HOW DAVID BECAME GOLIATH'S TEACHER

The Exploratory Evaluation of an Internal Corporate Accelerator Program

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Executive Summary

This executive summary provides a concise overview of the content of this report. First, the topic of the research will be explained. Next, the context in which the research was performed is described, followed by the definition of the problem that was addressed. Then, to address this problem, the concepts from literature concerning this problem are provided, followed by the objective of the current research. Finally, the empirical research questions are provided with the resulting answers to these questions. The summary is concluded with the conclusions of the research and the practical and academic relevance of these conclusions.

In this report, an internal corporate accelerator program was analyzed. Such a program is an adaptation of the existing format of a startup accelerator program, which is defined as a program in which startups work on their product development, customer development, and business development at an accelerated pace, with help of external parties and resources, for a fixed period of time. In an internal corporate accelerator program, however, not startups, but New Product Development project-teams from a corporate organization partake. This is done in an attempt to make the corporate innovation process faster and more flexible, thereby gaining some of the innovative capacity that can make startups a threat to large incumbent organizations.

The context of the current research is the initial exploratory evaluation of such an internal corporate accelerator program. This program was organized by Royal Philips, a Dutch company developing medical technology, in collaboration with HighTechXL, a Dutch organization that offers acceleration programs to startups. In this program, ten NPD project-teams from Philips partake, and are offered the standard accelerator program that is also offered to startups. The fact that these internal corporate NPD project-teams were offered the same program as startups in their acceleration program is where the problem, which was addressed in the current research, presented itself.

The problem is that, due to the novelty of the concept and the absence of scientific literature covering the topic, no design principles are known yet for designing an internal corporate acceleration program, and no information is available on whether the standard format of a startup acceleration program transfers well to an internal corporate acceleration program. Hence, the reason for doing the research was to determine whether this standard format transferred well to the new format of the internal corporate accelerator program, and, if it was found that this is not the case, to formulate a set of design principles for constructing a program that would be suitable for the internal corporate setting.

In order to formulate how an internal corporate accelerator program should be different from the standard startup accelerator program, the relevant concepts from literature concerning startup accelerator programs and corporate NPD projects were identified. Three different categories of concepts were identified, namely, the components that make up such an accelerator program, the goals of such a program, and, finally, the characteristics of corporate NPD projects in such a program.

The objective of the current research was, therefore, to identify and formulate a set of design principles for constructing (personalized) internal corporate acceleration programs, by assessing which characteristics of the corporate NPD projects increase the level of difficulty in reaching the goals of the program, and determining which components of the program are suitable for reducing this increased level of difficulty. These design principles could be used to construct future internal corporate accelerator programs, by prescribing which components to include in the personalized acceleration program of a specific project (depending on its characteristics), and, furthermore, how to divide the available time and resources over these components. To reach this objective, three empirical research questions were formulated and answered.

The first question that was answered concerned the experienced levels of difficulty in reaching the goals of the program by the population that was analyzed in the study. Second, it was assessed whether these observed levels of difficulty could be explained by the distribution of the project characteristics among the population. This was indeed found to be the case for some of the goals. Third and final, it was assessed which of the components of the program were appreciated for their ability to reduce the level of difficulty in reaching the goals of the program, and it was found that only half of the components were appreciated, and that the other components were not appreciated as being beneficial for this purpose at all.

Having performed these analyses, a set of design principles for constructing personalized internal corporate accelerator programs was formulated. These principles prescribe which components should be included in an accelerator program for a specific corporate NPD project, in order to reduce the level of difficulty in reaching the goals of the program for those goals that would have been more difficult to reach due to the characteristics of this specific project.

Furthermore, a quantitative measure for the added benefit of including a specific component in the internal corporate accelerator program of a specific project was determined (based on its project characteristics). With this measure, the design principles could prescribe what the division of the (limited) time and resources available to a project in the program should be over the different components, according to the ratios of the added benefits of these components.

Finally, it was argued that the design principles could be used for selection purposes, to select only those projects that stand to gain the most added benefit from partaking in an internal corporate accelerator program.

Having performed this initial exploratory evaluation, it can be concluded that the standard model of an accelerator program offered to startups does not transfer well to corporate NPD projects. The practical relevance of the current research was to identify and formulate a set of design principles for constructing personalized internal corporate accelerator programs that do meet the requirements of corporate NPD projects. Finally, the academic relevance of the current research was to highlight the differences between startups and corporate NPD projects in a highly comparable accelerator program, and, furthermore, to provide insights and directions for future research on the topic of internal corporate accelerator programs, which is a topic that is not covered in scientific literature at the time of writing.

The links between the current research and the Management of Technology program

- The work reports on a scientific study in a technological context, namely the New Product Development / innovation process of a High-Tech organization.
- The concepts of interest to the study are R&D management, innovation management, corporate entrepreneurship, and innovation strategy.
- The scientific methods put forward in the Management of Technology program were used to analyze the problem that was addressed in the study.

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Introduction

In this introduction, the problem that resulted in the proposition of the current research will be defined. Based on this problem definition, the objective of the research will be formulated, followed by the formulation of the research questions. Finally, a brief overview of this chapter and of the following chapters will be provided.

Problem Definition

ñWhat would a startup do if they entered our business?ò[1]

One of the pioneers of innovation management research, Joseph Schumpeter, presented, although unintended, the fundamental difference in innovation between large incumbent organizations and startups (Schumpeter, 1942). At first, in his theory that was later dubbed as Mark I, Schumpeter argued that innovation could only come from large organizations, who have the time, resources, and experience to drive innovation in society. However, Schumpeter experienced a change of heart, and published a contradicting theory, dubbed Mark II, which stated that only óstartupsô had the flexibility to drive real innovation. Although these two theories are nowadays viewed as complementary, where Mark I is related to incremental innovation, and Mark II to radical innovation, his change of heart does highlight an interesting phenomenon. Large organizations tend to focus on core capabilities, sustaining those activities that earned them their share of the market. However, as was argued by Leonard-Barton (Leonard-Barton, 1992), these core capabilities can become core rigidities, which actually hamper innovation. This observation is owed to the fundamental difference between new product development processes and entrepreneurial innovation processes, because NPD processes are linear in nature, where the goal is clear and a linear process is

[1] Kirsner, S. (2016, August 16). *The Barriers Big Companies Face When They Try to Act Like Lean Startups.* Opgehaald van Harvard Business Review: https://hbr.org/2016/08/the-barriers-big-companies-face-when-they-try-to-act-like-lean-startups

followed to reach that goal as efficiently as possible with a given set of resources, which is different from entrepreneurial innovation processes, where often an assessment is made of what resources are available, followed by the determination of what goals could be attained with them. It is often argued that this explicit difference in flexibility, where the entrepreneurial firm is characterized by iterative assessments of what is possible with the resources available and of what is required by the market by early-stage discussions with potential customers, making the entrepreneurial firm able to adapt to the evolutionary changes in the market, is the reason why large established organizations fail and crumble by the hand of a startup (Anderson, Tushman, & O'Reilly, 1997).

So, the problem with innovation in large organizations can be, among other factors, attributed to a lack of flexibility when designing new products or services. This problem is due to the, until recently adhered, dominant innovation strategy in large organizations called closed innovation (Chesbrough, The Era of Open Innovation, 2003), where very limited interaction occurred between the team responsible for the innovation process and other actors like customers, suppliers, or even others within the same company. The problem with such a linear, rigid, innovation strategy, is that large amounts of time and resources are spent on designing a new product before it is ever introduced to the end-users. This means that these processes are based on thinking, planning, and intuition, which is a near-impossible task when a product is to be offered to an evolutionary, and therefor unpredictable, market. A popular model for NPD processes in large organizations is called the stage-gate model (Cooper R. , 1990), as is shown in Figure 1:

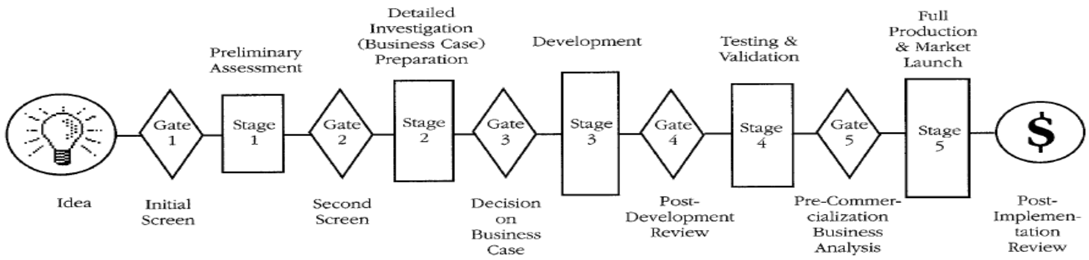

Figure 1: Stage-Gate model (Cooper, 1990)

In Figure 1, it is evident that a great deal of work has been done before the new product is actually introduced to a large public in stage 5 (although the new product is tested by a small group of external users in stage 4). By this time, the amount of sunk-costs and organizational adaptions to this new product have often been so large that, when it becomes apparent that the product/market fit isn’t satisfying, it is very difficult to change the product. It has therefor been argued that innovation processes should not be based on this linear of thinking and planning, but rather on early introduction to users, feedback, and constant change and pivoting of the product while it is still in development (Ries, 2011).

This “open and adaptive” process of innovation is now often referred to as the “Lean Startup Methodology”, popularized by authors such as Erik Ries (2011) and Steve Blank (2012). The Lean Startup Methodology is based on iterative hypothesis-driven design processes, where every new version of a product under development is introduced to the public in some way or another, allowing its designers to accumulate and incorporate feedback from actual users in every step of the process. The method leans heavily on Minimum Viable Products, which is a collection of the absolute bear-minimum set of features that a product requires for its functioning, which can be introduced to users as soon as possible (Ries, 2011). This MVP option, combined with split-testing, the process where different features of a product are evaluated by users, instead of the entire product, allows developers to learn about their actual customer needs, which allows for pivoting, or changing, of the product under development, making it far more likely to reach a satisfying product/market fit (Ries, 2011). By adopting this method, new product developers can adopt a method of iterating the óbuild-measure-learnô loop, which is an excellent way of providing sustained competitive advantage through innovation (Marchisio, 2010). This strategy shows characteristics of Agile Development, a strategy that allows developers to react rapidly to changes in the technology and market. Remarkably, the founder of the aforementioned Stage-Gate model is also experiencing a change of heart, focusing his most recent research efforts in this Agile Development system (Cooper R. , 2016).

Now, how does this method help out large organizations when it comes to innovation? It is evident that they are not small, flexible organizations that can completely change direction in a heartbeat. Nevertheless, an article that was published by Harvard Business Review discusses recent research that shows a novel tendency of large organizations to adopt the lean startup methodology in their organization. The researchers interviewed 170 executives of large organizations in R&D-related industries, such as General Electric, Adobe, and 3M, and 82% of the interviewees indicated that their firm had adopted, or was in the process of adopting, the lean startup methodology in some manner (Kirsner, 2016). The advantages of adopting such a methodology, according to those interviewed, are shown in Figure 2. Based on this problem description, it can be concluded that large organizations could benefit from adopting the Lean Startup Methodology.

Figure 2: Benefits of adapting a lean startup methodology in large organizations (Kirsner, 2016)

For large organizations, adopting the Lean Startup Methodology is a step towards Corporate Entrepreneurship. Although no common consensus on the definition of óCorporate Entrepreneurshipô has been reached in the field (Antoncic & Hisrich, 2003), (Ferreira, 2001), (Sharma & Chrisman, 1999), (Stopford & Baden-Fuller, 1994), an interpretation of its two-fold strategic role was stated by Burgelman (1983):

- The need for strategic autonomous behavior
- Operational link to the firmôs current capabilities and skills

A popular method for facilitating this difficult mixture of circumstances, acting autonomously whilst relying heavily on the firmôs capabilities and skills, and, hence, unavoidably its structures and routines to some extent, are Corporate Accelerators (Kohler, 2016). In Corporate Accelerators, external startups enjoy a predefined program, receiving support and coaching from large organizations, often with the intent to acquire the startup or its developed technology when the technology has proven itself (Weiblen & Chesbrough, 2015). This, however, remains an óexternalô type of innovation strategy, and it is with this observation that large organizations have initiated a new type of corporate accelerator, in which not external startups walk through an acceleration program, but internal New Product Development teams from the large organization itself.

This is where the problem definition for the current research presented itself. In the absence of scientific literature (as is shown in Figure 15 in Appendix F) covering the topic internal corporate accelerator programs, due to, perhaps, the novelty of the concept, or due to reluctance of large organizations to share their experience with this new innovation strategy, it is difficult for large organizations to develop such programs. Therefore, Royal Philips N.V., in cooperation with an existing startup accelerator from the Netherlands called HighTechXL, developed a program where internal NPD teams from Philips took place in the acceleration program designed by HighTechXL for startups. One may wonder whether this όone-size-fits-allô approach, with a program that was designed for startups, is adequate for internal corporate teams. The problem to be addressed in the current research can, therefore, be summarized as:

Problem Definition:

Due to the novelty of the concept and the absence of scientific literature covering the topic, no design principles are known for designing an internal corporate acceleration program, and no information is available on whether the standard format of a startup acceleration program transfers well to an internal corporate acceleration program.

Therefore, the objective of the current research is to determine whether all of the components of a standard startup acceleration program are also beneficial for internal NPD teams in an internal corporate accelerator program, and, with that obtained knowledge, to formulate a set of design principles with which future internal corporate accelerator programs can tailor the programs they offer to their internal NPD projects. The following section will elaborate in this objective.

Research Objective

The topic of this research concerns the exploratory evaluation of an internal corporate accelerator program, in an attempt to identify and formulate a set of design principles for developing future programs. A real-life case is used for this evaluation, namely the Business Accelerator from Royal Philips N.V., a Dutch Health-Tech company. The non-arbitrary choice for selecting Philips for this evaluation is elaborated upon in Chapter 3, in the section Case Selection.

The Business Accelerator is an initiative of Royal Philips, the Netherlands, in cooperation with HighTechXL, a High Tech startup accelerator in the Netherlands. In this initiative, a program is developed where 10 internal corporate development project-teams from Philips Research, all developing technology for the healthcare industry, will leave the comfort of their usual workspace, and spend 3 months in the accelerator, trying to further develop their projects by adopting elements of the Lean Startup Methodology and be accelerated in the same way startups would be in an accelerator program.

In this internal corporate accelerator program, the standard acceleration program that HighTechXL offers to startups is offered to the internal corporate project-teams, and these teams work by this program for 3 months. By completing this program, the teams aim to reach a number of goals (for example, to validate their business model). To help reach these goals, the program is comprised of a number of components (for example, coaching from external experts). In the absence of scientific literature covering the concept of these internal corporate accelerators, an open approach was taken, in which different conclusions could emerge from the evaluation:

1. No set of design principles could be identified and formulated.
2. A general set of design principles could be formulated for internal corporate accelerators.

3. A set of design principles could be formulated that allow for personalized acceleration programs for individual internal corporate NPD projects.

With the resulting set of design principles, a program of suitable components for internal corporate NPD teams could be constructed. Three possible outcomes of the research are listed, and the specifics of reaching each of the outcomes are provided below. In formulating these outcomes, the situation of startups in an accelerator program is used as a benchmark, and it is assumed that all components of a standard accelerator program are beneficial for startups.

1. **No difference could be identified between startups and internal corporate teams in an accelerator program: No set of design principles could be formulated.**

Based on scientific literature covering regular startup accelerators, the set of components that make up accelerator programs will be identified. Next, the appreciation of these components by the participants of the internal accelerator program will be assessed. If no significant difference in appreciation between the components would be found, the conclusion of the research would be that no design principles for internal corporate acceleration programs could be formulated, because the internal corporate projects were not found to (dis)appreciate any of the components in particular.

2. **A difference could be identified between startups and internal corporate projects in an accelerator program, but not between the internal corporate projects themselves: A general set of design principles for internal corporate accelerator programs could be formulated.**

If a significant difference in the appreciation of the components would be found, a set of design principles, regarding which components should be included in an internal corporate acceleration program, could be formulated. First, however, an explanation for this observed difference in appreciation would be required, and this explanation would be sought in the goals of the program.

The appreciation of the components depends on their ability to facilitate the reaching of the goals of the program. It could, however, be the case that some components are found to facilitate the reaching of one goal more than the other goals (a component consisting of extensive desk research might provide abundant information regarding the market and thereby help shape the business model, but such an activity might not help in developing the actual product).

If, therefore, the entire population of the internal corporate acceleration program would be found to experience a great amount of difficulty in reaching certain goals, the conclusion of the research would be that there exists a set of general design principles for an internal corporate acceleration program, because internal corporate development projects experience a great amount of difficulty with certain program goals, and the components prescribed by the design principles are capable of mitigating these difficulties.

3. **A difference could be identified between the individual projects in the internal corporate accelerator: A set of design principles could be formulated that allow for personalized acceleration programs for the individual projects.**

The conclusion of a general set of design principles mentioned above only holds when the entire population of the internal corporate acceleration program is found to experience comparable levels of difficulty with reaching the goals of the program. If, however, varying levels of difficulty with reaching these goals are found across the population, it cannot be concluded that internal corporate projects in general experience difficulty with certain goals, and would therefore require a general set of components to mitigate these difficulties.

In this case, the differences between the internal corporate development projects would have to be identified, followed by the evaluation of whether these differences explain the observed differences in difficulty with reaching the goals of the program. The factors that make these projects different would be their characteristics, concerning the project-team, the specifics of the technology they are developing, the specifics of the development process, and the specifics of their target market (among others).

If it is found that these project characteristics explain the observed difference in difficulty in reaching the goals of the program, it could be predicted which projects would be likely to experience greater levels of difficulty with certain program goals, due to their project characteristics. Then, by assessing which program components facilitate the reaching of these program goals, a personalized set of program components could be composed, which would mitigate this increased level of difficulty with reaching these program goals. Hence, in this situation, the conclusion of the research would be that a set of design principles could be formulated, allowing for the composition of a personalized set of program components for each individual project, based on its project characteristics.

The theoretical framework provided in Figure 3 shows how the research would arrive at one of these conclusions. The level of detail of the design principles increases from left to right, and are the result of the answers to the questions shown in the numbered boxes.

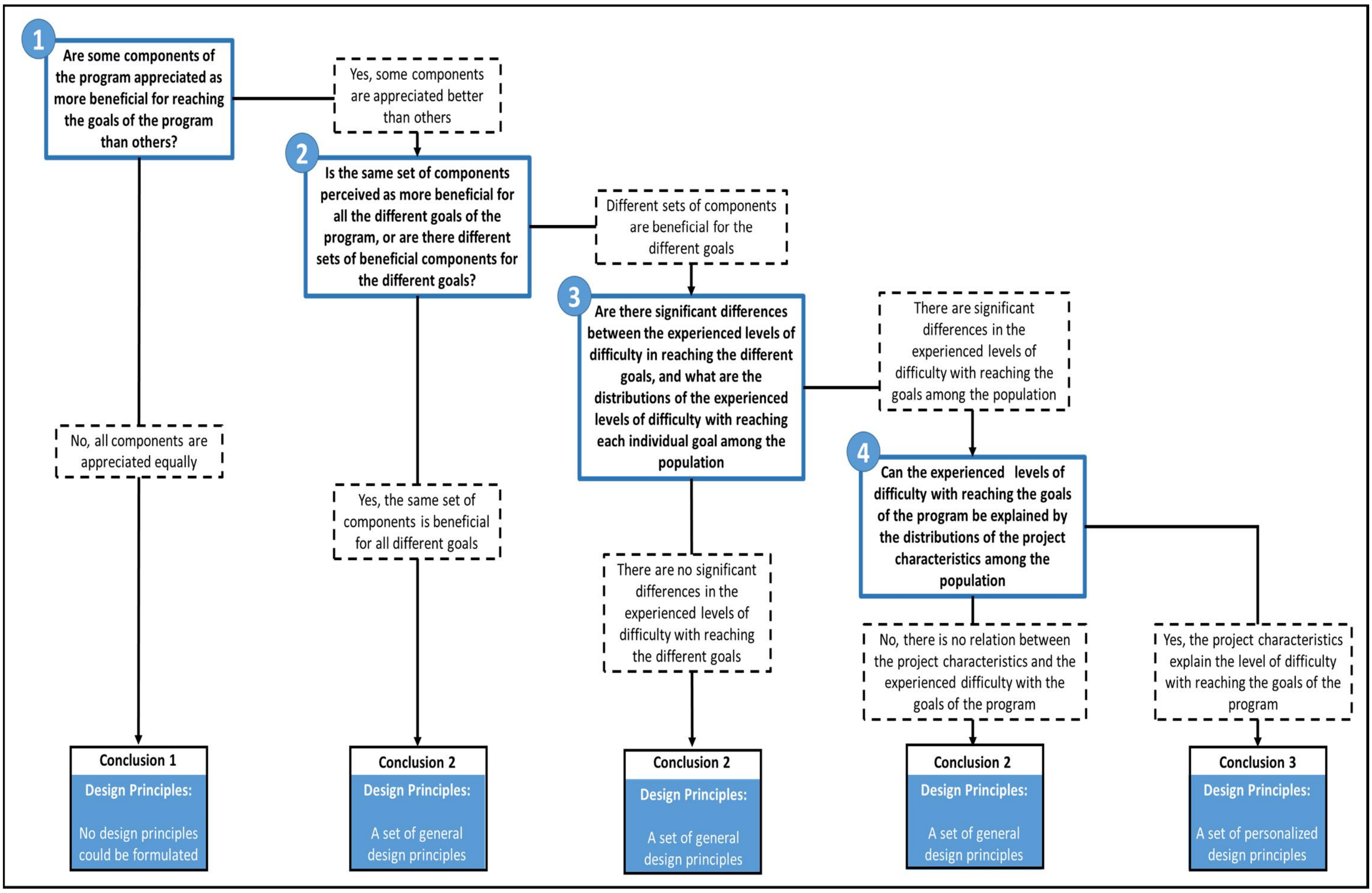

Figure 3: Schematic overview of the possible conclusions, and, therefore, design principles that could be the result of the research. The numbered boxes with the blue borders show the questions to be answered in the research, the boxes with the dashed black borders the possible answers, and, finally, the full blue boxes on the bottom show the resulting sets of design principles.

Because Conclusion 3 would provide the most valuable results, the remainder of this research and corresponding report will focus on this option. The objective of the current research is, therefore, formulated as:

Research Objective:

To identify and formulate a set of design principles for constructing (personalized) internal corporate acceleration programs, by assessing which characteristics of the individual projects increase the level of difficulty in the reaching of the goals of the program, and determining which components of the program are suitable for reducing this increased level of difficulty.

These design principles will prescribe which components to include in the personalized acceleration program of a specific project, and, furthermore, how to divide the time and resources available to the project in the program over these different components.

In doing this analysis, corporate organizations will be able to make a better selection on which projects to include in corporate accelerator programs (based on their characteristics) and, furthermore, corporate accelerator programs will be able to better adapt their program to individual internal corporate development projects. Finally, lessons can be learned on further potential implications of organizing such internal corporate acceleration program for the larger organization.

Having introduced the problem and the subsequent objective concerned with the proposed research, the research questions will now be formulated.

Research Questions

The main research question for this research is concerned with how the characteristics of a specific project in an internal acceleration program can complicate the acceleration goals of that project (an Acceleration Goal is one the goals the teams aim to reach by participating in the program), and how the different components of the program are perceived as being beneficial for mitigating these potential complications. In combining these sets of information, a personalized acceleration program of specific components can be constructed for each individual project:

How could an internal corporate accelerator program be adapted to the individual projects, based on the characteristics of these projects?

In order to answer this main research question, a set of sub-questions was proposed, starting with theoretical questions to be answered from literature, followed by the empirical research questions:

First, the identification of the typical components of corporate accelerator programs is required:

1. *Which components make up (corporate) accelerator programs?*

Next, an evaluation the goals of accelerations program is required:

2. *What are the Acceleration Goals in acceleration programs?*

Having identified the components and goals of acceleration programs, an evaluation of which characteristics influence corporate NPD projects is required:

3. *Which project characteristics influence development process of corporate NPD projects?*

Having identified the relevant goals and components of acceleration programs, and the relevant project characteristics from the body of scientific literature, the empirical questions specific to the current research are:

4. *What is the appreciation of the components of the program regarding their capability to help reach the goals of the program?*

If different levels of appreciation are found for the different components, an explanation for this observation is to be sought in the difficulty of reaching the different goals of the program:

5. *What are levels of difficulty experienced in reaching the goals of the program across the population?*

In the case that varying levels of experienced difficulty are found across the population, the identification of explanatory factors for these different levels is required:

6. *Can the distribution of the project characteristics among the population explain the distribution of the experienced level of difficulty with reaching the goals of the program?*

In case a correlation is found between the project characteristics and the experienced level of difficulty with reaching the goals, a personalized set of design principles can be formulated:

7. *Given a set of project characteristics, which program goals are expected to be more difficult to reach, and which program components can be offered to properly mitigate this increased level of difficulty?*

Finally, in an effort to broaden the scope of the current research, going from the micro-level (NPD teams) and meso-level (Accelerator Program), an analysis of the implications of such a program on the macro-level (the organization) is required:

8. *What are the implications of organizing such an internal corporate accelerator program for the larger organization?*

The importance of answering these questions, and thus satisfying the stated research objective, is two-fold, having practical as well as scientific relevance. This will be the topic of the following section.

