

## **Management priorities of technology-based growth ventures in two Finnish high-tech business contexts**

### **Abstract**

New knowledge about growth in technology-based growth ventures is needed to strengthen business development within its context. This retrospective multiple-case study clarifies the context-specific viewpoints related to the early stages of technology-intensive companies in two cities in Finland by addressing research question: What are the management priorities of technology-intensive growth ventures in Finnish high-tech contexts? Using the sequential incident technique and semi-structured interviews, managers of ten companies were asked to describe their business growth. The study tests the applicability of a literature-based framework for the early stages of growth in technology companies and analyses context-specific viewpoints. By taking account of the context, the study provides new insights into the growth and management of technology-intensive companies and special characteristics of different high tech contexts. Moreover, the results provided evidence for the applicability of the framework in the selected contexts.

*Keywords – growth management; business growth; technology-intensive companies; business contexts; sequential incident technique; multiple-case study*

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## Introduction

Small and medium-sized companies (SMEs) are the fastest growing sector in many national economies and are more flexible, adaptable and agile than many larger organizations (Tagliavini, Ravarini & Antonelli 2001, Yifeng 2011). Private enterprises can be regarded as the backbone of a flexible economy because they stimulate demand by creating jobs, innovations and competition (European Commission 2011). Early growth is the most critical period for a company's survival, and while SMEs create new jobs, many jobs are also lost due to closures. Decisions made during a business's early growth play a significant role in the company's survival and success.

McKelvie & Wiklund (2010) contend that business growth should be studied as a process rather than as an outcome, but most of the research to date has focused on the factors that lead to growth (growth as an outcome), without acknowledging content- or context-specific characteristics (McKelvie, Wiklund 2010, Shepherd, Wiklund 2009). McKelvie and Wiklund (2010) expressed concern that researchers try to answer questions about 'how much' firms grow before properly understanding 'how' they grow. Business growth processes are mostly described using generic-deterministic models; however, the latest developments are moving research towards more dynamic presentations of growth processes, (e.g. for probabilistic 'states of growth' see Levie & Lichtenstein, 2010; Muhos et al., 2010; Phelps et al., 2007). The vast majority of growth research has not acknowledged qualitative and contextual differences in the growth processes of companies (see McKelvie & Wiklund, 2010; Shepherd & Wiklund, 2009). This paradigm shift provides a starting point for building new context-specific research focused on the dynamic and contextual nature of business growth processes.

The present study is informed by stages of growth models discussed in recent reviews of the literature (Levie, Lichtenstein 2010, Muhos et al. 2010, Phelps, Adams & Bessant 2007). According to these stage models, managerial problems or critical incidents related to business development are predictable, and the manager can be prepared for them. The models identify typical managerial problems and suggest measures for managing business growth at different stages (Davidsson, Wiklund 2006). However, less attention has been paid to the applicability of these models to different business contexts or to the context-specific aspects of growth stages. To formulate a self-evaluation framework, Muhos et al. (2011) synthesised the main findings of 14 empirically-based stage models focusing on technology-intensive companies. The framework divided the early stages of technology-intensive companies into four stages: conception and development (stage 1), commercialisation (stage 2), expansion (stage 3) and stability (stage 4).

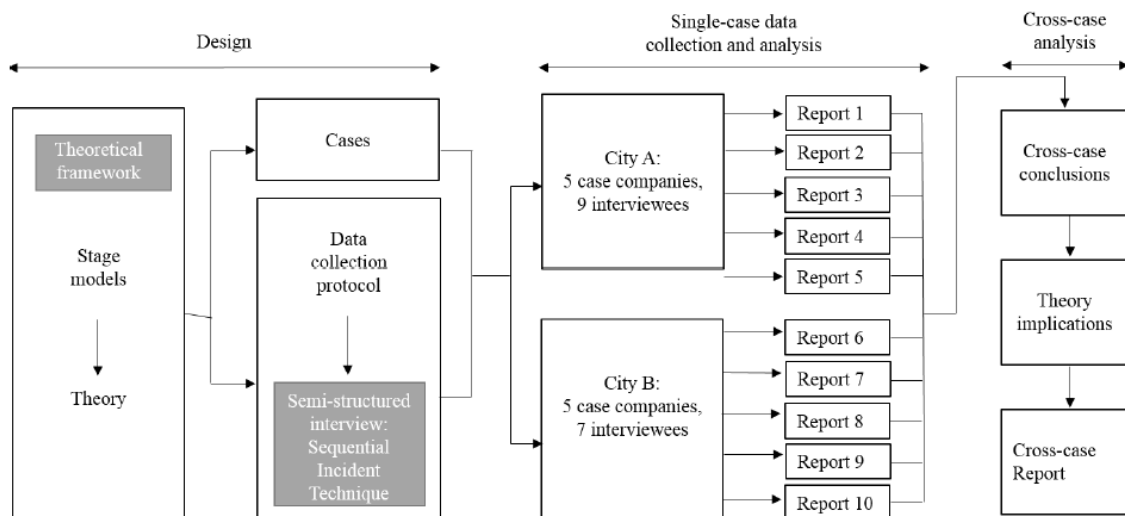
Application of the four-stage framework has been empirically tested in different business environments in California (Muhos et al. 2016), Finland, Thailand and Taiwan (Muhos et al. 2014b, Muhos et al. 2014a). The findings from these contexts offered preliminary support for the framework's applicability to the experiences of managers during the early stages of growth. However, it was also found that growth does not happen in isolation from the context. Each of these studies provided rich evidence about the context specific characteristics of growth such as commercialisation-oriented growth strategies of the US context (California), productization-oriented growth strategies of the Nordic context (Finland) and network-oriented growth strategies of the South-East and East-Asian contexts (Thailand and Taiwan). It was noted that these contexts should be further opened to generate more in-depth understanding of the growth mechanisms of technology-intensive businesses in different contexts within one country.

In the present study, Finland was selected as a target business context and the technology-based ventures as a research object. The above framework was applied and tested in two

different Finnish business contexts, the Jyväskylä and Oulu regions. As a main difference between these regions

The preconceived assumptions of the framework are described in detail in Appendix 1, and the coding set out in Appendix 1 was used to analyse and reflect upon the experiences of the managers of case companies during the early stages of company growth. In-depth analysis of those experiences identified gaps between reality and the four-stage framework, highlighting paths for further development of these models. The study addresses the following research question: *What are the management priorities of technology-intensive growth ventures in two Finnish high-tech contexts?*

For the purposes of this analysis, we define an early-stage technology-intensive company as follows. First, a technology-intensive company is a research and product development-based company whose continuous aspiration to valuable, rare and inimitable knowledge in high technology leads to new or enhanced products and services (see for example (Muhos 2011)). This refers not only to producers of technology products but also to companies whose business model is based on marketing technology expertise, either as a subcontractor or as a development partner. Second, the term early refers to the firm's recency. According to Storey and Tether (1998a, 1998b), the early stages of technology-intensive companies should be studied because these companies must cover their research and development costs using incomes that are insecure and may be actualised only after a long time. Additionally, the timeframe for technology-intensive business models is typically short, which may lead to delays and loss of earning opportunities.



**Figure 1** Research process

## Method

Following Yin (1994), this research takes the form of a retrospective multiple-case study. The case study is a research strategy that aims to explain causality or chains of events over a longer time period, or to pursue descriptive research (Eisenhardt 1989). A case study approach is appropriate when seeking to describe current phenomena in their real-life context by answering questions of 'how' and 'why' (Yin 1994). In the present study, we are interested in changes associated with critical incidents during the early stages of business growth. Detailed grounding in empirical reality facilitates development of a testable, relevant and valid theory (Glaser, Strauss 1967).

