University of Surrey
School of Management

Agile concept development in the Fuzzy Front End of Internet product development

by

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Abstract

This thesis explores how successful start-up innovators handle the early stage of web product development, contributing to academic knowledge on agile software development (ASD) and the fuzzy front end (FFE) of innovation. For exploration of the FFE behaviour, a multiple case study of 10 successful start-up innovators was conducted. Data from personal open-ended interviews with the innovators were analysed to uncover common themes.

Results reveal that start-up innovators are agile in their product concept development, and use activities and process phases that differ from the existing FFE models. The participants created working prototypes, conducted alpha tests, and collaborated with customers to develop alpha-tested prototypes rather than written product concepts. The author developed an agile concept development (ACD) model to illustrate this concept.

The research also unveils potential risks of ACD. A lack of systematic analysis, intuitive decision-making, and a missing business plan potentially increase the risk of commercial failure, while a poorly defined product concept and potentially unsustainable development practices can lead to challenges in later stages of software development.

Web product companies shall encourage ACD to create innovative web products. They should seek to attract innovators because they are the driving force behind the process. Implementing support systems in areas of low innovator attention and active portfolio management may lower the risk exposure of web product companies. More research on ACD, the characteristics of start-up innovators, and the early stages of other types of Internet products (e.g., mobile apps or games) must be conducted.

Keywords: New product development, Fuzzy front end, Agile software development, Start-ups, Internet, Innovators, Web products, New concept development, Agile concept development, Software
Dedication

This dissertation is dedicated to my beloved grandmother, Ingeborg Riemer.
Declaration of originality

I declare that this thesis, entitled "Agile concept development in the Fuzzy Front End of Internet product development" and the work to which it refers are the results of my own efforts. Any ideas, data, images or text resulting from the work of others (whether published or unpublished) are fully identified as such within the work and attributed to their originator in the text or bibliography. This thesis has not been submitted in whole or in part for any other academic degree or professional qualification. I agree that the University has the right to submit my work to the plagiarism detection service TurnitinUK for originality checks. Whether or not drafts have been so assessed, the University reserves the right to require an electronic version of the final document (as submitted) for assessment as above.

Jürgen Seitz,
12th March 2012
Table of contents

ABSTRACT .............................................. I
DEDICATION .......................................... II
DECLARATION OF ORIGINALITY ................... III
TABLE OF CONTENTS ................................. IV
LIST OF TABLES ....................................... VIII
LIST OF FIGURES ..................................... IX
ACKNOWLEDGMENTS ................................. XI
ABBREVIATIONS ....................................... XII

1. INTRODUCTION ................................... 14
   1.1 Research background .......................... 14
   1.2 Research objectives ........................... 19
   1.3 Research question .............................. 20
   1.4 Managerial relevance of the research study 21
   1.5 Research scope and limitations .............. 22
   1.6 Outline of this thesis ......................... 27

2. LITERATURE REVIEW ............................. 29
   2.1 Review process and used sources of literature 29
   2.2 Examined academic research areas ............ 30
   2.3 Information system development (ISD) ......... 31
      2.3.1 Information systems and technology research 31
      2.3.2 Software development processes .......... 32
      2.3.3 Waterfall development .................... 33
2.3.4 Iterative incremental development (IID) 34

2.4 Agile software development (ASD) 40
  2.4.1 Defining agile software development (ASD) 41
  2.4.2 Agile methods 44
  2.4.3 Agile characteristics and principles 48
  2.4.5 ASD research criticism 56

2.5 New product development (NPD) 57
  2.5.1 New product development research areas 58
  2.5.2 New product development process 61
  2.5.3 The Stage-Gate model 63
  2.5.4 Roles of individuals 69

2.6 Fuzzy front end (FFE) 74
  2.6.1 Foundation of FFE research 74
  2.6.2 Selected influence factors on the FFE 79
  2.6.3 FFE activities, processes and deliverables 81

2.6 Identified issues of exploration 96

3. RESEARCH DESIGN 98
  3.1 Philosophical underpinnings 98
  3.2 Qualitative approach to inquiry 102
  3.3 Case study research 104
    3.3.1 Multiple case study approach 105
    3.3.2 Defining the quintain 107
    3.3.3 Case selection 108
    3.3.4 Sources of evidence 114
    3.3.5 Ensuring quality 119
  3.4 Thematic analysis templates 121
    3.4.1 Agile principles 121
    3.4.2 FFE phases and activities 123
3.5 Limitations and ethical considerations 125

4. MULTIPLE CASE STUDY REPORT 129
4.1 Agile principles in the FFE phase 129
   4.1.1 High priority agile principles 129
   4.1.2 Low priority agile principles 143
   4.1.3 Ambiguous agile principles 145
4.2 FFE phases and activities 148
   4.2.1 Idea generation and enrichment phase 149
   4.2.2 Opportunity identification phase 156
   4.2.3 Opportunity analysis phase 159
   4.2.4 Idea selection phase 162
   4.2.5 Prototyping phase 163
   4.2.6 Alpha testing phase 167
   4.2.7 Concept definition 169

5. RESEARCH CONCLUSIONS 180
5.1 Reflection on identified issues of exploration 180
5.2 Agile concept development (ACD) model 183
5.3 Risks of agile concept development 187
   5.3.1 Risk of commercial failure 188
   5.3.2 Development challenges in later stages 190
5.4 Areas of further research 191
   5.4.1 Later stages of web product development 191
   5.4.2 Characteristics of start-up innovators 192
   5.4.3 ACD in other product categories 194
5.5 Managerial implications and recommendations 196
   5.5.1 Encouraging ACD 197
   5.5.2 Attracting start-up innovators 200
## 6. REFLECTIVE DIARY

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Major challenges</td>
<td>203</td>
</tr>
<tr>
<td>6.2 Academic development</td>
<td>205</td>
</tr>
<tr>
<td>6.3 Professional development</td>
<td>207</td>
</tr>
<tr>
<td>6.4 Personal development</td>
<td>208</td>
</tr>
</tbody>
</table>

## LITERATURE

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>210</td>
</tr>
</tbody>
</table>

## APPENDIX

<table>
<thead>
<tr>
<th>Case Report</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>221</td>
</tr>
<tr>
<td>2</td>
<td>224</td>
</tr>
<tr>
<td>3</td>
<td>227</td>
</tr>
<tr>
<td>4</td>
<td>230</td>
</tr>
<tr>
<td>5</td>
<td>233</td>
</tr>
<tr>
<td>6</td>
<td>236</td>
</tr>
<tr>
<td>7</td>
<td>239</td>
</tr>
<tr>
<td>8</td>
<td>242</td>
</tr>
<tr>
<td>9</td>
<td>245</td>
</tr>
<tr>
<td>10</td>
<td>249</td>
</tr>
</tbody>
</table>
List of tables

Table 1: Comparison of NCD and creative problem-solving models 23
Table 2: Agile Manifesto principles and Internet speed practices 40
Table 3: Agile Development compared to traditional development 42
Table 4: Description of main agile development methods 46
Table 5: Articles classified by JPIM Scheme 60
Table 6: New product development roles and skills 73
Table 7: Comparison of FFE and NPD phase 77
Table 8: Components of the front end appearing in literature 82
Table 9: Activities in the FFE 83
Table 10: Requirements for organizing the flow of ideas 92
Table 11: Four major research paradigms 100
Table 12: Differences between research approaches 101
Table 13: Types of research studies 102
Table 14: Goals of research 103
Table 15: Attended conferences and conducted interviews 111
Table 16: Cases in the multiple case study 113
Table 17: Sources of evidence in case studies 114
Table 18: Agile principles template 122
Table 19: Agile principles categories 122
Table 20: FFE process and activity template 124
Table 21: The strengths of case study approaches 125
Table 22: Weaknesses of case study approaches 126
Table 23: Summary of agile principle adoption by start-up innovators 181
# List of figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The waterfall model</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>Waterfall, iterative and time boxing process models</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>The spiral model of software development</td>
<td>36</td>
</tr>
<tr>
<td>4</td>
<td>Synchronize-and-stabilize software development model</td>
<td>38</td>
</tr>
<tr>
<td>5</td>
<td>Flexible model of product development</td>
<td>39</td>
</tr>
<tr>
<td>6</td>
<td>Publications on agile software development</td>
<td>43</td>
</tr>
<tr>
<td>7</td>
<td>Evolutionary map of agile development methods</td>
<td>45</td>
</tr>
<tr>
<td>8</td>
<td>Number of NPD articles in 10 selected journals annually</td>
<td>58</td>
</tr>
<tr>
<td>9</td>
<td>Innovation process</td>
<td>61</td>
</tr>
<tr>
<td>10</td>
<td>Increasing project costs in the Stage-Gate process</td>
<td>62</td>
</tr>
<tr>
<td>11</td>
<td>Regression of uncertainty and NPD information growth</td>
<td>63</td>
</tr>
<tr>
<td>12</td>
<td>Decision Gates in the Stage-Gate process</td>
<td>64</td>
</tr>
<tr>
<td>13</td>
<td>Five stages of the innovation process</td>
<td>64</td>
</tr>
<tr>
<td>14</td>
<td>Stages and gates of the five-stage innovation process</td>
<td>66</td>
</tr>
<tr>
<td>15</td>
<td>Next Generation Stage-Gate</td>
<td>68</td>
</tr>
<tr>
<td>16</td>
<td>Open innovation and the Stage-Gate process</td>
<td>69</td>
</tr>
<tr>
<td>17</td>
<td>Innovators as Inventor, champion and project manager</td>
<td>72</td>
</tr>
<tr>
<td>18</td>
<td>Different types of NPD leaders and their areas of expertise</td>
<td>73</td>
</tr>
<tr>
<td>19</td>
<td>Different fuzziness levels in the NPD phases</td>
<td>76</td>
</tr>
<tr>
<td>20</td>
<td>Framework for FFE study</td>
<td>79</td>
</tr>
<tr>
<td>21</td>
<td>Different Types of new products</td>
<td>80</td>
</tr>
<tr>
<td>22</td>
<td>Framework of major factors influencing FFE performance</td>
<td>81</td>
</tr>
<tr>
<td>23</td>
<td>Stylized FFE model</td>
<td>84</td>
</tr>
<tr>
<td>24</td>
<td>New Concept Development (NCD) model</td>
<td>86</td>
</tr>
<tr>
<td>25</td>
<td>Causal model of the FFE and new product development</td>
<td>89</td>
</tr>
</tbody>
</table>
Figure 26: Main stages of the innovation process by Boeddrich (2004) 90
Figure 27: Organization proposal for the FFE by Boeddrich (2004) 91
Figure 28: Decision-making process in the Fuzzy Front End 93
Figure 29: Front end process model by Hüsig et al. (2005) 94
Figure 30: Placing methodology at the centre 100
Figure 31: Steps in the multiple case study approach 107
Figure 32: The hourglass model showing the steps of serial innovators 140
Figure 33: Variety of possible units of business 176
Figure 34: The agile concept development (ACD) model 183
Acknowledgments

Four years ago, I was absolutely convinced that it would be easy to add the task of writing of my DBA thesis to my career in the challenging Internet environment. Two years ago, I was convinced that this task was absolutely impossible. Both convictions were wrong. I am very happy that I finally found a way to achieve this goal. However, finishing this challenging journey would not have been possible without the advice and support of some important people.

First of all, I thank my supervisors, Bob O'Keefe and Spinder Dhaliwhal. Our personal conversations and the lightning speed support via email, phone, and even Twitter guided me along the way and kept me motivated. Thank you for pushing me forward. I could not imagine a better support.

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Lastly, I thank my beloved girlfriend, Nicole Hauns, as well as my family, friends, and colleagues. They always supported me and gave me the energy to endure the late-night sessions necessary to realize this work.
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACM</td>
<td>Association for Computing Machinery</td>
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<tr>
<td>ACD</td>
<td>Agile Concept Development</td>
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<td>APQC</td>
<td>American Productivity &amp; Quality Centre</td>
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<tr>
<td>ASD</td>
<td>Agile Software Development</td>
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<tr>
<td>CAQDAS</td>
<td>Computer Assisted Qualitative Data Analysis Software</td>
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<tr>
<td>CSS</td>
<td>Cascading Style Sheets</td>
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<tr>
<td>DOD</td>
<td>US Department of Defence</td>
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<tr>
<td>EIASM</td>
<td>European Institute for Advanced Studies in Management</td>
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<tr>
<td>FFE</td>
<td>Fuzzy Front End of innovation</td>
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<td>FEI</td>
<td>Front End of Innovation</td>
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<tr>
<td>HTML</td>
<td>Hypertext Mark-up Language</td>
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<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
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<td>IID</td>
<td>Iterative Incremental Development</td>
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<td>IS</td>
<td>Information Systems</td>
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<td>ISD</td>
<td>Information Systems Development</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>JPIM</td>
<td>Journal of Product Innovation Management</td>
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<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
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<td>NCD</td>
<td>New Concept Development</td>
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<td>NGO</td>
<td>Non Government Organisations</td>
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<td>NPD</td>
<td>New Product Development</td>
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<td>NPI</td>
<td>New Product Innovation</td>
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<tr>
<td>OR</td>
<td>Operations Research</td>
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<td>PDMA</td>
<td>Product Development and Management Association</td>
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<tr>
<td>PHP</td>
<td>Hypertext Pre-processor</td>
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<td>Acronym</td>
<td>Description</td>
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<tr>
<td>PLR</td>
<td>Post Launch Review</td>
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<td>SAAS</td>
<td>Software As A Service</td>
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<td>SQL</td>
<td>Structured Query Language</td>
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<tr>
<td>TIM</td>
<td>Technology and Information Management</td>
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<td>UI</td>
<td>User Interface</td>
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</tbody>
</table>
1. INTRODUCTION

This chapter introduces the project, describes the document structure, and presents the managerial and academic background. Special focus is given to the growing relevance of product innovation and other emerging topics that led to this study. The project objectives and the research question are presented with emphasis on the challenge of balancing academic and managerial objectives. Finally, the author will explain the significance of the study, the scope, and limitations of the project.

1.1 Research background

This section describes the professional and academic background of this research project.

Product Innovation as a pure R&D function

Articles on product innovation in popular magazines and newspapers in the 80s and 90s generally began by praising innovations by major companies, such as a new chip generation by Intel, and contained general statements about the impact of R&D and science on these companies success. This standard pattern reflected the modus operandi of the overall industry, as R&D teams, innovation task forces, and technology scouting teams were the authorities within the company who were solely responsible for product innovation. These entities often were separate from other major operational units. Innovative products were attributed to the existence of corporate science labs and intense R&D spending. By allocating significant budgets for these innovation efforts, CEOs were able to remain focused on ensuring product line, brand, and company success in other important fields (e.g., marketing, sales, distribution, operations and M&A). CEOs were seldom praised for their product know-how, as they rarely directly headed major product innovation initiatives themselves (e.g., to overcome a major product innovation crisis).
Innovation capabilities as major company function

A new pattern emerged in the early 2000s, making it almost obligatory to mention Apple and its inspiring CEO, Steve Jobs, in conjunction with Apple’s newest product innovations. The iMac, iPod, and iPhone became the “poster-children” of Apple as a successful, product-driven, and innovative technology company. Editors of newspapers and journals wrote about the disruptive power of Apple’s new products. Apple’s unrivalled focus on simplicity impressed consumers, tech experts, and journalists. Steve Jobs became the icon of a CEO and was himself an innovator, adopting a vital role in new product development.

CEOs around the globe were inspired by Apple and started to emphasize product innovation in their company agendas. Academic research on product innovation also thrived; O’Connor (2008) stated that companies began to realize the need to create sustainable innovation capabilities in the heart of their organizations. It was no longer sufficient to put innovation efforts into a silo or treat innovation as a “program du jour.” Steve Jobs placed innovation high on the corporate agenda as well as changed public perception about product innovation. It became clear that product innovation was not only about new technologies; innovation incorporates design, usability, use cases, business models, and product concepts. For example, Steve Jobs changed the music business by bundling the iPod with an easy-to-use music download store, effectively forcing the music industry into adopting a simple, easy-to-understand pricing and sales model. O’Connor (2008) even argued that this placed innovation at the edge of becoming an emerging function in companies similar to marketing, quality, and finance.

Calantone et al. (2010) underlined the importance of product innovation in a meta-analysis of studies from literature in management, product innovation, and marketing. The authors discovered that new product and service performance were direct consequences of innovation, especially in western countries. Academic journals have reflected the growing importance of product innovation: The Journal of Product Innovation Management (JPIM) has since risen to a Top 10 academic business journals in the Thomson ISI citation index (Guo, 2008).
**Start-ups as driving forces of web product innovation**

In almost parallel fashion to the Apple phenomenon, the Internet industry started to produce several very successful product innovations at unprecedented speed. However, this time the innovation very often did not originate from major companies. After a recovery period following the burst of the first Internet bubble in early 2001, a second generation of Internet start-ups emerged and created a growing number of innovative products in the Internet sector. Web products such as Facebook, Twitter, and Salesforce.com came from obscurity and were rapidly adopted by consumers and companies.

The success of these web products and their respective start-ups has been attributed to charismatic entrepreneurs who pushed their companies and products harder than other leaders. These companies garnered success due to their agile product development strategies. The concept of agile development is especially prevalent with web applications, which are becoming more cost-effective and easier to create. The availability of affordable website hosting, free open-source software, and new, easy-to-use development frameworks have lowered the barriers to entry. Additionally, it is often argued that these start-ups provide their employees more creative space in which to develop new ideas.

While the reasons mentioned above surely are beneficial for the development of web products, this author’s practical experience raises doubts about whether they sufficiently explain the overall phenomenon. Substantial anecdotal evidence exists indicating that large, mature Internet companies have adopted several of the flexible, speed-oriented strategies often attributed to start-ups. Their products are often developed using open-source tools and strategies that foster creativity. For example, Microsoft co-invented the agile development method called SCRUM, and Google became well-known for granting a 20% time, allowing engineers to spend one day a week on personal interests that can help them enhance the company’s innovative potential (Levy, 2011).

**Product concepts as a driving force of innovation**

During preliminary investigations about the development of innovative web products, the author identified another influential field: product concepts. While
product teams in mature companies were still brainstorming new uses and products, start-up innovators were first to market with unique product concepts. The author examined this in his own company's attempt at creating and launching a successful social networking service. The product was developed via a high-speed agile approach, and several unique features were devised to differentiate the product from the leaders in the German market at that time: MySpace and StudiVZ. The attempt failed. Instead, two start-ups, Facebook and Twitter, won the global race by adopting unique approaches to social network usage patterns and outperforming all major competitors despite their far less polished offerings and non-existent initial user base. Using status updates to drive a social network was a novel and risky concept, as was providing users a 140-character limit rather than a full-feature blogging solution.

Academic relevance of the topic

Understanding how these types of companies created their unique product concepts might provide the key to the development of more successful web products. A comprehensive amount of research on the early stages of new product development (NPD) exists. It is referred to as fuzzy front end (FFE). Belliveau (2004) gave the following definition of the FFE phase:

The messy "getting started" period of product development, when the product concept is still very fuzzy. Preceding the more formal product development process, it generally consists of three tasks: strategic planning, concept generation, and, especially, pre-technical evaluation. These activities are often chaotic, unpredictable, and unstructured. In comparison, the subsequent new product development process is typically structured, predictable, and formal, with prescribed sets of activities, questions to be answered, and decisions to be made. (p. 508)

The main goal within this phase is creating a comprehensive product definition, which:

Defines the product, including the target market, product concept, benefits to be delivered, positioning strategy, price point, and even product requirements and design specifications. (Belliveau, 2004, p. 521)

Unfortunately, the NPD body of knowledge is still largely based on mature organizations, the manufacturing industry, and large-scale development projects. Successful innovation in web products seems to originate from more agile approaches to product development. There is limited research on the FFE
phase of web products developed in an agile development context in the NPD literature.

Research on agile web application development can mainly be found in a sub-segment of the information systems development (ISD) literature, agile software development (ASD). Web application development has been a highly researched topic in this area for over a decade. Studies have placed less emphasis on mature companies, opting instead to conduct research with smaller companies. However, this research discipline has not addressed the early development stages of the actual product concepts. Concepts of web products are treated mainly as abstract requirements defined by third parties, with no insight given on how the product concept actually develops.

Furthermore, authors in both the FFE and ASD areas have complained about a lack of research on actual behaviours and activities. Models in both areas often present a picture on how the process should be conducted, but the research scope has been mostly conceptual.

Managerial relevance of the topic

This thesis has high managerial relevance for this author and his company. The company is active in the three major fields of web products:

(1) Advertising-funded web products, which are offered to the consumer for free and generate revenue from advertisers.

(2) SaaS web products, which are usually offered on a monthly subscription basis to companies and consumers.

(3) Freemium web products, which are offered to consumers in basic free versions to up sell companies and consumers into paid premium offers.

Both the Online Advertising and the SaaS market are predicted to experience double digit growth in the next three years (Forrester, 2009, Morgan Stanley, 2011). The author's company is also planning for aggressive growth in these areas over several years, and the author is heading a product department within the company that is tasked with creating successful, innovative web products.
Combining academic and managerial relevance

As this topic is of both academic and managerial interest, this research project was undertaken for the following reasons:

(1) Exploring the FFE phase of web product development in start-ups will contribute to closing gaps in the academic body of NPD and ASD knowledge. The managerial implications and academic relevance of the topic makes it an ideal fit for a Doctor of Business Administration (DBA) thesis.

(2) Knowledge about the creation of successful web products in a start-up environment will be highly valuable for the author's company. It will support the creation of new innovative web products within the company and contribute to the company's growth targets.

Through this project, the author seeks to balance addressing the academic research gap with the need to display concrete managerial value.

1.2 Research objectives

To achieve the academic and managerial goals of this thesis, the research objectives must be clearly defined. This section describes these objectives in detail and provides the basis used in formulating the research question.

Explore the FFE phase of web product development

This research will explore how start-up innovators handle the early stage of developing a successful web product, and will include an exploration of the activities actually conducted in the FFE phase as well as the overall FFE process. The project will provide a comprehensive overview of activities and process steps that start-up innovators conduct when creating their product concepts.

Explore differences to existing FFE models

Second, the project will explore whether the conducted FFE process phases and activities differ from academic FFE models. Although the FFE process is a new research discipline, a substantial body of knowledge already exists. A
comparison with existing FFE models and described activities will add to the understanding of whether or not web product development differs.

Explore the influence of ASD on FFE

Third, the author will explore whether and how the agile development approach typically used in web product development influences the FFE phase. Preliminary interviews by this author with start-up innovators developing web products indicated such an influence, but gave only an abstract indication on agile behaviour. A closer look will reveal the ways in which agility influences the concept development of start-up innovators.

Identify potential downsides of this approach

The author will identify issues related to the behaviours of start-up innovators that contributed to the continuous improvement of managerial practices. The start-up innovators themselves might have identified problems with their approaches, and a comparison of their actual behaviours with conceptual models may reveal other potentially problematic areas.

Identify managerial implications for his company

Finally, the research will have managerial implications. The author's goal is to improve the innovation process of his company and web product companies in general. Best practices from successful start-up innovators will be adopted for mature web product companies. The author also seeks to provide recommendations on how to use the best practice examples.

1.3 Research question

Based on the research objectives, the author formulated the following research question to underline the highly explorative nature of the research project:

"How do innovators in Internet start-ups handle the fuzzy front end of innovation?"
The researcher will explore and describe the process steps and activities of start-up innovators in the FFE, as well as the influence of agile principles from the ASD literature. Although exploration is in the centre of the research, it is also important to provide a comprehensive report with an easy-to-read narrative to achieve the managerial goals. Therefore, the narratives of the case reports will also include explanatory elements.

1.4 Managerial relevance of the research study

This research study has both academic and managerial relevance. As the academic relevance will be emphasized in the literature review, this section shall only give a short overview on the managerial aspects.

Answering the research question is of high relevance for the web industry and the author's company. As mentioned before, the project will analyse the spectrum of web-based software offerings, also referred to as web products, including:

(1) Advertising-financed web products
(2) Software-as-a-service (SaaS) web products
(3) Freemium web products

As mentioned previously, the author's company is active in all three of these areas. All three areas are of increasing importance.

(1) **Advertising-financed web products** are predicted to grow in terms of user adoption, revenue, and number of companies entering the market (Forrester, 2009, comScore, 2011, Nielsen, 2011). Innovative web products by start-ups play an important role in this area. For example 9 out of the 10 most used social media products in the US were created in start-ups (Nielsen, 2011)

(2) **Software-as-a-service (SaaS)** is predicted to show double-digit yearly growth over the next years (IDC, 2010). Morgan Stanley (2011) predicted that start-ups will play an important role in SaaS, and the first major acquisitions in the SaaS field support this view. Mint.com, a consumer finance web product created by a start-up, was acquired by Intuit for a reported 170 million US$. Salesforce.com acquired Assistly.com, a start-up customer service tool.
(3) Freemium web products combine the free advertising-based model and SaaS subscription models in one product. According to Pujol (2010), the term freemium was introduced by venture capitalist, Fred Wilson, and popularised by authors such as Anderson (2009). The basic concept of this approach is to offer both a free and a paid version with distinct differences (Pujol, 2010). Although this author has found no formal reports on expected growth of this model, internal numbers found by the author’s company indicate a growing adoption of this model. This is especially the case among start-ups, who want to lower their customer acquisition costs and diversify their revenue sources.

1.5 Research scope and limitations

This section contains information about the project’s academic scope, limitations, and applicability to managerial practice.

Research based in the NPD and ISD body of knowledge

The NPD and ISD bodies of knowledge are the foundation for the current research. NPD research provides a comprehensive, multi-disciplinary body of literature on the new product development process, including the FFE phase. ISD and its sub segment, ASD, add to the knowledge of agile principles and methods used in software and web product development.

Insight can also be found in other bodies of knowledge, especially in research on entrepreneurship and creativity, as many start-up innovators can be classified as entrepreneurs and vice versa. Furthermore, the early phases of company foundation have several similarities with the FFE phase of new product development (Schirr & Hansen, 2010). Research on creativity is also relevant because the FFE phase is a creative process; Hansen (2007) found significant overlaps between FFE research and general research on creative problem solving (See Table 1).
Table 1: Comparison of NCD and creative problem-solving models

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Opportunity identification</td>
<td>Opportunity delineation, problem definition</td>
</tr>
<tr>
<td>Opportunity analysis</td>
<td>Compiling relevant information</td>
</tr>
<tr>
<td>Idea generation and enrichment</td>
<td>Generating ideas</td>
</tr>
<tr>
<td>Idea selection</td>
<td>Evaluating, prioritizing ideas</td>
</tr>
<tr>
<td>Concept definition</td>
<td>Developing implementation plan</td>
</tr>
</tbody>
</table>

Source: Hansen (2007)

After an extensive literature review to examine all of the adjunct fields, the author limited the focus to NPD and ISD research with their respective sub segments, FFE and ASD. As there is little common vocabulary, research foundation, and overlap between the fields, it seems unlikely that adding more research fields would contribute to the objectives of the current research. This is underlined by the fact that there are few cross-discipline research approaches between entrepreneurship and NPD research (Schirr & Hansen, 2010) and between FFE and creativity research (Hansen, 2007).

Research focus on FFE activities, FFE phases, and ASD principles

The focus of this research is also limited to the actual FFE activities conducted by the start-up innovators, their FFE phases, and the influence of adopted ASD principles. This focused approach will enable the project to make a more valuable contribution to the FFE and ASD body of knowledge. Although the activity perspective plays a major role in existing FFE research, only a limited amount of research has examined which activities are actually conducted. The models are often purely conceptual without any detailed information on the actual activities (Griffin et al., 2007). While this cross-case analysis will be strongly oriented towards FFE activities and phases, the author will provide additional background information on the innovators, their products, and companies in the single case reports. This approach will help readers to gain more insight into the single cases examined by this research.
Focus on web products

A wide variety of products can be categorized as Internet products. The fact that a product is connected to the Internet is hardly a sufficient commonality to identify a product category. As more and more products are connected to the Internet using fixed-line or mobile access, the definition of an Internet product might include all kind of hardware and software products as well as services. The Internet connection might be the product itself (e.g., DSL subscriber line), it can be key for providing the service (e.g., web-based e-mail), or it may just be an additional feature to an existing product (e.g., Internet-connected cars). The Internet connection might even be only for monitoring or customer service. As the author's company is focused on developing and distributing web-based software products, the author wants to focus on this area in order to provide the managerial relevance expected from a DBA thesis. The author therefore decided to use a more specific product definition of web products to describe the researched types of products.

First, the product must be an application that is accessed using an Internet browser. Additional mobile applications may be available, but shall not be the main application.

Second, the web product must be a software product that is financed through advertising or paid in a subscription, per-use licence model, or a combination of both (i.e., freemium). E-commerce pages, content portals, and games were excluded because the author's company does not focus on these areas.

The author formulated the following definition of a web product:

A web product is a software-as-a-service browser application offered for free, based on advertising revenues, as a paid software product, or in a "freemium" combination of both approaches. B2B and B2C offers are included.

Emphasis on specific web product

Although the author tried to achieve a great variety among the types of web products included in the multiple case study, the researched cases still only represent a specific group of web products. The web products were mainly focused on simplifying communication and getting work done. They could be
used for professional use cases (e.g., writing invoices), for private use (e.g., instant messaging), or both (e.g., a web-based wiki). This shall mainly be attributed to the following reasons:

First, the web conference-based fieldwork approach narrows the scope towards currently hot topics. As the selected conferences are commercially driven, the organizers naturally try to have these topics and web products on stage. Other web products, which were successful but not in vogue, are likely underrepresented. Some highly successful start-up innovators might also not be willing to speak at these conferences (e.g., Mark Zuckerberg) and thereby exclude a whole category (e.g., casual social networking).

Second, the geographical focus of the fieldwork and the defined time framework causes a likely bias towards certain products. In other geographical areas other topics might be highly successful at the same time (e.g., 3D chat in Asia). Just shortly after the end of the fieldwork time new web products (e.g., Twitter) rapidly gained adoption.

Third, the author naturally tried to include products which are especially relevant to his employer. He therefore preferred selecting cases in similar areas of business. As the author's company is very strong in the area of small- and medium-size companies and communication and collaboration software these services have a strong representation among cases.

It is therefore very important that the academic or professional reader has a specific look at the multiple case report and the single case reports in order to evaluate whether results are transferable to another area. In his recommendation the author also proposes research in other areas of web and Internet products.

*Emphasis on successful, innovative web products*

The author's goal is to extract recommendations for improving the innovation process in his own product development department by examining the experiences of start-up innovators who created true innovations. This approach can be compared to a best practice approach in management consulting and applied sciences.
Because objectively measuring the innovativeness of a web product is hardly possible, the author chose a pragmatic approach by recruiting innovators based on speaker schedules from Internet conferences with a focus on innovative web products. These conferences emerged in the early 2000s and gained significant momentum starting in the mid-2000s. In contrast to trade shows, these conferences are content-driven and focused on inspiring founders, investors, and business development professionals. The invitation to speak at these conferences was used as the main indicator for having developed an innovative web product.

This approach has its shortcomings. Although these conferences have a good reputation for selecting companies with innovative web products, a bias toward innovators who are good speakers and individuals with good personal networks is possible. When readers interpret the case study results, it is crucial to be aware of this purposeful but pragmatic selection of the population for the study.

**Examining start-ups**

The study will explore the FFE phase only for web products developed by start-up companies. As the author is employed by a major Internet company, the research is focused on Internet start-ups to avoid a conflict of interest, and because other mature companies would not have been willing to give a direct competitor insight into their web product development. The start-up innovators were happy to share their experiences because the author’s company is more likely a future partner for cooperation than a specific competitor in their field.

**Examining innovators**

In looking at scope and limitations it is necessary to understand that the research examined the FFE activities and phases of a specific group of individuals. Innovators are individuals who are influential in all major product development phases. The term is used in the research on roles in the NPD process. In research studies on different characteristics of individuals in NPD, Griffin et al. (2009) differentiated between four roles of individuals: inventors, champions, implementers, and innovators. While the first three roles are active
only in a specific part of the process, innovators are active in all roles. Several scholars have researched these roles and characterized innovators as being especially important for radical development projects (Sim et al., 2007). In large organizations the different roles are often shared among different individuals; however, in the early stage of start-ups it is very likely for the same individual to fulfil several roles. Despite the fact that the innovator role is common in start-ups, the author decided to include the innovator expression in his research question for the following reasons:

First, the author wanted to clearly emphasize the difference between entrepreneurs and innovators. Although innovators and entrepreneurs have much in common, entrepreneurs do not necessarily invent new products. Entrepreneurs more often exploit other opportunities by implementing existing business models in new countries or launching an effective sales or marketing strategy in a new product category.

Second, focusing his case research on innovators allowed the author to have an insight into the whole FFE process by interviewing only one person. The author is well aware of a potentially limited generalizability of the research results caused by this approach. The existence of the Innovator likely influences how the FFE is run. Results might therefore differ in start-ups where the Inventor is merely providing an idea and is not involved in the later FFE process.

Throughout this project, these innovators will be referred to as start-up innovators. The author is convinced that the benefits of examining this group outweigh the potential disadvantages and will add to existing research on innovators. Looking at start-up innovators can provide initial insight into this potentially interesting group of innovators and allow for comparisons with innovators in mature companies.

1.6 Outline of this thesis

The next chapter contains an extensive literature review that critically examines the research on Information system development (ISD), Agile software development (ASD), New product development (NPD), and the fuzzy front end
(FFE). A special focus will be on the activities and process steps in the different FFE process models and principles of ASD.

Chapter three contains the design of the research study and describes all major steps in detail. The philosophical underpinnings of the study and the rationale behind choosing a multiple case study design are explained. Characteristics of this approach, limitations, and ethical considerations are discussed.

In chapter four, the multiple case study report is presented with emphasis given to the concept development of the start-up innovators in the FFE. Activities of Start-up innovators are compared to described activities from the standard FFE process models. Furthermore, agile product development principles, their adoption by the start-up innovators, and their influence in the FFE phase are explored.

Chapter five contains the conclusions drawn from the case studies, including a reflection on the identified issues of exploration. This is followed by a presentation of the newly developed ACD model, which is based on the existing NCD model by Koen et al. (2001). Start-up innovators’ blind spots and the resulting risks are discussed. Areas of further research, managerial implications, and recommendations are also part of this chapter.

In the last chapter the author reports on his research journey through a reflective diary that describes major challenges as well as academic, business, and personal developments.

The Appendix contains short reports for the 10 selected cases.
2. LITERATURE REVIEW

This chapter describes the scope and sources for the literature review and contains a discussion of the academic research areas used. This is especially important because the topic at hand can be looked at from various academic disciplines. The literature review covers the following research areas:

1. New product development (NPD)
2. Fuzzy front end (FFE)
3. Information system development (ISD)
4. Agile software development (ASD)

2.1 Review process and used sources of literature

Hart's (2006) book, *Doing a Literature Review*, guided the review process with its outline of the major functions of a literature review:

1. Classifying and reading research
2. Argumentation analysis
3. Organizing and expressing ideas
4. Mapping and analysing ideas
5. Writing the review

It is important to note that these steps are non-linear, and can be completed in any sequence.

The literature review includes academic textbooks, business literature, journal articles, conference papers, theses, and working papers to give a comprehensive overview of the subject field as demanded by Hart (2006). Despite this broad approach, the author followed Rowley and Slack's (2004) requirement that articles in research journals should be the main sources for the literature review to ensure academic rigor. Conference papers, consulting reports, working papers, and theses should be used where they provide additional insights.
2.2 Examined academic research areas

The author conducted an extensive review looking at research about the early stage of product innovation. NPD research is quite a young discipline, but it has attracted researchers from various academic disciplines (Guo, 2008).

**New product development research (NPD) research**

NPD research became an established discipline in the 1980s, as a number of researchers began to emphasize the impact of new products on corporate success and presented models on how to improve the product innovation process within companies (Drucker (1986); Cooper (1986), Cooper and Kleinschmidt (1987). NPD research is a multidisciplinary area of research; articles are published in journals from different backgrounds, including R&D or marketing. Page and Schirr (2008) saw growth of this research area as closely interlinked with the introduction of JPIM, the *Journal of Product Innovation Management*.

NPD research imparted valuable insights into the process of product development. It changed product development from an "art" to a "science" (Griffin, 1997). The research agenda has broadened from success factors and staged development research to include areas such as the ideation of ideas. Furthermore, research has matured and researchers have begun to use more sophisticated methodology and models (Page & Schirr, 2008).

**Fuzzy front end (FFE) research**

FFE research is a sub-discipline of NPD research that examines the early, "fuzzy" stage of product innovation. The FFE phase is highly important, as it includes all activities necessary for creating a distinctly defined product concept. A significant amount of research underlines this importance. Therefore, this literature review will examine the process models in this area. Major contributors to the field were, among others, Khurana and Rosenthal (1997) Koen et al. (2001), Deppe et al. (2002), Herstatt and Verworn (2004), Reid and Brentani (2004), Hansen (2007), and Glassman (2009), Montoya-Weiss and O'Driscoll (2000).
Despite the existence of a comprehensive body of literature in NPD and FFE, the manufacturing industry is overrepresented (Guo, 2008). Therefore, this literature review will include ISD because it provides specific knowledge on the development of software and web applications. ISD approaches its task from a different angle than NPD research; it is solely focused on engineering. In contrast to NPD, ISD does not see a product as a whole. The product concept is usually given.

**Agile software development (ASD) research**

Within ISD, a specific research development area emerged in the last decade – ASD – that is considered to be the standard method of developing web applications. The amount of research in this area has grown significantly over the last decade. Preliminary interviews with start-up innovators conducted by the author showed that start-up innovators strongly believe agility to be the key to their success. Agile development is very popular in the start-up innovator community. Therefore, the literature review will integrate this body of knowledge to understand the FFE behaviours of start-up innovators. Major contributors were Cusumano and Yoffie (1999), Fowler and Highsmith (2001), Boehm (2002), Baskerville et al. (2003), Williams and Cockburn (2003), Dyba and Dingsoyr (2008), and Conboy (2009).

### 2.3 Information system development (ISD)

ISD research provides insight into the development of software and web applications. This section gives an introduction to the ISD literature and the specifics of web application development.

### 2.3.1 Information systems and technology research

ISD has been influenced by other related disciplines, including information systems (IS), information technology (IT), operations research (OR), and management sciences. Avison and Fitzgerald (2006) identified the following
main themes of ISD research in the literature:

- Organizational themes
- People themes
- Modelling themes
- Rapid and evolutionary development
- Engineering themes
- External development

A significant amount of ISD research focuses on how the structure and organization of the software development process. A substantial body of literature on development processes has been developed for more than three decades (Larman and Basili, 2003).

2.3.2 Software development processes

Authors usually describe the history of software development models as a journey from traditional waterfall or plan-driven software development to agile software development. This review will categorize the models in the following three stages:

1. Waterfall and plan-driven development
2. Iterative and incremental development
3. Internet speed and agile development

The concept of stages is helpful to give an overview of the research history, but in practice the different stages did not replace each other. Boehm (2002) called for a combined approach of agile and plan-driven approaches. In an analysis on agile development, Cohen et al. (2004) concluded that agile approaches would not rule out traditional models and that both approaches will co-exist in the future. Practice confirms this view as plan-driven development is still widely used. Sommerville (2007) emphasized that plan-driven approaches would still be valid in the future because different approaches are suitable for different kinds of software and uses. Baskerville et al. (2010a) even envisioned a post-agility decade where plan-driven and agile approaches would merge into a new set of methods.
2.3.3 Waterfall development

ISD research developed in a similar fashion, as did NPD research. The classic NPD model focused on defining the product concept as early and as precisely as possible. The specifications for a product were determined after an extensive concept definition phase. Once the product concept was finalized, no additional changes could be made. Further progress was tightly controlled in a stage-gate screening process in order to kill low potential projects quickly, thereby minimizing costs (Schirr & Hansen, 2010). Cooper and Kleinschmidt (1987) stated that an efficient product definition phase and the existence of sharp product definitions before the beginning of new product development were crucial for successful product innovation.

The waterfall model of software programming works on a similar assumption; the software requirements are defined early in the process and are then translated into a system or software design. After the software is implemented and tested, the code is integrated into the productive system and more tests are conducted. Finally, the software is handed over to operations and maintenance.

Royce (1970) is referred to as the first author who described the waterfall model. Larman and Basili (2003) emphasized that Royce did not suggest using the waterfall model; instead, he suggested a modified version of a pilot project. He also described first feedback loops, which were lost in many descriptions of the model. Sommerville (2007) illustrated the waterfall model and correctly integrated a feedback loop (See Figure 1).
2.3.4 **Iterative incremental development (IID)**

Iterative incremental development (IID) was first described by Basili and Turner (1975) who emphasized that the development of a software system could improve based on learning generated in the development process. This publication was followed by influential publications by Gilb (1978), Weinberg (1982), and Booch (1982). In summary, these authors argued for small incremental steps, feedback cycles involving customers, and frequent deliveries of results to stakeholders (Larman & Basili, 2003).

