 highlighted the need for quality resources, such as competent people, and effective project planning and management tools, like GitLab, to ensure timely and cost-effective delivery of software development projects.

- **Supply chain and ERP selection for thesis research.**

Unknown Speaker and Speaker 1 introduce themselves and explain the purpose of the call.

- **Company's product, market, and organizational structure.**

Ex-Nokia engineer founded Melo in 2015 to provide signal processing algorithms and software for situational awareness in autonomous driving and remote controlled machines.

Company focuses on developing and licensing algorithmic software, with core functions including product development, sales and marketing, and outsourcing.

Company prioritizes product development, marketing, and organizational structure, with a flat organizational structure and outsourced accounting and IT services.

- **Resource management and performance tracking in IT services.**

Company tracks sales pipeline, ideal customer segments, and performance metrics to optimize marketing and sales efforts.

Company monitors IT services availability and cost to ensure expected service level.

Speaker 2 explains how the company manages human resources in larger projects, prioritizing competent people and using GitLab for planning and execution.

- **Resource utilization and company performance tracking.**

Developers utilize various resources, including prototyping devices and test vectors, to validate software functionality and performance in different environments.

Company utilizes external experts and collaborates with startups for specific competence requirements.

Company prioritizes product development and external financing to balance cash flow and invest in own development.

- **Company's financial situation and scalability.**

The company tracks key performance indicators (KPIs) to monitor progress towards strategic targets, including monthly turnover, number of projects, and profitability, as well as runway and recurring income.

Company aims to secure new financing to scale operations, but faces long development cycles with customers.

Company may scale up or down operations based on economic conditions.

## Appendix 9. IC2 - Transcript Summary Otter AI (ed.) 2024

Speaker 2 discussed the company's focus on developing IoT devices and services for air quality monitoring, emphasizing the importance of research and development, marketing and sales, and legal compliance. He also highlighted the need for key performance indicators to monitor performance and identify areas for improvement. Meanwhile, Speaker 1 inquired about the company's core functions and resources required for their startup's growth, including people with the right expertise and willingness to learn. Later, Speaker 1 and Speaker 2 discussed financial metrics and indicators used to evaluate the scalability of operations, including monthly and annual recurring revenue, and shared their experience with adapting their system to meet new customer needs.

- **Supply chain and ERP selection for academic research.**

Unknown speaker introduces interview, while Speaker 1 clarifies data sharing terms and agrees to participate.

- **IoT devices and services, company background, and core functions.**

Three Nokia veterans founded a company in 2018 to develop IoT devices and services, but they sold their shares and founded a new company instead to pursue their original goal of providing air quality information.

Developing IoT devices and services, collecting data from the environment and transferring it to the cloud for analysis and action.

CEO highlights R&D, marketing/sales, and legal departments as core functions for the company.

- **Core functions, r&d, marketing, sales, and legal requirements in a small startup.**

Company of 4.5 people handles various functions, including R&D, marketing, and sales, with a focus on electronic design and software development.

Speaker 2: R&D aims to increase customer value by meeting unique needs and improving efficiency to handle larger volumes of customers.

Speaker 2: Sales and marketing are crucial for startups, with lead generation and order fulfillment being key processes.

Speaker 2 emphasizes the importance of maintaining high-quality logistics and manufacturing processes to ensure product accuracy and quality in a startup.

- **Resource management and financial metrics for a startup.**

Essential resources for core functions include people with expertise and a willingness to learn, with limitations on time and personnel.

Speaker 2: Startup faces challenges with component availability and manufacturing due to COVID-related disruptions.

Speaker 2 mentions financial metrics such as monthly recurring revenue and annual recurring revenue, as well as the company's flexibility in meeting demand variations.

- **Demand forecasting and supply chain management.**

Company successfully modified their system in two months, creating a new market opportunity with potential for significant growth in the coming years.

Company discusses potential investment opportunities and demand forecasting strategies with a potential investor.

Company forecasts demand by analyzing patterns in customer orders and asking customers about future plans.