Practical & Academic Relevance

The current research has practical, as well as academic relevance:

Practical relevance.

The practical relevance of this research is found in the valuable lessons that will be uncovered for innovative organizations and corporate accelerator programs. As was stated in the introduction, large organizations face difficulties in making their innovation processes flexible, allowing them to respond rapidly to changes in the market or new technologies, whilst also keeping them efficient and effective. By selecting the right projects to participate in corporate accelerator programs and construct personalized programs for each individual team, the innovative capacity of the organization can be increased. By performing the abovementioned analysis, corporate organizations can select the projects that benefit the most from participating in such a program, and the corporate accelerator program can adapt its program to the specifics of the different projects, thereby maximizing the added value of the program. Finally, the corporate organizations can learn what the implications for their organization could be when engaging in an internal corporate accelerator program.

Academic relevance.

The academic relevance of this research comes from the analysis of how development projects from large corporate organizations benefit from participating in corporate accelerator programs. By participating in a program developed for start-ups, and operating as if they were a start-up for 3 months, the differences between corporate development projects and startups in a highly comparable environment can be evaluated. Furthermore, in light of the absence of existing scientific literature covering these internal corporate acceleration programs, an initial evaluation of this topic will be provided, potentially uncovering insights and directions for future research. Finally, because the current internal corporate accelerator program is built upon elements of the Lean Startup Methodology, and an evaluation of the implications of this program on the larger organization is provided, insights are provided on how well elements from the Lean Startup Methodology can be introduced in the NPD processes of large corporate organizations.

Having provided the context and objective of the research, and the resulting research questions with their practical and academic relevance, a concise overview of this introduction, and an overview of the following chapters of this report, are provided below.

Summary & Next steps

Before introducing an overview of following chapters of this report, a summarizing overview of the problem definition, research objective, and most important empirical questions concerning the research is provided in the table below.

Table 1: Overview of the problem, context, objective, and questions of the current research.

Problem Definition	Due to the novelty of the concept and the absence of scientific literature covering the topic, **no design principles are known for designing an internal corporate acceleration program**, and no information is available on whether the standard format of a startup acceleration program transfers well to an internal corporate acceleration program. Hence, the reason for the current research is determine whether this standard format transfers well, and, if this is not the case, to determine how it could be adapted.
Context of the study	The Philips Business Acceleration Program. This internal corporate acceleration program is characterized as: • A program consisting of a set of **Program Components** • These program components are there to help reach the **Goals of the Program** • The **Characteristics** of the different projects that the members of the population are part of, which might increase/decrease the difficulty in reaching these goals of the program.
Research Objective	**To identify and formulate a set of design principles for constructing (personalized) internal corporate acceleration programs**, by assessing which characteristics of the individual projects increase the level of difficulty in the reaching of the goals of the program, and determining which components of the program are suitable for reducing this increased level of difficulty.
Empirical research questions	1. Which components are beneficial for reaching the goals of the program? 2. Which goals of the program are experienced as difficult to reach? 3. Do the project characteristics explain the difficulty in reaching these goals? 4. How can the results of these analyses be used to formulate the required design principles for an internal corporate accelerator program?

The first step in the current research will be performing a review of the relevant literature concerning the topic introduced above, followed by the operationalization of the concepts that were identified as relevant to the current research (Chapter 2: Literature Review). Next, the research methodology will be presented (Chapter 3: Research Methodology), followed by the presentation and discussion of the results (Chapter 4: Results & Discussion). Finally, based on the results and discussion of these results, the conclusions of the current research will be stated, along with the limitations of the research (Chapter 5: Conclusions).

Literature Review

This chapter will provide a review of the relevant literature regarding the topic of this research. First, an overview of the sub-topics and their relation will be provided, followed by a review of these sub-topics, and, finally, a summary of the concepts relevant to the current research will be provided, followed by the development of the theoretical framework.

As was stated in the previous chapter, the current research analyzes an internal corporate accelerator program, in which internal corporate development projects of a large organization work as if being startups for three months, working in an accelerator program that is based on the Lean Startup Methodology. In order to be able to properly perform this analysis, four distinct sections are presented in the review:

1. Because the accelerator program under investigation is based upon the principles of Lean New Product Development, and because the internal corporate teams will work as if they are startups, a concise introduction of New Product Development in startups, Lean, Lean New Product Development, and Lean in large organizations will be provided.
2. The current research focuses on a new type of accelerator, an internal corporate accelerator. Therefore, scientific literature concerning accelerators will be discussed, and, furthermore, one of the two sets of main concepts of interest to the current research will be identified in this section.
3. Then, the transition towards corporate accelerators will be made, discussing scientific literature that covers corporate accelerators and corporate entrepreneurship, and, most importantly, the third set of main concepts of interest to the current research will be identified.
4. Finally, the concepts will be operationalized for the current research.

After providing these sections, a summary of the variables of interest to the current research will be provided, together with the theoretical framework that will be used for the current research.

New Product Development in Startups and Lean

The term *Lean Startup Methodology* is two-dimensional. First of all, and most-importantly, the focus is on Lean Principles. However, when trying to determine the beneficial factors of this methodology, the *Startup*-related part is not to be ignored. A review of the relevant literature concerning success factors in new ventures (startups) was performed in an attempt to determine the relevant concepts apart from the Lean Principles.

In their case-study, Marion, Friar, and Simpson (2012) analyzed two successful startups. It was found that the characteristics of these new ventures were very comparable (and, not mentioned in the study but observed by the author, very relatable to Lean Principles):

- The ventures did not have full-time development teams, activities were performed by two full-time founders and part-time external contractors.
- Work was driven by goals, not the availability of resources, and internal team-members would jump in to fill the gaps.
- The members in the teams fulfilled multiple roles, in the functions of design, engineering, marketing, and project-management.
- There was no up-front formal process, the process was driven by working towards milestones.
- No formal stage-gate model was used, informal meetings resulted in decisions on whether to proceed or not.
- There was no strict project control, spreadsheets were used to monitor progress.

- Internal members and selected individuals were used as lead users for testing the product.

It is evident that these characteristics are very different from formalized NPD processes in large organizations (characterized by, according to Cooper (2016); stable requirements and specifications, large project teams, ordered culture and corresponding control, linear Stage-Gate planning, formalized roles, and most communication occurring formally via the team-leader). These startup-characteristics, however, are inspired by a lack of resources, rather than a conscious strategy. In a more thorough, quantitatively-based analysis, Kakati (2003) determined the criteria related to success in new ventures by interviewing and surveying 27 venture capitalists concerning their successful and unsuccessful investments in new ventures. It was found that, apart from the criteria related to the product, the market, and the financial aspects, significant differences between the successful/unsuccessful categories existed, including the characteristics of the entrepreneurs, the resource-based capacities, and the competitive strategies. The strongest correlations with success, and of interest to the current research, were found to be *the ability to react to risk well, Input sourcing capabilities, Customization strategy,* and (being the only criterion related to the actual product) *Product development via functioning prototypes*. Having identified a set of exploratory characteristics related to successful startups, followed by an analysis of the criteria correlated with success, the evaluation of Lean Product Development will now be provided.

Lean (New) Product Development: LPD.

Until recently, New Product Development (NPD) processes in large corporations were rather linear and closed processes, often organized via a strictly adhered stage-gate process (Cooper R. , 1990). Although being efficient and providing good results when concerning incremental innovations, these óclosed innovation systemsô caused large incumbents to be surpassed by startups, because the up-front planning and internal biases regarding product/service features and customers wishes were found to be incapable of dealing with the evolutionary character of radical innovations (Anderson, Tushman, & O'Reilly, 1997). Therefore, Chesbrough (2003) advocated the óera of open innovationô, an innovation system where more actors, such as suppliers, customers, other departments from within the organization itself, and even competitors, are included in the innovation process. This inclusion, and thereby reduction of the internal biases in NPD processes, is the first step towards LPD.

LPD focuses on Lean, a term first stated by Womack and Jones in their book *The Machine That Changed the World* (1990), describing the production systems at car-manufacturer Toyota. According to the book, Lean focuses on optimizing value and reducing waste in production processes. In the following years, Womack and Jones realized that the principles adhered in lean production could be applied in management, and they published their second book called *Lean Thinking* (1996). The *Lean Thinking Methodology,* as described by Womack and Jones, is based on five principles; *Define Value, Value Streams, Flow, Pull,* and *Perfection:*

Define value.

Defining value is related to the actual value of the product/service that is being developed. Oppenheim (2004) defines value as (1) Make a product of the best possible quality, and (2) Strive for a radical reduction of waste in terms of cost, time, and other resources. Haque and James-Moore (2004) go beyond this definition, and call for a specification of value from the perspective of the final customers, as well as other actors, internal and external to the development team. Finally, from a more practical perspective, Morgan and Liker (2006) adhere the principle of *Gentchi Gembutsu* (Go outside and see), which is one of the major philosophies at Toyota, trying to specify value by actually talking to customers and using their input to increase value. In a summarizing perspective, Schuh et al

(2008) introduced the concept of ôValue Systemsö, in which the market potential can either be over-shot in terms of value (over-engineering, too high costs), which is waste, and under-shot, which means missing out on available value (e.g. poor market understanding)

Value streams.

Defining value streams is the process of mapping out the development process, followed by an evaluation of where value is created, thereby revealing all activities that donôt contribute to creating value, which is the definition of waste in new product development (Hines & Rich, 1997). Haque en James-Moore (2002) have identified four principles; Implement processes that enable the identification of current and future value streams (processes that deliver value to customers), extensively define, standardize, and build-in the possibility for measurement of the value streams, define milestones and determine how to achieve them with the lowest amount of waste possible, and, finally, use animation and simulation tools to help define which value streams indeed bring value to the final design. Again, from a rather practical perspective, McManus (2005) published a comprehensive manual, in which defining the value streams is done by three basic steps; (1) Arrange and order process-steps and information-flows, (2) Collect data on the performance of these process-steps and on whether the information flows adequately, and (3) Summarize and evaluate where value is created.

Flow (of value).

The principle of flow concerns everything that is the opposite of delineation, Stage-Gating, and functional departments within organizations. According to Reinertsen (2005), every development process used to have adequate flow, until conveyer-belt-like efficiency-based models began to dominate. In the early days of Lean, with its original application to production systems, Flow meant the natural flow of parts and equipment through the production process, avoiding queuing and the need for large inventory warehouses (Womack & Jones, 1990). However, when concerning NPD processes, Flow is mainly related to the flow of value, information, and technology. Reinertsen advocates the use of small batch sizes, and thereby collecting and implementing constant feedback on your products. Oppenheim (2004) extended the principle by including ôTack Time Periodsö, which is the period of time required to develop a satisfying new product. This is a revolutionary change of perspective, because now an evaluation was to be made of how much time was needed to make the highest quality product, instead of evaluating how to make a high quality product in the least amount of time. Haque and James-Moore (2004) include the non-physical side of Flow, promoting the flow of information and produced technologies over different projects and teams.

Pull.

Pull is related to the direction of Flow. In an effort to eliminate waste, activities downstream in the development process ask for what is required (Pull), when it is required, and nothing more. Ward (2007) defines Pull as everybody reacting to the wishes of their customer, producing exactly that and nothing more. However, Haque and James-Moore (2004) extended this definition to include factors from within the organization, proposing an environment where information and technology is requested and received by activities downstream, instead of continuous production of information and technology upstream which might turn out to be waste. From a more physical perspective, Cusumano and Nobeoka (1998) propose to create Pull by introducing prototypes and features to customers, followed by the development of an actual technological component that could provide this feature.

Perfection.

Striving for perfection through continuous improvement. Morgan (2002) defines this from a people-perspective, where continuous learning is built-in into the development processes. It is related to the original Lean concept of *Kaizen* (Womack & Jones, 1990), which means “change for the better”, and is related to small step-by-step improvements of all people connected to the development process. However, Haque and James-Moore (2004) introduced a perspective that focuses more on the continuous and incremental improvement of all value-creating processes and propose the introduction of physical tools for monitoring and improving.

Over the past years, LPD and the five principles mentioned above have become an increasingly covered topic of interest in scientific literature. A systematic literature review performed by Martinez Léon and Farris (2011) showed an increasing trend in the number of LPD-related publications, as is shown in Figure 4.

Having introduced the broader area of interest, Lean Product Development, a review of the (non-academic) literature concerning the Lean Startup Methodology will now be provided.

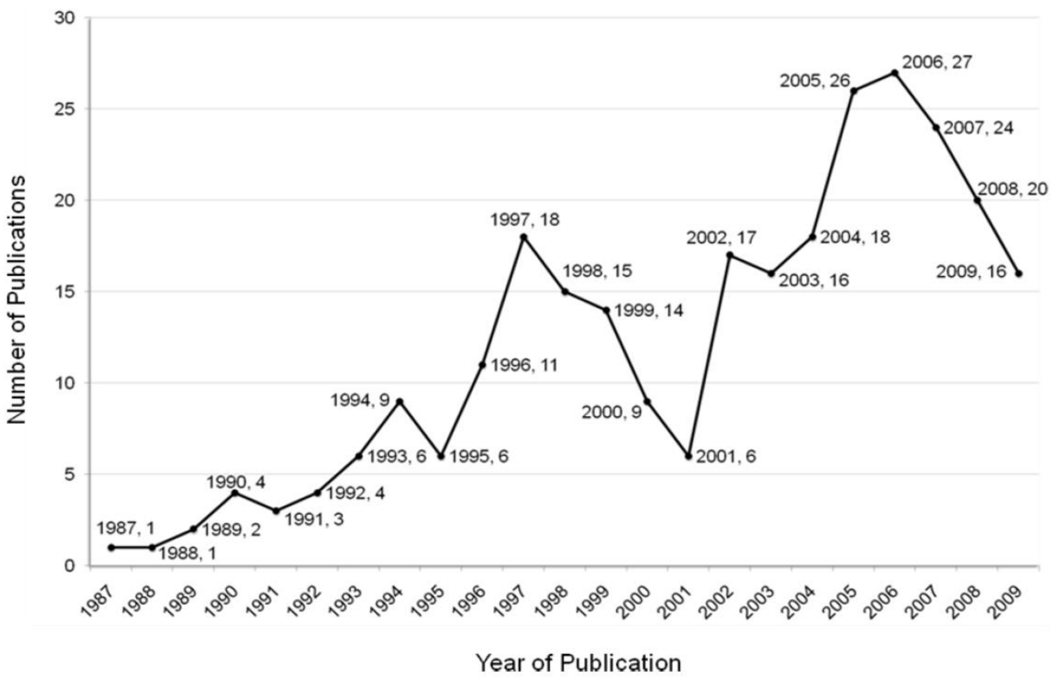

Figure 4: Number of LPD-related publications over time (Martinez Leon & Farris, 2011).

The Lean Startup Methodology in Large Organizations

The Lean Startup Methodology is methodology introduced and popularized by the serial-entrepreneurs Steve Blank and Erik Ries. In his Book, *The Lean Startup* (2011), Erik Ries describes a methodology for new startups to increase their chances of success. The methodology is focused on three main concepts; creating a *Minimum Viable Product* (MVP), which is a version of the product/service under development stripped of all functionalities and features other than those needed to function properly, which can be introduced to a group of customers with the goal of collecting feedback and performance data. Based on this introduction, *Validated Learning* moments are created, where the developers acquire new insights about their customersô wishes. Based on this newly found insights, the developers can choose to *Pivot or Persevere*, which means changing the direction of development, or to continue on the current path. These three concepts are enveloped in a continuously repeated Build-Measure-Learn loop, a concept popularized by Marchisio (2010). This attitude in development processes was recently supported by the founder of the popular Stage-Gate model, Robert Cooper (2016), called Agile Development. Originating from the IT industry, Agile Development aims at providing a more flexible development process, reducing development cycle times and including the voice of the customer (Cooper & Sommer, 2016). In a recent survey by Innovation Leader (2016), it was found that 82.4% of the 170 interviewed CEOôs of large organizations (e.g. GE, Adobe, and Airbus) already implemented some form, or elements from, the Lean Startup Methodology in their NPD processes.

The barriers faced by large organizations when adopting lean principles

The previous sections focused on the characteristics and benefits of lean principles and the Lean Startup Methodology. However, the literature reviewed for these paragraphs deals with situations where these lean principles have already been successfully adopted. This adoption, however, is not a straight-forward matter. Pederson et al. (2011) report that up to 70% of the organizations they analyzed fail to implement Lean successfully, and this number is even trumped by results from Bhasin and Burcher (2006), who report a 90% failure rate in the adoption of lean in UK-based organizations. In order to identify the causes for these failures, Albliwi et al. (2014) performed a systematic literature review on the topic, and found 34 common factors that were mentioned as causes for failure in a collection of 56 papers. The identified reasons for failure of interest to the current research (from most to least important):

1. Lack of top management, attitude, commitment and involvement
2. Lack of training and education
3. Poor project selection and prioritization
4. Lack of resources
5. Weak link between lean projects and strategic objectives of the organization
6. Resistance of culture change
7. Poor communication
8. Lack of leadership skills
9. Lack of awareness of benefits of lean
10. Wrong lean tools selected
11. Lack of consideration of human factors
12. View of lean as only set of tools instead of entire philosophy
13. Lack of understanding of different customers
14. Lack of employee engagement
15. Lack of awareness of the need for lean
16. Poor implementation execution
17. Failure to understand that specifics of the lean strategy are organization-specific

Albliwi et al. are not alone in identifying these factors. Bhasin (2012) analyzed 68 UK-based organizations concerning the low success-rate of lean adoption, and distinguished between factors for small, medium, and large organizations. The factors for large organizations, which is the interest of the current research, are presented in Table 2:

Table 2: Barriers faced by large organizations in adopting lean and the percentage of respondents recognizing those barriers

Barriers in large organizations for adopting Lean	%
Insufficient supervisory skills to implement lean	64
Insufficient workforce skills to implement lean	60
Employee attitudes/resistance to change	60
Insufficient senior management skills to implement lean	55
Cultural issues	53
Insufficient management time	52
Insufficient understanding of the potential benefits	45
Cost of the investment	45
Insufficient internal funding	39
Insufficient external funding	35
Need to convince shareholders/owners	22

Having provided an evaluation of the Lean Startup Methodology, and (the lack of) its application in larger organizations, the following sections will provide an evaluation of the characteristics of (Corporate) Accelerator Programs, which could potentially be used as a vehicle to implement elements of the Lean Startup Methodology in large organizations.

Accelerator Programs

The phenomenon of Accelerators is rather recent, Christiansen (2009) recognized *Y Combinator* as the first ôBusiness Acceleratorô that was founded, in 2005, and can actually be viewed as a spin-off of the well-known Incubator Model, where new ventures (startups) are assisted in multiple ways in a protected environment (Aernoudt, 2004). Although the delineations between Incubators and Accelerators are not set in stone, a distinction on a number of characteristics was made by Adkins (2011):

- In terms of duration, Incubators can be seen as a ölong-termô engagement, with an average duration of 33 months. Accelerators tend to be óshort-termô, with Bootcamps ranging from 1 to 3 months in duration.
- In terms of servicing, Incubators provide assistance in, again, long-term matters, such as experienced IP advice, developing management teams, access to experienced business consultants. Accelerators offer assistance, via coaching and mentoring, in facilitating ófast-testsô for the validation of ideas, to find initial customers, and to help prepare the new venture with pitches for potential investors.

These differences, among others that are stated in the paper, can lead to the conclusion that Incubators are for long-term activities, such as scaling and developing a functional business structure, whilst Accelerators are for determining the initial product, customers, market, and business model (Cohen S. , 2013). Despite novelty of the concept, Accelerators have gained momentum rapidly. The 2015 Global Accelerator Report (GUST, 2017) states that in 2015, the number of accelerators around the world was 387, having accelerated close to 9.000 new ventures. These accelerators work with cohorts of new ventures, and assist them in a short period of time through intense mentoring, with the primary goals of accelerating the business development and educating its employees on business principles (Pauwels, Clarysse, Wright, & van Hove, 2016). Further characteristics that define Accelerators were stated by NESTA, a UK-based innovation-research company (Miller & Bound, 2011):

- A competitive application process open to everyone.
- Upfront investment, (usually) in return for an equity stake (6 ï 8%)

- Strong focus on mentoring of the founding team as a whole, rather than individual development
- Time-limited pre-set program curriculum consisting of training, mentoring, and other events

These characteristics agree with the definition of Accelerators set by Cohen & Hochberg (2014): ñA fixed-term, cohort-based program, including mentorship and educational components, that culminates in a public pitch event or demo day (p. 4)ò

Having introduced an initial, concise, overview of the phenomenon of Accelerators, a more in-depth analysis of the components of such acceleration programs, as well as their goals, is required.

The components of accelerator programs.

An analysis of recent scientific literature concerning the components of these programs unveiled a set of recurring components that were mentioned as important or critical for acceleration programs, as is shown in Table 3:

Table 3: An overview of important components of Accelerator programs as mentioned in relevant literature.

Publications / Components	*Bergek & Norrman* (2008)	*Pauwels et al* (2016)	*Hoffman & Kelly* (2012)	*Batistella & Pessot* (2017)	*Mansoori* (2016)
Shared office space	X	X		X	
Support services	X	X		X	
Coaching and mentoring	X	X	X	X	X
Networking opportunities	X		X	X	
Training		X		X	X

Demo days		X		X	
Investment opportunities		X	X	X	
Autonomous validation					X

The components mentioned in Table 3 have slightly varying specifications among different authors, and also among different accelerator programs. However, a general set of tools and practices that constitute these components was identified by Batistella and Pessot (2017), in their case study analyzing an English accelerator program:

Shared Office Space.

An office space, offered by the accelerator and tailored for new ventures, where the founders can work on their business development 24 hours a day. It also provides a suitable location for meetings with potential investors and external partners.

Support Services.

Services offering advice and help on applications for numerous investments and grants, tax and legal advice, and, finally, technical and design services from experienced external partners of the Accelerator itself.

Coaching and Mentoring.

Periodical face-to-face meetings with (external) experts and experienced entrepreneurs who provide critical feedback and advice on, most often, the business model. These sessions often take shape as role-plays, where the mentor takes the role of potential client or investor (Pauwels, Clarysse, Wright, & van Hove, 2016).

Network Opportunities.

Network opportunities are facilitated by the accelerator, and three different types can be distinguished: Networking with local press for awareness, networking with other companies and start-ups from the same industry, and networking with investors, such as angel investors and venture capitalists.

Training.

Referred to as óEducation/Workshopsô, the accelerator programs offer a curriculum, often teaching Lean Startup Tools, such as the Value Proposition Canvas (Osterwalder, 2014), the Business Model Canvas (Osterwalder & Pigneur, 2010), the Lean óBuild-Measure-Learnô Loop (Ries, 2011), the Kanban Board, the óFour Steps to Customer Developmentô (Blank & Dorf, 2012), and, finally, more general masterclasses on subjects, such as, data analysis, sales, and marketing.

Demo Days.

Event organized by the Accelerator where the entire cohort of new ventures pitches its products and companies to potential investors (Dempwolf, Auer, & D'Ippolito, 2014).

Investment Opportunities

The Accelerator itself often provides an upfront investment, or invites partners from industry to provide this initial investment. Pauwels et al (2016) observed in 8 out of 13 accelerators they analyzed that these amounts range from ȥ3.600 to ȥ50.000 in exchange for a (dilutable) equity stake ranging from 3% to 10%. Additional rounds of investments during and/or after the program were also observed.

Autonomous Validation.

Autonomous Validation is a key component of every Accelerator program. However, it is not specifically mentioned in most analyses as a component, because for a new venture, Autonomous Validation is the only option available. The Lean Startup Methodology emphasizes this óGet out of the buildingô activity as the only way to validate the assumptions that underlie a new venture (Ries, 2011), and it is the fundamental activity to realizing the Build-Measure-Learn loop (Marchisio, 2010). With respect to the current research, however, where internal NPD teams, who regularly do not engage in these activities, validate their assumptions through Autonomous Validation, this activity can be distinguished as a crucial component of the Accelerator program (Mansoori, 2016).

Having provided an analysis of the components that make up accelerator programs, a discussion of the goals of such a program is required.

The Goals of Accelerator Programs.