Managers of ten case companies were analysed using the sequential incident technique (SIT), a specific form of the critical incident technique (CIT) (Flanagan 1954, Chell 2014). Interviewees were required to identify and describe the critical incidents (CIs) as well as the consequences of those CIs for the business. Any extant conceptual framework involves a set of preconceived categories, entailing assumptions; in the present study, this was the stage framework (Appendix 1). To test its assumptions, evidence was sought from the interview data, using CIT (Chell 2014). In this way, the stage framework could be tested and potentially extended.

Following Yin's (1989) guidelines, the case companies were not randomly selected but purposefully chosen, in line with the principles of case study research (Eisenhardt 1989, Yin 1994). The target population was early technology-intensive companies (maximum 15 years since establishment) with recognizable growth (> 10 employees), located in two medium-sized Finnish cities outside the capital region. In total, 16 interviews were conducted in 10 companies. Using semi-structured interviews, between one and three managerial viewpoints from each case company were explored during spring and summer 2016. The interview frame we used has previously been applied in similar case studies in a range of contexts (Muhos et al. 2016, Muhos et al. 2014b, Muhos et al. 2014a).

NVivo 10 qualitative data analysis tool was used to manage the transcribed interview data. A qualitative content analysis was applied using a deductive approach considered suitable for testing theory or data in a new context (Hsieh, Shannon 2005, Cho, Lee 2014). First, the identified critical incidents were classified as either parallel or contradictory to the preconceived assumptions of the stage framework. Second, any critical incidents that could not be matched to the framework were classified as context-specific viewpoints. The key growth indicators and the main characteristics of the case companies analyzed in this study are summarized in Table 1.

**Table 1** Key growth indicators

Case	Years established	Number of employees	Sales (M€)	Technology	Estimated growth stage
A1	12	50	3 710	Computer programming activities	(3) Expansion
A2	16	33	2 700	Computer consultancy activities	(4) Stability / renewal
A3	3	20	1 700	Mechanical and process engineering design	(4) Stability / renewal
A4	11	30	1 450	Business and other management consultancy activities	(4) Stability / renewal
A5	10	102	10 400	Manufacture of instruments and appliances for measuring, testing and navigation	(3) Expansion
B1	4	55	1 000	Computer programming activities	(2) Commercialisation
B2	5	13	2 700	Manufacture of communication equipment	(2) Commercialisation

B3	4	13	2 500	Business and other management consultancy activities	(2) Commercialisation
B4	9	86	25 961	Manufacture of electrical equipment	(3) Expansion
B5	7	17	1 867	Manufacture of communication equipment	(3) Expansion

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### Results

This section elaborates a case-by-case analysis of critical incidents associated with the early stages of growth. For all cases, the observed aspects of that are parallel or contradictory to the assumptions of the framework are enumerated in Table 2:

**Table 2** Observed aspects of early stages of growth compared to the framework

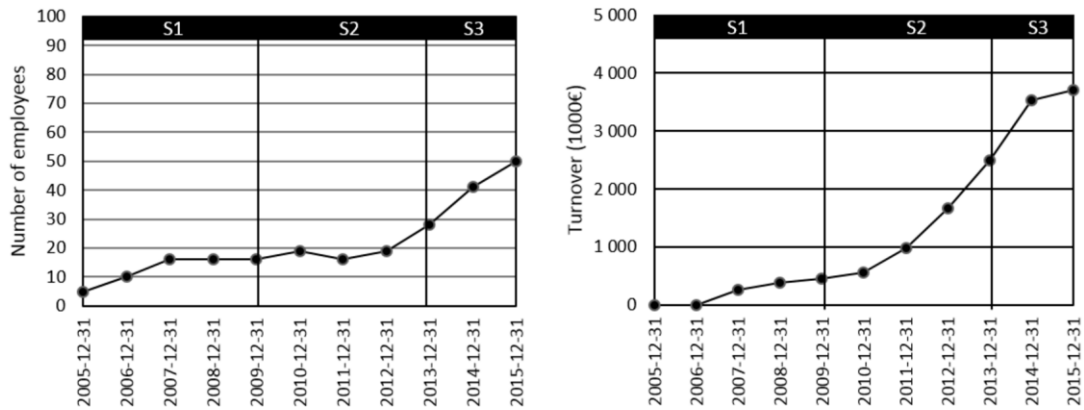
	Assumpti on*	Parallel aspects per case											Total	Contradictory aspects per case											Total
		A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	A1		A2	A3	A4	A5	B1	B2	B3	B4	B5			
Stage 1:	1:1	2	1	1	-	-	7	1	-	1	-	<b>13</b>	-	-	-	-	-	-	-	-	-	1	<b>1</b>		
	1:2	12	1	2	3	-	8	8	2	-	8	<b>44</b>	-	-	5	1	-	-	-	-	2	-	<b>8</b>		
	1:3	8	1	5	1	1	11	5	1	1	3	<b>37</b>	-	1	4	4	-	-	-	-	2	-	<b>11</b>		
	1:4	3	-	2	-	-	6	4	3	1	2	<b>21</b>	-	-	1	-	-	1	-	-	-	-	<b>2</b>		
	1:5	5	-	1	-	-	3	2	1	-	11	<b>33</b>	2	-	1	-	-	-	-	-	-	-	<b>3</b>		
	1:6	4	-	1	-	-	1	1	1	-	2	<b>10</b>	-	-	1	-	-	2	-	-	-	-	<b>3</b>		
	1:7	4	-	-	-	-	2	6	-	-	3	<b>15</b>	-	1	1	-	-	-	-	-	-	-	<b>2</b>		
	1:8	1	1	1	3	-	2	1	-	1	1	<b>11</b>	-	-	2	1	-	1	3	-	1	8	<b>16</b>		
	1:9	-	-	-	1	-	2	1	-	-	-	<b>4</b>	-	-	-	-	-	1	-	-	2	-	<b>3</b>		
	1:10	1	1	-	1	-	1	2	-	1	-	<b>7</b>	-	-	-	-	-	-	4	-	-	5	<b>9</b>		
	1:11	5	-	-	2	-	4	2	1	1	-	<b>15</b>	-	-	-	-	-	-	-	-	-	-	<b>0</b>		
	1:12	6	-	-	-	-	1	-	2	2	1	<b>12</b>	1	2	3	3	-	-	-	1	-	-	<b>10</b>		
Stage 2:	2:1	7	5	2	4	2	2	4	4	2	2	<b>34</b>	-	-	-	-	-	-	-	-	-	-	<b>0</b>		
	2:2	5	-	5	2	2	-	5	1	2	7	<b>29</b>	-	1	-	-	-	-	-	-	-	-	<b>1</b>		
	2:3	2	-	-	-	-	-	1	2	1	2	<b>8</b>	-	-	2	-	-	-	2	-	-	-	<b>4</b>		
	2:4	9	-	6	3	1	-	6	10	1	2	<b>38</b>	-	1	-	2	-	-	1	-	-	-	<b>4</b>		
	2:5	2	-	-	-	1	4	1	4	2	2	<b>16</b>	2	1	1	-	-	-	-	-	-	-	<b>4</b>		
	2:6	1	-	-	-	1	1	2	3	-	2	<b>10</b>	4	-	3	1	-	-	-	1	2	1	<b>12</b>		
	2:7	2	-	1	-	-	-	1	3	1	1	<b>9</b>	-	-	-	-	-	-	-	-	1	-	<b>1</b>		
	2:8	3	-	-	-	-	-	-	2	-	1	<b>6</b>	-	1	-	-	-	-	-	-	1	-	<b>2</b>		
	2:9	10	1	4	-	-	-	2	7	2	1	<b>27</b>	-	-	-	-	-	-	3	1	-	1	<b>5</b>		
	2:10	1	-	1	-	1	-	2	-	1	-	<b>6</b>	1	1	-	-	-	-	-	-	-	-	<b>2</b>		
	2:11	8	2	-	-	-	-	1	3	2	-	<b>16</b>	-	1	-	1	1	2	2	-	2	1	<b>10</b>		
Stage 3:	3:1	10	1	5	2	-	2	1	N/A	-	1	<b>22</b>	-	-	-	1	1	N/A	N/A	N/A	-	-	<b>2</b>		
	3:2	11	5	-	2	6	3	-	N/A	1	2	<b>30</b>	-	-	-	-	3	N/A	N/A	N/A	1	-	<b>4</b>		
	3:3	13	1	11	3	4	1	-	N/A	1	-	<b>34</b>	6	2	1	-	1	N/A	N/A	N/A	-	-	<b>10</b>		
	3:4	4	-	2	4	1	1	-	N/A	-	-	<b>12</b>	4	1	-	3	2	N/A	N/A	N/A	2	2	<b>14</b>		
	3:5	15	-	3	4	2	3	2	N/A	3	4	<b>36</b>	1	1	-	-	-	N/A	N/A	N/A	-	-	<b>2</b>		
	3:6	11	1	1	5	3	4	5	N/A	3	8	<b>41</b>	-	-	-	-	1	N/A	N/A	N/A	-	-	<b>1</b>		
	3:7	2	1	3	4	1	3	2	N/A	-	1	<b>17</b>	4	-	1	1	-	N/A	N/A	N/A	2	-	<b>8</b>		
	3:8	7	2	5	5	2	4	2	N/A	3	1	<b>31</b>	3	-	-	4	1	N/A	N/A	N/A	-	1	<b>9</b>		
	3:9	1	1	-	1	-	1	-	N/A	1	-	<b>5</b>	-	-	-	-	1	N/A	N/A	N/A	-	-	<b>1</b>		
	3:10	3	-	-	1	-	-	-	N/A	1	-	<b>5</b>	2	-	-	-	1	N/A	N/A	N/A	-	-	<b>3</b>		
	3:11	3	1	-	-	-	2	-	N/A	2	-	<b>8</b>	-	-	-	-	1	N/A	N/A	N/A	-	1	<b>2</b>		
Stage	4:1	N/A	-	1	3	-	N/A	N/A	N/A	1	-	<b>5</b>	N/A	1	-	2	N/A	N/A	N/A	N/A	N/A	-	<b>3</b>		
	4:2	N/A	1	2	-	1	N/A	N/A	N/A	1	-	<b>5</b>	N/A	-	-	-	N/A	N/A	N/A	N/A	N/A	-	<b>0</b>		
	4:3	N/A	10	-	8	1	N/A	N/A	N/A	3	1	<b>23</b>	N/A	-	-	1	N/A	N/A	N/A	N/A	N/A	-	<b>1</b>		