## Appendix 10. IC3 - Transcript Summary Otter AI (ed.) 2024

Speaker 1 and Speaker 2 discussed the potential of IoT technology in the construction industry, highlighting its benefits in improving quality and efficiency. Speaker 2 also discussed EGate's partnership strategy with channel partners in various countries, emphasizing the importance of understanding the value proposition and effective communication. Later, Speaker 2 discussed the challenges of securing funding for their tech startup in Finland and expanding their business internationally, including accessing funding and navigating different investor landscapes.

- **Supply chain management and ERP system selection.**

Speaker 2, 46, entrepreneur, shares background and experience in Tampa Bay area.

- **Utilizing IoT technology for construction quality control.**

Company developed an IoT sensor for measuring concrete strength, overcoming manual measurement challenges.

Ego is an IoT tool for building higher quality, faster, and healthier with less health hazards.

Speaker 2 emphasizes the importance of prioritizing people over profits in construction.

- **Outsourcing and partnerships for eGates' software and hardware development.**

Speaker 2 seeks to build a bigger team, including a CTO and CEO, to bring more expertise in-house.

Speaker 2 discusses eGates' partnerships and software-focused business model.

- **Utilizing resources (money, people, expertise) to grow a software company.**

Speaker 2 discusses using partnerships to expand business, prioritizing value over technical details.

Company is expanding its go-to-market efforts in Europe and developing new software integrations.

Speaker 2: Money is necessary but not enough; need best people, best idea, and best solution to attract best customers and channel partners.

Speaker 2: Utilize capital to hire marketers, increase marketing, and get more channel partners; prioritize structuring the organization first.

- **Fundraising challenges in Finland's small market.**

Company plans to invest in people, knowledge, and technology to become stronger and more investable.

Speaker 2 seeks investors for Finnish skateboarding app, has Indian partner and US patent.

Speaker 2 emphasizes the importance of believing in what is possible, even when others say it's impossible.

- **Expanding a startup internationally, focusing on financial performance and market growth.**

Speaker discusses challenges of scaling a startup in Finland due to small market size.

Speaker 2: Importance of financial analysis for business success (32:54)

Speaker 2: Need to track company performance and present to investors (33:39)

- **Scaling eGates' business in Europe, with focus on market education and resource allocation.**

Speaker 2: Scaling up slow without sufficient funds, partnerships help.

Speaker 2 plans to find investors for IoT and construction tech startups by networking and showcasing market demand.

Company aims to educate European markets on digitalization and data economy in construction industry.

- **Digitalization and data analytics in construction industry.**

Speaker 2 highlights eGauge's flexibility in meeting demand variations in operations and digitalization in the data industry.

Speaker 2 optimistic about reducing emissions through data-driven construction strategies.

Speakers discuss potential solutions for expanding a business, with a focus on resource management and Exede.