The literature discussed above focuses on the components, often proposing a framework of components, for an accelerator. However, a clear definition on the goals of an accelerator program is yet to be found. Of course the goal of an accelerator is to bring the accelerated startup to a success, however, determining project success is a complex undertaking, as the definition of success may change over time (de Wit, 1988), can be assessed in the short-term or long-term perspective (Shrnhur, Levy, & Dvir, 1997), and, of course, depends on the projectõs specific project goals (Baccarini, 1999). Even more, a startup is very different from an established organization (or a project in that organization), and, hence, according to Steve Blank, a startupõs goals can be caught in a single mission: ñA startup is an organization formed to search for a repeatable and scalable business modelò (p. 97)

To reach this all-encompassing goal, however, startups go through a number of phases, in which the building blocks for this goal are constructed, as is shown in Figure 5. These stages, finding the proper fit between your company and the environment, were introduced by Erik Ries (2011), and are commonly accepted as the goals in Accelerator programs:

1. *Problem / Solution Fit:* To what extent does your solution actually solve an existing problem in the market?
2. *Vision / Founders Fit:* To what extent is the team properly equipped with complementary capabilities and competences to build this company?
3. *Product / Market Fit:* To what extent is the value that you think your product offers indeed perceived as valuable by your customers?
4. *Business Model / Market Fit:* To what extent are your customers willing to adapt your profitable and scalable business model?

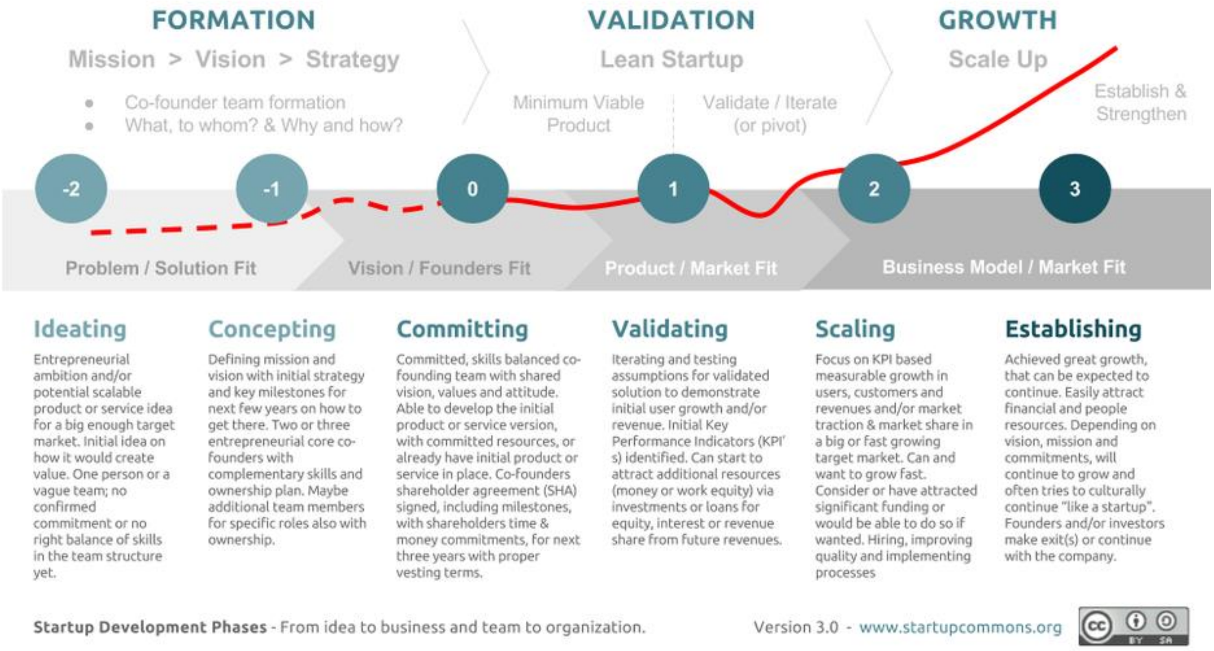

Figure 5: The phases a startup goes through in order to determine a scalable business model (Startup Commons, 2015)

Having introduced the concept of Accelerators in general, their components, and their goals, an evaluation of corporate accelerators will now be provided.

Corporate Accelerators and Corporate Entrepreneurship

In the previous section, the concept of Accelerators was introduced. However, the current research focuses on a specific subgroup of Accelerators, the Corporate Accelerator.

These corporate accelerators are programs that are backed by large organizations, in which the founding organization, sometimes in collaboration with an independent accelerator program, provides the services mentioned in the previous section (Chesbrough & Weiblen, 2015).

The reasons for running these corporate accelerator programs vary from program to program, however, in their analysis of 13 case studies of corporate accelerator programs, Kanbach and Stubner (2016) identified three major strategic objectives:

- To gain valuable insights in current market, technology trends, and developments.
- The further development and integration of the technology produced in the cohort.
- To test and launch potentially disruptive technology which might otherwise be prevented by the incumbentǿs internal processes.

With the addition of the corporate accelerator for purely financial considerations, where the incumbent acts as a Venture Capitalist and receives an equity stake in a potentially profitable venture, an overview of the four main accelerator typologies is shown in Table 4:

Table 4: Corporate Accelerator typologies (Kanbach & Stubner, 2016)

Accelerator type		Listening Post	Value Chain Investor	Test Laboratory	Unicorn Hunter
Objective		Strategic	Strategic	Strategic	Financial
	Primary objective	Understand recent trends and developments in a respective market and initiate relationships	Identify, develop, and integrate new products and services into parent company´s value chain	Create a protected environment to test promising internal and external business ideas	Invest in promising startups, make them more valuable, and earn a financial premium
Program focus	Locus of opportunity	External	External	Internal & external	External
	Strategic logic	Exploration	Exploration	Exploration	Exploitation
	Industry focus	Somehow related to parent company	Strongly related to parent company	At least somehow related to parent company	Broad industrial focus
	Equity involvement	No	Yes	Yes	Yes
	Venture stage	Frequently very early stage, but also later stage (depending on industrial focus)	Later stage with developed products and customers	Early stage, often in idea status and not legally founded	Early and later stage
Program organization	External partner	No	Partly	No	Partly
	Connection to parent	Part of parent	Part of parent	Separate legal entity	Separate legal entity
	Leadership experience	Internal / external	Internal / external	Internal	External
Example		YouIsNow Accelerator (ImmobilienScout24); Microsoft Ventures Accelerator (Microsoft)	TechStars METRO Accelerator (METRO AG); SPACELAB (Media-Saturn Holding)	:agile Accelerator (E-On); Allianz Digital Accelerator (Allianz SE)	Axel Springer Plug & Play (Axel Springer AG); Pro7Sat.1 Accelerator (Pro7Sat.1)

Corporate accelerators are no longer a rare phenomenon. CorpVenturing, a global corporate venturing consultant, states the existence of over 200 corporate accelerator programs (CorpVenturing, 2017), among which programs offered by world-leading multinationals, such as, Nike, Siemens, Microsoft, and Volkswagen (Dempwolf, Auer, & D'Ippolito, 2014). However, scientific literature covering the subject remains scarce, with only a limited section dedicated to the subject by Chesbrough & Weiblen (2015), Hochberg (2016), and Dempwolf et al. (2014) in their respective work, and only two articles, by Kohler (2016) and Kanbach & Stubner (2016), were found that are fully dedicated to the subject. This scarcity might be attributed to the novelty of the concept, or to the reluctance of organizations to share the details of their programs. Even more, on the subject of the current research, the Internal Acceleration Program with an external accelerator as a partner, not a single publication was found. However, the model for this program can be positioned in-between two different models that were identified by Hochberg (2016), the óPowered byô model, in which an external accelerator organizes an acceleration program for a corporation, and the óCompletely Internalô model, in which corporations accelerate internal teams themselves. Although, due to the absence of relevant literature, nothing can be stated regarding the composition of such a program at this point, an initial distinction can be made regarding the goals for internal NPD teams and external startups in acceleration programs. Steve Blank states in his article *Why Internal Ventures are Different from External Startup* (2014) that internal ventures require the ongoing internal support of the corporation and its business units. The concept of óGet Upstairs in the Buildingô, as compared to the Lean Startup principle of óGet out of the Buildingô, is therefore crucial activity for ensuring a proper fit between the (accelerating) internal venture and the rest of the organization (Blank, 2014).

Having provided an analysis of the higher-level factors of corporate accelerators, a final set of variables is to be identified, which are the characteristics of the actual projects (teams) in the accelerator program.

The characteristics of projects in a corporate accelerator program

The goal of the current research is to construct a framework, with which personalized acceleration programs can be constructed, based on the characteristics of the individual projects in the program. To this end, an evaluation of the different project characteristics of interest was performed. It does, however, require mentioning that the set of characteristics that was chosen might appear unusual to those readers who are familiar with the scientific literature on project (and product) characteristics in NPD processes. An example of such a standard list of characteristics is provided by Balachandra & Friar (1997):

- Existence of a target market for the product under development

- High growth market
- Short time to market
- Rate of product introduction
- Innovativeness of the product
- Perceived value of the product
- Patentability
- Demand Pull / Technology Push

Most of these characteristics, however, can only be determined post-hoc, that is, after the introduction of the actual product in the target market. In the current research, however, the products are still in the early stages of their development, meaning that no such post-hoc characteristics can be identified. At first sight, this might seem like a limitation, however, the framework that is to be constructed in the current research is only aimed at projects in these early stages of development, and, therefore, a set of early-identifiable characteristics for the products under development will now be provided. These characteristics were included in the research because they could be determined within the period of time in which the study was performed, and, furthermore, because these are the characteristics that were accessible to the researcher.

Before commencing the evaluation of characteristics that characterize the project and the technology being developed in it, a human-centered variable is to be introduced. This variable is related to the diversity within the teams of the development projects themselves. Recent work by Nakata (2010) indeed confirms the well-known credo in organization management that team diversity correlates positively with NPD success in a survey of 206 High-Tech development processes. Furthermore, in a more high-level meta-review of work concerning this relation, Sivasubramaniam et. al. (2012) provide a blueprint for designing high-performance NPD teams, in which team diversity is a crucial factor, indicating that *Team Diversity* is a characteristic to be included in the current research.

The following characteristics provided are related to the project and the technology under development itself.

The first thing that characterizes a development project is its origin, that is, what was the main driver for starting the project. This is often indicated as *Market-Pull* / *Technology-Push*, which is the only early-identifiable characteristics mentioned by Balachandra and Friar (1997). Despite the fact that early work by Cooper (1979) suggest a negative effect of a project finding its origin in a *Market-Pull*, the general hypothesis is that such projects have a larger probability at success than their *Technology-Push* counterparts (Balachandra & Raelin, 1984), (Carter, 1982).

Next, a number of factors that characterize the technology under development can be identified. The Ware-type of the technology (Hardware, Software, or a Hybrid between the two) is an important characteristic, especially when developing technology using the Lean Startup Methodology. The origin of this difference is explained by Elaine Chen in her book on bringing hardware products to the market, in which emphasis is placed on the fact that the ideas of fast iterations and MVPós are not too easily applicable to hardware products due to their physical nature, potentially complicating the development process (Chen, 2015). Next to this physical form of the technology, a technology is also characterized by its relation to its environment, that is to say, whether is stand-alone and operates in isolation (Modular), or whether it can be used in different systems (Platform). In an analysis of 108 NPD projects, it was found that this difference in Technology Archetype has little influence on the probability of success of the NPD project, however, that is does have a strong effect on the tasks and activities during the project (Tatikonda, 1999). It is because of this influence on the development process that this characteristics is included in the current research. Finally, as for the technology itself, the Type of Technology is considered (Product, Service or Product-as-a-Service). Nijssen et. al. (2006) argue that the probability of success depends on different factors for service innovation and product innovation, indicating that, all other factors being equal, projects developing a service will be set up differently for success than projects developing a product. Furthermore, Gebauer et. al. (2008) found that projects developing a Product-as-a-Service have strongly differing requirements concerning factors such as a firmôs strategic focus, its network, and the autonomy of its employees during the development, compared to the development of services. It is because of these considerations that the *Type of Technology* is included in the current research.

After identifying the relevant factors that characterize the technology itself, the goal of the development project is to be considered, which is introducing the technology in the target market. For this characteristic, a distinction is made between projects focusing on consumer markets (B2C) and projects focusing on business markets (B2B), because of the fundamental difference in the possibilities concerning customer development. This difference is noted by Hoyer et. al. (2010), who state that the integration of customers into the NPD process is more complicated in a B2C setting, because of a larger distance between provider and consumer, low levels of loyalty, and evolving customer preferences. The implications of this observation are confirmed by Stevens & Burley (2003), who identified a higher rate of failure for B2C products.

The final characteristic of interest concerning the development project itself is the stage of development the project is in when entering the accelerator program. The influence of the stage of development on the activities in an NPD process are clearly stated by the aforementioned authority in the field, Robert Cooper, in the evaluation of his Stage-Gate model (Cooper R. , 1990). Based on this work, a clear distinction between pre-Development (market-analysis, feasibility, customer wishes) and (post)-Development (product development, testing, marketing, operational plans) activities can be identified. In light of the current research, however, the boundaries between these stages are supposed to be minimized, following the Lean NPD process. The reason for still including the stage of development as a potential variable in the current research originates from work by Rochford and Rudelius (1997), who argue that the importance of different functional activities (R&D, Marketing, Strategic Decisions) strongly varies over the different stages. For the current research, where all functional activities are performed by members of teams themselves, this could result in varying requirements from the accelerator program, based on this stage the teamôs project is in.

Finally, the project characteristic having relevance at the highest level is the projectôs orientation towards its parent-organization. To be more specific, to what extent does the projectôs technology fit the portfolio and way of working of the larger organization and/or one of its business units. In his analysis of designs for corporate entrepreneurship, Burgelman (1984) argues that the relation between a development project and the larger organization depends on the strategic importance of the project, and operational relatedness of the project and its intended business unit. Depending on the projectôs position on these two dimensions, a dominant strategy can be chosen, ranging from direct integration, to creating a new business unit, and, finally, to completely spinning-off the project.

Having provided the literature review concerning the topics of interest to the current research, the following section will provide an overview of the relevant concepts from literature that will be used to perform the current research, and a theoretical framework will be constructed.

Summary & Operationalization

In this section, the relevant concepts for the current research will be enumerated, followed by the details of how these concepts will be used in the current research (the operationalization).

Summary.

The main concepts from the literature reviewed in the current chapter that are relevant to the current research are shown in the table below:

Table 5: Summary of relevant concepts from the literature reviewed in this chapter

Topic	Concept	Source
Accelerator goals	1. Initial product development 2. Customer development 3. Market development 4. Business model development	(Cohen S. , 2013)
Accelerator Components	1. Shared office space 2. Support services 3. Coaching and mentoring 4. Networking opportunities 5. Training 6. Demo days 7. Investment opportunities 8. Autonomous validation	(Bergek & Norrman, 2008) (Pauwels, Clarysse, Wright, & van Hove, 2016) (Hoffman & Kelley, 2012) (Battistella & Pessot, 2017) (Mansoori, 2016)
Startup goals	1. Business Model / Market Fit 2. Problem / Solution Fit 3. Vision / Founders Fit 4. Product / Market Fit	(Blank, 2013) (Ries, 2011)
Internal corporate venture goals	1. Project / Organization Fit	(Blank, 2014)
Project Characteristics	1. Team Diversity 2. Type of Technology 3. Stage of Development 4. Ware-Type 5. Technology Configuration	(Sivasubramaniam, Liebowitz, & Lackman, 2012) (Balachandra & Friar, 1997) (Balachandra & Raelin, 1984) (Cooper R. , 1979)

	6. Target Market 7. Project Origin 8. Organizationôs Portfolio	(Carter, 1982) (Chen, 2015) (Tatikonda, 1999) (Nijssen, Hillebrand, Vermeulen, & Kemp, 2006) (Gebauer, Krempl, Fleisch, & Friedli, 2008) (Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010) (Stevens & Burley, 2003) (Cooper R. , 1990) (Rochford & Rudelius, 1997) (Burgelman R. A., 1983)

The following sub-section will provide the operationalization of these concepts, showing how they will be used in the current research.

Operationalization.

For the current research, three distinct sets of variables are required, concerning the following topics:

- The *Components* of acceleration programs
- The *Goals* of accelerator programs
- The *Characteristics* of internal corporate NPD projects

These variables are created by operationalizing the aforementioned concepts from literature as described below. Furthermore, a number of concepts will be excluded. The rationale behind this selection will be discussed concisely. For the full details of this rationale, the reader is referred to Appendix B.

The program components.

The role of the program components is their ability to reduce the difficulty experienced in reaching the goals of the program. This ability is operationalized by the perceived benefit of the different components for facilitating the reaching of the goals of the program. Because it is hypothesized that this ability differs over different goals for a component, the ability will be measured separately for each goal of the program. Finally, the program components *Demo Day* and *Investor Opportunities* are excluded from the current research, because they donât concern the program itself, but occur after the program is completed, and because external investors are no factor in an internal corporate acceleration program, respectively. The resulting set of variables concerning the program components consists of:

- *Shared Office Space*
- *Support Services*
- *Coaching & Mentoring*
- *Networking Opportunities*
- *Program Curriculum*
- *Autonomous Validation*

Regarding their ability to reduce the difficulty experienced in reaching the goals of the program.

The Program Goals

For the goals of the program, a combination is taken between the accelerator goals provided by Cohen (2013), the Lean Startup goals provided by Ries (2011), and the internal corporate venture goal mentioned by Blank (2014). This combination is possible because the goals mentioned by Cohen are essentially captured in the goals mentioned by Ries, and, furthermore, because the acceleration program evaluated in the current research is based on the Lean Startup Methodology, it can be concluded that the Lean Startup goals are also the goals of the current program. Following these considerations, only the internal venture goals and Lean Startup goals, with the exclusion of the *Vision / Founders Fit* because this fit is to be established before the program begins, and therefore not a goal of the program itself, are used as the goals of the program. The remaining concepts are operationalized by assessing the extent of difficulty experienced by the participants in reaching the goals during the program, which are the following goals:

- *Problem / Solution Fit*
- *Solution / Market Fit*
- *Business Model / Marker Fit*
- *Project / Organization Fit*

The Project Characteristics

The project characteristics form the only set of variables in which different ways of operationalization is required for the different concepts. This is because some concepts are turned into variables measured on an interval scale and others on a nominal scale, in which some are dichotomous, and others are represented by more than two categories. The methods for operationalizing the concepts are shown below, and are measured by determining in which category the characteristics of each project falls.

- *Team Diversity:* A Gini-index (interval scale) is calculated to determine the intra-team diversity, based on the age, experience, functional department, and education of the members of the team.
- *Type of Technology:* Dummy variables are created, indicating whether the technology under development will be sold as a *Service (Yes/No), Product (Yes/No),* or as a *Product-as-a-Service (Yes/No)*

- *Stage of Development:* Dichotomous variable, indicating whether the project is in the *Exploratory* or the *Development* stage.
- *Ware-Type:* Dummy variables are created, indicating whether the technology under development is a *Software-system (Yes/No)*, *Hardware-system (Yes/No)*, or as a hybrid *Hardware-Software Combination (Yes/No)*
- *Technology Configuration:* This concept consists of two variables, which are both measured on a dichotomous scale. First, the *Technology Archetype*, indicating whether the technology is a *Modular* or a *Platform* technology, second, whether the technology is *Stand-alone*, indicating whether the technology requires additional infrastructure for its functioning (*Yes / No)*
- *Target Market:* Dichotomous variable, indicating whether the technology under development will be introduced to a *Business Market (B2B)* or a *Consumer Market (B2C)*.
- *Project Origin:* Dichotomous variable, indicating whether the development project originated from a *Technology-Push* or a *Market-Pull*
- *Organization Portfolio:* This final concepts also consists of two variables, namely whether a *Business Unit Exists (Yes/No)* that can incorporate the technology under development, and whether the project is *Backed by a Business Unit Upfront (Yes/No)*

This distribution of these project characteristics among the population used in the current research is provided in Appendix C.

After having operationalized the concepts from the body of literature that were identified as relevant to the current research, the figure below shows how they will be used in the current research, building upon the question posed in Figure 3.

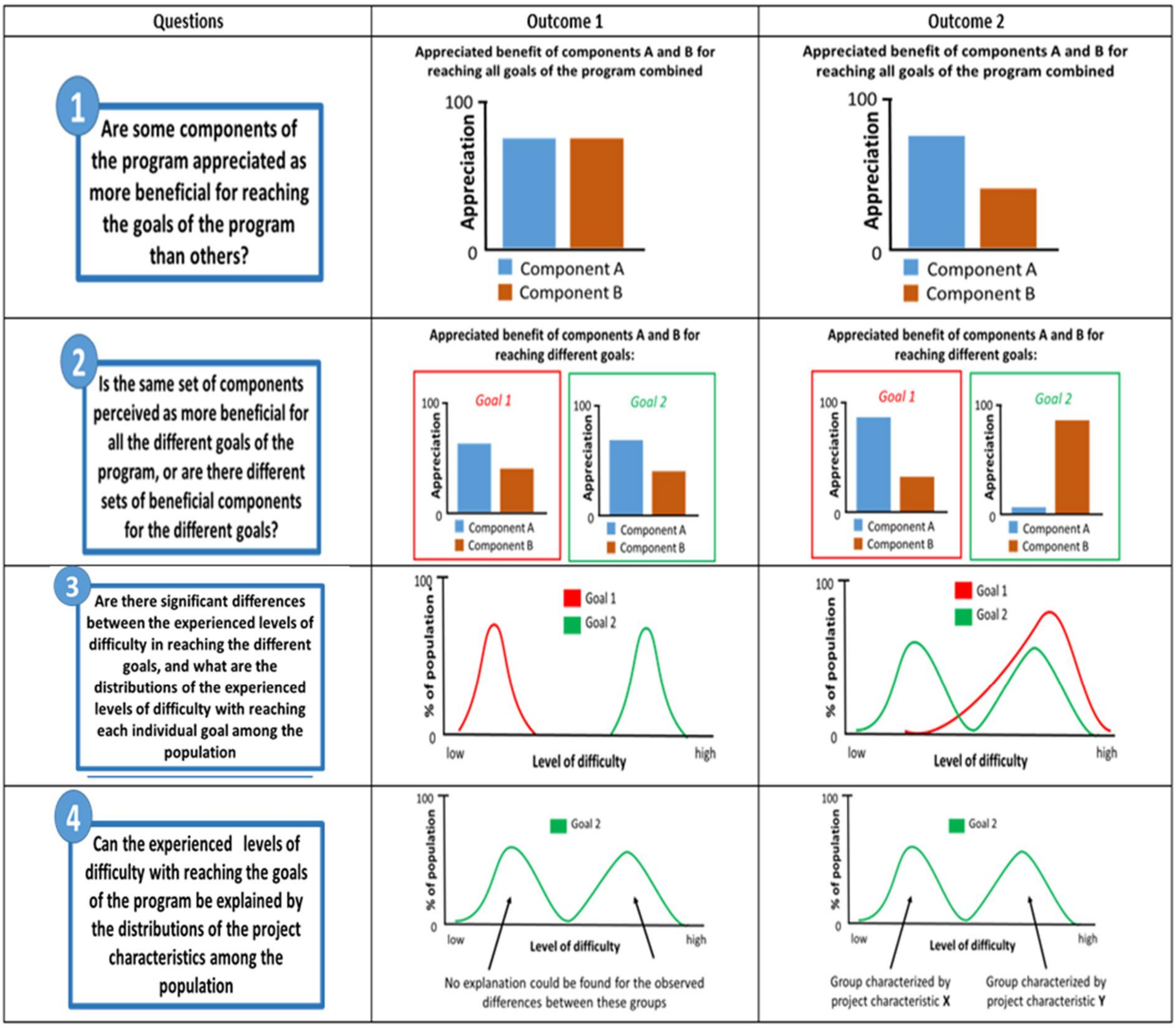

Figure 6: Overview of the different steps of the research. In each step, a question from the theoretical framework is to be answered, and the center- and right-hand columns show the possible answers to these questions. For every question, in case Outcome 2 is found in the analysis, the analysis in the row below will be performed, in an attempt to try and find an explanation of the observed result.

Having reviewed the scientific literature concerning the topic of the current research, provided a summary of the concepts used in the current research, and finally, showed how these concepts were operationalized and used in the current research, the following chapter will provide the methods used in the current research.

Research Methodology

In this chapter, the methodology of the current research will be provided. First, the Design of the research will be discussed. Next, the methodology for Data Collection, Data Manipulation, and Data Analysis will be provided, followed by the procedure for determining the design principles that are the goal of this research. Finally, the Case Selection and Population Composition methods will be provided.

Research Design

The design of the current has been shaped by a pragmatic approach. In the absence of scientific literature covering internal corporate acceleration programs, such as the one covered in the current research, Saunder, Lewis, and Thornhill (2016) propose the use of such a pragmatic approach. For the current research, this pragmatic approach meant performing subsequent analyses, attempting to answer the questions stated in the theoretical framework shown in Figure 3. The table on the following page provides an overview of the analyses that were performed. This table is the textual, more detailed representation of the schema shown in Figure 6, and, therefore, adheres to the same structure:

- Each row starts with a question from the theoretical framework.
- For each question, the method for analyzing the data is provided.
- For these methods of analysis, the possible outcomes are provided.
- For each possible outcome, the result is provided. This would either be that no usable outcome came from the analysis, and in this case the conclusion of the research is reached, or, when a usable outcome comes from the analysis, an attempt will be done to explain this outcome by proceeding with the question on the following row.