4:4	N/A	1	13	2	-	N/A	N/A	N/A	3	3	<b>22</b>	N/A	1	-	-	N/A	N/A	N/A	N/A	N/A	-	<b>1</b>
4:5	N/A	-	-	2	-	N/A	N/A	N/A	-	-	<b>2</b>	N/A	1	-	-	N/A	N/A	N/A	N/A	N/A	-	<b>1</b>
4:6	N/A	1	-	1	-	N/A	N/A	N/A	2	-	<b>4</b>	N/A	-	-	-	N/A	N/A	N/A	N/A	N/A	-	<b>0</b>
4:7	N/A	2	-	-	-	N/A	N/A	N/A	2	-	<b>4</b>	N/A	3	5	2	N/A	N/A	N/A	N/A	N/A	-	<b>10</b>
4:8	N/A	5	6	1	-	N/A	N/A	N/A	1	1	<b>14</b>	N/A	-	2	3	N/A	N/A	N/A	N/A	N/A	-	<b>5</b>
4:9	N/A	1	1	1	-	N/A	N/A	N/A	-	1	<b>4</b>	N/A	-	-	1	N/A	N/A	N/A	N/A	N/A	-	<b>1</b>
4:10	N/A	-	-	1	-	N/A	N/A	N/A	-	-	<b>1</b>	N/A	-	-	-	N/A	N/A	N/A	N/A	N/A	-	<b>0</b>
4:11	N/A	-	-	-	-	N/A	N/A	N/A	1	-	<b>1</b>	N/A	1	-	2	N/A	N/A	N/A	N/A	N/A	-	<b>3</b>
<b>Total</b>	<b>181</b>	<b>47</b>	<b>85</b>	<b>70</b>	<b>30</b>	<b>79</b>	<b>70</b>	<b>50</b>	<b>51</b>	<b>74</b>	<b>747</b>	<b>30</b>	<b>21</b>	<b>33</b>	<b>33</b>	<b>13</b>	<b>7</b>	<b>15</b>	<b>3</b>	<b>18</b>	<b>21</b>	<b>194</b>

Notes: \*stage:preconceived assumption; N/A = the stage not reached yet

## Case-by-case reports

### *Case A1: Computer programming activities (expansion stage)*



**Figure 2** Growth history of Case A1

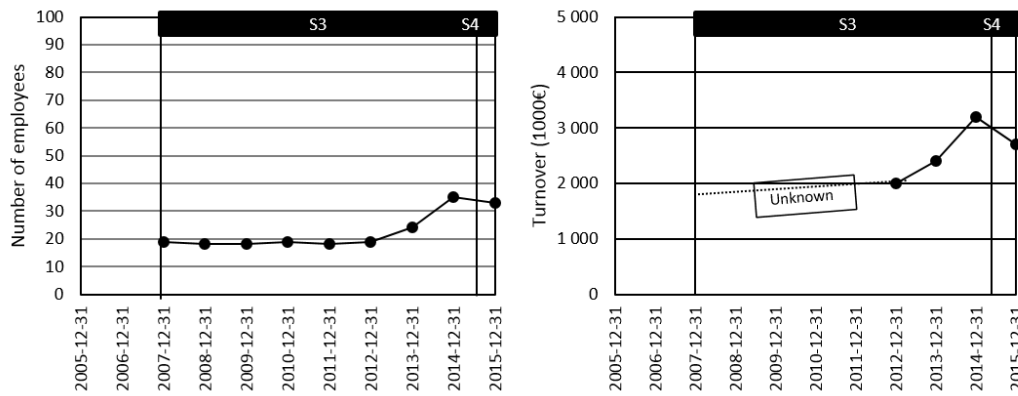
The only observed contradictions in stage 1 relate to assumptions 1:5 and 1:12. Contrary to 1:5, the entrepreneur was very familiar with the target market over several decades of doing business in the field. Contrary to 1:12, cash flow was already slightly positive in stage 1.

In stage 2, the observed contradictions relate to assumptions 2:5, 2:6 and 2:10. Contrary to 2:5, technical challenges were not a major issue. Contrary to 2:6, the team did not need to learn the production process because they had previously been co-workers in a similar team. The company does not actually produce a physical product but sells a productized software solution. Finally, there was one contradiction in respect of 2:10, in that survival was never a key issue.

In stage 3, the observed contradictions relate to assumptions 3:3, 3:4, 3:5, 3:7, 3:8 and 3:10. Contrary to 3:3, 'manufacturing' does not accurately describe the company's business model. Moreover, satisfied regular customers have recommended the company to new clients, so reducing the need for marketing. Contrary to 3:4, the company does not sell a product at increasing volumes but rather sells one concept to an increasing number of clients. Contrary to 3:5, the flow of information from clients to the R&D team needs to be further developed. Contrary to 3:7, business growth did not lead to personnel problems, with the exceptions of difficulty in recruiting sales personnel. Contrary to 3:8, the hierarchy has not increased, although the owner-manager will shortly step aside to make way for an external managing director. Finally, contrary to 3:10, more specialized functions have not been added; the same individuals take care of both research and development and client training, and different target markets are not assigned to specialized sales persons.

