FORECASTING CASH FLOWS FOR A PRODUCT-AS-A-SERVICE STARTUP

Bachelor Thesis
Written by: Nicole van Lente
1st Supervisor UT: dr. Reinoud Joosten
2nd Supervisor UT: ir. Henk Kroon
University of Twente
Industrial Engineering and Management

Preface

This thesis marks the completion of my Bachelor of Science in Industrial Engineering & Management. The research was conducted in collaboration with a startup, which, due to confidentiality agreements, remains unnamed.

I would like to thank the CEO of the startup for including me in various projects and valuing my input. Your openness and involvement made a significant impact, providing me with a highly positive introduction to the startup world. I also appreciate the entire team for promoting such a supportive working environment.

Special thanks to my primary academic supervisor, R. Joosten, for your guidance, constructive feedback, and thought-provoking conversations. I am also thankful to my second academic supervisor, H. Kroon, for your time and expertise.

Finally, I want to express my gratitude to my friends and family for their support and encouragement throughout this process.

This investigation has increased my enthusiasm for developing my professional skills, and I hope this report inspires the same excitement in you.

Nicole van Lente

Summery

This thesis examines the financial challenges faced by Company-X, a startup offering an innovative e-mobility Product-as-a-Service (PaaS). The company is struggling with cash flow issues because initial payments from customers do not cover its PaaS upfront costs. The research aims to develop a flexible financial model to address these challenges and ensure insights for financing options as the company prepares for market launch.

The proposed model suggests that a combination of equity financing and financial leasing can be an effective strategy. Equity financing provides the initial capital, while financial leasing helps manage ongoing cash flow. However, success depends on key factors like profit margins, lease terms, and the amount of equity raised. Recommendations include updating the model regularly and conducting additional research on product value and margin optimization.

In conclusion, using this flexible financial model can help Company-X achieve financial stability and successfully transition from pilot testing to full market launch.

Contents

Abbreviations

B2B	Business to business
E-mobility	Electrified-Mobility
PaaS	Product-as-a-Service
PM	Product Margin
PSA	Problem-Solving Approach
SLR	Systematic Literature Review
TCV	Total Contract Value

1 Introduction

In this chapter we describe the company and its business model together with the problem that is arising. We identify problem is identified by including a problem cluster and explaining the norm and the reality. An research goal is formulated together with the problem-solving-approach. To identify the knowledge problem, we constructed a main research question and supporting sub-questions. Afterwards, the final deliverables are provided and the scope and limitations are defined. Finally, the reliability and the validity of the study are described.

1.1 Description

In this Section, we explore the company's objectives and business model. Our analysis is based on data obtained from Company-X. However, due to confidentiality requirements, we will refer to the firm as Company-X and cannot disclose specific details.

1.1.1 Company description

Company-X is a startup that has developed an innovative concept supporting e-mobility, offered as a Product-as-a-Service (PaaS). This approach combines a product with a service to meet user needs (Mont, 2002). One key benefit of a PaaS is the ability to enhance the service through software updates even after the product is installed at a client's location. Besides, the product components can be used circularly, which promotes sustainability.

The start-up focuses on business-to-business (B2B) marketing, which means it offers its PaaS to other companies. The firm conducts pilot programs to demonstrate the benefits of its solution to allow clients to experience the system. Based on those pilots, the startup receives end-user feedback enabling Company-X to refine and improve both the system and the service. Currently, the startup is in the problem-solution-fit phase, working on improving and finalising its final version before the market launch.

1.1.2 Business description

The PaaS of Company-X is sold to other firms to implement the system at their companies. Each system consists of multiple units that the client's employees can use. They simply scan their employee card at the Main Unit to interact with it. The Units are used daily and can become a routine in the daily life of an employee. While using the system, employees contribute to E-mobility, thereby promoting a sustainable environment. This PaaS is an invention that enhance job satisfaction, and ensures workplace safety. Therefore the system is adopted by companies aiming to boost employee contentment and foster a safe and eco-friendly workspace.

1.2 Problem identification

In this Section we identify the problem and its root causes and we design a problem cluster. Afterwards, we explain the norm and the reality of the problem and we end with formulating the research goal.

1.2.1 The problem

Currently, Company-X is conducting pilots at several companies to test its system and receive feedback. The pilots vary and a separate contract is established with each client. During this study, several systems are developed and all contribute to the evaluation of 'Version 1'. Each iteration results in a sub-version, such as Version 1.1, Version 1.2, and so on. Once the PaaS has been developed well enough, the firm aims to introduce 'Version 2' to the market as the first official system offering.

However, the startup faces a significant challenge. The initial annual payment from customers does not cover the direct cash outflows required for each system. This means the cash outflows for building a system are higher than the first payment of the customer. The company is running into cashflow problems, since the customers pay their contracts spread over 5 years. This financial gap arises from the lack of insight into the company's cash flows, making it difficult to forecast revenue and manage cash flow effectively.

The primary issue is that Company-X has not yet defined a robust financing strategy for its PaaS model. Without a clear plan, the company risks financial instability, which could hinder its daily operations and the ability to scale.

1.2.2 Problem cluster

To understand the problem and its root causes, we made a Problem Cluster that visualises and categorises the different problems. The Problem Cluster for our investigation is given below.

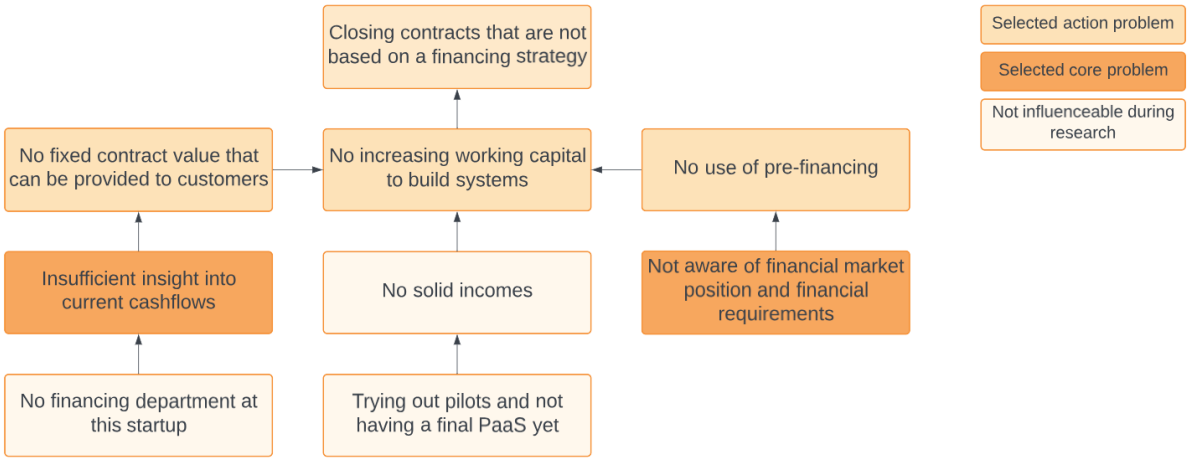

Figure 1: Problem Cluster.

Some problems cannot be influenced during the study due to Company-X's early startup phase. A startup has to develop and therefore does not yet have certain facets that large companies already possess. The two selected core problems influence the problem on top of the Problem Cluster. The core problems are: *Company-X has insufficient insight into its current cash flows* and *Company-X is not aware of its financial market position and financial requirements.* The surrounding action problems are the problems that we need to tackle to solve the core problems. The core problems lead to the fact that the firm does not close contracts based on a financing strategy, which indicates it is not ready yet to operate in the big market.

1.2.3 Norm

Eventually, Company-X aims to provide its clients with a fixed contract based on a financing strategy. These contracts should offer a 5-year subscription that is based on agreements about the product and associated services. Since the system is offered as a PaaS, it would be common for the clients to pay this contract annually.

1.2.4 Reality

The problem is that Company-X has an insufficient amount of working capital, so without a financial solution to provide additional cash inflows, they are running into cash flow problems. To sell a 5-year subscription, they have to cover the direct operation costs to build the system before they can sell it. The annual first-year payment of the clients does not cover the total building costs of the PaaS, so the firm needs to pre-finance the system by itself. The company is not tracking its current cash flows, so it is not known how much working capital is needed to sustain its operations.

1.2.5 Research goal

Company-X aims to offer its PaaS while maintaining sufficient working capital to support its operations and financial health. To achieve this, an efficient financing strategy that incorporates projected cash flows and pre-financing options is essential.

The main goal of our research is to develop a flexible financial model for Company-X. This model will allow the startup to evaluate various scenarios by testing different parameters and comparing outcomes. By providing detailed insights into cash flows over the first three years of gradually selling the PaaS, the model will help Company-X make informed financial decisions.

Our study aims to create a tool that supports Company-X in defining its financial strategy and making pre-financing decisions to ensure stability.

1.3 The problem-solving approach

This Section explains the problem-solving approach that is used for our investigation. The specific process that we focus on is the DMAIC process.

1.3.1 The DMAIC process

We utilise the DMAIC process for the problem-solving approach, which stands for Define, Measure, Analyse, Improve, and Control. This method is chosen because it provides a structured, data-driven framework for research and adheres to ISO standards. (Kumar Phanden et al., 2022). Our study will not produce a single solution but will offer guidance by analysing various scenarios. The DMAIC approach is ideally suited for this purpose, as it enables us to establish financial improvements through a flexible model and maintain control by testing different scenarios.

Figure 2: DMAIC Problem-Solving Approach.

1. Define: formulate the problem and the root causes the company faces.
2. Measure: collect data, facts and general information to use in our research.
3. Analyse: evaluate the current situation and map out the various aspects to understand the root causes.
4. Improve: determine which improvements can be applied to correct the root causes.
5. Control: state the controls needed to be implemented to sustain the improvement. This can be done by evaluating potential scenarios and indicating which one is relevant for possible specific occasions.

1.4 Identifying the knowledge problem

In this section, we identify the primary research question and its supporting sub-questions. The main research question serves as the guiding thread of our investigation. The sub-questions are essential for addressing the main question, as they break down the problem into manageable parts.

1.4.1 The research questions

We discuss the main research question and the sub-questions and their relation to the stages of the Problem-Solving Approach (PSA) together with their deliverables.

Main research question

How can Company-X optimise its cash flow to improve financial performance during the first three years Company-X intends to gradually offer its Product-as-a-Service?

Sub-questions

Our research design, based on the DMAIC Problem-Solving Approach, answers the research questions. The first step of the problem-solving approach is 'Define'. This has been done in Section 1.2 and we defined the problem by a problem cluster.

Secondly, the following step in the PSA, detailed in Chapter 3, is 'Measure'. The 'Background Study' is divided into two sections: the 'Operational Study' in Section 3.1 and the 'Financial Study' in Section 3.2

In Section 3.1 we study the operational performance and therefore answer the following sub-questions:

- What environmental factors are influenced by the e-mobility market, particularly in terms of market trends?
    - Deliverable: a list of environmental factors that might be relevant to the research.
- Who are the primary stakeholders associated with Company-X?
    - Deliverable: a visualisation of the primary stakeholders for Company-X.
- What is the internal structure of the company, based on the current customer situation and sales and marketing plans
    - Deliverable: an internal analysis of Company-X, supported by an SWOT analysis.
- Which financial challenges or constraints are commonly encountered to successfully enter the market?
    - Deliverable: a list of commercialisation requirements.

In Section 3.2 we study the financial aspects and therefore answer the following sub-questions:

- What are the cash inflows and outflows of Company-X?
    - Deliverable: an overview of the cash inflows and outflows of Company-X that we gathered through interviews within the company or estimated by literature research.
- Which financing options are there for Company-X
    - Deliverable: a few financing options that are analysed together with its potential.

For the third step of the PSA we analyse the root cause of the problem. This is done by creating a flexible model that analyses the cash flows of the startup. In Chapter 4 we explain the flexible model and its calculations. For this, we answer the following sub-questions:

- Which assumptions need to be made to use the flexible model?
    - Deliverable: a list of assumptions that are explained.
- How is the flexible model constructed?
    - Deliverable: explanation of the construction of the flexible model.
- Which parameters are used for the flexible model?
    - Deliverable: a list of parameters.
- How is the Cash flow statement constructed?
    - Deliverable: explanation of the calculations that are used for the Cash flow statement in the flexible model.

For the fourth step of the PSA we improve the current situation by testing several parameters in flexible model to generate optimal scenarios. In Chapter 5 we evaluate several these scenarios and therefore we answer the following sub-question:

- What cashflow scenarios are appropriate for Company-X?
    - Deliverable: different scenarios based on charts assessed for their success and feasibility.

Eventually, we 'Control' the outcomes, which is the last step of the PSA. This is done by discussing the results and drawing a conclusion. In Chapter 6 we conclude. The main research question is answered, which is: *How can Company-X optimise its cash flow to improve financial performance during the first three years Company-X intends to gradually offer its Product-as-a-Service?*

1.4.1 Final deliverables

During this study, we give financial advice on what Company-X can do to operate during the first three years it gradually intends to offer its PaaS. We outline a set of requirements based on a thorough literature review that the company must meet to ensure operational success. Additionally, we identify and analyse the constraints that Company-X has already addressed and highlight those that still require further attention.

The final deliverable is a flexible model in which we incorporate several variables investigated in this paper. Company-X is aiming for a business in which it gradually offers its PaaS on a contract

basis. To do so, we need a projected financial overview that can be used to make decisions. The normative goal, so the desired outcome of this investigation, is to construct a model which shows the cash flows of a three-year period in which Company-X gradually intends to offer its PaaS. One of the most important assumptions of this research is that Company-X eventually wants to offer its product as a PaaS on a contract basis of 5 years.

We frame the research to three years since this shows how the transformation of cash flows in long-term planning. The deliverable cash flow model comprises several parameters determined in this study. Most of those parameters are investigated, but some remain variable. This is because Company-X is still in the problem-solving fit phase and its future decisions are not certain yet. For the startup, it is convenient to have a flexible model that can adapt to its evolving needs. In this paper, we examine parameters, as indicated by the literature research and input from Company-X. The flexible model is made in Excel and variable input parameters can be adjusted. The goal of this Excel model is to generate different scenarios and outcomes based on different combinations of these variables. The model helps us evaluate the financial viability according to different scenarios, allowing Company-X to make informed decisions based on these predictions.

1.4.2 Scope

Since our study is time-bound, it is important to clarify its boundaries to define clearly which aspects fall within the scope of interest of this study.

We want to identify, from a financial perspective, what is required for Company-X to operate without running into cashflow problems during its first three years they want to gradually offer its PaaS. That is why this investigation focuses on the important factors that Company-X must consider, based on both operational and financial skills. The scope includes the conditions Company-X must meet for successful operation and the critical parameters indicating its financial status.

Since Company-X is a startup, its decisions can change rapidly, reflecting its ongoing development and the need to anticipate new situations. Therefore, our scope focuses on a projected period of three years, excluding current adjustments.

1.4.3 Limitations

Eventually, our investigation aims to construct a flexible model that provides cashflow insights for financing Company-X. Even though the outcomes are based on facts and estimations to predict the future, certainty cannot be guaranteed. Therefore, we offer guidance rather than a fully developed advise, allowing Company-X to consider our outcomes when making new financial decisions. Our advise will be based on the flexible model and the startup is free to adjust the model to their wishes and expectations.

It is up to the company itself to decide when it wants to bring its product to the market and how it wants to set up its sales strategy. That is why the final model is not based on a specific year, but it sketches a situation for the first three years during which Company-X intends to gradually introduce its PaaS offering.

1.5 Reliability and validity

We gather most of our information through interviews with employees of the startup. The CEO holds key details, so several meetings are scheduled with him to collect this information. Before incorporating these details into our study, we verify them to ensure their accuracy. Financial details are checked by comparing financial statements and receipts, which help validate the CEO's assumptions.

However, not all information can be checked through financial documents. We have to make assumptions to estimate the operation process and timelines for specific actions. While the CEO provides these estimates, we verify their reliability by consulting other employees to gather their perspectives. The outcomes of these interviews are summarised and presented to the CEO for further refinement.

Besides conducting interviews with the startup, we also gather data through literature research. To make sure the used information is reliable, we use several sources. Once a source is used, we look for another source that supports the information of the first source. When there is an uncertain aspect that cannot be found in other sources, this aspect is not taken into account during the study unless it can be configured by a supervisor or another expert.

1.6 Theoretical framework

To construct the theoretical framework, we answer the following question: Which methods can be used to determine the cashflows for a financial strategy for a startup offering a PaaS?

To understand what is needed for Company-X to operate successfully from a financial perspective, we should analyse the business operations. The day-to-day operations of the business influence multiple 'stakeholders', so a stakeholder analysis should be constructed. The interests of the people of the groups involved are important, so the impact on the stakeholders must be judged (Slack, Brandon-Jones, & Johnston, 2016). Additionally, to understand the business market position, we execute a SWOT-analysis. By doing this, the field of action is indicated by its concrete measures from the four dimensions strengths, weaknesses, opportunities and threats (Neeb, 2022).

Financial planning models are used to develop a coherent long-term strategy. Short-time financial planning is only looking at the next 12 months, but for our investigation, we need to look further. Therefore we need long-term financial planning. To avoid surprises and prepare for upcoming

actions it helps to establish goals for the firm according to long-term, financial planning (Brealey, Myers, & Allen 2020). That is why we focus on a time period of three years to construct the flexible model.

To develop a flexible financial model for Company-X, it is crucial to project both cash inflows and cash outflows. This process involves constructing a cash flow statement, which is essential for managing a company's finances effectively. (Sahay, 2022). A cash flow statement helps control cash and supports short-term financial planning by disclosing potential surpluses or shortages (Motlagh, 2013). For Company-X, a startup with limited working capital, this tool is particularly valuable. In the event of a cash shortfall, securing a bank loan can provide the necessary funds to sustain operations. Cash inflows typically originate from three main sources: owners (shareholders), lenders, and clients (Manos, Parker, & Myddelton, 2023). Those three sources of cash flows should be analysed and visualised to construct a flexible model for Company-X.

The disclosed surplus or shortage of cash can be projected by cash flow statements. This is very convenient for Company-X since it is a startup and does not have a high amount of working capital. When there is a cash shortage, raising the bank loan can be arranged to sustain operations. The flows of cash in a business can be determined by three sources of cash inflows, which are owners (shareholders), lenders and clients (Manos, Parker, & Myddelton, 2023). Those three sources of cash flows should be analysed and visualised to construct a flexible model for Company-X.

To find the parameters needed to indicate the cash flows, we should extract data. We can derive a part of the data from financial documents such as financial statements and transcripts. However, parts of the cash flows have to be estimated from past events and future forecasts. This information can be obtained through interviews with the company's CEO and employees. Different interviewing techniques do exist and we are going to make use of 'structured interviews' and 'semi-structured interviews'. Structured interviews are mainly a list of questions that have a particular order which provides a high degree of control over the interview situation (Jong & Jung, 2015). Semi-structured interviews are more flexible. They have a vision of where the interview should go, but the questions are formed in a way that provides the opportunity to expand on the responses of the interviewee (Jong & Jung, 2015). The method is important to probe the meaning of the interviewee which adds significance and depth to the data that is obtained. However, the interviewer should also be aware that the way of communicating can influence the conversation and have an impact on the data collection (Saunders, Lewis, & Thornhill, 2019).

3 Background study

This Chapter is divided into two Sections: the operational study and the financial study. In the operational study, we analyse the startup's operational aspects to identify its challenges and strengths. This analysis is crucial for understanding Company-X's position and assessing the feasibility of its transition from pilot testing to market introduction. Such insights are crucial to developing a financial strategy that is aligned with the operational realities and future growth ambitions of the company. Through this detailed assessment, we ensure that the financial strategies are based on a thorough understanding of the startup's operational actions.

3.1 Operational study

Before we can delve into the financial strategy, we need to understand the operational aspects of Company-X. In general, it is challenging for startups to establish themselves in large competitive markets while they are still focused on development. Young companies require a lot of time and iterative refinement of their strategies to create a stable position. Analysing the current operational strategy allows us to understand all facets of the company and this information can be factored into decisions for the financial strategy.