The section after this table will provide the information regarding collection of the data for the current research.

Table 6: Overview of the questions to be answered in the research, the methods to analyze the data and find these answers, the possible outcomes to these analyses, and, finally, the result when one of these outcomes is found.

Questions	Method of analysis	Outcomes	Result
Question 1: Are some components of the program appreciated as more beneficial for reaching the goals of the program than others?	**Chi-squared Goodness of Fit Test:** The distributions of scores for the appreciations of all components are compared.	**Outcome 1:** All components are appreciated equally. **Outcome 2:** Some components are appreciated better.	**Result 1:** No design principles could be formulated. **Result 2:** Proceed to *Question 2*
Question 2: Is the same set of components appreciated better for all the different goals of the program, or are there different sets of appreciated components for the different goals?	**Chi-squared Goodness of Fit Test:** The distributions of scores for the appreciations of a specific component are compared for all individual goals. (repeated for each component)	**Outcome 1:** The specific component is appreciated equally for all individual goals. **Outcome 2:** The appreciation of a specific component is different for the different goals	**Result 1:** The design principles should prescribe the components that were positively appreciated, regardless of which goals might be difficult to reach **Result 2:** Proceed to *Question 3*
Question 3: Are some goals clearly experienced as more difficult to reach by the entire population, or are there sub-groups in the population that experience different levels of difficulty with the same goals?	**Friedman Test:** The distributions of the experienced levels of difficulty with reaching the goals are compared. **Descriptive Statistics:** Compare the means, medians, and standard deviations of the distributions of the experienced levels of difficulty with the different goals.	**Outcome 1:** All goals were equally difficult to reach. **Outcome 2:** Some goals were clearly more difficult to reach than others by the entire population. **Outcome 3:** The different goals were not equally difficult to reach, nor were there specific goals that were difficult to reach for the entire population. But, maybe this variation is caused because there exist sub-groups with different characteristics in the population	**Result 1:** The design principles should prescribe the components that were positively appreciated, but no explanation for why could be formulated **Result 2:** The design principles should prescribe the components that were positively appreciated, because these components are beneficial for reaching the goals that were experienced as difficult by the population **Result 3:** Proceed to *Question 4*

Question 4: Can the level of difficulty experienced in reaching the different goals by a sub-group in the population be explained by the set of project characteristics that characterizes this sub-group?	**Linear Regression:** The correlation between the presence of the different project characteristics and the experienced level of difficulty with a specific goal will be assessed. (repeated for all goals)	**Outcome 1:** No statistically significant correlations were found. **Outcome 2:** Statistically significant correlations between the presence of certain project characteristics and the experienced level of difficulty with a specific goal were found.	**Result 1:** The same design principles as Result 2 from Question 3, but no explanation for why reaching these specific goals was difficult could be formulated. **Result 2:** Personalized design principles. Based on the characteristics of a project, it can be predicted which goals will be more difficult to reach. The personalized acceleration program should be composed of those components that were found to be beneficial for reaching these difficult goals.

Data Collection

In this section, the procedure followed for collecting the data will be provided. For the collection of the data, the survey shown in Appendix A was used. The three major components of this survey are:

1. Classification data: Collecting the relevant personal characteristics of the respondents, including a number of characteristics of their projects.
2. The goals of the program: Assessing the extent to which the respondents experienced difficulties in reaching the different goals of the program.
3. The components of the program: In this part, the respondents were asked to rank 6 different components, regarding the perceived benefit of these components for reaching the different goals of the program.

The details of how the survey was constructed for collecting data on the goals (part 2) and components (part 3) of the program are provided below. The reason for using a survey to collect the data for the current research was because no objective source of information was available for providing the required data, making a survey the least subjective instrument to collect the required quantitative data.

Survey part 1: The goals of the program

The measuring of the extent to which the respondents experienced difficulty with reaching the goals of the program was done using a 7-points Likert scale, assessing the respondentõs attitude on the question:

óWe had little difficulty in reaching goal X of the programô

The possible responses ranged from *Very strongly disagree* to *Very strong agree.* The reasons for choosing a 7-point Liker scale were the following considerations:

- The obtained ordinal data can be treated as interval data, making it eligible for a Linear Regression analysis, which is desirable for the small population at hand due to its robustness (Dillon, Madden, & Firtle, 1993).
- 7 points were chosen over 5, because the resulting larger effects are desirable in studies with a small population size. Furthermore, due to the small amount of time required for completing the survey, no time-related objections are posed with this more elaborate scale.
- An odd number of points, over an even number of points, was chosen, because including a mid-point, representing a óneutral attitudeö, allows the researcher to determine whether the underlying attribute was indeed measured. In case of a high frequency of neutral responses, often the underlying attribute is not measured properly

by the scale, because it represents an óUndecidedô possibility as a response (Raaijmaker, van Hoof, Hart, Verbogt, & Vollebergh, 2000).

Survey part 2: The components of the program

Contrary to the scale mentioned above, for the components of the program, a non-Likert scale was used. To assess the respondentøs attitude towards the perceived benefit of the components of the program, a forced-ranking method was chosen, in which the respondents had to rank the components, in terms of perceived benefit for reaching the goals of the program, from 1 to 6 (1 being most beneficial). The reason for choosing this method finds its origin in two considerations:

- The small size of the population requires an instrument with strong discriminating capacity.
- The program components are provided by an external organization, with which a long-lasting relationship is desirable for the Philips organization. This might result in a social desirability bias in the responses. Such bias results in a larger frequency of neutral and positive attitudes being measured than actually present in the population.

With these considerations in mind, the 6-point forced-ranking scale was chosen, due to the following properties of such a scale:

- The absence of a mid-point reduces the social desirability bias (Garland, 1991).
- The forced ranking results in the largest possible discriminating capacity.

Before administering the actual survey to the population, a pilot-test was performed. The survey was administered to three employees of Philips who were part of a previous edition of the internal corporate accelerator program. The results of this pilot showed that the phrasing was understandable, it was clear to the test-respondents which attributes were being measured, and, finally, that the amount of time required for completing the survey did not exceed a general span of attention by any means, meaning that the results were not influenced by the length of the survey.

The actual survey was administered electronically, via the internal e-mail system of the Philips organization, two weeks before the end of the program. This point in time was chosen because at this point the developmental activities of the projects were completed, and the remaining activities concerned preparing the final pitches for the Demo Day, writing up one-pagers, and discussions regarding the course of action to be taken after the program. The reason for administering the survey during, and not after, the program was to maximize the response-rate and reducing memory bias. Further actions to increase this response-rate were (informal) personal requests for completing the survey, more formal requests via the project-leaders, and, finally, a formal request via the organization of the program to all members. These endeavors resulted in a response rate of 87% (41 out of 47).

Having described the method for collecting the data, the following section will provide the methods used to analyze this data.

Data Analysis

In this section, the methods employed to analyze the collected data will be provided. First, the method for assessing what the appreciation of the components was will be provided. Next, the method for determining the experienced difficulty with reaching the goals of the program is provided. Finally, the method for determining the influence of the project characteristics on the ability to reach the goals of the program is provided. In the following section (3.4), the method for combining the results of these analyses and formulating the design principles will be provided.

The program components.

In order to assess the perceived benefit of the different components, the population was presented with the request to rank the benefit of the different components from 1 (being most beneficial), to 6 (being least beneficial) for reaching the individual goals of the program. This separation on the different goals was done because it is assumed that the benefit of the different components will differ for reaching different goals.

To assess whether a component was perceived as beneficial by the population, a Chi-Squared Test for Goodness of Fit was performed to test the distribution of the scores on each component. The hypothesis for testing all of these components was:

H_0: *The frequencies of scores are distributed uniformly over the possible scores.*

A perfectly uniform distribution, for a hypothetical population of $n = 60$, would result in a frequency of $60/6 \approx 10$ on each score, as is shown by the orange bars in Figure 7.

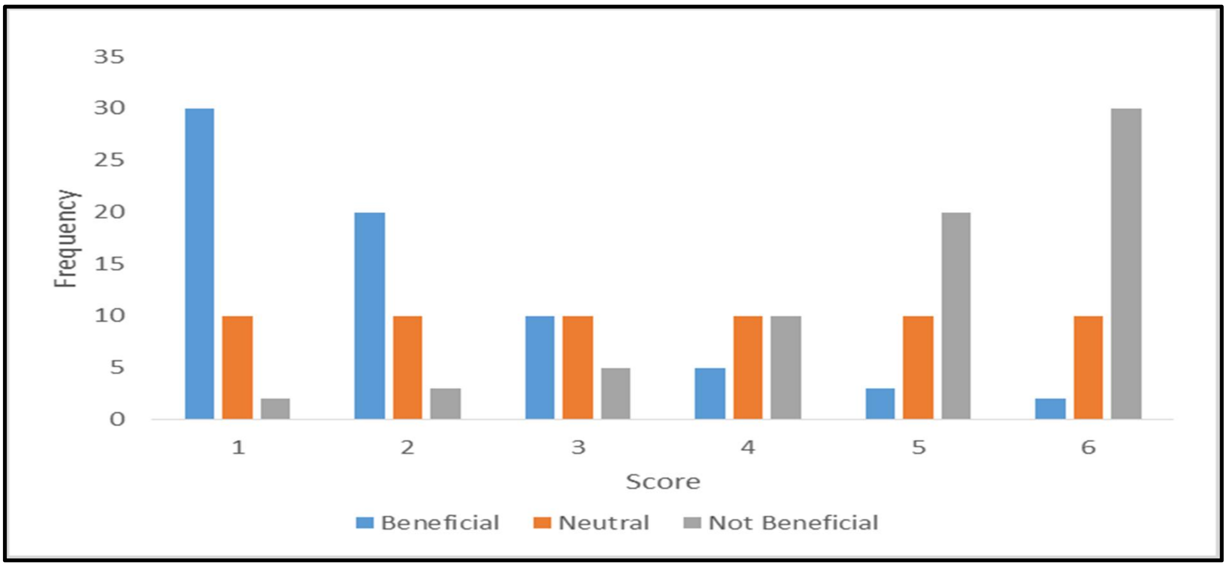

Figure 7: Example of a hypothetical frequency-distribution of scores for different components. The orange bars show a perfectly uniform distribution of responses, indicating that the component was not perceived as significantly positive or negative in terms of benefit. The blue bars indicate a positively-skewed distribution, indicating that the component was

perceived as significantly beneficial. Finally, the grey indicate a negatively-skewed distribution, indicating that this component was perceived as significantly unbeneficial.

For a statistically significant deviation from this uniform distribution, however, the null-hypothesis would be rejected, because the frequencies of the higher or lower scores would be greater, indicating a higher (blue bars in Figure 7) or lower (grey bars in Figure 7) appreciation of this specific component, respectively. Finally, based on the resulting χ^2 Test Statistic, an effect size was calculated, which indicates in what magnitude the distribution of scores deviates from a uniform distribution (Allen & Bennett, 2010):

$$w = \sqrt{\frac{\chi^2}{N}}\ (N_{min} = 39) \qquad (1)$$

This Cohenȏs *w* for effect size is not an objective measure, and is subject to different interpretations. In the current research, due to the small population size and resulting large effect sizes, the interpretation by Macbeth, Razumiejczyk, and Ledesma (2011) was adhered:

1. w > 0.3 : Small effect size
2. w > 0.5 : Medium effect size
3. w > 0.8 : Large effect size

Based on these categories, a neutral, positive, or negative distribution, and medium or large effect size (no small effect sizes were found in the current research), the following categories for the perceived benefit of the components was made:

Table 7: An overview of possible categorizations for the components under analysis

Category	Explanation
Very Beneficial	Frequency-distribution deviates significantly from an equal distribution towards **higher** scores, with a calculated effect size **larger than 0.8**

Beneficial	Frequency-distribution deviates significantly from an equal distribution towards **higher** scores, with a calculated effect size **larger than 0.5**
Neutral	The Frequency-distribution **does not deviate significantly** from an equal distribution.
Unbeneficial	Frequency-distribution deviates significantly from an equal distribution towards **lower scores**, with a calculated effect size larger **than 0.5**
Very Unbeneficial	Frequency-distribution deviates significantly from an equal distribution towards **lower scores**, with a calculated effect size larger **than 0.8**

Based on the classifications provided in Table 7, each of the programs components will be classified in terms of benefit for reaching a certain goal, and this will be done for each of the goals of the program separately.

Apart from this categorization of the benefits of the different components for reaching the different goals of the program, the effect sizes calculated with equation **Error! Reference source not found.** will be used as a quantitative measure for a components ability to help reach the goals of the program. In section 3.4, the method for using this quantitative measure to formulate the design principles will be provided.

Next, the method for analyzing the data concerning the experienced difficulty in reaching the goals of the program is provided.

The program goals.

To determine the experienced level of difficulty with reaching the different goals of the program, the respondents were asked to indicate to what extent they experienced difficulty in reaching the different goals, on a 7-point Likert scale, which results in a distribution of scores (from 1 to 7) for the entire population. These distributions were analyzed using two methods:

- Determine whether different levels of difficulty were experienced with reaching the different goals: *Friedman's ANOVA*
- Determine whether the entire population experienced the same level of difficulty with a single goal, or whether there is a distribution of experienced difficulties, potentially because there exist different sub-groups in the population: *Descriptive Statistics*

If, in the first analysis (*Friendman's ANOVA*) it is found that the different goals were not equally difficult to reach, the descriptive statistics (*Histograms of the distributions*) will be used to determine what the distribution of experienced difficulty with each individual goal was among the population. In the following sub-section, the procedure for testing whether the experienced levels of difficulty could be explained by the project characteristics will be provided.

The project characteristics.

For this first analysis, a Linear Regression analysis was performed. Due to the well-known nature and relative simplicity of this type of regression, a concise evaluation of its mechanics will be presented here, based on the book by Andy Field (2009). In the following section, an evaluation will be presented of how the results of this analysis were used.

In linear regression, the relation between an outcome (dependent) variable and several predictor (independent) variables is examined, under the assumption that there exists a linear correlation between the outcome and its predictors. Such a relation is represented mathematically in the following form:

$$y = b_0 + b_1 x_1 + b_2 x_2 \ldots . + b_n x_n + \varepsilon \qquad (2)$$

In equation **Error! Reference source not found.**, *y* is the magnitude of outcome, dependent on the values of the predictor-value x_n, where *n* is the number of predictors. The goal of such an analysis is to determine the values of b_n, called the regression coefficients.

These regression coefficients indicate how strong the influence of the different predictors is on the total outcome. In other words, for each 1-increment in x_i, the value of *y* increases by β_i. This equation is used to build a multiple linear regression model, in which a number of measured data-points is put in, after which a model of regression coefficients $\beta_{(1 \to n)}$ is fitted to this data, constructing a model that describes the given data as good as possible. Finally, an error-term ε is included, indicating to what extent the constructed model deviates from the measured data points.

For the current research, the regression coefficients will be used, representing a measure for the extent to which the different project characteristics increase the experienced difficulty in reaching the goals of the program. The following section will provide the details of this method.

The Design Principles

The design principles represent a set of rules, prescribing which components to include in an internal corporate acceleration program, depending on the circumstances. In the current research, these circumstances are the characteristics that characterize an internal corporate NPD project. Before providing the method for formulating the design principles, an important point of interest requires mentioning:

As was mentioned in the introduction of this report, the current research is an exploratory evaluation, evaluating a program for which no scientific literature exists at time of writing. Hence, no validated scale and instruments are at hands for the analyses, and so instruments had to be created. The result of this situation is that the results of the analyses provide only limited generalizability. Acknowledging this limitation, the current research aims at uncovering a set of design principles that would have been applicable for the current context, and to provide potential insights and directions for future research concerning the topic. Because of this limited generalizability, it was decided to normalize the quantitative results of the statistical analyses. This means that the abilities of the program components to facilitate the reaching of the goals of the program, represent quantitatively by the effect size *Cohen's w*, will be normalized and transformed to a 1-10 scale, in which the highest observed effect size will be 10. The same will be done for the regression coefficients that represent the extent to which the presence of specific project characteristic increases the difficulty of reaching the goals of the program. These too will be normalized and transformed to a 1-10 scale, in which the highest regression coefficient observed will be 10. In doing this normalization, all quantitative results will be relative quantities, used for comparison and analysis within the confinements of the current study.

Having provided the reason and method for the normalization of the results of the statistical analyses, the rationale for formulating these design principles is defined as:

Definition of the Design Principles:

The design principles prescribe a set of program components, based on the characteristics of a specific project in the program.

These characteristics increase the difficulty of reaching the goals of the program, and this increased difficulty is quantified on a scale from 1 to 10. This quantity will be called M.

The program components are there to mitigate this increased level of difficulty. Their ability to mitigate this difficulty is quantified on a scale from 1 to 10. This quantity will be called W.

The higher the increased level of difficulty in reaching a specific goal (M), the higher the need to mitigate this increased difficulty. The better the ability of a specific component to mitigate this increased difficulty (W), the higher the benefit of incorporating this component in a program. Hence, in combining these quantities, the added benefit of including a specific component is determined, for when a specific project characteristic is present. This added benefit will be called B (M x W = B).

Based on the definition provided above, it becomes apparent that two quantitative measures are required for formulating the design principles, which are the negative effect of a specific project characteristic on reaching the goals of the program (M) and the ability of a specific program component to counter this negative effect (W). Before providing the detail on these quantities, it requires mentioning that the actual level of difficulty of reaching a specific goal of the program was not used in formulating the design principles, only the extent to which this difficulty was increased (M) was used.

Formulating the design principles.

The following schema was used to formulate the design principles. In this schema, the four goals of program are labeled as goal *A*, *B*, *C*, and *D*. The increased level of difficulty in reaching goal *A* due to the first project characteristic (out of 8 characteristics) is labeled as $M_{1,A}$, and the ability of the first component (out of 6 components) to mitigate the difficulty in reaching goal *A* is labeled $W_{1,A}$.

Table 8: Schema of steps for formulating the design principles. The negative effects M of the project characteristics on reaching the goals of the program are combined with the positive abilities W of the program components to mitigate these negative effects. The result is the added benefit B of including a component in a personalized acceleration program for a project for which a specific characteristic is present. This is done for all characteristics and components, resulting in a set of design of design for which components to include, depending on which project characteristics are present.

	Step	Measure	Example
1	The negative effects of a project characteristic on the difficulties of reaching the program goals is determined (normalized regression coefficients).	$M_{1,A}$ $M_{1,B}$ $M_{1,C}$ $M_{1,D}$	$M_{1,A} = 3$ $M_{1,B} = 6$ $M_{1,C} = 2$ $M_{1,D} = 8$
2	The ability of a program component to mitigate the difficulties with reaching the different goals is determined (normalized effect sizes.	$W_{1,A}$ $W_{1,B}$ $W_{1,C}$ $W_{1,D}$	$W_{1,A} = 2$ $W_{1,B} = 7$ $W_{1,C} = 8$ $W_{1,D} = 9$

3	For each goal, the value for M is multiplied with the value for W, and the resulting values are summed up to give $B_{1,1}$.	$M_{1,A}$ **x** $W_{1,A}$ + $M_{1,B}$ **x** $W_{1,B}$ + $M_{1,C}$ **x** $W_{1,C}$ + $M_{1,D}$ **x** $W_{1,D}$ = $B_{1,1}$	3 **x** 2 + 6 **x** 7 + 2 **x** 8 + 8 **x** 9 = 136
4	The value $B_{1,1}$ is now the added benefit of including component 1 in a personalized acceleration program for a project that is characterized by characteristic 1. This procedure is now repeated for all characteristics and all components ($B_{1,1}$, $B_{2,1}$, $B_{3,1}$ é $B_{1,2}$ é $B_{8,6}$).		
5	The values $B_{x,y}$ are the basis for design principles. For a specific project, it is determined which project characteristics are present. Next, the total added benefit of a specific component is determined by adding up the values $B_{x,y}$ of this specific component for the characteristics that are present. This procedure is repeated for all components, providing the total added benefit of each component for a project characterized by these specific project characteristics.		
6	The total added benefits of all 6 components are compared, thereby providing the ranking of which components would be most beneficial to include in the personalized acceleration program of this specific project. Furthermore, the time and resources available in the program to the project can now be divided over the different components, according to the ratios of the total added benefits of these components for this specific project.		

Based on the steps shown in Table 8, the final design principles were formulated as follows:

Formulation of the Design Principles:

The personalized acceleration program for a project in an internal corporate accelerator program is constructed by dividing the time and resources available in the program over the different components, according to the ratios of total added benefits of these components. The total added benefits of each component for a specific project depend on the characteristics of this project.

Having provided the design of the research, the methods for collecting the data, the methods for analyzing this data, and, finally, the method for applying the results of this data analysis to formulate the design principles, the actual case used in the current research requires attention, before proceeding to the results of the research.

Case Selection and Composition of the Population

In this section, an argumentation for the selection of both the case and the composition of the population will be provided, along with potential complications that might arise due to the selected population and its composition.

Case selection.

The case selected for the current research is that of the cooperation between Royal Philips N.V. and HighTechXL, a startup accelerator from the Netherlands. The reason for this selection was due to Philips requesting their program to be analyzed. This did not mean, however, that Philips, and this current program, was not an ideal candidate for this case study:

Philips as a company.

As was mentioned in the introduction of the report, the current research concern an internal corporate accelerator program, which is aimed at increasing the innovative capacity of large corporate organizations. Philips is a 125-year-old technology firm, world-famous for its groundbreaking contributions in the areas of lighting, radio-technology, X-ray equipment, and even the development of the Compact Disc (Royal Philips N.V., 2017). Philips employs close to 90.000 people, has operations in over 40 countries, reported a yearly revenue of 24 billion euroȏs in 2016, and is largest filer of patents in Europe, with an annual investment of over 1 billion euroȏs in its R&D (Royal Philips N.V., 2016). Finally, regarding innovative capacity and being adaptive, in the course of its lifetime, Philips went from producing lightbulbs, to consumer electronics, and, in the recent major turnover, decided to solely focus on medical technology. These changes were accompanied by major reorganizations, something Philips is known for as well, providing a constant test of the companyõs ability to adapt (RfB, 2017).

Regarding the information provided above, it can be concluded that Philips is an adequate candidate for a study aimed at analyzing large corporate organizations that rely on constant innovation for their competitive advantage. Now, for the sake of generalizability, Philips is placed in the larger context of the industry it operates in.

The larger context of the industry in which Philips operates

As for the industry that Philips operates in, this is best defined as the Medical Technology Industry. In this industry, Philips is ranked in fourth place based on yearly revenue, only giving way to other well-known Med-Tech giants such as *Medtronic, Johnson & Johnson*, and *GE Healthcare.* Because of the size of the operations of Philips, and the fact that it only produces medical technology, not pharmaceuticals, Philips can be generalized to the context of óMultinational Developer of Medical Technologyô. This delineates the context of Philips, which includes the organizations mentioned above (among others, such as *Siemens)*, but not companies such as *Merck* or *Pfizer* (who mainly produce pharmaceuticals), nor does it include medium- or small-sized companies, such as startups. Finally, it requires mentioning that, although the organizations belonging to the context in which Philips is placed also produce it, producers of exclusively Medical Information Technology (such as *EPIC* and *Chipsoft*, who develop systems for Electronic Patient Records, but also *IBM* with *IBMõs Watson*) are also placed outside of the delineations that make up the context for Philips and its industry.

This delineation of the context in which Philips is placed as an organization is important, because it allows for the definition of the general context of innovation processes in which the innovation processes of Philips can be placed. Johnson & Moultrie (2012) state that the innovation process for developing medical technology is characterized by substantial investment of resources, and, furthermore, requires multi-disciplinary teams, extensive practical research and often timely and costly clinical trials. This brings a great deal of uncertainty into the innovation process, making it a very risky field of New Product Development. These characteristics, however, are exactly some of the complications that accelerator programs, building upon the Lean Startup Methodology aim to solve, making a company that is characterized by such innovation processes (such as Philips) an interesting candidate for the current study.

In terms of limitations of this general context for the current research, it was found that the ότry first and ask for forgiveness laterô credo, often preached to startups, provided complications between the external experts of the accelerator program and the corporate NPD projects in the program. This was because such an attitude is not possible in field of medical technology development, due to the fact the every form of market entry requires strict regulatory approval, such as FDA (Food and Drug Administration) approval, which takes over a year on average to be granted, and over 90% of requests are not granted at all (INVESTOPEDIA, 2015).

Having described the organization used for the current study, and placed this organization in a larger context in an attempt to increase the generalizability of the results, the composition of the population that was analyzed in the current study will now be described.

The composition of the population.