Appendix 11. Interviews Redefined Data Analysis Matrix

CATEGORIES	SUB-CATEGORIES	INTERVIEW CASE 1	INTERVIEW CASE 2	INTERVIEW CASE 3
PIVOTAL FUNCTIONS (1)	R&D	x	x	
	OPERATIONS AND COMPLIANCE	*Management *Organization	*HR *Accounting *Logistics - assembling	
	MARKETING AND SALES	x	x	*Sales: Through partners channels
	OTHERS	*Accounting and IT services Outsourced/Partly outsourced *Manufacturing - Programming	*Manufacturing Outsourced	* Operations and organization NO Compliance <i>(Operations are outsourced through channel partners)</i>
FUNCTIONALITY NEEDS (2)	R&D	Quality over quantity of customer case	Customer value (meeting customer requirement and increase of market value) and efficiency	
	OPERATIONS AND COMPLIANCE	Personal development and risk tracking	Legal clearance and decrease of risks *HR: expertise level *Accounting *Logistics - assembling: quality assurance and improvement	
	MARKETING AND SALES	Marketing funnel - sales pipeline track	Lead number of cases, demand prospect	
	OTHERS	*Accounting and IT services: Capabilities and tools/systems capacity *Manufacturing - Programming: Amount and size of cases	*Manufacturing Quality assurance and product accuracy	<b>OVERALL FUNCTIONALITY NEEDS:</b> *Channel partner growth *Milestones accomplishment *Closed contracts *Market penetration
RESOURCE MANAGEMENT (3)	TIME	x	x	
	PERSONNEL	x	x	x
	CAPITAL	x	x	x
	OTHERS	*Quality Management		*Channel partnerships
USAGE RESOURCES (3.1)		*Resources are adjusted based on the customer case -> Characteristics: flexible, adjustable, highly uncertainty	*Quality management	*Marketing *Expansion of channel partnerships
LIMITATION OF RESOURCES (3.2)	TIME	x	x	
	PERSONNEL	x	x	x
	CAPITAL/FINANCING	x	x	x
	OTHERS			*Autonomy Because of how they operate which is through channel partners *Market scope - prospects Funding, channel partners, mega trends
REPORTING REQUIREMENTS (4)	FINANCIAL METRICS	*Runway *Income	*Runway	*Financial history Balance sheet
	OTHERS	*Monthly KPI: - Number of projects - Profitability - Turnover *Strategic execution - Milestones accomplishment	*Monthly and Annual KPI: - Recurring revenue *Logistics: - Manufacturing and assembling performance  WHY: To keep their performance/operations	*Future strategy - milestones accomplishment *Market value Measuring market size and revenue estimations  WHY: to communicate value
SCALABILITY PROSPECT AND FINANCE (5)	YES			
	NO	<b>BECAUSE:</b> -The financing is not secured/reliable -Lack of commercial breakthrough -The long development cycle of the product	<b>BECAUSE:</b> - Lack of operational flexibility - The financing not secured/reliable - Time constrains	<b>BECAUSE:</b> -Lack of autonomy (scalability timing is dependable of channel partners) -Lack of financial and personnel resources
DEMAND FORECASTING (5.1)		*Customer Acquisition Rate - Customer Growth Rate -> Cases within target segment	*Contract agreements *Identifying patterns -In external market -> previous company *Market penetration prospect -Upon product modifications	*Channel partners market data Construction sales, location statistics *Channel partnership growth Rights available/optimal *Lack of channel partner prospect
DEMAND VARIATIONS (5.2)	HIGHLY FLEXIBLE	<b>BECAUSE:</b> -External economic situation: easy to acquire skilled personnel		
	MID-HIGH FLEXIBLE			<b>BECAUSE:</b> -The operational model allows to meet demand through channel partners -Leverage megatrends, legal requirements, channel partners reputation
	NOT FLEXIBLE		<b>BECAUSE:</b> - Personnel constrains -> Capital limitations	

## Appendix 12. Survey Questionnaire Results Reporting Table

Sections	Questions	N of answers	Answers
SCM Practices	<i>What are the main components of your supply chain network?</i>	5	OEM sub-component supplier(s), ODM assembly/distribution
			Mechanical.
			Component procurement, assembly, delivery
			Manufactures >Transport > Warehouse > Transport > Retailer/Consumer
			Sensor and software manufacturing
	<i>What are the key performance indicators (KPIs) used to evaluate your supply chain operations? Briefly explain why these indicators are important.</i>	5	On-time delivery, reproducibility, reliability, agility.
			Revenue.
			Amount of stock (component), amount of money in bank account. How quickly we can deliver, how much we can promise to deliver.
			Inventory Level: Optimizing the amount of inventory on hand. Open Sales Orders, Including Delay Time: Orders that are on hold due to stock management issues. Customer Satisfaction with Shipments (incl. reclamations): Assessing how pleased customers are with their order deliveries.
			For measuring devices, high and verifiable measurement accuracy and reliability. delivery reliability and delivery speed as well as price. In terms of software development, the team's expertise and mutual dynamics, delivery reliability and price.
<i>Are there any limitations or constraints related to transportation and logistics in your supply chain operations? Please provide brief explanations.</i>	5	No	
		Some sub-components and parts may have dual-use restrictions, especially in the current geo-political situation.	
		Schedule of the electric assembly factory.	
		We encounter challenges with oversized packages. Moreover, certain countries impose limitations on the dimensions of packages and some customs have limitations on kids' toys.	
		Our model is based on local production, thus the countries without local provider could purchase from the closest country which add on transportation costs, exmple of our production site in Kenya that provides for all the african countries	
Technology and Tools	<i>What technologies or tools does your company utilize for supply chain management?</i>	5	In-house tools.
			Accounting program
			Google sheets, email, phone
			Warehouse Management Systems
			Everything is outsourced so basically we order the Sensors using email and our sensor manufacturer then probably uses SCM and ERP
	<i>Are there any limitations or constraints in the technology or tools currently used for supply chain management? Please provide brief explanations.</i>	4	No
			Resources for adaptation to new processes.
			No.
			We have done mostly everything manually so far. However, we are starting light ERP system in two months.