In this operational study, we start with discovering environmental factors and get an idea of the awareness of E-mobility. We investigate the positions of the stakeholders and what their influence is on our study. Afterwards, we construct an internal analysis of Company-X that includes their current clients, and sales and marketing approach. This is supported by a SWOT-analysis in which we indicate the strengths, weaknesses, opportunities and threats of the startup. Besides, we studied the meaning of a Product-as-a-Service, since this is the main aspect that the startup considers important. Eventually, we did set up a list of guidlines for commercialisation based on literature sources, to understand what is needed to operate successfully and which aspects of Company-X need more attention. The focus is on gaining insights into the startup's cash flows to ensure a clear understanding of its operational realities and growth potential.

3.1.1 Environmental factors

Currently, a sustainable transformation in global sectors is driven by the urgent need to combat climate change. Financial markets play a big role in making these changes happen, leading to an increasing number of people adopting sustainable technologies (Li, 2023). Market trends cover shifts in the behaviour of technology, investments, demand and regulations that influence business strategies. Understanding these trends is crucial for this study as they provide insights into the environment in which Company-X operates. The following trends are particularly significant because they directly impact the e-mobility market and the associated environmental factors. By "environmental factors," we refer to the external conditions and influences that can affect the sustainability and growth of the e-mobility market.

- Technology Advancements: innovations in e-mobility technology drive market trends through improved performance and charging infrastructure.
- Confidence of investors: falling prices, favourable policies and growing interest are increasing investments in sustainable projects. Despite the COVID-19 pandemic, a record of $303.5 billion was reached in 2020 for worldwide investments in clean energy (Li, 2023). Following the integration of environmental, social and governance factors into companies, the link between financial markets and sustainability goals attracted even more investors (Pan, Cao, & Liu, 2023).
- Customer demand: compared to fuel-based vehicles, the operations of electric transport are very clean, which creates huge interest in electric vehicles and their demand is greatly increasing. Demand for sustainable mobility is growing every year. Even with the fears of global recession because of the war in Ukraine, the demand in 2022 for renewable energy projects remained higher than in the years before (United-Nations, 2023).
- Regulatory changes: there is an ongoing regulation between financial institutions, governments and industry partners to make sure the adoption of clean technologies will be stimulated. Environmental factors like air quality are coordinated by government policies, such as emission regulations and (Li, 2023). Those regulations influence the possibilities, but also the restrictions for e-mobility.

3.1.2 Stakeholders

a stakeholder analysis is conducted to identify and understand the various stakeholders involved with Company-X and their potential influence on the study. The stakeholders include the CEO, startup employees, clients and their employees, development partners, transport partners, suppliers, finance providers, insurance and certification providers, and government entities. Each stakeholder's role, their influence on the study, and the potential impact of the study's outcomes on them are carefully analysed.

Conducting a stakeholder analysis is crucial for several reasons. First, it ensures that all relevant parties are considered, which helps to anticipate their concerns and contributions. Understanding the influence of each stakeholder on the study is vital because their actions and decisions can significantly affect the research outcomes. Conversely, understanding the impact of the study on these stakeholders is equally important, as it allows for the development of strategies that align with their interests and expectations.

Stakeholder analysis visualisation

We created a visualisation to map the positions of each stakeholder. Those are categorized into four sections: 'Keep Satisfied,' 'Work Closely With,' 'Monitor,' and 'Keep Informed.' Those placed higher in the diagram hold greater influence over our investigation, as we rely on their information or need to consider their constraints and preferences. Stakeholders positioned further to the left are most impacted by our study, especially regarding the provision of detailed cash flow insights. The specific influences and impacts of each stakeholder is discussed below as well.

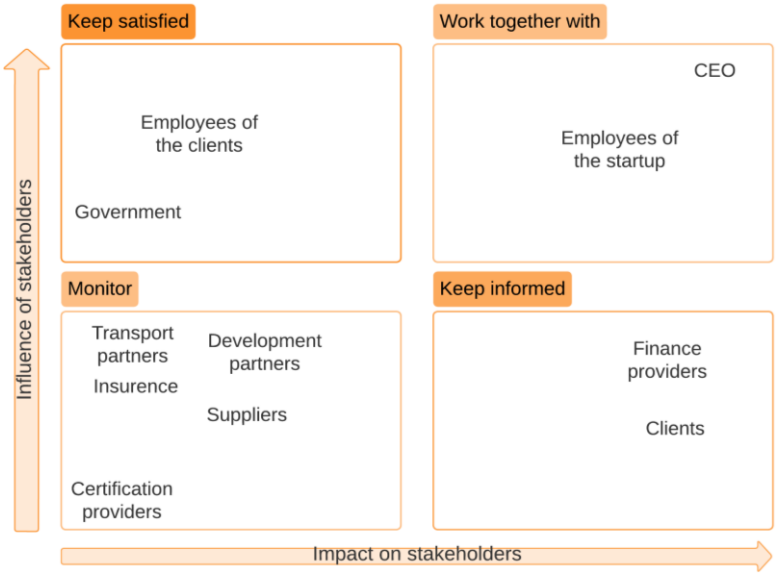

Figure 3: Stakeholder Analysis Visualisation.

The founder and CEO dedicates full-time efforts to the company and makes final decisions across all departments. Hence, his input and involvement are needed during this investigation. He can provide information about the current and desired situations, so we have to work together to optimise the outcome of the study. Besides, the CEO eventually benefits from new insights into his financing strategy, streamlining financial decision-making processes and speeding up the startup's overall progress.

Team members of the firm work in the team that the CEO of Company-X leads. This team consists of approximately 10 people with different tasks like software development, designing, improving user experience, monitoring sales and performing marketing. Most of the team members work part-time and some only stay for a relatively short period. Due to the startup's limited workforce and flexible structure, there are no fixed departments or functions for the employees. Every team member is working out their personal skill, but they also integrate to combine knowledge and fill tasks that do not belong to a specific employee. During this investigation, the team members of company-X contribute to providing information for the study.

The clients are the customers of Company-X, which means they adopt the PaaS at their company. Currently, clients show interest in purchasing the system, but it is hard for the startup to finalize a contract because of their unstructured financial strategy. The preferences of the clients need to be integrated into the financial plan to achieve optimal sales. By implementing a financing strategy, Company-X stands to enhance its sales, thereby benefiting both the company and its clients.

The employees of the clients are going to be the users of the PaaS, which means they are going to adopt the system in their daily actions. Their user experience is important for Company-X to include in its marketing strategies and product development. Generally, customers have limited influence

over the financial decisions of the companies they are working for, thereby having minimal impact on the overall financial strategy. However, it is observed that the implementation of PaaS enhances employee satisfaction. Therefore, an extensive financial strategy can improve customer satisfaction.

Development partners are extern firms that cooperate with Company-X to improve the PaaS. A few external software development partners provide the startup with software support for the PaaS. While the firm is executing its PaaS, the software development partners can improve the system together with employees of Company-X. Besides, there is also a mechanical design engineering partner that designs the prototypes of the PaaS and creates blueprints. The costs and lead times of those development partners are a big influence on the financial strategy based on their delivery timing and depreciation determining the cash flows.

Transport partners play a crucial role in delivering the PaaS to the client. The expenses to pay these partners directly impact the financing strategy, as they constitute a significant cash outflow. The financing strategy itself does not affect transport partners, as their operations and costs remain the same despite changes in the financing approach.

Suppliers provide the startup with necessary goods and services, or raw materials for further processing or production. Again, the costs and lead time of those suppliers are a great influence on the building time and cash flows of Company-X, since the firm depends on those supplies. Again our study does not impact the suppliers, since they do not change their costs or operations.

Potential finance providers are individuals or organisations that facilitate access to financial inputs like loans or financing funds. Examples of finance providers include banks, moneylenders, cooperatives, investors, and subsidies (Wulandari et al., 2021). Each financial provider can influence the strategy of the business and the financial aspects in their own way. For example, the startup depends on the amount of money an investor is willing to invest or the amount of money he provides. Besides a strong financial strategy can convince a financial provider to cooperate with Company-X.

The insurance covers the costs associated with potential risks. Company-X's system is insured during transport and storage, with additional general insurance for personnel. A monthly premium for these insurances is calculated as a percentage of the insured sum. These premiums are a large part of the cash outflows, thus greatly influencing our research.

Certification providers are important for Company-X. However, the startup certified the design of its Paas and we assume the company will continue to meet the certification requirements. Therefore it does not need to purchase new certificates, so there are no additional cash flows that can influence our study.

The government have become aware of e-mobility possibilities to reduce emissions. The Netherlands is striving for a zero-emission for passenger vehicles by 2030, to improve sustainability (*Electric*

Transport in the Netherlands, 2024). That is why the PaaS of Company-X can contribute to this goal and positively influence this stakeholder.

3.1.3 Internal analysis of Company-X

Now the Environmental factors and the stakeholders are analysed it is crucial to understand current operational tactics of Company-X. This allows us to examine the firm for their capabilities and business mission.

Current client situation

Company-X has been making frequent small changes during the investigation, which is common in the startup phase. Startups often adjust their strategies and operations quickly to adapt to market feedback and challenges, helping them find the best path to success. The startup is actively engaging in extensive promotional efforts to publicise its product to potential clients, resulting in numerous new contacts and agreements. Our focus is on the first three years of Company-X's gradual offering of its PaaS rather than current contracts and clients. However, analysing the current situation is crucial to understand Company-X's present position and future opportunities. Therefore, I attended seven sales meetings with clients to gain insights into the position and interactions of Company-X and its clients.

At the end of March 2024, Company-X did have three major parties for which a pilot setup was agreed. The first pilot was executed in March and April 2024 at the company of an important client. This system was already worked out in detail, so it did have the desired looks and functionalities. For a few weeks, the PaaS was used by 10 different employees who provided feedback. At the end of the pilot, the client confirmed that it wanted to adopt multiple systems at its company. During the sales meeting, I discovered that the client's demand exceeded Company-X's expectations, which was very positive. The second pilot is executed in May and June 2024. For this pilot, Company-X received a cash prize for winning a competition for startups. This prize almost covered the Costs of Goods Sold by the PaaS ensuring a new PaaS system without significant material costs. For the third pilot, a new improved system was built in which the errors of the first version were corrected. The third client funds an expense allowance covering transportation, installation, and organisational costs. In addition to the three pilots, the startup is identifying new potential clients. For 2024, the CEO is expecting additional pilots and securing future contracts.

Sales approach

Company-X has a sales approach to attract clients and sell the PaaS. However, it does not yet sell its PaaS on a fixed contract, so its sales approach can be adjusted to the wishes of the clients. This is because the startup is currently mostly focused on running pilots and attracting customers, so it needs to be open to change.

The sales flow visualisation in Figure 4, starts with a lead gained through marketing. The contact is made via an e-mail, which is followed up by an additional email in case of no response. Afterwards, a sales meeting is planned and this meeting can directly lead to a demo contract or it can continue with a new meeting for a scan for a pilot. Once the pilot scan is successful and a green light is given for a pilot, the contract is signed. A singed contract can be focussed on a pilot or a demo. A demo can be constructed to generate interest for the client to purchase the PaaS and a pilot is focussed on testing the system, receiving feedback and including the client in the development process before purchasing the product. To ensure the sale a next follow-up meeting is planned after the pilot. After the sale, the startup aims to upsell (encourage clients to purchase more PaaS's) and incorporate positive client referrals to attract new marketing leads. The sales flow is visualised below in a flow chart including each stage's steps.

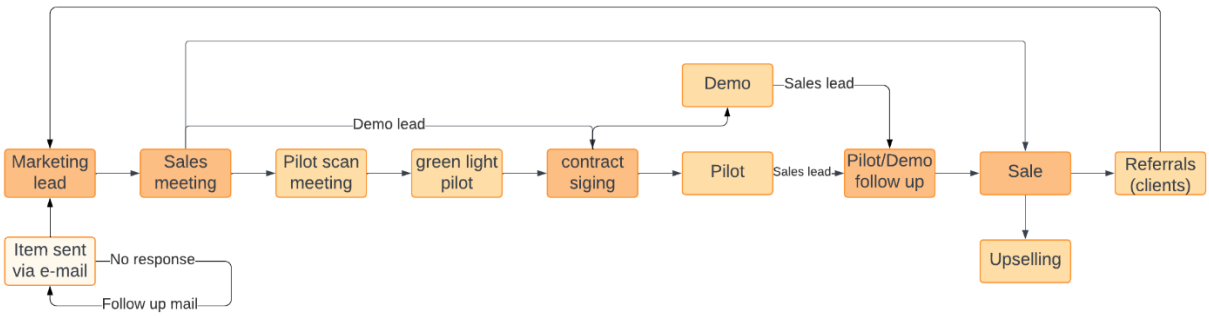

Figure 4: Sales flow.

During this investigation, I was able to attend several sales meetings together with the CEO of the company. We constructed meetings based on questions, which assured us to get a good understanding of the wishes and the bottlenecks of each potential client. These questions were created from the concept called 'SPIN selling'. This is a question model that follows the order of SPIN, through Situation, Problem, Implication and Need-payoff questions (Rackham, 1988).

The SPIN questions gave me insights into the sales approach of the startup. Rather than imposing the PaaS on potential clients, the CEO uses a questioning approach to assess whether their system aligns with the client's needs. This method involves gathering information about the situation of the client and identifying the existing challenges. Next, the CEO explores how his system can address those problems and whether his solution is suitable. He collaboratively does this without pushing the concept. His approach prioritises clients who benefit from his system to deliver value to the right audience. The CEO believes that SPIN's greatest value lies in guiding customers to recognize and articulate their own problems, as well as the potential solutions, through their own insights.

I discovered that the clients' awareness of potential challenges increased during those meetings. This is the moment clients discover their needs for the PaaS or turn to alternative solutions. That is a crucial point for the startup since they aim to maintain the attention of the client. In general, it is not necessarily the sector in which a company operates that determines its interest, but rather whether the company prioritises improving internal logistics, sustainability or employee satisfaction. Although the nature of a business doesn't always indicate immediate interest, the

startup is learning to identify the right timing for companies to prioritise innovations and adopt the system. This approach allows Company-X to better understand its target market and attract the right clients.

Marketing approach

The marketing objectives of Company-X are to enhance brand awareness and facilitate market introduction. Brand awareness is boosted by word-of-mouth achieved through networking activities and inviting customers to events of the startup. Referrals of clients are also important for the startup to positively expand its network. Referrals can come from external sources as well and are influenced by the employees of the startup talking to other parties. In addition, familiarity with the brand is very important, because it makes the brand memorable and increases sales potential. Once a customer is involved with the startup, the firm strives to maintain credibility to build trust and customer interaction.

The market launch aims to educate the public about the concept, establish a competitive position and win early adopters. The main marketing channels are LinkedIn, Instagram, Facebook, and word-of-mouth. LinkedIn is the primary channel because of its focus on B2B, featuring posts about events and company progress. This channel is widely used by the firm and thus also functions as an important marketing tool.

Finally, the firm invests considerable effort in showcasing itself at events such as fairs, pitches, and networking activities. I had the opportunity to attend an international fair and several pitch events, where I witnessed the power of word-of-mouth marketing. The startup attracted a diverse group of interested individuals. For example, I spoke with environmentally conscious employees, CEOs interested in innovative concepts, managers focused on employee satisfaction, and investors intrigued by new startups.

SWOT-analysis

Conducting a SWOT analysis is essential to understand the strategic position of a startup. SWOT stands for Strengths, Weaknesses, Opportunities, and Threats, and it helps evaluate both internal and external factors impacting the business. Strengths and weaknesses focus on internal capabilities and limitations, while opportunities and threats consider external market conditions (Neeb, 2022). This analysis provides a comprehensive view of the startup's current situation and its growth potential. By understanding these factors, stakeholders can make informed decisions to enhance strengths, address weaknesses, leverage opportunities, and mitigate threats to ensure the startup's financial stability and strategic success.

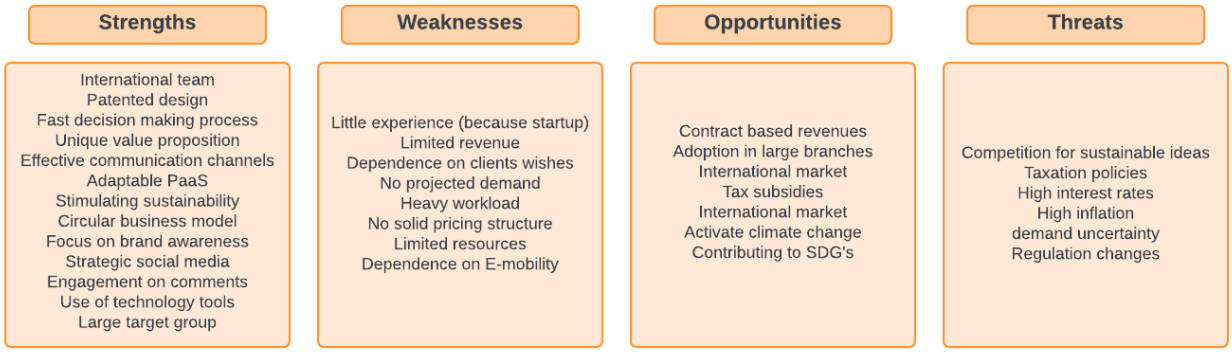

Figure 5: SWOT-analysis.

3.1.4 guidelines for commercialisation

Commercialisation is the phase in which a company has identified its business idea and is planning to bring its product or service to the market. A startup may face difficulties because of external factors such as unpredictable demand, and branding while trying to transform ideas into reality (Games et al., 2020).

Gans & Stern (2003) set up a framework to analyse the commercialisation strategy for startups and research on commercialisation for innovations driven by deep-tech is done by Kruachottikul et al. (2023), which is tested by three case studies of different exploitation methods. Both studies establish that the commercialisation phase is the phase in which a startup can truly perform its strategies and position for the first time. Nevertheless, the importance of effectiveness in delivering consumer value should not be underestimated, since a startup's limited financial and human resources can result in only purchasing a few strategic options. That is why our investigation needs to understand the requirements for commercialisation This helps identify the areas where the startup has made significant progress and those that require further attention before implementing a successful financial strategy.

Based on the outcomes of the two frameworks we have compiled a list of essential guidlines for a company seeking to commercialize and operate successfully in the market:

1. Construct a promising, validated business model: develop a business model that includes a comprehensive sales and marketing plan, informed by early market feedback.
2. Conduct patentability analysis: ensure that a patentability analysis is performed to secure legal protection for your innovations.
3. Practice effective project management: facilitate increased interaction among stakeholders by breaking down large tasks into smaller, manageable action steps.
4. Collaborate with incumbent firms: establish a strong foundation by partnering with established firms, rather than competing directly in the market, to avoid being perceived as a competitive threat.
5. Engage potential users early: develop innovative designs by involving potential users or clients as early as possible to ensure the product meets market needs.

In the next Section, we examine these guidelines with respect to Company-X's capabilities.

3.1.6 Operational conclusion

The Operational study serves as a precursor to the financial study, aiming to assess whether Company-X is ready for commercialisation. We evaluate each guidelines for commercialisation, determining whether Company-X is successfully fulfilling it and identifying aspects that need more attention.

1. Construct a promising, validated business model

The firm has a sales plan supported by a structured sales flow scheme. However, a comprehensive sales strategy that includes all potential tactics for gaining customers is not yet fully developed. The startup is still learning about its target group and its wishes. Once the target group is defined, the company is able to construct a comprehensive financing strategy. The marketing plan is improving and the firm is succeeding in attracting a substantial number of contacts that sustain a convenient potential customer base. The use of online platforms like LinkedIn is working effectively and the company also attends several fairs and activities to show its brand. This does pay off, since the startup gained several clients that tested the pilot and provided user feedback. Even though, the business model needs to be expanded with more details based on pricing, demand, location, etc, the business model is already promising for the current situation. With additional finalisations, Company-X can succeed in constructing a promising, validated business model.