The method that was used for composing the population is best compared to Purposive Sampling, a non-probability sampling method. This section will provide the relevant details for composing the population and the resulting implications of the composition of the population on the research, however, as the actual guidelines are classified, a generalized representation will be provided:

In the current study, the population was composed by the higher management of Philips Research, in which 10 project-teams were selected based on project characteristics such as funding and maturity level of the technology under development. Next, the team-compositions were modified, ensuring that each team was sufficiently diverse, contained strong leadership, had clearly defined roles and responsibilities, and, finally, that each team had realistic goals that could be addressed in the program. The selection process resulted in a population of 10 teams, hosting a total of 47 members.

Despite the fact that, generally, non-probability sampling results in problems with regard to generalization of the results, there are a number of considerations that mitigate these problems, and, furthermore, are actually of help in the current research:

- As was stated, the current research concerns acceleration programs for large, innovative, corporate organizations. The members of the current population, consisting of employees of Philips Research, therefore, are a fair representation of employees working for such organizations, being highly-educated, working for a large multinational organization that operates in a technological industry, and in the area of New Product Development.
- Due to the selection requirements and modifications of the team-compositions mentioned above, the influence of parameters related to the team-composition is limited, because they are artificially brought to comparable compositions (for details, the reader is referred to Appendix C). This means that the results from the data will be dominantly shaped by parameters external to the teams, such as type of technology that is developed and whether the technology is a technology-push or a market-pull.

The distribution of the project characteristics among the population that was analyzed in the current study is shown in Table 17, in Appendix C.

Finally, regarding potential complications due to the composition of the population, it requires mentioning that one team, team 7, was based in Asia, contrary to the other teams that were all based in Western-Europe, which is a factor to be accounted for, because the current research will assess perceptions of the members of the population, which might be culturally-influenced. Furthermore, the small population size (*N=41)* introduces complications regarding generalizability, and complicates the finding of significant correlations during the statistical analyses. The full set of complications with the current research is provided in Chapter 5 of this report.

Having provided an overview of the Research Design, Data Collection & Analysis methods, and the variable selection and method for constructing the final framework, the following chapter will provide the results of the current research and their discussion.

Results & Discussion

In this chapter, the results of the current research, and their discussion will be presented. After providing an initial summary of the results, an in-depth analysis of these results will be presented, answering the (sub-)research questions stated in the first chapter of this report.

The following section, the overview of the results, will provide a comprehensive but concise representation of the results, after which, in the subsequent sections, a more detailed representation of the results will be provided. The main questions to be answered in this chapter are:

Empirical Research Questions:

1. *What is the appreciation of the components of the program regarding their capability to help reach the goals of the program?*
2. *What are levels of difficulty experienced in reaching the goals of the program across the population?*
3. *Can the distribution of the project characteristics across the population explain the distribution of the experienced level of difficulty with reaching the goals of the program across the population?*
4. *Given a set of project characteristics, which program goals are expected to be more difficult to reach, and which program components can be offered to properly mitigate this increased level of difficulty.*

After providing these results, the scope of the analysis will, as was mentioned before, change from the meso-level (the accelerator program) to the macro-level (the influence of the acceleration program on the larger organization).

Overview of the Results

In this section, a summary of the results of the research will be provided. For the sake of clarity and consistency, the schema shown in Table 6 will be copied, and the actual results will be filled in. The summary of the results answering the first 3 questions from the box above is provided in Table 9. The answer to the fourth question, regarding the design principles will be provided after this table.

Table 9: Summary of the results of the research

<table>
<tr><th>Questions</th><th>Analysis</th><th>Result</th></tr>
<tr><td>Question 1:
Are some components of the program appreciated as more beneficial for reaching the goals of the program than others?</td><td>Chi-squared Goodness of Fit Test</td><td>Yes, the following components were found to be appreciated significantly better than the other components:
1. Coaching & Mentoring (CM)
2. Networking Opportunities (NE)
3. Autonomous Validation (AV)</td></tr>
<tr><td>Question 2:
Is the same set of components appreciated better for all the different goals of the program, or are there different sets of appreciated components for the different goals?</td><td>Chi-squared Goodness of Fit Test</td><td>The appreciation of the components varied from goal to goal. These were the orders of appreciation (scores in parentheses) of the components for each goal:
1. <u>Problem / Solution Fit:</u>
AV (7.6) > CM (4.3) > NE (0.0)
2. <u>Solution / Market Fit:</u>
AV (10) > CM (4.3) > NE (0.0)
3. <u>Business Model / Market Fit:</u>
CM (6.9) > AV (6.8) > NE (0.0)
4. <u>Project / Organization Fit:</u>
NE (7.0) > CM (5.4) > AV (0.0)</td></tr>
<tr><td>Question 3:
Are there significant differences between the experienced levels of difficulty in reaching the different goals, and what are the distributions of the experienced levels of difficulty with reaching each individual goal among the population?</td><td>Friedmanôs ANOVA

Descriptive Statistics</td><td>Statistically significant different levels of difficulty were experienced with reaching the different goals of the program. The goals ranked from most to least difficult to reach:
1. Project / Organization Fit
2. Solution / Market Fit
3. Business Model / Market Fit
4. Problem / Solution Fit

Furthermore, the experienced levels of difficulty among the population were strongly distributed over the possible scores, indicating that the population could not be treated as a single homogeneous group in terms of experienced difficulty in reaching the goals.</td></tr>
<tr><td>Question 4:
Can the experienced levels of difficulty with reaching the goals of the program be explained by the distributions of the project characteristics among the population?</td><td>Linear Regression</td><td>The table below shows which project characteristics were found to increase the difficulty in reaching which goals, and, furthermore, what the magnitude (M) of this increase in difficulty was:
<table>
<tr><th>Characteristic</th><th>Goal</th><th>M</th></tr>
<tr><td>Project Origin:
Technology-Push</td><td>Problem / Solution Fit</td><td>6.4</td></tr>
<tr><td rowspan="2">Technology Configuration:
Additional Infrastructure required</td><td>Problem / Solution Fit</td><td>10</td></tr>
<tr><td>Project / Organization Fit</td><td>6.7</td></tr>
<tr><td>Business Unit Exists:
No</td><td>Project / Organization Fit</td><td>5.5</td></tr>
<tr><td>Backed by Business Unit Upfront:
No</td><td>Project / Organization Fit</td><td>4.9</td></tr>
</table></td></tr>
</table>

As is shown in Table 9, only three program components and four project characteristics came out of the statistical analyses. Hence, the added benefit of the components depending on which project characteristics are present, which is the basis for the design principles, are shown below.

Table 10: Schema showing the design principles, indicating what relative added benefit can be obtained by including a component in a personalized acceleration program of a project characterized by a specific set of characteristics.

	Coaching & Mentoring	Networking Opportunities	Autonomous Validation
Project Origin: *Technology-Push*	28	0	49
Technology Configuration: *Additional Infrastructure Required*	79	47	76
Business Unit Exists: *No*	30	39	0
Backed by Business Unit Upfront: *No*	27	34	0

Having provided a concise summary of the results of the current research, the following sections will provide the details of these results, as well as an initial discussion of these results. For the full details of these discussion, the reader is referred to Appendices D and E.

The Appreciation of the Program Components

In this section, the program components will be categorized in terms of benefit for reaching the different goals, according to the method provided in section 0. These results are shown in Table 11. The section is concluded with an overview of the components that were positively appreciated for their abilities of reducing the difficulty experienced in reaching the goals of the program, as well as the quantitative measures for these abilities, which will be used in later sections to formulate the design principles.

The appreciation of the components for the different goals.

Table 11: Categorization of all components in terms of their benefit in reducing the difficulty experienced with reaching the different goals of the program.

Goal/ Category	Problem / Solution Fit	Solution / Market Fit	Business Model / Market Fit	Project / Organization Fit
Very Beneficial	Autonomous Validation	Autonomous Validation	Coaching & Mentoring Autonomous Validation	Networking Opportunities
Beneficial	Coaching & Mentoring	Coaching & Mentoring		Coaching & Mentoring
Neutral	Networking Opportunities Program Curriculum	Networking Opportunities	Networking Opportunities Program Curriculum	Autonomous Validation
Unbeneficial	Support Services	Shared Office Space Support Services Program Curriculum	Support Services	Support Services Program Curriculum
Very Unbeneficial	Shared Office Space		Shared Office Space	Shared Office Space

The results presented in Table 11 show a clear preference for a number of components, and, furthermore, a trend in these preferences for the three external fits (*Problem / Solution*, *Solution / Market, and Business Model / Market*). The observed difference in preferences between this set of goals and the final goal (*Project / Organization Fit*) confirms the previously mentioned categorization of the fits between the project and an environment external to the organization (the market) and between the project and the internal environment of the organization. A detailed discussion of the results shown in Table 11 is provided in Appendix D.

Having provided the varying levels of perceived benefit of the different components, the following sub-section provides an overview of the components that were found to be significantly more beneficial than the others, as well as the quantitative measure representing their ability to reduce the experienced level of difficulty in reaching the goals of the program.

Quantitative measures for the best-appreciated components.

Table 12: Overview of the quantitative measures for the relative abilities of the most beneficial components in reducing the difficulties in reaching the different goals of the program (on a scale from 1 to 10).

	Problem Solution	Solution Market	Business Model Market	Project Organization
Coaching & Mentoring	4.3	4.3	6.8	5.4
Networking Activities	0	0	0	7.0
Autonomous Validation	7.6	10	6.8	0

Table 12 shows, for example, that the component *Coaching & Mentoring* reduces the difficulty in reaching the *Problem / Solution Fit* and the *Solution / Market Fit* to the same extent, and, furthermore, that the component *Autonomous Validation* is more than twice as capable of reducing the difficulty in reaching the *Solution / Market Fit* as the component *Coaching & Mentoring*.

Having provided the results, and the interpretation of these results, of the appreciation of the components for reaching the different goals of the program, and having provided the selection of the most beneficial components to be used in the remainder of this chapter, the following section will provide the results on the experienced levels of difficulty in reaching the goals of the program.

The Difficulties in Reaching the Goals of the Program

In the previous section, it was shown that some of the components were appreciated better than others in terms of their ability to reduce the difficulty in reaching the goals of the program. Next, it was shown that not only the appreciation between the different components differed, but, furthermore, that also the appreciation of a specific component was different for the different goals. This latter difference brought forward the need to analyze the experienced levels of difficulties with reaching the different goals, with three possible outcomes:

1. All goals were equally difficult to reach. This means that the different goals can be treated as one single goal (the goal of the program), and the aforementioned difference in appreciation of a specific component for the different goals no longer matters. All positively-appreciated components should be prescribed by the design principles
2. Some goals were significantly more difficult to reach than others, and these levels of difficulty were experienced by the entire population, meaning that the entire population could be treated as a single homogeneous group. In this case, only the components that were positively-appreciated for the goals that were difficult to reach should be prescribed by the design principles.
3. Not only were the difficulties to reach the different goals significantly different, there was also a strong distribution in the experienced levels of difficulty with reaching each specific goal, meaning that the population could not be treated as a single homogeneous group.

The difference between the difficulties in reaching the program goals

In order to determine which of these three possibilities was the case, the data concerning the difficulties in reaching the goals was analyzed, and the distributions of the responses of the population for all four goals is shown in the figure below:

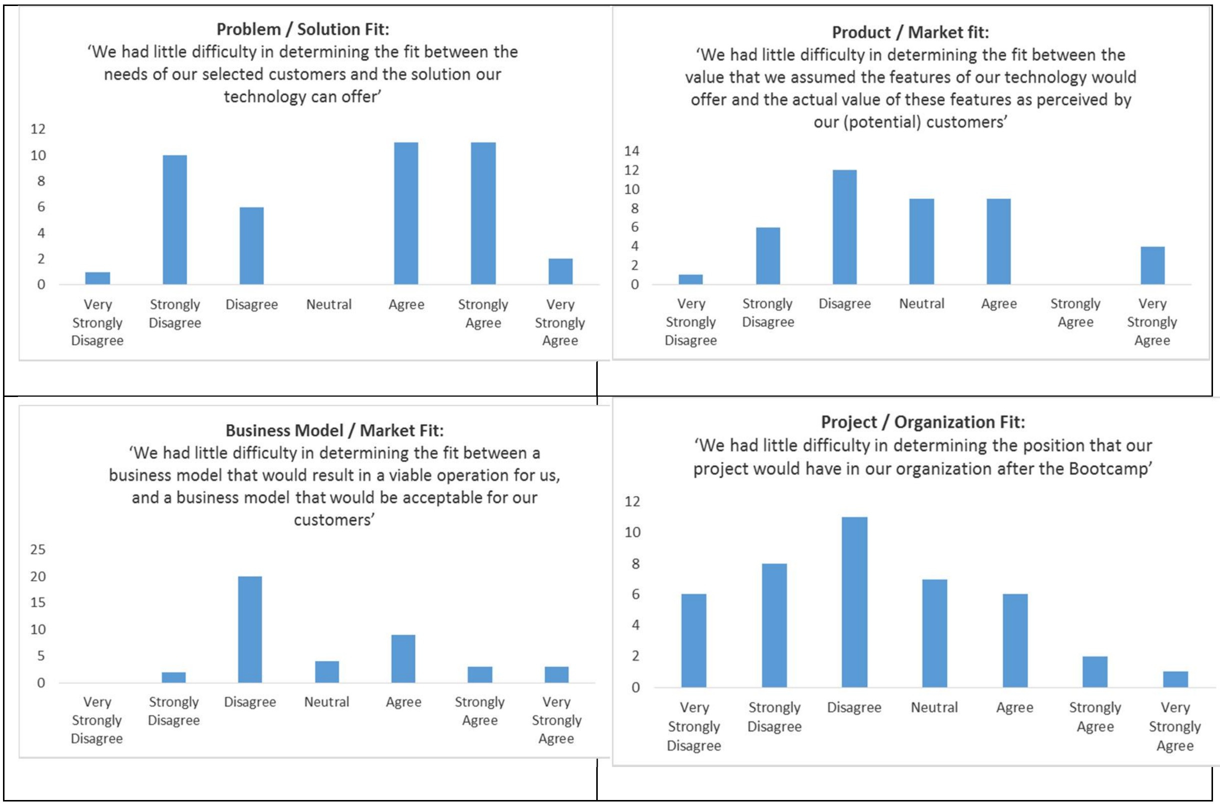

Figure 8: The distributions of the responses of the entire population regarding the levels of difficulty they experienced in reaching the goals of the program

In order to compare these distributions, the non-parametric *Friedmanôs ANOVA* was used, due to the fact that none of the distributions is normally distributed or meets the requirements for parametric analysis. The results of this test showed that the distributions of the experienced levels of difficulty with reaching the different goals of the program varied significantly:

Table 13: Results of the Friedmanôs ANOVA, analyzing the distributions of the experienced levels of difficulty with reaching the goals of the program. The results shown are significant at the Bonferroni-adjusted ***Ǔ*** *= 0.008.*

Test statistics		Goal	Mean rank
χ^2_F	12.139	*Problem / Solution Fit*	2.82
df	3	*Solution / Market Fit*	2.48
N	41	*Business Model / Market Fit*	2.70
p	0.007	*Project / Organization Fit*	2.00

As can be observed in Table 13, the significantly different levels of difficulty were experienced with reaching the different goals. The *Project / Organization Fit* was experienced as most difficult, and the *Problem / Solution Fit* as least difficult (also, pair-wise comparisons of the distributions showed that only the distributions of these two goals differed significantly, for the other comparisons no statistically significant differences were found).

The distribution of experienced levels of difficulty for a specific goal.

Having shown that the experienced levels of difficulty differed over the different goals, the question remained what the distributions of scores were for the individual goals. Because of small popluation (*N=41)*, it would have been difficult to find a normally distributed distribution, even when the entire population experienced comparable levels of difficulty with a specific goal. Hence, the only possible method of analysis was the visual inspection of the histograms in Figure 8. Based on these distributions, it cannot be concluded that the entire population experienced comparable levels of difficulty with a specific goal, and, hence, that the population could be treated as a homogeneous group concerning the experienced level of difficulty with reaching the goals of the program.

Therefore, having provided the results of the experienced levels of difficulty with reaching the goals of the program, the following section will provide the results of the analysis of whether the experienced levels of difficulty in reaching the goals among the population could be explained by the distribution of project characteristics among the population?

The Influence of the Project Characteristics on the Experienced Levels of Difficulty with Reaching the Goals of the Program

Having shown which program components were positively appreciated, which goals of the program were most difficult to reach, and the fact that the experienced level of difficulty with reaching a specific goal varied throughout the population, this section will provide the results of the analysis on whether the experienced levels of difficulty could be explained by the distribution of project characteristics among the population.

In performing the Linear Regression, as shown in Chapter 3, a number of statistically significant correlations were found between the project characteristics and the experienced level of difficulty with reaching the goals of the program. The relevant project characteristics were found to be:

- *Project Origin:* Technology-Push or Market-Pull.
- *Technology Configuration:* Stand-alone or Platform Technology, and the requirement for additional infrastructure.
- *Organizationôs Portfolio:* Whether a Business Unit exists that fits the technology under development, and whether a project already backed by an existing Business Unit upfront.

Furthermore, these project characteristics were found to have statistically significant correlations with the following two goals:

- *Problem / Solution Fit*
- *Project / Organization Fit*

The correlation model that summarizes the results of these analyses is shown in Figure 9. The sub-section after this figure will provide an interpretation of these results.

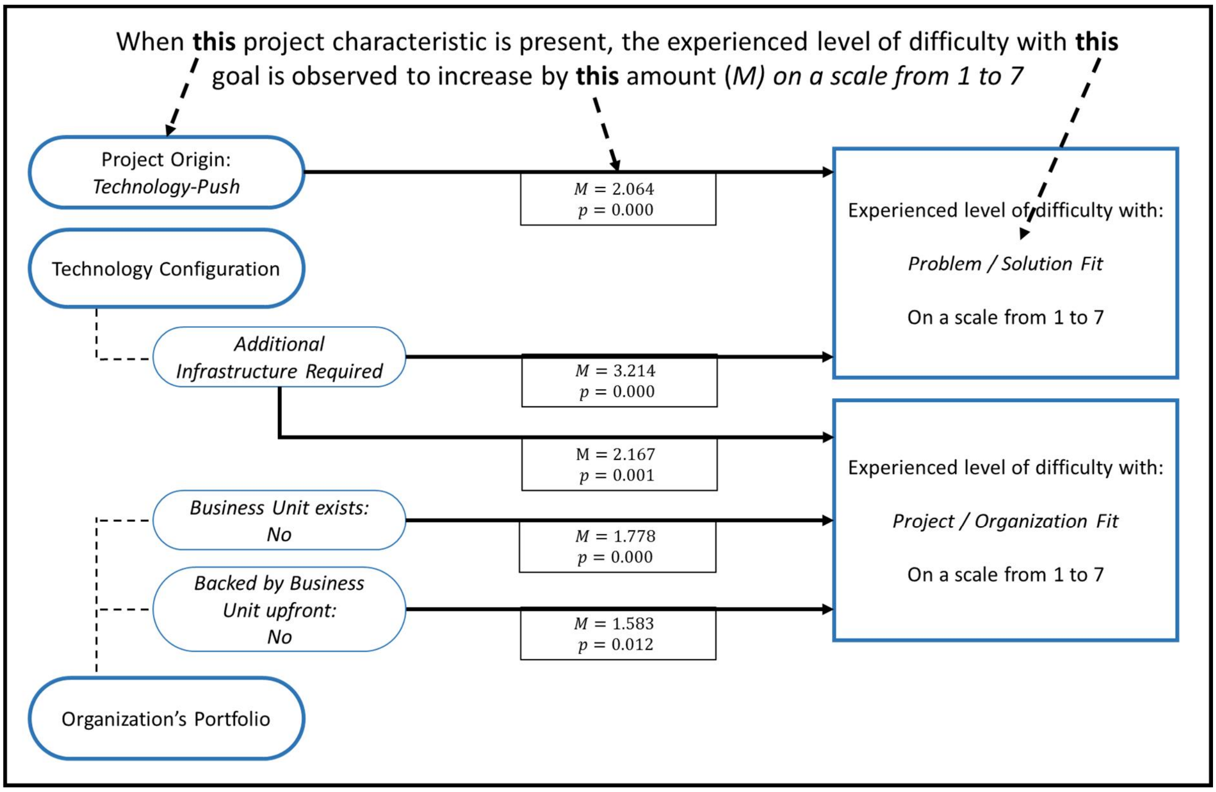

Figure 9: Final correlational model, showing the influence of the Project Characteristics on the ability to reach the goals of the program. The correlations are indicated with the black arrows, where M indicates the magnitude of the regression coefficient, and p the significance of this correlation.

Interpreting the influences of the project characteristics on the goals.

The influence of the project characteristics on reaching the Problem / Solution Fit.

As is shown in Figure 9, a project that finds its origin in a *Market-Pull* is far more likely to reach a satisfying fit between the problems in the market and what the technology should look like to solve these problems than a *Technology-Push (M=2.064, p=0.000)*. This is an expected result, because, in a *Market-Pull,* a technology is developed to answer an existing and explicit problem brought forward by the market, thereby knowing which threshold capabilities and features the technology should encompass. In a *Technology-Push*, however, technology is developed on the assumption that some demand is present or will arise. It is, however, often far from clear what the exact problem to be answered is, and, therefore, it is difficult to construct a technology to answer these problems.

The results of the statistical analysis also shows that a project developing a technology that is *stand-alone*, that is too say, a technology that doesnŏt require additional (external) infrastructure to function, is far more likely to reach a satisfying Problem / Solution Fit than a project with a technology that does require this infrastructure (*M=3.214, p=0.000*). This requirement for additional infrastructure was a very strong factor in one of the projects observed in the current study (Project 6). The technology under development in this project clearly answered a strong problem brought forward by the target market, however, this was only halve of the story. The technology under development proved very capable of giving warnings regarding the condition of certain patients, which was indeed what was expected of the system, however, following this warning, action was required. Neither Philips nor the target market had the required infrastructure in place to execute this action at that point in time, nor was developing this infrastructure something that fitted the Philips portfolio. Hence, despite a project being characterized as a *Market-Pull*, thereby making it a valid assumption that the Problem / Solution Fit could be found with relative ease, complications may still arise if the problem brought forward by the target market is answered in terms of technological features and capabilities, but the implementation of this solution is complicated due to, in this case, the requirement for currently non-existent infrastructure.

The influence of the project characteristics on reaching the Project / Organization Fit.

Figure 9 suggests that projects developing a technology for which a business unit already exists have a far greater chance of determining a suitable *Project / Organization Fit* (*M=1.778, p=0.000)* . This advantage, however, is completely annihilated when the project in question requires additional infrastructure from this Business Unit for the technology to be implemented (*M=2.167, p=0.001*). Furthermore, the chances of determining a suitable fit are even further extended when a project is already backed by a Business Unit when entering the program (*M=1.583, p=0.012*). This is an expected result, and, therefore, this parameter might seem to be redundant. However, being backed by a Business Unit does not mean that the ideal *Project / Organization Fit* is also already determined. It only means that the Business Unit is willing to fund the further development of the technology, meaning that efforts to align the project characteristics and the characteristics of the Business Unit are still desirable before the actual incorporation of the technology into the Business Unitøs portfolio.

The quantitative measures for the project characteristics.

As was mentioned in Chapter 3, the results of the Linear Regression provided above would be normalized. The results of this procedure, and, furthermore summary of the results of this section, is provided in Table 14:

Table 14: Overview of the negative influences of the project characteristics on the ability to reach the goals of the program, as well as the magnitude of these influences for the project characteristic ï program goal couples that were identified as statistically significant in the figure above.

The following project characteristics	Increase the difficulty in reaching the following goals	By the relative amount M (on a scale from 1 to 10)
Project Origin: *Technology-Push*	Problem / Solution Fit	6.4
Technology Configuration: *Additional Infrastructure required*	Problem / Solution Fit	10
	Project / Organization Fit	6.7
Business Unit Exists: *No*	Project / Organization Fit	5.5
Backed by Business Unit Upfront: *No*	Project / Organization Fit	4.9

Having provided the appreciation of the components, the experienced levels of difficulty with the goals of the program, and, finally, showed what the influences of the project characteristics were on the abilities to reach the goals of the program, the following section will provide the resulting design principles, based on these results.

Formulating the Design Principles

In the previous sections, all the required elements for constructing a set of personalized design principles were found. Now, as was mentioned in Chapter 3, the quantitative measures for the abilities of the components to reduce the difficulty in reaching the goals of the program will be combined with the quantitative for the increase in this difficulty due to the presence of the project characteristics. This procedure resulted in the results shown in the table below:

Table 15: Overview of the total relative added benefits of each component, given that a project characteristic is present. These values for the total relative added benefit are used for formulating the design principles

	Coaching & Mentoring	Networking Opportunities	Autonomous Validation
Project Origin: *Technology-Push*	28	0	49
Technology Configuration: *Additional Infrastructure Required*	79	47	76
Business Unit Exists: *No*	30	39	0
Backed by Business Unit Upfront: *No*	27	34	0

This table/matrix provides the basis for the set of design principles for constructing personalized internal corporate acceleration programs. Upon constructing a personalized acceleration program for a specific project, the following steps are to be taken:

The Design Principles:

1. *Assess which characteristics characterize the specific project.*
2. *Add up the added benefits from Table 15 of each component from the rows of project characteristics that were found to be present to determine the total added benefit of each component*
3. **(If the design principles are used for selection purposes):**
   Determine the total added benefit of all components combined for this specific project, and decide whether it is sufficiently beneficial to include this specific project in the internal corporate acceleration program.
4. *Construct the final personalized internal corporate acceleration program for this project by dividing the available time and resources over the different components, according to the ratios of the total added benefit of this components.*

Having provided the required elements for constructing the design principles, and the design principles itself, in the following sub-section these design principles will be applied to the projects in the population of the current research, in order to provide a practical example of the use of the design principles.