### *Case A2: Computer consultancy activities (stability/renewal stage)*





**Figure 3** Growth history of Case A2

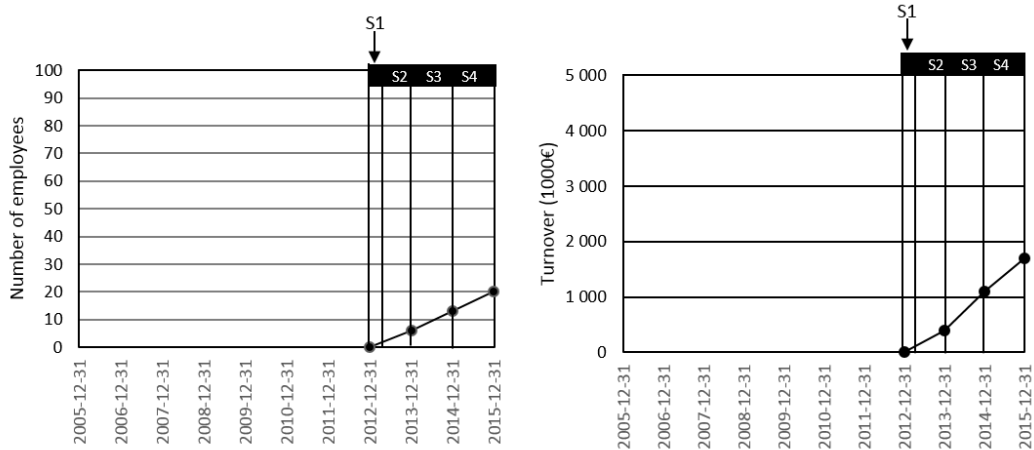
In Case A2, the contradictions in stage 1 relate to assumptions 1:3, 1:7 and 1:12. Contrary to 1:3, the owner had developed the sales product in his previous job, and an early customer base followed to the newly established company. Because of that previous development experience, the owner-manager had a clear vision of the product and production process, and so, contrary to 1:7, there was no need to develop a prototype. Contrary to 1:12, by virtue of the existing customer base and quick commercialization, cash flow was never negative.

In stage 2, the contradictions relate to assumptions 2:2, 2:4, 2:5, 2:8, 2:10 and 2:11. Contrary to 2:2, the actual sales and commercialization had already happened in stage 1. Contrary to 2:4, the company did not need to focus on marketing, as it had a number of stable public sector organizations as clients. Contrary to 2:5, the company encountered no technical challenges. Contrary to 2:8, the management style was not coordinative, and without a participatory manager, personnel were driven to internal conflict. However, contrary to 2:10, thanks to early commercialisation, the company did not struggle to survive. Stable customer organizations meant that the company never experienced negative cash flow.

In stage 3, the contradictions relate to 3:3, 3:4 and 3:5. Achieving growth was a key objective, but (contrary to 3:3) instead of marketing and manufacturing the product, growth was unsuccessfully pursued through recruitment of new staff. This caused the reported contradictions to 3:4, as the increased number of employees failed to increase production, sales and distribution volumes. Additionally, contrary to 3:5, unplanned marketing in new markets was inefficient and consumed company resources.

In stage 4, the contradictions relate to 4:1, 4:4, 4:5, 4:7 and 4:11. Contrary to 4:1, the company growth rate has not slowed, and there are high expectations for further growth because of a new generation product. Contrary to 4:4, the company is not targeting new markets; instead, the needs of current customers are prioritized. Contrary to 4:5, cost control and productivity are not of immediate concern. Contrary to 4:7, the company recruited an external managing director, but because of unsuccessful growth strategies in stage 3, the original owner has again taken over management tasks. Finally, contrary to 4:11, there is no expectation of decreased growth in cash flow, as the company is thought to be close to new growth.

**Case A3: Mechanical and process engineering design (stability/renewal stage)**



**Figure 4** Growth history of Case A3

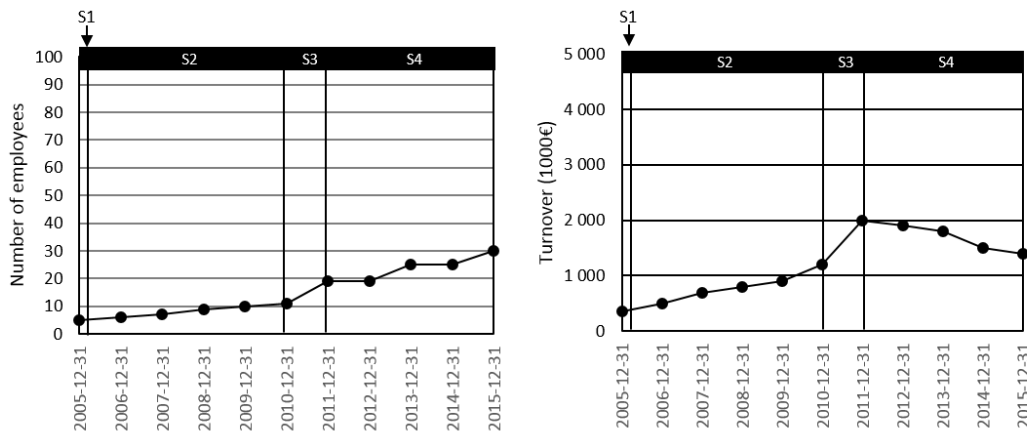
In stage 1, the contradictions relate to assumptions 1:2, 1:3, 1:4, 1:5, 1:7, 1:8 and 1:12. Contrary to 1:2, the objective was not to develop a product but a tailored product management concept. Contrary to 1:3, the company did not need to establish an early customer base by virtue of existing customer relationships and rapid success in commercialization. Contrary to 1:4, key decisions regarding the business idea were made before the company was established. Also contrary to 1:5 and 1:6, decisions regarding identification of market and resource mobilization were also made prior to the company's establishment. Contrary to 1:7, development of a prototype is not applicable to tailored expert services. Contrary to 1:8, decision making has been formalized and the manager has been supported by a management team from the beginning. Finally, contrary to 1:12, cash flow has never fallen into the red.

In stage 2, the contradictions relate to assumptions 2:3, 2:5 and 2:6. Contrary to 2:3, early manufacturing is not applicable to this company. Contrary to 2:5, the company has not encountered technical challenges because (contrary to 2:6), the company does not produce a physical product.

In stage 3, contradictions relate to assumptions 3:3 and 3:7. Contrary to 3:3, growth was not pursued through marketing and manufacturing a product so much as by searching for new industries and market areas as a means of maintaining growth. Contrary to 3:7, the company's growth has not led to personnel problems.

In stage 4, the contradictions relate to assumptions 4:7 and 4:8. Contrary to 4:7, the owners will not seek support from or be replaced by professional managers; only co-partners are allowed to hold a management position in the company. Contrary to 4:8, strategies and standardised procedures had already been introduced (in stage 1).