2. Conduct patentability analysis

The design of the product is patented in Europe, this means that no one in Europe is allowed to use the design. However, the concept itself is not yet patented, and there is no patentability analysis conducted by the startup. Therefore, the startup needs to focus more on patentability to secure legal protection for its innovations.

3. Practice effective project management

Currently, the startup has a team with employees that mainly work part-time. Since the employees are mostly staying for a short period and focus only on their own tasks, it is hard for the CEO to manage all the subtasks together with leading the general project. While large tasks are broken down into smaller, manageable action steps, there is still a need for more structure. Weekly meetings provide an overview of tasks, but increased interaction among stakeholders and employees would enhance project management effectiveness.

4. Collaborate with incumbent firms

The startup is partnering with established firms active in the same specific market. For example the firm partners with specific mobility firms and sustainable developers. Besides, it has several

suppliers that provide material and it includes them in the production process, since the suppliers provide customized materials. Additionally, Company-X works with partners to manage designs and software. Therefore the startup is performing well on collaborating with incumbent firms.

5. Engage potential users early

The current client situation is positive for the startup. Although the PaaS is not yet on the market, there is already interest from businesses in obtaining the system. Several clients are testing pilots and are involved in the process of the startup. The firm is engaging potential users early, and even contracts are being arranged for early buyers.

Overall, the startup is moving in the right direction. However, Company-X needs to pay more attention to conducting patentability analysis and practicing effective project management. Since commercialisation has not yet begun for Company-X, there is time to implement these improvements.

3.2 Financial study

Here, we examine Company-X's cash flows and analyse which parameters need to remain flexible. The cash flows are influenced by the terms of contracts established with clients. To gain a comprehensive understanding, we describe the cash flows based on a 'regular' contract, which is considered to be the most commonly sold. Due to confidentiality, we work with prices multiplied by a random factor. The calculations stay the same, but the final prices do not represent the actual situation for Company-X.

3.2.1 Regular contract of the PaaS of Company-X

The contract for the PaaS of Company-X comprises several aspects, determined by pre-established agreements. When a contract is signed, the client consents to these conditions. This is important in our research because the value of the PaaS is influenced by the costs covered under these agreements. In addition to the material cost of the product, the PaaS includes a service component that must be complied with.

The value of the contract is influenced by the number of units in the system and the contract duration. The systems can be adjusted to include more or fewer units, and the agreements are typically based on multi-year contracts. To understand the cash flows of the company, we analyse them according to a 'regular' contract. This regular contract consists of a system of 13 units and is set up for a duration of 5 years. Company-X anticipates this will be the most frequently purchased contract. The specific terms of this 5-year contract with 13 units are detailed below.

Section	Agreement
Initial Ownership	Company-X
Maintenance & Support	Included
Software & Firmware Updates	Included
Semi-annual Service Visit	Included
Mobile Connectivity Services	Included
Damage Insurance	Included
Uptime Warranty	75% uptime per system
Outage Compensation	€X / day / defective unit
On-Site Repairs	Included
Repair Cost (Labor & Travel)	Included
Support Response Time	< 60 minutes
Email Response Time	Within 48 hours
Repair Response Time	2-3 working days

Table 1: Regular contract.

3.2.2 Cash outflows

In this Section, we discuss the cash outflows of Company-X. Those are based on the Cash outflows for the system, the Investing Activities and the Operating Expenses. Those three components are the cash outflows that occurs during the first three years that the firm gradually sells its PaaS and are mentioned below.

3.2.1.1 Cash outflows for the system

With the cash outflows per system we mean the direct costs made to build and maintain the PaaS. Therefore we include the Cash for Costs of Goods Sold (COGS), the cash for Direct Labour Costs, the cash for Maintenance, the cash for Insurance Premiums and the cash for Transportation. Those costs combined, form the direct cash outflows for one PaaS. All the values that we mention are calculated per system.

Cash outflows for Costs of Goods Sold (COGS)

The Cash for Goods Sold (COGS) represents the direct cost of producing the goods a firm provides (Manos, Parker, & Myddelton, 2023). In our investigation, COGS encompass the material needed to build the system.

The material costs include all the costs associated with each system component. The system consists of several components with fixed prices and Company-X made a Bill of Materials (BoM) that we used to determine the costs of the system. The system entails 13 'Units' a 'Main unit', a 'Base' and 'Other parts'. The Cost of Goods Sold payment is executed simultaneously since some purchases need to be paid in advance for certain partners. To determine the cash flows at a specific moment, these lead times need to be included. Therefore, the costs for paying partners with a dependable lead time are distinguished per delivering partner. The costs for partners, which fall within the Total COGS, are mentioned below.

	Cash per system
Steel parts delivered by partner	€ 17,144
Coated parts delivered by partner	€ 3,389
Remaining COGS	€ 16,987
Cash for COGS	**€ 37,521**

Table 2: Cash outflows for COGS.

Cash outflows for direct labour

The direct labour costs for building the system are based on the number of assembly hours. The CEO of Company-X estimated the direct labour hours for each case and we mention them in the table below. The labour costs per hour are fixed and they are multiplied by the number of expected hours. The estimations are based on previous experiences of building the system.

	Per system
Cash per Hour	€ 50
Direct Labour Hours	272
Cash outflows for Direct Labour	**€ 13,600**

Table 3: Cash outflows for direct labour.

Cash outflows for maintenance

The PaaS also delivers a service, and the maintenance costs can be seen as the costs that are incurred by executing the service. The cash outflows for maintenance are calculated by frequencies per year which are determined by the CEO and the team.

	1 year	5 years	per month
Semi-annual on-site maintenance	€ 1,870	€ 9,350	€ 155
Support	€ 1,020	€ 5,100	€ 85
Connectivity	€ 204	€ 1,020	€ 17
Replacement units	€ 2,166	€ 10,834	€ 180
Replacement other parts	€ 899	€ 4,498	€ 75
Cash outflows for maintenance	€ 6,160	€ 30,802	**€ 513**

Table 4: Cash outflows for maintenance.

Cash outflows for insurance

The firm purchased insurance for each individual system, which means a premium is paid per PaaS. The startup has full coverage insurance for the stay of the PaaS, which means the system is fully insured if damage occurs during stays with a client. For this, Company-X must pay a premium of 3% over the insured sum. The determine the sum that needs to be insured, we first need to calculate the direct cash outflow per system. This includes the direct costs that are made to build the system, which are the COGS and the direct labour costs.

$$Direct\ Cash\ Outflows\ per\ System = COGS + Direct\ Labor\ Costs$$

To cover a margin in the insured sum, we want to calculate the premium according to the direct cash outflows per system with the Product Margin (PM).

$$Direct\ Cash\ Outflows\ per\ System\ with\ Margin = Direct\ Cash\ Outflows\ per\ System \times (1 + Product\ Margin)$$

$$Premium\ for\ the\ Stay\ per\ System = 3\% \times Direct\ Cash\ Outflows\ per\ System\ with\ a\ Margin$$

The premium is still deterministic because we have not defined the PM.

Besides the premium, there are a few other costs involved in the yearly insurance payment that Company-X needs to pay. For the yearly insurance premium per system, we use the following formula.

$$Yearly\ Insurance\ Premium\ for\ the\ Stay\ per\ System = Premium\ for\ the\ Stay\ per\ System + Polis\ Costs + Insurance\ Tax$$

$$Insurance\ Tax = Premium\ for\ the\ Stay\ of\ the\ PaaS \times 21\%$$

Cash outflows for transportation

The cash for transportation outflow occurs when the PaaS is transported from the assembly location to the client. With the transportation, we mean the shipping and the installation & setup. Again, insurance per transportation is established to insure the sum of the direct cash outflow per system. The premium for the transportation can be calculated as follows.

$$Premium\ for\ Transportation = 0.58\% \times Direct\ Cash\ Outflow\ per\ System\ with\ Margin$$

$$Insurance\ Premium\ for\ Transportation\ per\ System = Premium\ for\ Transportation\ per\ System + Polis\ Costs + Insurance\ Tax$$

Now, the yearly insurance premium for transportation is determined, we can calculate the total cash for transportation per system.

$$Total\ Cash\ for\ Transportation\ per\ System = Cash\ for\ Shipping + Cash\ for\ installation\ \&\ setup + Insurance\ Premium\ for\ Transportation\ per\ System$$

3.2.1.2 Cash outflows for operating expenses

The cash outflows for the operating expenses are the costs that are made periodically. Those costs may not be related to any particular project, but they are paid to continue daily operations (Brealey, Myers, & Allen 2020). The cash for operating expenses exists out of the cash for labour, cash for marketing, cash for rent, cash for utility, cash for software tools, cash for administration, cash for depreciation and amortisation, cash for licenses and cash for insurance.

The cash allocated for labour increases over the years as the production of systems rises. We have projected the cash for labour for each year based on a growth factor. After six years, the monthly cash flow is assumed to stabilise, because the number of installed systems becomes consistent.

	Cash per Month
Labour for Year 1	€ 71,400
Labour for Year 2	€ 119,000
Labour for Year 3	€ 214,000
Labour for Year 4	€ 309,400
Labour for Year 5	€ 380,800
Labour for Year 6+	€ 452,200

Table 5: Cash outflows for labour.

Most additional cash outflows for operating expenses are incurred monthly, meaning these costs must be paid each month. These cash flows also increase over the years, but predicting the expected growth curve for these costs is challenging. Therefore, we projected the cash flows for operating expenses based on the growth of cash for labour, assuming that the increase in labour will be the most comparable to the growth for these expenses.

Typically, cash flows from depreciation and amortisation are recognized at the time these expenses are incurred. However, in our analysis, we approached this differently, since we reviewed the average amounts over the past few years and derived a monthly average. While these expenses might occur randomly in reality, our model assumes a consistent monthly average for simplicity and stability.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6+
Marketing	€ 340	€ 567	€ 1,020	€ 1,473	€ 1,813	€ 2,153
Rent payments	€ 6,120	€ 10,200	€ 18,360	€ 26,520	€ 32,640	€ 38,760
Utility	€ 1,122	€ 1,870	€ 3,366	€ 4,862	€ 5,984	€ 7,106
Software Tools	€ 2,897	€ 4,829	€ 8,692	€ 12,555	€ 15,453	€ 18,350
Administration	€ 1,360	€ 2,267	€ 4,080	€ 5,893	€ 7,253	€ 8,613
Depreciation and Amortisation	€ 850	€ 1,417	€ 2,550	€ 3,683	€ 4,533	€ 5,383

Table 6: Cash outflow for operating expenses per month.

Additionally, there are annual cash outflows for operating expenses. These occur in the last month of each year to cover licenses and insurance for the upcoming year.

	Cash per Year
Licences	€ 6,800
Insurances	€ 3,622

Table 7: Cash outflows for operating expenses per Year.

3.2.1.1 Cash outflows for capital expenditures

Capital expenditure decisions are often referred to as investment decisions for larger projects. Corporations can invest in intangible assets such as research and development to sustain their reputation for the long run. Capital investments of today generate future cash returns (Brealey, Myers, & Allen 2020). The capital expenditure cash outflows are incurred monthly and we assume they do not change over the years since we do not expect Company-X to make huge changes regarding their development of software or research. We expect the PaaS to stay the same over the years. The cash flows that we incorporate in the model are mentioned below.

	Cash per Month
Software Development	€ 680
Research & Development	€ 1,360

Table 8: Cash outflow for capital expenditures.

3.2.3 Cash inflows

In this Section we discuss the cash inflows of the startup. The cash inflows are based on the cash inflows per system, which exists out of the transportation cash flows and the contract cashflows.

Cash inflows per system

The cash inflows per system are cash from transportation, cash from first contracts, and cash from second contracts. The cash from transportation (for shipping and installation & setup) is determined per month and can be calculated by the following formula.

$$\begin{aligned} &Cash\ from\ Transportation\ per\ Month \\ &\quad = Amount\ of\ placed\ systems\ per\ Month \\ &\quad \times Cash\ from\ Transportation\ per\ System \end{aligned}$$

With the cash from transportation per system, we mean the cash that is retrieved from the client for transporting one system. This includes the cashflows for shipping, installation & setup and the insurance premium for transportation, multiplied with the PM.

$$\begin{aligned} &Cash\ from\ Transportation\ per\ System \\ &\quad = Cash\ for\ Transportation\ from\ System \times (1 + Product\ Margin) \end{aligned}$$

The cash from contracts refers to the annual payments received from clients, based on the TCV over a duration of five years. Therefore, it is calculated by multiplying 1+ PM to the total cash outflows per system for 5 Years. The total cash outflows per system for 5 years and the TCV for 5 Years are determined by the following equations.

$$Total\ Cash\ Outflows\ per\ System\ for\ 5\ Years = Direct\ Cash\ Outflow\ per\ System + Maintenance\ Costs\ for\ 5\ years + 5 \times Yearly\ Insurance\ Premium\ for\ the\ Stay\ of\ the\ PaaS\ per\ System$$

$$Total\ Contract\ Value\ for\ 5\ Years = Total\ Cash\ Outflows\ per\ System\ for\ 5\ Years \times (1 + Product\ Margin)$$

Once the TCV is established for 5 years, we determine the contract portion per Year, representing the annual payment by the client. Therefore, we can calculate the cash from the contract for each specific year per system.

$$Cash\ from\ the\ Contract\ during\ Tth\ Year\ per\ System = Contract\ Portion\ during\ the\ Tth\ Year \times Total\ Contract\ Value\ for\ 5\ years$$

$$With\ T \in 1,2,3,4,5$$

After we determine the cash from the contract for each of the five years, we can calculate the monthly cash from the Contract. This represents the cash inflow based on the number of closed contracts during a specific month at the preceding years. Since clients make an annual payment, we have to include all closed contracts from previous years in the monthly cash flows for the corresponding month.

$$Monthly\ Cash\ from\ the\ Contracts\ during\ the\ Tth\ Year = \sum_{i=1}^{X} Amount\ of\ used\ Systems\ per\ Month\ in\ Year\ i \times Cash\ for\ Tth\ Year\ Contract\ per\ System$$

$$With\ T \in 1,2,3,4,5$$

With the cash from first contracts, we mean the cash flows from clients that purchase the system for 5 years. After those first 5 years, the contract ends and a new contract is established. We call this new contract the second contract. The same system can be used for this contract, so after 5 years, the cash inflows from the first contract are assumed to repeat themselves. For example, if there are 5 systems placed during the first month of the first year and there are 38 systems placed during the first month of the sixth year, there are cash inflows from 5 + 38 = 43 contracts.

3.2.4 Growth in the number of newly closed contracts

The number of contracts closed per month is assumed to grow according to an S-curve. The S-curve characteristic is the increasing growth rate of variables at the beginning of time. After a growth period, the growth rate then gradually slows down until it reaches a certain limit (He et al., 2018). This is the expected growth behaviour for Company-X's number of closed contracts since the startup is new in the market and has to build up a customer base. The company is aiming

for 40 contracts per month after six years of gradually operating. This is also why exponential growth is less realistic since the production of the startup cannot continue exponentially forever. After six years we expect a stabilisation of the number of signed contracts. Therefore, the formula of our s-curve reaches the number of 40 contracts signed per month during the 72nd month of our model. The Sigmoid function, which maps real-valued numbers in the range of 0 to 1 in an S-shaped curve, is used to represent this growth pattern

$$f(x) = \left(\frac{1}{1 + e^{-z}}\right)$$

$$z = -0.1 \times \left((x - x_0) + 1 - 37\right)$$

The parameter $x - x_0$ sets the duration of passage from one level to another (Shanin & Shtondin, 2021). Here, x_0 represents the position of the first month of the first year. To calculate the value of any other month x, we take the difference between the independent variable x and the parameter x_0. The constants -0.1 and $1 - 37$ modify the shape and position of the sigmoid curve.

The formula that we use in our model to calculate the number of monthly closed contracts is as follows.

$$f(x) = 4 + \left(\frac{37}{1 + e^{(-0.1 \times ((x - x_0) + 1 - 37))}}\right)$$

Adding 4 to the entire expression shifts the sigmoid curve vertically by 4 units, which provides a starting value of 5 for the first month. The plotted curve for the number of monthly new closed contracts can be found below.

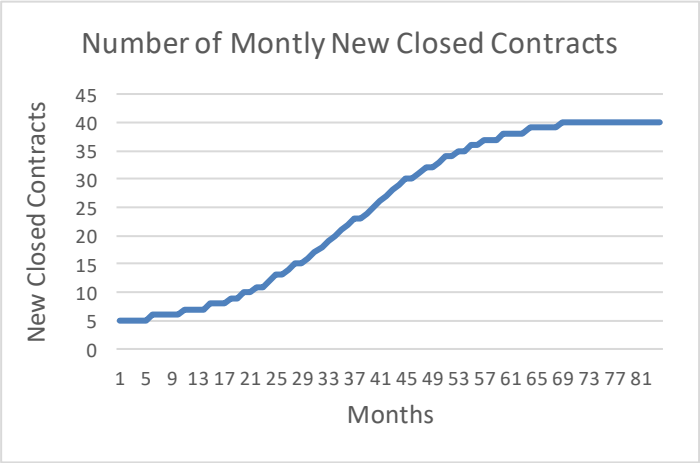

Figure 6: S-curved Graph for Number of Monthly Closed Contracts.

3.2.5 Financing options

Internal financing, which includes sources like retained earnings or the sale of assets, is generated from within the company. However, this alone is insufficient to meet the startup's financial needs, and therefore external financing is needed. External financing involves raising funds from outside sources, such as investors or lenders, and there are various options available. (Liao & Wang, 2024) We analysed three widely recognized immediate funding solutions: equity financing, debt financing, and financial leases.

Equity financing

Equity financing is a primary financing source for early-stage startups. It involves selling a portion of ownership in the company to investors in exchange for capital. Unlike other financing options, equity funding reduces the risk of cash flow issues related to loan repayments, but it does influence the dilution of ownership for the shareholders. This method often becomes essential as traditional lenders like banks hesitate to finance early-stage ventures until they demonstrate stable growth (Halt et al., 2016).

There is a so-called Angel Investor involved in Company-X who can provide equity financing. In general, angel investors are interested in investing privately in small businesses or startups during the growth stage. Since this is an uncertain stage with high risks, angel investors often wish for a high investment return rate. Normally, the contribution of an angel investor is $100,000 to $500,000 (equivalent to €93,000 to €465,000) in private equity funds (Halt et al., 2016). It is established that the angel investor of the startup is willing to finance the firm during the first three years it is gradually going to offer its PaaS. This means equity financing might be an option for Company-X.

Debt financing

In debt financing, a firm can borrow money with the intent to repay it over a fixed period. Over this period, there will be a specific interest rate as well. Debt financing is simply a loan where the lender does not gain any ownership of the business. Instead, the lender earns money through the interest on the loan amount (Manos, Parker, & Myddelton, 2023).

However, banks are often not easily willing to provide loans to unestablished startups but prefer lending to businesses with a proven financial track record. Lenders typically require a personal guarantee based on the business owner's assets and credit history to protect their investment (Halt et al., 2016). At a tech event called The Next Web, I attended a presentation on debt financing by RaboBank. I learned that while debt financing is becoming more accessible, but are primarily designed for scale-up businesses rather than start-ups. Altogether, debt financing is generally more attractive to larger, more established businesses than to startups. Therefore, debt financing might be relevant for the company once it is in the scale-up phase, but for now, we do not incorporate it into the model, since it is not realistic for Company-X to obtain debt financing from bank loans.

Financial lease

Leasing is a type of debt financing, but we distinguish between these different strategies due to their significant impact on Company-X. In a lease arrangement, the lessee (user) makes regular payments to the lessor (owner) in return for an asset. These payments are usually made monthly or semi-annually, starting as soon as the contract is signed (Manos, Parker, & Myddelton, 2023).

A financial lease is a specific type of lease that works like borrowing money, to provide a source of finance. The lessee gets immediate cash flow because they do not have to pay for the asset upfront. Therefore, the lessee also has a binding obligation to make the payments specified in the lease contract. For example, the user could have borrowed the full purchase price of the asset by accepting the binding obligation to make interest and principal payments to the lender (Brealey, Myers, & Allen 2020).