*From waterfall to iterative development*

In the 1970s and 1980s, iterative development was far from mainstream; however, Larman and Basili (2003) emphasized that institutions such as IBM and the US Department of Defence (DOD) had already started to use iterative approaches. These entities used these approaches to develop life-critical software systems for airplanes and submarines. In another example, Larman
and Basili described that the National Aeronautics and Space Administration (NASA) used the now common approach of time-boxed iterations for its space shuttle program. In this approach, iterations are set at a fixed time. Popular methods like SCRUM are based on time-boxing.

Jalote et al. (2004) illustrated the journey from the waterfall method to the time-boxed iterative model as shown in Figure 2:

Figure 2: Waterfall, iterative and time boxing process models

Source: Jalote et al. (2004)

**Spiral model**

The spiral model set a landmark in the development of Iterative and incremental models (Boehm, 1988). It promoted using development cycles to reduce risk in software development. Although the reduction of risk was previously attributed to a comprehensive requirement document early on, the risk reduction effect of different discrete iterations became emphasized. The model is described in the figure 3 below.
1990s publications

More publications began to emerge surrounding IID in the 1990s. Martin (1992) published a book on the rapid application development (RAD) approach, which already described many elements; these elements later were incorporated into the agile development movement. Beynon-Davies et al. (1999) described the components the as follows:

- Small development groups
- Rapidity of development
- Development in clean rooms away from everyday work
- Time boxing of development steps
- Incremental prototyping

Other popular methods, such as SCRUM (Schwaber, 1995), Dynamic Systems Development Method (DSDM) by Stapleton (1997), and Extreme Programming (XP) by Beck (1999), are currently referred to as agile development methods based on the IID work of the 1990s. While the IID movement progressed in this decade, Larman and Basili (2003) emphasized that many projects in the 1990s...
still failed due to the dominance of waterfall behaviour in software development.

2.3.5 Internet speed development

Baskerville et al. (2003) underlined the fact that web environments accelerate agile software development due to shorter cycle times, rapid requirement changes, and unpredictable product complexity. However, the agile development method dates back to non-Internet environments and was invented before the dot.com boom. For example, SCRUM originated in the manufacturing industry in Japan in the 1980s. Therefore, to better understand these development practices it is valuable to examine the original research on Internet speed development.

Baskerville et al. (2010a) conducted a 10-year review and concluded that the first dot.com bubble was a tipping point for agile methods. Early studies on Internet speed software development discovered significant differences to traditional development practices (Cusumano & Yoffie, 1999; MacCormack et al., 2001, Baskerville et al., 2003). In 2001 17 experts on IID wrote the agile manifesto (Fowler and Highsmith, 2001). The now popular term of agile software development (ASD) has been popularized by this group. Cockburn published the first book under this title in 2002. Although agile development is far from being purely developed for software on the Internet, the timing of publication and a close thematic interconnection fostered the fact that in practice web application development is almost always referred to as agile development. Baskerville et al. (2003) stated that agile development principles drove the development of web software. Meso and Jain (2006) concluded that agile methods were typical for Internet software development.

By comparing Internet speed development with agile approaches, Baskerville et al. (2003) anticipated the further direction of ISD research on the topic. Research on agile software development emerged as a dominant field in ISD and in a way replaced the research on Internet speed. In a review on development, Baskerville et al. (2010b) described Internet speed development research as a first step in understanding agile approaches.
Synchronize-and-stabilize model

In 1999, Cusumano and Yoffie published a paper on software development in the Internet era based on examinations of processes at Microsoft and Netscape. They described a "synchronize-and-stabilize software development model" (p. 69). This model employs a clear product vision but enables teams to change functional specifications until the final beta release is finished and the team freezes the user interface (UI). After the UI freeze, the team completes the code and rolls out the final release. Figure 4 shows the model, including alpha and beta release milestones:

Figure 4: Synchronize-and-stabilize software development model

Flexible development process models

While Cusumano and Yoffie (1999) researched only two companies,
MacCormack et al. (2001) examined 29 Internet software development projects and confirmed the need for more flexible development processes. An imminent need exists to generate information during the development process and to respond in later stages. A specific concept and a detailed design characterize successful product development projects based on the waterfall model. Web software development projects must be handled more flexibly, as the first integration happens before the final concept and the product is tested and designed during the concept phase (See Figure 5):

Figure 5: Flexible model of product development

![Flexible model of product development](image)

Source: MacCormack et al. (2001)

MacCormack and Verganti (2003) used the same sample of Internet projects to examine the effects of development practices in different contexts. They found evidence of a strong positive association between performance and early feedback in high-risk software development. The Internet environment is characterized by high uncertainly, requiring the development process to continually adapt to the project context. MacCormack and Verganti (2003) also discovered that ex-post reactions to uncertainty are generally not successful. In their view it is extremely important to decide on a flexible development process very early in the process. Early market feedback mediates market uncertainty, while early technical feedback mediates platform uncertainty.
Product development in Internet time

In 2003, Baskerville et al. explored the differences between the Internet speed development model and the traditional development model, and concluded that agile approaches are a better fit for web software development. They identified the following causal factors that foster an agile development approach (Baskerville et al., 2003):

- A desperate rush-to-market
- A new and unique software market environment
- A lack of experience developing software under the conditions this environment imposed (p. 71)

Baskerville et al. (2003) compared characteristics of the Internet speed software development processes with agile manifesto principles, as shown in Table 2.

Table 2: Agile Manifesto principles and Internet speed practices

<table>
<thead>
<tr>
<th>Agile Manifesto principles</th>
<th>Internet-speed practices and Discovery Colloquium agile principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Satisfy the customer through early and continuous delivery of valuable software</td>
<td>• Good software development methodologies engage the customer</td>
</tr>
<tr>
<td>• Welcome late and changing requirements; harness change for the customer’s competitive advantage</td>
<td>• Methodologies must accommodate requirements change</td>
</tr>
<tr>
<td>• Self-organizing teams develop the best architectures, requirements, and designs</td>
<td>• Software processes require good teamwork regardless of methodology</td>
</tr>
<tr>
<td>• Deliver working software frequently</td>
<td>• Release more often</td>
</tr>
<tr>
<td>• Business people and developers must work together daily throughout the project</td>
<td>• Implant customers in the development environment</td>
</tr>
<tr>
<td>• Routinely reflect on the team’s effectiveness and tune behavior</td>
<td>• Tailor the methodology daily</td>
</tr>
</tbody>
</table>

Source: Baskerville et al. (2003)

2.4 Agile software development (ASD)

Agile software development (ASD) was created in reaction to traditional plan-based development methods (Dingsoyr et al., 2010). It is sometimes also called
agile systems development. While traditional plan-based models were based on the idea of fully specifiable problems and the development of optimal solutions for these problems in a structured waterfall process, ASD solves the challenges of an unpredictable world through a creative agile process with users as the drivers. The ASD movement had a huge impact on software development worldwide (Dyba & Dingsoyr, 2008).

2.4.1 Defining agile software development (ASD)

ASD is a widespread field. Williams and Cockburn (2003) defined agility based on the agile manifesto values by Fowler and Highsmith (2001):

1. Individuals and interactions over processes and tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan (p. 35)

Furthermore they defined ASD as a non-linear development practice, while Erickson et al. (2005) emphasized the quick reaction to changes:

Agility means to strip away as much of the heaviness, commonly associated with the traditional software-development methodologies, as possible to promote quick response to changing environments, changes in user requirements, accelerated project deadlines and the like. (p. 89)

Conboy (2009) gave a more comprehensive definition for an ISD system to be agile including learning from change and a dedication to the contribution to customer value:

The definition of ISD method agility now becomes the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment. (p. 337)

Despite significant amount of literature on agile development, Baskerville et al. (2010a) concluded that the precise nature of agility is still unclear.

Comparison of waterfall and agile models

To obtain a common understanding of agile development, agile models are
often compared to traditional models. Dyba and Dingsoyr (2008) provided Table 3 comparing the two approaches:

Table 3: Agile Development compared to traditional development

<table>
<thead>
<tr>
<th></th>
<th>Traditional development</th>
<th>Agile development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamental</td>
<td>Systems are fully specifiable predictable, and are built through meticulous and extensive planning</td>
<td>High-quality adaptive software is developed by small teams using the principles of continuous design improvement and testing based on rapid feedback and change</td>
</tr>
<tr>
<td>assumption</td>
<td></td>
<td>Leadership and collaboration</td>
</tr>
<tr>
<td>Management Style</td>
<td>Command and control</td>
<td>Tacit</td>
</tr>
<tr>
<td>Knowledge management</td>
<td>Explicit</td>
<td>Informal</td>
</tr>
<tr>
<td>Communication</td>
<td>Formality</td>
<td>The evolutionary-delivery model</td>
</tr>
<tr>
<td>Development model</td>
<td>Live-cycle model (waterfall, spiral or some variation)</td>
<td>Organic (flexible and participative encouraging cooperative social action), aimed at small and medium-sized organizations</td>
</tr>
<tr>
<td>Desired organizational</td>
<td>Mechanistic (bureaucratic with high formalization), aimed at large organizations</td>
<td>Continuous control of requirements, design and solutions.</td>
</tr>
<tr>
<td>form/structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality control</td>
<td>Heavy planning and strict control. Late, heavy testing</td>
<td>Continuous testing</td>
</tr>
</tbody>
</table>

Source: Dyba and Dingsoyr (2008)

While this comparison can increase understanding of each approach, it does not account for the fact that ASD evolved from the waterfall to the agile approach. Certain aspects of the current—yet still not fully understood—model of agile development evolved over time from pure waterfall approaches. Conboy (2009) concluded that in order to truly understand the concept of agile development more research is needed.
Raising awareness for ASD

Dingsoyr et al. (2010) found a steady growth of scientific publications on agile development. Dyba and Dingsoyr (2008) differentiated studies on ASD using the following categories:

(1) Introduction and adoption
(2) Human and social factors
(3) Perceptions on agile methods
(4) Comparative studies (p. 833)

Most of the scientific papers were published in the following journals:

- Institute of Electrical and Electronics Engineers (IEEE) Software
- Institute of Electrical and Electronics Engineers (IEEE) Computer
- Communications of the ACM

Conboy (2009) also noted a significant increase in conferences and workshops on these issues. Dingsoyr et al. (2010) demonstrated this growth in interest as shown in Figure 6.

Figure 6: Publications on agile software development

Source: Dingsoyr et al. (2010)
Nerur et al. (2010) argued that

The strategic nature of software development and the increased heterogeneity among software development's stakeholders (p. 17)

were driving forces behind the development of the agile model.

The changing nature of the problems solved by software increased uncertainty and complexity: While in the past a certain specific problem was solved for a small group, now more unstructured, cross-functional problems that impact multiple stakeholders must be addressed. New development methods, which used standard frameworks, enabled development professionals to follow a more agile method and increased the value of the approach.

2.4.2 Agile methods

There are vast amounts of books, articles, and other publications on specific agile development methods. Conboy (2009) differentiated these methods between commercial and in-house methods, with the in-house methods often being inspired by a commercial method. DSDM is referred to as the oldest agile method (Stapleton, 1997).

Other popular methods include SCRUM by Schwaber (1997), Lean Software Development by Poppendieck and Poppendieck (2003), XP by Beck (1999), and Crystal by Cockburn (2000).

Historical overview

Abrahamsson et al. (2010) provided the following map of ASD methods (See Figure 7). The map shows the historic development from the traditional methods to the agile methods.
In a review of ASD research, Dyba and Dingsoyr (2008) provided the following overview of key methods:

Source: Abrashkin et al. (2010)
<table>
<thead>
<tr>
<th>Agile method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal methodologies</td>
<td>A family of methods for co-located teams of different sizes and criticality: Clear, Yellow, Orange, Red, Blue. The most agile method, Crystal Clear, focuses on communication in small teams developing software that is not life-critical. Clear development has seven characteristics: frequent delivery, reflective improvement, osmotic communication, personal safety, focus, easy access to expert users, and requirements for the technical environment.</td>
</tr>
<tr>
<td>Dynamic software development method (DSDM)</td>
<td>Divides projects in three phases: pre-project, project life-cycle, and post project. Nine principles underlie DSDM: user involvement, empowering the project team, frequent delivery, addressing current business needs, iterative and incremental development, allow for reversing changes, high-level scope being fixed before project starts, testing throughout the lifecycle, and efficient and effective communication.</td>
</tr>
<tr>
<td>Feature-driven development</td>
<td>Combines model-driven and agile development with emphasis on initial object model, division of work in features, and iterative design for each feature. Claims to be suitable for the development of critical systems. An iteration of a feature consists of two phases: design and development.</td>
</tr>
<tr>
<td>Lean software development</td>
<td>An adaptation of principles from lean production and, in particular, the Toyota production system to software development. Consists of seven principles: eliminate waste, amplify learning, decide as late as possible, deliver as fast as possible, empower the team, build integrity, and see the whole.</td>
</tr>
<tr>
<td>Scrum</td>
<td>Focuses on project management in situations where it is difficult to plan ahead, with mechanisms for &quot;empirical process control&quot;, where feedback loops constitute the core element. Software is developed by a self-organizing team in increments (called &quot;sprints&quot;), starting with planning and ending with a review. Features to be implemented in the system are registered in a backlog. Then, the product owner decides which backlog items should be developed in the following sprint. Team members coordinate their work in a daily stand-up meeting. One team member, the scrum master, is in charge of solving problems that stop the team from working effectively.</td>
</tr>
<tr>
<td>Extreme programming (XP; XP2)</td>
<td>Focuses on best practice for development. Consists of twelve practices: the planning game, small releases, metaphor, simple design, testing, refactoring, pair programming, collective ownership, continuous integration, 40-h week, on-site customers, and coding standards. The revised &quot;XP2&quot; consists of the following &quot;primary practices&quot;: sit together, whole team, informative workspace, energized work, pair programming, stories, weekly cycle, quarterly cycle, slack, 10-minute build, continuous integration, test-first programming, and incremental design. There are also 11 &quot;corollary practices&quot;.</td>
</tr>
</tbody>
</table>

Source: Adopted from Dyba and Dingsoyr (2008)
Shortcomings of method-based views

Conboy (2009) emphasized that the continuous presentation of new, specific agile methods (mainly by consultants) significantly helped popularize the ASD field. The downside of a strong focus on specific methods is that little research has been performed on the underlying concept of agility. Conboy (2009) argued that the lack of a common view on ASD makes it difficult to characterize a method as agile. Why are certain methods characterized as agile while others are categorized as traditional? This question becomes even more imminent if one looks deeper into specific methods. Some propose contradictory behaviours and strategies, but are nevertheless characterized as agile.

This leads to the second shortcoming, in that there is no clear understanding of what an ASD method comprises. Some methods focus on instructions for developers, some focus on project management, and others merely describe philosophical principles (Conboy, 2009). This lack of common understanding makes it almost impossible to compare among different agile methods or with traditional methods. It becomes exceedingly difficult to choose the right method for a topic or task if the methods cannot be compared.

Furthermore, in practice methods are adopted in a heterogeneous fashion. Methods are interpreted and modified, and may be only partially or temporarily implemented in an organization. Some research suggests that only 5% of companies have fully implemented a specific method (Conboy, 2009).

Limited applicability of methods for start-ups

Despite the shortcomings of research on specific commercial agile methods, making comparisons is a common research practice. Conboy (2009) criticized the use of such approaches in non-standard settings, such as open source development, distributed development, and development in start-ups. This author does not subscribe to this view, instead believing that new online collaboration and communication tools enable developers to act over distance in very similar ways as described for co-located teams. Virtual whiteboards, videoconferencing, and screen sharing are tools that can be used to bridge the distance. For example, several online tools specifically allow SCRUM
According to Conboy (2009), commercial methods were not created for the start-up environment. While start-up innovators do often refer to agility and even specific agile methods, they rarely follow one specific method. For example, these innovators indicated that they did not follow SCRUM, but they acted "scrummy." Researching whether a specific method would have had a different influence on the FFE seems inappropriate for the dynamic environment of innovators in the start-up sector. The innovators must solve so many problems they themselves hardly have time to research whether XP or SCRUM would be a better fit. Therefore, it is unlikely this method would contribute to this research thesis.

In conclusion, the author will focus on identifying the underlying principles of ASD, which can be used for analysis of the processes of the start-up innovators in a more comprehensive way. By this process, the author seeks to understand whether the start-up innovators act in an agile manner and whether this agility influences the FFE phase of product innovation.

### 2.4.3 Agile characteristics and principles

In 2003, Williams and Cockburn summarized ASD characteristics as being "about feedback and change" (p. 39). Several authors published journal papers and books on the underlying characteristics of agile development, including Fowler and Highsmith (2001), Williams and Cockburn (2003), Nerur et al. (2010), Ericksson et al. (2005), Dyba and Dingsoyr (2008), Conboy (2009), Sharp and Robinson (2010), and Baskerville et al. (2010b). This section summarizes these publications to devise a comprehensive list of agile characteristics. This list will be used in the cross-case analysis of the thesis.

**The agile manifesto**

A group of 17 engineers formulated the agile manifesto (Fowler & Highsmith, 2001), which is the most popular document on agile principles. Though it is not sufficient to only use its principles to characterize agility, the manifesto has added significantly to their development. However, to fully understand agile
principles and characteristics, it is necessary to explore the principles contained in the manifesto.

*Agile development characteristics*

While there is a significant amount of research on specific agile principles, limited empirical evidence exists, leading to the combination of conceptual propositions and evidence. This review will not distinguish between conceptual propositions and empirical evidence, as this analysis is provided in order to support the upcoming case studies. Therefore, a mixed list is sufficient for supporting a deeper understanding of FFE processes.

*Speed orientation*

In 1998, Aoyama argued that “the Internet changed software development’s top priority from what to when” (p. 56). Baskerville et al. (2003) called this “a desperate rush to market” (p. 71), resulting in the need for shorter development cycles despite growing demands for functionality and quality. To solve this problem, Aoyama (1998) proposed the use of an agile software process (ASP):

> ASP aims to develop software quickly while maintaining the flexibility needed to respond to changing requirements. (p. 57)

Speed Orientation has since been defined as a principle of ASD. Fowler and Highsmith (2001) stated:

> Our highest priority is to satisfy the customer through early and continuous delivery of valuable software. (p. 35)

*Constant iterations*

The speed orientation principle leads into another major characteristic of agile development: constant iterations. Jalote et al. (2004) described the iterative process as follows:

> In an iterative process, the development of a software system is done in increments, each increment forming of iteration and resulting in a working system. (p. 117)

Constant iterations contribute both to speed and to the learning and adoption of elements of agile development, which are described later. Through constant
iterations it is possible to quickly react to input from the development process or other resources.

**Time-boxed iterations**

Aoyama (1998) stated the “dynamics shift from volume based to time-based” (p. 57) early on in the agile process. In his publication, Aoyama also described the on-going struggle between functionality and delivery date, concluding that time-to-delivery is of higher importance in an agile process. This is also reflected in popular agile methods, such as SCRUM, where time-boxed iterations are set and the team determines which features to develop based on the time allotted.

**Frequent releases**

Iterations are closely connected to frequent software releases, which are valuable and working characteristics and goals of ASD (Baskerville et al., 2010a). Iterations are used internally as well as included in short-release cycles to provide valuable software to the consumers on a more frequent basis. Traditional software development was geared towards big releases occurring years apart, while agile software development uses more frequent releases. Fowler and Highsmith (2001) formulated the following principle:

> Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale. (p. 35)

Baskerville et al. (2003) emphasized that the constant releases with short cycle times remove the pain of “slipping” a feature, which is quite common in software projects.

**Facilitation of change**

Highsmith and Cockburn (2001) stated that due to a more dynamic environment, the question in software development shifted from “how to avoid change” to “how to handle change.” Change itself is inevitable. These authors viewed the reduction of change costs as the only viable strategy and doubted the possibility of anticipating all requirements as early as proposed by waterfall
models. Fowler and Highsmith (2001) stated the openness towards change in the following principle:

Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage. (p. 35)

Conboy (2009) considered the facilitation of change to be a major part of ASD, that is achieved through actively creating the need for change, conducting practices that pre-empt change, or making it easy to react after change occurs. This process fosters additional learning as well.

**Contribution to valuable software**

Conboy (2009) described the contribution to valuable software as listed in the agile manifesto and other literature on agile software development as economy, quality, or simplicity perceived by the customer. Good software design contributes to at least one of these aspects and does not compromise any of the aspects. Fowler and Highsmith (2001) emphasized the importance of perceived value and formulated the following principle in the agile manifesto:

Working software is the primary measure of progress. (p. 35)

This characteristic seems to play an obvious role in agile development. Highsmith and Cockburn (2001) wrote about the “unforgiving honesty of working code” (p. 121), emphasizing that a working piece of software is far more valuable than a written concept document.

**Readiness of the used method**

Conboy (2009) refers to a continual readiness of the method. As an example he describes that a test will not need hours to be set up; ideally it will run instantaneously at any given moment. Short setup time and minimal costs to prepare characterizes this continual readiness of the method.

**Cooperative customer collaboration**

Cooperative customer collaboration is seen as a general characteristic of agile methods (Meso & Jain, 2006). The agile manifesto (Fowler & Highsmith, 2001) included early “customer collaboration over contract negotiation” as a core
value and underlined this through the following principle:

Business people and developers must work together daily throughout the project. (p. 35)

Martin et al. (2010) identified several customer roles, such as the collaboration guide, skills specialist, or direction setting roles. These roles and the agile manifesto principle reflect the view of the customer as a businessperson who leads developers.

**Product learning and adoption**

Customer or end-user collaboration is strongly interconnected with learning and adoption. Learning and adoption can happen either based on internal learning form the process or through user interaction (Fowler & Highsmith, 2001).

**Test-driven development**

Hellmann et al. (2010) identified test-driven development as a major part of ASD. User interfaces (UI) should be tested and improved through the use of prototypes. These prototypes only have to be functional; there is no need for polished products. Hellmann et al. indicated that such a test-driven approach could reduce the amount of UI revisions in later phases.

**Continuous design improvements**

Fowler and Highsmith (2001) stated that continuous design improvements are part of agility:

Continuous attention to technical excellence and good design enhances agility. (p. 35)

Fowler and Highsmith (2001) clearly emphasized that agile is not to be misunderstood as another word for hacking. In the hacking culture excellent design is not an issue. Boehm (2002) also made a clear distinction between agile methods and hacking. He believed that agility does not undermine good development practice.
Process learning and adoption

Process learning and adoption are also important agile development principles (Fowler & Highsmith, 2001). Developers are encouraged to continuously reflect on their current process and to improve it. This shall be done by developers themselves and shall not be forced on them from outside.

Co-located development

Some authors have indicated co-location of the development team as a characteristic of agile software development (Ramesh et al., 2006). These authors emphasized that the process-based needs of distributed environments present major challenges to the use of agile principles such as focus on the individual. Ramesh et al. (2006) indicated that it is possible to incorporate agility practices in distributed development, but requires balance between agility and the needs of the distributed development.

Emphasis on simplicity

The strong focus on working software leads to certain behaviours within agile development, including eliminating work that does not directly contribute (e.g., comprehensive documentation). The agile manifesto refers to this as an emphasis on simplicity (Fowler & Highsmith, 2001):

Simplicity—the art of maximizing the amount of work not done—is essential. (p. 35)

However, reduction of work comes at a price. Boehm (2002) criticized that such behaviour could avoid the creation of software architecture, which is valuable for future developments.

Frequent feedback loops

Highsmith and Cockburn (2001) emphasized that agile development is based on frequent feedback loops that should not take longer than a few weeks. A loop of six months is not advisable.
Reflections in action

Finally, internal regular reflection sessions are seen as a major part of ASD. Fowler and Highsmith (2001) stated:

At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly. (p. 35)

Baskerville et al. (2003) emphasized that agile development processes for web applications are highly dependent on developers' knowledge. Constant reflections on actions taken are imperative, especially as projects tend to be ongoing processes without a defined beginning or end.

Intense team interaction

Sharp and Robinson (2010) summarized the most important principles of team interaction in agile practice with 3 Cs: Collaboration, Communication, and Coordination. This author grouped these characteristics under the term intense team interaction due to their suggested frequency and intensity.

Intense Collaboration

Sharp and Robinson (2010) pointed out that collaboration among team members is an essential part of agile development, but that limited research exists in this area. Even so, existing research suggests that developers of an agile team must be highly collaborative (Bryant et al., 2006). This collaboration is reflected in agile methods; for example, extreme Programming XP uses pair programming where two developers collaborate on nearly every subtask.

Frequent Co-ordination

Sharp and Robinson (2010) defined co-ordination as "the management of dependencies among activities" (p. 61) and distinguished between regular and ad-hoc co-ordination. They identified daily stand-ups, planning games, and the assignment of cards with user stories as typical co-ordination efforts.
Verbal communication

Sharp and Robinson (2010) described the communication in agile teams as highly focused towards verbal communication, leading to less written documentation of complex user stories or requirements. Highsmith and Cockburn (2001) stated that individuals could transfer ideas faster through face-to-face conversation than through documents. Agile developers prefer verbal communication. Fowler and Highsmith (2001) pointed out:

The most efficient and effective method of conveying information to and within a development team is face-to-face conversation. (p. 35)

Emphasis on individuals

Nerur et al. (2010) added the individual to the list of agile principles, indicating that an emphasis on individuals was an important characteristic of agile development. In fact, the agile manifesto (Fowler & Highsmith, 2001) stated that strong individuals are more important than processes:

Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done. (p. 35)

This has also been criticised. Boehm (2002) stated that agile processes are likely to fail without highly skilled people and emphasized that knowledge in agile teams is mostly tacit, which might be lost if key people leave the team.

Participative development

A participative development takes advantage of the full potential of the individuals involved in the development process. Meso and Jain (2006) stated that it is a best practice to decentralize leadership and decision-making in an agile development process to address problems where they are encountered.

Self-organisation

This participative approach is closely connected to the promoted self-organisation of the development team. Instead of forcing the team into a specific system, the team members are able to organise their own work. Fowler and Highsmith (2001) stated:
The best architectures, requirements, and designs emerge from self-organizing teams. (p. 35)

Meso and Jain (2006) stressed enabling team configurations to naturally evolve based on the working relationships of team members.

**Orientation towards sustainability**

The balance between development team members’ quality of life and accomplishing the work is another basic principle. Fowler and Highsmith (2001) stated:

> Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely. (p. 35)

Nerur et al. (2010) discussed the necessity for jobs and work designs to develop in a sustainable way. Agility cannot be achieved through working long hours; proper life and work balance is also necessary.

### 2.4.5 ASD research criticism

Conboy (2009) stated that agile development research lacks rigor and theoretical grounding because this research category is mainly based on industry- and consulting-driven foundations. Conboy and Morgan (2010) stated that a lack of a cumulative tradition leads to ambiguity in definitions and meanings, thereby limiting the applicability for practitioners and researchers. Dingsoyr et al. (2010) emphasized that agile development is continuously debated because it is multi-faceted and poorly delimited. The scope of the topic is unclear; for every scholar who characterizes the topic as a cultural revolution in software development, there is another who classifies it as a project management philosophy. In 2009, Conboy identified several shortcomings of the research on agility:

- Lack of clarity
- Lack of "theoretical glue"
- Lack of “cumulative tradition”
- Lack of parsimony
- Limited applicability (p. 329)
Despite its rising popularity, scientific research on ASD remains limited compared to the number of practical publications on agile software development; in particular, empirical evidence remains quite limited (Abrahamsson et al., 2010). The field is still dominated by publications from practitioners and consultants promoting certain agile methods. Only a limited amount of research focuses on the actual foundations of the agile movement.

2.5 New product development (NPD)

Belliveau (2004) defined NPD as follows:

The overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product. Also frequently referred to just as ‘product development. (p. 521)

According to Kahn et al. (2005), quantitative studies differentiating successful from unsuccessful products emerged in the early 1970s and the field developed further. The Product Development and Management Association (PDMA) was founded in 1976. The Journal of Product Innovation Management (JPIM) was first published in 1984. It quickly became the dominant journal for NPD research. In a meta-study of product development research, Page and Schirr (2008) analysed 10 NPD, management, marketing and R&D journals and came to the conclusion that number of articles on NPD had grown both in absolute numbers and relative percentage (See Figure 8). Despite this growth, JPIM retained its dominance, accounting for almost half of the publications.
2.5.1 New product development research areas

In the 1980s and 1990s, the field was not only dominated by one journal, but also by only a few authors. According to Biemans et al. (2010), the most cited academic papers on product development were published in the 1980s by Cooper and Kleinschmidt (1987) and Gupta et al. (1986). In the 1990s, research on NPD performance (Montoya-Weiss and Calantone, 1994), NPD practices (Griffin, 1997), and the integration of marketing and R&D (Griffin and Hauser, 1996) were among the most cited articles. The dominance of this group of authors ended in the late 1990s (Biemans et al. (2010), as Griffin became the editor of JPIM and Cooper moved towards consulting. The number of influential authors increased and the number of publications targeted towards practitioners soared in the 1990s and 2000s. The first handbook of the PDMA was published by Rosenau in 1996 and was accompanied by more practice-oriented publications such as the NPD Tool books 1, 2 and 3 (Belliveau, 2002, 2004; Griffin, 2007).

However, the number of publications is not the only determinant of the
importance of a research field. The academic relevance of the research, quality of the research methods, and business relevance are other key factors. In this regard, three summaries on the state of research described similar conclusions. Page and Schirr (2008), Guo (2008), and Biemans et al. (2010) examined NPD research and concluded that the quality of research methods improved significantly in NPD research; however, significant issues in methodology remain and must be solved. Guo (2008) recommended broadening the geographic footprint of the research, which is now strongly based in the US and Europe; furthermore, all three authors perceived a stronger focus on service innovation as a high priority.

An analysis of the subjects of NPD research creates a mixed picture. According to Biemans et al. (2010), research papers on processes are dominant. They are the largest field in terms of published articles and have the highest academic impact based on number of citations. Although Biemans et al. predicted the relevance of process-oriented papers to decline over time, the conclusions based on these papers still guide the field.

In their review of the NPD body of knowledge, Page and Schirr (2008) adopted a broader view by analysing 10 different journals. This changed the focus of the overall body of knowledge slightly; however, what they referred to as "organizing for innovation" remained dominant and accounts for almost half of all publications (See Table 5).
### Table 5: Articles classified by JPIM Scheme

<table>
<thead>
<tr>
<th>JPIM Subject</th>
<th>Number</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizing for Innovation</td>
<td>391</td>
<td>48</td>
</tr>
<tr>
<td>Product Development</td>
<td>258</td>
<td>32</td>
</tr>
<tr>
<td>Strategy</td>
<td>232</td>
<td>28</td>
</tr>
<tr>
<td>New Product Planning</td>
<td>165</td>
<td>20</td>
</tr>
<tr>
<td>Technology Innovation</td>
<td>181</td>
<td>22</td>
</tr>
<tr>
<td>Market Analysis</td>
<td>115</td>
<td>14</td>
</tr>
<tr>
<td>Forecasting</td>
<td>109</td>
<td>13</td>
</tr>
<tr>
<td>Creativity</td>
<td>71</td>
<td>9</td>
</tr>
<tr>
<td>Concept</td>
<td>49</td>
<td>6</td>
</tr>
<tr>
<td>Industry Analysis</td>
<td>47</td>
<td>6</td>
</tr>
</tbody>
</table>

*Topics assigned to a least 20% are shown in bold.

Source: Page and Schirr (2008)

The JPIM scheme uses broad categories, and Page and Schirr (2008) only researched publications until 2004; therefore, this table provides only an indication of gaps in the literature. Several authors stated that the most significant improvements in product innovation could be achieved in the FFE phase (Glassman, 2009). Furthermore, industry and market context have not been sufficiently analysed. Guo (2008) concluded his review with a recommendation to research NPD activities with regard to competitive and environmental differences. The current research is focused on the FFE activities of start-up innovators and can contribute to closing this gap in knowledge about FFE activities and phases in the dynamic, agile environment of web product development in start-ups.
2.5.2 New product development process

NPD is a growing research area with a significant interdisciplinary body of literature (Page & Schirr, 2008). The next sections will focus on areas of research that contribute to understanding how start-up innovators handle FFE.

Best practice model of NPD

According to Glassman (2009), the predominant view of New Product Development (NPD) evolved as a logical continuation from the first research on R&D management. The early straight-forward R&D process from research to market launch evolved into a research funnel concept that was then split into separate steps: (1) R&D process, (2) New Product Development, and (3) Commercialization.

Research on staged development processes and success factors took a dominant role in the beginning of NPD process research, but the focus broadened over the years (Page & Schirr, 2008). Smith and Reinertsen introduced the term fuzzy front end (FFE) in 1991. Since the introduction of the FFE term, product innovation research evolved further and a three-phase concept of the NPD process was established (See Figure 9).

Figure 9: Innovation process

Source: Glassmann (2009)

Koen et al. (2002) described three major phases of product innovation.
1. Front End of Innovation (FEI)
New ideas for innovations and product concepts are created in this first phase. Koen et al. (2002) emphasized that the FFI phase affords companies the greatest opportunity to improve the success of their NPD efforts.

2. New Product Development (NPD)
Products are developed from product concepts. All aspects of product development, from design to manufacturing, must be addressed in this phase. Many companies, especially those in the manufacturing industry, achieve high productivity gains in this phase using product development systems such as the Stage-Gate (Cooper, 2008) and the PACE approach (McGrath, 1996).

3. Commercialization phase
In this phase, the company works on increasing profit from the new product or through enhancements. This phase will be excluded from the rest of this review, as the monetization efforts after the launch are not a part of this dissertation.

Regression of uncertainty
In looking at the main characteristics inherent in each stage, Glassman (2009) emphasized that expenses increase significantly as the project proceeds (See Figure 10).

Figure 10: Increasing project costs in the Stage-Gate process
The Stage-Gate process became so popular because it decreases the risk of incurring high costs through the inclusion of development gates, or points at which the project could be stopped or changed. Deppe et al. (2002) pointed out that uncertainty decreases and the amount of information grows from the FFE to the commercialization phase (See Figure 11).

Figure 11: Regression of uncertainty and NPD information growth

Source: Deppe et al. (2002)

2.5.3 The Stage-Gate model

Issues of execution, development, and processes are among the most researched areas in NPD. In an analysis on published research in JPIM, Guo (2008) found that detailed development issues had the second highest amount of publications, topped only by research on general performance and success/failure drivers. Some scholars have presented different approaches to explain and structure development processes; however, the Stage-Gate model (Cooper, 1986) is usually presented as a standard model for managing these NPD processes. According to PDMA and APQC benchmarking, approximately 70% of businesses have adopted Stage-Gate inspired processes (Kahn et al., 2005). Ettlie and Eisenbach (2007) indicated that approximately half of the automotive engineering managers in their study used a traditional Stage-Gate process and about a third used a modified version for NPD.

The Stage-Gate model in its simplest form breaks NPD into different stages and
gates. During each stage, the project team conducting the activities planned for that stage gathers the necessary information and analyses the achieved results. Each stage at which a decision is made whether to invest further into the project is followed by a gate (See Figure 12).

Figure 12: Decision Gates in the Stage-Gate process

Each Stage

Activities
Information gathering activities by project team

Integrated Analysis
An integrated analysis of results by project team

Deliverables
A result of integrated analysis-input to the gate

Followed by a gate
Go/Kill
A go/kill decision point—results are assessed & a decision to invest more is made

Source: Cooper (2008)

The Stage-Gate process seeks to reduce project risks through the continuous reduction of uncertainties. Clearly defined decision gates effectively enforce active decisions on whether to move on to the next, more expensive stage.

The classic Stage-Gate model consists of five main discrete, identifiable, multi-functional, and cross-functional stages. In each stage the necessary information is gathered to move forward towards the next stage of the development process (See Figure 13).

Figure 13: Five stages of the innovation process

Scoping
Stage 1

Build Business Case
Stage 2

Development
Stage 3

Testing and Validation
Stage 4

Launch
Stage 5

Source: Present author, adapted from Cooper (2006)

The following sections provide a short overview of each stage.
Scoping stage
This stage comprises an inexpensive evaluation of market opportunities and a technical assessment. This investigation is normally conducted as desk research without primary research. All activities are structured to provide the necessary background on market, business, and technology.

Business case stage
In the second stage, a more detailed investigation is conducted and a business case is prepared. This includes a detailed market and competitive analysis, an in-depth assessment of the technology, a defined product concept, and a financial and business analysis. Furthermore, a project plan with actions to be conducted, necessary resources, and planned timelines is prepared.

Development stage
At this stage the design of the product is defined and development starts. The result of this stage is a prototype that has proven to be successful during in-house and lab testing. The product and customer interaction is tested under controlled conditions.

Testing and validation stage
This is the final stage before launch. A variety of tests are conducted to examine the viability of the whole project, including customer testing and field trials to predict the product’s acceptance by future customers. The production process is finalized through a series of trial runs and a detailed financial and marketing plan is prepared. A cross-functional team with members from nearly all major departments of the company work together during this stage.

Market launch stage
This stage marks the commercialization of the product. Full production of the product commences and it begins market distribution. The “post-launch plan” includes monitoring product success and fixing bugs. Product life-cycle management also gets implemented in its first rudimentary form.

A gate precedes every stage. At these gates a management committee decides
whether to move on to the next stage. The classic Stage-Gate process includes five gates (See Figure 14):

Figure 14: Stages and gates of the five-stage innovation process

The gates help ensure the overall success of the product development process. Managing the gates as “quality control check points” enables solid decision-making. The function of the gates is generally conducted through the staff meetings where senior management and selected production teams come together to evaluate overall performance. Proper handling of inputs, criteria, and outputs is necessary to ensure the quality of the gate review:

**Inputs**
Inputs are all of the deliverables that are important for the gate review. This information is the basis for an informed decision and must be presented in a comprehensive format by the project team.

**Criteria**
Criteria are the qualitative and quantitative metrics used to measure NPD performance and progress. Usually scorecards are used to handle this part of the new product development process.

**Outputs**
The most important output is a decision about the next steps. Whether to move on or to cancel. Furthermore, projects and tasks are prioritized, an action plan is created, and the company approves the necessary resources. These decisions are made based on defined criteria.
Since the first introduction of the Stage-Gate model by Cooper in 1986, it has been updated several times. Cooper (2008) conceptualized Stage-Gate as a complete idea-to-launch system, a scalable system with next-generation versions. He added the Discovery stage and Post Launch Review (PLR) to the model. By adding these stages Cooper sought to overcome the perception that Stage-Gate is appropriate only for development processes.

**Discovery stage**
This stage is also called the ideation stage. Cooper (2008) added this stage to emphasise that ideas can come from multiple sources from inside as well as outside the company. Examples of possible sources are start-ups, development partners, and inventors. No detailed descriptions on the actions in this stage were provided.

**Post Launch Review (PLR)**
The achieved performance is compared with the expected results after 12 to 18 months. Lessons learned are extracted, and the project is formally terminated. Ensuring accountability of the team is a major goal of the post launch review.

Furthermore, Cooper introduced less complex versions of Stage-Gate to make the system more suitable for lower-risk projects, such as incremental product extensions. Figure 15 depicts the model to which Cooper (2008) referred to as Next Generation Stage-Gate.
Despite these enhancements, Stage-Gate is still mainly renowned for its impact on the product development process, including significant reductions in product cycle time (Ajamian & Koen, 2002). Ajamian and Koen (2002) criticized Stage-Gate and its lesser known alternative, the PACE process (McGrath, 1996), for their inability to manage the unpredictable nature of high-risk technologies. The authors argued that outcome-based systems are less helpful in these uncertain situations. Ettlie and Eisenbach (2007) confirmed that the companies in their studies optimized their development processes and reduced development times but did not use Stage-Gate for radical new technology products. Chesbrough (2003, 2006) went a step further with his criticism on traditional internally focused innovation processes, stating that innovation must innovate itself to cope with an information-rich, fast-paced environment. He saw the need for open innovation in which ideas and technologies are leveraged from internal and external sources. Open innovation became a new research area adopted by several researchers, such as Chesbrough et al. (2006) and Drexler (2006). Docherty (2006) demonstrated the integration of the Open innovation approach into new product innovation as shown in Figure 16.
Docherty (2006) referred to the same three major steps as the existing “closed innovation” models, but emphasized external interactions with third-party technology or ideas. This external cooperation is a two-way street. Not only is external knowledge used for the company’s own product innovation, it is also an approach for commercialization. For example, intellectual property is licensed to external partners.

### 2.5.4 Roles of individuals

As early as 1912, Schumpeter distinguished different roles of individuals in the innovation process; he wrote about inventors and entrepreneurs. Since then, many more roles have been described in the literature.

**Gatekeepers**

Research on gatekeepers has been published in R&D and TIM literature since the 1970s. Aldrich and Herker (1977) examined interactions across the
boundaries of an organization and described gatekeepers as facilitators and filters of information. Tushman and Katz (1980) described gatekeepers as individuals with strong communication networks who can understand external information and translate this information into meaningful terms for colleagues within their unit. These individuals can (and usually do) act as boundary spanners between elements inside and outside the organization, and determine which information is vital for the company. This decision can be crucial for the innovation process. Reid and Brentani (2004) compared their function to electronic circuitry, where information can be directed to one path or another. Ettlie and Elsenbach (2007) emphasized that the gatekeeper role is no longer solely pursued by higher ranks like R&D supervisors; instead, it is shared among engineering, production staff, and senior and middle management. Internet technology, the changing role of R&D supervisors, increasing speed of innovation, and open innovation approaches have been identified as possible factors causing this change.