Applying the design principles to the projects in the current study

The table below shows the results of applying the design principles to the project in the current research.

Table 16: Results of applying the design principles on the current population. The table shows the relevant characteristics of each project and, based on these characteristics, what their optimal personalized acceleration program would be. Finally, the total relative benefit to be obtained from this program is shown in the final column.

Project	Project Origin	Additional infrastructure required?	Business Unit exists?	Backed by Business Unit upfront?	**Personalized program** *(added benefit per component)*	**Total added benefit**
1	Push	No	Yes	No	1. CM (55) 2. AV (49) 3. NE (34)	138

2	Push	No	Yes	No	1. CM (55) 2. AV (49) 3. NE (34)	138
3	Pull	No	Yes	No	1. NE (34) 2. CM (27) 3. AV (0)	61
4	Pull	No	Yes	No	1. NE (34) 2. CM (27) 3. AV (0)	61
5	Pull	No	Yes	No	1. NE (34) 2. CM (27) 3. AV (0)	61
6	Pull	Yes	Yes	No	1. CM (106) 2. NE (81) 3. AV (76)	263
7	Push	No	Yes	Yes	1. AV (49) 2. CM (28) 3. NE (0)	77
8	Pull	No	No	No	1. NE (73) 2. CM (57) 3. AV (0)	130
9	Push	No	No	No	1. CM (85) 2. NE (73) 3. AV (49)	207
10	Push	No	Yes	No	1. CM (55) 2. AV (49) 3. NE (34)	138

Based on the results shown in Table 16, a number of conclusions can be drawn from applying the design principles to the actual case studied in the research:

- The design principles indeed prescribe different personalized acceleration programs for the different projects.
- Some of the components that were found to be beneficial don’t offer any added benefit for specific project (*Autonomous Validation* offers an added benefit of 0 for *Project 3)*

- There is significant difference in the total added benefit to be obtained from partaking in the internal corporate acceleration program. *Project 6* stands to gain the most added benefit (263), *Project 3, 4, and 5* the least (61). This also means that, when using these design principles for selection purposes, *Project 6* would be the first to be selected, the other 3 projects last.

The Implications for the Larger Organization

As was stated in the introduction of this report, organizing the internal corporate accelerator was not solely aimed at progressing the individual projects at an accelerated pace. It was, also, organized with further strategic intentions. By providing such an open and experimental environment for the teams, a sense of empowerment arises, which the senior management of Philips Research hopes will drive a bottom-up cultural change, towards a bottom-up implementation of Lean Principles among the participating teams. In this section, therefore, an evaluation of whether the aforementioned barriers to the implementation of Lean have been overcome during the current internal corporate accelerator program.

Based on the identified barriers by Albliwi et al. (2014) and Bhasin & Burcher (2006), that were provided in the Literature Review chapter, a set of generalized barriers that can be overcome with such an internal corporate acceleration program was composed. It does, however, first require mentioning that one of the major barriers identified by the researchers mentioned above is insufficient funding, or costs, and that this barrier is near-impossible to circumvent in organizing such a program properly, especially due to the collaboration with the external partner (the accelerator).

Lack of commitment from senior management

The problem with commitment from senior management in implementing an organization-wide Lean Methodology often lies in directing time and dedication from senior management, as well as the organizationôs resources, to this transformation, whilst keeping essential core operations running (Aboelmaged, 2011).

The current internal accelerator program, however, requires only minimal input from senior management, because the program is organized by a dedicated program team from Philips, in collaboration with the program team of the accelerator itself. In doing so, senior management can be committed throughout the program by evaluating the result of the program and playing a key role during the Demo Day, without dedicating large portions of their time to the program. Furthermore, this single program requires only a minor dedication of resources, and, therefore, multiple programs in time can be used as a step-wise implementation method, which can be terminated when the benefits no longer outnumber the costs.

Lack of training for employees

The lack of training often arises due to the costs related to this training, however, this lack of training was identified as the second-most critical factor in the failure of Lean implementation (Albliwi, Antony, Lim, & van der Wiele, 2014). As was stated in the introducing paragraph of this section, these costs are difficult to avoid, however, efficiency of the training can be increased by deviating from a classroom-only training approach.

In the current program, the training is covered in the Program Curriculum, as composed by the acceleratorôs program team. The vast advantage of the current program is that the training is not only theoretical, consisting of classroom education on Lean Principles, but also forces the teams to immediately implement the new knowledge and skills in their validation efforts. This playground-like setup establishes a crucial theory-practice combination, which increases the effect and efficiency of employee training (Jacobs, 2003).

Lack of employee engagement and resistance to cultural change

In their analysis of two subsequent attempts to implement Lean, with the first resulting in failure, whilst the second attempt proved successful, Scherrer-Rathje et al. (2009) identify employee engagement and resistance to cultural change, linked to lack of team autonomy, as a major barrier for successful implementation of Lean.

In the current program, however, a bottom-up approach was chosen, providing the teams with a substantial amount of autonomy, thereby realizing a relatively strong level of engagement. It did, however, prove to be exceptionally difficult to establish real cultural change, due to the confidentiality regulations of the larger organization. Despite of the increased level of autonomy of the teams, real Lean operations, such as rapid Build-Measure-Learn loops (Marchisio, 2010), were not possible due to these regulations. Furthermore, the Lean Startup principles related to Rapid Prototyping (or MVP) and Fast Decision Making found substantial resistance due to the dominant notion that speed of these activities would be annihilated due to the sluggishness of the larger organization.

Lack of leadership and Lean skills among leadership

Apart from the commitment required from senior management on a strategical level, an actual implementation procedure also requires execution, which comes down to lower levels of management having to realize this change. However, the lack of leadership skills and lack of Lean skills, resulting in a lack of credibility in an organizational transformation (Bhasin, 2012), make up another barrier.

This is where the collaboration with the external accelerator was of great value. In mentoring the teams through the Lean operations, and providing workshops and lectures on the Lean concepts, the experienced entrepreneurs from the accelerator established sufficient credibility in terms of leadership and Lean skills. Furthermore, Philips itself made use of the potential of its middle managers by appointing credible managers with knowledge of and experience in Lean operations, thereby establishing another source of leadership and required skills, making these managers intermediaries of the required change (Balogun, 2003). This appointment of experienced managers was possible due to the limited size of the operation, which means that the same procedure, or even same managers, can be used for any subsequent programs.

Lack of awareness of the benefits of Lean

In a large organization, the implementation of Lean principles can have great advantages, however, when those advantages or not experienced by its employees, the successful implementation of the methodology can be complicated (Martinez-Jurado & Moyano-Fuentes, 2012). This observation is strongly linked to the third paragraph in this section, concerning employee engagement, because engagement to an activity of which the benefits do not reveal themselves is difficult.

This is where the short-term accelerated nature of the program, alongside the provided autonomy and push for autonomous validation, proved its value. By applying activities related to the Build-Measure-Learn loop (Marchisio, 2010), such as validations of assumptions in the target market on a high pace (often multiple interviews with potential customers or experts per week), the teams were able to observe the benefits of the Lean Principles, such as Validated Learning, Pivoting, and Acceleration (Ries, 2011) in real-time.

Lack of understanding of the existence of different customers

Many product introductions result in disappointing returns, because the product did not meet the customerôs demands, often due to the lack of realization that different customers value different functionalities (Matzler & Hinterhuber, 1998). It is therefore that realization that continuous Lean operations require continuous customer discovery and validation (Trimi & Berbegal-Mirabent, 2012). At the current organization, this activity of customer discovery and validation was often perceived as a single step, or phase, instead of a continuous loop, identifying other customer segments, or adapting to changes in customer demands.

In the current program, however, the teams were given lectures on the existence of different customers and their different needs, and applied the Business Model Canvas (Osterwalder & Pigneur, 2010) and Value Proposition Canvas (Osterwalder, 2014) to these different segments in workshops. Furthermore, the teams actively validated their assumptions with their potential target customers, and were confronted with the results of these activities each week in the weekly mentoring sessions. In these sessions, chaired by the experienced entrepreneurs-in-residence of the accelerator, and, sometimes, experienced employees from within Philips itself, the teams had to present the results of their validation activities, and the critical analysis of the mentors helped determine whether a validation applied to all different customer segments, or just a single customer. With this method, a realization of the existence of different customers, and that these different segments require different offerings, was established among the teams.

Having provided an evaluation of how the internal corporate acceleration program can be used as a vehicle to overcome six of the major barriers to the successful implementation of Lean Principles in large organizations, one could come to the conclusion that organizing such a program is a good method for implementing Lean Principles in large organizations. However, it must not be overlooked that the strength of this program for this particular application is also its weakness, being its size. The limited size of this program allows for a relatively low-risk operation, and provides proper concentration and dedication of attention to its members, however, the program hosted less than 100 members, out of the 8.000 employees that this department of Philips, Philips Research, has.

It is therefore that the step-wise implementation procedure, as mentioned in the previous paragraphs, where multiple, subsequent, programs are run at different locations, as

Philips is currently doing, could offer a solution to the size-problem. By organizing a large number of different program over the span of multiple years, a true bottom-up cultural change, characterized by the implementation of the Lean Principles of the program, can be achieved. This strategy is comparable to organizational change originating from a Community of Practice, where all of the program cohorts combined form the COP, which is strong vehicle for change in modern organizations (Wenger & Snyder, 2000).

Having provided all of the results of the current research, and their discussion, the resulting conclusions will now be provided in the following chapter.

Conclusions

In this chapter, the conclusions and limitations of the study will be provided.

Conclusions

This report set out to provide an answer on the question of whether the standard format of a startup accelerator program would transfer well to an internal corporate accelerator program, and, when this was proven to not be the case, it was shown how this format could be adapted for internal corporate purposes by answering the three empirical research questions of the study. The first question was concerned with whether the components of this standard startup accelerator format would reduce the difficulty in reaching the goals of an internal corporate accelerator program, and it was shown that only half of the components in fact did so. The second question was what the actual levels of difficulty in reaching the goals of such a program were, and it was found that there was a strong distribution in the experienced levels of difficulty with reaching the goals by the population that was analyzed in the current study. The third and final question concerned whether this observed distribution in the levels of experienced difficulty could be explained by the characteristics that characterize internal corporate New Product Development projects, and it was found that this was indeed possible for some of the goals.

The results of these analyses were combined to formulate a set of design principles, which could be used to determine which components to include in a personalized internal corporate accelerator program, depending on the characteristics of a specific project in the program. Furthermore, it was shown how the design principles could be used to determine the proper division of time and resources over these components in the program. Finally, it was argued that the principles could be used for selection purposes, to select only those projects to partake in an internal corporate accelerator program that would stand to gain the most benefit from such a program. After formulating the design principles for such programs, it was argued that these internal corporate accelerator programs could be used as a vehicle for introducing improvements to the regular New Product Development processes of corporate organizations.

In conclusion, the objective of the research was met, building on the research questions, which were answered. The design principles that were set out to be identified were successfully composed, allowing for the composition of personalized acceleration programs for internal corporate NPD teams, based on their specific characteristics.

Having provided the conclusions of the research, the limitations encountered in the current research are provided below.

Limitations

The first limitation encountered was the lack of scientific literature covering the specific topic of interest. To overcome this problem, theory and concepts were collected from adjacent topics, which provided the necessary concepts used in the study. Suggestions for dealing with this complication in future work are scarce, because it is simply giving the field time to mature and expand the body of work.

The second limitation is also related to the results of the literature review of this research. As was mentioned in Chapter 2, the project characteristics included in the current research were selected on the basis of which characteristics were measurable in the context of the current study. In case a longer period of time had been available for the study, or a higher level of access in the organization was granted during the study, potentially a different set of characteristics would have been used. Hence, the boundaries in terms of time and access make it impossible to conclude that this set of variables is the general set of variables to be used for research in this field, thereby vastly limiting the generalizability of the results. This limitation, however, was known from the start, and, therefore, the study was set up as the initial exploratory evaluation that was presented in this report. The results, therefore, are a valuable source of initial insights in the field, and could provide directions for future research on the topic.

The third limitation also originated from the novelty of the topic and the absence of existing scientific literature (and also the limited time available for the study). Because of the absence of benchmarks in the body of literature, no tested and validated instruments or scales of measurement were available for collecting the data in the study. Hence, new and original instruments and scales had to be developed, without the possibility of testing or validating these them. This limits the validity of the results of the study, because different results might have been found when others instruments or scales were used. It is, therefore, proposed that the study is repeated in future research, with a different set of scales and instruments, to assess the validity of the current study.

The fourth limitation is related to the generalizability, originating from the population and organizations used in the study. Firstly, the lack of diversity between the teams, all originating from the Philips organization, makes it difficult to state that the results are transferrable to others organizations, and, furthermore, because all projects in the population operated in the medical industry, the same applies for generalization to other industries. Finally, having looked at only a single accelerator organization, the perceived benefits of the components are strongly influenced by the quality of the components in this specific accelerator. Because of these limitations, the researcher strongly suggests to expand the population in future studies, incorporating a variety of organizations, from different industries, and comparing different accelerator organizations.

The fifth limitation came from the size of the population. Initially, a conceptual model was developed, which was to be tested in the research. The model consisted of independent variables (the project characteristics), intermediate variables (the goals of the program), and, finally, dependent variables (the components of the program). However, no statistically significant correlations were found for this model, and it is difficult to conclude whether these correlation indeed do not exist, or whether the size of the population was too small to make these correlations statistically significant. However, because this was an initial exploratory evaluation, aimed at providing initial insights and directions for future research, the improvised, far less generalizable method of analysis used in the current research was developed, in order to at least provide some tentative insights and future directions on a topic that was never studied before. Furthermore, the size of the population itself also limits the generalizability of the results. Suggestions for future research, in line with the suggestion mentioned above, are increasing the population size.

References

Aboelmaged, M. (2011). Reconstructing Six Sigma barriers in manufacturing and service organizations: the effects of organizational parameters. *International Journal of Quality & Reliability Management, 28*(5), 519-541.

Adkins, D. (2011). What Are the New Seed or Venture Accelerators? *NBIA Review, 27*(1), 3.

Aernoudt, R. (2004). Incubators: Tool for Entrepreneurship? *Small Business Economics, 23*(2), 127-135.

Albliwi, S., Antony, J., Lim, S., & van der Wiele, T. (2014). Critical Failure Factors of Lean Six Sigma: A Systematic Literature Review. *International Journal of Quality and Reliability Management*, 1012-1030.

Allen, P., & Bennett, K. (2010). Non-Parametric Procedures. In P. Allen, & K. Bennett, *PASW Statistics by SPSS; A Practical Guide* (pp. 223-278). Melbourne: Cengage Learning Australia.

Anderson, P., Tushman, M., & O'Reilly, C. (1997). *Technology Cycles, Innovation Streams and Ambidextrous Organizations.* New York: Oxford University Press.

Antoncic, B., & Hisrich, R. D. (2003). Clarifying the intrapreneurship concept. *Journal of small business and enterprise development, 10*(1), 7-24.

Baccarini, D. (1999). The Logical Framework Method for Defining Project Success. *Project Management Journal, 30*(4), 25-32.

Balachandra, R., & Friar, J. (1997). Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework. *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT, 44*, 276-287.

Balachandra, R., & Raelin, J. (1984). When to kill that R&D project. *The Journal of Science Policy and Research Management, 17*, 30-33.

Balogun, J. (2003). From Blaming the Middle to Harnessing its Potential: Creating Change Intermediaries. *British Journal of Management, 14*, 69-83.

Battistella, C., & Pessot, E. (2017). Open Accelerators for Start-ups Success: A Case Study. *European Journal of Innovation, 20*(1), 80-111.

Bergek, A., & Norrman, C. (2008). Incubator Best Practice: A Framework. *Technovation, 28*, 20-28.

Bhasin, S. (2012). Prominent Obstacles to Lean. *International Journal of Productivity and Performance Management*, 403-425.

Bhasin, S., & Burcher, P. (2006). Lean Viewed as a Philosophy. *Journal of Manufacturing Technology Management*, 56-72.

Blank, S. (2013, May). *Why the Lean Start-Up Changes Everything.* Retrieved December 10, 2016, from Harvard Business Review: https://hbr.org/2013/05/why-the-lean-start-up-changes-everything

Blank, S. (2014, March 26). *Why Internal Ventures are Different from External Startups.* Retrieved June 23, 2017, from SteveBlank: https://steveblank.com/2014/03/26/why-internal-ventures-are-different-from-external-startups/

Blank, S., & Dorf, B. (2012). *The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company.* Pescadero: K&S Ranch.

Burgelman, R. (1984). Designs for Corporate Entrepreneurship in Established Firms. *California Management Review, 16*(3), 154-167.

Burgelman, R. A. (1983). A Process Model of Internal Corporate Venturing in the Diversified Major Firm. *Administrative Science Quarterly*, 223-244.

Carter, D. (1982). Evaluating Commercial Projects. *Research Management, 15*(6), 26-30.

Chen, E. (2015). A Word on Customer Development. In E. Chen, *Bringing a Hardware to the Market* (pp. 53-57). Boston: MIT Press.

Chesbrough, H. (2003). The Era of Open Innovation. *MIT Sloan Management Review, 44*(3), 34-42.

Chesbrough, H., & Weiblen, T. (2015). Engaging with Startups to Enhance Corporate Innovation. *California Management Review, 57*(2), 66-90.

Christiansen, J. D. (2009). *A Framework For Developing Seed Accelerator Programmes. Cambridge Master Thesis.* Cambridge: Cambride University.

Clifford, C. (2016, September 27). *Sam Adams founder says CEO stands for Chief Everything Officer in a start-up.* Retrieved from CNBC: http://www.cnbc.com/2016/09/27/sam-adams-founder-says-ceo-stands-for-chief-everything-officer-in-a-start-up.html

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale: Lawrence Earlbaum Associates.

Cohen, M., Agrawal, N., & Agrawal, V. (2006, May). Winning in the Aftermarket. *Harvard Business Review*. Retrieved from Harvard Business Review.

Cohen, S. (2013). What Do Accelerators Do? Insights from Incubators and Angels. *Innovations, 8*(3), 19-25.

Cohen, S., & Hochberg, Y. (2014, March 31). *Accelerating Startups: The Seed Accelerator Phenomenon.* Retrieved June 20, 2017, from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2418000

Cooper, R. (1979). Identifying industrial new product success: Project NewProd. *Industrial Marketing Management, 8*, 124-135.

Cooper, R. (1990). Stage-Gate Systems: A New Tool for Managing New Products. *Business Horizons*, 44-54.

Cooper, R. (2016). Agile–Stage-Gate Hybrids. *Research-Technology Management*, 21-29.

Cooper, R. (2016). Agile–Stage-Gate Hybrids. *Research-Technology Management*, 21-29.

Cooper, R., & Sommer, A. (2016). From Experience: The Agile–Stage-Gate Hybrid Model: A Promising New Approach and a New Research Opportunity. *Journal of Product Innovation Management*, 513-526.

Copeland, T., & Tufano, P. (2004). A Real-World Way to Manage Real Options. *Harvard Business Review, 82*(3), 90-99.

CorpVenturing. (2017, June 23). *Corporate Accelerators*. Retrieved from CorpVenturing: http://www.corpventuring.com/services-corporate-accelerators.html

Cusumano, M., & Nobeoka, K. (1998). *Thinking beyond Lean: How Multi-Project Management is Transforming Product Development at Toyota and Other Companies.* New York: The Free Press.

de Wit, A. (1988). Measurement of Project Success. *International Journal of Project Management, 6*(3), 164-170.

Dempwolf, C. S., Auer, J., & D'Ippolito, M. (2014). *Innovation Accelerators: Defining Characteristics Among Startup Assistance Organizations.* SBA.

Dillon, W., Madden, T., & Firtle, N. (1993). *Essentials of Marketing Research.* Homewood: Irwin.

Duncan, R. (1979). What is the right organization structure? Decision tree analysis provides the answer. *Organizational Dynamics, 7*(3), 59-80.

Ferreira, J. (2001). Corporate entrepreneurship: a strategic and structural perspective. *New England Journal of Entrepreneurship, 4*(2), 59.

Field, A. (2009). Regression. In A. Field, *Discovering Statistics Using SPSS* (pp. 293-356). London: Sage Publications LTD.

Garland, R. (1991). The Mid-Point on a Rating-Scale: Is It Desirable? *Marketing Bulletin*, 66-70.

Gebauer, H., Krempl, R., Fleisch, E., & Friedli, T. (2008). Innovation of product-related services. *Managing Service Quality: An International Journal, 18*(4), 387-404.

GUST. (2017, June 20). *Global Accelerator Report 2015*. Retrieved from GUST.com: http://gust.com/global-accelerator-report-2015/

Haque, B., & James-Moore, M. (2002). Characteristics of Lean Product Introduction. *International Journal of Automotive Technology and Management*, 378-401.

Haque, B., & James-Moore, M. (2004). Applying Lean Thinking to New Product Introduction. *Journal of Engineering Design, 15*(1), 1-31.

Harrison, D., & Klein, K. (2007). WHAT'S THE DIFFERENCE? DIVERSITY CONSTRUCTS AS SEPARATION, VARIETY, OR DISPARITY IN ORGANIZATIONS. *Academy of Management Review*, 1199-1228.

Hines, P., & Rich, N. (1997). The Seven Value Streams Mapping Tools. *International Journal of Operations & Production Management, 17*(1), 46-64.

Hochberg, Y. (2016). Accelerating Entrepreneurs and Ecosystems: The Seed Accelerator Model. *Innovation Policy and the Economy, 16*(1), 25-51.

Hoffman, D. L., & Kelley, N. (2012). Analysis of Accelerator Companies: An Exploratory Case Study of Their Programs, Processes, and Early Results. *Small Business Institute Journal, 8*(2), 54-70.

Hoyer, D., Chandy, R., Dorotic, M., Krafft, M., & Singh, S. (2010). consumer cocreation in new product development. *Journal of Service Research, 13*(3), 283-296.

INNOVATION LEADER. (2016). *Lean Startup: Making it work in Large Organizations.* Innovation Leader.

INVESTOPEDIA. (2015, May 22). *What are the major barriers to entry for new companies in the drugs sector?* Retrieved from INVESTOPEDIA: https://www.investopedia.com/ask/answers/052215/what-are-major-barriers-entry-new-companies-drugs-sector.asp

Jacobs, L. R. (2003). *STRUCTURED ON-THE-JOB TRAINING - Unleashing Employee Expertise in the Workplace.* San Francisco: Berret-Koehler Publishers, Inc.

Johnson, J., & Moultrie, J. (2012). Technology confidence in early stage development of medical devices. *International Journal of Innovation Science, 4*(2), 57-70.

Kakati, M. (2003). Succes Criteria in High-Tech Ventures. *Technovation*, 447-457.

Kanbach, D. K., & Stubner, S. (2016). Corporate Accelerators as a Recent Form of Startup Engagement: The What, the Why, and the How. *The Journal of Applied Business Research, 32*(6), 1761-1776.

Kirsner, S. (2016, August 16). *The Barriers Big Companies Face When They Try to Act Like Lean Startups.* Retrieved from Harvard Business Review: https://hbr.org/2016/08/the-barriers-big-companies-face-when-they-try-to-act-like-lean-startups

Kohler, T. (2016). Corporate accelerators: Building bridges between corporations and startups. *Business Horizons, 59*(3), 347-357.

Kozlowski, S. W., & Bell, B. S. (2003). Work groups and teams in organizations. In W. C. Borman, D. R. Ilgen, & R. J. Klimonski, *Handbook of psychology: Industrial and organizational psychology* (pp. 333-375). London: Wiley.

Leonard-Barton, D. (1992). Core Capabilities and Core Rigidities: A Paradox in Managing New Product. *Strategic Management Journal, 13*, 111-125.

Macbeth, G., Razumiejczyk, E., & Ledesma, R. D. (2011). Cliff's Delta Calculator: A non-parametric effect size program for two groups of observations. *Universitas Psychologica, 10*(2), 545-555.

Mansoori, Y. (2016). *How the Lean Startup Methodology Affects Entrepreneurs and their Organizations: The Case of a Swedish Startup...* Gothenburg: Chalmers University of Technology.

Marchisio, G. (2010). *A time-based theory of enterpreneurship for family business: the ooda loop.* Retrieved from http://www.lums.lancs.ac.uk/files/PPR093.pdf

Marion, J., Friar, J., & Simpson, T. (2012). New Product Development Practices and Early-Stage Firms: Two In-Depth Case Studies. *Journal of Product Innovation Management, 29*(4), 639-654.