There are several ways to utilize a financial lease, each offering unique advantages depending on the needs of the business. In any leasing arrangement, there is always a lessor, who provides the capital or equipment, and a lessee, who uses it. For Company-X, various leasing options are available. One approach is for an external leasing company to lease capital directly to the startup, providing the startup with cash inflows that help cover its cash outflows. Another option is for the leasing company to lease the system directly to the startup's clients, making the leasing company the owner of the system while the client benefits from its use.

While these examples highlight some of the potential leasing strategies, our investigation will not focus on selecting a specific leasing method. Instead, we will include the concept of leasing as a flexible financing tool in our model. Ultimately, the CEO of the startup can choose the most appropriate leasing method based on the company's financial situation and goals. For now, financial leasing is integrated into the cash flow model, allowing us to analyse the resulting cash inflows and outflows and compare monthly cash flows. In our investigation, we address leasing as a way to finance capital, considering essential factors like lease terms and interest rates, which are typically negotiated with the external leasing company.

Once the lessee receives the cash to sustain cash outflows, it must make Monthly Lease Payments to repay the Leased Value. The lessor (the leasing company) incorporates an interest rate established in advance. Typically, the annual interest rate is provided by the lessor. However, to align with our monthly cash flows, we need to calculate the monthly interest rate by dividing the annual interest rate by 12.

$$r_{monthly} = r_{annual}/12$$

The annual interest rate is commonly around the 10%, which provides an monthly interest rate of 0.8334% (Halt et al., 2016)

After the monthly interest rate is determined, we can calculate the monthly lease payment, using the formulation of the instalment payment for the monthly period (Goenawan, 2015). First, the symbols below need to be defined:

$$r_m : the\ Monthly\ Lease\ Interest\ Rate$$
$$n : the\ Lease\ Term\ in\ months$$
$$h_0 : the\ Leased\ Value$$

So, the formula of the periodic Lease Payment each month for the months to n is:

$$Montly\ Lease\ Payment = Leased\ Value \times \frac{r_m(1+r_m)^n}{(1+r_m)^n - 1}$$

The lease value is determined by the CEO of the startup as the direct cash outflow per system with margin. The direct cash outflows per system are relatively high and the first payment of the customer does not cover these costs. Therefore the startup is running into a negative cashflow, since the cash outflows for building a system are higher than the cash inflows are higher than the contract portion of the first year. By leasing the direct cash outflows of the system, there is no direct cash flowing out for building the system. The CEO wants to include the PM as well, since it provides means to also cover the indirect and overhead costs.

Flexible terms and the option to upgrade the asset during a lease period are possible in a financial lease. Besides, the upfront costs are minimal, so there is no large initial expenditure needed. Therefore, lease financing is more flexible and has lower upfront costs compared to debt financing (Yan, 2006). In addition, smaller companies that have less information about their market position are often more likely to lease because it is more accessible than debt financing (Kang & Long, 2001). Therefore, financial leasing might be a good solution for the startup since it is accessible to small firms.

4 The model

Here, we start with mentioning the assumptions for the model to understand the scope of the model. Our objective is to develop a model with adjustable parameters to estimate the expected cash flows. Therefore we discuss the flexible parameters and the design of the model.

4.1 Assumptions for the model

The flexible model is constructed to be as realistic as possible. However, we made a few assumptions and those are discussed below.

Warehouse: The startup does not have a warehouse with enough storage capacity to stock large materials or entire systems. Therefore, the materials must be ordered just before each system production. This ensures that cash flows for building a system are directly aligned with newly closed contracts. We assume the company will continue this approach, producing systems in response to demand without utilizing a warehouse.

The growing curve of the number of contracts: we assume the amount of newly closed contracts will stabilise after 6 years at exactly 40 contracts per month. We assume no fluctuations in the S-curve or the stabilisation.

Transportation: we assume that each system needs its individual transportation (shipping and the installation & setup), so the cash for transportation is the same for each system.

Contract extension: the closed contracts entail a subscription of 5 years. We assume the customer will establish a new contract once this period ends. Therefore, the cash inflows from second contracts during the last five years are equivalent to the cash flows of the first contracts of the first five years. We assume the second contract has the same TCV as the first contract.

System lifetime: we assume that the lifetime of each system is ten years and that all systems will function perfectly for this duration, excluding any failures covered under maintenance. Therefore, there are no additional COGS, direct labour costs, or transportation costs for the second contract with a client.

Unforeseen costs: since the system is fully insured and cash for maintenance is included, we assume that there are no additional unforeseen costs for the startup.

Expanding Business Perspective: we assume the cash outflows for monthly operating expenses will grow over the years in line with the increase in cash for labour. This assumption is based on the idea that as the number of employees increases, the scale of operations and equipment per employee also grows. For our investigation we do not incur a fluent exponential increment, but a yearly increment. Meaning, we assume new employees are added only at the beginning of each year, not throughout the year. Additionally, the cash for yearly operating expenses remains

constant over the years since we do not assume licences and the included insurance to change in the future. The same applies to the monthly capital expenditures, as we do not foresee significant changes in the software or design of the PaaS.

Yearly Costs: Insurance and license costs are amortized annually. All insurance payments are made in the month preceding the new year, so the cash flows for insurance are recorded in the last month of the previous year. However, the license payment depends on the subscription date. For our model, we assume this occurs in the last month of the previous year as well. Consequently, we assume all annual payments take place in the same month each year.

Insurance reconciliation: company X pays its insurance premium just before the new year begins. In reality, the actual number of closed contracts is determined at the end of the year as well, and any discrepancies are reconciled. However, our investigation is a projection, so we assume no reconciliation is necessary at year-end.

Deductible taxes: for financial leasing, it might be possible to deduct the taxable income. However, it is essential to consult with a tax advisor to understand the specific terms and tax laws that impact the tax situation (Brealey, Myers, & Allen 2020). The startup does have a tax advisor, but cannot be consulted for this topic, so we lack sufficient knowledge in this area. Therefore, we will not consider this tax deduction option in our investigation and assume the startup will not use it.

Equal monthly lease payment: various ways to pay off a lease arrangement exist. Our study assumes that the monthly lease amortisation per lease remains constant each month. However, this does not imply that the total lease cash flows are identical each month. Multiple leases may be amortized within the same period, causing the total monthly lease payment to be recalculated frequently. Nonetheless, we assume the payment for each individual lease amortisation remains constant every month.

4.2 Construction of the Excel model

The Excel Model contains several sheets with different purposes. The sheets used are the following ones:

Figure 7: Sheets of the Flexible Excel Model.

- The Graphs sheet displays various graphs from different scenarios and outcomes of the Cash flow Statement. Several graphs are discussed in the Scenario Evaluation.
- The Cash flow Statement sheet contains all the calculations and projects the monthly cash flows for the next ten years. This Cashflow Statement is explained in Section 3.3.4. The calculations are generally based on the formulas and tables provided in the Background

Study above. However, there are no fixed values used in the Cash flow Statement; all the calculations refer to values of cells from the Cash Outflow and the Cash Inflow sheets.

- These two sheets show the cash inflows and outflows in a structured way, in the same order as mentioned for the cash flows in the Background Study. The tables in the Background Study are adopted from those sheets. The values of those cells are also not fixed; they refer to cells from the Parameters and Values Startup sheets. These sheets contain all the input values for the model.
- The Value Startup sheet contains the values that are already determined by the startup and do not need to be flexible for now. These are, for example, fixed prices from suppliers or fixed equipment costs. However, we preferred to keep those values adjustable so the startup can change them if needed. For our investigation, we keep those values fixed and cannot show this sheet due to confidentiality.
- The Parameter sheet contains a list of parameters that can be adjusted to project different situations with the model. We elaborate on the different parameters in the next chapter. The Parameter sheet includes the values that still need to be determined by Company-X, so we made them flexible to analyse several scenarios.

This means that all the values in the model are flexible since there are no fixed numbers used in the calculations. All the values used for the Cash flow Statement can be adjusted in the Value Startup sheet and the Parameter sheet. Therefore, the model is optimal for the startup as it is flexible and easy to use. This investigation provides advice that Company-X can use, but the model is suitable for future projections that go beyond this study.

4.3 Parameters for the model

The parameters for the model are kept flexible because they are not yet fully established by the startup, and these parameters can significantly affect the startup's cash flows. However, we have forecasted some parameters together with the CEO, since these projected values are the most assumable. Therefore, we have divided the parameters into two sections: Forecasted Parameters and Flexible Parameters.

4.3.1 Forecasted parameters

We identified the forecasted parameters based on factors such as building capacity, partnership contracts, and assumed lead times. These parameters are predicted but must remain adaptable to optimise the strategy if needed. The forecasted parameters are outlined below.

The initial cash at the beginning of Q1 establishes the startup's starting position as they gradually want to offer their PaaS. This parameter can be updated to reflect the current situation when the startup is ready. For now, we project the cash at the beginning of Q1 to be €0,00, so we start with a natural basis.

The parameters for payment lead times are distinguished by the contracts closed with suppliers and partners. The time between the start of building a new system and paying for the steel material is one month, as Company-X can pay the receipts of its steel partner exactly one month after the delivery of the steel. This forecasted parameter is noted as parameter i_s. This afterwards payment shifts the cash flows for steel one month ahead. The time between the start of the building and the payment for the coating, parameter i_c, is also one month, as the coating takes place after the building process and the payment is made directly. The time between the start of the building and paying for the remaining material, parameter i_r, is -1, as the payment for the remaining material should be made one month before the start of the building to ensure the materials arrive before construction begins.

Parameters for payment lead times	Months	Symbol
Time between start building and paying steel	1	i_s
Time between start building and paying for coating	1	i_c
Time between start building and paying remaining material	0	i_r

Table 9: Parameters for payment lead times.

The parameters for operation times are based on the workforce and expected lead times of the team. Once a new contract is closed, it will take about a month before the startup starts building the system because preparations such as ordering materials need to be done. Therefore the parameter i_k, the time between closing a contract and starting with building the system is 1 month. The deployement is done two months after the start of the building, as it takes a month to build and another month to coat the system and prepare it for transport. So the parameter i_l, for the time between building and placing, is 2. For now, we assume the first payment is made directly after placing the system, so there is no time between placing and the first payment from the customer. However, this parameter i_m can be changed in the future if the startup has a convenient customer base, allowing clients to pay in advance.

Parameters for operation times	Months	Symbol
Time between closing contract and building	1	i_k
Time between building and placing	2	i_l
Time between first payment and placing	0	i_m

Table 10: Parameters for operation times.

Parameters for contract agreements are included as the firm can discuss different contracts with clients. In the period before the startup gradually sells its PaaS, it can discover the ideal contract portion for each yearly payment. For now, we assume that each annual payment will be the same, with each year's contract portion being 0.2, as the summation must be exactly one. The formula for the TCV, discussed in Chapter 3.2.3, depends on the PM. The flexibility of the PM prevents us from showing a fixed value, so the TCV calculation is based on projected scenarios. However, the startup can adjust the parameter if they prefer to use a different TCV.

4.3.2 Flexible parameters

We intend to experiment with variables to identify the most favourable scenarios. These parameters significantly impact the cash flows, and their values are currently deterministic for Company-X. This means the startup can adapt their strategy to optimise scenarios based on these parameter values. The flexible parameters are explained below.

The first flexible parameter is the PM, since it is not yet determined by the startup. This is a challenging but crucial decision for the CEO. Currently, the firm has several potential clients interested in purchasing the PaaS, but the exact contracts are not yet finalized. During this pre-launch period, the startup needs to define the future PM. Therefore, a flexible PM is essential for exploring different scenarios with the flexible model, which can help sketch a path to obtaining the optimal PM based on the cash outflows.

The other flexible parameters are required to explore different scenarios of financing, based on equity financing and leasing.

For equity financing, we can establish a minimum cash balance, which is the minimal working capital the startup maintains during operations. The equity financing amount comes from an external party like an angel investor. The flexible model calculates when the monthly cash flow will exceed the minimum cash balance and includes new funding in the model. Thus, the cash flow will never fall below the minimum cash balance since equity funding will provide new cash inflows. The values of these two parameters can be adjusted to analyse several scenarios.

For Lease Financing, the startup is interested in financing the Direct Cash Outflows of the Systems. In a lease agreement, the leased value, the interest rate, and the lease term are negotiated with the leasing company. The Lease Interest Rate is usually around 10%, but can vary by leasing company. The Leased Value per system is equal to the direct cash outflows per system with margin, which depends on the PM. A flexible Lease Term helps manage cash flow better by adjusting payments to match financial conditions. Shorter leases may have higher payments but offer flexibility, while longer leases typically have lower payments but less adaptability. so this parameter is crucial to find advantageous scenarios.

4.4 The cash flow statement

The operating activities determine the monthly cash flows during the operations of the startup. This includes the cash outflows per system, for operating and capital expenses. Once the cash outflows are extracted from the cash at the beginning of the period and the cash inflows, we find the Net Cash from Operating Activities. Afterwards, the monthly Financing Cash flows are calculated and the Cumulative Cash flow is calculated for each financing option and eventually, we find the Cumulative Cash flow with Financing. To achieve this, it is essential to understand the monthly cash flows and their calculations. Therefore, we have explained how each cash flow is integrated into the model and the Flexible Cash flow Statement is showed in Appendix A.

Indicators

All cash flows are based on three indicators: the number of new contracts closed per month, the number of new systems built per month, and the number of new systems placed per month. Each of these indicators is interrelated and aligned with the forecasted parameters mentioned above.

- New Contracts Closed per Month: This is detailed in Section 3.2.5 and follows an s-curve model. The other two indicators are derived from this indicator.
- New Systems Built per Month: The forecasted parameter $i_k = 1$ indicates a one-month interval between closing a contract and building a system. The parameter i_k refers to the indicator of New Systems Build per Month.
- New Systems Placed per Month: Similarly, the forecasted parameter $i_l = 2$ indicates a two-month interval between building and placing a system. The parameter i_l refers to the indicator of New Systems Placed per Month.

4.4.1 Operating activities

Cash outflow for the system in month t

Cash outflows for the COGS related to steel parts are determined by the time between paying for the steel and building the system. Once this parameter i_s is set, these cash outflows are calculated in the month the steel is paid for.

$$\begin{aligned} &Cash\ in\ Month\ t\ for\ COGS\ related\ to\ Steel\ Parts \\ &\quad = Cash\ for\ COGS\ for\ steel\ per\ system \\ &\quad \times Number\ of\ New\ Systems\ Build\ in\ Month\ (t - i_s) \end{aligned}$$

The cash outflows for COGS associated with coated parts are determined by the time between building and paying for coating. Once this parameter i_c is set, these cash outflows are calculated in the month the coating is paid for.

$$\begin{aligned} &Cash\ in\ Month\ t\ for\ COGS\ related\ to\ Coating \\ &\quad = Cash\ for\ COGS\ for\ Coating\ per\ system \\ &\quad \times Number\ of\ New\ Systems\ Build\ in\ Month\ (t - i_c) \end{aligned}$$

Cash outflows for the remaining COGS are determined by the time between building and paying the remaining material. Once this parameter i_r is set, these cash outflows are calculated in the month the remaining parts are paid.

$$\begin{aligned} &Cash\ in\ Month\ t\ for\ COGS\ related\ to\ Coating \\ &\quad = Cash\ for\ COGS\ for\ Coating\ per\ System \\ &\quad \times Number\ of\ New\ Systems\ Build\ in\ Month\ (t - i_r) \end{aligned}$$

Cash for Direct Labour in month t are calculated as followed:

$$Cash\ in\ Month\ t\ for\ Direct\ Labour = Cash\ for\ Direct\ Labour\ per\ System \times Number\ of\ Systems\ Built\ in\ Month\ t$$

The cash outflows for maintenance are calculated monthly and occur every month for each system that is in use. Since we assume a system lifetime of 10 years, the maintenance costs are calculated for each system built during that month and the previous 119 months. Therefore we multiply the monthly maintenance costs by the amount of placed systems that month and add this to the maintenance cash outflow of the month before. We can do this since our model does not exceed 10 years. If it did, we need to make sure only the amount of systems placed during the previous 119 months were added up. Cash for Maintenance in month t is calculated as followed:

$$Cash\ for\ Maintanance\ in\ Month\ t = Cash\ for\ Maintanance\ in\ Month\ (t-1) + Cash\ for\ Maintanance\ per\ System \times Number\ new\ Systems\ Placed\ in\ Month\ t$$

The transportation costs are only charged to the client once at the moment of placement. Cash for Transportation in month t are calculated as followed:

$$Cash\ for\ Transportation\ in\ Month\ t = Cash\ for\ Transportation\ per\ System \times Number\ new\ Systems\ Placed\ in\ Month\ t$$

The insurance cash flow is based on the predicted number of systems for the upcoming year. Company-X pays its insurance premium just before the new year begins, insuring the total projected number of systems it plans to sell.

$$Cash\ for\ Insurance\ in\ the\ last\ Month\ t\ of\ the\ year = Cash\ for\ Insurance\ per\ System \times \sum_{i=t+1}^{t+13} Number\ new\ Systems\ Placed\ in\ Month\ i$$

Cash outflow for Operating Expenses and Cash for Capital Expenditures in month t and year T

All the monthly and yearly Operating Expenses and monthly Capital Expenditures are already calculated in Section 3.2.1.2

Cash inflows from the system in month t

Cash inflow from Transportation is determined by the number of new placed systems. Cash from Transportation of the system in month t is calculated as followed:

$$\begin{aligned} &Cash\ from\ Transportation\ in\ Month\ t \\ &\quad = Cash\ for\ Transportation\ per\ system \\ &\quad \times Number\ of\ New\ Systems\ placed\ in\ Month\ t \end{aligned}$$

Cash inflows from contracts is received on an annual basis. For instance, if a client's first payment occurs in the fifth month of the year, the subsequent annual payments will also occur in the fifth month. Thus, cash flows in a specific month include first payments from new clients that year, second payments from clients who started the year before, third payments from clients who started two years ago, and so on. Given that the contract duration is five years, the startup will receive payments annually from the initial contracts for a total of five years. Consequently, we use a flexible model to calculate and summarize all the cash from contracts received during that specific month over the last five years. The first payment depends on the parameter i_m. Once this parameter i_f is set, these cash outflows are calculated in the month the steel is paid for

$$\begin{aligned} &Cash\ from\ Contract\ in\ Month\ t\ in\ Year\ T \\ &\quad = \sum_{i=max(T-5,0)}^{T} Cash\ from\ Contract\ in\ Year\ i \\ &\quad \times Number\ of\ New\ Systems\ Build\ in\ Month\ (t - i_m) \end{aligned}$$

4.4.2 Financing options

Cash outflows for financing in month t

The cash required for a financial lease is represented by the Monthly Lease Payment for each lease arrangement over its lease term, denoted as n. When a lease is initiated, a lease term is established, during which the startup must make regular monthly payments to maintain the lease. Consequently, the cash outflow for the financial lease in any given month t includes all the Monthly Lease Payments from month $t - n$ up to month t.

$$\begin{aligned} &Cash\ for\ Financial\ Lease\ in\ Month\ t \\ &\quad = Montly\ Lease\ Payment \times \sum_{i=\max(t-n,0)}^{t} Number\ new\ Systems\ Placed\ in\ Month\ i \end{aligned}$$

Cash inflows from financing month t

For equity financing, we seek new equity funding whenever the minimum cash balance is exceeded. Therefore, we use an If-Then-Else formula. Once the Minimum Cash Balance tends to be exceeded, new equity funding is included for that specific month.

$$IF,\ Cash\ at\ the\ End\ of\ Period\ (t-1)\ with\ Financing + \\ Net\ Cash\ from\ Operating\ Activities\ in\ Period\ t\ without\ Financing\ < Minimum\ Cash\ Balance$$

$$Then, \quad Cash\ from\ Equity\ Fianancing\ in\ Month\ t = Amount\ for\ Equity\ Financing$$

$$Else, \quad Cash\ from\ Equity\ Fianancing\ in\ Month\ t = 0$$

For financial leasing, we aim to establish a new leasing contract for each new system as soon as the contract is signed. This ensures that cash inflows from the lease occur immediately before the cash outflows needed to build the system. By doing this, the lease consistently covers the direct cash outflows associated with the system.

$$Cash\ from\ Lease\ Financing\ in\ Month\ t \\ = Leased\ Value\ per\ System \times Number\ of\ New\ Contracts\ Closed\ in\ Month\ i$$

5 Scenario evaluation

The various potential outcomes based on parameters. Ultimately, the CEO is responsible for deciding the values of the parameters for the flexible model. The CEO can use the model and the scenario evaluations to make informed financing decisions.