Reid and Brentani (2004) emphasized the role of individuals in the FFE phase of discontinuous innovation. Lower rank individuals often see arising opportunities that senior management cannot see. It is a bottom-up process where these individuals act as boundary spanners between the environment and the company. The individual sees a pattern and determines whether information is valuable for the organization. In this regard, they are also gatekeepers.

**Champions**

Schon popularized research on champions as early as 1963. He described the champion as someone who takes the personal risk of promoting an idea despite a high risk of failure. According to Chakrabarti (1974), selling an idea to management and gaining the necessary support is the main function of the product champion. Rothwell (1994) saw the existence of empowered product champions as a key factor for speed and success in the product development phase. Champions do not typically invent products, but rather drive the product through the organization (Hebda et al., 2007). Kim and Wilemon (2002a) emphasized the role of product champions in the FFE as being able to
transform an idea into a valid product concept. To understand the role of a champion it is helpful to look at an example where no champion was needed. Sim et al. (2007) used the combination of Shampoo and Conditioner as an example. The need for this innovation was imminent to all departments, but scientists were unable to find a solution. In this case, it only took one inventor. No champion was needed.

**Inventors**

Inventors, sometimes also referred to as scientists, are a specific group of individuals acting in the FFE phase. They are important for driving scientific and technical innovation. They typically work in R&D, and hold advanced technical degrees and training (Sim et al., 2007). Their goal is to solve critical problems and move technology forward, and they are less interested in customer needs.

Sim et al. (2007) described inventors as experts in their fields who are technically independent, usually are given the freedom to solve problems on their own, and enjoy learning how things work or finding solutions to problems. They can have difficulty seeing the larger context and oftentimes become so consumed by a project that they neglect social opportunities. These individuals are not able to sell their products internally or externally; therefore, they depend on champions to sell their ideas. Inventors play an especially important role in areas that depend on technically brilliant solutions.

**Implementers**

Implementers, sometimes also referred to as project managers, are of high relevance for the innovation process as they push things forward through orchestrating people, technology, and tasks. Their profound knowledge about the product, a deep understanding of customer needs, and good communication skills help them to complete this task (Sim et al., 2007). Thieme et al. (2003) argued that implementers who combine planning skills, a participative management style, and technological tend to experience higher product success.

An important factor in understanding implementers is their attitude towards
work. They have polished skill sets, are hardworking and reliable, and enjoy their jobs. However, they can also be seen as average and risk-averse. They avoid corporate politics and keep a certain emotional distance from their work, preferring to be emotional in other areas (Sim et al., 2007).

**Innovators**

Finally, individuals may be innovators in the NPD process. Griffin et al. (2009) stated that these individuals usually create breakthrough technology-based innovations. These individuals have technological expertise, can imagine new applications, and can sell the innovation within the company. The current research uses the definition of an innovator proposed by Sim et al. (2007), who described innovators as individuals who fulfil the inventor, champion, and project manager role at the same time (See Figure 17):

Figure 17: Innovators as Inventor, champion and project manager

![Diagram showing the roles of Inventor, Champion, and Project Manager in the NPD process](source: Adapted from Sim et al. (2007))

These individuals are present at many different stages of FFE. Focusing on large mature companies, Sim et al. (2007) found differences in terms of motivation, personality, and background. The skills of innovators significantly differ from the skills of other roles (See Table 6).
Table 6: New product development roles and skills

<table>
<thead>
<tr>
<th>Core skills</th>
<th>Inventor</th>
<th>Champion</th>
<th>Implementer</th>
<th>Serial Innovator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical expertise</td>
<td>✓</td>
<td>●</td>
<td>●</td>
<td>✓</td>
</tr>
<tr>
<td>Market expertise</td>
<td>●</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Political guiding</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Process implementation</td>
<td></td>
<td>✓</td>
<td></td>
<td>●</td>
</tr>
</tbody>
</table>

✓ Primary Skill, ● Secondary sensitivity

Source: Sim et al. (2007)

Sim et al. (2007) not only examined different skill sets and roles, they also attempted to determine which role best fits which kinds of product innovations. They concluded that inventors are best for technical development, champions for market development, implementers for incremental product innovations, and innovators for radical product innovation (See Figure 18).

Figure 18: Different types of NPD leaders and their areas of expertise

Based on this figure and the specifics of web product development, innovators stand out as the best fit to describe individuals who create web products.
2.6 Fuzzy front end (FFE)

FFE research established itself based on an emerging understanding that early stages of product innovation have different characteristics, functions, processes, and activities compared to later development phases. This section presents the foundation of FFE research, and moves into an exploration of FFE activities, processes, and deliverables. Research results and developed models in this area are especially important, as they are the basis for the case study analysis presented in a later chapter.

2.6.1 Foundation of FFE research

This section presents an overview of the definition of the FFE, its main characteristics, and the high importance of this phase.

**FFE definitions**

Several authors have contributed to the definition of FFE. The term was first introduced by Smith and Reinertsen (1991). Koen et al. (2001) defined the FFE phase as “those activities that take place prior to the formal, well-structured New Product and Process Development” (p. 46). Koen et al. preferred talking about the Front End of Innovation (FEI) instead of FFE. They argued that the early stages of product innovation do not have to be fuzzy.

In contrast Belliveau (2002) emphasized the fuzzy nature of this phase and defined the fuzzy front end of Innovation as “the messy getting started period of product development” (p. 444). Although the term Front End of Innovation (FEI) has been promoted by some researchers and is frequently used for conferences on the topic in Europe and the US, the term “fuzzy front end” (FFE) remains the most widely accepted term by journal papers and books. Therefore, throughout this paper, the author will refer to the early stage as fuzzy front end (FFE).

Murphy and Kumar (1997) made it clear that ideas might not only be developed further, they might also be terminated: “from the generation of an idea to either its approval for development or its termination” (p. 5).
Crawford and Di Benedetto (2000) and Koen et al. (2001) emphasized that the outcome of FFE must be a clearly defined new product concept. Kim and Wilemon (2002a) added a description of the FFE activities as follows "...when an opportunity is first considered worthy of further ideation, exploration, an assessment, and ends when a firm decides to invest in the idea" (p. 269). The activities around ideas were seen by Montoya-Weiss and O'Driscoll (2000) as the basis of the FFE:

A new product originates from an idea, or in many cases, integration of multiple ideas. The process of transforming an idea into a robust concept requires definition of the underlying technologies, identification of expected customer benefits, and assessment of the market opportunity. The idea-development and subsequent idea-selection stages of new product development are often referred to as the "Fuzzy front end" because they typically involve ad hoc decisions and ill-defined processes. (p. 143)

Hansen (2007) added novelty, creativity, and a market perspective, and devised the following definition:

And the front end of product innovation is a creative process in which novel and valuable product ideas are produced by an individual or a group of individuals working together to take advantage of a market opportunity, the outcome of which is a clearly defined new product concept. (p. 16)

**Characteristics of the FFE**

Scholars emphasized that the FFE phase is very unstructured. Hansen (2007) stated that activities in the FFE suffer from low levels of formalization, and that in order to generate product concepts several unwritten and non-documented rules must be followed. Murphy and Kumar (1997) emphasized that the dynamic and unstructured nature of FFE make it difficult to generalize research findings. Herstatt and Verworn (2004) emphasized that the FFE phase is the least well-structured phase in both practice and theory.

The characteristics of NPD and the FFE phase are very opposite to each other. The fuzzy front end is unpredictable and uncertain, whereas a high degree of certainty is present in the new NPD phase. Kim and Wilemon (2002a) illustrated this using the fuzziness curve shown in Figure 19.
In addition to the fuzziness level, several other areas differ significantly between NPD and FFE. The nature of work in FFE is mainly experimental, explorative, and in a way disorganized, whereas in the second phase the work is goal-oriented and disciplined (Koen et al., 2001).

Financing for each phase differs as well. The FFE phase requires significantly fewer financial resources, and the allocation of money is often realized in an unconventional way. For example, budgets are shifted from other projects. The development phase is normally funded following a regular budgeting process.

Another characteristic of the FFE phase is the absence of profound information for a proper decision process. Compared to the formalized Stage-Gate process, the FFE decision process is mainly qualitative, informal, and approximate. The outcome of FFE is often simply a high-level product concept, or a blueprint of several unsolved problems. In contrast to clear outcomes of the Stage-Gate process, doubts remain whether the product is feasible. It is therefore much easier to reject the project in this phase (Kim & Wilemon, 2002a).

Table 7 combines a number of already published comparison tables by Kim and Wilemon (2002a) and Koen et al. (2001). Combining these tables provides a comprehensive overview of the differences between the phases.
<table>
<thead>
<tr>
<th></th>
<th><strong>FFE phase</strong></th>
<th><strong>NPD phase</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nature of work</strong></td>
<td>Experimental, often chaotic, “Eureka!” – Moments. Can schedule work-but not invention</td>
<td>Disciplined and goal oriented with a project plan</td>
</tr>
<tr>
<td><strong>Commercialization date</strong></td>
<td>Unpredictable or uncertain</td>
<td>High degree of certainty</td>
</tr>
<tr>
<td><strong>Funding</strong></td>
<td>Variable. In the beginning phase many projects may be “bootlegged”, while other will need funding to proceed.</td>
<td>Budgeted</td>
</tr>
<tr>
<td><strong>Revenue expectations</strong></td>
<td>Often uncertain with great deal of speculation</td>
<td>Predictable with increasing certainty, analysis and documentation as the product release date gets closer</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Individuals and team conducting research to minimize risk and optimize potential</td>
<td>Multi-function product and process development team</td>
</tr>
<tr>
<td><strong>Measure of progress</strong></td>
<td>Strengthened concepts</td>
<td>Milestone achievements</td>
</tr>
<tr>
<td><strong>State of an idea</strong></td>
<td>Probable, fuzzy, easy to chance</td>
<td>Determined to develop, clear, specific, difficult to change</td>
</tr>
<tr>
<td><strong>Features of information for decision-making outcome</strong></td>
<td>Qualitative, informal, approximate</td>
<td>Quantitative, formal, precise</td>
</tr>
<tr>
<td><strong>Width and depth of focus</strong></td>
<td>Broad but thin</td>
<td>Narrow but detailed</td>
</tr>
<tr>
<td><strong>Ease of rejecting an idea</strong></td>
<td>Easy</td>
<td>More difficult</td>
</tr>
<tr>
<td><strong>Degree of formalization</strong></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td><strong>Personal involvement</strong></td>
<td>Individual or small team</td>
<td>A full development team</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>Small/none</td>
<td>Large designated</td>
</tr>
<tr>
<td><strong>Management methods</strong></td>
<td>Unstructured, experimental, creativity needed</td>
<td>Structured, systematic</td>
</tr>
<tr>
<td><strong>(Visible) damage If abandoned</strong></td>
<td>Usually small</td>
<td>Substantial</td>
</tr>
<tr>
<td><strong>Commitment of the CEO</strong></td>
<td>None or small</td>
<td>Usually high</td>
</tr>
</tbody>
</table>

Source: Adapted from Kim and Wilemon (2002a) and Koen et al. (2001)
Importance of the FFE phase

Several researchers have emphasized the importance of the FFE phase, suggesting that the FFE phase has a significant impact on a product's success and the overall innovation process. In 1994, Cooper and Kleinschmidt made the following statement:

The greatest differences between winners and losers were found in the quality of execution of pre-development activities. (p. 26)

As early as 1987, Cooper and Kleinschmidt listed the "proficiency of pre-development activities" (p.180) as crucial for product success. Reinertsen (1999) indicated that the FFE phase provided great opportunities for improving a product's success at comparably low costs. Beck et al. (1999) emphasized the potential for making better, more informed decisions based on a clear product concept created in the FFE.

Kim and Wilemon (2002a) emphasized that companies may surpass their competition in the FFE. Reid and Brentani (2004) suggested that FFE is essential to the entire NPD process. Backman et al. (2007) believed that

The greatest opportunities for improving the overall innovation process lie in the very early phases of NPD. (p. 18)

Verworn et al. (2008) saw significant influences on quality, costs, and timing. They also emphasized that a better understanding of the FFE phase will contribute to higher success rates for NPD efforts. Hanson (2007) indicated that benefits from activities in the early stage of NPD usually surpass NPD activities targeted towards later stages.

Criticism of FFE research

NPD and FFE research have been criticized based on focus and methodology (Page & Schirr, 2008). In the current body of literature, manufacturing is overrepresented while there is too little focus on services (Guo, 2008). This bias makes it difficult to generalize results. There is also no common understanding of best practice methods to research NPD and FFE. Guo (2008) stated that many current process models might not represent the complex, nonlinear development processes in an adequate way. He believed that man models are
too rational to explain sometimes-irrational activities, decisions, and processes.

2.6.2 Selected influence factors on the FFE

The understanding that a distinct FFE phase, which is different from later stage NPD phase, exists and the insight that this phase is of high relevance for product success, laid the basis for a comprehensive body of FFE knowledge. This section will forego a complete overview on FFE literature in order to focus on the areas of higher relevance for the case study. Three areas of FFE research are especially relevant to this thesis project.

Contextual influences

One important insight from the FFE body of literature is the fact that contextual factors have an important influence on the FFE phase. Contextual factors might be country, company or product-specific. Herstatt et al. (2002) created the following framework to illustrate this as shown in Figure 20.

Figure 20: Framework for FFE study

Source: Herstatt et al. (2002)
Newness of a product

Knowing whether product innovation is incremental or radical is very important (Herstatt et al., 2002). Different kinds of products need different FFE strategies. Koen (2005) used the typology of Wheelwright and Clark (1992) to differentiate types of products. This typology distinguishes between three types of products (See Figure 21).

![Figure 21: Different Types of new products](image)

<table>
<thead>
<tr>
<th>Extent of Process Change</th>
<th>Extent of Product Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Core Process</td>
<td>New Core Product</td>
</tr>
<tr>
<td>Next Generation Process</td>
<td>Next Generation Product</td>
</tr>
<tr>
<td>Upgrade</td>
<td>Additon to Product Family</td>
</tr>
<tr>
<td>Incremental Change</td>
<td>Derivatives and Enhancements</td>
</tr>
</tbody>
</table>

Source: Wheelwright and Clark (1992)

This research project focuses mainly on radical product innovation. The start-up innovators were selected due to the innovative nature of their products, this pre-selects more radical innovation. Furthermore, a product is by default new to the company for start-ups. The current body of NDP literature indicates that the FFE process is different for radical products compare to incremental products (Reid & Brentani, 2004). Readers of the thesis must be aware that the results of this study are likely not suitable for those incremental innovation projects.
External and internal influence

It is important to emphasize that influences might occur from inside or outside the company. Kim and Wilemon (2002b) illustrated this in Figure 22.

Figure 22: Framework of major factors influencing FFE performance

Factors such as internal politics and company culture are important influence factors, especially in large companies. For start-up innovators, internal organizational influences are less likely; however, investors and advisors might play a very important role.

2.6.3 FFE activities, processes and deliverables

In preparation for this case study, this section will focus on described FFE activities and processes, as well as deliverables of the overall phase. Reid and Brentani (2004) saw the analysis of the processes as the predominant FFE research area. Proposed FFE models and descriptions of FFE activities and
processes guided this project’s multiple case study analysis.

**FFE activities**

Though it seems an obvious first step to research FFE activities, only a very limited amount of research on the activities actually conducted in the early phase exists. Griffin et al. (2007) criticized FFE research, and stated that too much research has been conducted on how the FFE should be run, while only very few studies actually focus on what is actually happening. Verworn et al. (2008) also stated that little empirical evidence exists because most of the FFE papers are theoretical or conceptual. The literature review underlines a gap in the existing body of knowledge on the FFE. As a basis for the current study, the author therefore analysed a number of FFE concept models to create a framework for analysis of the cases.

**Hansen (2007)**

Hansen (2007) attempted to extract typical components and activities from the FFE models. Table 8 shows the components that appeared in the literature.

**Table 8: Components of the front end appearing in literature**

<table>
<thead>
<tr>
<th>Idea generation</th>
<th>Discovery stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity Recognition/Identification</td>
<td>Preliminary analysis</td>
</tr>
<tr>
<td>Idea development</td>
<td>Clarification/elaboration</td>
</tr>
<tr>
<td>Idea selection</td>
<td>Problem definition &amp; clarification</td>
</tr>
<tr>
<td>Product definition</td>
<td>Focus of attention</td>
</tr>
<tr>
<td>Project evaluation</td>
<td>Device function or specification</td>
</tr>
<tr>
<td>Opportunity analysis</td>
<td>Incubation</td>
</tr>
<tr>
<td>Concept definition</td>
<td>Modification</td>
</tr>
<tr>
<td>Product strategy formulation and communication</td>
<td>Detailed analysis &amp; multi-functional project development</td>
</tr>
<tr>
<td>Project planning</td>
<td>Evaluation/arguments</td>
</tr>
<tr>
<td>Executive reviews</td>
<td>Decision</td>
</tr>
<tr>
<td>Idea development and screening</td>
<td>Company vision/mission/strategic planning</td>
</tr>
<tr>
<td>Business and market opportunity analysis</td>
<td>Leadership/Culture</td>
</tr>
<tr>
<td>Define options</td>
<td>Idea portfolio</td>
</tr>
</tbody>
</table>

Source: Hansen (2007)
Glassman (2009)

Glassman (2009) proceeded in a similar direction and grouped activities. Table 9 provides an overview of activities in each group.

Table 9: Activities in the FFE

<table>
<thead>
<tr>
<th>Activities related to developing a particular idea</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
<td>Partnering</td>
</tr>
<tr>
<td>Business case building</td>
<td>Planning</td>
</tr>
<tr>
<td>Commitment building</td>
<td>Protoyping</td>
</tr>
<tr>
<td>Concept refinement</td>
<td>Research</td>
</tr>
<tr>
<td>Development</td>
<td>Review</td>
</tr>
<tr>
<td>Idea diffusion</td>
<td>Testing</td>
</tr>
<tr>
<td>Knowledge creation, storage &amp; diffusion</td>
<td>Application Exploration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities related to alignment and management of FFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio planning</td>
</tr>
<tr>
<td>Strategic planning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities related to generation of ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
</tr>
<tr>
<td>Diffusing ideas</td>
</tr>
<tr>
<td>Environmental screening</td>
</tr>
<tr>
<td>Idea capture &amp; storing</td>
</tr>
<tr>
<td>Idea diffusion</td>
</tr>
<tr>
<td>Idea generation</td>
</tr>
<tr>
<td>Idea screening</td>
</tr>
<tr>
<td>Knowledge creation, storage &amp; diffusion</td>
</tr>
</tbody>
</table>

Source: Glassman (2009)

FFE processes

While the two tables of Hansen (2007) and Glassman (2009) provide a good insight into described FFE activities, they provide limited indication on phases on the process. The author will therefore look more closely at FFE process models.


In 1998, Khurana and Rosenthal published a research article in JPIM with a FFE process view. The process view was part of case study research on the
FFE practices of 18 business units in Japanese and US companies. Their model distinguishes between three phases:

(1) Pre-Phase Zero activities
Idea generation, market analysis, and a technological assessment are conducted in this first phase.

(2) Phase Zero
This phase occurs after a decision is made about whether to explore a product opportunity. A product concept is generated in this phase.

(3) Phase One
In this phase the feasibility of a possible project is evaluated and the project plan is generated.

All three phases must be aligned with the product and portfolio strategy. A stylized illustration can be found in Figure 23.

Figure 23: Stylized FFE model

Khurana and Rosenthal described FFE activities and divided them according to operational-level activities and strategic-level activities (Chang et al., 2007). Operational-level activities include the identification of customer needs, gaining an understanding about the market and competitors, an evaluation of existing technological capabilities, specifying necessary resources, identifying key risks and challenges, defining product requirements, and testing concepts. Strategic-level activities include project planning and aligning the innovation strategy to existing business plans and technology roadmaps.

The model of Khurana and Rosenthal (1998) was a first major step towards generating an FFE process model, but had three major shortcomings:

1. The authors provided limited details about the activities that happen in the FFE phase. In particular, they did not map out the early front-end activities, and did not describe creative idea generation activities. The authors provided only limited insight on how to align strategy with FFE.

2. The authors were not precise in assigning described activities to the different phases in the model (Backman et al., 2007).

3. The model was not the result of specific empirical process research. Khurana and Rosenthal (1998) took a broader research approach; the model is seen more as an explanatory description, and therefore has a more conceptual character.

**Model of Koen et al. (2001)**

Koen et al. published their New Concept Development (NCD) approach in 2001. According to Griffin et al. (2007), this model is one of most—if not the most—comprehensive FFE process models. The NCD model has three major areas:

1. The *inner area*, with five major front-end elements.

2. The *engine*, representing leadership and organizational culture as the driving force of the FFE.

3. The *influencing factors* from outside the organization.

The model is depicted as a circle with interacting elements to represent the
non-linear nature of the front-end. The term “process” is also avoided to underline this characteristic (See Figure 24).

Figure 24: New Concept Development (NCD) model

Source: Koen et al. (2001)

The five major front-end elements included in the (1) Inner area are described in more detail:

The Opportunity identification is either formal or informal. Creativity tools and techniques like brainstorming are used in formal approaches to discover market or technological opportunities. The arrow from outside indicates that this element is one of two entry points into the FFE process.

In the Opportunity analysis element, the identified technological or market opportunities are assessed. Although standard procedures for such an assessment exist, this element is usually not formalized. While the size of the opportunity, availability of resources, and the existence of necessary skills in the company play a major role, the fit to the company’s culture and the risk
affinities of upper management are also key influencers.

In the *Idea generation and enrichment* phase, ideas are developed further to exploit opportunities. In this element, ideas and product concepts are iteratively developed. They are discussed, examined, and studied. Once again, the process can be either formal or informal; several formal techniques, such as idea banks, are available. Ideas may be derived from inside or outside the company. Therefore, this is the second starting point into the FFE.

In the *Idea selection* phase, companies must decide whether to move on with a specific idea or to abandon it. Both formal decision models and individual evaluations are used. In both cases, companies often use projections on financial returns and necessary investments, evaluations on capabilities and unique advantages of the organization, and market and technology risk assessments.

The *Concept definition*, originally called “concept and technology development,” is the last element. In this phase, a final project proposal is created, which usually includes a business plan. This concept is usually based on several assumptions and is the outcome of the FFE phase.

The NCD model provides a comprehensive picture of the FFE. It was the first model to include a process perspective as well as the driving forces behind FFE and environmental factors. The introduction of the NCD model has therefore been a major milestone for FFE research (Glassman, 2009). The broad approach of the NCD model is also one of its disadvantages and limits its practical value. The activities in the different stages are described only on a very basic level. Buijs (2003) demonstrated the generic nature of this model by comparing the NCD model to general creative problem-solving models.

Another factor limiting the practical value of the NCD model is its lack of explanation of the interaction between the different elements and phases. This was an important factor in using a circle to represent the iterative nature and the constant interaction inherent in the model; however, this also causes confusion about what action to take and when.

Koen et al. (2001) achieved a major step towards creating a common language for FFE research.
Model of Zhang and Doll (2001)

In the same year that Koen et al. (2001) presented their NCD model, Zhang and Doll (2001) presented a model illustrating the causality between the FFE and NPD. Similar to Koen, Zhang and Doll referred to the high relevance and little knowledge about this phase. The model contains three major elements, all of which are predictors of NPD success:

(1) Front End Fuzziness
This element illustrates the environmental uncertainty and ambiguity influencing the FFE phase. Companies often do not have clear ideas about consumer preference, technology, and their competition.

(2) Foundation elements
Zhang and Doll (2001) viewed having a strong corporate basis with a clear strategic NPD program to be a major success factor.

(3) Team Vision
Zhang and Doll (2001) noted the vision of a common purpose and clearly defined targets to be key predictors of NPD success. For Zhang and Doll, the team vision is a mediator between the other elements. The team is decisive.

In summary, this model is not a classic process model, it emphasized different influence factors on the FFE (See Figure 25).
Zhang and Doll (2001) added to the body of knowledge by showing new perspectives influencing FFE and NPD performance. Unfortunately, the article is highly conceptual; it does not go beyond the pure description of influence factors. Thereby, the model contributes to the current case study only by indicating specific activities such as supplier or customer involvement.

Model of Boeddrich (2004)

Boeddrich (2004) proposed a model based on a benchmarking of German and European companies, though the model did not represent actual practices found in companies. Instead, Boeddrich proposed a model on how the FFE process should be structured (See Figure 26).
The model is based on the idea of systematically managing the flow of ideas as the basis of transforming creative ideas into innovation projects. Boeddrich (2004) envisioned a constant idea pipeline and software-based idea management as the key to success (See Figure 27).
Figure 27: Organization proposal for the FFE by Boedrich (2004)

Boedrich (2004) positioned his model as mid-way between a technocratic process and a completely chaotic and creative FFE phase. Similar to the Stage-Gate process in NPD models, he aimed to reduce uncertainty before the decision. Therefore, he introduced procedures that can be used during the FFE process as a way to verify estimates (e.g., strategic guidelines for innovations, a strategic analysis of ideas, and Preliminary Projects). He indicated that formal idea or innovation managers, top-management, and cross-functional decision-teams are needed.

Furthermore Boedrich (2004) listed a number of requirements that must be fulfilled to effectively organize the flow of ideas in the FFE. He differentiated between (1) General and (2) Company-specific requirements (See Table 10).
Table 10: Requirements for organizing the flow of ideas

<table>
<thead>
<tr>
<th>General requirements</th>
<th>Company specific requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic guidelines for innovations</td>
<td>Company-specific idea categories</td>
</tr>
<tr>
<td>Installation of a broad idea-collection point</td>
<td>Company-specific evaluation methods and selection criteria</td>
</tr>
<tr>
<td>Systematic idea clustering</td>
<td>Commitment to the owner of the idea-management process</td>
</tr>
<tr>
<td>Cross-functional decision-making</td>
<td>Commitment of certain individuals to promote innovation within the company</td>
</tr>
<tr>
<td>Predefined and transparent criteria for idea selection &amp; implementation</td>
<td>Definition of creative scopes</td>
</tr>
<tr>
<td>Funnel function for the selection process</td>
<td>Influence top-management on the FFE</td>
</tr>
<tr>
<td>System simplicity</td>
<td>Number of stages and gates in the tailor-made Idea management</td>
</tr>
<tr>
<td></td>
<td>Investigation of stakeholders in the structured fuzzy front end and participation</td>
</tr>
</tbody>
</table>

Source: Boeddrich (2004)

Boeddrich’s (2004) proposal can only be considered a guideline of how to structure the FFE, as he did not provide sufficient evidence of the effectiveness of such an idea management process. However, for start-up innovators, the proposal does not seem to fit. The approach is clearly targeted towards large companies.

Model of Reid and Brentani (2004)

Reid and Brentani (2004) created a conceptual model for the FFE phase of discontinuous product innovation. While most of the existing models for the FFE were created for incremental product innovation, they wanted to create a model for more radical innovation.

While incremental, continuous innovation projects usually can be handled by top-down assignment from management to the organization and can be represented in process and activity models, this is hardly the case for discontinuous product innovations, Reid and Brentani (2004) believed that radical innovation occurs as a bottom-up process from an individual level to the corporate level. Individuals recognize an opportunity and make an initial gatekeeper decision whether to evaluate further. If they want to pursue the idea,
they span internal and external boundaries to gather the necessary information. Individuals then make another gatekeeper decision to determine whether to bring the idea to the corporate project level. The same individuals act as both gatekeepers and boundary spanners.

In their model, Reid and Brentani (2004) conceptualized this process by describing three key interfaces (see Figure 28):

1. Boundary interface: Individuals link environment and company
2. Gatekeeping interface: Individuals decide whether information is relevant to the organization
3. Project interface: Corporate-level decision whether to further evaluate a concept or an idea

Figure 28: Decision-making process in the Fuzzy Front End

Reid and Brentani (2004) added high value to FFE research. First, they highlighted differences in the FFE process of discontinuous and incremental innovation. Second, conceptualizing the involvement of individuals added an important perspective to FFE research. While Boeddrich (2004) clearly described the top-down process, Reid and Brentani (2004) described a bottom-up approach. For the current research study, the Reid and Brentani model is most appropriate as web products are mostly discontinuous products created by individuals.

Despite this achievement, the model has a major shortcoming. Due to the conceptual nature of the model, it does not provide insight into the actual
activities of these important individuals. It remains unclear how boundaries are spanned and what activities are conducted to evaluate whether an idea is worth being pushed up the corporate processes. The model can be characterized as the FFE information and decision-making model for breakthrough products. To provide higher practical value, follow-up research is necessary.

*Model of Hüsíg et al. (2005)*

Hüsíg et al. (2005) developed a Stage-Gate FFE model based on existing literature as part of a research paper on process formalization in the FFE (See Figure 29).

They divided the FFE process into three stages:

1. Environmental-screening
2. Idea generation
3. Concept project and business planning (p. 2)

Similar to the classic Stage-Gate Model, these stages are followed by gates:

1. Opportunity screening
2. Idea evaluation
3. Go/No-Go for development (p. 2)

Figure 29: Front end process model by Hüsíg et al. (2005)
These authors provided no additional background on the activities happening within the stages and gates. Therefore, similar to the model of Koen et al. (2001), the model helps to provide an overview of the front end but is not very helpful for optimization of FFE in a company context.

The authors themselves pointed out that the presented model used an idealized process and noted that the model differed from traditional Stage-Gate in that no sequential order of activities can be expected. Redirection of projects is common in the FFE, as teams often pursue several ideas and merge them into one or more concepts; therefore, the subject of analysis changes quickly.

In summary, the model of Hüsig et al. (2005) represents important stages in FFE, but it bears a high risk of misleading interpretation due to the Stage-Gate approach. It also does not provide greater details on activities in the FFE. The major value of their research is therefore not the process model, but the indication, that structure in the FFE might improve the results of FFE.

**FFE deliverables**

Through this analysis of the literature, a picture emerged that the FFE phase should lead to a clear product concept (Khuarana & Rosenthal, 1998; Koen et al., 2001; Hüsig et al., 2005; Hansen, 2007). Different authors described different elements surrounding this concept.

Glassman (2009) summarized the following list of suggested deliverables from the literature:

1. A clear product concept
2. Knowledge and understanding required to develop the product concept
3. Selection of the right/best idea/concepts
4. A strong business case
5. A development plan required to manage the NPD activities, and
6. Assets such as intellectual property or working prototypes (p. 33)
Another important element is the decision surrounding whether a project will move forward. Simply writing down results and different options on how to proceed is not enough. It is a common understanding that this decision is a deliverable of the process (Khuarana & Rosenthal, 1998; Koen et al., 2001; Reid & Brentani, 2004; Hüsig et al., 2005; Hansen, 2007).

Based on this literature review, this author decided to use the NCD model by Koen et al. (2001) as a template for this thematic case study analysis. The broad approach of the model, its strong focus on process phases, and its high reputation (Griffin et al., 2007) were the bases for this decision. Focusing on one model will enable a greater contribution to the academic mission of Koen et al. (2001) – to help create a common vocabulary for FFE research.

### 2.6 Identified issues of exploration

To conclude the literature review section the author presents three issues of exploration he identified based on the review and preliminary interviews:

*Do successful innovators adopt agile principles in the FFE phase?*

First, the preliminary interviews indicated that start-up innovators adopt agile principles as described in the literature review, and use these agile principles in their FFE phase. While agility has been mainly described in the actual software development, the author wants to explore whether and how successful start-up innovators use agile principles in their product concept development.

*Do successful innovators follow FFE process models?*

Second, NPD literature suggests that the FFE phase has great influence on the success of the new product development. Scholars describe certain process steps that should be conducted during the FFE phase. Close adherence to these steps is described to be a major success factor for innovative products. The author wants to explore whether successful start-up innovators are following the steps described in FFE process models.
Do new use scenarios drive web product innovation?

Third, in preliminary interviews the start-up innovators indicated that their web products are less about innovative technological software solutions and more about innovative new use scenarios. While technology plays an important role, the innovators see web technology as a commodity.

The literature only provides an abstract view on this issue. FFE research underlines the high importance of product concepts, but does not look more closely into the content of these concepts. ASD literature underline that providing value to the customer is more important than brilliant, documented code, but also does not give further indication on what this value consists of. Therefore the author wants to explore whether new use scenarios drive web product innovation rather than technological innovation.
3. RESEARCH DESIGN

This third chapter gives overview of the research design, including the philosophical underpinnings, the qualitative approach, and the chosen case study design.

The author provides background information on the multiple case approach, describes how the cases were selected, and explains which sources of evidence were used. Furthermore, the thematic cross-case analysis will be explained. The chapter concludes with ethical considerations and a detailed discussion of research limitations.

3.1 Philosophical underpinnings

This section presents the philosophical underpinnings of the study and explains the resulting selection of the qualitative research strategy.

Worldviews and research paradigms

Before starting any research, it is essential for the researcher to reflect on the philosophical worldview that will be the basis of the study. Worldviews influence the selected research strategy and methods (Creswell, 2009). It is necessary to think through these basic considerations; it is a common practice to include this background information in the description of the research design to give the reader a holistic picture. Descriptions of this worldview include notions about truth, knowledge, and other basic set of beliefs. These worldviews are often referred to as research paradigms.

Prominent Research Paradigms

Guba and Lincoln popularized the concept of looking at worldviews as research paradigms in 1985. They described “naturalistic inquiry” as an alternative to the dominant positivist paradigm. Since then, they further differentiated their comparison and now distinguish between five different views: constructivism, positivism, critical theory, post-positivism, and the participatory paradigm.
Morgan (2007) stated that the rise of new research paradigms is closely related to a comeback of qualitative research; he stated that the new metaphysical paradigms led the way for more acceptance of this research approach. A look at older and newer textbooks underlines this statement, as some old textbooks did not even mention qualitative approaches whereas current textbooks about research methodology generally treat both directions almost equally. The same textbooks also reveal shortcomings of the existing duality between qualitative and quantitative approaches to research. Both are treated as two extremes. Quantitative research and the inherent positivist paradigm are generally referred to as being deductive and objective; qualitative research and the according metaphysical paradigms are referred to as being inductive and subjective.

Research practice shows these black and white distinctions are seldom realized in research studies. Researchers tend to move between induction and deduction, neither of which is likely in its purest form (Morgan, 2007). Several researchers, including Morgan (2007) and Creswell (2009), therefore consider a pragmatist worldview to be an alternative approach. After extensively researching the different paradigms, this author has become an advocate of the pragmatist paradigm.

**Pragmatist paradigm**

Creswell (2009) described pragmatism as being oriented in real-world practice. Pragmatism bases the world on “actions, situations, and consequences, rather than antecedent conditions” (p. 231). Pragmatists do not postulate one philosophy or reality; “they do not see the world as an absolute unity. Truth is what works at the time” (p. 11). Kvale and Brinkmann (2008) described pragmatism in the following way:

Pragmatism as a philosophical position, with its central view that language and knowledge do not copy reality but are means of coping with a changing world, has come to the fore in a postmodern age. Pragmatism emphasizes the primacy of practice and the use-value of the ideas and theories produced by researchers. (p. 51).

Pragmatists do not deny the existence of an internal world in the mind and an external world independent of the mind; however, they do not believe it is worth
reflecting extensively on reality and the laws of nature (Cherryholmes, 1992). Creswell (2009) summarized the differences between the major research paradigms as shown in Table 11.

Table 11: Four major research paradigms

<table>
<thead>
<tr>
<th>Postpositivism</th>
<th>Constructivism</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Determination</td>
<td>• Understanding</td>
</tr>
<tr>
<td>• Reductionism</td>
<td>• Multiple participant meanings</td>
</tr>
<tr>
<td>• Empirical observation and measurement</td>
<td>• Social and historical construction</td>
</tr>
<tr>
<td>• Theory verification</td>
<td>• Theory generation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advocacy/Participatory</th>
<th>Pragmatism</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Political</td>
<td>• Consequences of actions</td>
</tr>
<tr>
<td>• Empowerment</td>
<td>• Problem-centered</td>
</tr>
<tr>
<td>• Issue-oriented</td>
<td>• Pluralistic</td>
</tr>
<tr>
<td>• Collaborative</td>
<td>• Real-world practice oriented</td>
</tr>
<tr>
<td>• Change-oriented</td>
<td></td>
</tr>
</tbody>
</table>

Source: Creswell (2009)

Adopting the Pragmatist paradigm

Although pragmatism itself has a long philosophical history, adopting the pragmatist paradigm is less about philosophy and more about a truly pragmatic approach to research. Adopting the pragmatic research paradigm influences the strategy of inquiry, it places methodology at the centre (See Figure 30).

Figure 30: Placing methodology at the centre

Therefore, the pragmatist paradigm is often closely connected to mixed-method
research approaches because it enables the use of different reasoning and methods to achieve a research goal. However, it is not solely bound to mixed-methods.

To explain the difference between the qualitative, quantitative, and pragmatic approaches, Morgan (2007) emphasized the following three areas as shown in Table 12.

Table 12: Differences between research approaches

<table>
<thead>
<tr>
<th></th>
<th>Qualitative Approach</th>
<th>Quantitative Approach</th>
<th>Pragmatic Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection of theory and data</td>
<td>Induction</td>
<td>Deduction</td>
<td>Abduction</td>
</tr>
<tr>
<td>Relationship to research process</td>
<td>Subjectivity</td>
<td>Objectivity</td>
<td>Intersubjectivity</td>
</tr>
<tr>
<td>Inference from data</td>
<td>Context</td>
<td>Generality</td>
<td>Transferability</td>
</tr>
</tbody>
</table>

Source: Morgan (2007)

(1) Connection of theory and data: The pragmatic approach emphasizes abductive reasoning where data and theory constantly interact with each other. In the real world it is almost impossible to work in a purely data-driven (inductive) or a purely theory-driven (deductive) environment. The areas always interfere; observations are converted into theories, and theories are assessed through action. Theories created from qualitative work are tested against quantitative data.

(2) Relationship to research process: In the pragmatic approach, neither complete subjectivity nor complete objectivity can be achieved. Individuals interpret the world as uniquely different; instead of pure objectivity, only mutual understanding can be achieved between individuals.

(3) Interference from data: Finally, in the pragmatic view research is neither totally specific nor completely context-independent and thereby universal. Knowledge must be brought to appropriate use in different circumstances. Transferability of knowledge must be evaluated in the context. Some research results might have higher transferability than others and might be applicable in a broader context. However, even these results are never completely context-free.
As mentioned above, pragmatism is often referred to as the research paradigm used for mixed-method strategies. Although the pragmatist view fits very well with mixed-method approaches, it is important to understand that adopting a pragmatist paradigm does not automatically lead to choosing a mixed-method approach. Kvale and Brinkmann (2008) stated that the important issues in mixed-method approaches are less on the level of paradigms and more on the practical level. The challenge lies in orchestrating the methods to achieve a better result than with a single method.

3.2 Qualitative approach to inquiry

The author chose to use a qualitative research approach for this exploratory research on the FFE activities of start-up innovators.

Approaches for inquiry

Before starting a study it is important to decide on the right research approach and type of study. Creswell (2009) summarized the major types of studies and their quantitative, qualitative, or mixed-method characteristics as shown in Table 13.

Table 13: Types of research studies

<table>
<thead>
<tr>
<th>Quantitative</th>
<th>Qualitative</th>
<th>Mixed Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Experimental designs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-experimental designs, such as surveys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Narrative research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Phenomenology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ethnographies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Grounded theory studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Case study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sequential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Concurrent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Transformative</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Creswell (2009)

The research question “How do innovators in Internet start-ups handle the Fuzzy Front-end of Innovation?” is designed to understand yet unknown processes and activities that have not been researched in the past; therefore, the question has an explorative character. Hart (2006) summarized the differences between research goals as shown in Table 14.
Table 14: Goals of research

<table>
<thead>
<tr>
<th>Type</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploratory</td>
<td>- to satisfy curiosity, provide better understanding or for general interest;</td>
</tr>
<tr>
<td></td>
<td>- to examine the feasibility of further study by indicating what might be relevant to study in more depth;</td>
</tr>
<tr>
<td></td>
<td>- to provide illumination on a process or problem. Questions focus on the how, what, when and where. Studies tend to be small scale and often informal in structure, for example, illuminative evaluation.</td>
</tr>
<tr>
<td>Descriptive</td>
<td>- to understand a common or uncommon social phenomenon by observing the detail of the elements that make it a phenomenon in order to provide an empirical basis for valid argument. Questions focus on the how and what. Studies tend to be small scale and qualitative, for example, ethno methodological research.</td>
</tr>
<tr>
<td>Explanatory</td>
<td>- to explain the cause or non-occurrence of a phenomenon;</td>
</tr>
<tr>
<td></td>
<td>- to show causal connections and relationships between variables of the type “if A then B”;</td>
</tr>
<tr>
<td></td>
<td>- to suggest reasons for events and make recommendations for change. Questions focus on the why and aim to uncover laws and regularities of a universal nature. Studies can be large or small scale and are often based on hypothetico-deductivism and associated quantitative data.</td>
</tr>
</tbody>
</table>

Source: Hart (2006)

Since little is known about the activities of innovators, it is not possible to formulate hypotheses or verify whether to support or reject them based on data collection.