Martinez Leon, C., & Farris, J. (2011). Lean Product Development Research: Current State and Future Directions. *Engineering Management Journal*, 29-51.

Martinez-Jurado, P., & Moyano-Fuentes, J. (2012). Key determinants of lean production adoption: evidence from the aerospace sector. *Production Planning & Control: The Management of Operations, 25*(4), 332-345.

Mathieu, J., Maynard, M., Rapp, T., & Gilson, L. (2008). Team Effectiveness 1997-2007: A Review of Recent Advancements and a Glimpse Into the Future. *Journal of Management, 34*(3), 410-476.

Matzler, K., & Hinterhuber, H. (1998). How to make product development projects more successful by integrating Kano's model of customer satisfaction into quality function deployment. *Technovation, 18*(1), 25-38.

McManus, H. (2005). *Product Development Value Stream Mapping (PDVSM) Manual.* Cambridge: Massachusetts Institute of Technology Lean Aerospace Initiative.

Miller, P., & Bound, K. (2011). *The Startup Factories: The rise of accelerator programmes to support new technology ventures.* London: NESTA.

Morgan, J. (2002). High Performance Product Development: A System Approach to a Lean Development Process (PhD Dissertation). *University of Michigan*.

Morgan, J., & Liker, J. (2006). *The Toyota Product Development System.* New York: Productivity Press.

Nakata, C., & Im, S. (2010). Spurring cross-functional integration for higher new product performance: A group effectiveness perspective. *Journal of Product Innovation Management*, 554-571.

Nijssen, E., Hillebrand, B., Vermeulen, P., & Kemp, R. (2006). Exploring product and service innovation similarities and differences. *International Journal of Research in Marketing, 23*(3), 241-251.

Oppenheim, B. (2004). Lean Product Development Flow. *Systems Engineering, 7*(4), 352-377.

Osterwalder, A. (2014). *Value Proposition Design.* New Jersey: John Wiley & Sons Inc.

Osterwalder, A., & Pigneur, Y. (2010). *Business Model Generation: A Handbook for Visionaries, GameChangers, and Challengers.* New Jersey: John Wiley & Sons Inc.

Pauwels, C., Clarysse, B., Wright, M., & van Hove, J. (2016). Understand a New Generation Incubation Model: The Accelerator. *Technovation, 50*(51), 13-24.

Pedersen, E., & Huniche, M. (2011). Determinants of lean success and failure in the Danish public sector: a negotiated order perspective. *International Journal of Public Sector Management*, 403-420.

Pfannstiel, M., & Rasche, C. (2017). *Service Business Model Innovation in Healthcare and Hospital Management.* Cham: Springer.

Raaijmaker, A., van Hoof, A., Hart, H., Verbogt, T., & Vollebergh, W. (2000). Adolescents Midpoint Responses on Likert-Type Scales Items: Neutral or Missing Values? *International Journal of Public Opinion Research, 12*(2), 208-216.

Reinertsen, D. (2005). Let it Flow. *Idustrial Engineer*, 40-45.

RfB. (2017, 10 07). *Philips Electronics N.V. - Company Profile, Information, Business Description, History, Background Information on Philips Electronics N.V.* Retrieved from ReferenceforBusiness.com: http://www.referenceforbusiness.com/history2/26/Philips-Electronics-N-V.html

Ries, E. (2011). *The Lean Startup.* London: The Penguin Group.

Rochford, L., & Rudelius, W. (1997). New Product Development Process: Stages and Successes in the Medical Products Industry. *Industrial Marketing Management, 26*, 67-84.

Royal Philips N.V. (2016). *Philips Annual Report 2016: A focused Leader in Health Technology.* Amsterdam: Royal Philips.

Royal Philips N.V. (2017, 10 07). *The Philips Heritage*. Retrieved from Philips.com: https://www.philips.com/a-w/about/company/our-heritage.html

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research Methods for Business Students.* Hawthron: Pearson Education Limited.

Scherrer-Rathje, M., Boyle, T., & Deflorin, P. (2009). Lean, Take Two! Reflection from the second attempt at Lean implementation. *Business Horizons, 52*(1), 79-88.

Schuh, G., Lenders, M., & Hieber, S. (2008). Lean Innovation: Introducing Value Systems to Product Development. *PICMET 2008 Proceedings, 27-31 July, Cape Town, South Africa 2008 PICMET* (pp. 1129-1136). Cape Town: IEEE.

Schumpeter, J. (1942). *Capitalism, Socialism and Democracy.* New York: Harper & Brothers.

Sharma, P., & Chrisman, J. J. (1999). Toward a Reconciliation of the Definitional Issues in the Field of Corporate Entrepreneurship. *Entrepreneurship: Theory and Practice, 23*(3), 11.

Shrnhur, A. J., Levy, O., & Dvir, D. (1997). Mapping the Dimensions of Project Success. *Project Management Journal, 28*(2), 5-13.

Sivasubramaniam, N., Liebowitz, S., & Lackman, C. (2012). Determinants of new product development team performance:A meta-analytic review. *Journal of Product Innovation Management*, 803-820.

Startup Commons. (2015, August 13). *Startup Development Phases.* Retrieved June 23, 2017, from StartupCommons: http://www.startupcommons.org/startup-development-phases.html

Stevens, G., & Burley, J. (2003). Piloting the Rocket of Radical Innovation. *Research-Technology Management, 46*(2), 16-25.

Stopford, J. M., & Baden-Fuller, C. W. (1994). Creating Corporate Entrepreneurship. *Strategic Management Journal, 15*(7), 521-536.

Strauss, K. (2013, May 30). *The Startup Life: Old Dogs And Young Pups.* Retrieved from Forbes: https://www.forbes.com/sites/karstenstrauss/2013/05/30/the-startup-life-old-dogs-and-young-pups/#2f4d4e4a1027

Tatikonda, M. (1999). An Empirical Study of Platform and Derivative Product Development Projects. *Journal of Product Innovation Management, 16*, 3-26.

Trimi, S., & Berbegal-Mirabent, J. (2012). Business model innovation in entrepreneurship. *International Entrepreneurship and Management Journal, 8*(4), 449-465.

Verschuren, P., & Doorewaard, J. (2010). *Design a Research Project.* The Haque: Eleven International Publishing.

Ward, A. (2007). *Lean Product and Process Development.* Cambridge: Lean Enterprise Institute, Inc.

Weiblen, T., & Chesbrough, H. W. (2015). Engaging with Startups to Enhance Corporate Innovation. *California Management Review, 57*(2), 66-90.

Wenger, E., & Snyder, W. (2000). Communities of Practice: The Organizational Frontier. *Harvard Business Review*, 139-146.

Womack, J., & Jones, D. (1990). *The Machine That Changed the World.* Boston: Rawson Associates.

Womack, J., Jones, D., & Roos, D. (1996). *Lean Thinking: Banish Waste and Create Wealth in your Corporation.* Boston: Simon and Schuster.

Yin, R. (2014). *Case Study Research Design and Methods.* Los Angeles: SAGE.

Appendix A: The Survey

1. Classification Data

Dear Bootcamp member,
Thank you for taking the time to help me in my research by filling out this survey. My name is Joost Zeeuw, and I'm a student at the Delft University of Technology. The results of this survey will be used for my graduation research, for which I am analyzing corporate acceleration programs, such as the Bootcamp.

This survey aims to collect data regarding the importance of the different components of the Bootcamp program to reach your acceleration goals.

The data that is collected in this survey will be handled strictly confidential, and all information regarding your personal details and the company you work for will only be used to make an initial categorization, and group the results of you and your team members, after which all information linking your results to you as a person, your project, and your company will be deleted permanently.

Important information!

In this survey, you will be asked about thefit between, for example, the problems of your customer and the solutions your technology will offer to solve these problems. Please interpret the concept fit as 'our customers have specific needs, to what degree does our offering meet those needs?'

* 1. Please answer the following questions

What is the name of the company you work for?	
What is the name of the project you worked on during the Bootcamp?	
How many members did your Bootcamp team have?	
What is your age?	
What is your highest level of education? (High School | Bachelor | Master | PhD)	
For how many years have you been professionally employed, including your current employment?	
For how many years have you been working at your current employer?	

What is your current job title?	
For how long has your project been running before entering the Bootcamp? Please indicate in months	
What percentage of your time did you spend on the Bootcamp activities per week?	
What percentage of your time were you physically present at the Bootcamp per week?	
Are you developing a product or a service?	
Are you developing software or hardware?	
Are you developing B2B (Business to Business) or B2C (Business to consumer) technology?	
At what stage was your development project when entering the Bootcamp? (explorative | development | testing | implementation)	

2. The Acceleration Goals

In the program, a number of acceleration goals were presented, followed by three months of work at the Bootcamp trying to reach those goals. In this survey, you will be asked to indicate to what extent you feel these goals were achieved during the program, followed by questions assessing your appreciation of the different components of the program in reaching these goals.

The four acceleration goals of the program are stated below. Please indicate the extent to which you agree or disagree with the statements regarding the different goals:

* 1.

Problem / Solution Fit:

'We had little difficulty in determining the fit between the needs of our selected customers and the solution our technology can offer'

Very strongly disagree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Very strongly agree
○	○	○	○	○	○	○

* 2.

Product / Market fit:

'We had little difficulty in determining the fit between the value that we assumed the features of our technology would offer and the actual value of these features as perceived by our (potential) customers'

Very strongly disagree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Very strongly agree
○	○	○	○	○	○	○

* 3.

Business Model / Market Fit:

'We had little difficulty in determining the fit between a business model that would result in a viable operation for us, and a business model that would be acceptable for our customers'

Very strongly disagree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Very strongly agree
○	○	○	○	○	○	○

* 4.

Project / Organization Fit:

'We had little difficulty in determining the position that our project would have in our organization after the Bootcamp'

Very strongly disagree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Very strongly agree
○	○	○	○	○	○	○

3. Ranking the Components

For reaching your acceleration goals, 6 components of the program were identified as most important in the program. The components of the program and their definition:

1. Shared Office Space

The fact that you and your team sat together most of your time, at your own shared table, being directly in contact with each other and always available for discussions and brainstorms.

2. Support Services

The direct access to support services which, otherwise, would have to be contacted in different departments. Think of design services, legal counsel, or others

3. Coaching and Mentoring

Your weekly meetings with the entrepreneurs in residence, and coaching by your acceleration manager in explaining and monitoring the progress of your deliverables

4. Networking (internal and external)

The positive effects of having a large number of teams in the same place, and external coaches who have a large network. Getting contacts from these people in your direct surrounding to help you progress your project.

5. The Program Curriculum itself

All the workshops, trainings, and presentations in which tools were provided to help accelerate your development project, such as the Business Model Canvas Workshop and the Interview Training.

6. Autonomous Validation

The possibility for autonomous validation of all your assumptions and decisions through interviews, hackathons, and other market research activities

* 1. Please rank the different components in order of importance for reaching the acceleration target (1 being most important, 6 being least important):

Product / Problem fit

'We had little difficulty in determining the fit between the needs of our selected customers and the solution our technology can offer'

- [ ] Shared Office Space
- [ ] Support Services
- [ ] Coaching and Mentoring
- [ ] Networking (Internal and External)
- [ ] The program Curriculum
- [ ] Autonomous Validation

* 2. Please rank the different components in order of importance for reaching the acceleration target (1 being most important, 6 being least important):

Product / Market Fit

'We had little difficulty in determining the fit between the value that we assumed the features of our technology would offer and the actual value of these features as perceived by our (potential) customers'

- [ ] Shared Office Space
- [ ] Support Services
- [ ] Coaching and Mentoring
- [ ] Networking (Internal and External)
- [ ] The program Curriculum
- [ ] Autonomous Validation

* 3. Please rank the different components in order of importance for reaching the acceleration target (1 being most important, 6 being least important):

Business Model / Market Fit

'We had little difficulty in determining the fit between a business model that would result in a viable operation for us, and a business model that would be acceptable for our customers'

- [ ] Shared Office Space
- [ ] Support Services
- [ ] Coaching and Mentoring
- [ ] Networking (Internal and External)
- [ ] The program Curriculum
- [ ] Autonomous Validation

* 4. Please rank the different components in order of importance for reaching the acceleration target (1 being most important, 6 being least important):

Project / Organization Fit

'We had little difficulty in determining the position that our project would have in our organization after the Bootcamp'

- [ ] Shared Office Space
- [ ] Support Services
- [ ] Coaching and Mentoring
- [ ] Networking (Internal and External)
- [ ] The program Curriculum
- [ ] Autonomous Validation

Appendix B: Variable Selection

In order to make a determination of which variables to include in the current research, a conceptual model of an accelerator program will be constructed in this appendix. This model will, however, not be used in the current research, other than for this validation of variable-selection.

Based on the literature review provided in Chapter 2, as was shown in Table 3, the dominantly-present components of accelerator programs are:

- Shared Office Space
- Support Services
- Coaching and Mentoring
- Networking Opportunities
- Training (Program Curriculum)
- Autonomous Validation
- Investment Opportunities
- Demo Days

Furthermore, as was mentioned in section 0, startups in accelerator programs work towards reaching a state of attractiveness, that is, attractive enough for investors to provide funding and for other external parties to engage in potential partnerships. These sources of funding and potential partnerships are required for further development, or to enter the stage of scaling. This attractiveness is, as was mentioned in the same chapter, four-dimensional, and is formed by reaching four ǿfitsô:

- The Problem / Solution Fit
- The Solution / Market Fit
- The Business model / Market Fit

- The Vision / Founders fit.

The reaching of these fits is, therefore, perceived as the goal of an acceleration program.

With respect to a conceptual model of an acceleration program, it are these program components and program goals that form the base of the model. The components, providing resources that the startup in the program must acquire, or providing temporary resources in the form of expertise present at the accelerator, facilitate the Technology- and Business-Development during the program. Next, after having worked towards reaching the goals (fits) of the program for a set period of time, the program reaches its end, and the new ventures hope to acquire new resources, in the form of funding and partnerships, allowing them to proceed into the next phase. A (simplified) conceptual model, based on these considerations, is shown in Figure 10:

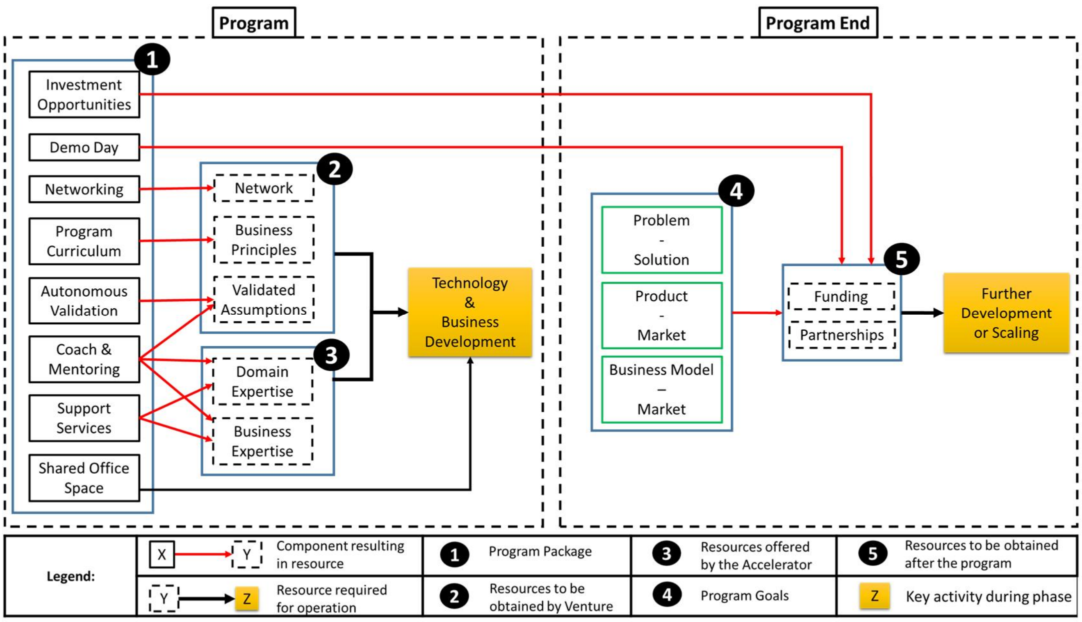

Figure 10: (Simplified) Conceptual Model of a startup acceleration program

The conceptual model shown in Figure 10 is limited to the phases of interest to the current research. As was stated by Pauwel et al. (2016), acceleration programs are concerned with a pre-program phase, with its major focus being selection, and a post-program phase, in which alumni-relations are the main focus. These phases, however, are out of the scope of the current research. This delineation is not arbitrary, because, as was mentioned before, the compositions of the teams are altered to avoid complications during the program related to the composition, meaning that there is no real question of selection of teams other than meeting diversity and leadership standards. Regarding the post-program phase, this presumes the existence of a long-term period after the program in which the new venture exists. However, in a large corporate organization, development projects are handed over to a new department, such as a business unit, when it is sufficiently mature to proceed to the next phase. This means that the development team and its project seize to exist, thereby not meeting the requirement for long-term existence. Because of the first delineation, excluding the selection phase, the current conceptual model only contains three out of the four goals stated previously, not including the Vision / Founders fit. The rationale for this exclusion is that the Vision / Founders fit is actually primarily a selection-criterion, meaning that this fit must be present prior to the program, in order to be selected for participation.

Based on the model presented in Figure 10, three steps of selecting variables were done:

1. Program Components: The removal of components not of interested to the current research.
2. Program Goals: The addition of a program goal relevant to internal corporate projects.
3. Project Characteristics: The incorporation of the characteristics of the projects in the model.

Program Components

As is shown in Figure 10, the components *Demo Day* and *Investor Opportunities* are concerned with activities after the actual program itself. Furthermore, these components primarily serve as tools for creating awareness amongst potential investors regarding the existence of the new venture. In a large corporate organization, however, the potential investors are represented by, for example, business units that might incorporate the project's technology in their portfolio. These stakeholders are well-aware of the existence of technologies under development in their own organization that might fit their part of the organization's portfolio, and, hence, it was concluded that the components *Demo Day* and *Investor Opportunities* are not of interest to the current research, and will, therefore, not be included in the current research.

Program Goals

The list of program goals was already adapted to the current research in the previous sub-section, however, as was stated by Steve Blank (2014), internal corporate development projects face additional requirements that startups don't have to account for. This additional fit is based on the other fits, however, where these fits were fits between the project and the external environment (the customers and the market), this additional fit is a fit between the project and the internal environment of the larger corporate organization. In order for a project's technology to be incorporated in the organization's portfolio, it has to, among others, fit within the strategy of the portfolio, the business model must fit the modus operandi of the business unit of interest, and the potentially required infrastructure must be available.

It is, therefore, important for the projects in the program to have proper communication with the stakeholders that would be responsible for incorporating the project in the organization's portfolio to ascertain a satisfying alignment between the configurations of the technology and its potential landing-place in the larger organization. This fit will be called the *Project / Organization Fit*, and represent the fourth and final goal of the program.

Project Characteristics

In order to develop personalized acceleration programs for specific projects, it is first required to assess how the characteristics of a project influence its ability to reach the goals of the program. Based on this analysis, a fitting set of program components can be constructed to mitigate the complications that might arise, due to the projectøs characteristics, in reaching its goals during the program. In order to perform this analysis, a set of relevant program characteristics was constructed. It does require mentioning, however, that this is not a fully comprehensive list of the actually relevant characteristics. This is due to, for example, the fact that there is a strong dependence in reaching certain goals on how ógoodö, or ópromisingö the technology under development is, and, furthermore, on the characteristics of the intended customer market, in terms of difficulty to penetrate, size, and level of competition. Because these characteristics are difficult to assess objectively and uniformly, they are excluded from the list presented below.

The project characteristics there were included in the current research, as was mentioned in Chapter 2, are:

- *Type of Technology:* Whether the technology under development would be sold as a Product, a Service, or a hybrid-form, such as a öProduct-as-a-Serviceö.
- *Stage of Development:* Exploration, Development, or Implementation.
- *Ware-Type:* The technology under development is either Software, Hardware, or combination of both where a new software-system is specifically developed for the hardware under development.
- *Technology Configuration:* The technology is either a Platform Technology, in which the core of the technology can serve multiple purposes, or a Modular Technology, with a single application. This is known as the Technology Archetype. Furthermore, the technology can be stand-alone, or requiring additional infrastructure in terms of supporting technologies or services.

- *Target Market:* The type of customer for the technology, being professional (B2B) or private (B2C)
- *Project Origin:* The reason for starting a development project can either be a Technology-Push, in which a technology is developed and then presented to its potential target market, or a Market-Pull, in which a technology is developed to answer a clear and explicit demand from a target market.
- *Organizationôs Portfolio:* The extent to which a projectôs technology easily fits within the organizationôs portfolio, that is, whether there is the existence of a business unit that fits the technology, which is equipped to accommodate the business model proposed for the technology, and, finally, if applicable, whether the required enabling infrastructure for the technology is available.

Appendix C: The Distribution of Project Characteristics

Table 15 provides an overview of the distribution of project characteristics among the population used in the current research.

Table 17: Overview of the projectsô characteristics relevant to the current research. As is shown, Technology Configuration is two-dimensional, consisting of Technology Archetype and Infrastructure, and, furthermore, Organizationôs Portfolio is four-dimensional, also consisting of infrastructure, and whether there is an existing Business Unit (BU) for the projectôs technology, whether the projectôs technology fits the BUôs modus operandi, and, finally, whether the project was backed by a Business Unit up-front.

						Configuration		*Organizationôs Portfolio*		
Team	**Type of Technology**	**Ware-Type**	**Target Market**	**Stage of Development**	**Project Origin**	**Technology Archetype**	**Infra-structure required?**	**BU: Exist?**	**BU: Back?**	**BU: Fit?**
1	Service	Software	B2B	Explorative	Push	Modular	No	Yes	No	Yes
2	Product	Hybrid	B2B	Explorative	Push	Modular	No	Yes	No	No
3	Service	Software	B2B	Explorative	Pull	Modular	No	Yes	No	No
4	Hybrid	Hybrid	B2B	Explorative	Pull	Modular	No	Yes	No	Yes
5	Service	Software	B2B	Explorative	Pull	Modular	No	Yes	No	Yes
6	Hybrid	Hybrid	B2B	Explorative	Pull	Modular	Yes	Yes	No	Yes
7	Product	Hardware	B2C	Explorative	Push	Modular	No	Yes	Yes	Yes
8	Product	Hybrid	B2B	Development	Pull	Modular	No	No	No	No
9	Service	Software	B2B	Explorative	Push	Modular	No	No	No	No
10	Service	Hardware	B2B	Development	Push	Platform	No	Yes	No	Yes

Table 18 shows a summary of the projects in terms of team-size and diversity. The table provides an overview of the Gini-Coefficients of the teams. The Gini-Coefficient is a measure for diversity in a group (Harrison & Klein, 2007), and, in this case, is the average of the Gini-Coefficients of the Age, Gender, Education, Years of Employment, Years of Employment at Philips, and the Functional Department of the members in each team.

Table 18: Gini-Coefficients showing within-team diversity. Higher scores mean higher diversity.

Project-team	Members	Gini-Coefficient
1	5	0.33
2	5	0.22
3	3	0.18
4	5	0.28
5	4	0.16
6	6	0.27
7	5	0.33
8	5	0.35
9	5	0.23
10	5	0.31

As is shown in Table 18, the Gini-Coefficients are comparable and close to the mean of the entire population (0.27±0.07), and indeed suggest the teams to be sufficiently divers. Furthermore, the Gini-Coefficient for Age is significantly lower for each team, which is to be expected for a population of experienced corporate professionals, who are all in comparable age-groups. This has a strong negative influence on the overall Gini-Coefficient, which has an average value of 0.31 when Age is excluded as a parameter.

Appendix D: Additional Discussion on the Results Concerning the Appreciation of the Components of the Program

Shared Office Space

The shared office space is indicated as strongly non-beneficial throughout the entire population. This is a strong difference between the current population, containing internal corporate teams, and startups, for whom this component is very valuable (Dempwolf, Auer, & D'Ippolito, 2014). The *Shared Office Space* offered by startup-accelerators provides startups with a professional location to invite external stakeholders, such as potential investors and partners. Furthermore, this shared space where all members of the teams work together is important for a startup, because every member of the team does a bit of everything concerning the different functional activities (Marion, Friar, & Simpson, 2012).

This is a strong contrast with a large corporate organization, where a professional location is already present, and, furthermore, employees are used to work in functional departments, and have multiple meetings throughout the project to discuss their work. With this fundamental difference in mind, the lack of appreciation for this component is understandable.

Before proceeding with the next components, however, a final point requires mentioning that could have been of influence in the appreciation of this component. The space that was offered in the current case was of limited quality. With a number of different teams in the same room it was a noisy atmosphere, which is likely have decreased the appreciation of this component for the current population.