**Case A4: Business and other management consultancy activities (stability / renewal stage)**



**Figure 5** Growth history of Case A4

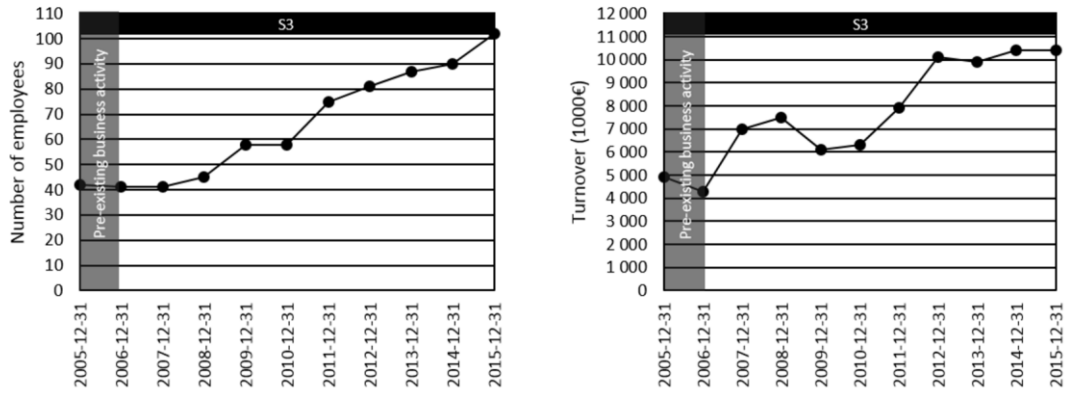
In stage 1, the contradictions relate to assumptions 1:2, 1:3, 1:8 and 1:12. Contrary to 1:2, the objective was not to develop a product but to sell project management services. Contrary to 1:3, establishment of an early customer base was not a key objective because the owners already had existing customer contacts. Contrary to 1:8, management was strategic and was based on an active advisory board since establishment of the company. Contrary to 1:12, cash flow was positive since year one.

In stage 2, the contradictions relate to assumptions 2:4, 2:6 and 2:11. Contrary to 2:4, successful customer projects led to new orders without any specific marketing activities. Contrary to 2:6, the company does not manufacture a physical product but sells project management services. Contrary to 2:11, cash flow also remained positive in stage 2.

In stage 3, the contradictions relate to assumptions 3:1, 3:4, 3:7 and 3:8. Contrary to 3:1, as a project management concept cannot be replicated in the same way as a physical product, company growth was steady but not necessarily as high as among product-based companies. Contrary to 3:4, sales have not invariably increased, but sudden decline in purchase orders has even led to co-operation negotiations in the case company. Contrary to 3:7, growth has not led to personnel problems, and contrary to 3:8, hierarchy has remained low.

In stage 4, the contradictions relate to assumptions 4:1, 4:3, 4:7, 4:8, 4:9 and 4.11. In the original business area, the company has faced a slowing growth rate, but, contrary to 4:1, the company as a whole is aiming at further growth through new products, business areas and markets. Contrary to 4:3, the company has already launched second generation products and services in earlier stages. Contrary to 4:7, the company does not employ professional managers. Contrary to 4:8, standardization and formalization do not describe the company procedures, although strategic thinking has been applied since stage 1. However, the company has no written strategy. Contrary to 4:9, risks are taken in launching new products and in approaching new markets. Contrary to 4:12, cash flow growth is not diminishing.

**Case A5: Manufacture of instruments and appliances for measuring, testing and navigation (expansion stage)**



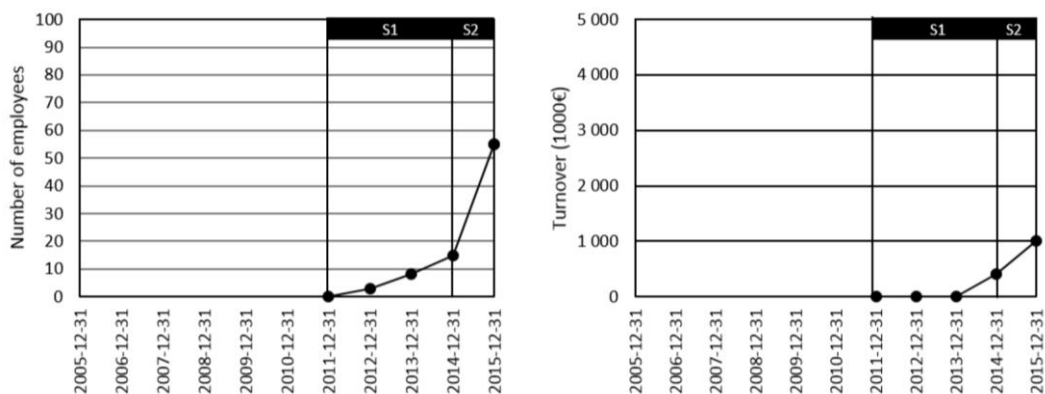
**Figure 6** Growth history of Case A5

In stage 1, there are no contradictory aspects related to the framework assumptions.

In stage 2, the only contradiction relates to 2:11, as cash flow was never negative.

In stage 3, the contradictions relate to 3:1, 3:2, 3:3, 3:4, 3:6, 3:8, 3:9, 3:10 and 3:11. Contrary to 3:1, company growth has been stable, and a high growth rate is not recognized. Contrary to 3:2, the case company's main market sector is changing very slowly, so no active changes are needed. Contrary to 3:3, as the case company has almost 100% market share, there is no scope for increase in the company's main market. Contrary to 3:4, the company could not sell and distribute its products at increasing volume because of a global economic depression that caused orders to decline for several months. Contrary to 3:6, as the company sells its products mainly to established customers, there are no active efforts to attract new customers. Contrary to 3:8, the organizational hierarchy has remained low. Contrary to 3:9, budgets are not deployed for communications and pre-planning; instead, results are assessed after each reporting period. Contrary to 3:10, there are no specialized functions. Finally, contrary to 3:11, cash flow has increased steadily without sudden peaks in growth.

**Case B1: Computer programming activities (commercialisation stage)**



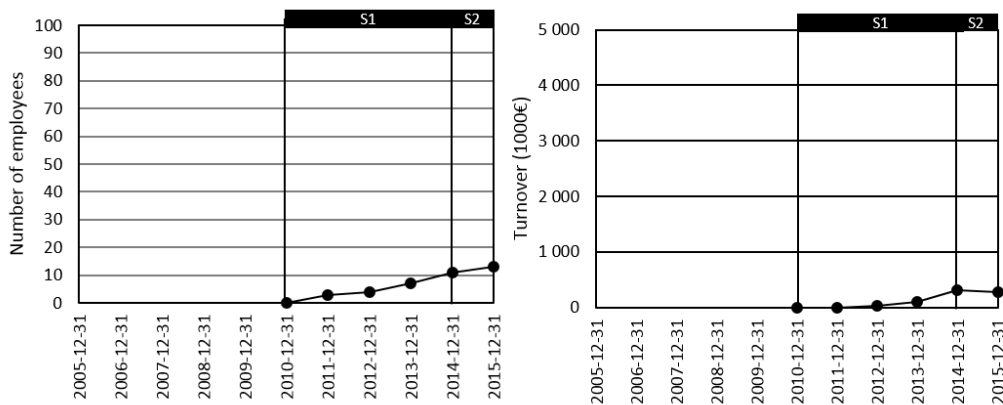
**Figure 7** Growth history of Case B1

In stage 1, the contradictions relate to assumptions 1:4, 1:6, 1:8 and 1:9. Contrary to 1:4, key tasks are not related to the business idea but to technology development. Contrary to 1:6, resource planning has not been optimal because the company tried to resolve an extensive development task with a small employee team when focusing and prioritizing

would have been more resource-effective. Contrary to 1:8, management was not informal, as a management team (including external investors) was formed at an early stage. Contrary to 1:9, there is some inefficiency in communication between owner and investor members of the management team.

In stage 2, the only contradictory aspects relate to 2:11. Negative cash flow even grew in the commercialization stage because the company had no paying customers. The interviewee estimated the company being at stage 2. However, he recalled several critical incidents that are parallel to stage 3. Thus, there is discrepancy between the self-perceived and framework-based estimation of the current growth stage.