The qualitative case study approach

For the research question at hand, a qualitative case study emerged as the best inquiry strategy. Hancock and Algozzine (2006) stated that case studies are more exploratory than confirmatory and seek to identify themes and behaviours. Creswell (2009) recommended the case study approach to inquiry for more in-depth exploration. In addition, case studies are used to explain and illustrate interventions (Yin, 2009). Tellis (1997) emphasized that case studies are designed to bring out the details, while other methods often hide the details. Although case study research originated in evaluation research, the approach is now used in a much wider context and is especially useful in describing and exploring complex situations. Yin (1984) defined a case study as follows.
In general, a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context: when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used. (p. 23)

Yin (2009) state in his book that case studies are most likely to be right when exploring questions of "how" and "why." Although other qualitative research approaches, such as ethnography or grounded theory, are also often used for answering these types of questions, this author preferred the case study approach, as it encourages the creation of a rich, theoretical framework based on existing knowledge before preparing the case study (Hancock & Algozzine, 2006). Using such a framework for the research study at hand will add value to the existing literature, as research on the FFE process and ASD have been conducted in other contexts.

Although the research at hand is widely exploratory due to its specific context, the extensive amount of theory available in the area of research enables the author to formulate a theoretical template for fieldwork and analysis. In fieldwork, guidance is given on relevant topics. In the analysis phase, it is helpful to compare the case study results with existing models; this aids to understanding recurring topics and new emerging topics.

Case studies are generally seen as a qualitative research choice (Creswell, 2007) and are used in an explorative way. The approach fits very well with the pragmatist research paradigm. Clearly, Yin (2009) did not restrict case studies to qualitative procedures. Similar to pragmatists, he proposed using appropriate methods and including various approaches to prepare a case study.

3.3 Case study research

This section explains the chosen research approach. Reasons for choosing a multiple case study approach, modifications made to the approach, the case selection, the selected sources of evidence, and the cross-case analysis will be presented. Finally, measures of quality insurance are discussed.
3.3.1 Multiple case study approach

Case study research uses one of two major approaches—single- or multiple-case research. Yin (2009) recommended using single-case studies when testing a well-formulated theory or when there are unique or extreme cases that are worth analysing. Flyvbjerg (2006) argued that single cases could be used to generalize research results if a critical case is selected.

Stake (2005) proposed using multiple cases in one study to gain knowledge about a phenomenon, which he referred to as quintain. In this approach, single cases belong to a particular collection of cases that are categorically bound together.

The primary difference between Stake’s (2005) multiple case study approach and the approaches proposed by Yin (2008) and Flyvbjerg (2006) is that Stake puts the quintain at the centre of research and accepts constraint insights into single cases. Stake formulated this shift as follows:

The ultimate question shifts from ‘What helps us understand the case’ towards ‘What helps us understand the quintain?’ (p. 6)

This shift of attention from the individual case to the quintain reflects the nature of this author’s research questions very well. As this author is not interested in the behaviour of one single innovator but in the general pattern, the primary concern is with the identification of common activities, the relevant process steps, and the influence of agile principles. According to Stake (2005), multiple case studies may contribute to further development of theory and a better understanding of the situation at hand. This view reflects the nature of the current research, which attempts to add to theory about FFE, agile development, and innovators, but also seeks to identify managerial implications.

Modified multiple case study methodology

The current research used a modified version of the multiple case study methodology as proposed by Stake (2005). A strong emphasis on open-ended interviews with the innovators as a major source of knowledge and the comparably high number of cases correlates this research with the category of interview studies described by Kvale and Brinkmann (2008) and King and
Horrocks (2009). The author considered conducting a pure interview study, but decided to conduct a case study approach as this approach provided important practical benefits over a pure interview study.

First, the author could not be sure about the quality of the interviews when setting up the study. It was not clear whether open-ended interviews at professional conferences, with very busy start-up innovators, conducted by a doctoral candidate provide the necessary quality for a pure interview study. Case studies allow completion of missing information from the interviews and therefore are a good method for novice researchers like the author. Furthermore, interviews are commonly the major source of insight in case studies (Yin, 2008).

Second, an extensive amount of information is publicly available on successful start-up innovators and their products. This adds to the knowledge about the FFE phase and provides valuable context. As the author followed some of the participants’ publications and blogs, he was well aware of the quality of additional information he could gain. This author used the additional sources of evidence to understand the activities and to provide a rich description of the cases, which also adds to readability for professional readers.

Third, despite concerns in the academic world about the case study method, this method has a very good reputation in the professional world. As studying successful start-up innovators can to some extent be compared to best-practice approaches commonly used in business, using this approach aids in achieving the managerial goals of the author.

**Focus on a multiple case study report**

The author focused on preparing a multiple case study synopsis. Stake (2005) pointed out that in a multiple case study analysis, the case reports may become more of a synopsis or summary but the preparation of the single-case report remains important. Therefore, the author decided to prepare short, single-case reports as a background for the comprehensive cross-case analysis. These reports are available in the appendix. By providing only short single-case reports, the author slightly modified the approach by Stake in order to focus on
a comprehensive multiple case report which is appealing for both professionals and academics. As promoted by several textbooks (Creswell, 2009; Patton & Quinn, 2002; Thietart, 2001), research methodology should not be used as a receipt for research but rather should serve as a guideline for individual research.

Steps of the multiple case study approach

The following phases were conducted in this multiple case approach (See Figure 31):

Figure 31: Steps in the multiple case study approach

Source: Present author, adapted from Stake (2005)

3.3.2 Defining the quintain

In the research approach by Stake (2005), clearly defining the quintain is essential. Several of the elements defining the quintain and case selection were already described in the research scope section; the quintain can be summarized as the first research objective:

This research explores how start-up innovators handle the early stage of developing an innovative web product. The activities conducted in the FFE phase process shall be described, and the overall FFE process shall be illustrated. The author creates a comprehensive overview of activities and
process steps that these individuals conduct in creating their product concepts.

3.3.3 Case selection

When selecting cases, the author followed Stake’s (2005) recommendation rather than Yin’s (2008) proposal. Yin proposed selection according to a replication logic similar to experiments in which additional cases are added only with a distinct research goal to either verify or falsify a research result or to add additional knowledge. Conversely, Stake suggested a wider selection approach, asking the following questions:

(1) Is the case relevant to the quintain?

(2) Do the cases provide diversity across contexts?

(3) Do the cases provide good opportunities to learn about the complexity and contexts? (p. 23)

This approach can neither be compared to a statistical survey sampling in a clearly defined population nor to the replication logic of Yin (2008). Creating variety and increasing the amount of study opportunities are the major goal of this selection approach. A real representation can hardly be achieved due to a limited amount of cases, but a wider range of cases should provide additional insight into different contexts. In this research, the author selected the cases based on the following two major considerations:

First, the author wanted to understand how the cases are bound together by the quintain. Cases shall contribute to this understanding.

Second, the author wanted to achieve variety through different backgrounds, regional contexts, and types of web products.

Case commonalities

Stakes (2005) formulated that for multiple case studies, the cases need to be similar in some way. The following list provides an aggregated view of how the cases in the current study are bound together:

(1) The participants created web products. These are web applications that are
offered in advertising-financed, software-as-a-Service (SaaS), or Freemium models. Their web products can be B2B or B2C services.

(2) The participants were speakers at web conferences. This indicates that they developed an innovative product. The products are often referred to as WEB 2.0 products.

(3) The participants worked in start-up companies in Europe and North America, including Canada. These start-ups were created after the burst of the first Internet bubble in 2001.

(4) The participants were innovators. According to the definition provided by Sim et al. (2007), they acted as inventors, champions, and implementers, and were present in all stages.

Case variety

Stake (2005) recommended the purposeful selection of cases within diverse contexts, both typical and atypical settings. The author attempted to achieve variety using the following contexts.

Diverse personal backgrounds of innovators

Individuals with different personal backgrounds and characteristics were chosen. Both serial and first-time innovators were included in the case selection. The first-time innovators tended to be in their 20s, while the serial innovators were in their 30s and 40s. Based on this age difference, the innovators had different levels of maturity and experience. Some innovators began their careers directly after studying, while others had several years of work experience in start-up or mature companies. Their different backgrounds also affected their financial situations. The experienced innovators either financed their initial company phase through income from agency work or were already financially independent based on a previous company trade sale. The younger innovators coming directly from the university usually had to start their initial phase using bootstrapping strategies, such as splitting income from one paycheck, while some obtained initial business funding from friends and family.
Different categories of web products

Not only were the innovators’ backgrounds different, they also created different types of web products. As the author’s company produces B2B and B2C products, both types were selected. Separating B2B and B2C products is sometimes difficult, as several products can be used in both a business and private context (e.g. social networks or web-based graphic software).

Variation in start-up environments

The research was US-centric, as many successful web products are created in the United States. As the author’s employer was active in Europe and North America at the time of the fieldwork, the author attempted to identify innovators from these areas. The start-ups had diverse setups. While most started with significant venture capital funding early on, there were also companies without any external funding. In addition, the companies had diverse strategies. While most focused on selling the company at a certain stage, others concentrated on generating long-term cash flow and were clearly reluctant to sell the company.

The case selection process

As previously mentioned, potential start-up innovators were identified from the schedules of major Internet conferences. The author selected 12 Internet conferences that he could attend during the fieldwork stage from February 2008 to April 2009. 72 potential start-up innovators were identified through desk research. Based on the initial feedback from possible interview candidates, the author attended 7 conferences and arranged 22 interview appointments. Due to one no-show, 21 interviews with potential start-up innovators were conducted.

Using conference-speaking invitations as an initial selection criterion carries a potential bias towards PR-savvy companies, good speakers, and individuals with strong personal networks, but it also presents a unique opportunity to obtain access to individuals who are normally very difficult to interview. This practical consideration was very important, as the author needed to focus on companies from the United States, especially Silicon Valley, to gain comprehensive knowledge on start-up innovators. Table 15 contains a list of the
conferences attended and the number of interviews conducted.

Table 15: Attended conferences and conducted interviews

<table>
<thead>
<tr>
<th>Conference</th>
<th>Date</th>
<th>City</th>
<th>Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift 2008 Conference</td>
<td>06.02. – 08.02.08</td>
<td>Geneve, Switzerland</td>
<td>1</td>
</tr>
<tr>
<td>FOWA 08 EU Conference</td>
<td>08.10. – 10.10.08</td>
<td>London, UK</td>
<td>1</td>
</tr>
<tr>
<td>LeWeb 09 Conference</td>
<td>09.12. – 10.12.08</td>
<td>Paris, France</td>
<td>5</td>
</tr>
<tr>
<td>WEF Technology Pioneers Conference</td>
<td>28.01. – 01.02.09</td>
<td>Davos, Switzerland</td>
<td>1</td>
</tr>
<tr>
<td>FOWA 09 US Conference</td>
<td>22.02. – 24.02.09</td>
<td>Miami, US</td>
<td>6</td>
</tr>
<tr>
<td>Lift 09 Conference</td>
<td>25.02. – 27.02.09</td>
<td>Geneve, Switzerland</td>
<td>3</td>
</tr>
<tr>
<td>WEB 2.0 Expo Conference</td>
<td>31.03. – 03.04.09</td>
<td>San Francisco, US</td>
<td>4</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td></td>
<td></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>

Source: Present author

21 interviews were transcribed and roughly analysed. Furthermore, desk research was conducted on the potential start-up innovators. Based on both analyses, 10 start-up innovators were selected for this case study analysis. The selection was based on the following two main criteria:

(1) Desk research and interview analysis needed to confirm that the participants were innovators according to the definition by Sim et al. (2007). This required that they were involved in all major innovation roles as inventors, product champions, and project managers.

(2) Participants from diverse backgrounds were needed to support case variety. Unfortunately, the only female participant did not meet the innovator criteria; therefore, no female start-up innovators were included in the sample.

Table 16 provides an overview on the selected start-up innovator cases. The
cases are marked using case IDs to ensure confidentiality.
<table>
<thead>
<tr>
<th>Case ID</th>
<th>Main operations in</th>
<th>Company founded</th>
<th>Web product started</th>
<th>Description of web product</th>
<th>Employee categorization</th>
<th>Single or multi-product company</th>
<th>B2B or B2C Service</th>
<th>First or serial start-up innovator</th>
<th>Company</th>
<th>Venture / Angel funded</th>
<th>Reported venture funding</th>
<th>Exit Status</th>
<th>Trade Sale / Going Public Valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 2</td>
<td>US, Denmark</td>
<td>1999</td>
<td>2004</td>
<td>Web products for project management, collaboration, CRM, group chat, calendars etc.</td>
<td>11-50 employees</td>
<td>Multi</td>
<td>B2B</td>
<td>Serial</td>
<td>Chicago, IL</td>
<td>Yes</td>
<td>$10M</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Case 3</td>
<td>US</td>
<td>2007</td>
<td>2007</td>
<td>Web products for photo manipulation, typography, music editing, 3D rendering etc.</td>
<td>11-50 employees</td>
<td>Multi</td>
<td>B2C</td>
<td>First-time</td>
<td>New York, NY</td>
<td>Yes</td>
<td>$7M</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Case 4</td>
<td>US</td>
<td>2006</td>
<td>2006</td>
<td>Web product to create online forms and web-based surveys</td>
<td>1-10 employees</td>
<td>Single</td>
<td>B2B</td>
<td>First-time</td>
<td>Tampa, FL</td>
<td>Yes</td>
<td>$0.12M</td>
<td>$35M</td>
<td>Trade Sale 2011</td>
</tr>
<tr>
<td>Case 5</td>
<td>US</td>
<td>2003</td>
<td>2003</td>
<td>Web product to build a social networking with business contacts and search for jobs</td>
<td>1001-5000 employees</td>
<td>Single</td>
<td>B2C</td>
<td>Serial</td>
<td>Mountain View, CA</td>
<td>Yes</td>
<td>$103M</td>
<td>$4.3B</td>
<td>Going public 2011</td>
</tr>
<tr>
<td>Case 6</td>
<td>Canada</td>
<td>2003</td>
<td>2003</td>
<td>Web product to create invoices, track time and expenses, and to collect online payments</td>
<td>51-200 employees</td>
<td>Single</td>
<td>B2B</td>
<td>First-time</td>
<td>Toronto</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Case 7</td>
<td>US</td>
<td>2005</td>
<td>2005</td>
<td>Web product for web-based instant messaging and social networking with friends</td>
<td>51-200 employees</td>
<td>Single</td>
<td>B2C</td>
<td>First-time</td>
<td>Mountain View, CA</td>
<td>Yes</td>
<td>$70M</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Case 8</td>
<td>US</td>
<td>2003</td>
<td>2005</td>
<td>Online collaboration solution for businesses and institutions</td>
<td>11-50 employees</td>
<td>Multi</td>
<td>B2B</td>
<td>First-time</td>
<td>San Mateo, CA</td>
<td>Yes</td>
<td>$6.6M</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Case 9</td>
<td>US, Israel</td>
<td>2006</td>
<td>2006</td>
<td>Open Source Online Video Platform for businesses, institutions and enthusiasts</td>
<td>51-200 employees</td>
<td>Single</td>
<td>B2B</td>
<td>Serial</td>
<td>New York, NY</td>
<td>Yes</td>
<td>$44.1M</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Case 10</td>
<td>US, Hungary</td>
<td>2006</td>
<td>2007</td>
<td>Web products for life-casting and live video streaming of events online</td>
<td>51-200 employees</td>
<td>Single</td>
<td>B2C</td>
<td>First-time</td>
<td>San Francisco, CA</td>
<td>Yes</td>
<td>$104M</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
3.3.4 Sources of evidence

According to Yin (2009), six sources are the main sources of evidence in case study research (See Table 17).

Table 17: Sources of evidence in case studies

<table>
<thead>
<tr>
<th>(1) Documentation</th>
<th>(2) Archival records</th>
<th>(3) Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) Direct observations</td>
<td>(5) Participant-observation</td>
<td>(6) Physical artefacts</td>
</tr>
</tbody>
</table>

Source: Yin (2009)

This multiple case study approach used publicly available documents and interviews, with interviews being the primary source of evidence.

Document reviews

Document reviews were used to analyse the context of the start-up innovators, help the researcher to learn about the web products the innovators created, the contexts in which the start-ups are working, and the backgrounds of the start-up innovators. The author did not have access to internal documents in the FFE phase, such as emails or protocols, but published documents such as blog posts, press announcements, and web forum postings helped the author to understand timelines and backgrounds of this phase. The reviewed documents are filed in a case database. The following types of documents were used.

Web databases and start-up blogs

Start-up databases, such as the Crunchbase from Techcrunch (www.techcrunch.com), provided background information on the selected start-ups; these included press publications and blog posts.

Professional social networks

Social networks for professionals, such as LinkedIn.com, provided background information on the start-up innovators.
Blog posts and help forums

Several start-up innovators blogged or published information in help forums regarding their Internet products. Some start-up innovators even blogged about the early product innovation phase. The author used old blog posts to get an overview on timelines and processes.

Conference programs

Conference programs and websites of the selected conferences at which the start-up innovators spoke provided information on the innovators, web products, and companies.

Start-up innovator publications

Some start-up innovators published books, white papers, and conference presentations on their product development and management approaches. These publications were also used in document reviews.

Personal interviews

The main sources used to prepare the comprehensive case study report were personal interviews with the start-up innovators.

Decisions for personal interviews

The author audio-recorded personal face-to-face interviews. From his own professional career, the author was well aware of the limitations of phone calls. The author wanted to have the participants’ full attention in personal interviews. Giving the participants the option of taking part in the personal interviews directly at the conferences proved to be a key factor in recruiting start-up innovators. As the author was granted permission from the conference organizers to access the press lounges and was given access to a private room, all interviews were conducted in a sufficiently private setting.
Audio recording

All participant interviews were recorded with an MP3 recorder and were transcribed for further analysis. All participants agreed to the audio recording and transcription.

Interviewing as a craft

To prepare for interviews, the author read instructions on interviewing and took training in academic interviewing. The most important lesson learned from this was that interviewing as a craft or art must be learned by experience and that the interviewer should be open to new phenomena that arise during the interview. A qualitative interviewer seeks to cover both facts and meaning by searching for knowledge expressed in normal language and obtaining nuanced descriptions about specific situations, actions, experiences, and feelings. Although the interviewer focuses on specific topics, new phenomena are able to emerge (Kvale & Brinkmann, 2008). The two authors also addressed the interplay of pragmatism and interviews as follows:

From pragmatism, interview researchers can learn to focus on the practical aspects of what they are doing, on the craftsmanship of their activities, and on the issues of values and ethics raised by the use-value of their research results. (p. 51)

Transcription of interviews

The U.S. transcription service, Casting Words, conducted audio transcription of participant interviews. The author verified the accuracy of the transcripts himself. Unfortunately the author was not aware of the common practice to send the transcripts to the participants in order to get feedback. By doing so the author would have gained both verification by the participants and further elicitation. The author realized this missed opportunity too late to correct it; the risk of hindsight bias would have been too high after more than a year.

Thematic cross-case analysis

This section describes the thematic cross analysis that was used in analysing the interviews, the analysis templates, and the software-assisted analysis.
procedure. Finally, it provides the necessary background on the development of case reports.

**Thematic analysis**

The author analysed the interview data using a modified thematic analysis approach. Thematic analysis approaches have been proposed by several scholars, including Huberman and Miles (2002), King (2004), and Braun and Clarke (2006). Braun and Clarke (2006) thematic analysis approaches generally attempt to identify themes in written text. King and Horrocks (2009) described themes in interview research analysis as follows:

Themes are recurrent and distinctive features of participants’ accounts, characterizing particular perceptions or experiences that the researcher sees as relevant to the research question. (p. 150)

Thematic analysis is generally used for in-case and cross-case analysis, and themes are not only collected but also conceptually organized. The organization is often hierarchical through the development of themes and sub-themes. In thematic analysis, coding the text using descriptive or interpretive methods often identifies overarching themes. This coding approach is not to be confused with content analysis techniques, in which the frequency of a specific word’s use is counted and interpreted. Descriptive coding describes participants’ actions, perceptions, and experiences in short form, it merges overlapping codes into single codes wherever possible. Interpretive coding goes beyond pure description and focuses on the interpretation of certain text elements.

**Types of thematic analysis**

There are two primary approaches to thematic analysis: analysis can be conducted in a top-down or in a bottom-up approach. In the bottom-up approaches, the coding procedure starts from zero and the coding emerges out of the text; this approach is similar to those of grounded theory and phenomenology (King & Horrocks, 2010) as no initial coding scheme is created. In the top-down approaches, such as the matrix analysis pioneered by Huberman and Miles (2002), a priori matrix headings are defined and only minor adaptations are allowed.
Miller and Crabtree (1992) and King (2004) proposed template analysis as a third method. In this approach, initial templates are generated from the theories that are then used in the coding procedure; these templates can be modified significantly during the process. King (2008) viewed this pragmatic approach to thematic analysis as an excellent solution for studies in which theoretical or applied concerns should be integrated. Furthermore, he recommended this approach for studies with up to 25 one-hour interviews. Bottom-up approaches are more time consuming, and are advisable only in smaller studies with a single-digit number of cases. Matrix approaches can handle higher numbers of cases but lack the necessary flexibility to identify emerging themes. Therefore, this author decided to use a template approach for interview analysis.

The computer-assisted analysis procedure

The author modified the template analysis approach to better integrate the analysis and writing-up stages of the multiple case study report. Instead of coding interviews with CAQDAS software, analysing the themes, and then writing a report, the author used an integrative process. The author used the Scrivener software package to conduct a computer-based analysis and to write up the case reports. The Scrivener software package combines powerful, flexible outlining functionality with a text processor.

The author analysed the interviews using the following steps:

1) Two templates, "Agile principles" and "FFE phases and activities," were used. The first template, the "Agile principles" template, was developed from the literature review and is largely based on the agile manifesto by Fowler and Highsmith (2001). The second template, the "FFE phases and activities" templates, was adopted from Koen et al. (2001).

2) These templates were added as outline categories into the Scrivener software package.

3) The interview transcripts were analysed, and statements about specific topics were copied into the corresponding outline categories.

4) If new topics emerged, these topics were added under a new outline category or subcategory of an existing template category.
5) If new topics fell into similar categories, these categories were merged into broader main categories.

This approach enabled the author to analyse and structure all relevant statements from the interview transcripts into the appropriate template categories. The author preferred this manual, computer-assisted approach to established tools such as NVivo or MAXQDA as it allowed a faster analysis and closer integration of case writing and analysis. Having the statements directly in the Scrivener word processor allowed the author to write case reports based on the categorization while maintaining direct access to the statements. This manual analysis approach allowed the author to include the relatively high number of ten cases despite the part-time nature of the research. The author prioritized this opportunity to add additional contexts and insights from more cases over the potentially higher acceptance of an established tool.

*Effective analysis approach*

The selected approach was effective in identifying themes and gaining a deep understanding about the quintain. It combined a solid qualitative thematic analysis with the writing of a comprehensive story. A key proposition of case study research is that it tells a comprehensive story; it should be easy to read as a whole, to aid in understanding a case. It gives deeper insights into the topics than does pure analysis (Flyvbjerg, 2006). Although no coding table was produced in this approach, thematic analysis frameworks and the theory from the literature review clearly guided the crafting of the story. In case study research, the analysis cannot produce the final result; it only assists case study research. Analysis in case studies is not viewed as a statistical procedure (Yin, 2008).

### 3.3.5 Ensuring quality

Silverman (2005) characterized ensuring quality in qualitative research as an on-going journey. He encouraged researchers in qualitative research to not only discuss abstract concepts that might ensure quality, but also to provide insights for the audience regarding the procedures used for quality research. Two major
topics to be addressed were validity and reliability. Silverman recommended the following definitions (Hammersley, cited in Silverman, 2005, p. 210):

Validity
‘By validity, I mean truth: interpreted as the extent to which an account accurately represents the social phenomena to which it refers’ (Hammersley, 1990: 57)

Reliability
‘Reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions’ (Hammersley, 1992: 67).

Yin (2008) stated that both validity and reliability could be best achieved by using well-established research strategies and methods. This includes the research design, data gathering and analysis.

Research design

The author used a proven research design. The decision to conduct a multiple case research enabled the author to triangulate by exploring the FFE behaviour of 10 different start-up innovators. Tellis (1997) stated that case studies use triangulation primarily to ensure the quality of the process. Denzin and Lincoln (1994) identified data-, investigator-, method-, and theory triangulation as possible ways to triangulate collected data. Yin (1984) proposed data triangulation by using multiple sources. The author used data triangulation, selecting several sources for evidence and analysing multiple cases with different backgrounds.

Data collection

In the data collection phase, the author took several research quality measures, clearly defining the research population and using desk research and case selection after the initial interviews. To ensure reliability and to enable the repetition of the case analysis by a third party, the author created a database of cases in the web-based CRM system, Highrise. This database contains data from desk research and interview data, such as transcripts and audio files. Third parties can listen to the interviews, read the transcripts, and obtain access to the desk research documents identified by the author.
Data analysis

The author selected a thematic template analysis approach to data analysis. This approach enabled the author to combine existing academic literature with exploration in the case studies. As proposed by Eisenhardt (2002), results were compared with the literature to obtain a clearer picture of the construct.

3.4 Thematic analysis templates

The author used thematic analysis templates for the analysis of the interviews. In this section he presents these templates.

3.4.1 Agile principles

The following agile principles template (See Table 18) was used to guide the initial analysis and preparation of the case report.
Table 18: Agile principles template

<table>
<thead>
<tr>
<th>Agile principles</th>
<th>Short description of the principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to valuable software</td>
<td>Valuable software is what works and provides value. It is about economy, quality, or simplicity perceived by the customer (Conboy, 2009).</td>
</tr>
<tr>
<td>Cooperative customer collaboration</td>
<td>Collaboration with customers is key for creating valuable software. This collaboration should be conducted constantly, ideally on a daily basis (Fowler &amp; Highsmith, 2001).</td>
</tr>
<tr>
<td>Co-location</td>
<td>Co-location of the development team is a key characteristic of agile software development (Ramesh et al., 2006).</td>
</tr>
<tr>
<td>Emphasis on individuals and self-organisation</td>
<td>Strong individuals are more important than processes (Fowler &amp; Highsmith, 2001). Team configurations to naturally evolve based on the working relationships of team members (Meso &amp; Jain, 2006).</td>
</tr>
<tr>
<td>Facilitation of change</td>
<td>Change itself is inevitable. In agile development change is not avoid but handled in a positive way (Highsmith &amp; Cockburn, 2001).</td>
</tr>
<tr>
<td>Intense interaction</td>
<td>Intense Collaboration, Communication, and Coordination are necessary to act truly agile (Sharp &amp; Robinson, 2010). Conversations are more effective than detailed documents (Highsmith &amp; Cockburn, 2001).</td>
</tr>
<tr>
<td>Product learning and adaption</td>
<td>Agile developers are constantly learning about their product and adapt to the new learning (Fowler &amp; Highsmith, 2001).</td>
</tr>
<tr>
<td>Process learning and adaption</td>
<td>Agile developers are constantly improving their processes and adapt them accordingly (Fowler &amp; Highsmith, 2001).</td>
</tr>
<tr>
<td>Readiness of the used method</td>
<td>Agile methods have a short setup time and minimal costs to prepare for testing the software (Conboy, 2009).</td>
</tr>
<tr>
<td>Sustainable development</td>
<td>Proper life and work balance of developers is necessary to develop in a sustainable way (Nerur et al., 2010).</td>
</tr>
<tr>
<td>Speed orientation</td>
<td>Agile software process focuses on developing software quickly (Aoyama, 1998). Early development has the priority over other software principles. (Fowler &amp; Highsmith, 2001).</td>
</tr>
</tbody>
</table>

Source: Present author

After adding statements from the interview transcripts to the corresponding template category, the author categorized the principles into the following three clusters (See Table 19).

Table 19: Agile principles categories

<table>
<thead>
<tr>
<th>Categorie</th>
<th>Short description of the categorie</th>
</tr>
</thead>
<tbody>
<tr>
<td>High priority principles</td>
<td>Agile principles are high on the agenda of the start-up innovators</td>
</tr>
<tr>
<td>Low priority principles</td>
<td>Agile principles are low on the agenda of the start-up innovators</td>
</tr>
<tr>
<td>Ambiguous principles</td>
<td>The start-up innovators have no common opinion about the principles</td>
</tr>
</tbody>
</table>

Source: Present author
The start-up innovators themselves set these priorities. High-priority topics were high on this group’s agenda and were emphasized in interviews.

A summary of this part of the case-study analysis appears in the research conclusions. It confirms the influence of the agile principles adopted by start-up innovators on concept development.

3.4.2 FFE phases and activities

The New Concept Development (NCD) model by Koen et al. (2001) was used as a thematic template to guide the second part of the multiple case report (See Table 20) and to identify specifics of the FFE phase in terms of process phases and activities that were conducted.
<table>
<thead>
<tr>
<th>NCD Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opportunity Identification</strong></td>
<td>Activities and methods that a company uses to identify opportunities to pursue Can be a breakthrough opportunity a problem or a customer need Will lead to a new offering, new process, new service, new product platform, new market thrust or new product Facilitated or unfacilitated pathways</td>
</tr>
<tr>
<td><strong>Opportunity analysis</strong></td>
<td>Accessing the opportunity to confirm that it is worth pursuing Understanding unmet customer needs competitive intelligence and trend analysis would be used extensively Business capability and competency would be assessed Business and scientific sponsorship would be evaluated Despite effort significant technology and market uncertainty will often remain</td>
</tr>
<tr>
<td><strong>Idea generation and enrichment</strong></td>
<td>Birth, development and maturation of the opportunity into ideas Translates the opportunity into specific ideas An evolutionary process where ideas are built upon, torn down, combined, reshaped, modified and upgraded May be formal (i.e. idea banks, brainstorming, etc.) or informal (i.e. an experiment goes awry, unusual request from customer, etc.)</td>
</tr>
<tr>
<td><strong>Idea selection</strong></td>
<td>Selection of ideas for allocation of resources Selection by individual form self-generated options or a formalized portfolio methodology</td>
</tr>
<tr>
<td><strong>Concept definition</strong></td>
<td>Development of a business case Assessment of technology and market risks Determination of detailed product specifications (may only apply to incremental products) Possibility of an overlap with the NPD process Technology Stage Gate (TSG)</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>Clearly defined product concept</td>
</tr>
<tr>
<td><strong>Engine or bull’s-exe portion</strong></td>
<td>The engine or bull’s-exe portion it the leadership culture, and business strategy of the organization that drives the five key elements that are controllable by the corporation.</td>
</tr>
<tr>
<td><strong>Influencing factors</strong></td>
<td>The influencing factors consist of organizational capabilities, the outside world (distribution channels, law, government policy, customers, competitors, and political and economic climate) and the enabling sciences (internal and external) that may be involved. These factors affect the entire innovation process through to commercialization and are relatively uncontrollable by the corporation.</td>
</tr>
</tbody>
</table>

Source: Adapted from Koen et al. (2001)
Statements from the interview transcripts were categorized based on the thematic template, and new template categories and sub categories were identified from interviews. Furthermore, the author identified a typical journey through the FFE phase. This will contribute to the comprehensive narration presented in the case study report, as required by Flyvbjerg (2006).

### 3.5 Limitations and ethical considerations

This section presents the methodological limitations and ethical considerations of the multiple case study research.

**Methodological limitation**

The case study approach has several strengths, as described by Hodkinson and Hodkinson (2001).

Table 21: The strengths of case study approaches

<table>
<thead>
<tr>
<th>Strengths of case study approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>• They can help us understand complex inter-relationships</td>
</tr>
<tr>
<td>• Case studies are grounded in &quot;lived reality&quot;</td>
</tr>
<tr>
<td>• Case studies facilitate the exploration of the unexpected and unusual</td>
</tr>
<tr>
<td>• Multiple case studies can enable research to focus on the significance of the idiosyncratic</td>
</tr>
<tr>
<td>• Case studies can show the processes involved in causal relationships</td>
</tr>
<tr>
<td>• Case studies can facilitate rich conceptual/theoretical development</td>
</tr>
</tbody>
</table>

Source: Hodkinson and Hodkinson (2001)

These strengths are accompanied by several weaknesses and limitations of the approach. Hodkinson and Hodkinson (2001) listed the weaknesses as shown in Table 22.
Table 22: Weaknesses of case study approaches

<table>
<thead>
<tr>
<th>Weaknesses of case study approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>• There is too much data for easy analysis</td>
</tr>
<tr>
<td>• Very expensive, if attempted on a large scale</td>
</tr>
<tr>
<td>• The complexity examined is difficult to represent simply</td>
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<tr>
<td>• They do not lend themselves to numerical representation</td>
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<tr>
<td>• They are not generalisable in the conventional sense</td>
</tr>
<tr>
<td>• They are strongest when researcher expertise and intuition are maximised, but this raises doubts about their “objectivity”</td>
</tr>
<tr>
<td>• They are easy to dismiss by those who do not like the messages that they contain</td>
</tr>
<tr>
<td>• They cannot answer a large number of relevant and appropriate research questions</td>
</tr>
</tbody>
</table>

Source: Hodkinson and Hodkinson (2001)

The current research approach has three major limitations.

**Limited ability to summarize the complex picture**

The fuzzy and agile nature of the early stage of innovation can only partly be represented using multiple case research and in the resulting model. To obtain a deeper understanding of how start-up innovators run the front end, it is necessary to read both the single-case and multiple case reports.

**Limited generalization and transferability**

Limited generalization ability and transferability to other fields is natural, as the start-up innovators operate in a specific environment. Web-based software development is unique in its flexibility and agility. In the recommendations for further research, the author identified e-commerce, content offerings, gaming, and native web applications as potential areas for agile development. The validity of the identified model in these areas needs to be researched in further studies. This present study is only transferable to browser-based web products.

**Limited objectivity of research approach**

The author has limited objectivity as a researcher. Although the author took several measures to ensure unbiased case selection, data collection, and
analysis, the author conducted this research project without the help of other researchers. As a professional in the industry, the author is not unbiased and followed the tendency to use the interview and desk research to write the case as a coherent story. Michael Watts (2007) summarized this general tendency in the following statement:

Here, the truth, my truth that had been recorded in a series of observations made over a course of study, is presented as a composite story: a truth in action (p. 214)

Ethical considerations

After checking the ethical guidelines of the University of Surrey, the author concluded that there were no ethical concerns about this research. Despite the limited risk of ethical problems, measures were taken to ensure that no ethical problems occurred. These measures included those stated below.

Privacy of start-up innovators and third parties

No confidential data sources were used for this case study. The author had no access to internal data such as memos, emails, or protocols. All data were obtained from publicly available sources or information was voluntarily given in the interview. The author was well aware that aggregated data might be problematic even if they were obtained from various public sources. Therefore, he ensured a secure, password-protected access to the case study database.

As open interviews were conducted, some Innovators provided extensive information about themselves and third parties; this information sometimes was not directly related to the topic. As the author cannot be sure about the consent of these third parties and in order to protect the start-up innovators from involuntary publishing of private, non-research-related content, the author decided not to add the full transcripts of the interviews to the appendix. Instead he only provides the short cases reports.

Informed consent

Interviews were conducted with informed consent. At the beginning of every research interview a briefing was given on the purpose and background of the
interviews, the planned use of the interview data in a publicly available doctoral thesis, and the option of stopping the interview at any time. The participants agreed to the recording and transcription of interviews, the use of quotes from the interviews, and the preparation of an aggregated report and an individual case study report. To achieve as much openness as possible, the author informed the participants that pseudonyms would be used in the thesis. Overall, the author identified no critical ethical issues. No participant raised concerns.
4. MULTIPLE CASE STUDY REPORT

This chapter contains the multiple case study report. The following sections extensively describe the adoption of agile principles, the FFE phases and the activities of start-up innovators.

4.1 Agile principles in the FFE phase

Start-up innovators describe the FFE phase as agile. The statements that can be attributed to agile principles and the positive attitude towards these principles were significant in number. Nearly all of the described principles were present in interview statements made by the start-up innovators, and they encouraged agile behaviour as a significant aspect of product concept development. Only four principles were either not on the agenda of the participants or the start-up innovators discussed them controversially. This led to an ambiguous picture.

The principles of "readiness of methods used" and "process learning" seemed to be of low priority for start-up innovators. While methodology issues are often discussed in the literature, the start-up innovators seemed more focused on the product rather than on processes and methods.

The principles of "sustainable development" and "co-location" showed no clear tendency. Both topics were strongly encouraged by one group and discouraged by another group of start-up innovators. Some opposed the idea of innovators and employees working seven days a week, while others did not see an alternative means of ensuring success. Opinions varied regarding whether a co-located or distributed development was superior. This will be discussed in greater detail during this multiple case report.

4.1.1 High priority agile principles

The start-up innovators described several high priority agile principles present in the FFE process. The number of statements about agility exceeded the expectations raised in the preliminary case interviews and added insight into the
FFE of web products. For start-up innovators, the boundaries between concept development and the creation of the actual product are flexible; agility in the FFE phase is similar to that of the development phase. Several critical FFE phases were handled in an agile manner. Compared to traditional FFE processes, they are not trying to reduce uncertainties, they are actively exploring and are quickly adapting to new insights.

A high priority agile principle: Contribution to valuable software

All of the start-up innovators made statements regarding contributions to valuable software. For them, valuable software is what works for the Internet user. This reflects the “contribution to valuable software” principle described in the agile development literature. One mature start-up innovator emphasized that he really wanted to make a difference in the life of the users of his web product.

What I thought then and still think, if I can change the way – in qualitatively better ways – how people improve their careers, then that changes 40 years of their lives. (Interview quote in case 5)

Others were less ambitious but still had clear goals about the value of their software. A greater simplicity of software was a dominant theme in the kinds of contributions the start-up innovators wanted to make. The majority of innovators stated that they wanted to simplify tasks for their users. They wanted to serve a specific purpose and help their users get things done.

I mentioned earlier, that just because you can build a feature doesn’t mean that it should be implemented into the product. It has to fall right into the proper use cases. (Interview quote in case 3)

The start-up innovators stated that much of the existing software was difficult to use and had too many features. One innovator explicitly emphasized that his web products were easier to use than others because they had fewer features and were focused on real-life use cases.

Our philosophy in general is to build what we need, not to build what we can dream up. I think, a lot of software is about building what you can dream up: all these scenarios and features you might need. (Interview quote in case 2)

A minimalistic user interface was very important for the innovators. They talked about their products being flat and having an intuitive interface. Some also
indicated this minimalism to be the core of successful web products.

I did think, this is pretty cool. It’s minimalist, it’s very straightforward. But the only thing you can do on the website was to sign up for wiki. So it was really ridiculously minimal. I think a lot of websites were showing the benefits of simplicity, of just keeping things real to the metal, real straightforward. (Interview quote in case 8)

Some start-up innovators even talked about their web product having a specific, appealing personality. They were proud of having added a specific experience and personality. They believed that a more human approach could be achieved through using clear language error messages, specific wording, and a unique front end.

What makes us unique is that there’re a lot of people in this space and the market is very, very large. Our product – if you actually take a look at it – it’s not the product that has the most number of features. We focus on customer experience, and personality of the app, and ease of use. Those are the three things that we have. (Interview quote in case 4)

The topics of quality and economy of software, which had been described as possible contributions in the ASD literature, were less prominent among start-up innovators. Despite this lack of awareness, the economic value of some web products was significant. Most of the web products developed by start-up innovators are offered as free, ad-supported web applications with the option to buy premium versions with advanced features.

Most start-up innovators made it clear that a web product should include a free version. They did not think about beating an existing price. Only one start-up innovator explained that he offered a product at a lower price than that offered by an established competitor. He described the economic problem of his users trying to work with the expensive Adobe Photoshop package.

I can’t see what you are creating because I haven’t paid $700.00–$1,500.00. Whatever, depending on the package. I don’t have the software. I only see the flat file. I can’t really edit it. If I am doing an MS Paint, it really doesn’t do the trick. (Interview quote in case 3)

His service allowed users to use photo manipulation features for free, which were previously available only in expensive, professional software packages. This was a key argument for his web product. Despite this clear price proposition, the start-up innovator was not satisfied with being perceived as someone who was merely beating his competition by aggressive pricing; rather,
he emphasized several times that he also contributed to the development of the photo manipulation software category by enabling new methods of sharing and group collaboration.

A high priority agile principle: Intense team interaction

The start-up innovators conducted intense team interaction as described in ASD in the FFE phase. Instead of writing a product concept for themselves and hiring a contractor to develop the defined product, the start-up innovators developed their product concept in a collaborative way, switching back and forth between concept and development activities. The teams used for the concept development were usually heterogeneous and included employees, contractors, investors, advisors, and even customers. Often contractors were hired and eventually became co-founders. Almost all start-up innovators referred to the concept development process as being collaborative, with intense discussions and significant product changes resulting from this process.

I am working with the best team I have ever worked with. And I trust everyone's intuitions about the product. And if they say something I know that it's worth listening to as a product idea or a strategy, or whatever. We have quite a debate-oriented process as in ‘Shall we do this?’ ‘Yes, I agree for these reasons.’ ‘I disagree for these reasons.’ (Interview quote in case 1)

As described in ASD, direct verbal communication is preferred over written product specifications. Product ideas and concepts were developed through intense interaction. The start-up innovators wrote hardly any text documents; after they agreed on the idea, they started with drawings, mock-up screens, or wireframe models to visualize their product and expand the concept. They usually discussed these visualizations in group-sessions to move the product further.