Since we apply a multiplication factor to all initial prices, the y-axis does not reflect actual cash amounts and will not be displayed, as it is irrelevant. However, the x-axis and the overall shape of the graph remain unchanged regardless of the multiplication factor. Consequently, the graphs are accurate, allowing us to discuss different scenarios effectively.

5.1 Long-term projections

Although this investigation focuses on a three-year period, it is also valuable to understand long-term projections. Therefore, we extended the flexible cash flow statement to cover ten years. For the PM we take a value of 40%, which is relatively high. If Company-X does not utilize financing options, the net cash flow per month would look as follows.

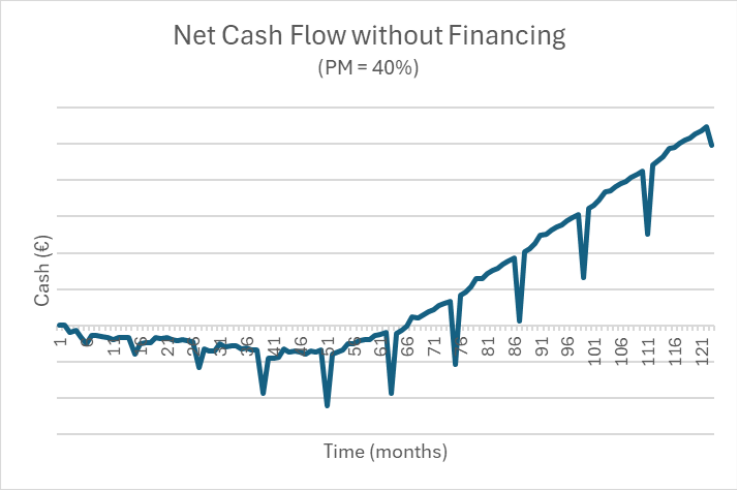

Figure 8: Net Cash Flow without Financing with a PM of 40%.

Significant drops are visible during the last month of each year, due to high insurance cash flows that only occur at the end of each year. Graphs for Net Cash Flow without Financing with different PMs are presented in Appendix B.1. The graphs illustrate that a lower PM results in more challenging cash flow, characterized by larger negative peaks and delayed positive growth.

The Cumulative Cash Flow, which indicates the cash at the end of each period, is more relevant for our investigation. This is the total amount of cash flow that accumulates over multiple periods. It tracks the ongoing cash position of the startup by adding the Net Cash flow of each period to the previous cumulative total. The Cumulative Cash Flow without financing and a PM of 40% is presented below.

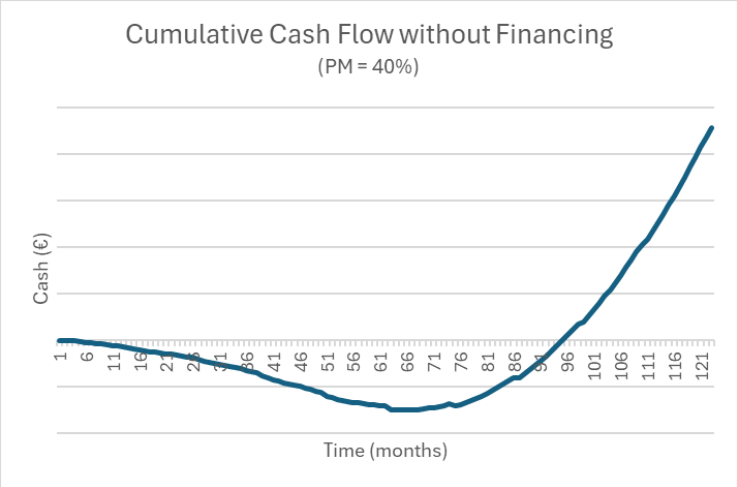

Figure 9: Cumulative Cash Flow without Financing with a PM of 40% for 10 years.

In this scenario, the firm experiences negative cash flow in the first 63 months, meaning it is spending more cash than it is generating. The graph reaches its lowest point at month 63. After this point, the startup achieves a positive cash flow and the company's financial situation begins to improve. Once the cumulative cash flow is zero, the company has covered all its expenses but has not generated any surplus, which indicates its breakeven point. In this scenario, the breakeven point is during the 93th month (almost 8 years).

In Appendix B.2, the Cumulative Cash Flow without Financing is displayed with various PMs. The accompanying graphs indicate that a lower PM results in the lowest cash flow point occurring later. Consequently, the startup achieves a positive financial position later, delaying the generation of positive cash flow.

Regardless of the perspective, this positive cash flow scenario is unrealistic without financing, as Company-X cannot sustain such low cash flows and would likely fail. Therefore, it is evident that the company requires a financing solution to maintain its operations.

5.2 Three-year time span

Our study focuses on a three-year period, which is the initial phase where Company-X plans start to gradually selling its PaaS. For this period, we analyse different scenarios for various financing options. Below, you will find the graph for Cumulative Cash Flow without Financing over the three-year scope.

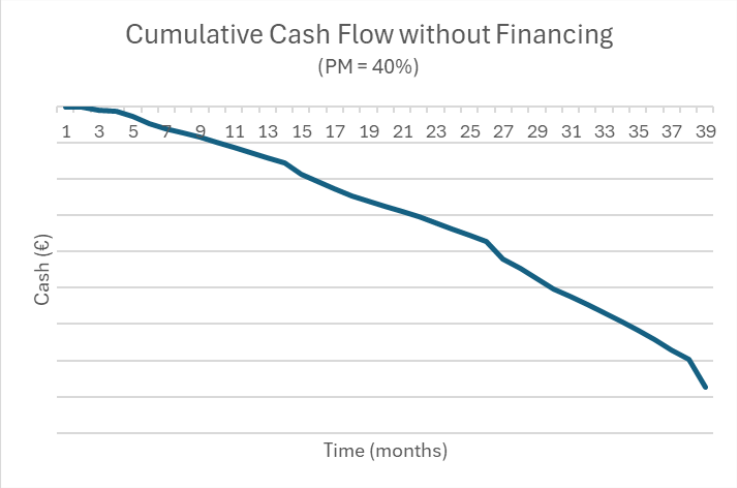

Figure 10: : Cumulative Cash Flow without Financing with a PM of 40% for 3 years.

5.2.1 Equity Financing

For this financing option we have outlined several scenarios displaying different amounts of cash from equity. When the cumulative cash flow exceeds the minimum cash balance, a new cash inflow from equity financing is calculated. This can be done by an investment of the Angle investor for example. The legend for the equity financing graphs is provided below.

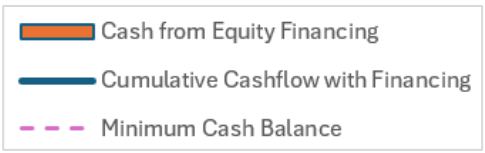

Figure 11: Legend for the Equity Financing Graphs.

Scenario 1

In this scenario, the minimum cash balance is set as an assumed parameter. We start with a relatively high amount for equity financing, which exceeds the assumed contribution from an

angel investor mentioned in Section 3.2.5. The parameters are represented by symbols to maintain confidentiality.

Flexible Parameter	Value
Minimum Cash Balance	B_1
Amount for Equity Financing	E_1

Table 11: Flexible Parameters for Scenario 1.

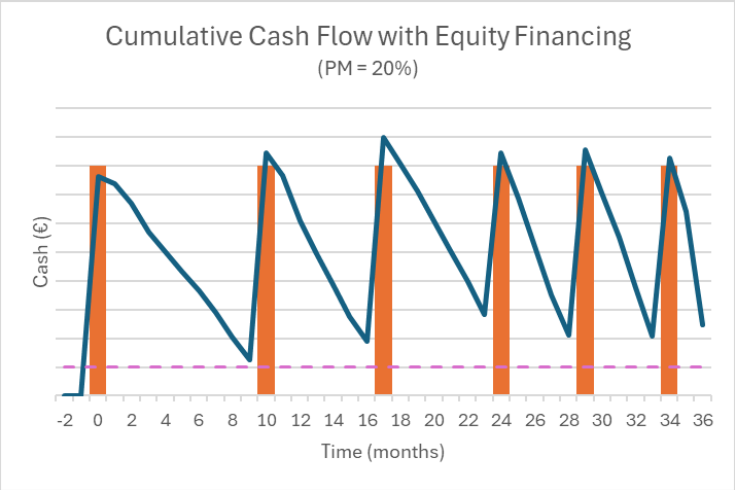

Figure 12: Cumulative Cash Flow with Equity Financing parameter E_1 and a PM of 20%.

We observe that equity needs to be raised eight times over three years to maintain a working capital above the minimum cash balance B_1. Given that the amount per equity financing is already relatively high for an angel investor, this scenario does not seem realistic for Company-X.

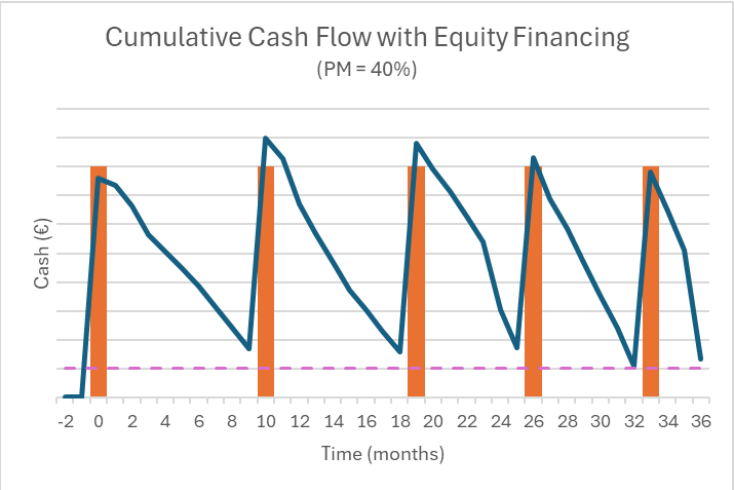

Figure 13: Cumulative Cash Flow with Equity Financing parameter E_1 and a PM of 40%.

If the PM is increased from 20% to 40%, fewer equity injections are needed. However, this still does not seem like a feasible option, because the number of the investments are still too high for an Angle Investor.

Scenario 2

In Scenario 2, we use the same cash balance as in Scenario 1, as it is suitable for the startup and allows for easier comparison. The amount for equity financing is increased compared to Scenario 1.

Flexible Parameter	Value
Minimum Cash Balance	B_1
Amount for Equity Financing	E_2

Table 12: Flexible Parameters for Scenario 2.

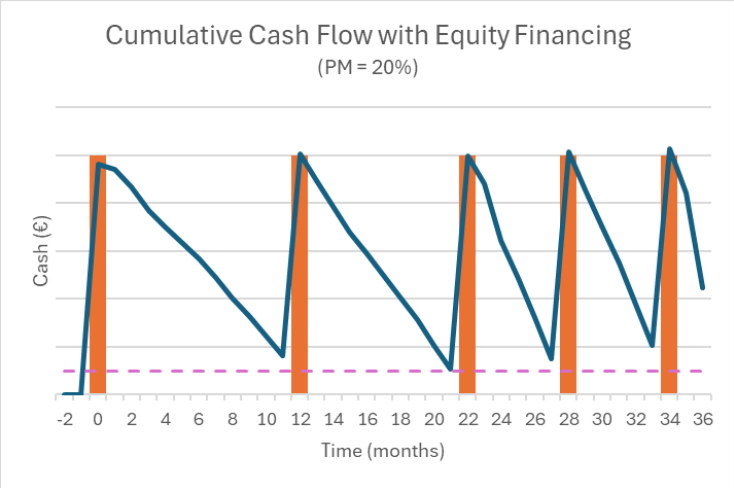

Figure 14: Cumulative Cash Flow with Equity Financing parameter E_2 and a PM of 20%.

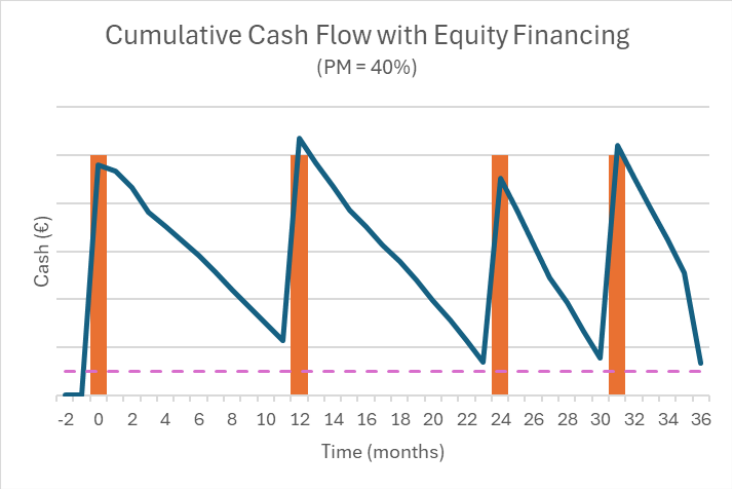

Figure 15: Cumulative Cash Flow with Equity Financing parameter E_2 and a PM of 40%.

Although the frequency of equity investments decreases, the individual investments are still quite high for an angel investor, making this scenario unrealistic as well.

Conclusion

The cash balance decreases rapidly, making it difficult to maintain a positive balance through equity financing alone. Numerous equity injections are needed to keep a positive cumulative cash flow. Since the required investments significantly exceed the typical contributions from angel investors, these scenarios do not appear realistic.

Nevertheless, we are unable to communicate with this angel investor, so we do not know the exact amount he is willing to provide. Therefore, we cannot confirm whether the investments are truly excessive. The final decision rests with the CEO of the startup. However, for our analysis, we assume that equity financing alone will not be sufficient to sustain a healthy cash flow for the startup.

5.2.2 Financial lease

The next option is to lease the cash outflows for the direct costs of building the system, allowing the startup to avoid upfront payments. We display different scenarios to identify the optimal decisions.

Scenario 3

We start with a lease agreement with a lease term of 24 months, which is equivalent to 2 years. This is a relatively low lease term.

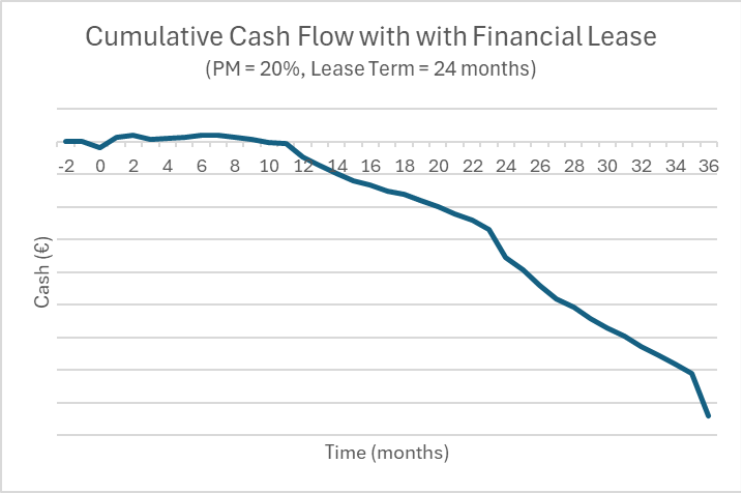

Figure 16: Cumulative Cash Flow with Financial Lease with a PM of 20% and a Lease Term of 24 months.

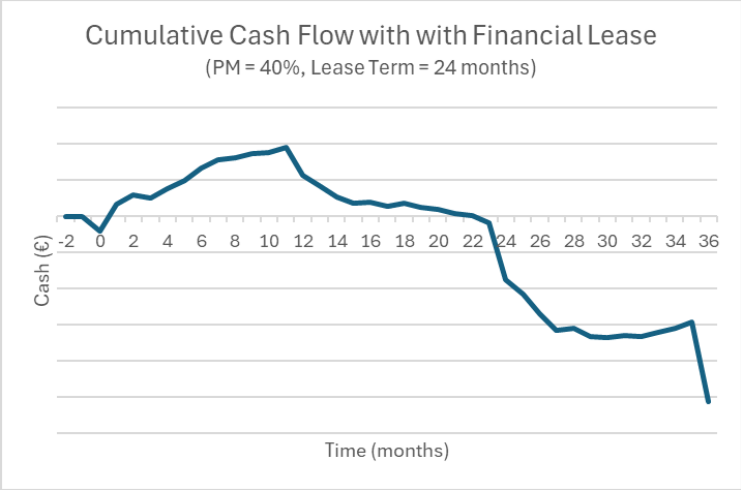

Figure 17: Cumulative Cash Flow with Financial Lease with a PM of 40% and a Lease Term of 24 months.

With a lease agreement of 24 months, the startup still experiences negative cash flow if the profit margin (PM) is 20%. Increasing the PM to 40% makes the cash flows initially positive but they turn negative after 22 months. This indicates that the lease term is too short, resulting in high monthly payments and eventually negative cash flow. As already mentioned, the insurance payments at the end of each year has an significant influence on the cash balance and therefore a decrease in the graph can be seen at the end of each year.

Scenario 4

In this scenario we project a lease term of 48 months to compare the differences with scenario 3. Larger negative peaks in net cash for operating activities occur when the PM is relatively low, which results in fluctuation in the Cumulative cash flow. Increasing the PM reduces these peaks and therefore the graph becomes smoother.

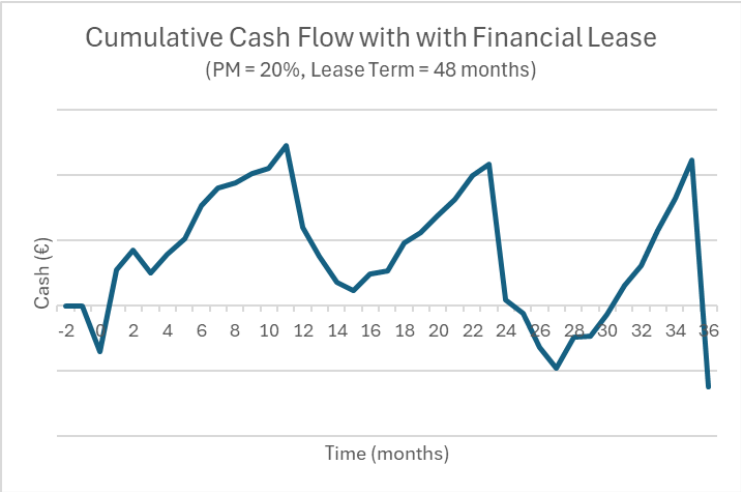

Figure 18: Cumulative Cash Flow with Financial Lease with a PM of 20% and a Lease Term of 48 months.

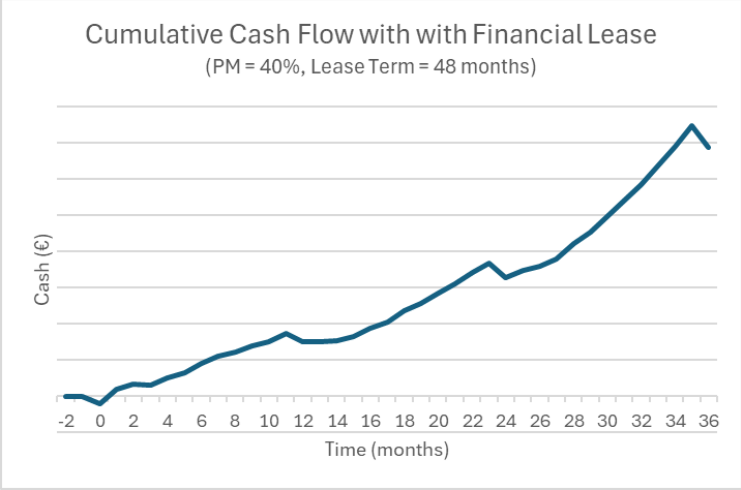

Figure 19: Cumulative Cash Flow with Financial Lease with a PM of 40% and a Lease Term of 48 months.