**Case B2: Manufacture of communication equipment (commercialisation stage)**



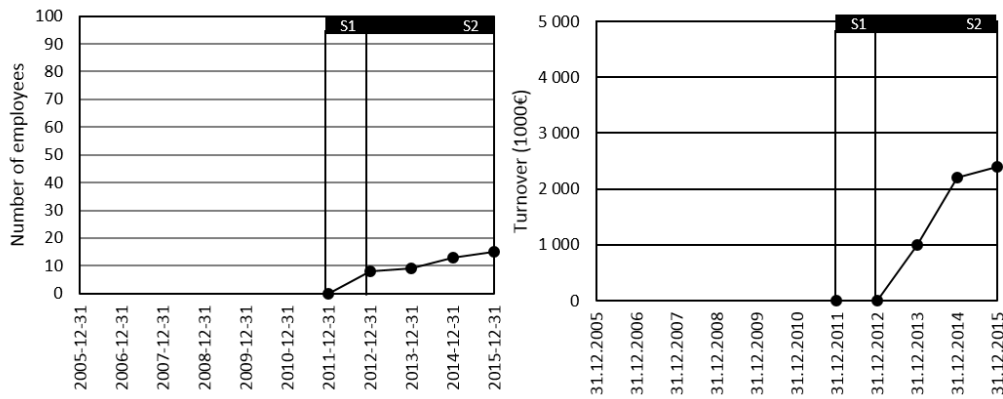
**Figure 8** Growth history of Case B2

In stage 1, the contradictions relate to 1:8 and 1:10. Contrary to 1:8, a management team has been established and processes were being developed from the beginning. Contrary to 1:10, the owner-manager is not the only decision maker, as there are external experts in the management team.

In stage 2, the contradictions relate to 2:3, 2:4, 2:9 and 2:11. Contrary to 2:3, the company has directly targeted volume production rather than early production. Contrary to 2:4, marketing has been based mainly on free visibility in the press and social media and in customer networks. Contrary to 2:9, besides the owners, the management team also includes employee representatives, and responsibilities have been assigned to named individuals. Contrary to 2:11, sales have not yet secured positive cash flow, and the company is financed by external capital investors.

The interviewee also recalled critical incidents that are parallel to five assumptions of stage 3, namely: 3:1, 3:5, 3:6, 3:7 and 3:8. The company is growing, which sets focus on new customers. The management aims to increase effectiveness which leads to increased hierarchy. Also some personnel problems occur.

**Case B3: Business and other management consultancy activities (expansion stage)**

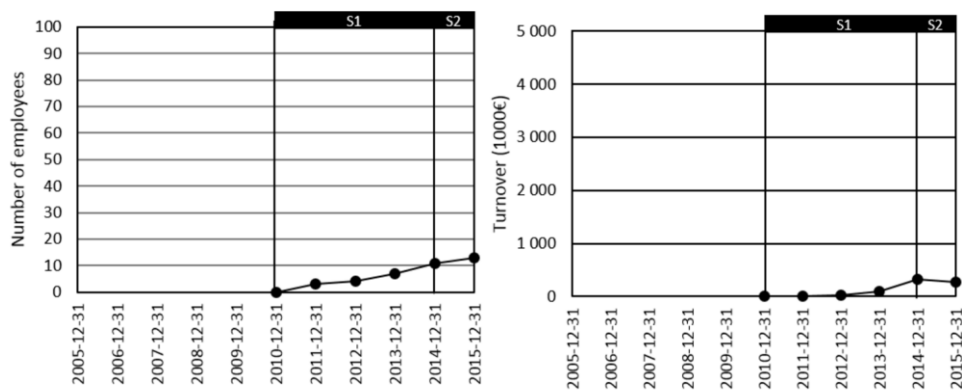


**Figure 9** Growth history of Case B3

In stage 1, the only contradiction relates to assumption 1:12; cash flow has always been positive.

In stage 2, the contradictions relate to assumptions 2:6 and 2:9. Contrary to 2:6, the company manufactures products according to the customer’s wishes. This willingness to deliver a variety of tailored products means that learning the manufacturing process is not of relevance to the case company. Contrary to 2:9, the board of management also board includes an external member as well as the owners.

**Case B4: Manufacture of other electrical equipment (expansion stage)**



**Figure 10** Growth history of Case B4

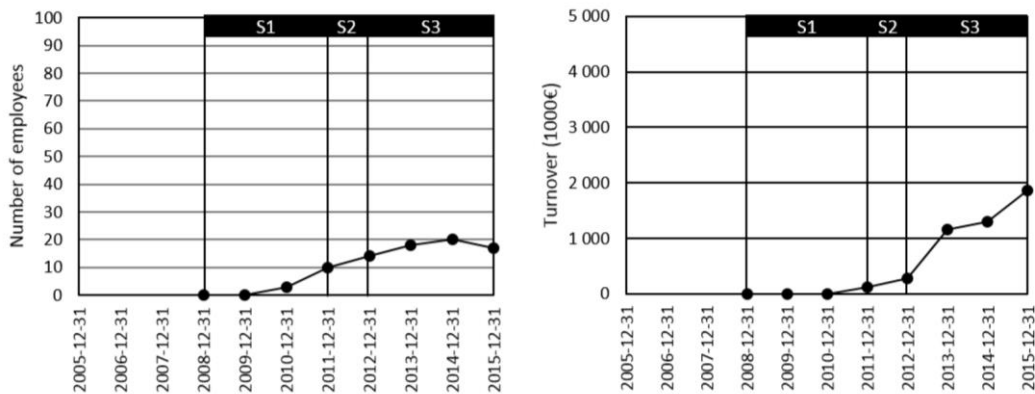
In stage 1, the contradictions relate to 1:2, 1:3, 1:8 and 1:9. Contrary to 1:2, conception and development was unnecessary because the business model had been used in a preceding company. Contrary to 1:3, as the owners had established customer contacts from that earlier company, they did not need to create an early customer base. The customers also supported the establishment of the case company. Contrary to 1:8, the management style is formal and less flexible, and contrary to 1:9, there has been no face-to-face communication between managers and employees because of geographical separation.

In stage 2, the contradictions relate to 2:6, 2:7, 2:8 and 2:11. Contrary to 2:6, there was no need to learn the manufacturing process because employees were familiar with a

similar process prior to establishment of the case company. Contrary to 2:7, as management and production were physically located hundreds of kilometres apart, management style was not participatory, and there was little management coordination. Contrary to 2:8, then, there was no active link between managers and the operative team. Contrary to 2:11, the company's cash flow remained negatively affected by over-indebtedness in stage 1.

In stage 3, the contradictions relate to 3:2, 3:4 and 3:7. Contrary to 3:2, the focus has remained on the basic business model. Contrary to 3:4, sales have been negatively affected by authority decisions. Contrary to 3:7, a modest growth rate has not led to personnel problems.

**Case B5: Manufacture of communication equipment (expansion stage)**



**Figure 11** Growth history of Case B5

In stage 1, the contradictions relate to assumptions 1:1, 1:8 and 1:10. Contrary to 1:1, the founder-owner has received support and advice from an external investor, who has strong experience in that business sector. Contrary to 1:8, management style has not been informal, as a board of management has made decisions from the beginning. Contrary to 1:10, the owner is an important decision-maker, but the board has supported him from the outset.

In stage 2, the contradictions relate to assumptions 2:6, 2:9 and 2:11. Contrary to 2:6, because the manufacturing process was familiar to employees, they did not need to use resources for learning the process. Additionally, contrary to 2:9, the board is an important stakeholder in decision-making processes, along with the owner. Contrary to 2:11, cash flow did not deteriorate following expensive technology development.

In stage 3, the contradictions relate to assumptions 3:4, 3:8, 3:9 and 3:11. Contrary to 3:4, launching a new product diverted retailers' attention from the original product, sales of which dropped for a while. Contrary to 3:8, the organization structure has remained unchanged since the beginning, and hierarchy has not increased. Contrary to 3:11, cash flow is turning positive but the company is not profitable yet.

**Context-specific management priorities**

Cross-case analysis helps to estimate the feasibility of the growth framework that is a synthesis of several empirically-based studies on the case companies. In total, 941 parallel or contradictory critical incidents were identified. Of these, 747 paralleled the framework assumptions, and 194 contradicted those assumptions. Because only few case companies

had reached the stability/renewal stage this cross-case analysis mainly focuses on three first growth stages to strengthen validity of the conclusions drawn on the data.