I brought Alan Blue on board and had him start mocking up stuff so that everyone could come with a projector over to the apartment and start looking at... (Interview quote in case 5)

For many start-up innovators, this communication did not need to be conducted face-to-face. They used Skype chat, instant messaging, and collaboration tools such as screen sharing, wikis, or email. One start-up innovator even said that the innovator team had a Skype video chat open all day. This gave them the virtual experience of constantly being in the same office despite actually
developing their product using a distributed approach in Europe and the United States. Overall, there were mixed opinions about co-location, which is the standard for agile development and distributed development. This will be discussed in more detail later in this doctoral thesis.

This intense interaction is possible only because the start-up innovators were quite open about their product ideas early on. They frequently talked about their concepts with many people, regardless of possible confidentiality issues. They were more focused on obtaining feedback than on keeping secrets, using the following encouragement and advice from a trusted group.

Sometimes you hear, 'I'm in stealth mode.' I don't get that. I don't understand. ...We are very open about sharing ideas before they are out so that we get some interesting feedback from people along the way. (Interview quote in case 2)

The frequent coordination described in ASD was a standard procedure for the start-up innovators. Some did not create a roadmap for their product, while others created a roadmap but changed it continuously and called it a "living document." As the creation of an early prototype, it was usually part of concept development, and this coordination often looked very similar to collaboration proposed in ASD methods. The start-up innovators often implemented daily or weekly iterations and altered approaches in short meetings.

So, you know, like daily basis, have five to ten minutes review. What are you going to do today? What are you going to do this week? and it's really... keeping that open communication... (Interview quote in case 3)

This coordination can happen on a personal level or remotely using collaboration tools. The specific preferences for communication channels were different in different start-ups and often even within the same start-ups.

Chat online, help schedule meetings, Skype, have Wikis and groups to share, messaging ... so multiple different types of various, because everyone likes to interact differently or share information differently, some people like emails some people don't like emails so make sure everyone is happy with that but at the same time everyone is on the same page. (Interview quote in case 3)

A high priority agile principle: Emphasis on Individuals and self-organisation

As one might expect in the environment of Internet start-ups, case studies supported the strong emphasis on individuals proposed by ASD literature. Many innovators had known their development team for a long time. They had worked
together previously, and the initial team was usually already on board in the FFE phase, developing the concept. Based on past experience in working together, the team naturally organized itself as proposed by the agile manifesto and collaborated on its own terms. None of the start-up innovators talked about selecting a development or project management method for the team.

Really the only best practice is whatever the team’s comfortable with, but making sure to pick something. It can get overwhelming, if you have multiple different outlets, but early on it’s important to set we are using this tool to communicate. Do not send me an email about this topic because if you want to send me you’ll have to update the Wiki. (Interview quote in case 3)

Participative development was described as the standard course of business by the start-up innovators. The start-up innovators did not claim that they conceived a product idea that was only executed by others; rather, they regularly referred to the product concept as a collaborative work. Despite this collaborative approach, several start-up innovators stated that they finally make important decisions if no consensus is achieved.

I’m not sure that it’s entirely fair, because we would discuss it, and we would be hey like, what do we think would be important? What do we think needs to be done? How hard do we think it’s going to be to implement these things? The road map produced would come out of those discussions. At the same time, responsibility for it being correct, is mine. (Interview quote in case 8)

**High priority agile principle: Facilitation of change**

Facilitation of change is another main principle of agile development that seemed to be a part of the DNA of start-up innovators. Not only do start-up innovators prepare for change in the development process, they also embrace change as a natural part of Internet development. While agile development usually refers to change caused by external contractors, which then has to be realized by developers, the start-up innovators started their product development effort well aware that ideas, concepts, and execution of the idea might change.

I started off knowing, and this was really helpful, that whatever idea I picked to start off with, would probably be wrong, and that I would need to just keep on iterating and trying things out. (Interview quote in case 8)

Change is clearly an element with a strong presence in the concept development phase. Listening to users and adapting the product to serve their
needs starts in the FFE phase. Trial and error techniques are used not only in methods of execution, but also in envisioned use cases. One start-up innovator described how his initial product concept failed and led him to develop a less sophisticated product. The real use case was the key to success, not his clever technology.

So I said, hey, leave your ego aside. Run with the thing that seems to be working. Listen to the market. So I started improving the product based on what people were saying. I set up a forum, so that customers could support each other, so I didn't have to worry too early on about building a support team. I just kept on putting out releases every day, making the product a little bit better. (Interview quote in case 8)

Another start-up innovator discussed humility as a main characteristic of being successful. He described how he had learned to listen instead of talking and how he lost his arrogance about what was right or wrong in the concept development process. In this specific case, the start-up innovator developed a product concept based on his own beliefs and had to learn that the value of software is defined by how it solves the customer's problems and challenges.

As a designer I was really bad about – like, I always thought like whatever design that I had, like if someone has a problem with it, it's because they were dumb, or that they were using it wrong. When you are doing client work you are like one-on-one with someone. And if they have a problem with something, you just see it like, 'That's just one person that is having a problem.' Like, 'obviously, if they saw how brilliant I was, it would be fine.' But, when you have like thousands and thousands of users, and they are like: 'Dude, I have a problem finding this thing?' you start growing a sense of humility. And I truly now believe that humility is like a key component into running a good business, and being a good designer, and being a good programmer or being a good developer, because you start realizing like, 'Yeah, I am fallible. I have something wrong.' It allows you to apologize, it allows you to make changes, it makes you to adapt to things, because you say like, 'I don't have all the answers.' It allows you to go out and look for research and stuff. (Interview quote in case 4)

Openness towards learning about the use case was a very strong theme in the cases. One start-up innovator changed the product concept with his team three times based on new inputs from FFE activities. The team ended up with a completely different product than it had envisioned in the beginning.

We had dinner somewhere and we were just like yeah, you know, it's just not clicking and we also weren't sure, we just didn't build in that one an awesome consumer experience ... So we were just like you know, it's not working ... the third thing we did I do remember. It was pretty simple so we were like OK, we're done with the file-sharing thing, and another eight months had passed, so now we're like 16 months in. (Interview quote in case 7)
Another start-up innovator turned a specific feature into the main product after the team realized during the alpha testing phase that this feature was tremendously popular and outperformed the other use cases.

Even by the time when we launched the first version of our site, which was in early '07, we weren't quite decided on the direction. It was actually our users that decided it. (Interview quote in case 10)

What remains unclear is a clear, defining line of when start-up innovators will change the concept and when they will stick to the initial design. Although they strongly referred to real data as their basis, start-up innovators often acted intuitively.

A high priority agile principle: Cooperative customer collaboration

The facilitation of change is closely interconnected with cooperative customer collaboration. The start-up innovators collaborated with customers early on, and this process actually extended beyond product and prototype testing. It also included the very early FFE stages. Some start-up innovators began discussing their product concepts with the community even before they had a clear vision of the product. They were open about their product concept development to try to obtain early feedback from potential customers.

So before going out and going ahead and saying, we are going to build a software company, we went to the community. We said, you are creating all these works of art that are great. What are you using? What tools, what features within? Whether they are using Photoshop or Corel or Gimp, whatever software they were using. What features are you using? (Interview quote in case 3)

The collection of feedback was done through structured approaches, such as surveys or testing setups, and also through unstructured methods, such as posting links to the early alpha version in a blog and getting feedback through comments.

Well, what's interesting is that if you look back at the original posts that we posted when we launched ... It's cool. I think there's maybe forty comments, or something... it's cool to read back through those comments, and see some people go, 'This will never work,' 'This is stupid,' 'Where are the Gantt charts,' which are typical project management tools. 'What is this? This doesn't make it a project management tool!' And then other people are like, 'Wow! This is exactly what I wanted.' So you'll see that there's the wide variety of feedback. (Interview quote in case 2)

Other start-up innovators published mock-ups and scribbles before the product
was online.

We had 7,000 people who signed up for the mailing list when we said that we released a prototype, we released an initial interface prototype, just to show this is how it's going to feel like. It didn't save to a database. It didn't save any of your settings. There is no user manual. It just showed, this is what it is going to feel like when you drag and drop, and this is how easy it was going to be to use. We just wanted to get feedback. (Interview quote in case 4)

The initial prototype was used not only to obtain feedback about the idea but also to figure out whether there was interest among the potential target group.

But there was still a far concept. What do you mean you couldn't create directly in the browser? So we went to the top users and they said that would be the coolest thing. (Interview quote in case 3)

Several start-up innovators were part of a specific community of enthusiasts or had built up a significant number of subscribers on a specialized blog. These followers helped them to develop the product concept.

We started showcasing videos of what people can do. We had like a select 100 people that were helping us test stuff. But then, we invited more people who were signed up. And slowly, we would send out invitations to people to test out the software as well. (Interview quote in case 3)

The specific early involvement of users surprised this author, as the theme of early open collaboration theme was unexpected based on FFE literature. Not only did users continue their involvement during the development phase, they also helped to build up an interested community. One start-up innovator even copied this approach from another innovator in the case study. He had listened to this start-up innovator's conference presentation with a friend, and then they decided to start an interested community before determining which product to create.

It was sort of like, "Sounds like a good idea." And that night, we registered our web development blog... We didn't even know what we were going to write about. It was like, "This is what the blog is going to be..." and then we started just writing about things we were running. Because we were really behind, we were like, "We don't know all the things we needed to run a business, program software or design that software, but we are really smart." (Interview quote in case 4)

Another start-up innovator deliberately decided to use the existing community that he had created during a previous failed product launch to experiment with new product ideas and concepts. He created several software experiments in a very short time, and after one idea took off, the start-up innovator immediately decided to continue in this direction.
About a year into that, I realized I was probably going to need to experiment with some other ideas on the side as well, to see if one of those would take off. I launched a couple of those different ideas. (Interview quote in case 8)

In several cases, the product was initially developed for internal purposes and users identified the business opportunity. Customers asked the start-up innovators whether they could use the tool for themselves. The start-up innovators therefore started to develop a sellable product and abandoned client work. They then usually started a full-time engagement for the web application.

So we started using it even before it was done with one of our clients. ... It was a redesign project. We were using it and learning stuff about it and getting feedback from the client and the whole thing. And they eventually said, ‘I could use this for my own projects. I need something like this, too.’ Everyone has projects. (Interview quote in case 1)

While some start-up innovators recognized the business opportunity of their web product more or less by chance, based on customer feedback, others had a more focused approach. They deliberately acquired early adopters to obtain feedback and to improve the web product they wanted to push into the market. One start-up innovator reported the acquisition of an initial user base through listings on the Craig’s List service, while another team targeted lead users with a specific background based on their individual networks.

So, we wrote our ideal first hundred users down, and then went to them and gave them accounts. Some of them didn’t care, and some didn’t have time, and some of them loved it. Some of them hated it, because they liked the idea but hated how we had done it. They wrote us a big, long email about the decisions we made were wrong, which was incredibly useful. We basically targeted them. Having thought about a few people who’d be interested, we thought “Let’s write a big list of actual individuals that we know would want to use this, and let’s try to give it to them.” (Interview quote in case 1)

Others discussed the tremendous value of testing with average users. In one specific case, the team conducted a “girlfriend test.” The team sat next to the girlfriends of team members while they tried out the product. During this test, the team discovered important shortcomings of the concept and changed the product significantly.

So, we run this girlfriend test. We put her in front of this thing and we said, “Start making a form. Do something. We’re not going to tell you anything. You can’t ask any questions. Just build like a survey to collect stuff.” So, she sits in front of it, and we watch and don’t say anything for a long time. She had such trouble with it. Like with all the stuff. All assumptions that we had. (Interview quote in case 4)

Although the start-up innovators were very enthusiastic and outspoken about
customer collaboration, they also were vague about how they used the feedback. Several start-up innovators talked about the fact that one needs use intuition when determining which customer feedback to address.

Another is, for me on my side, being able to take a lot of information, process it, chuck a lot of it – forget about a lot of it – and then use the bits that I think are important to then alter decisions. Because you get so many suggestions and so much input. There are so many data points, everywhere. You have to decide which ones to listen to. If you listen to all of them, you would freak out. You would go back and forth all of the time. (Interview quote in case 7)

A high priority agile principle: Product learning and adoption

Overall product learning and adoption behaviour were an essential part of the FFE behaviour of the start-up innovators. What was indicated in the preliminary interviews was confirmed in the case study. The start-up innovators were using iterations already in the idea phase.

You actually get to the, 'Well, here’re the three ideas I got. Number two is the best. Number two is what I’m going to start working on.' And sometimes what happens is you’re going down the road with number two and you realize, 'Oh, number two’s really bad.' Maybe I want to go try number one, now. Or, maybe I’ve come up with another one; maybe I want to try number four. (Interview quote in case 5)

Although induction is a part of the FFE in mature companies, it is remarkable how differently the start-up innovators handle it compared to innovators in mature companies. In their research on serial innovators in mature companies, Griffin et al. (2007) described the enormous amount of time the innovators spent on validating their ideas through market research and concept improvement. These innovators wanted to have the highest possible confidence that the developed product would contribute to the overall goals of their parent companies. Griffin et al. created the hourglass model of Innovation, with five major steps (See Figure 32).
Figure 32: The hourglass model showing the steps of serial innovators

Motivation to Innovate

Find the Right Problem

Interesting Problem

Understand the Problem

Refine

Invent and Validate

Proposed Solution

Prototype

Execute

Create Market Acceptance

Refine

Launch Flawlessly

Source: Griffin et al. (2007)

In comparison, the start-up innovators were agile in their concept development; they preferred to try new ideas.

And so, the path on innovation for the first category tends to be, ‘Throw it against the wall and iterate and try to make it work.’ This artefact worked. And the path in the second is, ‘Try the idea that you think is the aperture by which you can start growing the whole thing.’ (Interview quote in case 5)

They were not searching for the one idea or solution with the most potential;
rather, they saw topics that were close to them personally as being the right problems to address, and after having an idea, they saw induction and iteration as the natural progression.

Because the classic thing about innovation is inductive not deductive. It's kind of what's your best idea. The way you execute an entrepreneurship in business is: This is my best idea. I'm going to play with it. Right? I'm going to play that one form. You iterate and change it, but you don't kind of run through a process to logically deduce. (Interview quote in case 5)

On the one hand, this reflects the nature of software development in the Internet with very low entry barriers; on the other hand, the openness of start-up innovators to trial and error is remarkable, as these innovators often bet their careers on these trials. The learning and adaption continue through the different stages of innovation. Even in later stages of development, the product concept remains flexible.

What will do, is every two weeks, we go and revisit it. We say, what have we learned that changes this? Sometimes it's like, well, nothing. We're doing the right thing, let's keep marching on. OK. Those are very straightforward meetings. (Interview quote in case 8)

The iterations are usually live-tested in the early prototype or alpha product. In contrast to the previously described agile development techniques, the steps employed by start-up innovators did not usually entail testing the software code intensively before deployment. They accepted that there would be mistakes in the actual software deployment and fixed problems as they went.

The best type of testing that we found is, like, 'live testing with the system.' And it's to a wider range and to a wider market. Because on the web, people are using all different kind of browsers, all different types of operating systems, all different types of toolbars, and you just can't test for all those with just three people. You don't have time for a QA team. And we didn't have time to do like test driven development, where you write an interface test for every single thing that we create or make, because it just slows you down. (Interview quote in case 4)

In this approach, several start-up innovators referred to a “launch as early as possible” philosophy. They stated either that an early launch was a key success factor or that they would have, in retrospect, launched earlier to make learning faster.
My philosophy all along has been to put stuff in front of the user as fast as possible and see what they have to say about it. So for the product management stuff, I would make prototypes, but the prototypes actually worked. So, they were more engineering alphas than prototypes. They were really wired through the databases and stuff like that. (Interview quote in case 8)

The idea of pushing something out and then fixing the issues was a common approach. The start-up innovators were not afraid to destroy their reputation with the first version. They allowed themselves to launch terrible versions. One start-up innovator stated this as follows.

You can make your product less terrible. That should be like your main goal. Make something that could be plausibly useful to somebody, and then make it marginally less terrible continuously. (Interview quote in case 8)

A high priority agile principle: Speed orientation

The start-up innovators had a strong speed orientation, especially those from Silicon Valley. One start-up innovator summarized this in the following statement.

That's another thing that Silicon Valley is known for, its clock speed. We move fast. (Interview quote in case 5)

Another start-up innovator proposed a time-boxed approach to product development. He suggested that only product concepts that can be realized in 3-4 months are viable. According to this start-up innovator, projects that take a longer time need be cut back in scope.

That's my suggestion for everybody who builds software. What can you get done in three or four months? That's version one right there. If you can't get it done in three or four months you have to cut back on your scope. Don't keep adding more time; cut back on your scope. There's always more time to add utilities and stuff like that. (Interview quote in case 5)

Despite this speed orientation, the development of the product and even the product concept were time consuming for some of the innovators. This can be attributed to long part-time development phases in which the start-up innovators combined their development with keeping their main jobs, doing contract work, or continuing to work on a previous project. One Internet innovator spent over a year developing his initial product concept, and it took him another year to actually create the first prototype. The start-up innovators who used long development times referred to this as a mistake and stated that they should
have launched a simpler product in less time. More insight on part-time development will be given in the FFE section.

4.1.2 Low priority agile principles

Among the many agile principles that were adopted by start-up innovators that influenced the FFE phase, some were considered low priority.

Low priority agile principle: Process learning and adoption

The start-up innovators showed nearly no awareness regarding process learning and adoption; rather, they hardly mentioned development processes. They made statements about product learning, human resources issues, and entrepreneurial challenges (such as getting funded), but hardly mentioned anything about their processes and how to improve them. One might attribute the lack of reflection on processes to the limited knowledge and experience of the innovators. While this lack of experience was evident in some first-time start-up innovators, several innovators in the case study had significant process experience and had worked with experienced product development teams.

Every person I am working with has made many, many and many products before. Whereas, every other project I did before that where you are - it's like working in a team. You are working in a big company there's almost always someone there who's not really a product person at all or who's quite junior, or who frankly you just don't trust for some reason. You don't think they are as good as someone else in the team. Obviously, there are better and worse programmers and better and worse designers. I am working with a handpicked team that I trust. And we are making a thing partly for its own sake, as well as, with the external goal of making a successful company. (Interview quote in case 1)

This strong confidence about their resourcefulness was especially present with the serial start-up innovators. One described the early development process as an almost routine process of his experienced team.

And all of us had worked in start-ups before. All of us had done at least one if not two start-ups before. So, at that point, it's very different because there's not an audit what the hell do I need to do. We'd all go, "This needs to be done, this needs to be done, this needs to be done. Yes... That one first. OK you on this one, you on this one, and you on this one... OK go. (Interview quote in case 5)

Based on the significant experience in the corporate and start-up environment
of some innovators in the case study, it seems insufficient to attribute the lack of reflection on processes only to a lack of knowledge and experience.

Several start-up innovators argued that they deliberately worked in a start-up to avoid complex processes and the need to improve those processes. They wanted to collaborate directly and talked about the advantages of small start-ups over big companies in terms of processes; they believed it was easier for small companies to function because fewer people were involved.

And like, 'Well that would be fun to try.' I think an awful lot of things we try, whether we did in the product, in its design or in its style, and still that we do now, are things you could never have done at somewhere like the BBC or Nokia without three months of strategic planning and approval by ten different heads of department. And it's the joy of going 'Well. That worked for them. Why don't we try that?' ‘Oh, it didn't work. Drop it.' Rather than ‘Let's do a big planning process.' So a lot of it was essentially intuitive. (Interview quote in case 1)

There are several other possible explanations for the lack of reflection on processes. It is likely that process problems are generally topics that arise in later stages in the development process; therefore, methods and processes were not on the agenda of the start-up innovators when describing the FFE phase. Other explanations might be found in the very small team size or the initial excitement about the product, which reduces awareness about process problems. This case study does not offer explanations for the lack of process learning and adoption of start-up innovators, but concludes that this agile principle was not of high priority for start-up innovators in the FFE.

Low priority agile principle: Readiness of the used method

The limited awareness of processes already indicates the low priority of the readiness of the used method. As processes and methods are not high on the agenda, the innovators did not tend to extensively evaluate the readiness of their methods. Although some start-up innovators had used distinct development methods in previous jobs, they did not refer to specific agile methods in their start-up. They referred to agility in a broader context, as stated below.
I have always been very comfortable, very happy with agile iterative process that none would fall, very much based on continuous course correction: Do some work, look at what was done, choose the next thing: do some work, look what was done, choose the next thing. Don't plan what you're going to do in three months' time, except have goals what you would have achieved in three months' time. But don't plan the actions. Plan the actions at the end of each chunk of work. (Interview quote in case 1)

The only agile method explicitly mentioned by start-up innovators was the SCRUM method. One Internet innovator emphasized that his team acted in a “SCRUMish” process. Although they did not completely follow the method, they adopted some elements, such as time-boxed iterations and a backlog.

We have a backlog of things we want to do one day and we go, ‘Should we do some of them, or should we do something brand new, Scrumish?’ We’re not following a prescribed process, but we’re just adapting. I think, too, important that all of us – certainly the original three of us that went through the thing – we’d all been working in making products, web products and phone products for over 10 years, each of us for over 10 years. And, I think we’ve all got internalized simulated sense of what works for us and what doesn’t. (Interview quote in case 1)

The same start-up innovator also used SCRUM-like, time-boxed sessions in an offsite meeting to develop the product concept. This was the only evidence of a set agile method being used in product concept development.

4.1.3 Ambiguous agile principles

The start-up innovators did not view all agile principles the same; two such principles could be classified as ambiguous agile principles: co-location and sustainable development.

The results for these two principles were mixed. Some innovators strongly emphasized the importance of ensuring sustainable work-life balance for the developers and themselves so they would stay productive for a long time. Others emphasized the opposite, stating that an Internet innovator needed to conduct a tremendous amount of work in long workdays. While the ASD literature generally proposes that agile development is usually conducted in co-located teams, and only a limited amount of literature exists on distributed agile development, several start-up innovators worked in distributed teams. While the co-located teams praised the benefits of co-location, the distributed teams saw disadvantages of this method and doubted that agile development should be
co-located.

The following sections will explore these issues in more detail.

*Ambiguous agile principle: Co-location*

While process topics were hardly present in the case interviews, the topic of co-located and distributed development was an imminent topic for the start-up innovators. ASD has generally been attributed to co-located teams, and only a limited amount of research on distributed agile development exists. Ramesh et al. (2006) asked whether distributed development could be agile and concluded that agile elements indeed could be included in distributed development.

Several start-up innovators also indicated that distributed agile concept development was possible. These participants referred to the need to find the best talent from all over the world and were confident in their approach despite the geographic distance between the teams. These start-up innovators used online tools to mimic the advantages of co-location quite successfully. One Internet innovator described how his group used group chat to maintain informal contact all day while developing in Europe and the United States.

> Campfire is our real-time chat. We use Campfire all day long. I don’t know how we would get business done without Campfire. Campfire is so incredibly important to us. ... All day long we’re in Campfire. (Interview quote in case 2)

Some start-up innovators did not view distributed development as a potential burden for agile behaviour. To them, it was natural to develop concepts and products in a distributed way. They were used to collaborating in virtual communities and hardly distinguished between personal, telephone, and instant messenger conversations. One Internet innovator even strongly emphasized the advantages of working remotely and strongly argued for the superiority of less intrusive online communication over personal office conversations in a co-located office.
'Stay away from one another.' 'Work remotely.' ... We can share files and code in real time. But the real difference, though, is just simply that it's passive. It's just like a conversation is going on, which often happens in offices: There's a conversation going on but it's vocal and you can't hide from it. It's going on. ... It's going to distract you. But I can just hide it and then it's out of my way. Or sometimes people will say 'I'm going off Campfire right now to get some work done,' and so they close the window and then you know they're gone. But other times you just hide it and it's out of your way. (Interview quote in case 2)

The fact that approximately half of the interviewed start-up innovators practiced development in a distributed way is an indication of the general workability of distributed agile concept development.

Against the successful examples stands the strong opposition of other innovators in the sample who promoted the advantages of true co-location and working on a product concept in the same room. These innovators practiced the principles of which they spoke. They hired team members only from their local area or flew across the Atlantic for long series of informal product concept development sessions. They argued that spending personal time together was necessary for a creative concept development process.

And we chat about them. We wouldn't take it too serious. It's, you know, really joking and talking and it's OK. And you wouldn't be tight agendas, it would be rolling with it. The next day, we were thinking about more ideas, a lot of jokes, drinking – just taking it easy, letting things happen. (Interview quote in case 9)

In summary, the case study was inconclusive regarding co-located versus distributed development discussion. There is indication that agile development can be practically conducted by start-up innovators over long distances, but there were also strong opposing opinions among some participants.

**Ambiguous agile principle: Sustainable development**

A similarly ambiguous picture occurred in sustainable development. Some of the start-up innovators believed that the development teams needed to have a good work-and-life balance to be successful.

I don't really like the idea of a start-up business anyway. I like the idea of a business. I think that there's a difference between a start-up and a business. I don't think that there should be, but there is. I think if you're going to build something you should think of it as a business, not a start-up because a start-up is this idea that 'we're going to be broke for a long time and work crazy hours and do whatever we need to do to get it done.' I don't think that's usually a healthy way to do stuff. (Interview quote in case 2)
These start-up innovators argued that working long hours reduced productivity and needed to be avoided. They referred to both personal experience and gathered anecdotes.

We looked at research in video game development teams. And one of the surveys shows that: on a period of a blitz, where you make people work towards a deadline, where you force people to work like 60-hour weeks. What it turns out is if you make them work multiple 60 hour weeks, three weeks of working at 60 hours a week, you get the same amount of work as three weeks of working 40 hours a week. The reason is because the last two weeks, you've actually become less productive and less efficient over time. (Interview quote in case 4)

Other start-up innovators displayed a completely opposite attitude. They were very outspoken about the need to make sacrifices to be successful.

If you feel like you are not dedicated enough to work 12, 14, 16 hours, seven days a week for the next two to three years, then, don't start. Find yourself a good job that you can go home five or six PM, spend time with your family. Because I think there is no other way to do this. (Interview quote in case 10)

No pattern could be identified regarding which Internet innovators would follow which direction. One might expect that more experienced start-up innovators would be more focused on a proper balance, but no such theme could be identified among the cases.

4.2 FFE phases and activities

This section explores the FFE phases and activities of start-up innovators. The author used the NCD framework by Koen et al. (2001) to ensure a structured thematic analysis and better comparability with the existing research.

To increase the managerial value of this section of the multiple case report, the author chose to describe a typical journey through the FFE. Comprehensive storytelling shall contribute to a holistic understanding of the FFE phase for Internet products. When following this journey, the reader must be aware that the FFE typically is not a linear process. Start-up innovators go back and forth between the phases, skip phases, or act differently at certain stages.

The early activities are described as the idea generation and enrichment phase, which is followed by observations regarding opportunity identification. The discussion then moves to the main activity of the start-up innovators: prototype building. The innovators did not spend much time writing concepts, conducting
market research, and building business cases. Rather, they were very much focused on creating an early prototype of their product. The extensive alpha testing phase comes next. Similar to prototyping, this phase is not part of standard FFE, but the start-up innovators integrated alpha tests into their concept development and regularly changed and adapted their product concepts based on these tests.

Finally, this section will describe how the overall change in the FFE phase changes the opportunity analysis, idea selection, and concept definition phase, providing insight into the part-time nature of the overall process. Many innovators developed their products part-time, while also working as employees, contractors, or business owners.

4.2.1 Idea generation and enrichment phase

In the NCD model, Koen et al. (2001) marked two entry points into the FFE phase. The FFE phase starts with either the opportunity identification or the idea generation. For start-up innovators, the idea generation and enrichment phase was the dominant starting point. This is not unusual. Murphy and Kumar (1997) stated that NPD usually starts with a given idea. Only a few (usually more experienced) innovators based their product ideas on attractive market opportunities. Therefore, this discussion uses idea generation as the entry point.

Agile idea evolution

In talking about idea generation and enrichment, it is important to be aware that start-up innovators usually referred to their first idea as the starting point of an inductive idea development process. These initial product ideas usually evolved over time.

'I knew what the exact shape was...’ that's never the way ideas work in my experience. (Interview quote in case 5)

Some innovators even reported that they started with an idea that changed significantly based on new insights during the FFE phase. The further development of an idea happened through casual idea enrichment with a
trusted personal network. This trusted personal network of advisors usually consisted of potential or already selected co-founders, business angels, partners from previous business relation, and close personal friends or family. The idea was usually discussed in non-business environments such as bars or over weekend trips.

It originally came out of meeting up at a pub to talk about an idea, and then from that we went on. (Interview quote in case 1)

The start-up innovators generally stated that they were not afraid of sharing their ideas openly; they did not believe that secrecy about an idea was a key factor for success.

I'm more afraid that no one is going to know who we are and what we are doing than someone is going to take my idea and run with it. (Interview quote in case 2)

Shortly after these first loose discussions, the start-up innovators usually pushed the idea forward in a more professional way. Several innovators arranged kick-off meetings and scheduled structured brainstorming sessions.

Let's go away for the weekend, literally book a holiday cottage on the English coast. This seems like a fun thing to make. (Interview quote in case 1)

One of the more experienced serial innovators even took a month off to further develop an idea from the initial thoughts with a group of potential co-founders.

So, we came to Israel to meet the other two guys and so it's important to be physically together in a good amount of time and to clear all the stuff from your brain. We all have so many things we take care of. (Interview quote in case 9)

Brainstorming, mind mapping, discussions, and sketching were described activities in this phase. Although several distinct idea generation and enrichment techniques were described in the cases, the idea generation and enrichment practices of start-up innovators were still far less formal than the practices proposed by Koen et al. (2001).

The participants in the case study did not conduct a structured process to find high-potential product ideas; rather, they developed and enriched their ideas in an agile way based on their personal backgrounds.

Sources of idea generation and enrichment

Idea generation was generally characterized by lead user knowledge and
specific privileged insights of the start-up innovators. They generally preferred choosing an idea close to their background and personal preferences.

Lead user knowledge

Perhaps the best examples of lead users were innovators who created the initial tools and discovered the potential for a commercial product later. They created their web products as internal tools for their own companies, because they could not find a solution on the market.

We were looking into tools to manage our client projects and we weren't really happy with what we saw so we decided to build our own, internally, to solve our own problems. Our own problems were not the typical project management tool problems, which were typically, or historically, or traditionally about charts, graphs, statistics and reports. Those weren't the problems we were having. The problems we were having were simply communication: how to get feedback from clients, how to share a file with them, how to keep track of who's doing what, and when its due. Things like that. So we decided to build our own tool. (Interview quote in case 2)

Later they were encouraged by customers or advisors to sell the product to those who had similar needs. Thus, producing to sell was not initially intended.

We started using it with our own clients and they said, 'This is really good, I could use this too.' We said maybe we can turn this thing we built for ourselves into a product and that's what we did in February 2004. (Interview quote in case 2)

Several of the innovators were also lead users. For example, a frequent traveller might launch a unique travel product, an online photography and graphic enthusiast might generate a web-based photo manipulation product, and small business owners might create a service for easy invoicing of customers without the need to understand bookkeeping software.

Two innovators in the case study were outstanding examples of the importance of lead user knowledge and early collaboration. They both tried to launch a product for an envisioned use case of an abstract target group in their first approach. They failed in their first attempts but were successful with the products based on lead user knowledge in their second attempt.

In the first "better product" case, one innovator started creating a content management system as a competitor to leading content management systems such as WordPress.com. He used these systems as an average user but was not a lead user in the field. Despite this fact, he tried to create a more holistic
content management solution to beat competitors in this existing product category.

So, we always had this idea that we would build something that would help people do content management. That's the way we thought about it at the time. (Interview quote in case 4)

Potential investors told the innovator not to launch this product due to its commodity character. But after a product concept presentation, they were excited about a specific feature within the product idea: the HTML form builder and data collector.

Yeah, sure. ... came out of this problem, basically. ... and I used to work at the University of South Florida. We worked in the research department. Our job was to develop a lot of web, like simple database stuff for other people. I found out that it was a really horrible process. A lot of people who has no technology experience were asking for database applications to collect information over the Internet. It ended up being these applications technically aren't very hard, but not anybody can make them. Understanding how a database works, how to do the scripting, and all this stuff take a lot of time. So, there are tedious amounts of work even though they're extremely efficient for helping people do stuff. (Interview quote in case 4)

The Internet innovator did not realize the value of this specific feature, but the investors were intrigued by the opportunity for a product based on this feature. They saw the need and convinced the innovator to focus on this part of his product concept.

It was just from a different perspective...it was not from the idea of content management. ... they understood form builder, right, create something people collect information, is easier to understand than trying to explain 'what is a content manager or what does that do?' (Interview quote in case 4)

In the second case, the start-up innovator had run an instant messenger product for several months without gaining user adoption. The fact that he kept supporting Non Government Organisations (NGOs) helped him discover the potential of his original idea. He created an easy-to-use browser wiki tool as a weekend project to reduce his personal amount of work in non-profit organizations.
I had been helping a bunch of different organizations I was involved with, creating private wikis for them on my own servers. But I hadn't really thought of it as a business, even though this was a really useful tool for those people. I got sick of setting up the wikis by hand, because it took a while. It took a couple hours of server configuration and stuff. I said, you know what? This is silly. These people should be able to set themselves up. I decided to go and write some software on my server that would let anyone sign him or her up for a private wiki. (Interview quote in case 7)

Within a few days, thousands of Internet users started using the tool that the start-up innovator offered for free. This growth rate was in sharp contrast to the slow adoption of the technology-driven instant messenger approach he had been working on for over a year. He then realized the momentum behind the wiki approach.

This blew me away. I was like, wow, there's a lot of interest in this. It was a moment of humility for me, because this big fancy project I'd worked on, for a year and a half of my life, was not really getting a lot of attention. This weekend hack, this thing that I'd literally put together between one and eight in the morning, ended up totally surpassing it in a week or two. (Interview quote in case 7)

The cases in the study suggest that most products in the idea generation and enrichment phase were generated through lead user knowledge, specific insights, and early collaboration. This indicates a superiority of these ideas, but it is also possible that the greater success of these approaches might be attributed to a motivational effect. One innovator who had decent success with a previous product created for an abstract use group and use case pointed out that innovators often simply lose interest in the products they are less passionate about. The excitement only stays if the innovator is also a user of the product and keeps on pushing the product. One innovator explained why he abandoned a former project with limited success in the quote below.

But it wasn't something that I was really passionate about. It was more of an experiment to see if I could build it. I figured I could, and I brought David in to do it, and tried it. It was fun but it wasn't something that we were really excited about. And it wasn't ultimately something that I used. ... I think this is an important point, too: if you don't really use the thing that you are building it's not going to be that good and you don't really care about it anymore. (Interview quote in case 2)

The lead user approach of the start-up innovators fits with results from literature and the characteristics of web products. According to van Hippel (2001), corporate innovators tend to create innovations that are improvements on well-known needs, while lead users create functionally novel products based on their
user-need and use-context information. According to current literature, technological knowledge and use knowledge are needed to create a successful innovation (van Hippel, 1994; Reid & Brentani, 2004). Kristensen and Magnusson (2010) found out that many companies have technological knowledge the use of this knowledge is often missing. Professional developers often have high technological skills, but they usually do not have enough use experience as they try to generate innovation for a domain with which they are unfamiliar. This asymmetry is one of the main reasons why ordinary users, and especially lead users with technological knowledge, often come up with new ideas for products. They have use knowledge and can create real user value (Lüthje, 2004).

Specific insights

Being a lead user is not the only way the start-up innovators obtained specific use knowledge. Specific insights from previous jobs, start-up ventures, and product launches also helped the start-up innovators.

In one example, a start-up innovator found the success formula for a social network for business professionals based on his unique job experiences in the venture capital community and a previous failed attempt to launch a dating service.

An open fish bowl of professionals doesn't really work very well; because the problem is...if you allow 60-year-old desperate guys and beautiful 25-year-old women into the same service exactly you have a serious problem. Because they all hit on the 25-year-old women. Well, the business analogy is, if you allow the VCs and the experienced start-up execs and the angels in with the desperate entrepreneurs or job seekers that sort of thing; it's the exact same conflict. (Interview quote in case 5)

This unique insight enabled the innovator to create the concept for a reference-based social network for business professionals. For the first time, successful professionals felt comfortable becoming a member of such a network without constantly getting business requests from parties in which they were not interested. Just as the privacy settings and matchmaking features of dating services enable women to use the service with comfort, the need for a personal reference now allows business professionals to use the advantages of the service without getting unwanted requests from job seekers or sales people.
Collaborative idea enrichment

Start-up innovators gained use knowledge not only based on their background, interests, and specific insights, but also from collaborative FFE activities. They conducted collaborative idea enrichment using social media functionalities as well as personal meetings and telephone calls.

Start-up innovators heavily used social media functionalities such as blogging, forums, and social networking. A significant number of start-up innovators were active members of both virtual and real communities, both of which were relevant for use cases the start-up innovators tried to solve with their product.

Several outstanding examples of the utilization of virtual communities were represented in the case study. A start-up innovator who created an online photo manipulation product was running an online community for the creation of digital art at that time. Two other innovators, both of whom later created web products for small online companies, had blogs about small-company topics. These innovators had achieved significant readership.

At the time, I think we had 15,000 people subscribe to our RSS feed ... now we're at like 30,000. (Interview quote in case 4)

These start-up innovators actively used social media tools and their readership to obtain feedback on the product ideas early on. They presented product ideas in the early phase to obtain feedback and improve the product.

Then what we started doing was that as we were building it we started blogging about it: talking about this thing we had coming up soon. And we started previewing some of the features that would be in it, maybe a month or two ahead of time before we launched it ... We talked about it publicly before it was out. (Interview quote in case 2)

In this way, the start-up innovators followed an open innovation approach. They informally gathered feedback and improved their product ideas and concepts. Another innovator used social media in a more structured way; he used a survey approach to enrich his idea. This allowed him to obtain unique insight into which product features were really relevant, and provided the basis for starting the creation of the web product.
Surprisingly, out of 90% of the responses we got back from people saying they only use 10% of the features. So they would have huge software installed on their computer. They paid a lot of money for it. They are only using 10% of the features of this whole entire thing. So we said, you know what? That is what we are going to do. We are going to focus on that 10% and only provide that simple solution, but yet powerful. So that people can create the stuff that they are doing but not focus on this whole bloat software. We are going to try to do as much as possible. We are going to focus on only the necessities. (Interview quote in case 3)

Not all of the innovators were active in online communities, but these innovators adopted similar open strategies in real-life. Silicon Valley start-up innovators, especially, referred to personal networks as sources for ideas.

That is where the idea came from. It was from calling a bunch of people and saying, ‘Hey, what do you really want?’ Then, we realized that, OK, a lot of people really want live chat in their sites. (Interview quote in case 7)

These idea enrichment activities typically did not follow a structured analysis approach; rather, the start-up innovators gathered feedback in an unstructured way from all kinds of sources, such as friends, family, potential customers, other founders, and potential investors. The general pattern was that the innovators were open to sharing their ideas and triangulating feedback from many sources early on.

But it was really about getting to understand exactly who our customers might be and on the order of talking to maybe eight to ten people, sharing the idea and kind of thinking what might work. Some with, you know, also start-up kind of perspective, some with maybe an investor perspective, and the rest of them start-ups. (Interview quote in case 9)

4.2.2 Opportunity identification phase

For the second entry point into the FFE phase, the opportunity identification phase, the activities in this area quickly emerged as rare among the selected cases. When asked about their activities in this area, the start-up innovators usually referred to informal discussions they had with experienced business partners or trusted advisors.

I went and talked to every smart person who knew about the Internet that I knew and I could trust. ... Like, ‘OK, here's what I'm thinking, what are you thinking? What's good, what's bad, what do I need to focus on,’ that sort of stuff. (Interview quote in case 5)

The opportunity was seldom identified through market evaluation and was more
often based on personal expertise and experience. The start-up innovators' approaches were only partially driven by the size of the opportunity; they did not choose a completely new area with a great market potential. Rather, they chose a topic related to their personal interest, work experience, or specific expertise. The opportunity identification of the start-up innovators correlates with research results of studies on the discovery of entrepreneurial opportunities conducted by Shane (2004) and Venkataraman (1997). In these studies, the scholars showed that entrepreneurs often recognized opportunities based not on certain skills or activities, but rather on their personal background and previous knowledge.

And it was kind of like a slow evolution of going from working on it for ourselves to more and more 'I think there are other people who can use this.' So maybe we should try doing that. And then it was like, 'Wow, there are lots of people who can use this.' And it was a very gradual process. Still on going, I would say, to realize the opportunity that it presents you. (Interview quote in case 6)

In this regard, start-up innovators and entrepreneurs are similar. This almost naive look at the marketability might be due to the fact that the projects were often started as a side project or as a kind of experiment. As creation and distribution of an initial working product is quite fast, easy, and not very expensive, most prototypes were launched without evaluating the opportunity early on. Furthermore, some innovators referred to the high inaccuracy of opportunity screening and analysis.