In the scenario where the lease term is extended, the cash flows with a PM of 20% do not achieve a positive cumulative cash flow at the end of 3 years. However, when the PM is increased to 40%, the cumulative cash flows become positive and continue to grow. This positive growth is preferable, even though the PM of 40% is relatively high. Therefore we measured with new PM values between the 20% and 40%. We discovered that with a PM of 22% the cash balance remains positive after the 1st month. This shows the importance and vulnerability of the value of the PM.

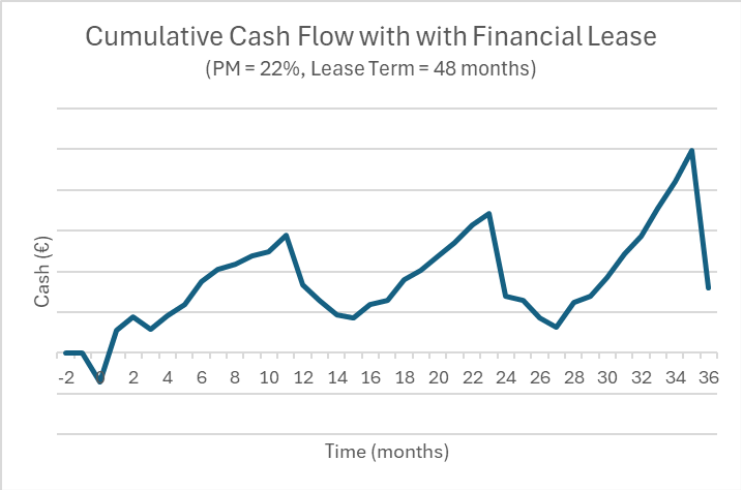

Figure 20: Cumulative Cash Flow with Financial Lease with a PM of 22% and a Lease Term of 48 months.

Scenario 5

In Scenario 5, we increased the leasing term to five years. This adjustment resulted in relatively small monthly lease payments, a beneficial arrangement that needs to be coordinated with the leasing company.

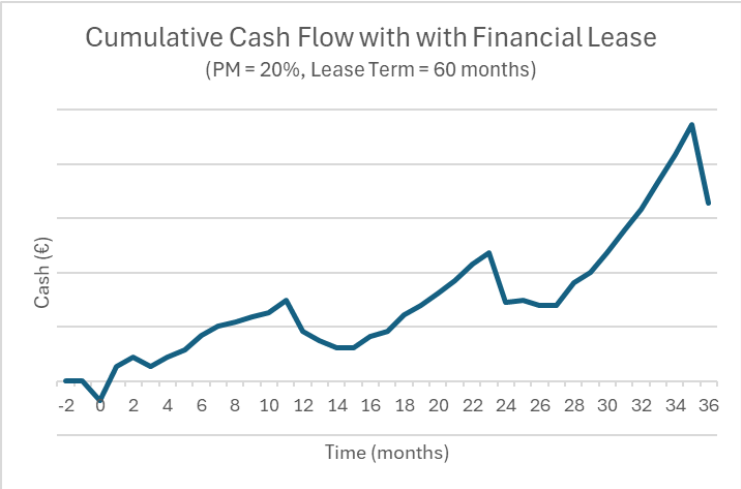

Figure 21: Cumulative Cash Flow with Financial Lease with a PM of 20% and a Lease Term of 60 months.

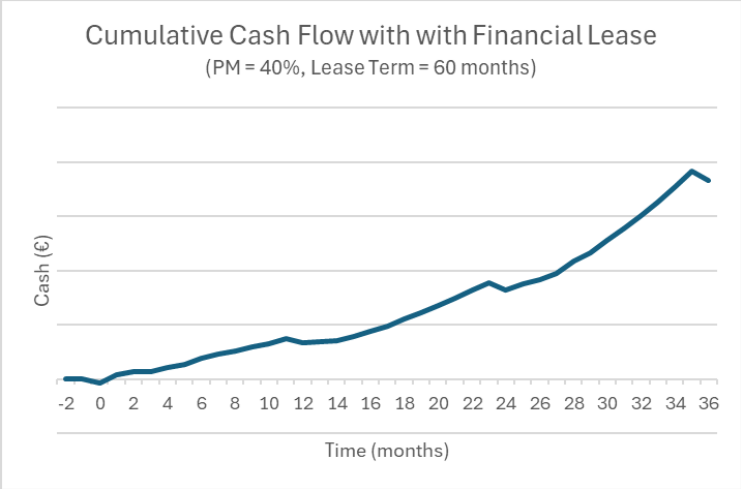

Figure 22: Cumulative Cash Flow with Financial Lease with a PM of 40% and a Lease Term of 60 months.

Both the cumulative cash flow for a PM of 20% and 40% were positive, indicating that both scenarios would be advantageous for inclusion in a financing strategy. However, the PM of 20% results in a negative dip in the beginning, which occurs because of the large insurance payments during the month before the upcoming year.

Conclusion

The conclusion is that a financial lease can be an effective option for maintaining a positive cash flow. However, its success depends on the leasing term and the PM. With a 42-month leasing term and a 20% PM, cash flow remains insufficient. By extending the lease term or increasing the PM, the cumulative cash position becomes positive. Therefore, a financial lease presents an achievable solution for the startup if it can negotiate a favourable lease term with the leasing company. The CEO can also adjust the margin, and by making informed decisions regarding the margin and the lease agreement, he can ensure sustained positive cash flow.

5.2.3 Both financing options

Besides each individual financing option, it is also possible to combine the cash flows from equity financing and a financial lease. Therefore, we constructed three additional scenarios to analyse combinations of the two options.

Scenario 6

In Scenario 6, we combine Scenarios 1 and 4. We use the parameters of Scenario 1 for equity and the lease term of 48 months as used in scenario 4.

Flexible Parameter	Value
Minimum Cash Balance	B_1
Amount for Equity Financing	E_1

Table 13: Flexible Parameters for Scenario 6

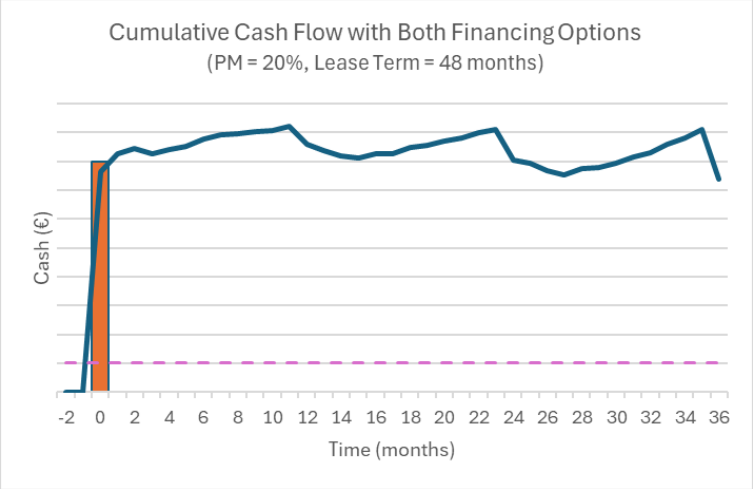

Figure 23: Cumulative Cash Flow with Both Financing Options with a parameter E_1, a PM of 20% and a Lease Term of 48 months.

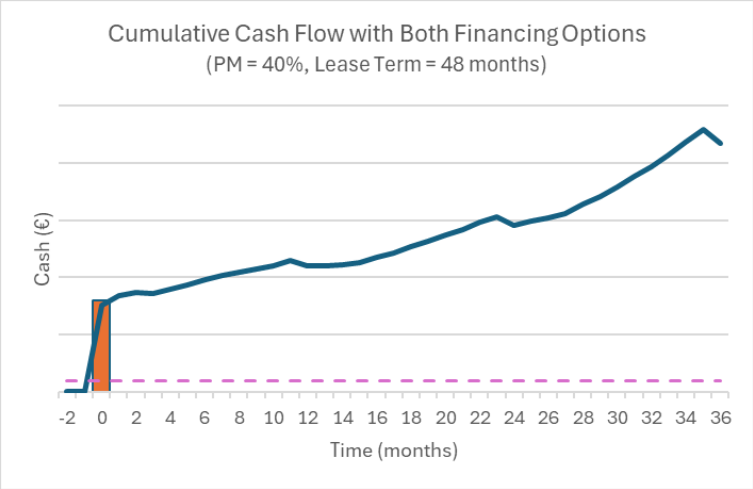

Figure 24: Cumulative Cash Flow with Both Financing Options with a parameter E_1, a PM of 40% and a Lease Term of 48 months.

The outcome provides a cumulative cash flow with a positive cash balance. However, as mentioned in Section 5.2.1, the value of E_1 is relatively high for an angel investor. Therefore, Scenario 6 depends on the angel investor, but we assume it is not a realistic situation for Company-X.

Scenario 7

In Scenario 7, we opted for a smaller amount of equity, mentioned as E7, which is a reasonable amount for an angel investor to provide.

Flexible Parameter	Value
Minimum Cash Balance	B_1
Amount for Equity Financing	E_7

Table 14: Flexible Parameters for Scenario 7.

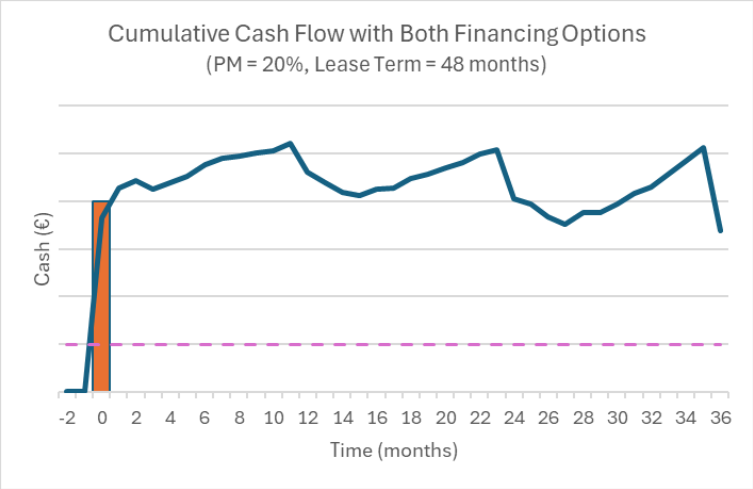

Figure 25: Cumulative Cash Flow with Both Financing Options with a parameter E_7, a PM of 20% and a Lease Term of 48 months.

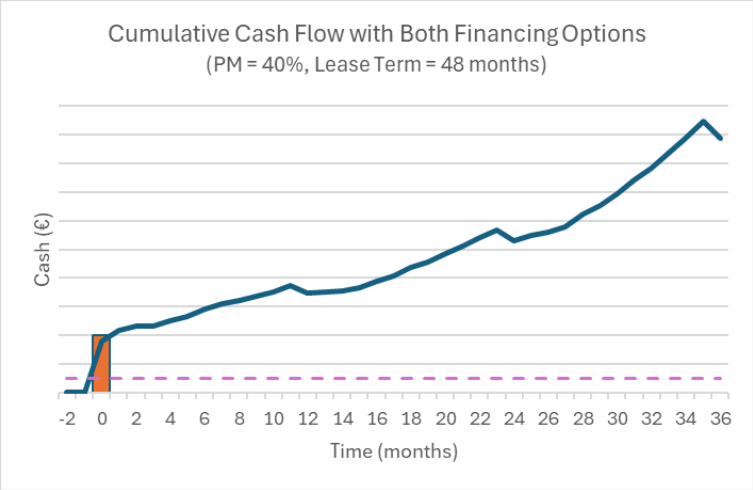

Figure 26: Cumulative Cash Flow with Both Financing Options with a parameter E_7, a PM of 40% and a Lease Term of 48 months.

With a PM of 40%, the cash flow shows steady growth. However, with a PM of 20%, the cash flow gradually decreases.

Scenario 8

In this scenario, we analyse a modest amount for equity financing. This amount, labelled with E8, represents a low investment for an angel investor.

Flexible Parameter	Value
Minimum Cash Balance	B_1
Amount for Equity Financing	E_8

Table 15: Flexible Parameters for Scenario 8.

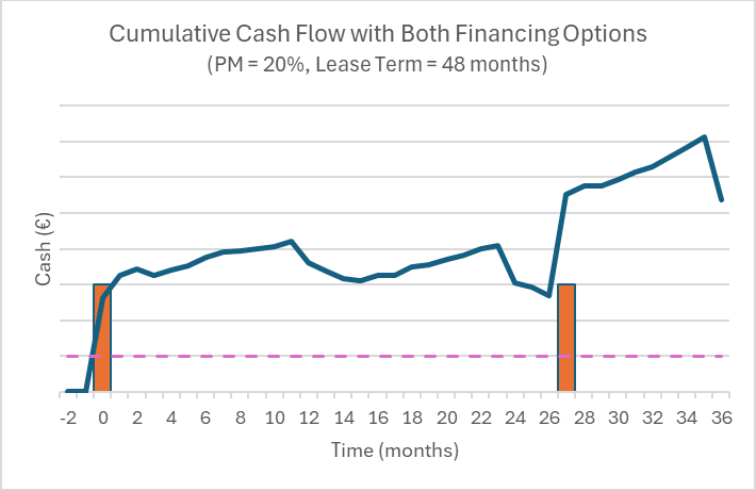

Figure 27: Cumulative Cash Flow with Both Financing Options with a parameter E_8, a PM of 20% and a Lease Term of 48 months.

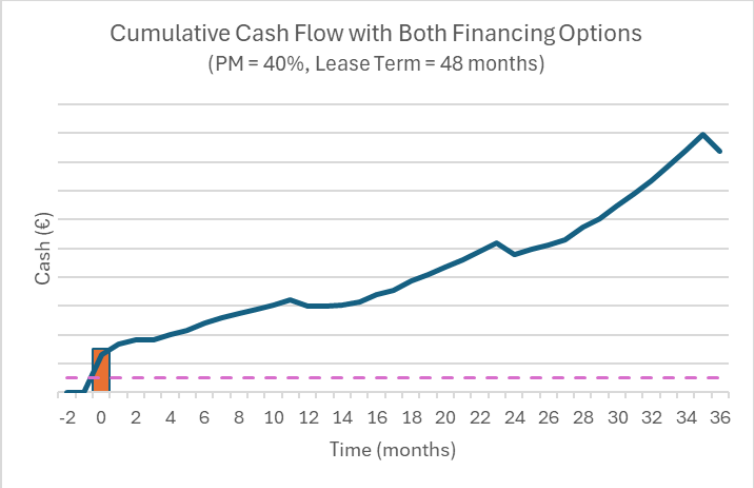

Figure 28: Cumulative Cash Flow with Both Financing Options with a parameter E_8, a PM of 40% and a Lease Term of 48 months.

Although for a PM of 20% an additional investment is required during the 27th month, these two investments are relatively small. Consequently, the pressure on the angel investor is reduced,

allowing for a more manageable distribution of capital over time. For a PM of 40% a second investment is not even required.

Conclusion

Combining both equity financing and financial leasing can be a highly effective strategy. Equity financing provides sufficient initial capital, while financial leasing ensures a positive cash flow during operations. However, the values of the flexible parameters are critical for optimal outcomes.

A higher PM makes it easier to maintain a positive cash flow, but it may also deter potential clients from closing contracts. Therefore, the CEO must carefully determine the ideal PM. Additionally, the amount of equity and the lease term are crucial parameters that influence the cash flows. A longer lease term leads to more stable cumulative cash flow, but this term needs to be negotiated with the lease company. The amount of equity financing should be thoroughly discussed with the equity provider, likely the current angel investor of the startup.

6 Discussion

In this discussion, we will review the implications of our study's findings, focusing on both its strengths and areas for improvement.

Our investigation resulted in a flexible model that provides insights into Company-X's potential cash flows under different scenarios. This flexibility is a major strength of the model, allowing the startup to adjust parameters and make informed decisions as new data becomes available. However, it is important to note that the model's projections are based on limited data due to the startup's early stage. This limitation means the forecasts may not be completely accurate, so the scenarios should be seen as potential rather than precise predictions.

One key oversight in our analysis was not including the interest rate on the lease amount as a cost for the client. Our model currently assumes that the startup pays this interest cost, but it is possible that the client could be responsible for it instead. This option was not explored in our research, but it is an important factor to consider. Future work could involve calculating the interest per system and adding it to the client's annual contract value for more accurate financial insights.

On a positive note, this research has been a rewarding experience. It has given me a better understanding of the complexities involved in running a startup. Attending sales meetings and major industry events offered practical insights into the challenges and opportunities startups face. These experiences have deepened my appreciation for the dynamic nature of new ventures and have been valuable in shaping my approach to financial modelling.

7 Conclusion

The startup is moving in the right direction for commercialisation. Even though the firm needs to pay more attention to conducting patentability analysis and practising effective project management, there is time to implement these improvements before it wants to bring its PaaS to the market.

Our research has provided a comprehensive flexible model that Company-X can use to inform its financing strategy for gradually selling its PaaS. The model highlights the significant challenge of maintaining a positive cash flow through equity financing alone, because of the high investment amounts required that exceed typical contributions from angel investors.

To address this, we explored the potential of financial leasing as an alternative. The analysis shows that while a 42-month leasing term with a 20% profit margin (PM) is still insufficient, extending the lease term or increasing the PM can result in a positive cumulative cash flow. This indicates that financial leasing, under favourable terms, is a convenient strategy for maintaining a positive cash flow.

Combining both equity financing and financial leasing emerges as the most effective approach. Equity financing provides the initial capital necessary to start operations, while financial leasing supports ongoing cash flow needs. However, the success of this strategy depends on several key parameters, which are the profit margin, the lease term, and the amount of equity financing.

A higher PM improves cash flow but may deter potential clients. Therefore the CEO must determine the PM carefully. Additionally, longer lease terms enhance financial stability, but they need to be discussed with the lease provider and the amount of equity financing is determined together with the provider, which probably will be the angel investor. Altogether, the flexible model will support the CEO in making decisions regarding its financial strategy, based on the projected cashflows.

In conclusion, by leveraging a combination of equity financing and financial leasing with carefully optimised parameters, Company-X may be able to achieve financial stability.

To answer the research question "*How can Company-X optimise its cash flow to improve financial performance during the first three years Company-X intends to gradually offer its Product-as-a-Service?*" we need to refer to the flexible model. To optimise its financial performance, Company-X can use a combination of equity financing and financial leasing with a carefully chosen PM, a well-negotiated lease term and a sufficient amount of equity financing. There are multiple scenarios possible for Company-X to sustain a positive cash flow and enable a smooth transition from pilot testing to full market introduction and successful scaling. The model itself provides the startup with insights they can use to improve its financial performance during the first three years Company-X intends to gradually offer its Product-as-a-Service.

7.1 Limitations

Our investigation is constrained by several key limitations. Firstly, many values in our model are based on projections, which limits the reliability of the results. Startups often face rapidly changing conditions, making it difficult to forecast accurately. For example, cash outflows for operating expenses were calculated on a monthly basis but are increased annually in our model. This creates sudden jumps in costs each year, whereas in reality, these costs would likely grow more gradually. Additionally, cash flows will inevitably change over time due to factors such as system optimisation, price increases, cost reductions, supplier discounts, and overall cost reductions. These factors were not fully accounted for, which further limits the model's applicability to real-world scenarios.