In general, the framework's assumptions are mostly parallel to the experiences of Finnish technology-intensive companies. All preconceived assumptions were supported by one or more case companies. All cases supported assumptions 1:3 and 2:1. This confirms that establishment of an early customer base in the conception and development stage, and finding early reference customers in the commercialisation stage are fundamental actions for all technology-intensive companies. In addition to the latter, only parallel aspects were reported for assumption 1:11 indicating that function as a product development team is typical for technology-intensive companies.

When comparing the number of identified critical incidents for each assumption, the cases highlight relevance of three to five assumptions in each growth stage. In the conception and development stage, most parallel incidents are related to assumptions 1:2, 1:3 and 1:5. Thus, in a newly-established technology-intensive company the focus is on development of a product or technology and establishment of an early customer base. Identification of a market is the first preparatory step for upcoming stages. In the commercialisation stage, four framework assumptions gained most parallel viewpoints: 2:1, 2:2, 2:4 and 2:9. The stage begins with early reference customers and focus is on business creation and product commercialisation including marketing. The owners alone or together with partners have the administrative control. In the expansion stage as many as five assumptions stand out: 3:2, 3:3, 3:5, 3:6 and 3:7. Finally, although only few case companies had completely reached the stability/renewal stage, six of them recall some incidents parallel to this stage. It seems that particularly assumptions 4:3 and 4:4 are the first ones to be met when a company is moving towards the stability/renewal stage. Then, the focus is on increasing effectiveness and efficiency while launching a second product generation and identifying new markets.

Assumptions 1:8, 2:6, 2:11, 3:4 and 4:7 gained more contradictory than parallel aspects. This indicates that the management style in the case companies is rather formal and the owner may be supported by a management team already at stage 1. Contradictions to 2:6 and 3:4 are related to the product centricity of the reference framework. All case companies are classified as technology-intensive companies but many of the entrepreneurs describe them as an expert or project management organization where technology is basically just a tool to provide their real sales article for customers. The cash flow development does not necessarily follow the framework's assumptions; in some cases, cash flow was already positive in stage 1 because of early commercialization, whereas in some cases, cash flow remained negative until stage 3. Finally, experiences of three out of four cases reached the renewal/stability stage were contradictory to the assumption that the owner is supported or replaced by a professional manager or managerial team. The owners want to keep control and express reluctance to let an outsider take over managerial tasks.

The proportion of cases reporting parallel incidents to each assumption is presented in Appendix 1.



What context-specific viewpoints should be considered when applying the stage framework in the Finnish context? The interview data included 317 critical incidents that could not be matched to framework's preconceived assumptions. These unclassified 'other incidents' are regarded as context-specific viewpoints. The context-specific viewpoints related to the Finnish technology industry context are: a) importance of staff availability, commitment and qualifications; b) experience and networks as a prerequisite for successful business; and c) searching funding and business advisors.

With regard to (a), staff commitment is especially important for the growth of technology-intensive companies.

*"We have found very competent and also committed staff, which has been really important for our quick development." (Case B2)*

All case companies are located outside the capital area which may lead to fewer but more committed job applicants. Although meeting the customers and business partners requires travelling, a less central location actually brings financial benefits for companies.

*"Why would we want higher salaries for everyone or higher turnover of staff? And above all, our workers would be available to every competitor. I do not see any benefits of being located in the capital area." (Case A1)*

*"Our location does not provide any benefit for us, but the business ecosystem here... I cannot imagine we could move our R&D anywhere else because we use so much local resources." (Case B2)*

From an employee's perspective, a start-up company may be seen as risky, and a newly established company may have difficulty in attracting job-seekers who have the option of choosing a more established employer. Besides, job-seekers are not necessarily willing to move to a new city or the qualifications of job seekers does not match to employer's requirements.

*"Although there are many job seeking engineers in Finland, it has not resulted in more applicants. People are not ready to move because of job. There are not many job seekers in [our town], so it is more viable to hire a student and train him." (Case A2)*

*"We have a constant lack of technically qualified workers for hands-on tasks. On the other hand, there are a lot more manager level people available. And when looking at sales people, they are of their own kind. They sell themselves to available jobs." (Case B2)*

In terms of (b), it is recognised by interviewees that investors and other supporters play an important role in gaining access to the right customers. Influential persons can provide faster access to funding and improve visibility among important potential clients. The most beneficial services for the case companies are those creating networking possibilities, both in Finland and abroad. However, a careful comparison of different business service providers demands too many resources. The interviewees believe that

the most effective way to promote internalization and growth is to establish networks with investors who are familiar with the technology industry.

*"I think there are some money available here [in this region] but maybe the valuations are not as high as the founders wish. And if they could invest more when the company grows. And to also get 'smart money' – networks are needed." (Case B1)*

*"One of our success stories is cooperation with investors. Through them we gain a lot more added value than we ever imagined. We have also broadened our networks and had several discussions. Now we are probably listed by almost all international investors." (Case B2)*

In relation to (c), a long product development phase is typical of technology-intensive companies, requiring funding either from the owners or from external investors. Some of the interviewees are quite satisfied with the public funding systems. The financial support measures are regarded as equal regardless of the home city. There are many financing measures available but comparing them takes a lot of resources.

*"In Finland, all these support instruments and channels and measures are rather uniform. If you can apply for some public financing in one city, you can also apply it in another." (Case A3)*

*"Public governance has been significant for us also in terms of financing. I cannot blame it." (Case B5)*

*"In a way it is good that there is help available for companies and they are being pushed to international markets. But for companies it often seems like chaotic or unformalized. It would be easier to have a principle of one-stop shop." (Case B2)*

Publicly financed business services could be helpful but the competence of business advisors is questioned. The advisors are regarded to lack a sufficient personal experience of entrepreneurship and technology industry to be considered as credible advisors.

*"The only really beneficial advisors are people who have been through the same process or who have seen several times somebody else doing it." (Case B1)*

*"There are advisors who have never seen establishment and management of any company other than in movies or books. It is terrible." (Case B5)*

## Discussion

Company growth has been studied extensively in recent decades, introducing multiple perspectives that include static equilibrium theories (Coase 1937), stochastic models (Gibrat 1931), transaction cost theories (Williamson 1975), economics of growth and resource-based theories (Penrose 1959), evolutionary theories (Nelson, Winter 1982), organisational ecology theories (Hannan, Freeman 1977), strategic adaptation theories (Sandberg, Hofer 1982), motivational theories (McClelland 1961) and stages of growth theories (see e.g. (Greiner 1972)). Most of this research has focused on the factors that lead to growth (growth as outcome), without acknowledging the potentially significant qualitative and contextual differences in how firms grow (growth as process) (see (McKelvie, Wiklund 2010, Shepherd, Wiklund 2009)). In this regard, configuration perspectives (related to company lifecycle or stages of growth) (see for example (Muhos et al. 2010, Muhos 2011)) have attempted to clarify the managerial challenges and priorities arising in companies' early stages (see for example (Churchill, Lewis 1983, Greiner 1972)).

From the configurations perspective, this study explored the applicability of the reference framework (Muhos et al. 2011) of early growth in technology-intensive companies, including an analysis of context-specific viewpoints. Using SIT to address the research question, we analysed ten cases in two Finnish cities to assess how the experiences of managers related to the framework assumptions.

The applicability of the framework was initially tested by analysing the number and content of aspects paralleling its assumptions. We found more parallel than contradictory viewpoints. These results provide evidence of the framework's applicability, as all of its assumptions are supported by one or more cases. To summarize the findings, when context-specific viewpoints are taken into consideration the empirically-based stage framework seems a fairly effective tool for reflecting on and predicting the challenges faced by companies during their early development.