I think when you have an idea that you think is novel at some level, you just have to build it and see. You just don't know how many people are going to use the thing. It's much more about the product. (Interview quote in case 7)

One founder stated that he identified the opportunity immediately after realizing that there were tremendously high adoption rates for his initial beta product and then decided to focus his company full-time on the product. He stated that one needed to believe in the idea and gain users, and that the money would follow.

So you have to come up with an idea that you think a lot of people will use, which is a prerequisite to making money on the web. Then you have to just believe that, hey, there are a lot of other people out there like me, because it's a big world, and they probably want instant messaging available on the web, too. And just see. (Interview quote in case 7)
Part-time as lower entry point

The start-up innovators did not usually identify a great opportunity and go for it full speed. Rather, the idea was in most cases pushed forward on a part-time basis while studying, working, or even running a company. In the case study, part-time was not the exception but the norm.

Basically what we always did was Wednesday nights and Sundays. So Wednesday nights we'd get together at someone's apartment, and Sundays I'd leave business school and we'd be in someone's apartment. (Interview quote in case 7)

Even experienced serial innovators often worked on their new web products on a part-time basis while running other ventures. A common theme was the combination of Internet product development in an agency or as a freelancer and parallel development of several side projects.

No need to raise VC money

The start-up innovators reported that they generally needed only a small amount of money to start their projects. They were either self-financed or had a small amount of financing from friends, family, or business angels. While one might expect a start-up innovator to spend time ensuring that he or she is working on the right opportunity, the innovators typically focused on the product idea itself.

In fact, in the beginning it's all product side, right? Nothing is not product in the beginning. You have nothing else. Without a product you have no business. There are companies that, in the bubble, who are able to go raise money to hire people to build something that hasn't yet been launched. OK. But the thing that will make or break that is how much people actually use the product. You have no clue ... until you've got a product that's out in the market, I'm not sure you quite yet have something. (Interview quote in case 7)

Product development conducted by the innovators themselves

The start-up innovators themselves, along with one or more members of a founding team, usually did the actual product development. In general, the start-up innovators presented their teams as product-driven.

We are all very producty. I think it is really important that people who are doing a product company are product-y in nature. We all wanted to do it, and we are all very, very motivated. (Interview quote in case 10)
Work was often conducted remotely, as no company office had been established yet. Furthermore, highly talented people were often acquired from online communities while discussing software development issues or a topic of specific interest such as graphic design.

It's best key people are spread out like I said there are talented people in different locations and we didn't want to limit our talent pool just for people in like five blocks from our house. So we went out where ever the talent was. (Interview quote in case 3)

As already described in the section on agile principles, most of the innovators were confident that distance work was not negative or difficult; they saw more advantages than disadvantages to this setup. Several start-up innovators initially hired their future partners as contractors for software coding and graphic design.

Our product was built with ten hours a week of his time - not a day, but a week - for about four or five months. And we paid him on an hourly basis because he was still in college (or university) in Denmark. He's from Denmark as well. We actually worked remotely with one another. (Interview quote in case 2)

**Financing of early phase through main job**

Overall, it remains unclear why the start-up innovators put so little effort looking at the marketability of their products. The part-time, agile approach explains this in part, but it remains unclear why the innovators even took the risk without proper investigation into the validity of the opportunity. One Internet innovator reported that he had to finance his co-founders' full-time work on the project. He kept his day job to share his salary with the two co-founders, financing the full-time development work done by them.

But, Chris, at the point, was like, 'This isn't going to work', because we won't be making any money at the time. So, Chris decided he was going to keep his job and he was going to split his pay check between the two of us. So, Ryan and I were pulling off of our savings. I actually cashed in my retirement money. And Chris split his pay check three ways with two other guys. (Interview quote in case 4)

4.2.3 **Opportunity analysis phase**

The lack of focus was also present in the opportunity analysis behaviour of the start-up innovators in the FFE. For the start-up innovators, opportunity analysis
activities were low on the agenda. This behaviour was in sharp contrast to that of innovators in mature companies who spend a significant part of their time ensuring the creation of a product with significant market potential (Griffin et al., 2009).

Limited belief in market research for innovative products

Several start-up innovators saw limited or no value in doing market research, as they perceived conducting market research as not being valuable for highly innovative products. They even stated that conducting market research might be counterproductive in terms of innovativeness.

I would say that for most innovations that market research shouldn't be a critical element. It shouldn't be, let's say a barrier... a criteria, until after you've already essentially came up with an idea that inspires you. ...So I think if you need to do a tremendous amount of research to convince yourself to do something, or to create this idea, or whatever it might be then I think you are too far removed from the customer need. (Interview quote in case 10)

Limited belief in the validity of market research

Other innovators made even stronger statements about their reluctance towards market research. Asked whether he conducted market research, one start-up innovator stated the following.

No, none. I don’t really believe in it. Again, we're focused on building products that solve our own problems. We recognize that if it solves our problems it's going to solve a lot of other people's problems. (Interview quote in case 2)

The same interviewee emphasized his point about market research by making a reference to Steve Jobs.

I don't believe in market research. I'd heard Steve Jobs talk about that recently, too: about how they never research... 'We build things that we love.' I always like how when he announces products, if you listen to him carefully... he doesn't always do this, but he'll say, 'this is the new product. We love it, we hope you like it too.' (Interview quote in case 2)

Preferences for real data over market research

The innovators usually preferred real-use data to data generated by market research. They doubted the validity and value of market research data and preferred the generation of real-use data.
That's the other thing: I don't really believe in these 'market research' things because they're not real. You can ask people questions and you can bring them into a lab and do testing but it's not real. They're not really using it. They're doing tasks that they've been told to do and I don't really feel like you can get good feedback from people in that scenario. I much prefer to do what I believe is right: put it out there and let real people use it in their real everyday lives for real projects and get us real feedback. (Interview quote in case 2)

One of the experienced serial innovators in the case study pointed out that a network of experienced and trusted people was more important in obtaining direction than market research activities.

So, assembling all those things, and getting that driving forward in an accurate way, where you're simulating market feedback, advice feedback, strategy feedback, et cetera, through the discussion of the idea with your network of people around you. It's one of the things you use a network for. (Interview quote in case 5)

**Market research as an exercise for investors**

One start-up innovator who had also been an inventor in the first generation of Internet start-up companies stated that market research was a necessity for highly financed Internet start-up companies. Web product development teams usually do not need high financing in the early stage and therefore do not have to put their start-up on the venture capital market early on.

When you have a huge amount of capital invested, it makes sense to do that. But, like for example, the capital required to launch our product – and it's cheaper now, even – was like... because we decided we would get money, so we geared up a full team. Frequently, what happens in WEB 2.0 stuff is, three or four people do it together. They are all doing very low salaries and everything else. And so, that can run for a while. (Interview quote in case 5)

Low financial capital investments are nothing new in FFE research. Boeddrich (2004) proposed that a structured FFE could be realized with low financial commitment. Start-up innovators pushed this a step further; it was remarkable how far they went with prototype development without significant investment. Almost always, they pitched for money with a usable, alpha-tested prototype version to prove their product concept.

**Competitor research as main activity**

While the start-up innovators conducted only limited market research activities in the FFE, most innovators conduct competitor research early on. The
innovators expressed a quite narrow scope regarding the direct competitors of their start-up companies. An experienced innovator who was also an Angel investor called this a self-defence mechanism.

Almost all start-ups really start tracking competitors pretty early. And they start going, ‘OK. These are the one, two, seven other companies that I pay attention to, and only them,’ relative to what’s going on, because the problem is, for example, you’re going to track Microsoft or Google competitively, it’s like, ‘Well, shit. If they come out with something that actually displaces us, we’re not going to be able to change that,’ Right when you’re small, and if they don’t, they don’t. (Interview quote in case 5)

A mixed picture emerged while talking about the timing of when start-up innovators started to search for competitors. Although several start-up innovators stated that competitive research via Google was one of their first activities, others started this research only after the FFE phase.

Just built it. We didn’t look at competition. I can’t even remember when we found our first competitor. I think we might have been live. I think we literally might not have looked at competing offerings until the service was... This was it. I can’t say I’m proud of that. It’s so naive, right? But, I think it takes some of that sometimes. (Interview quote in case 6)

Another start-up innovator made a further interesting point. He stated that there was no need to actively search for a competitor, as the web community will tell the start-up innovator about the competitor anyway.

When you are a company that has competitors, as soon as a competitor comes up or seems like a competitor, someone will tell you, right? (Interview quote in case 3)

4.2.4 Idea selection phase

As already indicated by the short opportunity identification and analysis phases, the start-up innovators spent almost no time in the idea selection phase. The idea selection process was usually very informal and is based on the personal background of the start-up innovators. Individual interests and the context of a specific community or company usually drove the selection. Nearly no systematic collection or clustering activities for product ideas could be identified in the case study. Activities to build a structured idea pipeline, such as a broad collection of ideas, defining idea categories, and idea clustering as described by Boeddrich (2004), were hardly conducted. Without these, the start-up
innovators cannot build an idea funnel using systematic selection. One Internet innovator summarized idea selection in a remarkable sentence.

We liked it ourselves. We wanted it ourselves. We thought it had a good shot. We could see a world where people would like it and where people would want it. (Interview quote in case 7)

In looking at this approach to idea selection, one might call the start-up innovators naive, but the limited time spent on idea selection was a direct consequence of two newly-introduced phases into the FFE phase: the prototyping phase and the alpha testing phase. Instead of spending their time selecting ideas based on idea generation, idea enrichment, opportunity identification, and opportunity analysis, the start-up innovators used their ability to create prototypes quickly, test them in alpha phase, and decide, based on the results, whether to further pursue, modify, or completely change the product idea.

On the one hand, the research results confirm the results of Reid and Brentani (2004). Individuals pursue a gatekeeping role by deciding which idea to push forward. On the other hand, the start-up innovators eliminated important parts of the selection in this process step. They decided only after the alpha test of a prototype whether to move on, deciding intuitively which idea to push into prototyping and alpha testing; they had the ability to switch very fast from one idea to another one. Some start-up innovators in the case study created three prototypes on three different ideas before deciding which product concept to push into the market.

4.2.5 Prototyping phase

In the activities that the start-up innovators actually conducted in the FFE phase, it quickly emerged that the major activities were conducted in the newly-introduced prototyping phase. With these prototypes, the start-up innovators used an almost "What you see is what you get" (WYSIWG) approach to product concept generation and development. They generally tended towards skipping concept writing and evaluation activities and preferred to create and build their products early on. This hands-on mentality was present in almost all cases.
Sketches instead of using concept papers

In the early product concept phase, the start-up innovators preferred preparing User Interface (UI) sketches to writing formal product concepts or written use-cases. They perceived sketching as easier to understand and closer to the actual product than written concepts.

That just made sense. Our whole feeling is if I write something down to describe it you might read it and I might read it but we might interpret it differently. Even though it is the same words, people interpret words differently. Of course people can interpret art differently but a picture with a box on it is like, 'That's a box. I get it.'...The closer we can get to something that actually looks like something, the less abstractions there are. Writing is very abstract. ...So that's why we always try to sketch first. Sketching gets rid of the abstractions and tries to get closer to the real thing as early as possible. It's also cheap and easy and fast. (Interview quote in case 2)

Sketches of the UI and the user flow are often the only documents prepared before starting the actual software coding for the first prototype of the product.

Yeah, you usually come up with the idea, draw it, right? So everybody is visualizing the same thing. Then start coding it. (Interview quote in case 7)

The preparation of written documents was usually only conducted if requested by external sources such as venture capitalists, but most start-up innovators reported that seed finance companies and business angels adopted the preference for "the real thing" themselves and were now expecting working prototypes instead of PowerPoint presentations in investment pitches.

You build a prototype, or a product, and then they put you in a room full of investors, VCs and Angels. And you pitch to them and you try to make your company fly. (Interview quote in case 4)

Working prototype as major activity

After sketching, the start-up innovators quickly moved forward to the creation of working prototypes. Only some innovators in the case study used specific prototyping tools for this task; most innovators relied on standard web development tools and databases.

That's the process: start with a sketch, go into HTML and start hooking it up, and start using it and start getting a feel for it. Does it work? Does it not work? Then add more or take stuff away if it is not working. (Interview quote in case 2)

The source code of these prototypes was often already the basis for the source code of the later product. Therefore conceptual work, prototyping, and product
development intermingled heavily from the beginning.

It's a web company, so prototype is product, in a way. What we built was functional, ultimately the product itself. (Interview quote in case 10)

Based on this intermingling of concept development, prototype building, and product development, the start-up innovators did not distinguish between the concept and development phases. They conducted activities usually located in the NPD phase in the FFE phase and vice versa.

No formalized product planning process

The preference for hands-on building was also represented in the product planning processes. The start-up innovators usually planned for a very short period of time, if they planned at all.

Now we have to define what is the simplest thing that we can launch. And based on the simplest thing we can launch, part of how we started subdividing tasks were things like, 'OK, we're going to need to have a profile.' (Interview quote in case 5)

Although some start-up innovators reported that they prepared basic product roadmaps, these approaches were much more pragmatic than project planning processes conducted in larger organizations.

Own product development capacity

The start-up innovator with a small core team of two to four people, usually co-founders, conducted the initial prototype development work. The Internet innovators reported that all members of the founding teams were involved in the creation of the product concept even if they took on other roles within the company in later stages. Most of the start-up innovators in the multiple case study had engineering backgrounds.

The ideal thing is they have a team of one to three people that incorporates two types, a businessperson and a tech person. (Interview quote in case 5)

Prototyping as FFE process

As the start-up innovators were capable of creating such prototypes in a short amount of time with a small team and limited resources, they used these
prototypes early on the FFE process. The creation of a working prototype is a true, front-end process. The prototype is used to refine the product concept and to determine whether a project is worth continuing.

With the creation of a prototype, no commitment is given on either the product concept or the project. Several start-up innovators reported that they created prototypes for previous projects and realized by doing the prototype that they had to move on to a different project. Others realized, based on their prototype, that the web application had potential.

We put the prototype thing together in this weekend and then went back to our jobs and gave accounts to a few friends to see if they liked it. People said they liked it and it was worth doing. (Interview quote in case 1)

**Prototyping as part of the creative process**

The prototype is not only a tool to decide whether to move on, but is also a major creative activity in the FFE process of start-up innovators. Prototypes are used to determine how certain functionality should be changed or whether a UI design makes sense. Prototyping, therefore, has a far greater conception and creative function than the one in mature product development environments.

They'd worked at Nokia where your work on a phone will get onto the shelf three years later. Because of, if you're working on R&D or a new product innovation, the actual shipping it's in your hand can take three years as a cycle, or at least a year because of manufacturing processes and just general organizational slowness. And we're all like, well, why don't we see if we can make a product in a weekend...And we did this; we actually did I think four Scrum iterations in a weekend; three on the first day and one on the end. And each one would be like, OK, so what have we got? Well, we need you to do the design of the home page while I try to make a database that has geographic information in it. (Interview quote in case 1)

Several start-up innovators were very outspoken about the need to run a prototype. They wanted to understand the look and feel of the web product or of a feature within the application.

So, often we try to get as quickly as possible to having a sense of how it will feel when it's done, even if that's by making a mock-up of the system that's built in code, with bits that don't work or that are faked, or some of the web pages are missing. (Interview quote in case 1)
4.2.6 Alpha testing phase

The prototype not only helps to develop the product concept in a more natural, realistic approach, also enables the innovator to do live product testing early on. The alpha testing phase is another newly-introduced component in the FFE phase.

High adoption of alpha testing

As already described in the section on agile principles, conducting tests with first users was the standard way of developing a product concept among the case study participants. The innovators did not use classic methods of user involvement, such as focus groups, but instead took their prototype product and made it available to a certain number of more-or-less selected individuals.

The longer it is not functional and not usable, the longer it just festers. And so I think it's better to just try to get something up and functional. So we did that.

(Interview quote in case 7)

The adoption of agile principles clearly is a driving force behind this approach. The start-up innovators wanted to create value. True value reflects perceived value by the user, and this perception can be achieved only by integrating the user. Listening to the users was also seen as a reduction of risk.

Rather than having three people in a room tell you what features to build, you have an entire community of over a half million people who have been using software, design software from the get go tell you what they would like what they don't like and building that. No better focus group to figure out what features to build and what to do. So as long as we felt as long as we listen to the community and get as much feedback as possible, we'll be on the right course.

(Interview quote in case 3)

Start-up innovators put tremendous effort into the creation of these prototypes. Every single Internet innovator in the case study stated that he conducted early live tests. The topic of building and testing prototypes was by far the most prominent topic in the cases.

Reasons for using alpha tests

Many of the procedures used in alpha testing have already been described in the section on agile principles. In a closer analysis of the reasons for this strong theme, other explanations emerged.
Social software

A strong reason for the use of alpha testing is that many of the examined web products had a social aspect. Value not only is created through the software but also is generated from the network. A professional social network is valuable only if the right people are in the network. Whether a collaboration feature is valuable can be tested only if several users are testing the feature.

It's social software. It doesn't really work unless there are several people using it and they are friends with each other. (Interview quote in case 1)

This uncertainty about the social behaviour within the software does include the intended and unintended usage of the software. As previously mentioned, certain user behaviours led to changing the concept from that of a complete product to only one feature that later became the product itself.

We watched how the friend connections, or the one-on-one chats, and the speed date... We had a speed date function back then, they weren't used. But the ability to broadcast through a few, or a lot of people, that was the only, single biggest feature back then. That was used, excessively. After this first version we sat down and decided that this is going to be on the shape. (Interview quote in case 10)

Data vs. surveys

Uncertainty is also interconnected with another advantage of early alpha testing. Several innovators referred to the fact that data gathered from real users were more reliable than that of surveys that asked people about their preferences. Statements in surveys are not always congruent with actual behaviour.

I just think that it's very important to get constant feedback, and also analytics. So, just because someone says they want something, or they'd do something in a certain way, doesn't mean that they do it. So, it's like, yeah. I love this feature. It's the best feature. And then, you check in analytic, they've never used that feature once. They've never went to that page on the website more than once. And it's because people assume they're sort of interested in something, isn't necessarily. Their actions aren't the same, so knowing how to differentiate between the two. (Interview quote in case 3)

Lead users vs. real users

Another important function of early alpha testing is the combination of lead user knowledge and real user feedback. The built-it-for-yourself lead user approach
of start-up innovators was, on the one hand, tremendously important in spotting a truly unique need, but on the other hand, could be a handicap if the innovator preferred a user interface design that is not suited for the majority of users.

So, I think that's an important distinction, too; you build something for yourself. But then once you've launched, it's very good to hear from the users what they want and what they think, and see how they use it through data and through surveys, because you have no idea, really, how people are using it. And once you've launched, now you're building something for your users. Less for you, more for your users. (Interview quote in case 7)

Early alpha testing helps to weigh the built-it-for-yourself approach with user feedback. One innovator went as far as to state that the creation of the first version was often completely different from the follow-up versions.

Going from version zero to version one in a product, which is very different than one to one or one to two. The games were very different. (Interview quote in case 5)

Viral distribution

The start-up innovators also pointed out that alpha testing has an important marketing aspect. Many web products include viral distribution as a key feature to gain new users without spending a large amount of funds on marketing. For example, users are provided with benefits such as additional data storage if they start sharing.

Without alpha- or beta testing, it is nearly impossible to make projections about the viral effects of features. This can be achieved only if the products are tested in real environments.

So, test with the market some stuff. Get validation for the new stuff we do these days and actual contracts when we know values. And test it against accepted theory. Does it have network effect or not? Does it create strategic value? Is it monetizable? Do I actually just believe, at a gut level, that the users will like it? (Interview quote in case 5)

4.2.7 Concept definition

The introduction of the prototyping and the alpha testing phases significantly changes the relevance of and the activities in the concept definition phase.
Concept creation and writing activities

The start-up innovators hardly ever conducted concept creation and writing activities. Instead of writing the concept, they moved straight to product sketches and prototyping.

Paper scribbles as the preferred method

The sketching activities were usually conducted on paper, as this was perceived as the fastest option. Only a few innovators also used wire-framing tools. Wire framing offers a set of standard graphics such as buttons, windows, and pop-ups to make the UI screen design process faster and easier. In general, all start-up innovators focused on the user interface early on.

What we did was we go to paper, get a big thick marker and start sketching some interface designs on paper. The way we develop software is we do the interface first. We don’t do functional specifications documents. We don’t write up all the features a product is going to have first before it has it. We draw the interface and the interface defines what the product needs to actually do. (Interview quote in case 2)

After these steps, the innovators conducted different activities. Some innovators immediately started the software coding process, while others created the design in Photoshop and then moved on to software coding. The start-up innovators usually used SQL databases, PHP, HTML, and CSS. Some of the start-up innovators used popular programming frameworks such as Ruby on Rails. One innovator described this process as follows.

Yes, we go as fast as possible... so, first it starts with a sheet of paper, graph paper, I am just drawing things. And as soon as I get a sketch that looks like: ‘OK, this I want. This is like ugly’ - rough sketches. I am not like a beautiful sketcher. And, I am like, “All right. It's like... just a bunch of squares... And then in Photoshop I might very quickly... I don't even finish it Basically I start with basic shapes and I play around with some colours just to see if 'Does it feels right,' and then I immediately will abandon Photoshop and I go, 'OK, how do I recreate that?' I'd be getting HTML and CSS. So, I create the structure... we go immediately into something that I could click on a web site adding a little bit of job scripting, but all the interactive stuff is usually done by Ryan, so I pass that on to him and I was like, 'OK, if you hide this and show this, this is what it's supposed to do at this time.' (Interview quote in case 4)

Advice from a trusted network

Although the start-up innovators followed different routes through the process,
they all focused on putting out a working version as soon as possible and on reducing the time spent on concept definition.

**Technology analysis activities**

All of the innovators in the sample considered themselves to be tech-savvy. They knew the technology behind web products, and the majority of them were directly involved in creating the software coding with their teams – even though technology was not their main concern.

Ultimately what we would do is not a technology innovation. We’re a service. (Interview quote in case 9)

They were well aware of the technological problems that they had to solve, and they used creative solutions when necessary, but they did not see technology as a differentiating factor. They used existing, well-documented technologies and viewed the implementation of these technologies as the important factor.

Yeah. Definitely there are things ... people ask me: oh, how did you do that in terms of the technical side of things. But I think it's the implementation. There might be competitors that are using the same thing, but people are using our software because they like the implementation of the sources and derivatives and all that practice. ... I think it's all about implementation and approach to things. People can say that about a pencil, right? Everyone has a pencil, but it depends on the artist who is going to draw it in a certain way who is using the implementation of this tool. (Interview quote in case 5)

This does not mean that the start-up innovators did not create technology innovation. One of the innovators in the sample even created a programming framework that is now very popular in the Internet developer community and is the basis for several well-known online services. But even this major development was not created as a deliberate move to create a technological advantage.

We didn't even know we were building a framework. We were just building the product and then David saw that there were these things that he could extract so that if we built another product down the road he wouldn't have to do the same stuff over and over. That happened by accident. (Interview quote in case 2)

This explains why the start-up innovators hardly ever conducted activities around technology analysis; they just did not see the benefit of this kind of technology screening.
User interface and feature needs

While the start-up innovators spent little time on technology analysis, they invested a significant amount of time in creating a usability concept. Knowing that small changes in the usability of the product could cause success or failure led to a remarkable amount of investigation by the start-up innovators to improve user interfaces and understand feature needs.

Using existing knowledge on product development

Although they rushed towards a quick launch in an agile approach, the innovators spent a significant amount of time on knowledge work in areas relating to the UI and features. They read blogs and books about design and user interfaces, visited conferences, and searched for the best practice examples. While the start-up innovators were very hands-on in all of their approaches, they took time to carefully design this important part of the web applications.

We don't use jargon, we always explain everything, we don't assume that you have any knowledge ahead of time for any of the terms that we talk about and so it's extremely friendly in that aspect, but also we go to extents that we have like a personality in terms of the "log in" button from the home page, there is a tiny dinosaur and when you hover it, it roars at you, when you log in we have lots of fun copy, we have Shakespeare quotes in all the major interface sections, I'm sure stuff that you don't obviously need, but it adds a touch of, we took time and care to make sure each part is something special, something memorable for you to think about. (Interview quote in case 4)

Upon closer examination of the backgrounds and contexts of the start-up innovators, it became quite clear that the start-up innovators were usually well trained in creating web applications. It is not like the situation of lead users, who identify a need or problem and then start learning basic HTML and design. The start-up innovators in the case study had previously created a significant number of web applications. They had done a lot of developmental and design work in their previous companies, created web applications for clients as freelancers, or had trained themselves through previous start-up experience. Two of the start-up innovators in the sample even published their own print publications and ran blogs on web application development before starting the company. They were still running this blog at the time of the interview.
We run a web development blog ... It talks about the business code and design aspects of running an Internet software company, a lot of stuff that we do with our company. (Interview quote)

Simplify user interface and used language

As previously mentioned in the section about agile characteristics, one of the main themes in these applications was simplification. The start-up innovators learned that applications must be easy to use and that the UIs must be intuitive.

Keep it really simple. Make sure it's a product that you're passionate about and would use yourself. The front page should make it, very obvious what it is and let the user take immediate action without scrolling. Keep it small and very, very currently focused on something. (Interview quote in case 7)

The innovators were very clear and focused regarding their desire for a clean and easy-to-understand product. Role models such as Google and Apple drove this preference. The innovators were also very focused on intuitiveness, looking at a lot of examples and learning from best practices. Not only were the intuitive UIs necessary to make the product easy to understand, the innovators also stated a need to provide guided routes through their products.

And unfortunately, users are not very creative; you have to guide them specifically. And so, you have to build templates and things, you have to suggest ideas and give them inspirations. Anything that's open ended as a product is very hard for people. (Interview quote in case 4)

Several start-up innovators also emphasised the need to use clear, understandable human language in their web applications. They spent a significant amount of time optimizing their communication with users.

But, people who are like users or normal people, they are not thinking in term of potential, they are thinking in terms of 'I have a problem. How do I solve the problem?' It's very singularly focused, and it's not like 'How do I solve the problem in a creative way' And so, you have to basically say, 'I have a solution that's exactly the answer to your problem, which is I do these specific things.' (Interview quote in case 4)

These optimizations were already conducted in the early phase. Start-up innovators viewed this optimization of user interface and communication with the user as an important conception topic. For some start-up innovators, it was even the core of their product. Thus, they addressed this topic in the FFE phase and continued optimizing constantly.
Creating products with fewer features

Not only did the start-up innovators focus on an easy-to-understand UI and an appealing, easy-to-understand wording, several start-up innovators even went a step further, creating products with fewer features than traditional products in their respective fields. They said less was more. The start-up innovators reported that it was technically quite easy to add a lot of features to the product, but they reported that products with fewer features were more appealing and valuable to the consumer. This approach seems counterintuitive to many engineers, but the start-up innovators learned their lessons in their previous engagements.

For me, it is always about use cases. I love technology. I love developing code and finding out clever ways to do things but always, when I have got some new technique or something that I want to do, the way I explore it is trying to make something that a person would use, rather than try and make something that is high performance or make something for other programmers to admire or whatever. So, I propose the feature because: I know it is feasible, but I think there is a certain combination of desire or utility that this product feature would serve. (Interview quote in case 1)

Business case building and planning activities

With regard to the activities of start-up innovators around their business model, it is obvious that the start-up innovators were not following a conventional, financially driven approach.

I wasn't even thinking with dollar signs. I was just thinking about building. Just build it, just build it. Get it done. Get it to the next stage. Try and get it out there. Just try and get it to launch. Not even thinking about the dollars, again, behind it. The business model came like the last month before launch. We weren't worried, we just build it, build it, and build it. (Interview quote in case 6)

Business case building

Activities for the creation of the business plan, strategic planning, and risk assessment played minor roles in the concept definition phase. Although one might expect the start-up innovators to place high importance on the business plan, as they created not only a new web product but also a new company, activities in this area were often deferred to a later phase in the development of the company. In mature companies, the business plan is often needed to obtain acceptance, funding, and staffing (Sim et al., 2007); conversely, the Internet
innovators mainly funded themselves or managed to obtain funding from business angels without a detailed plan. In the early stages, the start-up innovators followed a more discovery-driven approach.

No, at this point, certainly during that weekend, we didn't talk about business models. I think there was a mostly implicit understanding that if you make a successful service that's in travel – a lot of money is spent in travel, and so we will find ways to make a business model from it. (Interview quote in case 1)

The start-up innovators believed that having a business model or plan is important but that it was not the highest priority in planning the revenue and profit streams in great detail in the FFE phase. They were very much product focused and believed the revenue model would follow.

Truth be told, it's kind of a waste of time. I wouldn't advise somebody that the first step in starting a company should be to write the business plan. I'd go out there and do it; become an expert as fast as possible. And the best way to do that is to be the first kid on the block who's actually offering that thing for sale. (Interview quote in case 8)

Such an approach was described in academic theory early on. Discovery-driven planning was proposed by McGrath and MacMillan as early as 1995, and subsequent research papers and books referred to the concept and developed it further (Christensen, 1997; McGrath & MacMillan, 2009; McGrath, 2010).

Although the concept is sometimes described as an alternative to Stage-Gate NPD models, the discovery-driven planning model is not a classic NPD model; rather, it is mainly an iterative approach to business planning. In contrast to conventional planning, a discovery-driven approach is not about predicting what will happen in detail or to come as close to the projections as possible. Instead, as much as possible should be learned at low cost in an iterative approach (McGrath & MacMillan, 2009).

In a recent journal article, McGrath (2010) positioned the discovery-driven approach to business models in the Internet environment and stated that far more business approaches can now be realized. Free offerings and advertising financed offerings are now viable due to a lower cost base. It is also possible to experiment with different business models.

McGrath (2010) proposed using the generation of insights, rapid experimentation, and evolutionary learning to discover and exploit new models in uncertain, complex, and dynamic environments. Using such an inductive
approach can be useful in gaining a competitive advantage by identifying business models that other players in the market did not recognize using conventional, analytical approaches. McGrath stated that the use of a discovery-driven approach is often the reason start-up companies are successful in markets where large companies have far better resources, such as brand equity, engineering capacities, and so forth.

McGrath (2010) used the example of “free services” on the Internet as described by Chris Andersen (2009) to explain the variety of models. While free Internet services refinanced with advertising are quite well known, other sources, such as the Freemium approach, are just gaining ground (See Figure 33).

Figure 33: Variety of possible units of business

The current research supports the view that business models of start-up innovators are created by a discovery-driven approach, but indicates that start-up innovators were using this approach intuitively, rather than on purpose.
I didn't do a lot of things. I didn't see an opportunity, size up the market, design a product then go build it. I felt the pain. I built something. I kept building it and then figured out the other pieces and it's just like a different approach. (Interview quote in case 6)

Not only is the choice of model trial-and-error, but the decisions on key parameters are also being made on the fly without purposeful testing scenarios.

One company, which is well regarded for its successful Freemium model, explained its initial decision on pricing in the following way.

Then we had to come up with prices so we just guessed. We made up some numbers. It seemed like they made sense. 'What would I be willing to pay for this?' Here's some numbers that I would be willing to pay. So we guessed and did that and then put it out there. (Interview quote in case 2)

Only a few days later, these start-up innovators had to change their pricing structure again to be accepted by the credit card company. This constraint raised the bottom line of the start-up by a million dollars.

So as we were filling out our application for our merchant account to charge credit cards, they asked us about how regular the payments were. We put down 'annual'. They said we won't approve you for that. Because we're on the hook too much - the credit card company is on the hook. So they were like, 'you have no track record. We're not going to let you charge $499 for a year. If you go out of business in eight months, people are going to want their money back.' So we had to change our model to do it monthly. It turned out to be a great decision because...basically, before we were going to charge $99 for the basic plan per year, which is only about $9.00 or $8.00 a month or something like that when you multiply it out by 12. But now for the same plan when we launched we charged $19 a month. It's more than doubled the revenue per customer per year because we charged monthly. I think that was a lucky decision. (Interview quote in case 2)

The potential implications of the limited business case activities are ambiguous. On the one hand, the start-up innovators intuitively used a discovery-driven approach. This business model seems conceptually appropriate in a highly dynamic environment. On the other hand, the lack of planning might cause start-up innovators to enter into small markets and business models with limited upside potential.

Risk assessment

Looking at the risk assessment of the start-up innovators, a similarly ambiguous picture arises. Their risk assessment mainly relied on a perceived low downside risk.
Yeah, absolutely. And I think that was purely going on intuition, like it costs very little money to form the company. So let's form the company, and then let's try it with people. (Interview quote in case 1)

The start-up innovators invested a lot of time but only a limited amount of money. They were often financially independent, as they were either very young and had a very low cost base, or they already achieved a certain financial independence based on other sources of income or a successful trade sale in the past. While both experienced and first-time start-up innovators had a similar view of the low initial risks, they had different views of the potential upside. The risk of entering into an unattractive market was less present in the minds of first-time innovators.

I knew where I needed to get to, and I just did it. I did not think about or analyse or strategize anything. (Interview quote in case 6)

More experienced start-up innovators checked the potential of their idea using a trusted network. They were still reluctant to perform extensive market research. Instead they used their network to pitch their idea and get feedback.

When that was ready we said, okay, let's try pitching it to the investors, just to see if it passes. Not that we needed money initially, but just as a way of seeing if it made sense. So, we went out to people we know and just pitched the idea. And then, saw that their feedback was, what they think about it. (Interview quote in case 9)

**Strategic planning**

The start-up innovators clearly preferred constant iteration to strategic planning. Several innovators stated that they perceived iterative approaches as much more enjoyable. Start-up innovators who had previously worked in a mature company were especially enthusiastic about the possibilities in a start-up environment.

Much less up front planning. Much more, kind of, 'Let's try and see if we like it. Let's try and see if it's a good product,' and so on. I am working with the best team I have ever worked with. And I trust everyone's intuitions about product. And if they say something I know that it's worth listening to as a product idea or a strategy, or whatever.... (Interview quote in case 1)

**Road mapping**

While most Internet start-up companies lacked a strategic planning process in terms of roadmaps, a mixed picture occurred in the case study. Some start-up
innovators claimed that they did not need such a document at all.

There was no clear product roadmap. There was not anything like that. (Interview quote in case 6)

Others stated that they had a constant road map but did not formally write it down.

It would just be like we just talked about what we had to get done and what we had done so far. And just went from there if that makes sense. It's very amorphous. There are no written plans, really. There's no project management really. It's just three people, two of whom are actually doing any real work. So it's just so pie-in-the-sky that you're just working on a project. It's like a school project. (Interview quote in case 7)

Selected innovators prepared roadmaps that they published to their communities of users in order “to give back” and also give a clear guidance on what was coming up. The start-up innovators stated that this enabled them to launch early without putting off power users.

There was a page, like a couple of things that were this is what the feature set is going to look like, basically planning out. We felt like if we got the feedback from the community, we had to be focused on the structure that it could be easily now executed, right? We didn't want to promise. We were going to do that feature and certain times we said that would be a great feature but it takes too much time to do or we will do it later and we did. Some features we released in stages but it had to have a clear roadmap to do that and build it up. (Interview quote in case 3)
5. RESEARCH CONCLUSIONS

The research conclusions chapter presents a comprehensive summary of the major research results. First, the author reflects on the identified issues of exploration. Then the agile concept development (ACD) model developed in this research project is presented and potential risks are identified. After this summary of results, the author identifies areas of further research on later stages of web product development, start-up innovators and ACD. In the final section, the author proposes why and how managers should encourage ACD and attract and support start-up innovators.

5.1 Reflection on identified issues of exploration

The author identified three issues of exploration that guided the research, and will now reflect on those issues of exploration.

Do successful innovators adopt agile principles in the FFE phase?

First, the author wanted to explore whether and how successful start-up innovators use agile principles in their product concept development. This behaviour, which has already been indicated in the preliminary interviews with start-up innovators, was also present in the cases of the research study.

From the 11 principles in the analysis template, seven were of high priority, two were of low priority, and two were seen as ambiguous by the start-up innovators. They do not adopt all principles, but the FFE phase can generally be characterized as agile (see Table 23). The start-up innovators were acting in an agile manner; they were using agile principles within the FFE phase.

This exploration contributes to academic knowledge as it clearly indicates that principles of agility shape the character of the FFE phase of web products. The start-up innovators intuitively followed this road; for them there is no clear distinction between the early and the later stage of NPD. Acting agile helped them to create a successful product concept. Agility is a new dimension for FFE research with the potential to change the FFE phase significantly.
Table 23: Summary of agile principle adoption by start-up innovators

<table>
<thead>
<tr>
<th>Agile principles</th>
<th>Priority</th>
<th>Description of start-up innovators behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to valuable software</td>
<td>High</td>
<td>The start-up innovators showed a strong focus on delivering valuable software. They focus on solving real-life use cases and want to help users to get things done. Making software simpler and intuitive is very important to them.</td>
</tr>
<tr>
<td>Cooperative customer collaboration</td>
<td>High</td>
<td>Customer collaboration goes beyond product and prototype testing. The start-up innovators published and discussed mock-ups and scribbles before the idea even was finalized. They usually are involved and have access to lead user and enthusiast communities helping them early on.</td>
</tr>
<tr>
<td>Co-location</td>
<td>Ambiguous</td>
<td>While ASD has been attributed to co-located teams, the start-up innovators have mixed opinions. Some are outspoken about the need to work closely together, others see the advantage of using global talent in a distributed approach.</td>
</tr>
<tr>
<td>Emphasis on individuals and self-organisation</td>
<td>High</td>
<td>As one might expect the product concept development depended on few strong individuals. The team naturally organized itself and collaborated on its own terms.</td>
</tr>
<tr>
<td>Facilitation of change</td>
<td>High</td>
<td>The start-up innovators not only prepared for change, they actively embraced change as a natural part of the web product concept development. They involve users early in the FFE and use feedback and data to develop ideas further.</td>
</tr>
<tr>
<td>Intense team interaction</td>
<td>High</td>
<td>Although the teams were usually heterogeneous and included employees, contractors, investors, advisors, and even previous customers, the teams interacted intensively. Instead of writing concepts they created mock-ups, prototypes and discussed intensively what is best for users.</td>
</tr>
<tr>
<td>Product learning and adaption</td>
<td>High</td>
<td>The start-up innovators were constantly learning about the product concept and adapted quickly. Much iteration already happens in the idea phase. For them the FFE is not about reducing uncertainty (deductive approach) but about discovering new ideas (inductive approach).</td>
</tr>
<tr>
<td>Process learning and adaption</td>
<td>Low</td>
<td>The start-up innovators showed nearly no awareness regarding process learning and adoption; rather, they hardly mentioned development processes. They are focused on product and running basic functions of their companies such as IT, finance and human resources.</td>
</tr>
<tr>
<td>Readiness of the used method</td>
<td>Low</td>
<td>The start-up innovators did not evaluate the readiness of their methods; they develop their concepts on the fly without reflecting on how to improve the method.</td>
</tr>
<tr>
<td>Sustainable development</td>
<td>Ambiguous</td>
<td>While some of the start-up innovators believed in a good work-and-life balance, other emphasized the need to make sacrifices and to work long hours to be successful.</td>
</tr>
<tr>
<td>Speed orientation</td>
<td>High</td>
<td>The start-up innovators believe in speed. They strongly encourage emphasize speed over completeness. They want to launch early and to improve the product later on.</td>
</tr>
</tbody>
</table>

Source: Present author

**Do successful innovators follow FFE process models?**

Second, the author wanted to explore whether successful start-up Innovators are following the steps described in FFE process models. This has been
indicated by FFE literature. Scholars suggested that a better-structured FFE process would lead to a more successful product.

In this issue of exploration the research shows that start-up innovators are not following the suggested process steps from FFE research. Start-up innovators emphasized different process steps compared with the FFE literature. Not only did used FFE activity template based on the NCD by Koen et al. (2001) not fit the conducted behaviour, the reported activities of start-up Innovators were hardly matched by any models.

When creating a web product, activities that were formerly part of the structured NPD process are now part of the early concept development. The start-up innovators were successful in creating discontinuous, radical innovations without following the described model. The process models talk about steps to take, but the start-up innovators went another route with a radical “prototype it and test it” approach. These steps are laid out in greater detail later in this thesis.

*Do new use scenarios drive web product innovation?*

Third, the author wanted to explore whether new use scenarios drive web product innovation rather than technological innovation. This has also been indicated by preliminary interviews.

The multiple case studies show that indeed successful web product concept development by start-up innovators is less about technological innovation and more about use scenarios based on lead user knowledge of the innovators and intensive customer collaboration early in the FFE process. None of the start-up innovators stated that his/her business was based on a technological invention. Some start-up innovators even went as far as characterizing technology as a cheap commodity in web product development. They all refer to specific use cases that they wanted to support. Usually they stated that they created the product for themselves.
5.2 Agile concept development (ACD) model

Based on his research, the author created the Agile Concept Development (ACD) model based on the New Concept Development (NCD) model by Koen et al. (2001). As already described in the literature review, Koen et al. (2001) created the model because the single ideation step assumed in the Stage-Gate model by Cooper (1993) was no longer sufficient. The model was created in a circular shape to emphasize its non-sequential character; the segments loop backwards and forward. In the NCD model, the final product concept is a result of opportunity identification and opportunity analysis, idea generation and enrichment, idea selection, and concept and technology development. Corporate culture drives the process. The author modified the ACD model to reflect the explored behaviours by start-up innovators more accurately.