7.2 Recommendations

Given the limitations discussed, we recommend that Company-X use the model as a flexible tool to explore various financial strategies. The model allows for experimentation with parameters such as profit margin, lease terms, and the balance between equity financing and leasing. By adjusting these factors, the CEO can identify the most beneficial financial strategy that aligns with the startup's business objectives. Additionally, it is crucial that Company-X negotiates favourable terms with suppliers and insurers, such as negotiating insurance payments on a quarterly basis and securing discounts or extended payment terms with suppliers. As the startup grows, the model should be continually updated with actual data to ensure that the insights remain relevant and accurate.

7.3 Further research

Further research is essential to refine the findings and expand upon the current study. First, a detailed analysis of the Product Value and Product Margin is needed, as these are critical to understanding the startup's financial viability. Our current investigation provided projections and experimented with these values, but the optimal figures have not been determined. Additionally, further research should explore specific methods of utilizing equity financing and financial leasing. This includes comparing different equity providers and their terms, as well as determining the roles of the lessor and lessee in various leasing scenarios. Moreover, as assumptions in Section 4.1 heavily influence the study’s outcomes, it is crucial to validate and refine these assumptions with empirical data to enhance the robustness and reliability of the model. Lastly, future research should also consider developing a comprehensive financial analysis, including thinks like a profit and loss statement and burn rate projections, to provide a more complete financial picture of Company-X.

Appendix A

	Q0			Q1			Q2			Q3			Q4		
Operating month	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12
Number of new contracts closed per month	0	0	0	5	5	5	5	5	6	6	6	6	6	7	7
Number of new systems build per month	0	0	0	0	5	5	5	5	5	6	6	6	6	6	7
Number of new systems placed per month	0	0	0	0	0	0	5	5	5	5	5	6	6	6	6
Operating activities															
Cash at beginning of period without financing	€ 0	€ 0	€ 0	-€ 119,880	-€ 206,009	-€ 445,075	-€ 786,811	-€ 1,013,526	-€ 1,242,807	-€ 1,474,655	-€ 1,739,657	-€ 2,027,761	-€ 2,295,426	-€ 2,566,172	-€ 2,839,998
Cash outflows for the system															
Cash for COGS (Steel parts delivered by partner)	€ 0	€ 0	€ 0	€ 0	€ 0	€ 85,722	€ 85,722	€ 85,722	€ 85,722	€ 85,722	€ 102,866	€ 102,866	€ 102,866	€ 102,866	€ 102,866
Cash for COGS (Coated parts delivered by partner)	€ 0	€ 0	€ 0	€ 0	€ 0	€ 16,949	€ 16,949	€ 16,949	€ 16,949	€ 16,949	€ 20,339	€ 20,339	€ 20,339	€ 20,339	€ 20,339
Cash for COGS (remaining)	€ 0	€ 0	€ 0	€ 0	€ 84,936	€ 84,936	€ 84,936	€ 84,936	€ 84,936	€ 101,923	€ 101,923	€ 101,923	€ 101,923	€ 101,923	€ 118,910
cash for Direct Labour Costs	€ 0	€ 0	€ 0	€ 0	€ 68,000	€ 68,000	€ 68,000	€ 68,000	€ 68,000	€ 81,600	€ 81,600	€ 81,600	€ 81,600	€ 81,600	€ 95,200
Cash for Maintenance	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 2,567	€ 5,134	€ 7,700	€ 10,267	€ 12,834	€ 15,914	€ 18,995	€ 22,075	€ 25,155
Cash for Transportation	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 29,388	€ 29,388	€ 29,388	€ 29,388	€ 29,388	€ 35,265	€ 35,265	€ 35,265	€ 35,265
Cash for Insurance per system	€ 0	€ 0	€ 109,459	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 214,449
Cash outflows for Operating Expenses															
Cash for Labour	€ 0	€ 0	€ 0	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400	€ 71,400
Cash for Marketing	€ 0	€ 0	€ 0	€ 340	€ 340	€ 340	€ 340	€ 340	€ 340	€ 340	€ 340	€ 340	€ 340	€ 340	€ 340
Cash for Rent payments	€ 0	€ 0	€ 0	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120	€ 6,120
Cash for Utility	€ 0	€ 0	€ 0	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122	€ 1,122
Cash for Software Tools	€ 0	€ 0	€ 0	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897	€ 2,897
Cash for Administration	€ 0	€ 0	€ 0	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360
Cash for Depreciation and Amortization	€ 0	€ 0	€ 0	€ 850	€ 850	€ 850	€ 850	€ 850	€ 850	€ 850	€ 850	€ 850	€ 850	€ 850	€ 850
Cash for Licences	€ 0	€ 0	€ 6,800	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 6,800
Cash for Insurance	€ 0	€ 0	€ 3,622	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 3,622
Cash outflows for Capital Expenditures															
Cash for Software Development	€ 0	€ 0	€ 0	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680
Cash for Research & Development	€ 0	€ 0	€ 0	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360
Cash inflows from the system															
Cash from Transportation	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 35,265	€ 35,265	€ 35,265	€ 35,265	€ 35,265	€ 42,318	€ 42,318	€ 42,318	€ 42,318
Cash from First Contracts	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 111,711	€ 111,711	€ 111,711	€ 111,711	€ 111,711	€ 134,053	€ 134,053	€ 134,053	€ 134,053
Cash from Second Contracts															
Net Cash Flow from Operating Activities	**€ 0**	**€ 0**	**-€ 119,880**	**-€ 86,129**	**-€ 239,065**	**-€ 341,736**	**-€ 226,714**	**-€ 229,281**	**-€ 231,848**	**-€ 265,002**	**-€ 288,103**	**-€ 267,666**	**-€ 270,746**	**-€ 273,826**	**-€ 532,364**
Cumulative Cashflow without financing	**€ 0**	**€ 0**	**-€ 119,880**	**-€ 206,009**	**-€ 445,075**	**-€ 786,811**	**-€ 1,013,526**	**-€ 1,242,807**	**-€ 1,474,655**	**-€ 1,739,657**	**-€ 2,027,761**	**-€ 2,295,426**	**-€ 2,566,172**	**-€ 2,839,998**	**-€ 3,372,363**
Financing activities															
Cash outflow for financing															
Cash for Lease Arrangement	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Cash inflow from financing															
Cash from Equity Financing	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Cash from Lease Arrangement	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Net Cash Flow from Financing Activities	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Cumulative Cashflow with only Equity Financing	€ 0	€ 0	-€ 119,880	-€ 206,009	-€ 445,075	-€ 786,811	-€ 1,013,526	-€ 1,242,807	-€ 1,474,655	-€ 1,739,657	-€ 2,027,761	-€ 2,295,426	-€ 2,566,172	-€ 2,839,998	-€ 3,372,363
Cumulative Cashflow with only Financial Lease	€ 0	€ 0	-€ 119,880	-€ 206,009	-€ 445,075	-€ 786,811	-€ 1,013,526	-€ 1,242,807	-€ 1,474,655	-€ 1,739,657	-€ 2,027,761	-€ 2,295,426	-€ 2,566,172	-€ 2,839,998	-€ 3,372,363
Cumulative Cashflow with Financing	**€ 0**	**€ 0**	**-€ 119,880**	**-€ 206,009**	**-€ 445,075**	**-€ 786,811**	**-€ 1,013,526**	**-€ 1,242,807**	**-€ 1,474,655**	**-€ 1,739,657**	**-€ 2,027,761**	**-€ 2,295,426**	**-€ 2,566,172**	**-€ 2,839,998**	**-€ 3,372,363**

Figure 29: Cashflow Statement Year 1 with a PM of 20% and financing cashflows of €0.

	Q5			Q6			Q7			Q8		
Operating month	13	14	15	16	17	18	19	20	21	22	23	
Number of new contracts closed per month	7	7	8	8	8	9	9	10	10	11	11	
Number of new systems build per month	7	7	7	8	8	8	9	9	10	10	11	
Number of new systems placed per month	6	7	7	7	7	8	8	8	9	9	10	
Operating activities												
Cash at beginning of period without financing	-€ 3,372,363	-€ 3,759,530	-€ 4,126,773	-€ 4,497,610	-€ 4,790,917	-€ 5,108,351	-€ 5,406,374	-€ 5,739,092	-€ 6,096,451	-€ 6,443,157	-€ 6,815,017	
Cash outflows for the system												
Cash for COGS (Steel parts delivered by partner)	€ 120,011	€ 120,011	€ 120,011	€ 120,011	€ 137,155	€ 137,155	€ 137,155	€ 154,300	€ 154,300	€ 171,444	€ 171,444	
Cash for COGS (Coated parts delivered by partner)	€ 23,729	€ 23,729	€ 23,729	€ 23,729	€ 27,118	€ 27,118	€ 27,118	€ 30,508	€ 30,508	€ 33,898	€ 33,898	
Cash for COGS (remaining)	€ 118,910	€ 118,910	€ 118,910	€ 135,898	€ 135,898	€ 135,898	€ 152,885	€ 152,885	€ 169,872	€ 169,872	€ 186,859	
cash for Direct Labour Costs	€ 95,200	€ 95,200	€ 95,200	€ 108,800	€ 108,800	€ 108,800	€ 122,400	€ 122,400	€ 136,000	€ 136,000	€ 149,600	
Cash for Maintenance	€ 28,235	€ 31,829	€ 35,422	€ 39,016	€ 42,609	€ 46,716	€ 50,823	€ 54,930	€ 59,551	€ 64,171	€ 69,304	
Cash for Transportation	€ 35,265	€ 41,143	€ 41,143	€ 41,143	€ 41,143	€ 47,020	€ 47,020	€ 47,020	€ 52,898	€ 52,898	€ 58,775	
Cash for Insurance per system	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Cash outflows for Operating Expenses												
Cash for Labour	€ 119,000	€ 119,000	€ 119,000	€ 119,000	€ 119,000	€ 119,000	€ 119,000	€ 119,000	€ 119,000	€ 119,000	€ 119,000	
Cash for Marketing	€ 567	€ 567	€ 567	€ 567	€ 567	€ 567	€ 567	€ 567	€ 567	€ 567	€ 567	
Cash for Rent payments	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200	
Cash for Utility	€ 1,870	€ 1,870	€ 1,870	€ 1,870	€ 1,870	€ 1,870	€ 1,870	€ 1,870	€ 1,870	€ 1,870	€ 1,870	
Cash for Software Tools	€ 4,829	€ 4,829	€ 4,829	€ 4,829	€ 4,829	€ 4,829	€ 4,829	€ 4,829	€ 4,829	€ 4,829	€ 4,829	
Cash for Administration	€ 2,267	€ 2,267	€ 2,267	€ 2,267	€ 2,267	€ 2,267	€ 2,267	€ 2,267	€ 2,267	€ 2,267	€ 2,267	
Cash for Depreciation and Amortization	€ 1,417	€ 1,417	€ 1,417	€ 1,417	€ 1,417	€ 1,417	€ 1,417	€ 1,417	€ 1,417	€ 1,417	€ 1,417	
Cash for Licences	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Cash for Insurance	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Cash outflows for Capital Expenditures												
Cash for Software Development	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	
Cash for Research & Development	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	
Cash inflows from the system												
Cash from Transportation	€ 42,318	€ 49,371	€ 49,371	€ 49,371	€ 49,371	€ 56,424	€ 56,424	€ 56,424	€ 63,477	€ 63,477	€ 70,530	
Cash from First Contracts	€ 134,053	€ 156,396	€ 156,396	€ 268,107	€ 268,107	€ 290,449	€ 290,449	€ 290,449	€ 335,133	€ 335,133	€ 357,476	
Cash from Second Contracts												
Net Cash Flow from Operating Activities	**-€ 387,167**	**-€ 367,243**	**-€ 370,837**	**-€ 293,306**	**-€ 317,434**	**-€ 298,023**	**-€ 332,718**	**-€ 357,359**	**-€ 346,706**	**-€ 371,861**	**-€ 384,064**	
Cumulative Cashflow without financing	**-€ 3,759,530**	**-€ 4,126,773**	**-€ 4,497,610**	**-€ 4,790,917**	**-€ 5,108,351**	**-€ 5,406,374**	**-€ 5,739,092**	**-€ 6,096,451**	**-€ 6,443,157**	**-€ 6,815,017**	**-€ 7,199,081**	
Financing activities												
Cash outflow for financing												
Cash for Lease Arrangement	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Cash inflow from financing												
Cash from Equity Financing	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Cash from Lease Arrangement	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Net Cash Flow from Financing Activities	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Cumulative Cashflow with only Equity Financing	-€ 3,759,530	-€ 4,126,773	-€ 4,497,610	-€ 4,790,917	-€ 5,108,351	-€ 5,406,374	-€ 5,739,092	-€ 6,096,451	-€ 6,443,157	-€ 6,815,017	-€ 7,199,081	
Cumulative Cashflow with only Financial Lease	-€ 3,759,530	-€ 4,126,773	-€ 4,497,610	-€ 4,790,917	-€ 5,108,351	-€ 5,406,374	-€ 5,739,092	-€ 6,096,451	-€ 6,443,157	-€ 6,815,017	-€ 7,199,081	
Cumulative Cashflow with Financing	**-€ 3,759,530**	**-€ 4,126,773**	**-€ 4,497,610**	**-€ 4,790,917**	**-€ 5,108,351**	**-€ 5,406,374**	**-€ 5,739,092**	**-€ 6,096,451**	**-€ 6,443,157**	**-€ 6,815,017**	**-€ 7,199,081**	

Figure 30:Cashflow Statement Year 2, with a PM of 20% and financing cashflows of €0.

	Q9			Q10			Q11			Q12		
Operating month	25	26	27	28	29	30	31	32	33	34	35	36
Number of new contracts closed per month	13	13	14	15	15	16	17	18	19	20	21	22
Number of new systems build per month	12	13	13	14	15	15	16	17	18	19	20	21
Number of new systems placed per month	11	11	12	13	13	14	15	15	16	17	18	19
Operating activities												
Cash at beginning of period without financing	-€8,007,924	-€8,542,491	-€9,111,485	-€9,683,655	-€10,157,858	-€10,689,855	-€11,203,714	-€11,732,343	-€12,319,794	-€12,898,378	-€13,513,293	-€14,142,710
Cash outflows for the system												
Cash for COGS (Steel parts delivered by partner)	€ 188,588	€ 205,733	€ 222,877	€ 222,877	€ 240,022	€ 257,166	€ 257,166	€ 274,310	€ 291,455	€ 308,599	€ 325,744	€ 342,888
Cash for COGS (Coated parts delivered by partner)	€ 37,288	€ 40,678	€ 44,067	€ 44,067	€ 47,457	€ 50,847	€ 50,847	€ 54,237	€ 57,627	€ 61,016	€ 64,406	€ 67,796
Cash for COGS (remaining)	€ 203,846	€ 220,834	€ 220,834	€ 237,821	€ 254,808	€ 254,808	€ 271,795	€ 288,782	€ 305,770	€ 322,757	€ 339,744	€ 356,731
cash for Direct Labour Costs	€ 163,200	€ 176,800	€ 176,800	€ 190,400	€ 204,000	€ 204,000	€ 217,600	€ 231,200	€ 244,800	€ 258,400	€ 272,000	€ 285,600
Cash for Maintenance	€ 80,085	€ 85,732	€ 91,893	€ 98,566	€ 105,240	€ 112,427	€ 120,128	€ 127,828	€ 136,042	€ 144,769	€ 154,010	€ 163,764
Cash for Transportation	€ 64,653	€ 64,653	€ 70,530	€ 76,408	€ 76,408	€ 82,285	€ 88,163	€ 88,163	€ 94,040	€ 99,918	€ 105,795	€ 111,673
Cash for Insurance per system	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 665,687
Cash outflows for Operating Expenses												
Cash for Labour	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200	€ 214,200
Cash for Marketing	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020	€ 1,020
Cash for Rent payments	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360	€ 18,360
Cash for Utility	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366	€ 3,366
Cash for Software Tools	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692	€ 8,692
Cash for Administration	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080	€ 4,080
Cash for Depreciation and Amortization	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550	€ 2,550
Cash for Licences	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 6,800
Cash for Insurance	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 3,622
Cash outflows for Capital Expenditures												
Cash for Software Development	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680	€ 680
Cash for Research & Development	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360	€ 1,360
Cash inflows from the system												
Cash from Transportation	€ 77,583	€ 77,583	€ 84,636	€ 91,689	€ 91,689	€ 98,742	€ 105,795	€ 105,795	€ 112,848	€ 119,901	€ 126,955	€ 134,008
Cash from First Contracts	€ 379,818	€ 402,160	€ 424,502	€ 558,556	€ 558,556	€ 603,240	€ 625,582	€ 625,582	€ 692,609	€ 714,951	€ 759,636	€ 781,978
Cash from Second Contracts												
Net Cash Flow from Operating Activities	**-€534,567**	**-€568,994**	**-€572,170**	**-€474,202**	**-€531,998**	**-€513,859**	**-€528,629**	**-€587,451**	**-€578,584**	**-€614,915**	**-€629,417**	**-€1,342,883**
Cumulative Cashflow without financing	**-€8,542,491**	**-€9,111,485**	**-€9,683,655**	**-€10,157,858**	**-€10,689,855**	**-€11,203,714**	**-€11,732,343**	**-€12,319,794**	**-€12,898,378**	**-€13,513,293**	**-€14,142,710**	**-€15,485,592**
Financing activities												
Cash outflow for financing												
Cash for Lease Arrangement	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Cash inflow from financing												
Cash from Equity Financing	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Cash from Lease Arrangement	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Net Cash Flow from Financing Activities	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Cumulative Cashflow with only Equity Financing	-€8,542,491	-€9,111,485	-€9,683,655	-€10,157,858	-€10,689,855	-€11,203,714	-€11,732,343	-€12,319,794	-€12,898,378	-€13,513,293	-€14,142,710	-€15,485,592
Cumulative Cashflow with only Financial Lease	-€8,542,491	-€9,111,485	-€9,683,655	-€10,157,858	-€10,689,855	-€11,203,714	-€11,732,343	-€12,319,794	-€12,898,378	-€13,513,293	-€14,142,710	-€15,485,592
Cumulative Cashflow with Financing	**-€8,542,491**	**-€9,111,485**	**-€9,683,655**	**-€10,157,858**	**-€10,689,855**	**-€11,203,714**	**-€11,732,343**	**-€12,319,794**	**-€12,898,378**	**-€13,513,293**	**-€14,142,710**	**-€15,485,592**

Figure 31: Cashflow Statement Year 3, with a PM of 20% and financing cashflows of €0.