The cases were classified into stages based on the self-assessments of interviewees. The analysis showed that a company may exhibit some aspects of a subsequent stage, indicating that transitions from one stage to another are not clear-cut events but a gradual process. While the framework orders stages sequentially, the probabilistic model allows for greater freedom of movement from one stage to another; in some instances, a company may even skip a stage.

The conception and development stage can take several years, but some companies begin commercialisation very early if the business began from a ready-to-sell product and has an existing clientele. Such a company can jump almost immediately from development and conception to commercialisation or even to the expansion stage. This is typical where the company is a follow-up to a product development process or a spin-off of an existing company. A technology company may also have several simultaneous product processes at different stages. In the case companies here, new technological ideas have been introduced along with the original business idea, or the business has spread to new markets already in the commercialisation stage. In this way, the growth stages specified in the framework could be seen to exist at the same time in case companies.

In the commercialisation stage, the most important exceptions related to the product-centricity of the framework. Adapting to changing circumstances is a prerequisite for survival in the technology industry, and an increasing proportion of business in technology-intensive companies is moving from pure production towards services. The framework also assumes that the production process is learned during the early stages, but some of the case companies were based on a pre-existing production, or the team was already familiar with the process. Other exceptions to the framework related to

assumptions about the development of cash flow at different stages. The framework assumes a decrease in negative cash flow at the commercialisation stage, but a majority of the case companies reported incidents that contradict this assumption. While cash flow can be positive from the start by virtue of quick commercialisation, cash flow remained negative in some other companies even in the expansion stage.

The framework assumes that companies encounter personnel problems during rapid growth. However, a majority of the case companies did not report such problems. Moreover, although the framework fails to address other aspects of staff recruitment, commitment and qualifications or the importance of the working environment for business growth, these issues arose repeatedly during the interviews. The assumptions of the stage framework are formulated from the perspective of a product- or technology-based company. However, in many of the case companies, the 'product' is actually expertise or project management services based on technological knowhow and software rather than on selling only a market-ready product. Interviewees criticized the framework in this regard. Beyond this framework for technology-intensive companies, Muhos et al. (In press) have synthesized a separate evidence-based growth framework for service businesses. The next step is to consider whether the framework should accommodate a hybrid model beyond the traditional distinction between companies as either product- or technology-intensive or service-based.

The cases revealed several context specific differences. The context-specific characteristics of the Finnish context are related to availability and commitment of personnel, understanding of the business field, funding and continuous renewal. Business service providers are expected to give support in building networks and finding expertise abroad. Overlapping business services and was considered as waste resources and source of confusion among the owner-managers of the case companies. Diverse study options in the region produce new employees for technology companies. From the perspective of technology-based ventures in the context of Jyväskylä, the absence of faculty of technology was experienced as a gap in this respect.

### ***Limitations and further research***

The generalisability of case study findings is sometimes questioned (Yin 1994). Such findings can be generalized as theoretical assumptions but should not lead to direct conclusions regarding the whole population. The aim is to generalise the findings analytically but not statistically. Here, the findings of the present case study were compared to the framework of growth for technology-intensive companies. Where two or more cases confirm the framework's pre-assumptions, the finding can be said to strengthen the framework's theoretical foundation. Secondly, the case studies were expected to reveal context-specific viewpoints not included in the framework's assumptions. The findings cannot be directly generalized to other business contexts and depend on the time point of data collection. As the stories are unique, we cannot predict whether identical solutions would be successful in another context or at another time point. However, the stories of growth in the case companies offer real-life examples of the incidents and challenges encountered by technology-intensive companies during the early stages of growth. This study brings us a step closer to clarifying the role of context-specific perspectives in the early stages of technology-intensive businesses in different contexts. To date, four contexts have been analysed; future studies should examine further contexts, as well as exploring the previous contexts in greater detail.

Growth is a multidimensional phenomenon, and every early technology-intensive company is to some extent unique (Muhos et al. 2016). Most business growth studies

have focused on the factors that lead to growth (growth as outcome) without acknowledging the potentially significant qualitative and context-specific differences in the growth process (McKelvie, Wiklund 2010, Shepherd, Wiklund 2009). For this reason, there is a need to develop models that incorporate context. The present study is part of a research series that aims to develop the field with this perspective in mind. As described above, there is a surplus of generic growth models, but context-specific characteristics are neglected or completely ignored. The aim of the present study is to highlight the importance of these contextual factors in business growth. The recent shift from deterministic ‘stages of growth’ to probabilistic ‘states of growth’ (Levie, Lichtenstein 2010, Muhos et al. 2010, Phelps, Adams & Bessant 2007) offers a starting point for research that emphasises context in this way. From the states of growth perspective, business growth is based on probabilities, suggesting that rather than following a linear sequence from one stage to another, a company’s development can proceed or return from one stage to another. Every state of growth brings more or less uniform challenges and possibilities for the company, and in every transition between the states—back or forth or jumping states—the challenges and possibilities change. This states of growth perspective offers new possibilities for applying the findings of the present study.

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Appendix 1

<i>Stage</i>	<i>Stage description (assumption codes)</i>
<p>1 Conception and development</p>	<p><i>The newly established firm is owner-dependent (1:1). The objective is product and/or technology development (1:2) and <b>an early customer base is established</b> (1:3). Key activities relate to the business idea (1:4), identification of a market (1:5) and resource mobilisation (1:6). Development of a working prototype is initiated (1:7). Management is informal, flexible and creative (1:8); communication is face-to-face (1:9), and the owner makes the decisions (1:10). The organization functions as a product development team (1:11). Cash flow falls into the red because of a lack of product at this point (1:12).</i></p>
<p>2 Commercialisation</p>	<p><b>Stage 2 begins with early reference customers</b> (1:1). <i>The objective is the creation of a business and the commercialisation of a product (1:2). This stage is characterised by early manufacturing (2:3), marketing (2:4) and initial technical challenges (2:5). The company learns to make and produce the product (2:6). Management style is participative (2:7) and coordinative (2:8). The owner and/or a small number of partners dominate the nucleus of the administrative system (2:9). Resource generation and survival are key issues (2:10). The amount of negative cash flow decreases (2:11).</i></p>
<p>3 Expansion</p>	<p><i>In stage 3, manufacturing and technical feasibility and market acceptance lead to high growth (3:1) and constant change (3:2). The main objective is to manage the company toward growth and to increase market share by marketing and manufacturing the product efficiently and at high volume (3:3). The company needs to produce, sell and distribute product at increasing volumes (3:4) while managing efficiency and effectiveness through structures and processes (3:5). New customers and new market channels require constant attention (3:6). Personnel problems result from constant growth (3:7). The owner and/or entrepreneurial team are central, although a sense of hierarchy increases (3:8). Budgets are moderately used for communication (3:9). More specialized functions are considered and added (3:10). Positive cash flow increases rapidly (3:11).</i></p>
<p>4 Stability/renewal</p>	<p><i>The company faces a slowing growth rate (4:1) and intense competition in a maturing product market (4:2). An effort is needed to launch a second generation of the product, and effectiveness and efficiency must be addressed (4:3). The identification of new markets is essential for company renewal (4:4). However, cost control and productivity become central concerns (4:5). Ensuing product generation and profitability improvements help to maintain growth and reasonable market share (4:6). The owner is usually supported by or replaced by a professional manager or management team, and professional management systems are added (4:7). Strategies, rules, regulations and procedures are standardised and formalized (4:8). Employees become specialized non-risk takers (4:9). Specialized</i></p>

	functions are added (4:10). This stage is characterized by decreasing cash flow (4:11).
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Notes: **bold** = assumption supported by every case; ***bold italic*** = assumption supported by a majority of cases; normal = assumption supported by half or fewer cases