Figure 34: The agile concept development (ACD) model
Influence of agile principles

The author added agile principles to the model. Agile principles appear as a layer around the centre of the model as they are adopted by the start-up innovators and are present in all phases. In this layer, the author does not distinguish between high relevance, low relevance, and ambiguous agile principles. The potential risks caused by the selective adoption of agile principles by start-up innovators are reflected in the following section.

Innovator as a driving force

Although the motivations of start-up innovators have not been at the centre of this research project, the case study gave a strong indication that the innovators’ characteristics and motivations are the driving force. Therefore, the author placed the start-up innovator at the centre of the model.

Prototyping phase

In the prototyping phase, functional versions of the real product are created. These versions often lack many of the features of the final product, but convey a sense of its usability. Typical activities and process steps in this phase are:

- The creation of the prototypes based on user interface sketches
- Occasionally creating graphic layouts, building wireframe models with specific software (e.g., Balsamiq.com)
- Direct programming the functional prototype with a minimal feature set
- Many releases of small prototype iterations

While the start-up innovators had different philosophies on how to build the prototype like “Photoshop first” or “direct HTML only,” generally they were building a working prototype. They focused on creating the live version in a stripped-down version as quickly as possible.
Alpha testing phase

In the alpha testing phase, the prototype is usually tested in "real-life." The start-up innovators want to get feedback early on. They often have privileged access to certain user groups.

Not only is it far easier to test the product using a "real" product, it is sometimes absolutely necessary. Web products with social components only reveal their appeal if a certain number of users actually use the software.

Typical process steps and activities in the alpha testing phase are:

- Making the alpha prototype version available to a closed user group
- Searching for early adopters and average users to test the product
- Analysis of use pattern and key performance indicators
- Gathering qualitative feedback from different users
- Constant iterations in the user interface and the change of behaviour
- Constant bug fixing
- Re-evaluation of the product concept based on results

The start-up innovators in the case study reported that real usage data and the feedback of users were most valuable in developing the product concept. However, they also reported the need to decide whom they should listen to and whom to ignore. Although the start-up innovators were data-driven, intuition still played a role in the testing process. This will be discussed in the risks section.

Condensed selection, analysis, identification and concept phases

In the ACD model the following phases are condensed. This reflects the reduced number of activities in this phase.

(1) Opportunity identification. The start-up innovators hardly conducted opportunity identification activities. Product ideas based on use cases were their main entry point into the FFE phase.

(2) Opportunity analysis. Due to the focus on ideas, opportunity screening
and analysis activities are marginalized. The start-up innovators were much more focused on their product ideas than on the size of the opportunity. Market research and environmental screening activities were not a priority. The possibility to generate real data from alpha testing and the doubts about the validity of research data drove this phase.

(3) Idea selection. Ideas were selected intuitively or based on feedback and data generated from alpha testing. Structured idea selection approaches as proposed in FFE process models were very rare.

(4) Concept and technology development. The start-up innovators did not write up a business plan or comprehensive product concept. They preferred visualizations and creating the real thing. Technology analysis was hardly conducted. Planning activities were not high on the agenda; usually.

Extended idea generation and enrichment

This phase is extended in the model. This shall represent the long time the start-up innovators spent in this phase. The extension is less about many activities conducted in this phase and more about the long time the idea is developed further based on prototyping, alpha testing, and constant customer collaboration. Start-up innovators usually conducted this phase in part-time and included casual discussion of ideas with advisors, investors, co-founders, and future customers in non-formal settings.

Constant customer and advisor collaboration

The ACD model also illustrates the constant customer collaboration of Internet innovators. While in the NCD model, Koen et al. (2001) saw the environment just as an external input factor; the start-up innovators sought customer collaboration in all phases of the ACD. Typical collaboration activities are:

- Publishing product ideas and scribbles and getting feedback
- Discussing ideas with advisors (investors, friends, and family)
• Alpha testing with early adopters and average users
• Live observations of user behaviour

In the model, this author added this part as an additional layer around the FFE activity phases.

**Alpha tested prototype**

Start-up innovators did not create written and clearly defined product concepts, as proposed by Koen et al. (2001). In ACD, start-up innovators deliver an early alpha-tested prototype, which is then usually developed further or used in a beta launch. In most cases, this is the only outcome of the FFE process and is seldom accompanied by additional concept papers. Alpha-tested prototypes help start-up innovators in two ways. First, they are able to launch earlier into the market. Several start-up innovators cited this as very important as they believed that the first mover had significant advantages over followers. Second, it is helpful to create prototypes and to gather first results on user behaviour to get a venture capital funding round. The majority of companies had received venture funding. These participants reported that it was much easier to get early-stage or venture funding with an alpha product. Many investors expect to see a running alpha product and want to see alpha testing analytics.

5.3 **Risks of agile concept development**

The author also identified potential risks of ACD conducted by start-up innovators. They skip certain FFE activities and follow only selected agile principles, which can result in blind spots.

The case study itself focused on successful start-up innovators who created an innovative web product. Therefore, the study cannot provide a comprehensive picture of all risks involved and how often the blind spots of start-up innovators lead to failure. What this research does show is the blind spots identified in the FFE behaviour and the potential risks.
5.3.1 Risk of commercial failure

Skipping or massively reducing phases and activities that Koen et al. (2001) described in his model bears the risk of blind spots. The start-up innovators are not conducting these activities and accept immanent risk of commercial failure.

Opportunity identification blind spot

The opportunity identification section is one of the two entry points into the FFE. Koen et al. (2001) described this phase as driven by the business strategy and the preceding idea selection, but also described the possibility of the detection of a new customer need or undetected problem by a single person. While Koen referred to several techniques that should be used to identify opportunities, such as scenario planning and trend analysis, the start-up innovators mainly detected needs based on their own background or interests. This strong focus on their personal needs has the potential to lead to an opportunity identification blind spot.

Another difference between the NCO and ACO model can be seen in the opportunity analysis. Koen et al. (2001) claimed that large amounts of resources were regularly used to analyse the size and the fit of the opportunity. Strategic framing, market segment assessment, competitor analysis, and customer assessments were described as elements of a typical analysis. Such an analysis is typically estimated as requiring 60-90 days. Start-up innovators in the case study had often already created a prototype in this time.

The start-up innovators who use the ACO model act differently from those in the NCO model. They do not use an analytical framework to size or evaluate the opportunity at hand. They trust their intuition and passion and believe that monetization will happen if they build a great product for an imminent use case. The activities around opportunity analysis, such as searching for competitors in the field, were reduced to the minimum. Since there is no systematic opportunity analysis, the start-up innovators accept an increased risk of targeting an unattractive or even non-existent market niche.
**Idea selection blind spot**

Looking at the idea selection, a similar pattern to the opportunity analysis occurs. While the NCD model of Koen et al. (2002) described a typical idea selection process with one page and multi-page papers to enable a decision, the start-up innovators tended to use intuition when choosing an idea. As the start-up innovators were mostly able to proceed with their idea without asking for sign-offs, they moved on without a proper decision and reflection process.

Many start-up innovators did not give up their main jobs or contract work when they started the project as a side business. This allowed them to explore their idea without having to make a final decision on the idea to select. While little time was used for idea selection, this still played an important role, as start-up innovators often had to select the right idea based on their results from the prototype and alpha-phase. As the start-up innovators were very receptive to feedback from advisors and customers, this risk seemed to be less immanent than the risks in the areas of opportunity identification and analysis, but an idea selection blind spot of start-up innovators still involves risks.

**Limited environmental screening**

The majority of start-up innovators reported that they did not conduct a proper assessment of the technology, competitive, and strategic perspectives. Failing to conduct this research presents several risks. They might develop a good product with an existing user need, but users might not be willing to pay for the product if a free alternative is available. New technologies and competitors might render the product obsolete in a very short time. Asked about these risks, the start-up innovators admitted to this but emphasized their limited resources. They accepted this risk to gain speed and they refer to a limited risk of launching the product due to a low cost structure. This is closely interconnected with the opportunity identification bias. According to Koen et al. (2001), however, environmental screening should go even further by assessing all major risks. Limited environmental screening is a blind spot that most start-up innovators willingly accepted in order to focus their resources on building a working alpha product.
5.3.2 Development challenges in later stages

Blind spots are not only caused by the low priority given to certain analytical FFE activities; the selective adoption of agile principles also causes blind spots. These blind spots have the potential to cause development challenges in later stages of the NPD process.

Limited process reflection

Reflection on processes was very low on the agenda of start-up innovators. Although an important part of the agile movement, processes were not a priority for start-up innovators. This blind spot might lead to additional costs and longer development times. Furthermore, the start-up innovators were making themselves more dependent on strong individuals. It was difficult for them to improve a process or make themselves more independent of a certain employee.

Lack of method awareness

As a direct consequence of the lack of process reflection, the start-up innovators were not aware of methods they implicitly or explicitly used. They adopted agile principles, but specific agile methods were not important to them. This lack of method awareness can be expected in the start-up environment, as many agile methods were developed for large organizations. Still, it is important to be aware of this blind spot as the start-up innovators on the one hand adopt agile principles but on the other hand do not work with methods developed to handle an agile development process.

A poorly defined concept

In the NCD model, Koen et al. (2001) presents a comprehensive product concept as the final gate for moving on to the NPD phase. They wrote extensively about the need for convincing concept documents with business and project plan, projections on the financial impact, and future value proposition. One can imagine the time a team needs to invest in writing this document.
Looking at the start-up innovators’ ACD approach, the concept was neither the final deliverable of the FFE phase nor was it high on their agendas. They argued that a working alpha product that anybody can use was far superior to an abstract written description of the product. Although this may be correct in many cases, the working alpha product is not a substitute for essential concept elements such as product, business, and rollout plan. A quite poorly defined concept was typical for start-up innovators, so the immanent blind spots involve a risk of later failure.

Risk of higher cost at later stages

These blind spots of start-up innovators in the early concept phase bear a high risk of higher costs at later stages. Some start-up innovators reported later problems with the scalability of their software. Integrating features without a proper concept led to these problems.

For the majority of participants, however, this potential risk was not high on the agenda. The start-up innovators were generally satisfied with their prototype version. One must bear in mind that the selected cases were largely successful innovators. Their products were successful. They presented at a major Internet conference. A different case selection strategy might show different results. Examining failed start-up innovators would better reveal these downsides.

5.4 Areas of further research

This section emphasizes future areas of research. The research findings indicate a need for further research on later stages of web product development, characteristics of start-up innovators, and ACD in other product categories.

5.4.1 Later stages of web product development

This research concluded that the FFE phase used by start-up innovators when developing innovative web products is significantly different from traditional models. As the relevance of web products grows, more revenue is generated in
the web, and more time is spent online, researching later stages of web product development seems to be valuable. The case studies provided hints that the adoption of agile principles and collaboration with customers significantly changed in later stages. Several start-up innovators also made statements on challenges they faced in later stages based on their agile concept development. Conducting research projects on these later stages will likely help achieve the goal of improving the innovation process of web software companies.

5.4.2 Characteristics of start-up innovators

The case study focused on FFE activities and the agile principles adopted by start-up innovators, but it also provided first insights into the mind-set of this group of innovators. Looking at the characteristics of start-up innovators seems a necessary way to understand this interesting group.

Maturity of start-up innovators

There were innovators of different ages in the sample, and in some cases this might have been an important factor. On the one hand, more mature start-up innovators claimed to be more relaxed and professional. On the other hand, first-time innovators might be more open and have less to lose while trying radical new ideas.

The theme of maturity is closely connected to that of experience. Some innovators had extensive entrepreneurial experience. The case studies gave some evidence that innovators who were also experienced entrepreneurs emphasized FFE activities that novice innovators did not. They analysed opportunities to a greater extent and tried to create a more complete picture. The experienced start-up innovators adhered to the ACD model. They did tend to be more reflective and open towards assessing the opportunities. This difference has also been described in entrepreneurship research. While entrepreneurs usually identify market opportunities based on previous experiences or existing knowledge (Shane and Ulrich, 2004), serial entrepreneurs learned that they need to generate a set of choices to be successful. Similar effects might be the case for start-up innovators.
Motivation of start-up innovators

Understanding the intrinsic motivation of start-up innovators is another interesting way to understand this important group. Intrinsic motivation can be compared to the engine in the NCD model by Koen et al. (2001). Koen et al. referred to the engine as a company culture and strategy driving the FFE process. In examining start-up innovators, this tends to be more about their personal traits. The start-up innovators drove the concept development. Understanding their motives will be an important aspect of creating a better picture of the early stage, the ACD model, and the start-up innovators.

Excitement, Dedication and commitment

In the case interviews, the start-up innovators made several statements about how their passion helped them to push things forward. The common message was that they had to be passionate to invest the effort and working hours needed to succeed. Even the start-up innovators who opposed working long and irregular hours were outspoken about their passion, enthusiasm, and resourcefulness. They described passion not only as the rocket fuel for working hard, but also as the source of inspiration for great product concepts and constant improvement. Understanding what drives innovators and how passion influences the product development process therefore seems to be a valuable road for future research.

Need for impact

Trying to understand the passion of innovators leads to the question of why start-up innovators are passionate. Several start-up innovators made statements about a strong need to impact the life of others. Start-up innovators did not simply want financial success; they wanted to change something substantial. Several start-up innovators referred to this as a reason to move from executing client work to a product business. They wanted to scale, take greater risks, and make bolder moves to achieve a greater goal. This need for an impact appears to be a “part of the DNA” of successful start-up innovators. Some innovators reported that they wanted to have impact early on in school.
One start-up innovator wanted to become an academic to change the world. After learning about the limited impact of most journal papers, he decided to become an start-up innovator. The case study only provides clues in this direction. To truly understand the motivation of start-up innovators it seems valuable to start a focused research project. This might also have a business impact, as understanding the motivation of successful start-up innovators might help lead others to make the right investment decisions.

**Skill set of start-up innovators**

Finally, an interesting characteristic of start-up innovators is the trade off between a generalist and specialist skill set. The start-up innovators referred to themselves as generalists. A closer look at this topic reveals that the case is not that clear. Several start-up innovators were very specialized in a certain area of expertise. They could be referred to as “technology nerds.” Researching whether generalists, specialists, or combined teams are a winning combination promises to be very valuable and interesting. Understanding this topic might identify individuals who are more likely to be part of a winning team.

**5.4.3 ACD in other product categories**

The third potential field of future research is researching ACD in other product categories. The ACD model has been identified in the specific field of browser-based web products. Future research shall identify whether the model is valid in product categories or whether it needs to be refined for new categories. This includes e-commerce and content websites, native web applications, and Internet games.

**E-Commerce and content websites**

Looking at other fields in the browser-based Internet, the categories of e-commerce and content websites are the most prominent. Several successful services in these areas were also created in the start-up environment. E-commerce start-ups such as Groupon.com or Zappos.com are among the poster children of successful web start-ups. They created e-commerce
innovations, which had not been thought about a few years or even months previously. What several mature e-commerce players thought of as an already commoditized area, turned out to be one of the most vibrant innovation areas in recent Internet history.

A similar development happened in the area of content-driven web offerings. In this field it was not the established brands but new start-ups that came up with innovation. New companies such as Engadget.com, the Huffington Post, and Techcrunch.com created opinion blogs with a significant readership. They created the new category of hyper-local news and left behind the traditional ways of providing content on only one website. Companies such as Demand Media created specific content directly targeted on search engines. By providing specific content on many different special interest content areas in a search-engine optimized form, they gained significant readership and revenue.

To understand the scope of the ACD model, it is necessary to understand whether the model is also applicable for the FFE phase of these types of web products. Specific research setups in these areas therefore seem valuable.

Native web applications

Another important field in the understanding of ACD is testing whether the model stays the standard course of concept development in the rapidly developing field on native web applications. An increasing amount of Internet usage happens via “apps” on mobile devices, tablets, gaming consoles, subnotebooks, and Internet-enabled TVs. These small native software programs are usually downloaded and installed on the devices. As these apps are device-specific and do not have the restrictions of a browser, the user experience is often better. When used while travelling, it can be an advantage that these applications often do not need a constant Internet connection.

App development combines elements of traditional packaged software and web applications. On the one hand, these applications must be device- and operating system-specific; on the other hand, the app infrastructure allows for many small releases. This infrastructure also changes the payment behaviour. Usually a payment is only one click away; this is likely to change the purchasing
behaviour of customers and the resulting business models.

As mobile Internet usage is predicted to overtake fixed-line Internet-usage and new devices are rapidly gaining market share, new generations of start-ups often focus their initial web products on mobile applications. Their products often include location-based elements, which make them more valuable on the road.

A follow-up research project shall determine whether the ACD model remains valid for the FFE phase developing these apps. Based on the higher complexity of developing apps, one might expect the FFE approach to shift towards a more traditional and less agile approach. The tremendous number of available applications in the Apple, Microsoft, and Google Android app stores speaks against this theory.

Internet Games

Games are very popular both in the browser-based and application-based Internet. According to Nielsen (2011), Internet users spend 9.8% of their online time in May 2011 playing online games. Games were thereby the No 2 category, falling significantly behind social networks & blogs with 22.5%, but clearly in front of e-mail with 7.6%.

In the last few years, gaming has developed from consoles to more casual and social gaming on the Internet and mobile devices. To arrive at a holistic picture of the FFE processes of start-up innovators and to understand the scope of ACD, it seems necessary to look at this area. As the author’s company is not involved in gaming, the author did not examine this field in this study.

The fictional characteristics of gaming might change the FFE phases and activities. Furthermore, developing games usually involves more time, budget, and manpower. Therefore, the ACD model might have to be modified for this area. Research on Internet gaming innovators seems exciting and promising.

5.5 Managerial implications and recommendations

The final section of the chapter presents the managerial implications of this
research. As this DBA thesis was intended to improve the product innovation process of web software companies, the author will provide recommendations that are especially interesting for mature web software companies. The author emphasizes three activities that are relevant for his and other mature Internet companies: encourage ACD, attract start-up innovators, and build support systems and portfolio management.

5.5.1 Encouraging ACD

The research results suggest that web software companies need to re-evaluate the product innovation process. The research underlines the recommendations by Koen (2005) that a company needs to allow new discovery outside of the existing strategic approach. The research indicates that start-up innovators push the boundaries even further as they completely revise their initial ideas based on new discoveries. If a company’s goal is to create innovative web products, this case study research suggests encouraging ACD in the FFE of web products.

Allowing agility

More flexible product development processes and a greater openness in the FFE seem necessary to encourage ACD. Start-up innovators should be allowed to conduct experiments in order to create attractive web product concepts. They take different routes to create their product concept, they apply agile principles to the FFE, and they follow a rapid prototyping and alpha testing approach. It therefore seems problematic to force them into classic Stage-Gate product development. They do not consider the generation of business plans, product specifications, and road maps to be useful, necessary steps before building a prototype. They start creating prototypes regardless of the size of the opportunity, test this prototype, and figure out the details of the product and business concept on the fly. In order to create these prototypes, they adopt a hacking mentality instead of a proper software development approach. Whatever works is valuable. Companies will need to react to this and allow innovators to experiment with prototypes without complicated sign-off
processes. They need to allow experimentation and agility.

*Deciding whether to use ACD*

An important company task is to have the capability to identify when to use which product development approach. This research focused on browser-based web products. These products serve a specific, unique need identified by the start-up innovator. It is not clear yet whether the identified agile ACD activities and processes are right for all web products. A company needs to be clear about its innovation pipeline and the different kinds of product ideas and concepts it has in this pipeline. If it wants to build browser-based web products for innovative new use cases, the ACD approach seems valuable; for other areas, more conventional new product development processes might be a better fit. Building up capabilities to identify and decide when to use ACD and when to use a more conservative approach to NCD are major managerial implications for mature companies.

*Understanding how to encourage ACD*

Finding the right approach to enable ACD is another managerial challenge. Companies need to find ways to allow ACD despite an established corporate culture.

*20% time approach*

Google conducted a well-known example of a more flexible new product innovation strategy. Several major product innovations were created in a so-called 20% time for developers. The 20% time is “a day off per week” granted to developers to allow them to build their own product ideas (Levy, 2011).

With the 20% time, Google encourages employees to work on something that interests them personally and might be beneficial for the company without the need for formal approval. While this approach eliminates the burden of approval and emulates the part-time development approach of many start-up innovators, it also has the potential downside that developers are not contributing enough resources and brainpower. After the part-time idea generation and enrichment
phase, the start-up innovators in the cases had to invest more time than just 20% to create a prototype. The 20% time approach does not answer the question of when to increase the efforts or even move to a full-time approach. The need for approval is deferred, but there still is a burden. In his Google book, *In the Plex*, Levy (2011) described how product managers were desperately trying to schedule appointments with one of the founders to get their new project approved. A 20% time approach appears to be a good solution, but is not certain. Some other companies have tried different approaches, such as dedicated R&D labs. This case study cannot offer a solution to this problem; it can only point to the need to encourage agile approaches in the FFE in order to build innovative web products. Companies need to figure out the right way for their company and market situation.

**Labs approach**

Balancing openness and corporate control becomes a major managerial challenge. While a start-up can easily launch a half-baked product, this might be more difficult for major brands. Published opinions on a specific product might influence the whole company and it might be difficult to close down an experiment without a huge public outcry. Discussing product ideas in an open idea generation and enrichment phase can also be more difficult as it might be seen as hinting at a change in company strategy. Journalists and analysts may also see a struggling experiment as a sign of operational or strategic problems within the company. This might prove to be problematic for publicly listed companies.

Some major companies, such as Google, tried to respond to this by creating "labs" where experimental applications or extensions are launched. These experiments were launched as lab applications to manage expectations of shareholders and stakeholders. Other companies, such as Microsoft, developed research labs with huge groups of company internal alpha testers. This approach might be a step in the right direction, but several start-up innovators reported that from thousands of alpha-testers, only a small amount were giving valuable feedback. The start-up innovators themselves identified these few, because they were especially interested in a certain topic. As the start-up
innovators in the sample were already members of enthusiast groups, it might prove difficult to attract the right enthusiasts. Once again, the case study can only indicate the managerial challenge facing big companies. Different solutions need to be tested continuously in order to find the right approach to enable ACD.

5.5.2 Attracting start-up innovators

This thesis indicates that agile concept development depends on the start-up innovators conducting the process. The examined start-up innovators had a specific lead user insight, were passionate about a topic, and were intrinsically driven to make a massive impact with their web product. As described before, companies need to create playgrounds for agile concept development activities, but it is not feasible to give average employees the possibility to do this. There is a need to attract start-up innovators for mature Internet companies.

Open agile development culture

According to this research, an important basis for companies to be attractive to start-up innovators is an open agile development culture. As start-up innovators tend to be strong supporters of agile development, an attractive development culture truly needs to encourage agile principles. An environment in which developers are required to program according to completely defined concepts and fixed plans is not attractive for the innovators. Developers need the possibility of launching their own ideas. Furthermore, an open culture needs to be encouraged. Developers must be allowed to become deeply involved with specific user or open source developer communities in order to find innovative use cases or applications. Such an open development approach not only takes time and involves giving up secrecy; it is also necessary to allow developers to contribute to the enthusiast communities in order to build a reputation.

Provide added value

Unfortunately, pursuing an open agile development culture is not necessarily enough to attract start-up innovators. Several start-up innovators in the sample
were very confident about their ability to launch a product without corporate support. Therefore, it is a major challenge for mature Internet companies to win over start-up innovators. Mature companies need to find strategies that provide added value to start-up innovators. One start-up innovator in the sample hinted at a possible way to deliver such added value. He used an incubator to launch his web product and venture, and described this as a great option. As these innovators are driven by their product idea, it seems like a logical, attractive offering to take care of non-product related issues. Giving the start-up innovators a potential for an upside through company shares shall further reduce potential disadvantages over starting their own company. A boom of incubators and several successful web products developed in incubator companies seem to underline this idea, even though the incubators that were hyped in past boom times often did not survive economic downturns. Whether with or without an incubator, providing an open agile development culture is a major managerial challenge for companies.

5.5.3 Providing support and active portfolio management

A third managerial implication is the need for support systems and portfolio management. The current research uncovered several blind spots of start-up innovators that imply possible risks of failure and high follow-up development challenges. Companies should therefore support their innovators and should implement professional portfolio management.

Support systems

Regardless of whether companies have in-house innovators, use an incubator approach, or just invest in start-ups for web products, helping start-up innovators and revealing blind spots seem promising and necessary. Central functions might be to conduct market research and environmental screening. Results might be used as additional input for the start-up innovators or as insights for central functions of an incubator. This intelligence should not be used to mimic a Stage-Gate approach; it mainly delivers support for the innovators.
Portfolio management

Looking at the agile approach that the start-up innovators apply to concept development, a good portfolio management strategy seems to be very important. As these innovators naturally take high risks and bet on very specific use cases, it seems necessary to have an overview of the different start-up innovators’ projects and the risk exposure of the company. Good portfolio management enables mature companies to be agile and to allow innovators to play without assuming too much risk for the parent company. Active portfolio management also may change the company’s acquisition strategy.
6. Reflective diary

This chapter contains the author's reflections on the DBA journey and its impact on his academic, professional, and personal development. As this is a personal diary, I will switch to first person in this chapter. I will explain how my actual areas of development significantly differed from what I had expected at the beginning of the journey.

6.1 Major challenges

Many of the problems that I had been warned about in the preparation course occurred in the course of more than four years of DBA thesis research.

Finding the right topic

Choosing a dissertation topic was probably my greatest challenge - especially as I tried to find a topic that suited both my professional and academic goals. Many of the topics I initially thought about were not relevant enough to one or the other. I found the right topic after attending a research presentation by Abbie Griffin at my first PDMA conference in Orlando, Florida. Her research on innovators in mature companies inspired me. I was thrilled to see common patterns and differences to what I experienced in Internet companies. This excitement pushed me through the research process and reminded me how important it is to follow my passion. Like the start-up innovators in my research, I found it much easier to invest time and energy in a topic about which I was passionate.

Balancing life and work

I was warned that balancing family life, work, and the dissertation could be a serious problem. Despite this early warning, I greatly underestimated the scale of this problem. The last four years showed me why the phase I am in right now is sometimes referred to as "rush hour of life." The only way to meet this challenge was with the help of my girlfriend, my family, close friends, my supervisors, and great advisors. At first I tried to achieve my goals just by
working longer hours, but I did not realize that my productivity was going down. My family, friends, and advisors reminded me to slow down, concentrate on the important things, and say no to tempting but non-essential challenges.

**Getting back on the bandwagon**

Another major challenge was falling off the bandwagon and then getting back on. In the past, working hard meant steady progress to me. With my DBA I realised major downtimes for the first time. After each milestone like literature review, fieldwork, and analysis, I had several weeks in which I would hardly work on the thesis at all. I felt exhausted and needed to take a break. There was always a reason to do something else, and I am very thankful for many supporters who helped me get back on the bandwagon.

**Focusing on the essential patterns**

Although my passion for my topic helped me to keep going and to overcome the downturns, it also distracted me and made it difficult for me to focus on the essential topics in my research. In each phase of the DBA thesis I made needless and time-consuming detours. In the literature review I spent several weeks reading about entrepreneurship and innovation without writing a single paragraph. During the fieldwork I was so excited about the content of the interviews that I conducted 21 of them. I did not select interviewees carefully enough and conducted interviews with individuals who were not creating relevant, innovative web products. Although I generated interesting and valuable data for future research, it took time and attention away from the core topic. In the analysis I also looked at areas that were not at the heart of the research question. The extensive amount of data led me to think about what else I could get out of the data instead of looking deeply into my thesis topic. My curiosity and excitement about the topic brought me close to becoming an ABD, or "All but dissertation," student. Only the advice of close friends, my girlfriend, my family, and supervisors helped me to regain focus and resume work on my thesis instead of reading about topics that were interesting but non-essential.
Getting on the bandwagon

I want to thank Spinder Dhaliwal and Bob O'Keefe for two decisive meetings in which I told them I needed to suspend my research project. While expressing an understanding for my situation, both encouraged me to reconsider my decision and keep going. Spinder and Bob kept me from making a wrong decision. Without these conversations I would not have finished this dissertation.

6.2 Academic development

The DBA thesis helped me tremendously in my academic development. My theses in the bachelor and MBA programs were very similar to consulting reports. This thesis, in contrast, was a piece of academic research.

Developing academic skills

I quickly realized that I had to develop my research skills in order to finish my dissertation. My introductory courses were very helpful, but based on my applied science and business school background I did not feel confident about conducting the DBA research project without additional knowledge gathering and training. I started developing my research skills by reading books on how to set up a research project, about quantitative and qualitative methods, and about fieldwork skills such as interviewing. I spent several days at the British Library reading extensively about research but realized that it was incompatible with my personal learning style. I learn much better in a seminar or by conducting a project. I participated in several research seminars in addition to those provided in the DBA program in order to improve my skills, my knowledge, and to establish a routine. This decision paid off. Not only did these seminars help me to learn much more quickly, they also encouraged me to push my research project to higher levels.

Academic conferences

I also needed to understand my research area before deciding on the topic. I
attended research conferences before and during the entire dissertation process. After attending my first conference, I realised that the value of these conferences was threefold. First, it was much easier to get an overview on research perspectives and relevant areas than it was by just reading journal papers. Second, the conference papers reflected current research that would not be published until one or two years later. It is important to attend these conferences to keep up with these early publications and to stay abreast of emerging topics. Submitting research papers to conferences had the additional benefit of peer reviews with advice on further research directions. Third, it is valuable to build up a network with fellow researchers in relevant disciplines. This network may support the research by challenging the results and pointing out other topics or areas of improvement.

Academic working style

A major insight has been realizing the difference between the professional and academic work styles. David Gilbert introduced this topic to us, but I did not comprehend the difference until I experienced it myself. In my career, I perform tasks, work on projects, make decisions, and engage in persuasion in meetings or group presentations. Fast, intuitive decision-making based on limited amounts of information, self-management, and multi-tasking are success factors.

This professional skill set is not necessarily sufficient for academic work. It is sometimes even counter-productive. Good academic work evolves from thinking. It is necessary to take the time for an extensive literature review; there is no shortcut. A researcher needs to take time off and just start exploring; this is not a straight route and true understanding can be achieved only by in-depth research and thought. I had to become aware of my energy level and state of mind. It is not always the right time for challenging academic work.

The professional-academic gap

Further developing my research skills also came with some disillusionment. Diving deeper into academic circles it became obvious that academics often are
far away from providing true value for businesses and overall society. Many researchers deliberately study a very small theoretical problem. They focus on good methodology and target a specific academic journal with the goal of improving their reputation and their academic career. True value for business and society is rare; researchers are often not connected enough outside their academic circles. It is possible to do research that makes a significant impact and still has academic rigor. I set the goal of bridging the gap among academia, business, and society.

6.3 Professional development

The DBA also had a significant impact on my professional development.

Positive career development

While writing the DBA thesis, I developed behaviours and capabilities that improved my professional development and career. I will give two examples.

Habits and skills as careers bases

The additional time pressure forced me to focus on the important tasks and decisions to be made on the job. I learned to decline projects that I perceived as not worth pursuing, either because they were not helping our organization to achieve its goals or because the project was set up to fail. In the past I often accepted these projects despite better knowledge and spent many hours on "busy work." Not only did this extend my workday, it also wasted company's resources.

The academic approach helped me to reflect critically on whether I asked the truly important questions and looked at problems from the right perspective. This helped me to make clearer decisions and to challenge the status quo with greater confidence. I stopped several initiatives in non-core areas and challenged the team to focus on the main objectives and key performance indicators. This helped my department and my company to go through the economic downturn in 2008 and to profit from the subsequent recovery.
**Diversity as a major factor of success**

Embracing diversity is another important habit I adopted from this DBA research. I used to work with very homogeneous teams and conducted a recruiting strategy, which focused on one type of employee. Continuing this strategy would have led to a streamlined, efficient, but less creative team. While such a selection strategy might be right for some businesses, it is important to hire creative people when developing web products. Early in my research project I learned to understand the value of input from people of different backgrounds, viewpoints, and experiences in order to develop a great product. I now embrace hiring people with diverse backgrounds and characteristics for my product departments. I also encourage collaboration between teams and departments even if it does not directly lead to quick solutions. Collaboration leads to better products, new ideas, and a more creative and entrepreneurial environment.

**6.4 Personal development**

In addition to the professional impact, the DBA process had significant impact on my personal development. While it complicated my personal life, it also helped me to grow.

*Getting things done*

The additional pressure of conducting my main job and the DBA thesis work forced me to make some lifestyle changes. I needed to become more productive. I educated myself about efficient behaviour and became both more focused and more relaxed. I made a complete inventory of my personal, business, and academic areas of responsibilities, projects, and commitments in order to decide what I allowed to come to my attention. This abstract approach enabled me to react better to the random input that is brought up by life.

*Value-based goal setting*

Having a complete inventory of my commitments enabled me to think about
which projects I wanted to and could conduct. It also enabled me to decide which commitments should be kept and which should be re-negotiated. This led to a deeper consideration of my values and priorities. What is important to me? What kind of people do I want to spend time with? Thinking about my life in this way was an important consequence of my struggles to move on with my DBA. I also realized that how I work, what I work on, and with whom I work are more important than financial benefits. If I am working on the right thing, work generates rather than drains energy. Based on this insight, I focused my work on the things I love: building and exploring. I took a new responsibility within my company to follow this passion. I did not regret this decision and I am sure that I will continue this road in the future.

Habit of diary writing

Another habit I adopted from this research turned out to be tremendously helpful: journaling. In case studies the researcher shall use a research diary to improve and to ensure quality in the research process. While I have not always been perfect in keeping a research diary, I became more accustomed to diary writing. I started writing a diary about my personal life and still do so.

New software applications developed by start-up innovators actually helped me develop this habit. These applications not only remind me regularly, but have made the process feel far more natural. It was encouraging for me to incorporate diary writing into my daily PC routine because I am not used to handwriting anymore. The diary software I use was not included in my research, but would fit into the case study.

This habit taught me about myself, to reflect on what I have felt, and it keeps me accountable for making progress in my academic, professional, and personal life.
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Appendix

Case Report 1

The British start-up innovator in case No 1 started the creation of his web application in January 2007. The innovator had an engineering and research background with over 10 years of corporate experience.

Working on R&D or a new product innovation, big huge companies. I mean I'd spent four years at the BBC running reasonably big projects with big, slow organizational processes. Over 10 years of experience, worked for the UK Press Association. I was the systems architect, so I was designing, working with developers to design the shape of the overall system. Like this chunk of functionality will talk to this chunk of functionality. And I wrote a bunch of the code that managed the content. Certainly early on I was very much just a peer technologist, whereas now I tend to describe myself, if I would label, as a creative technologist. The most important thing to me is products.

(Interview quote in case 1)

After his corporate career, the start-up innovator spent some years as a freelance developer.

Been a freelancer. 'Hire me, because I know how to prototype products quickly' or 'Hire me, because I understand the social use of music on the Internet, because of my experience with the BBC. I can write code, and I will get involved in your product in these ways,' or 'I will understand your needs on a product level not on a technology level, so we can work more quickly in that sense.' I spent four months living in the French Alps in the winter, and snowboarding, and just getting contracting work to pay my way. Just working remotely, and went to Amsterdam, and San Francisco, Montreal. (Interview quote in case 1)

He did not want to return to a full-time job until the idea to create a unique web product emerged over drinks in a pub. This web product had a very basic functionality, which can be described as social software. The application helps frequent travellers to find overlapping travel schedules.

The basic use case is that two friends or business contacts - one from London, one from Australia - might both be in Berlin at the same time. Normally they would miss each other as neither expects the other to be in Berlin. Entering their travel schedule into the web product or having an automatic calendar synchronization set up notifies friends if they happen to be in the same country, region, or city.

The co-founder of the start-up innovator identified this use case based on his
own experience; he travelled often and had missed seeing friends when their itineraries crossed. He tried to solve this problem using an email footer with his travel schedule, but this solution did not satisfy him. He realized that this problem could only be solved by a social software application.

After discussing the use case in a pub, the innovator and his co-founder decided to find a team and build the first prototype as a weekend project. All members of the team had worked on Internet product development before; the co-founders knew each other from previous jobs.

Every person I am working with has made many, many and many products before. (Interview quote in case 1)

All the co-creators had day jobs, so the project started as a side project. Therefore, the start-up innovator approached concept development as a weekend project. The start-up innovator booked a quiet weekend location outside of London and created the first prototype. The start-up innovator referred to this as a SCRUM weekend inspired by a popular agile software development method with fixed iteration intervals that the start-up innovator had used in previous jobs.

We actually, because we'd done big Scrum projects and that kind of thing, we said, ‘Can we do a Scrum weekend?’ ‘Can we do a one-hour planning, two-hour iteration, rather than like a one week or two week iteration?’ Then we have lunch, and over lunch we do the planning. Then we have a two-hour iteration in the afternoon. Then we kind of have a walk on the beach and do the planning. Then we have a two-hour iteration in the evening. Then we have dinner. And we did this. (Interview quote in case 1)

The team created its first prototype over that weekend. Directly after the weekend they opened up user accounts for alpha testing with friends and received very positive feedback. Based on this positive feedback they created a legal entity.

Maybe this could be a company rather than just a hobby company or whatever...Why don't we form a company to hold that property? (Interview quote in case 1)

The team moved forward on a part-time basis.

Other guys were still working full time. I was still doing lots of contracting work. We kept on working on it. I think we met up maybe two, three or four times over the next two months in cafes or just shared spaces, to talk about product and stuff. And then we would go away separately and do the Photoshop and coding work. (Interview quote in case 1)
After very positive initial feedback, the start-up innovator went full-time. This was originally funded by the co-founders, but quickly moved to a proper financing round for product development.

So you go 'Well, let's make the company, and take the product to a conference. If it does well, let's put a little bit of time into making the product better. If making the product better continues to be fruitful it isn't just a shallow product, so it doesn't have a lot of life in it. If that goes well, then we will find a way to finance putting more time into it.' (Interview quote in case 1)

From there the company developed quickly and by the time of the interview the company had grown to nine employees. Although the company is based in London, the product has been developed with individuals working in Canada, USA, Finland, Australia, and the UK.

The company and its web product were sold in a trade sale to a major mobile phone manufacturer in 2009.
Case Report 2

In case No 2, the start-up innovator started his business in 1999 as a web design company. The company had two other co-founders, both of whom left before 2003. The start-up innovator had to run the company alone and hired a contractor in 2004 who became a partner in 2006.

While doing contract work, the start-up innovator searched for a project management tool that would assist him in managing client projects. While testing several such tools, he realized that none could solve the project management problems of a small company. While the project management tools were focused on charts, graphs, statistics, and reports, the start-up innovator struggled with problems such as file sharing, handling a flood of emails, and keeping track of to-dos, feedback, and milestones.

The start-up innovator realized that email was not the answer, so he started to create workarounds using upcoming Internet technologies. He used a software tool originally created for blogging to post project status updates, share files, and collect feedback from corporate customers in a structured way. He also used this tool to create to-do and milestone lists.

In order to improve collaboration with his customers, he hired a contractor to develop a specific tool for this purpose. The start-up innovator knew this contractor from a previous product development project, so both were experienced in creating a product together. Although the product was initially an internal tool, the start-up innovator saw the potential for a product that could be sold early on after using it with a client. The initial thought, that this might be a suitable problem of business owners, led to discussions with an expert on project management who also saw the potential of the product within the project management and team collaboration market.

It really wasn't because of him that we turned it into a product. It was just further... Justification, I think, is the word. It was further justification that this might work. This might be a product... I showed it to him and he said, "This is the first one I've seen that makes sense to me, I get it," and so we said, "Let's turn this into a product and see what happens." (Interview quote in case 2)

Encouraged by this early positive feedback, the company started to produce the former internal tool. Despite this decision, the project still was seen as a side project.
We had no idea it was going to happen. The process of turning it into a product was basically fleshing it out some more so it was polished enough that other people could use it. When you make something for yourself there are a lot of assumptions that go into it because you understand it, you built it. But others might not get it because they didn't build it. They weren't there. (Interview quote in case 2)

Three people were now involved in the prototype creation: the start-up innovator, an employed interface designer, and the contract developer. The team focused on four functions of the prototype: posting messages, and sharing files, to-do lists, and milestones. They created easy-to-use software as an alternative to the complicated project management software that was the industry standard.

The team also focused on usability. The product concept development was led by the interface design as the basis for a rapid prototyping. Interfaces were sketched and directly transformed into working HTML front ends.

So that's why we always try to sketch first. Sketching gets rid of the abstractions and tries to get closer to the real thing as early as possible. It's also cheap and easy and fast. I can sketch 50 drawings in an hour of just different ideas but to actually make those things work it takes a lot more time. (Interview quote in case 2)

As the start-up innovator was an active blogger in the web development and design community, he started to blog about his project. He shared ideas about the software and gave insights into its development. He elicited feedback on certain parts of the product concept and as several thousand people were reading the blog, he not only received a large amount of feedback but also created an enthusiastic, potential customer base. He largely co-created the tool with his customers.

The start-up innovator published his first product as early as possible even though some major functionality was not yet included. The product was launched in both a paid and a free version from the beginning. A user could sign up for the web product and use it, but the billing functionality was not yet ready. The team used the remaining four weeks to the first billing period to correct this problem.