<b>Challenges and Risks</b>	<i>What are the most significant challenges or risks your company faces in managing its supply chain operations? Please provide brief explanations.</i>	5	Balancing between design protection and intellectual property vs. securing redundant supply chain.
			Loss of good subcontractors.
			If China attack in Taiwan then huge semiconductors shortage is coming.
			1. Manual work 2. Lack of manufacturers 3. Seasonality 4. Overstock
			As we outsource the development and production of measuring devices and software development, we are in a way dependent on how our suppliers organize their own operations and how, for example, the software subcontractor can commit the resources committed to our project so that the turnover and brain drain of key developers is as small as possible.
<b>Demand and flexibility</b>	<i>How flexible are your supply chain operations in responding to changes in demand?</i>	5	Strongly dependent on the stage of product life cycle.
			Not that flexible.
			Good enough at least so far.
			Quite flexible.
	<i>What challenges or considerations do you encounter when scaling up your supply chain operations?</i>		depends very strongly on the supplier's situation. If demand is high and resources are limited, there will be problems with supply reliability and responsiveness.
			In practice, all products are custom made for specific customers and changing specifications introduce additional challenges for planning / scaling up.
			Finding good work force.
<b>Additional Comments</b>	<i>Is there anything else you would like to share about your company's supply chain management challenges or experiences?</i>	3	We need to expand our factory and hire more people.
			Finding new manufacturers
			we have to trust that the suppliers will be able to supply us with enough iron and software to meet the growing need. we will also be recruiting mis developers to ensure delivery reliability and cost efficiency.
			No
			We are small start up and management of supply chain is one of "small millions things" one person does at our company. Don't take my answers as good description how companies does supply chain management.
-			

Appendix 13. SCM-Related Challenges Along Startup Phases Table (Wagner 2021)

Boundary focus	Initial start-up phase	Growth phase	Stability phase
Across the startup firm boundaries (supply chain)	Ensure high customer responsiveness and rapid delivery	Increase customer base Expand channels of distribution Leverage supplier management competencies	Integrate suppliers for lead time reduction Engage with suppliers for lean practices and productivity Ensure sustainable supply chain
Within the startup firm (operations)	Increase inventory turns to preserve working capital deployable to product and market development	Increase production volume to service greater demand Reduce lead times Obtain internal returns (greater gross margin) to support scale-up	Continuously reduce lead times and increase reliability Increase employee productivity to support greater unit output Ensure sustainable operations
Within the startup firm (R&D, product and service and technology commercialization)	Choose of breadths and depths of idea and innovation search Select mode of technology commercialization (internal vs. externalized) Organize and protect intellectual property rights (IP)	Integrate products with services	Diversify and augment products