Appendix B.1

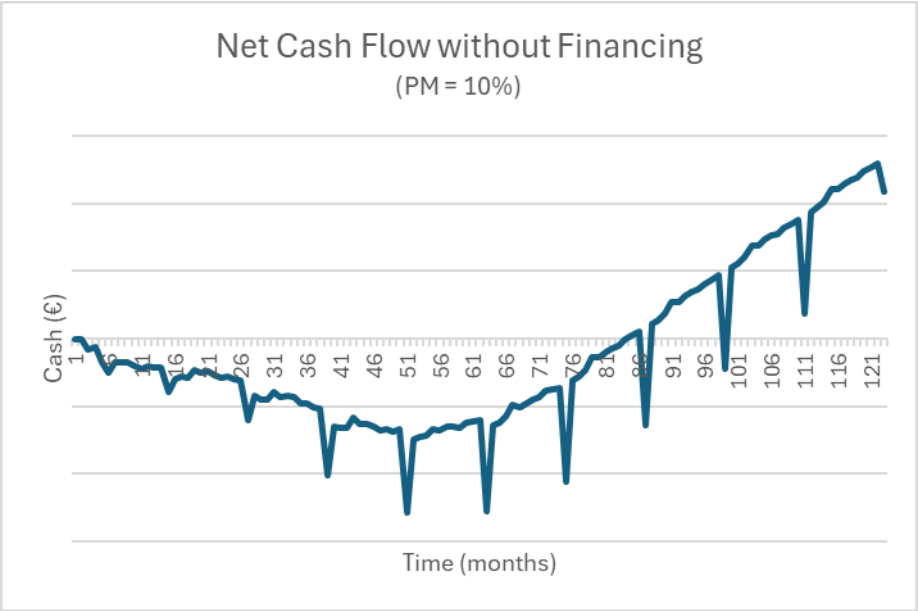

Figure 32: Net cash flow without financing with a PM of 10%

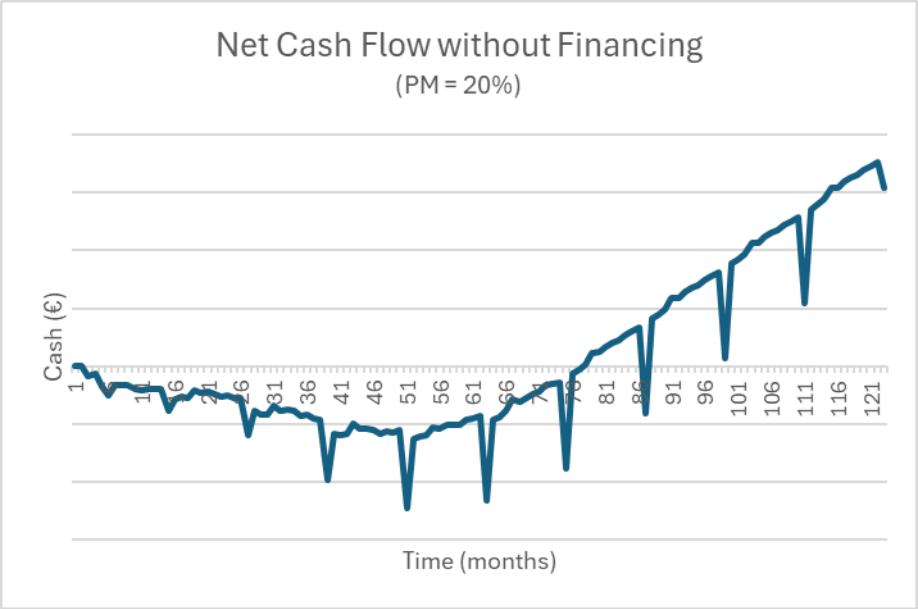

Figure 33: Net cash flow without financing with a PM of 20%

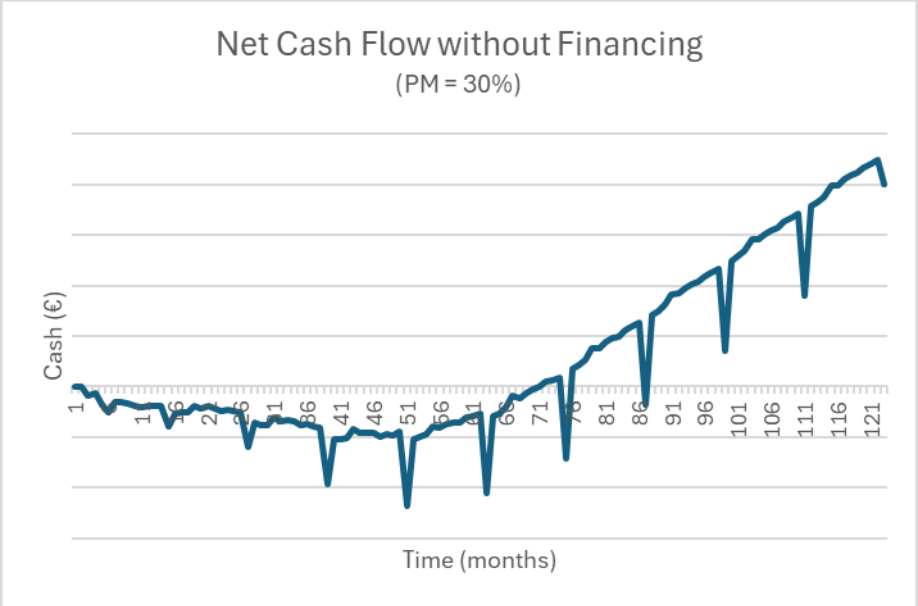

Figure 34: Net cash flow without financing with a PM of 30%

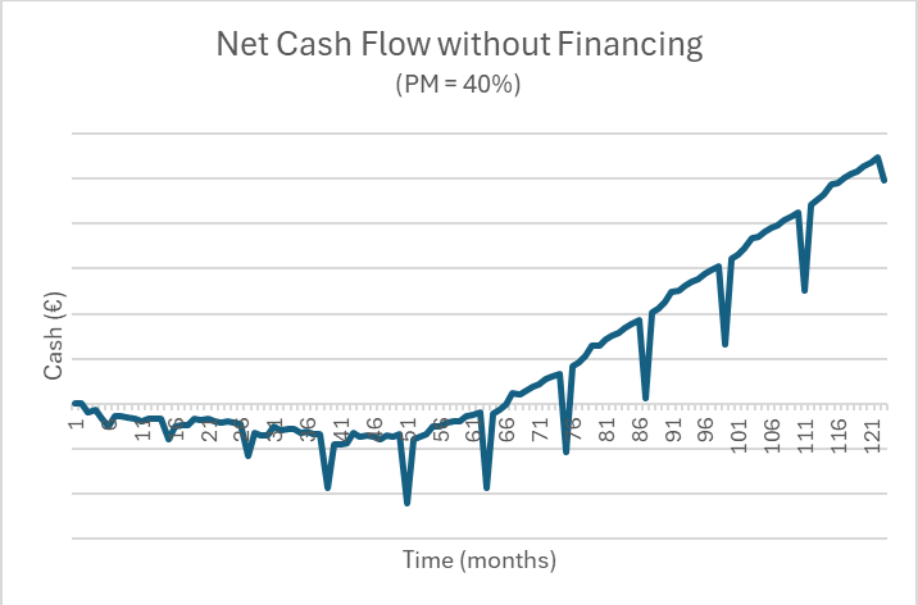

Figure 35: Net cash flow without financing with a PM of 40%

Appendix B.2

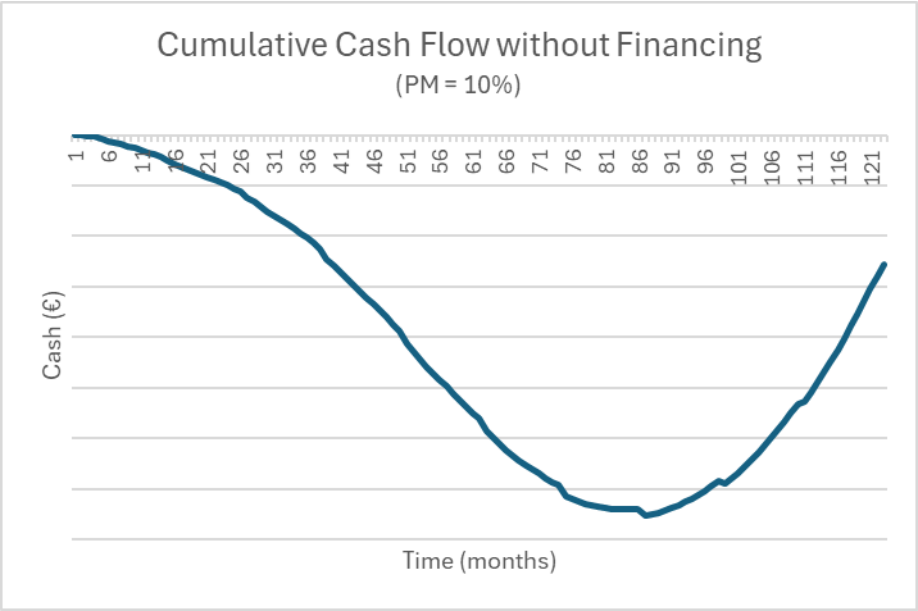

Figure 36: Cumulative cash flow without financing with a PM of 10%

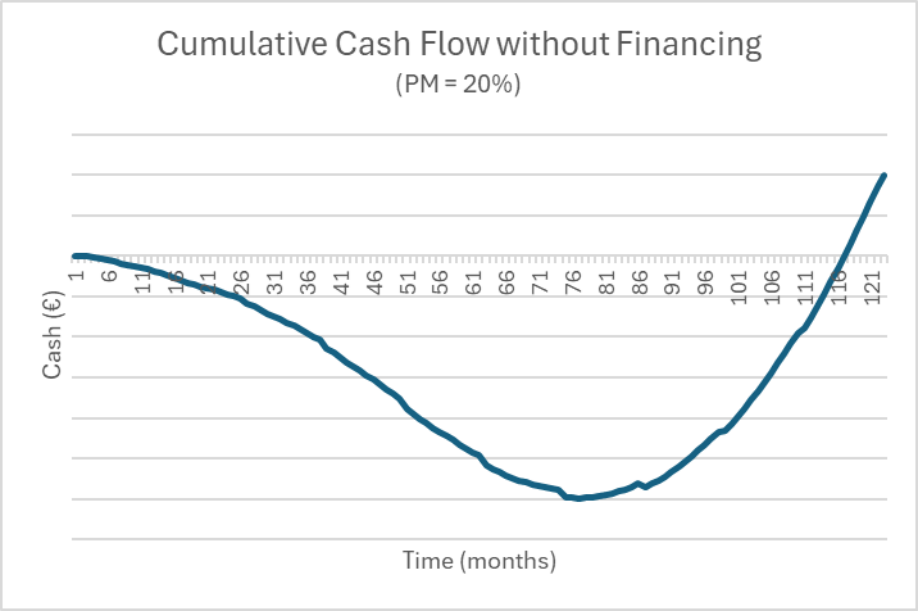

Figure 37: Cumulative cash flow without financing with a PM of 20%

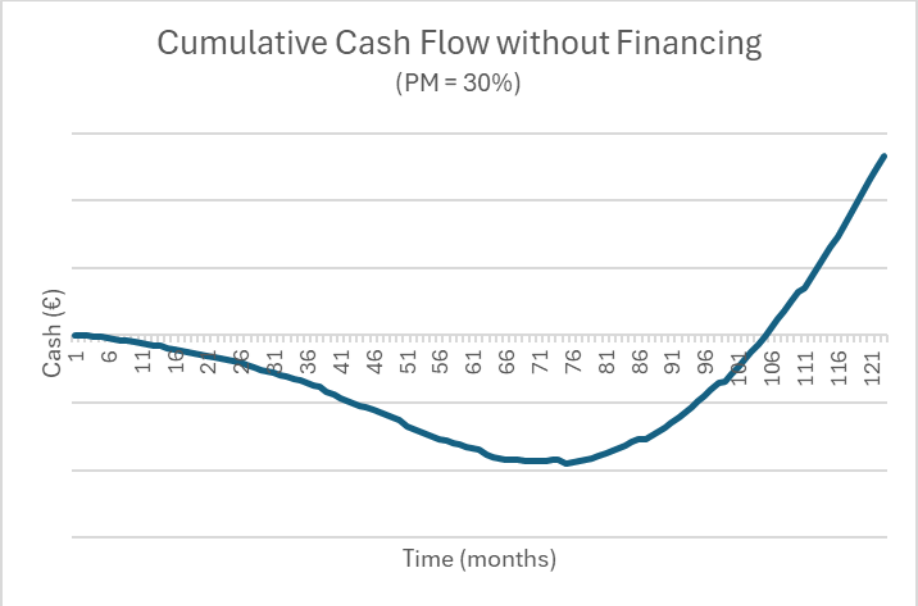

Figure 38: Cumulative cash flow without financing with a PM of 30%

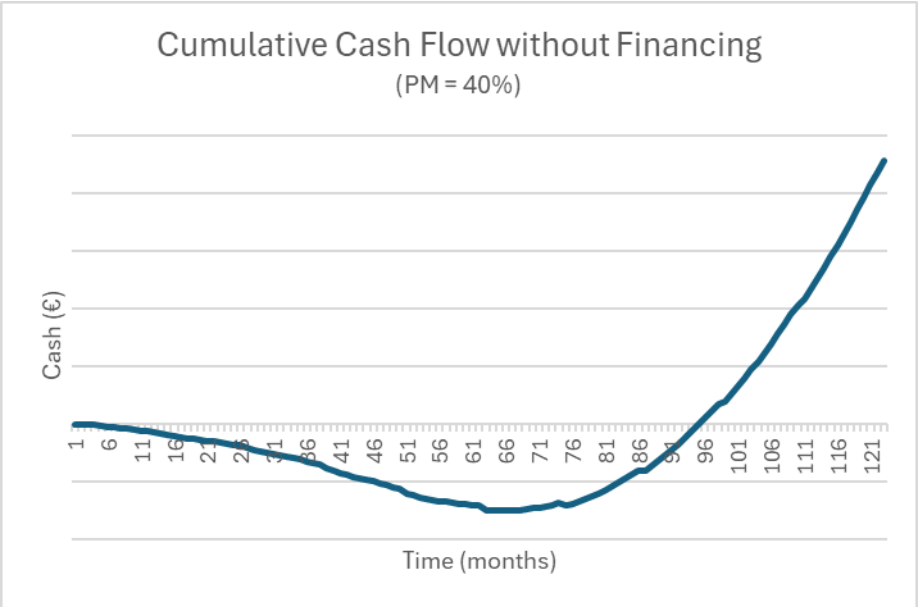

Figure 39: Cumulative cash flow without financing with a PM of 40%

Bibliography

Brealey, R. A., Myers, S. C., & Allen , F. (2020). *Principles of Corporate Finance*. McGraw-Hill Education, NewYork. file:///C:/Users/nevan/Documents/Afstuderen/Literature/Finance%20boeken/Principles%20of%20Corporate%20Finance%20by%20Richard%20A.%20Brealey,%20Stewart%20C.%20Myers,%20Franklin%20Allen%20(boek%20Uni).pdf

Electric Transport in the Netherlands. (2024). Netherlands Enterprise Agency. https://english.rvo.nl/topics/electric-transport

Games, D., Kartika, R., Sari, D. K., & Assariy, A. (2020). Business incubator effectiveness and commercialization strategy: a thematic analysis. *Journal of Science and Technology Policy Management*, *12*(2), 176-192. https://doi.org/10.1108/JSTPM-03-2020-0067

Gans, J. S., & Stern, S. (2003). The product market and the market for "ideas": commercialization strategies for technology entrepreneurs. *Research Policy*, *32*(2), 333-350. https://doi.org/https://doi.org/10.1016/S0048-7333(02)00103-8

Goenawan, S. I. (2015). The calculation of the house installment payment and the formula approach without a calculator by the assistance of metris *Journal Ilmiah Widya Teknik*. https://d1wqtxts1xzle7.cloudfront.net/39787495/7_45-TI-13_WT-17_78-83-libre.pdf

Halt, G. B., Donch, J. C., Stiles, A. R., & Fesnak, R. (2016). *Intellectual Property and Financing Strategies for Technology Startups* [Book]. https://doi.org/10.1007/978-3-319-49217-9

He, J., Wang, Z., King, M., Hang, W., & Zhao, C. (2018). Research on prediction methods for motor vehicle driver training demand based on an S-curve. *Transportation Research Part F: Traffic Psychology and Behaviour*, *58*, 831-842. https://doi.org/https://doi.org/10.1016/j.trf.2018.07.015

Jong, Y. O., & Jung, C. K. (2015). *The Development of Interview Techniques in Language Studies:* . file:///C:/Users/nevan/Downloads/The-development-of-interview-techniques-in-language-studies-Facilitating-the-researchers-views-on-interactive-encountersEnglish-Language-Teaching.pdf

Kang, S., & Long, M. S. (2001). The fixed payment financing decision: To borrow or lease. *Review of Financial Economics*, *10*(1), 41-55. https://doi.org/https://doi.org/10.1016/S1058-3300(01)00023-4

Kruachottikul, P., Dumrongvute, P., Tea-makorn, P., Kittikowit, S., & Amrapala, A. (2023). New product development process and case studies for deep-tech academic research to commercialization. *Journal of Innovation and Entrepreneurship*, *12*(1), Article 48. https://doi.org/10.1186/s13731-023-00311-1

Kumar Phanden, R., Sheokand, A., Kumar Goyal, K., Gahlot, P., & Ibrahim Demir, H. (2022). 8Ds method of problem solving within automotive industry: Tools used and comparison with DMAIC. *Materials Today: Proceedings*, *65*, 3266-3272. https://doi.org/https://doi.org/10.1016/j.matpr.2022.05.383

Li, B. (2023). *The role of financial markets in the energy transition: an analysis of investment trends and opportunities in renewable energy and clean technology*. file:///C:/Users/nevan/Downloads/The-role-of-financial-markets-in-the-energy-transition-an-analysis-of-investment-trends-and-opportunities-in-renewable-energy-and-clean-technologyEnvironmental-Science-and-Pollution-Research.pdf

Liao, L. K., & Wang, V. S. P. (2024). The effects of information environment on internal and external financing choices [Article]. *International Journal of Business Excellence*, *33*(1), 142-167. https://doi.org/10.1504/IJBEX.2024.139116

Manos, R., Parker, K., & Myddelton, D. R. (2023). *Corporate Finance for Business: The Essential Concepts* (2nd ed.). Springer. Champ, Switch. https://public.ebookcentral.proquest.com/choice/PublicFullRecord.aspx?p=7243838

Motlagh, A. J. (2013). Accounting: Cash Flow Statement. *IOSR Journal of Business and Management*. file:///C:/Users/nevan/Downloads/Accounting_%20Cash%20Flow%20Statement.pdf

Neeb, H.-P. (2022). *Account Management Strategies in B2B Sales*. Springer. Friedrichsdorf. file:///C:/Users/nevan/Downloads/Account-Management-Strategies-in-B2B-Sales-Generating-Customer-Value-and-Building-Sustainable-Business-Relationships--Methodology-Processes-ToolsAccount-Management-Strategies-in-B2B-Sales-Generating-Customer-Value-.pdf

Pan, W., Cao, H., & Liu, Y. (2023). "Green" innovation, privacy regulation and environmental policy. *Renewable Energy*, *203*, 245-254. https://doi.org/https://doi.org/10.1016/j.renene.2022.12.025

Rackham, N. (1988). *SPIN selling*. McGraw-Hill. New York.

Sahay, S. A. (2022). Usefulness of Cash Flow Statements. In *Encyclopedia of Finance* (pp. 1657-1683). Springer. file:///C:/Users/nevan/Downloads/Usefulness-of-Cash-Flow-StatementsEncyclopedia-of-Finance-Third-Edition.pdf

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students*. Pearson. Harlow, United Kingdom. https://ebookcentral.proquest.com/lib/itc/reader.action?docID=5774742

Shanin, I., & Shtondin, A. (2021). Modelling approaches to innovative development of forestry enterprises using the sigmoid function. IOP Conference Series: Earth and Environmental Science, https://www.scopus.com/inward/record.uri?eid=2-s2.0-85120898013&doi=10.1088%2f1755-1315%2f875%2f1%2f012058&partnerID=40&md5=0d148a84eb0dc57255e5135575ea86bc

Slack, N., Brandon-Jones, A., & Johnston, R. (2016). *Operations Management*. Pearson. Edinburgh. file:///C:/Users/nevan/Documents/TBK%20-%20IEM/Year%201/M2/Operation%20Stratagy/Alistair%20Brandon-Jones,%20Nigel%20Slack,%20Robert%20Johnston-Operations%20Management-Pearson%20(2016).pdf

United-Nations. (2023). *World Investment Report 2023: Investing in Sustainable Energy for All*. U. N. Publications. https://unctad.org/system/files/official-document/wir2023_en.pdf

Wulandari, E., Meuwissen, M. P. M., Karmana, M. H., & Oude Lansink, A. G. J. M. (2021). The role of access to finance from different finance providers in production risks of horticulture in Indonesia. *PLoS ONE*, *16*(9 September), Article e0257812. https://doi.org/10.1371/journal.pone.0257812

Yan, A. (2006). Leasing and Debt Financing: Substitutes or Complements? *Journal of Financial and Quantitative Analysis*, *41*(3), 709-731. https://doi.org/10.1017/S0022109000002593