Approximately six weeks after launch, the start-up innovator realized the huge potential of the web product and stopped taking client work. The company then started replicating its success story by creating more products based on their
lead users' knowledge. The company founders stayed with the principle of always creating a product for themselves, which would then be made available to their clients. The start-up innovator attributed the success of his products to this principle. He did not use the first product he created before this venture; it was only created for an abstract group of potential users.

At the time of the interview, the company had five products focused on small businesses and self-employed professionals. The company had 12 employees and strictly followed the principle of staying small. Only one or two people worked on a project at a time. The company has a strong focus on generating continuous revenues instead of making a trade sale:

> About 30 different VC firms had pitched to us and I didn't want to work with a VC firm. I didn't need venture capital money. It wasn't about venture capital; we already had a sustainable business. It was more about having an entrepreneur with Jeff's level of wisdom and experience available to us. (Interview quote in case 2)

The start-up innovator stated that he wanted to build a business that lasts for at least 20 years and was not interested in a trade sale or IPO. He wanted to keep the company privately owned. When asked about his further ambitions, he stated that he wanted to help change the common approach to business:

> I'm kind of frustrated by how business has been portrayed in the past. It's funny. People look to like Jack Welch and Donald Trump as business role models. I think that's completely ridiculous. I don't get that. Donald Trump and Jack Welch and these big time CEOs have zero to do with you as a small business owner. I feel like most of the business advice that I've heard out there is really built for huge, massive businesses and I don't think that applies to small business. (Interview quote in case 2)
Case Report 3

The start-up innovator interviewed for case study No 3 created a web-based alternative to desktop software for photo manipulation together with a co-founder. He was inspired to create the product by his co-founder who had run a non-profit community of hobbyist artists since 2002. They initially started a company for the creation of art t-shirts that would enable artists to earn income by selling art-themed t-shirts. The web product for photo manipulation started as a side project to the community and to make it easier to create new art that could be published and printed. The t-shirt printing start-up fell apart in 2006, one week before the planned launch because the t-shirt-printing manufacturer went out of business. As no alternative could be found on such short notice, the start-up innovators concentrated on the development of the web-based photo manipulation software. He went full-time in early 2007, encouraged by the artist community’s positive response to the software.

The decision for the engagement was triggered by community demand and first proof of concepts from the development side. Within the non-profit community with over a half million registered users, questions on software selection, tutorials on how to use software, and requests for illegal copies of the expensive Adobe Photoshop software package were common topics. The start-up innovators determined that there would be a need for an affordable, easy-to-use tool for photo manipulation. Furthermore, the start-up innovators identified a need for web-based collaboration among artists as compatibility problems between software versions and difficulties transferring large files were also common.

The start-up innovator realized that web-based photo-manipulation software could meet this need very well. The start-up innovator initiated the development of the product concept by conducting surveys within the community and interacting with potential lead users. He determined that only about 10% of all possible software functionality was used to create most of the art pieces, but that other web applications for photo manipulation were missing some crucial functionality such as layering and collaboration. Competing desktop software programs focused on the casual user, not on the semi-professional, hobbyist artist. There was a need for a new software category of web-based photo
manipulation software with social networking features.

So we wanted to change that process. So the way people are saving. If it happens directly in the browser so that other people can open it and remix it and provide their own variations on concept. So people were sort of intrigued by that as well and excited. Now, you can see where people are commenting and creating new versions. So, thinking about it more deeply than just replacing Photoshop or replacing Illustrator. We're not trying to replace. We're trying to facilitate a new way of people creating. (Interview quote in case 3)

Although the start-up innovator in this case used market research techniques like surveys to identify needs and preferences, he did not use proper techniques to size the market for such software.

It was a new venture and I didn't do market research, to be honest with you. (Interview quote in case 3)

While in other cases the start-up innovators referred to technology as minor challenges, the start-up innovator in this case described it as a major challenge. Several developers that the start-up innovator contacted believed the creation of such software was impossible with the web-infrastructure at that time. The development of the web product, headed by a third co-founder who had already been involved in the art community project and the t-shirt start-up, was therefore conducted in the longest initial development time of all cases. It took the team nearly two years to create an alpha-tested prototype before they launched the product in 2008. The development was perceived to be more difficult than other projects, so an international team of experts in image manipulation in Adobe Flash was recruited on a contract basis. Assigning small projects for the software first tested their skills.

What we did was, we had to find who's going to build the software. At the time, we were doing blog searches of people that were doing image manipulation in Flash. There were only a handful of people that were doing it, at the time. We asked them to work on a small project together. One was in Italy. Someone was in Germany. A guy was in New York. Instead of hiring them directly - because they were working at their own jobs. They were working at their own jobs doing different things. (Interview quote in case 3)

Although the start-up was one of the few companies that used a structured survey to identify needs, it still tested alpha versions of the software with lead users.
We had like a select 100 people that were helping us test stuff. But then, we invited more people who were signed up. And slowly, we would send out invitations to people to test out the software as well. If we let thousands of people open it right away, we wouldn’t be able to interpret and get that feedback from the users, as well as making sure that everything would scale properly. We’re saving these files directly. Other people are opening it. And we said, no. We’re still early. Like, we’re not ready to release this to the public. And we still want feedback. So, if you’re going to join us, you sort of allow us to ask you questions. And we appreciate you sort of providing us as much feedback as possible. So, that’s how it started. (Interview quote in case 3)

This closed phase took the company half a year, but turned out to be very valuable for the product. Despite the structured effort to collect input, the start-up innovator realized that only real-time behaviour tracking within prototypes revealed the users’ needs and common behaviours. As mentioned in other case studies, the start-up innovator in this case also highlighted the importance of data. In addition, he insisted that personal privileged insights into the needs of lead users were the key to create an appealing web product.

So, I think it’s the experience that comes from running…. I think that knowing that, being in touch with the artist, and the creator, and the hobbyist, you know, and knowing what they want rather than thinking - like I said early, then sitting around the room, Oh, I can create this. Or, we can do this feature, and then, releasing it. And no one wants it. (Interview quote in case 3)

At the time of the interview, the company had a virtual organization developing the software with developers located remotely all over the world. They were collaborating via chats, Skype, and wikis. The company already started to extend its mission to make tools for the creation of art more accessible by entering adjunct fields of photo manipulation like vector-based graphics. The company operates on a Freemium model, offering a free advertising-based basic version of their software with advertisements and a paid feature-rich version without ads. They have a main office in New York. No information on employees was available.
Case Report 4

The start-up innovator in Case Study No 4 ran an online form builder and data collection tool. It helps people to create contact forms, online surveys, registration, and order forms.

It's a simple database app that helps secretaries avoid the IT department and the IT department to avoid secretaries. (Interview quote in case 4)

Three friends created the product. These friends had worked together before and created their own online product after a visit to an online conference in Austin in 2005. The co-founders first planned to build an audience by running a web development blog as a side project to their day jobs. The blog focused on business code and design aspects of running an Internet software company. Although the co-founders did not have much previous experience, the blog gained 30,000 readers. The start-up innovator attributed the early success of the blog to his journalistic experience and to the passion of the blogging founders.

Because we were really behind, we were like, 'We don't know all the things we needed to run a business, program software or design that software, but we are really smart.' (Interview quote in case 4)

Inspired by the early success of a single blog post, the co-founders decided that two founders would work the business full-time while the other split his pay check with them. The co-founders started an online software business by bootstrapping - a common expression for founders who grow their start-up with little seed money and usually make money from side businesses. The co-founders started to publish a paid PDF magazine to generate income while developing their software.

Basically, we were going to try to bootstrap this thing before we took funding. We were going to earn everything ourselves. ... So that was the whole endeavour. And the magazine would be good enough that it would make money. But, what we didn't calculate was how much it needed to make. (Interview quote in case 4)

While blogging and publishing the magazine, the co-founders tried to launch an online gaming site as their first product. Both attempts failed; the PDF magazine did not draw enough subscribers and the gaming website failed due to limited success of the game. The start-up innovator also attributed the failure of the online gaming site to a lack of personal excitement and involvement.
I don't really play video games, but I said I'd try out Ever Quest 2 and just write an article like in terms the experience from a new person, a review from that. And that thing totally bombed. I mean, they got some traffic and stuff, but they couldn't keep up with it, because it also turned out that Dave didn't really like the game that much, so they were like, 'Can't keep doing something we don't even really like that much.' (Interview quote in case 4)

After the first failed attempt, the founders sought another approach. They decided to go for online content management, and approached an incubator who provided initial financing and expert advice in the very early phase of prototype development. In discussions with the investors, the start-up innovator developed his concept into the more marketable category of a form builder.

After the incubator had accepted them, the development of the prototype took the start-up innovator and his co-founders about four months. With this prototype the co-founders raised enough money to go full-time and close their side business. In the summer of 2006, the team launched the product. The fast-paced product development was made possible by rapid concept and prototype development and the involvement of the community of the founders. As examined by other cases, the start-up innovator did not even make final screens but created only rough interface sketches that were directly converted to prototypes.

And then in Photoshop I might very quickly... I don't even finish it. Basically I start with basic shapes and I play around with some colours just to see if 'Does it feels right,' and then I immediately will abandon Photoshop and I go, 'Okay, how do I recreate that?' I'd be getting HTML and CSS. (Interview quote in case 4)

The start-up innovator used the entire community of over 7,000 people early on to get feedback. The feedback and the background of the founders led to a unique product concept compared to form builder solutions from companies like Microsoft and Adobe.

'None of this is easy to use.' I was like, 'I can't use any of these, because these won't do it the way that I feel like it's the easiest possible.' So, I had to start from scratch. (Interview quote in case 4)

The start-up innovator focused on some core concepts for his product. First, the product was designed to be as simple as possible. Therefore, the start-up innovator decided to dramatically reduce the options for the users.
And by limiting those choices, people build a lot faster. They focus on getting to where they want to be, sort of kicking ass as opposed to sort of taking the time to figure out 'what's all my configurations, what are all the decisions I need to make?' (Interview quote in case 4)

Second, the start-up innovator decided to enable form creation in a WYSIWIG (What you see is what you get) approach. In contrast to traditional form builders, the creator of a form directly saw the form with which the user will be confronted.

What I really want to be able to do is when I add something, I see it happen immediately. And then the thing that gets added is like, I am pretty sure, 90% of it - or like 99% of it - is exactly what I want. (Interview quote in case 4)

Third, the start-up innovator focused on creating a beautiful product that would appeal to non-technical users.

We don't use jargon, we always explain everything, we don't assume that you have any knowledge ahead of time for any of the terms that we talk about and so it's extremely friendly in that aspect... (Interview quote in case 4)

At the time of the case study interview, six people were employed at the company: three founders, two developers, and an accountant. The company was still a virtual company with everybody working from his or her home office.

Everybody works from their own homes. We don't have a central office. We find this to be much more ideal. It ends up being a huge benefit and a feature for a lot of developers to prefer - like, they work from home. You don't have to deal with traffic or anything like that. Also, we found it to be way more productive because everyone's out of their way. (Interview quote in case 4)

In 2011, the company was sold to a leading online survey company.
Case Report 5

The start-up innovator in Case Study No 5 was a well-known, successful entrepreneur and investor in Silicon Valley. The examined web product was his third major venture after one successful and one failed attempt. The web application is a networking service in which a professional can establish his or her identity, set up trusted connections with professional contacts, and search for possible business partners, employers, and employees.

At the time of the interview, the start-up innovator ran the company as CEO. He started building the web application and the company in November 2002, directly after a very successful trade sale of his previous Internet company. As a very well known entrepreneur he had several options to join, build up, and finance new Internet ventures. He preferred to invest in entertainment and dating sites, joining their boards, but operationally focused on running a professional networking service.

The idea for this service was based on the start-up innovator's first online venture: a social networking product where people could share flats, carpool, find golf partners, and also find business partners. This early social networking product failed, but the start-up innovator never gave up thinking about the value of social networks.

Early on the start-up innovator saw an opportunity to use social networking in the professional arena. He experienced the high value of professional networks in his own career and realized his business development and financing deals were based on his own network.

... people also need to pay attention to their circles of whom they know for professional purposes, because the old adage is it's not what you know it's whom you know. That provides a lot of career opportunity and ability and everything else. (Interview quote in case 5)

Based on his personal experience and his previous approach to creating a social network for business professionals, the innovator had unique insights that an individual's existing network is the key for matching that person to the right people. An open professional network does not work for business professionals, as too many job seekers or worthless business contacts approach them.
And so I realized that actually a network was essential for having essentially a spectrum of people at different levels of seniority and wealth and success and everything else. Because, you do actually want to transact with each other. It's not just like the VCs want to talk to... They want to talk to the right entrepreneurs, not that they don't want to talk to entrepreneurs, but they want to talk to the right ones. (Interview quote in case 5)

He compared his approach to dating sites. On dating sites, privacy controls such as hiding the picture, age, and other information protect mainly female community members from being approached by annoying date seekers. In this professional social network, influential investors are protected by the need for a reference from the existing network. Only people who already know somebody in their network can contact the community members. The start-up innovator created the product and the company with four co-founders. The co-founders were recruited based on previous collaboration; he described them as a tremendously strong team.

Part of what I learned ... was that you want to assemble the strongest team that you can when going out of the gate. That helps you formulate the ideas, it helps you hit the direction right, helps you recruit other people, helps you execute. (Interview quote in case 5)

He attracted such a strong team on the basis of his reputation in Silicon Valley. His successful trade sale made it attractive to work for the start-up innovator.

So, the ... story is not the classic first-time entrepreneur has no exposure to any of this kind of story, it's the, 'I've done this twice before, I've been successful enough to have some money, and certainly to have some reputation. And I have a bunch of people I know.' (Interview quote in case 5)

Two of the co-founders were involved in the first social network. The start-up innovator described his selection process as purposeful and focused on finding the best people. One of the co-founders has been competing with the start-up innovators in a previous attempt. The start-up innovators referred to all the co-founders as personal friends.

Pulling together people early in a company is a little like financing. The closest analogy is like marriage. So, you actually don't want to bamboozle people in. You want them to choose, I want to be in this. For example, if you marry someone under false pretences, they think you are a, b, and c. You say, 'I'm a, b, and c. I'm wealthy, and I travel all the time, we're going to travel together. And then they discover that you live in a trailer somewhere. Obviously, they hopefully discover that before they marry you. But, it's a serious problem. (Interview quote in case 5)

The start-up innovator built up his new venture only two months after the first talks. This was possible as the start-up innovator invested his own money and
had a team of experienced people. Approximately one month after the initial discussions, the team started mocking up and discussing the interface.

All of us had done at least one if not two start-ups before. So, at that point, it's a very different because there's not an audit what the hell do I need to do. We'd all go, 'This needs to be done, this needs to be done, this needs to be done. Yes... That one first. Okay you on this one, you on this one, and you on this one... Okay go.' (Interview quote in case 5)

In contrast to the first-time entrepreneurs, the start-up innovator hired five additional employees at the start. These employees were people the founding team had worked with in previous start-ups. The team moved into an office and started work immediately.

We just moved in with our laptops, cell phones. We were doing business on the cell phone and the laptops. (Interview quote in case 5)

The modus operandi in the FFE was similar to that of other start-up companies. The team began with the creation of the prototype, constantly iterating and improving the concept. They focused on getting the smallest possible product online as soon as possible.

Once again the business plan was not the top priority of the innovators, but as this start-up was created in 2002, the costs of development were much higher than they would be three to five years later. They raised money early on.

We decided, 'Look, we are going to get financing; we are going to go.' So, we actually hired 13 people, and we are going. But, even with all of that it was $500,000 to launch the whole site and getting it up and running, developing it, and iterating and past that. We were playing for being at scale sooner, because we were absolutely confident about our ability to raise money. (Interview quote in case 5)

The product launched in early May of 2003, approximately half a year after the initial idea. At launch the company already had 13 employees, including employees the founders had not worked with before. At the time of the interview with the innovator the web product was already the leading social network for business professionals worldwide. The company had over 100 employees and was growing by double digits every month. In 2011, the company went public.
Case Report 6

The start-up innovator from Case No 6 was running a web design and development consultancy. He worked from his apartment and helped small business launch websites. The invention of the founder had been created due to a personal problem. In early 2003 the innovator realized that writing invoices using Word was neither productive nor safe.

Anyway, so January 2003, I was using Word to invoice my customers and I opened up an old invoice for a customer because that's what you do. So you have all the address, information and their past services. I put in the new information like, what they bought this time, the new total and I clicked save. What I forgot to do is to rename the file. So I saved over the original document, I lost it. And in doing that I said, 'This is crazy.' (Interview quote in case 6)

The innovator tried to find a better solution but only found bookkeeping software such as Quicken, which he considered to be too complicated. Based on his expertise, he created his own web-based invoicing tool. He worked approximately four hours a day on the product for three weeks. With this effort, he was able to bill his own clients within the month. After the initial creation the start-up innovator developed the product to create additional value for his clients. At this point the start-up innovator was not yet thinking about offering the web-based software application to third-party customers. Asked about his motives at this point, the start-up innovator referred to his personal characteristics.

I guess I'm sort of like, when I get something in my head I'm a bit of a straight-line thinker, so I was frustrated. I knew where I needed to get to, and I just did it. I did not think about or analyse or strategize anything. I just said, 'This is it. I'm not using Word anymore. I'm going to build something like this,' and I just built it. (Interview quote in case 6)

The idea to create a product started to evolve after the start-up innovator demonstrated the product to a contractor who later become his co-inventor and co-founder. The start-up innovator had been working with him on previous projects and also considered him a personal friend. They had travelled together in the past. The contractor immediately saw potential for the product and asked the start-up innovator for permission to develop it further.

Well, he took an interest. I sent him a link. He asked if he could play with it. I said sure. Then, I guess, I probably sent him all the files. And he just started rebuilding it. So he knew kind of how it worked and he rebuilt all the back-end to it. (Interview quote in case 6)
From then on, the two start-up innovators worked together on the product as a side project and rebuilt it through a more professional development approach. They were still not sure about the goal of their side project, but eventually saw the potential to sell it as a web-based software application for small businesses.

We looked at the customers I was serving. I had some customers in travel and just some small business customers, and we realized, ‘Hey, some of them could really use something like this as well.’ (Interview quote in case 6)

The awareness about the opportunity at hand rose over the next six to 10 weeks. The start-up innovators started to believe that there was an underserved potential market and were encouraged to push the project further based on two inspirations.

First, a business executive in an accounting firm took interest in investing as a business angel. This investment did not happen as the business angel decided to invest in something else, but the due diligence process and the attractiveness to a reputable businessperson encouraged the start-up innovator to think of the project as a business.

He kind of understood all the questions to ask and the value of it. Because he came from a big Fortune 1000 accounting solution kind of thing. But he understood that this is about saving time and helping people manage their books and get organized and all this stuff. So he asked those questions and he kind of believed in it. And he seemed to like us well enough. (Interview quote in case 6)

Second, the book, Unleashing the Idea Virus, by Seth Godin, which he read in October 2003, inspired the start-up innovator. The idea of a viral distribution inspired him. The innovator had realized interest in the tool after sending his first invoices and started to think about viral potential of the idea.

I think that was a huge source of inspiration for a long period of time: that book, and understanding that things can get big through word of mouth and through getting passed around. ... I can think of all the passion I had when I was reading that book. I couldn't stop thinking about it. I couldn't sleep I was so excited but I also didn’t know what it looked like. I can't even remember the pictures in my mind at that time. I just remember the excitement, and the excitement turned into how to improve the product. (Interview quote in case 6)

Similar to several other cases in this case study research, the prototype and alpha testing efforts were of higher priority and came before incorporating the company and writing the business plan for the product. The founders decided to create a legal entity and a rough business plan just one month before launch in early 2004. At this point he had already worked on the product for three years.
and had not considered major product decisions in great detail.

We just did it. We just did it. There was not much thinking about how to strategize or position or anything. We launched it. We had our pricing all wrong and we had to fix that. There are just so many steps along the way.
(Interview quote in case 6)

This case was characterized by a comparably long development phase. Overall, the time before the product launch took three years. On the one hand this might be attributed to the fact that this founder started his web application in the first years of the 2000s. Web application development in the early 2000s was generally less developed and the innovators did not have the easy-to-use development frameworks that became available after 2005. On the other hand, this long development process is also an effect of the start-up innovator's behaviour in the early phase. He did not follow the launch-early paradigm of other start-up innovators. Instead, he improved the product without going to market.

The more hesitant approach of this innovator can also be seen after the launch; it took the innovator another two years to decide to go full-time on the product. He kept his consulting business and used it to hire his first part-time employee - a computer scientist whom he refers to as the honorary third founder. The start-up innovator in this case is an example for a bootstrap approach in the early phase of the company. Instead of raising money for a potentially valuable business, he relied on his consulting business to finance the early phase.

Yes, and I didn't pay myself very much. I pay the other people who worked with me a lot more. If I did it over, I'd probably do it the same way. But they said that's a bad idea, you've got to pay yourself. I really did not pay myself for three years. It's almost three years if you really think about it because it was two years afterwards that I actually made the transition full time. God, it's crazy, it's kind of sad. (Interview quote in case 6)

In 2011, the company is still owned by the start-up innovators and is entering international markets.
Case Report 7

The start-up innovator in case No 7 initially worked in corporate development at IBM in New York. On a business trip he came up with the idea for a consumer back-up service. He teamed up with two engineering students from Stanford that he knew. The two female engineering students were intrigued by the start-up culture at Stanford and immediately started working on the idea with the start-up innovator.

Parallel to his decision to try to create a backup service for consumers, the start-up innovator quit his job at IBM to attend business school at Stanford. The team worked for eight months on the development of the concept and the prototype, but finally abandoned the project.

At the end of eight months we had a prototype but we never released it. We were like it's okay but not great. We are going to kill it and move on to another idea. It was painful to kill something you've worked on for eight months. We were like it's just not hitting it. (Interview quote in case 7)

The decision resulted from the unsatisfying product and doubts about the short-term feasibility of the business. The start-up innovators were neither passionate about the product they had created, nor did they believe that the product could be profitable in the short-term. They were also discouraged by the need for large venture funding.

I think particularly ... weren't sufficiently passionate about it. That's probably one problem. Just the idea in general. A second problem was at the time, storage was pretty expensive and so you couldn't really do that idea without VC and ideally we wanted to launch something that we didn't need VC to launch. (Interview quote in case 7)

The team moved to another product: a file-sharing service. The idea of using users' computers for storage in a peer-to-peer approach sounded attractive and feasible without huge VC funding. As other file-sharing services faced significant legal challenges directly after the team started working on the prototype, they assessed the situation and abandoned the project given the high legal risks.

But then at that time also a ton of regulations started popping up around file sharing stuff and even though ours was not designed to be something that would let you pirate a bunch of stuff, we were like okay but they're still going to try to come after it because it's file sharing period. (Interview quote in case 7)

Finally, the team came up with a third product idea: a web-based messenger
system. This idea merged elements of the previous product that had an instant messenger component already integrated and the need for identification of the co-founders based on their own use of instant messenger services.

And we realized that when we were in each others' apartments, that it was very, very hard to get on instant messaging to chat with our friends, because there was no good web interface, and you had to have the damn software at home, installed on a machine to get on IM on your account. ... It was, like, a problem we had. And so we started working on that. We got really passionate about it. We were, like, this is a good idea.... It was a personal problem that we had on a daily basis basically. And then, you know, we had this notion that instant messaging could really - you know, there was no fundamental innovation in instant messaging for a long time. It had become pretty stale. (Interview quote in case 7)

The team immediately started developing the new product. The usually met on Wednesdays and Sundays, and in between they coded the software or worked on the product concept. The team followed the rapid prototyping approach described in other case studies. The start-up innovator attributed the success of the team in developing a compelling web-based messenger product to hard work and the fact that all team members were product-oriented.

Furthermore, the start-up innovator stated that the team was strongly consensus-oriented in terms of all product decisions. The team had an agile approach to concept and product development, especially in the FFE phase. In the interview, the start-up innovator compared the approach to a school project. This relaxed attitude towards the project management process was present in the interview. The start-up innovator referred to work as entertaining and fun. He focused on creating a fun company culture, which would differentiate the company from others and attract skilled employees.

But it is a lot of fun at the end of the day. If you step back and look at what you get to do, it's awesome. And it is like a big fun project. Even when you are not doing your job anymore, because you are working on this, it's still a fun project, as opposed to work. (Interview quote in case 7)

Not only the product development approach but also the approach towards business development followed classic patterns. While the team did market research on the first two ideas and finally abandoned both, they embarked on their third project with a more discovery-driven approach. The team did not do proper market research; they did not even conduct basic competitor research. Nor did they try to size the market, believing that there were too many variables to measure.
It's again one of those things where it's a new thing that the market hasn't totally conceptualized on. You can't really size the market...And so, it's - yeah - it's hard to think about monetization early on, you don't know, right? You don't know what the usage pattern will be, which dictates a lot of how you do monetization. Do people spend long time or short time on it? Do they send a lot of messages or few messages? Do they use one screen or many screens? You just don't know. (Interview quote in case 7)

The team therefore started completely product-oriented, focusing on winning users and creating usage. They believed that monetization of this usage would automatically follow. The innovators did not focus on modelling a business plan; they just launched the prototype to understand the usage patterns.

The company had 45 employees. A senior vice president of an established company joined the company as COO and had equal decision rights as the three founders. Based on a significant venture funding that the team took despite their earlier concerns about VCs, the company is still very product- and user growth-focused.

Asked about recommendations for fellow innovators, the start-up innovator cited working with a strong team as most important. Maintaining the key people as employees of the company is a key task for the start-up innovator. The topic of maintaining good people was especially present with Silicon Valley start-ups.

Making sure we keep the team really happy, really high quality people and growing people as fast as we can. Those are definitely the top two. We're always worrying about the team. We want to be huge. We're big, but we want to be massive. So there's some more work to do. (Interview quote in case 7)
Case Report 8

The start-up innovator in case No 8 had a strong development background. He was the typical developer-turned-start-up innovator. Before starting his own company he worked for an Internet company creating virtual 3D worlds similar to Second Life. He worked long hours, but characterized the time with this company as a very good time with a great team. Even so, in 2003 he decided he did not want to work for someone else.

At that point, I realized that, to continue my personal development, I probably needed to do something outside of engineering. Because I had been spending so much time, such a large percentage of my life, focused on doing engineering that I wanted to expand out of that. (Interview quote in case 8)

Being familiar with iterating business models from his experience and from books, the start-up innovator decided to experiment with different products and models.

What I found really inspiring was reading some of the business histories of companies that made it big time that became very successful. One thing that jumped out at me was how commonly, and consistently, the early days were really gnarly. They would go and think of ideas, and ideas wouldn't turn out so well. They'd try some other ideas, and those ideas wouldn't turn out so well. They'd try another idea, and that idea would seem like it would turn out well, and then something would go catastrophically wrong. All these kinds of stories littered the early days of most companies that become big and successful and great. Nintendo started out as a playing card company. (Interview quote in case 8)

The founder's first idea was the creation of a web-based project management tool. He envisioned project managers as the main target group, but felt overwhelmed by its many different requirements. He started creating a prototype but then gave up.

I was initially thinking that I was going to make a web-based project management tool. So I went off and talked with a bunch of project managers about what their needs were. I started prototyping an interface. About two months in, after a lot of conversations with project managers, I ended up concluding there was no way to really do it effectively. (Interview quote in case 8)

A second idea evolved using instant messaging for business conversations. He created a special interest instant messaging product, which creates a kind of meeting protocol out of instant messenger conversations. The product was marketed as a virtual secretary that keeps track of conversations. It was a technologically sophisticated solution, one that was capable of working with all common instant messengers, but the use case was highly theoretical and not
sufficient to gain market success.

The start-up innovator worked on this project on his own and spent 1.5 years on it before abandoning the idea. The product neither was successful commercially nor in terms of user adoption. After a year the start-up innovator began to realize that the idea was not working. He decided to try some other side projects. He launched some ideas for unique applications and did freelance work for other companies. Using this trial-and-error approach, he finally came up with the successful idea of an easy-to-use wiki. A wiki is a website similar to Wikipedia that is either used by a closed user group in an organization to collaborate or in publicly useable spaces.

At his previous company, the start-up innovator was a strong advocate of the upcoming open source collaboration solution. He started using the software for his own software coding documentation and got his colleagues excited about collaborating with him and with each other. He finally had everyone in the company using this tool.

While trying to establish his instant messaging product in the market, the start-up innovator supported Non Government Organizations (NGOs) in his spare time by creating wikis for a better collaboration. At this time, wikis still were quite difficult-to-install open source projects. In order to make the task of supporting NGOs easier, in May 2005 the start-up innovator decided to create a tool that automatically performed the necessary setup.

The start-up innovator made the tool publicly available and planned to sign up a dozen NGOs. Forty-eight hours after making the tool available, more than 1,000 organizations signed up for the service. Not only NGOs, but also all kinds of services were interested. After the overwhelming success of the side project, the start-up innovator directed his efforts towards refining the product. He started to release improvements on a daily basis and created a self-help-system for users.

After the first overnight success, the web product and also company grew rapidly. After achieving more than 100,000 users, the start-up innovator brought two full-time co-workers on board for marketing and technology. The start-up innovator granted incentives with a significant amount of company share and
the referred to them as co-founders. After a year of development with this team, business angel capital was raised and a company office was rented.

The business model behind the product was created almost by accident. Without doing proper calculations, the start-up innovator assumed that Google AdSense Keyword Advertising would provide the revenue stream for the service. Bothered by users’ constant complaints about the included advertising, he created an ad-free paid option of software.

> So what I wanted to do, I wanted to give people the feeling that they were in control, the feeling that they could remove the ads if they wanted to. I set up a subscription plan where, for $5 a month, you could be an early adopter, and get rid of the advertisements. You wouldn’t get any extra functionality or anything. (Interview quote in case 8)

This decision to create an ad-free premium account led to the company’s successful Freemium business model.

> I wasn’t actually expecting that anyone would take me up on it, because I just wanted them to be comforted, that they could, in theory, get rid of the ads. But it turns out, I was totally shocked, a lot of people were willing to do it. Not just because they hate ads, but also because they wanted to support the company. (Interview quote in case 8)

While the start-up innovator started with the wrong assumption that Google advertising would drive revenue, the premium-accounts turned out to be the main revenue model. At the time of the case interview, the San Mateo-based company considered itself the world’s largest business wiki host with more than 800,000 groups and 50,000 companies.
Case Report 9

The start-up innovator in Case No 9 was a serial technology entrepreneur who started Internet companies in Israel, the US, and Canada in the fields of Internet, mobile applications, and security. He founded the company with three other innovators. This founding team was carefully selected. All co-founders were experienced, had good academic backgrounds, and enjoyed working in a start-up.

Furthermore, the start-up innovator selected a team of people he personally liked. He mentioned liking his colleagues as being a prerequisite of a successful start-up innovator team because in a start-up there is no division between professional and private life.

In terms of the actual picking the people, it was first and foremost people you enjoy being with on a daily basis. We spend 80% of our time whatever in semi-related to activities to work, especially an entrepreneur. That's really part of the business all the time. You can be travelling and doing stuff, but there's no straight line. You are going to drop the pen and come in the morning. It's part of your life. It's your baby. So, you don't want to bring somebody into your living room that you don't like, especially not bringing them in every day for a few years into your living room. So, you pick people that you enjoy at the human level. (Interview quote in case 9)

He also referred to selecting a team with common values and dreams. For the start-up innovator this is very important, as he believed a start-up company has three main purposes:

Coming up with a new idea and turning a dream into a reality. You want to try again and again to get more and more impact. And the third is that, of course, everybody enjoys more money. (Interview quote in case 9)

This team consists of two co-founders from Israel and two from the US. The interviewee was the force behind the product concept and the creation of the company. He is now CEO but the other start-up innovators referred to the product as a collaborative work. All co-founders had the same stake in the company.

The start-up innovator showed strong confidence in combined teams from Israel and the US as several successful start-ups had been created this way. In this unique case the team decided to work together before it even had an idea for its Internet start-up.
Sure. To start with, when we came together, we first decided to work as a group and then formed the idea. So, I think that the first angle is to decide whom you want to brainstorm with and, based on that, you kind of figure out what type of company will come out of it. (Interview quote in case 9)

These start-up innovators started their company not based on the excitement of an idea, but on the idea of being entrepreneurs.

After forming the company, the two founders from the US travelled to Israel to meet and brainstorm ideas with the two other co-founders. They took time off to develop their idea.

And it took us about a month and a half, or two months, of brainstorming and just sitting and drinking a lot of coffee and meeting and going on the beach and travelling together, just having a good time and deciding what it is we liked, and then we checked some stuff, coming back, saying "Maybe not," and then we'd check different things. (Interview quote in case 9)

The brainstorming session had a different scope from the sessions described by other start-up innovators. These entrepreneurs focused on identifying opportunities, evaluating markets, and writing business cases.

Okay, let's write a business plan, just to see if we can verbalize it and learn enough through the process. We each wrote a piece or was in charge of a piece. And then we iteratively, when we met every day, we would review that piece together and brainstorm and priority check and connect. So, we all kind of glued it together. (Interview quote in case 9)

Ideas were not evaluated based on use cases and need analyses; the start-up innovators acted more like corporate innovators. They iterated their idea based on evaluation of the market and raised money before they had their final product.

And we initially actually came up with an idea that is more to do with contests on the web; started looking in to it; decided it wasn't a big enough vision...that idea that we created the business plan, was then tweaked to the second idea for which we modified the business plan. So, that's within the course of two months I would say. (Interview quote in case 9)

After the formation of the company in October 2006, it took the founders six months to get funding and set up operations. Then the team started developing.

It took the start-up innovator team another six months to develop the product.

But, the formation of the company was before we had even a clear understanding of what we wanted to do. We formed it and then we started continuing to talk about this stuff. Really we started developing it more seriously I would say on March and we launched it on September. So, it's really half a year in development. (Interview quote in case 9)
With starting the development of the product a more common pattern known from other start-up innovators occurred. The idea for the product evolved from a contest website to a tool for collaborative media manipulation to an open source video toolkit.

...then came from that to an idea of collaborative creation of articles, of video, and of shows; and then ran with that for a bit; and, I think, slowly, within the course of the first four months, came to the idea of collaborative media...

(Interview quote in case 9)

The start-up innovator decided to design a platform instead of a destination site, started offering open-source toolkits as promotional tools, and offered software-as-a-service elements on top. Despite the potential risks for future revenue potential, the start-up innovator was convinced of the distribution advantages and the ability to generate revenues despite the limitations of open-source software.

Then came the dilemma, do we go all the way and release this as open source, which is big dilemma. Because open source is a double-edged sword for a commercial company. For many, it spells potential problem in revenue. For many it spells opportunity. It really depends how you use it. And I think for us, it was first and foremost an ideological fit to say, if we are enabling people to create stuff together, we want them to be able to create the applications together. We go all the way. (Interview quote in case 9)

The start-up innovator described using an open-source software approach as a way to design the product without doing all the work. He compared providing a platform to developers to providing Lego elements for customers.

The best way to design a product is that everybody designs the product, arguing that we will enable the platform that will provide the people the ability to design the product. We give them the components that kind of are, everybody will agree that are maybe building blocks, like Lego, but then you say go ahead. There are so many niche solutions. That's the other point of understanding that when you start a new industry, usually there is a skimming of the industry around the killer type of app. Let's say, YouTube for video sharing, for user generated primarily. (Interview quote in case 9)

The alpha launch procedure was similar to the pattern of launching the simplest product possible in a short time.

The first launch was kind of an alpha. What we did do is I took a group of about 100 students in the states that were doing an internship project with us for free. (Interview quote in case 9)

Although the FFE phase of these start-up innovators was far more analytical, it still followed the ACD approach. The innovator was very outspoken about
customer collaboration.

But, at the end of a day, two main things have happened. One is analytical thought process, and the second is gut instinct and feeling. There's no way to go around that once you've spoken to customers about different things. (Interview quote in case 9)

Similar to other start-up innovators, the founding team took a tremendous amount of time for part-time generation and enrichment of the idea, building, and testing a prototype. In a way, the start-up innovators had a phase even before the actual FFE phase, which can be seen as company building and financing.

As of 2011, the company is running a commercial SaaS solution and an open source solution. It is still owned by the founders.
Case Report 10

The start-up innovator in Case No 10 was based in Budapest Hungary. He was running a web development company that did client work mainly for US companies and also developed its own web products. Among his clients were his later co-founders. He had done some work for them on a previous Internet start-up that the two US founders had to abandon because one founder was called up for military service in Iraq and the other partner, his brother, had to serve at US military camp. The three partners remained in contact and one of the US founders later proposed starting an online venture together.

We remained in contact, but it was just occasional, emails and such. In 2006, late 2006, John reached out to me to see if I wanted to do something together, on our own, not for customer, a third party. (Interview quote in case 10)

After the three founders decided to do something together, they started brainstorming via email and Skype.

We knew that we wanted to do something that is going to connect people, that is very close to our users, that was the period of where this whole social idea was really picking up. We were sure about this, but what could this be? This is where the brainstorming really started. (Interview quote in case 10)

Searching for a more concrete idea, the start-up innovators identified the potential of online live video. The interviewee had used this before for some clients and saw live video as an interesting aspect of social networking. He started exploring the idea by combining discussion of use cases with first prototype applications.

We pretty much spoke daily and this went on for weeks. In a month or so we reached a phase where we had a few test applications. We knew by that time that we wanted to do something with live video. We weren't exactly sure how that is going to work in the existing product, but we knew live video was exciting. We were all very, very excited about it. (Interview quote in case 10)

The team was very excited but did not see potential for a live video service; they still saw it as a feature of a more common activity on the Internet like online dating or social media.

Live video actually was an instant win when it came up, after just a few days. The rest of the brainstorming was primarily about finding the area where you’re going to move in with live video. For a long time, it looked like we would go into either matchmaking or social media... (Interview quote in case 10)

They created a social network that also incorporated matchmaking and live
As a matter of fact, the very first version of our site, which fortunately no one else but the founders remembers, it had quite a few social networking elements. Even by the time when we launched the first version of our site, which was in early '07, we weren't quite decided on the direction. It was actually our users that decided it. (Interview quote in case 10)

The dating functionality did not take off, but users used the live broadcast feature intensively. They used the one-to-many live video broadcast quite heavily. Encouraged by the data, the team decided to focus on one-to-many live streaming. Without any market research, they assumed that they were the only ones developing this product and went full speed.

Yeah, fortunately we did a poor job on the market research. And we pretty much thought that we were the first ones to really do this. I mean there were a lot of companies doing this on a one-to-one basis; technologies for customer service and enterprise, which were paid services. But we were 100% certain that we were the first ones to do this live service as a free service open to everyone. We were almost right. (Interview quote in case 10)

After starting to build their prototype, they realized that another company was launching a similar web product and already had an alpha service on the market. Fortunately, this encouraged the start-up innovators to launch their alpha version as quickly as possible.

I mean I was doing things on my own but it definitely was a little ad hoc. The technology and the media service was finally there. ... We were in a hurry to hit the market first. (Interview quote in case 10)

The common goal to beat the competitor pushed the team to launch its alpha version very early and the service gained rapid adoption and public attention. In a very short time it managed to obtain financing which was very important, as streaming capacity was still quite expensive. The whole development had been done remotely; the first time the start-up innovators met was after they secured significant financing.

The first time we actually met in person, at least John and I, was after financing. The first time when all three founders met, John, Brad and I, by that time, we had $14 million. So we talked about doing things remotely.  
(Interview quote in case 10)

The start-up innovators in this case were the most outstanding case of start-up innovators working remotely in an agile way. Remote work was very natural for this start-up innovator.
We were pretty effective with Skype primarily. We really did not feel how much extra value could being in the same room has. It does in a certain way, but we were able to do it differently. Sometimes when we just wanted to discuss very quick, we just used audio. But you know, when we had more important meeting and we wanted to look into each other’s eyes, we used video. (Interview quote in case 10)

The entire team was very upbeat about doing work collaboratively. They strongly believed that group work could be done over distance.

Sometimes we did, yes. Many times it was individual process where we just sent the results. But sometimes we did it collaboratively. (Interview quote in case 10)

Reflecting on the product development and the product success, the start-up innovator cited simplicity as the key for success. Their first iteration was complicated and not focused on a great new use case. By stripping down the product, they achieved contribution to valuable software. The case is another example of the simplification theme found among the innovators.

I think keeping it simple is also key. If you come up with a complicated product design, then people are going to check your product and get annoyed that they can’t use it. People do not like when they don’t understand something almost immediately. They will get annoyed and leave, and never come back. But if you can hold their hand and in a minimal amount of steps, get them up and running, it’s something that can be interesting for them. They’re going to come back, tell their friends, and you’re on your way to success. So don’t get too complicated. (Interview quote in case 10)

The start-up innovator also referred to lead user knowledge as the most important source of useful innovation. He combined his knowledge of how to realize live video with the insight of users’ interest in such broadcast services. Furthermore, by working remotely he himself was a typical user of online video.

The very first thing I would do is always trying really hard to think about would you or your network use this as a valuable service. Or is this more something that you can do as a hobby project but not really counting on it. (Interview quote in case 10)

At the time of the interview, 40 people were employed at the company and was seen as the market leader in the field. In 2011, the company was one of the leading live broadcaster platforms worldwide.