Appendix 14. Stakeholder Analysis Data Reporting Table

CATEGORIES	KEY STAKEHOLDERS	EXPERTISE AND FUNCTIONS	IMPACT AND CONTRIBUTION SPECIFICATIONS
Experts	Tapio Siik	Financial advisor + Developer of <b>Startup Funnel (tool)</b> + <b>Trade and Development Aid Helpdesk (service):</b> explore funding paths with expert service	<b>Financial readiness</b> (Financing opportunities and instruments.) + (through projects and grants offered by UN organizations, development banks, and NGOs)
	Teru Kyckling	Senior Business Advisor, International Relations, Startups + Developer of <b>Startup Funnel (tool)</b>	<b>Growth support</b> (Strategic growth facilitation.)
Organizations	Hippo Enabler	<b>Providing HippoMeter (tool):</b> A company situation analyzer.	<b>Investors meetings readiness</b> (Identifying potential issues and areas for improvement.)
	Tartu Science Park	<b>Providing Scale-up Launchpad Program (service):</b> Growth program.	<b>Practical assistance for company's challenges to create more scaled growth</b> (Focus on financing, team, strategy and expansion into new markets.) <i>*Oriented to companies with product/services connected to the Smart City theme</i>
	Norrköping Science Park	<b>Providing the Scale-up Launchpad Program (service):</b> Growth program.	<b>Practical assistance for company's challenges to create more scaled growth</b> (Focus on financing, team, strategy and expansion into new markets.) <i>*Oriented to companies with product/services connected to the Smart City theme</i>
	DIMECC	<b>Providing a co-creation platform for digital transformations (tool/service)</b>	<b>Reduce entry time to market</b> (Conducting strategic R&D new technologies: facilitation, networking and matchmaking.)
	Demola	Collaboration with academic institutions to provide <b>trend contextualization and demonstration service (service)</b>	<b>Enhancing resiliency and strategic planning</b> (Interaction and engagement with early talent and providing future insights.)
Institution	Platform 6	<b>Community of startups, investors, advisors, partners and industry experts</b>	Improving access to capital, market and talent.

Appendix 15. Stakeholder Analysis - Accessibility and Impact Measure Table

CATEGORIES	KEY STAKEHOLDERS	HIGH ACCESSIBILITY, LOW IMPACT	LOW ACCESSIBILITY, LOW IMPACT	HIGH ACCESSIBILITY, HIGH IMPACT	LOW ACCESSIBILITY, HIGH IMPACT
Experts	Tapio Slik			Reasoning: easy to contact (contact info available), linked to different financial services, enable connection to "extra value" through other services/people/organizations	
	Teru Kyckling	Reasoning: easy to contact (contact info available), discussion rather than action			
Organizations	Hippo Enabler			Reasoning: easy to get access, offer tailored/personalized assistance/support	
	Tartu Science Park		Reasoning: limited spots for participation, they select who participates, few events/ll to none action points currently available		
	Norrköping Science Park		Reasoning: limited spots for participation, they select who participates, few events/ll to none action points currently available		
	DIMECC	Reasoning: easy to contact (contact info available), offering pretty general but offer access from experts			
	Demdia	Reasoning: easy to contact (contact info available), offering pretty general, more correlated to academics work			
	Platform 6	Reasoning: easy to contact however criteria needs to be met, offering pretty general but may have high impact depending on who is within the services/events PG offer			

## Appendix 16. Data Triangulation Variable-by-Variable-Matrix

Method	Environment	Themes	Convergences	Divergence
Interview	Internal	R&D: product development	R&D is addressed by internal and external aspects within Tampere scale-ups operational situation and Tampere startup ecosystem's parties	SCM challenges from supply chain dependence is not covered within external support efforts from stakeholders
Interview	Internal	KPIs: driven by customer satisfaction, predominance of financial metrics		
Interview	External	Resources: personal and capital		
Interview	Internal	Demand forecasting: founded on current customers' base	Financial is the main factor influencing operational performance and management, additionally to external efforts	
Interview	Internal	Scalability: varies upon business model		
Interview	Internal	Flexibility: varies due to scalability		
Survey	External	Supply relationship challenge: based on product design and protection, and security of supply chain	Supply chain is highly dependable on different internal and external factors	The impact of external networking expansion efforts is addressed within Tampere's scale-ups internal aspects
Survey	External	Regulatory and geopolitical constraints: shortage of resource supply		
Survey	Internal	Operational barriers: inventory issues		
Survey	Internal	Responsiveness: flexibility and scalability varies to meet demand fluctuations	Market demand highly affects internal factors, where operational scalability varies, influencing flexibility to meet demand fluctuations	
Stakeholder Analysis	External	Financial aid: capital gain, financial support		
Stakeholder Analysis	External	R&D: product development		
Stakeholder Analysis	External	Network expansion: collaboration prospects		