Support Services

The component of the program offering *Support Services* was also appreciated poorly. This result can be explained by two different factors, both originating from the specific Accelerator ï Organization combination.

The first factor originates from the mismatch in terms of strategic focus of the accelerator and the organization of Philips itself. As was mentioned by Pauwels et al. (2016), the Strategic Focus (which industry, sector, or geography the accelerator focuses on) is a key design element in constructing an accelerator program, because it provides a strong selection criterion for which startups are selected for the accelerator program. That is to say, the areas of expertise of the accelerator must match the areas in which a startup in the program operates in. In the current case, however, such a match was not present. The accelerator can be classified as being a generalist regarding its industry-focus, with limited experience the healthcare industry. This resulted in the fact that the support services, such as business advice, provided by the accelerator were experienced to be of a general nature, and often poorly applicable in the healthcare industry.

The second factor also originates from the strategic focus of the accelerator, however, this focus is implicit. This strategic consideration is that startup accelerators focus on startups, and, thereby, are experienced in providing support to startups, which are not limited in their operations by the fact that they are part of a larger organization. This resulted in situations where advices were given to, for example, employ aggressive tactics for getting in contact with potential customers. For the corporate teams, however, such activities are not possible, because of the codes of conduct of the larger organization, meaning that no activities that could potentially harm the image of the organization or negatively influence existing or future relations could be undertaken.

Coaching & Mentoring

The component *Coaching & Mentoring* was perceived as (very) beneficial for all goals of the program. This is an expected result, because of the type of goals that were set for the program. The goals of the program all encompass finding a fit, that is, a fit between, one the one hand, that what the project is and has to offer, and, on the other hand, that what the external environment wants or expects. The major part of this component consisted of weekly sessions, in which the teams present what the current status of their project was to a group of experienced entrepreneurs and senior employees from the Philips organization. These sessions resulted in an evaluation of both sides of the required fits.

First, in presenting their work, the teams are confronted with an external objective view of their results and assumptions. This proved to be an excellent way of discovering errors in judgement by the teams, and to highlight hidden pitfalls for their projects. It is through these activities that the teams strongly reduce the internal bias concerning their projects, thereby closing the gap between what they think they offer and what they actually offer.

The second evaluation is provided in the form of a role-play. The entrepreneurs and Philips employees, in this role, represent the stakeholders in the external environment (the market), and, furthermore, the stakeholders in the internal environment of the organization (the business units of the Philips organization). Through their experience in industry and the organization itself, they were able to approximate the requirements these environments would have. In doing so, the teams learned about these requirements for their projects, and, furthermore, a critical objective assessment could be made by all parties of the discrepancy between the offerings of the teams and aforementioned requirements of the environment.

Networking Opportunities

For the component *Networking Opportunities,* a clear distinction can be observed concerning its perceived benefit over the different goals. For the first three goals, the fits with the external environment (Problem / Solution, Solution / Market, and Business Model / Market), this component was not perceived as beneficial. For the final fit, the fit with the internal corporate environment (Project / Organization), however, this component was perceived as very beneficial. These differing results can be explained by the following observations:

Regarding the external fits, for which the component was not perceived as beneficial, an explanation can be found in the intended result of this component, and the limitations imposed by the larger organization itself. As was shown in Figure 10, the *Networking Opportunities* are intended for connecting to potential investors and partners. For internal corporate development projects, however, these connections are not needed. Investment comes from within the organization in the form of budget, and the larger organization itself has an excellent and well-established network of potential partners for all aspects of the development process. Furthermore, regarding the limitations imposed by the larger organization, the project-teams did not have the full freedom of establishing new connections with external parties that startups do have. There are prescribed channels and protocols for reaching out to parties outside of the organization, which makes it a slow process, and, finally, the project-teams were often not at liberty to discuss all relevant details of their projects with external parties due to regulations in place protecting internal company information. With these considerations in mind, the lack of necessity for an autonomous network-development, and the limitations imposed by the larger organization on these endeavors, it came as no surprise that this component was not perceived as beneficial for the external fits.

For the final fit, however, this is a very different story. Being related to the internal environment of the larger organization, no limitations are imposed by the rules and regulations of the organization. With this freedom for establishing internal networks, the teams were able to establish relevant connections with stakeholders in the organization, such as in the departments controlling the operations of specific target markets and the business units of interest for the different projects. In opening discussions with these stakeholders at an early stage, expectations, requirements, and potential complications between the project and the larger organizations could be identified in an early stage, allowing for them to be mitigated properly during the development process. In an organization with over 90.000 employees, stationed in different continents, and with a strong focus on portfolio management, these internal networking activities are all but redundant.

Program Curriculum

The component *Program Curriculum*, consisting mainly of weekly lectures and workshops regarding Lean Startup Methodologies, development processes, and business principles, were not perceived as beneficial for either of the goals of the program. This result could find an explanation in the professional experience of the population. The training offered in the program curriculum is aimed at providing basic knowledge of the aforementioned affairs, which, for startups, is of great value. The famous out-of-university type of entrepreneurs is often inexperienced in business and relatively young of age: The average age of entrepreneurs in the American accelerator program Y Combinator is 26 (Strauss, 2013). This is a fundamental difference with the subjects in the current population, who have an average age of 38 and an average tenure of 13 years of professional employment. During these years in industry, courses on how to execute development projects and on basic business principles will have been enjoyed. Furthermore, the Philips organization has adopted a strong focus on introducing methodologies from the Lean Startup Methodology in their development projects, such as using the Business Model Canvas (Osterwalder & Pigneur, 2010).

It is, therefore, no surprising result that a curriculum designed for people who specifically lack experience in these fields is not perceived as beneficial by the current, more experienced, population.

Autonomous Validation

The component *Autonomous Validation* was perceived as very beneficial for all goals of the program, except for the final goal, the Project / Organization Fit. This latter result comes as no surprise, because this component of the program entailed getting out of the building and meeting with customers and experts in the respective field the project operated in. Furthermore, hackathons were organized to find answers regarding the target markets. None of these activities, however, were related to the internal environment, and, hence, were found to be beneficial for reaching the internal fit. Further validation of this interpretation can be found in the relation between the components *Networking Activities* and *Autonomous Validation*. The autonomous validation of assumptions regarding the Project / Organization Fit consisted of connecting to the relevant departments of the organization and discussing with them. This activity is fully captured in the component *Networking Activities*, and, therefore, a switch between the perceived benefit of these two components can be observed for the Project / Organization Fit, compared to the other fits.

As for the remaining three goals, the component was perceived as very beneficial. This confirms the observation provided in the literature review in Chapter 2, in which the importance of validating assumptions iteratively during the development and the Build-Measure-Learn loop is stressed by multiple authors (Blank, 2013), (Cooper R. , 2016), (Marchisio, 2010).

Appendix E: Additional Discussion on the Results Concerning the Experienced Level of Difficulty in Reaching the Goals of the Program

Problem / Solution Fit

Having provided the correlations between the relevant project characteristics and the Problem / Solution Fit, an analysis was performed to assess whether these complicating characteristics were indeed present in the project that were to have relatively more difficulty in reaching this fit.

When analyzing the first histogram in Figure 8, representing the Problem / Solution Fit, two groups can be identified, in which the first group indicated to have had relatively little difficulty in determining the fit between the problem in the market and the solution they offer, and the other group having experienced a greater difficulty in determining this fit. In order to verify that this difference could be explained by the project characteristics *Project Origin* and *Technology Configuration*, a Kruskall-Wallis ANOVA was performed over the data, using the variable óTeamô as a grouping variable:

The Kruskall-Wallis ANOVA indicated that there was a significant difference between the assigned ranks for the different groups (*Mean Ranks: …….)*, □ □□□□□□□□□ □□□ □□□□□ 17.509, □□ □ 9, □ □ 41, □ □ 0.041.

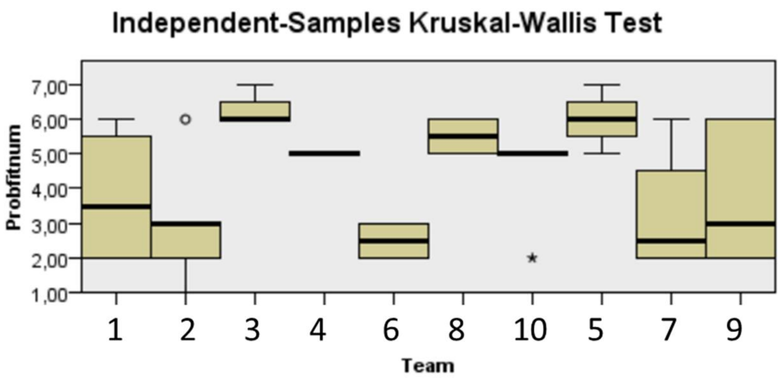

Figure 11: Results of the Kruskall-Wallis ANOVA for goal 1, using óTeamô as the grouping variable.

The results shown in Figure 11 clearly indicate two different groups, those with relative little difficulty in determining the Problem / Solution Fit, and those projects that experienced great difficulty in determining the Problem / Solution Fit:

1. Projects with difficulty: 1, 2, 6, 7, and 9.
2. Projects without difficulty: 3, 4, 5, 8, and 10

For the project that experienced a greater difficulty in determining this fit, it was indeed the case that their project origin was a *Technology-Push* (Projects 1, 2, 7 and 9) or that additional infrastructure was required (Project 6).

Solution / Market Fit

Contrary to the Problem / Solution Fit, no valid correlation model between the project characteristics and the Solution / Market Fit was found. In a second, less robust analysis, a multinomial ordinal regression was performed, also without a statistically significant model as a result. Although a model with the characteristics *Ware-type* and *Technology Type* was found to perform better than the Intercept only model ($\chi^2 = 7.907,\ df = 3,\ p = 0.048$), the *Goodness-of-Fit Test* showed that the observed data fits the model relatively poorly ($Pearson$: $\chi^2 = 19.884,\ df = 12,\ p = 0.069$), and, furthermore, the *Nagelkerke Pseudo R-Square statistic* showed that only 18.2% of the variance was explained by the model. This still indicates that the model is statistically significant, however, the assumption underlying the Logistic Regression of *Proportional Odds* was violated, thereby rendering the model invalid.

Furthermore, in the verification analysis, as was is shown in Figure 11 for the Problem / Solution Fit, no statistically significant differences could be found between the teams in terms of reaching this fit. Therefore, it was concluded that, based on the current data, the project characteristics had no influence a project's ability to reach the the Solution / Market Fit.

A possible explanation for this result is found in the way the teams worked on developing their technology during the program. The key component in the program, as will be shown in later sections of this chapter, was *Autonomous Validation,* meaning that they were strongly encouraged to ǵget out of the buildingô (Ries, 2011) and have a strong interaction with their potential customers, receiving multiple accounts of feedback during the development. Because of these activities, insight into the workings of the target market is accumulated, and, more importantly, (almost) every new step and decision regarding the features and capabilities of the technology is discussed with the potential customer before proceeding. Therefore, it can be concluded that the teams and their potential customers have to be on the same page regarding the technology in order to be able to proceed with the development of this technology, and this exactly what the Solution / Market Fit encompasses.

Having provided the results regarding the influence of the project characteristics and the ability to reach the Solution / Market Fit, and having provided an interpretation for these results, the following section will provide the results regarding the Business Model / Market Fit.

The Business Model / Market Fit

The Business Model / Market Fit showed no statistically significant correlations with any of the project characteristics in the Multiple Linear Regression model. Hence, similar to the Solution / Market Fit, a less robust Multinomial Ordinal Regression was performed. The results of this analysis are shown below.

This third goal, the Business Model / Market Fit, is somewhat of a cross-over when it comes to determining whether the fit is mainly internal (such as the Project / Organization Fit), or external (such as the Problem / Solution Fit). This duality originates from the fact that, firstly, a business model must be proposed that is sufficiently profitable for the organization (internal), and, secondly, the target market must accept this business model, which mainly concerns whether the technology is provided as a one-time-purchase or as some form of a subscription-based model.

The first component of this duality is difficult to assess, because, at this stage, no rigorous large-scale pricing and market penetration analyses are performed. The profitability of a project is, therefore, mainly relying on assumptions. It was, however, hypothesized that with greater maturity of a project, more of these assumptions could be validated. The project maturity is represented by the variables *Project Age* and *Stage of Development*, which were, therefore, hypothesized to positively correlate with the Business Model / Market Fit. Furthermore, as far the external component of this fit, entailing the extent to which the target market accepts the proposed business model, it was hypothesized that the variables *Type of Technology* (Product, Service, or Hybrid) and *Ware-Type* (Hardware, Software, or Hybrid) would correlate with the Business Model / Market Fit. More precisely, it was assumed that a technology that was simply a physical piece of Hardware, which was offered as a one-time-sale Product, would be much more easily accepted by the target market, contrary to complicated Product-as-a-Service schemes, or software-systems that would be like a black box to its customers. The resulting correlation model is shown below:

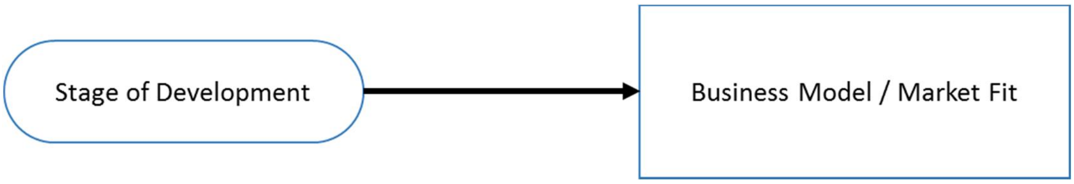

Figure 12: Correlational model showing the relation between the Business Model / Market Fit and the predicting variable, the Stage of Development ($\chi^2 = 5.195, p = 0.023, df = 1$)

As is shown in Figure 12, only the project characteristic *Stage of Development* showed a statistically significant correlation with the Business Model / Market Fit. The results of the statistical analyses, and an interpretation of these results, will be provided below:

> The model presented in Figure 12 has a Chi-square value of 5.195, which is statistically significant ($p = 0.023, df = 1$), indicating that the model performs better than the intercept-only model.
>
> The *Goodness-of-Fit* parameters indicate (*Pearson*: $\chi^2 = 7.386$, $df = 4$, $p = 0.117$) that the observed data is consistent with the model.
>
> The *Nagelkerke Pseudo R-Square statistic* has a value of 0.126, indicating that 12.6% of the variation in the reaching of the Problem / Solution Fit can be explained by the model.
>
> The *Test of Parallel Lines* ($\chi^2 = 7.179$, $df = 4$, $p = 0.127$) indicates that the assumption of proportional odds is valid.

As can be observed in the boxes above, only the project characteristic *Stage of Development* had a statistically significant correlation with the Business Model / Market Fit, indicating that projects that found themselves in the Development stage experienced a relatively smaller difficulty in reaching this fit than projects in the Explorative stage (none of the respondents indicated their project to be in the Implementation stage). However, as is shown above, the statistical parameters indicate that the model performs relatively poor. The observed data is only just consistent with the model, and, furthermore, only 12.6% of the variance in the model could be explained by the predictor variable. A possible explanation for the poor performance of the model, and the lack of more statistically relevant correlations with the hypothesized predictors, is, again, two-fold.

The first component, concerning the internal part (the expected profitability of a proposed business model), is complicated because of the stage of development that the projects in the internal accelerator program are in. Contrary to the first two fits, in which the external party was represented by the actual users, the external party with whom the financial part of the Business Model / Market Fit must be achieved are often not the actual users in a Business-2-Business technology. In this case in particular, the medical professional in, for example, a hospital, will use the technology, but the financial department will be the one paying for it. It is, therefore, difficult to validate the assumptions regarding the financials of a project with the validation efforts that are done during the program, because these focus on the features and capabilities of the technology itself, which is done with the end-users, who only have a limited capability of assessing these financial assumptions. It is, therefore, an expected result that projects that find themselves in a later stage of development, indicating a higher level of maturity, experienced a relatively lower difficulty in determining the Business Model / Market Fit.

As for the second component of this fit, the external part, which is mainly concerned with the form in which a technology is offered to the customer, none of the hypothesized project characteristics (*Type of Technology* and *Ware-Type*) had any influence on the ability to determine the Business Model / Market Fit. At first sight this might seem surprising, however, a potential explanation for this result can be found in the industry from which the population is taken. This result is, therefore, contrary to the result mentioned in the previous paragraph, limited in terms of generalizability to other industries. The target market of the projects in the current accelerator program is, broadly taken, the healthcare industry, and, more specifically, hospitals. This industry is a front-runner when it comes to adopting a business model called Product-as-a-Service, a model that is often said to be revolutionizing a broad scope of industries, being adopted by industry-giants such as Boeing, Cisco, and IBM

(Cohen, Agrawal, & Agrawal, 2006). The healthcare industry is especially welcoming to such models, in which, for example, MRI-scanners are no longer purchased, but leased as part of a complete solutions subscription, in which the producer offers a broad spectrum of additional services (Pfannstiel & Rasche, 2017). It is, therefore, that no additional complications arose for projects when going from a simple One-Time-Sale of a product business model to a more complicated Product-as-a-Service model, because this particular target market is accustomed to these innovative business models.

Having provided the correlations between the relevant project characteristics and the Business Model / Market Fit, an analysis was performed to assess whether these complicating characteristics were indeed present in the project that were to have relatively more difficulty in reaching this fit.

As was shown in Figure 8, the responses for the Business Model / Market Fit show a high frequency for the response "Disagree", followed by a number of medium to small frequencies towards the agreeing responses. Upon assessing whether different groups could be found in the population based on the *Stage of Development*, a Mann-Whitney U test was performed. For the grouping variable *Stage of Development*, a significant difference could be found between groups:

The Mann-Whitney U test indicated that the perceived difficulty in reaching a Business Model / Market Fit was significantly higher for respondents working on projects in the stage 'Explorative' (*Mean Rank = 18.80, n = 32)* than for respondents working on projects in the stage 'Development' (*Mean rank = 28.83, n = 9)*, ⍰ = 73.500, ⍰ = − 2.378 (corrected for ties), ⍰ = 0.017. This effect can be described as 'Medium (r = 0.37)' by Cohen's estimation of effect sizes (1988), and is shown in Figure 13:

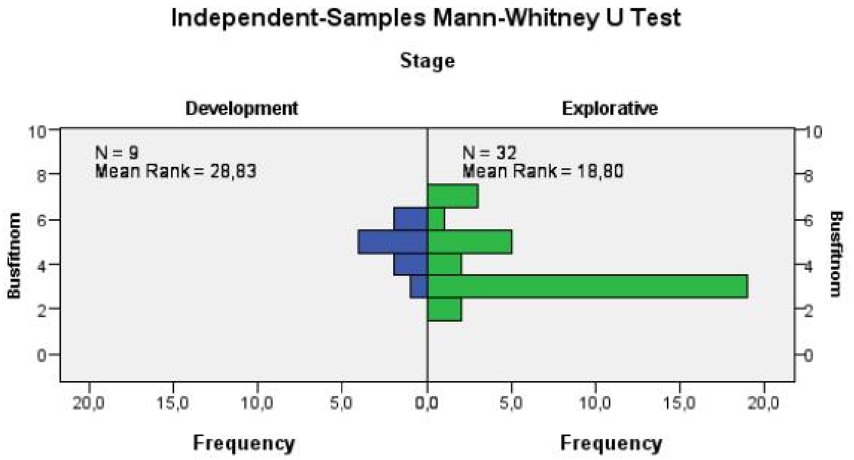

Figure 13: Perceived difficulty for reaching the Business Model / Market Fit between different stages of development

The results shown in Figure 13 indeed confirm the result that projects in the *Explorative* stage of development experience a greater difficulty in determining the Business Model / Market fit.

Based on the absence of any statistically significant results from the Linear Regression analysis, and the very poor performance of the Multinomial Ordinal Regression model, combined with the absence of any discriminating properties of this project characteristic on the project level (Figure 13) it was decided not to include the project characteristics *Stage of Development* in the final framework.

Having provided the results, and interpretation of these results, of the influence of the project characteristics and the Business Model / Market Fit, the following sub-section will focus on the Project / Organization Fit.

Project / Organization Fit

In line with the previous subsections, an analysis was performed in order to assess whether the project characteristics that were found to complicate the *Project / Organization Fit* were present in projects that were found to have a relative greater difficulty in determining this fit. For this assessment, a Kruskall-Wallis ANOVA was performed over the *Project / Organization Fit* scores, with the variables *Project* as the grouping variable. The results are shown below.

The Kruskall-Wallis ANOVA indicated that there was a significant difference between the assigned ranks for the different groups (*Mean Ranks: …….*), □ □□□□□□□□□ □□□ □□□□□ 21.350, □□ □ 9, □ □ 41, □ □ 0.011.

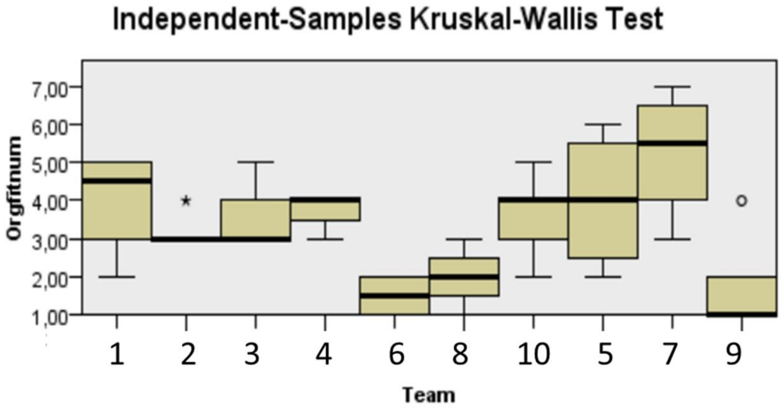

Figure 14: Perceived difficulty for finding the Project / Organization Fit for the different teams.

As can be observed in Figure 14, most projects have a relatively medium score regarding the Project / Organization Fit, except for Project 6, 8, 7, and 9:

Project 6: Relatively low score, despite there being an existing Business Unit in which this technology would fit, which is consistent with the model because this project required additional infrastructure for its technology.

Project 8 and 9: Relatively low score, which is consistent with the model, because no Business Units existed that fitted the technology for this project.

Project 7: Relatively high score, which is consistent with the model, because this project was backed by an existing Business Unit upfront when entering the program.

Having provided, discussed, and validated the results from the analyses, a final point of interest arises. As was shown in the results of the statistical analyses, the requirement for additional infrastructure had a severe effect on reaching this goal, even stronger than the complete absence of a Business Unit. This result seems counter-intuitive, because surely it would seem easier to adapt an existing Business Unit than to find a place in the organization's portfolio for a technology that doesn't fit an existing Business Unit. This is, however, not the case, because of two reasons. First, which was the case specifically for Project 6, the required additional infrastructure might be so far from what fits the organization's portfolio that it would be certain that such an infrastructure would simply never be constructed by the organization. This provides a severe complication for the project at hand, and would mean that the *Technology Configuration* would have to be significantly altered. On the other hand, however, in the case of the absence of an existing Business Unit, two options exist. Either a new Business Unit can be constructed (which is rare, but possible), or the project could become an internal venture, thereby no longer requiring a fit with an existing Business Unit. These two options would not be possible for a project for which a Business Unit already exists, but requires additional infrastructure, because this new Business Unit or internal venture would then overlap with the existing Business Unit, resulting in undesirable situations, such as, internal competition for employees, customers, and sales channels.

Appendix F: Results of Searching for Literature on Internal Corporate Accelerators

Documents

1) Athey, M.J., Laumas, P.S.
Internal funds and corporate investment in India
(1994) *Journal of Development Economics*, 45 (2), pp. 287-303. Cited 31 times.

Document Type: Article
Source: Scopus

2) Kupp, M., Marval, M., Borchers, P.
Corporate accelerators: fostering innovation while bringing together startups and large firms
(2017) *Journal of Business Strategy*, 38 (6), pp. 47-53.

Document Type: Article
Source: Scopus

3) Coste, J.-D., Gatzke, S.
A Novel Approach to Innovation Platforms: Symbiotic On/Off Spaces, Cross-Industry Sponsor
(2017) *New Space*, 5 (3), pp. 155-162.

Document Type: Article
Source: Scopus

4) Coste, J.-D., Gatzke, S.
A novel approach to innovation platforms: Symbiotic on/off spaces, cross-industry sponsor
(2016) *Proceedings of the International Astronautical Congress, IAC*, .

Document Type: Conference Paper
Source: Scopus

5) Baláž, P., Liner, M.
Was the economic reform sufficient instrument for solving the financial crisis? [Bola Hospodárska Reforma Účinným Nástrojom Na Riešenie Finančnej Krízy v Juhovýchodnej Ázii?]
(2005) *Politicka Ekonomie*, 53 (2), pp. 239-264.

Document Type: Article
Source: Scopus

Figure 15: The results of searching for the term Internal Corporate Accelerator with an academic search engine (SCOPUS). Only 5 papers were found, and none of them in any way related to the topic of interest. Search performed on 29-01-2018, the final day of the research project.