

A Work Project, presented as part of the requirements for the Award of a Master's degree in Management from the Nova School of Business and Economics.

**Development of an Assetless Internationalization Plan for 3DWAYS –
Financial Potential Assessment**

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ABSTRACT

This thesis develops an internationalization strategy for 3DWAYS, a Portuguese supply chain management company, to expand into niche markets in Europe's sustainable manufacturing sector. Utilizing an assetless model, 3DWAYS provides tailored solutions to clients addressing supply chain transparency, efficiency, and sustainability challenges. Combining internal and external analysis and competitive insights, Germany and the UK are identified as target markets in the medical technology and smart home niches. A go-to-market strategy details positioning, partnerships, and marketing initiatives, concluding in an implementation roadmap. A financial impact assessment quantifies incremental profits, offering actionable insights to establish 3DWAYS as a European supply chain intermediary.

Keywords: Internationalization, Market Selection, Go-to-market Strategy, Financial Impact

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0. CONTEXT – GROUP PART

0.1 Introduction

In today's global economy, resilient and innovative *Supply Chain Management* (SCM) is vital for competitive success, especially amid disruptions like geopolitical tensions and sustainability demands. 3DWAYS, a Portuguese company, addresses these challenges by offering its clients sustainable manufacturing and supply chain solutions, thereby providing a hands-on end-to-end service ranging from material sourcing, supplier selection, and production supervision to project management and product development. It does so by acting as an intermediary between hardware-selling firms (its clients) and suppliers or manufacturers while leveraging an asset-light business model. Having built a broad supplier network over time, 3DWAYS provides transparent, resilient, and sustainable services to firms of all kinds of sizes from industries such as medical devices, consumer electronics, and micro-mobility.

The core of 3DWAYS' business model is built around mediating between corporations – 3DWAYS' clients – and a robust network of suppliers, focusing on sustainable sourcing, procurement, and manufacturing practices while implementing supply chain optimization measures without engaging in prototyping or direct manufacturing itself. By outsourcing production to the most suitable supplier partners and overseeing the end-to-end supply chain, 3DWAYS ensures efficiency and sustainability while reducing costs for its clients.

3DWAYS, currently active in Portugal, aims to scale its operations across Europe through an assetless internationalization strategy. This thesis develops a strategic roadmap by analyzing market opportunities, competitive landscapes, and industry trends in key European countries. It evaluates 3DWAYS' internal capabilities and external conditions to provide actionable insights on segment targeting and market entry, positioning 3DWAYS as a relevant manufacturing and supply chain intermediary in the chosen niches.

0.2 Project structure and scope

As *Figure 1* outlines, this thesis is structured into five phases, beginning with an internal assessment of 3DWAYS' current operational strengths and weaknesses, followed by an external analysis of its macroeconomic business environment, market conditions, and competitive landscape. Subsequently, a shortlist of potential countries and industries for market entry is identified, setting the foundation for a targeted *Go-To-Market* (GTM) and positioning strategy for the selected market segments. Eventually, a financial potential assessment is conducted that illustrates the viability of this expansion plan.

Project phases and respective work packages			
	Key Questions	Methodology	Data sources
Introduction/ Context	<ul style="list-style-type: none"> What is the context of the project? Who is 3DWAYS and what problems are they facing? What is the scope of the project? 	<ul style="list-style-type: none"> Interview with 3DWAYS Desk research 	<ul style="list-style-type: none"> Public client data
Status-quo analysis	1 Inside-out status quo analysis of 3DWAYS <ul style="list-style-type: none"> What is 3DWAYS' vision and mission? Which values do they advocate? What does 3DWAYS' business model look like? (CVP, GTM, ...) How is 3DWAYS looking financially? What are the revenue drivers? 	<ul style="list-style-type: none"> Interview with 3DWAYS Data analysis 	<ul style="list-style-type: none"> Financial statements Customer/partner data Strategy/product data
	2 Outside-in status quo analysis of 3DWAYS <ul style="list-style-type: none"> What macroeconomic trends and developments are present? At which market are we looking and how do we segment it? Who are the main competitors and what do they offer? 	<ul style="list-style-type: none"> Interview with 3DWAYS Data analysis Global market reports 	<ul style="list-style-type: none"> Geopolitical data Global market reports
Strategy development	3 Selection of countries and niche markets <ul style="list-style-type: none"> How to derive a short list of pre-selected countries/industries? How to combine and analyze the pre-selected countries/industries? How to narrow down the pre-selection and target the right niches? 	<ul style="list-style-type: none"> Literature review Interview with 3DWAYS Data analysis 	<ul style="list-style-type: none"> Economy/market sizes Public indices/scores EU industry reports
	4 Go-to-market strategy <ul style="list-style-type: none"> How to position 3DWAYS' from customers' POV in the new market? What to adjust in the business model and which entry mode to use? What does the roadmap look like and which KPIs to monitor success? 	<ul style="list-style-type: none"> Literature review Benchmark analyses 	<ul style="list-style-type: none"> Marketing literature Public competitor data
Impact assessment	5 Financial potential assessment <ul style="list-style-type: none"> What are the relevant revenue and cost drivers? What EBITDA can be expected? What is the financial impact of the key recommendations? 	<ul style="list-style-type: none"> Interview with 3DWAYS Data consolidation Financial analysis 	<ul style="list-style-type: none"> Financial statements Desk research Internal client data
Conclusion/ Wrap-up	<ul style="list-style-type: none"> Answer the key questions raised in the beginning: Where to play and how to win? 	<ul style="list-style-type: none"> Aggregation of analyses 	<ul style="list-style-type: none"> Results from all phases

Figure 1: Project structure and respective work packages

The research draws on primary and secondary data, incorporating insights from client interviews, financial data, and industry benchmarks as well as literature reviews, ensuring a robust and evidence-based approach. By systematically evaluating 3DWAYS' potential for European expansion, this thesis aims to offer a roadmap that aligns with the company's mission of fostering sustainable manufacturing practices as well as efficient and resilient supply chains for its customers.

This project analyzes key internal and external factors for 3DWAYS' European expansion. Objectives include assessing current capabilities, analyzing market landscapes, selecting target countries and industries, and developing a GTM strategy with financial recommendations for a

profitable entry. The scope is limited to status-quo analysis, strategic planning, and an impact assessment, excluding certain activities.

Specifically, the project excludes significantly adjusting the current services offered, designing new service offerings, and considering countries or industries outside of Europe. It also does not cover the actual implementation or long-term monitoring of the proposed market entry strategy. Having a clear definition of the scope ensures that the project remains targeted and achievable within the given timeframe and resources, focusing solely on strategic situation analysis, internationalization strategy development, implementation and monitoring planning to support 3DWAYS' European market entry aspirations.

0.3 Target picture

The solution framework for 3DWAYS' internationalization strategy, as demonstrated in *Figure 2*, shows how the five phases build upon and interlock with each other, each contributing to a comprehensive plan aimed at achieving profitable market entries in selected European niche markets. This structure enables a systematic exploration of critical decision points – *"Where to play"* and *"How to win"* – by leveraging 3DWAYS' resources and capabilities as well as its assetless model within the European context.

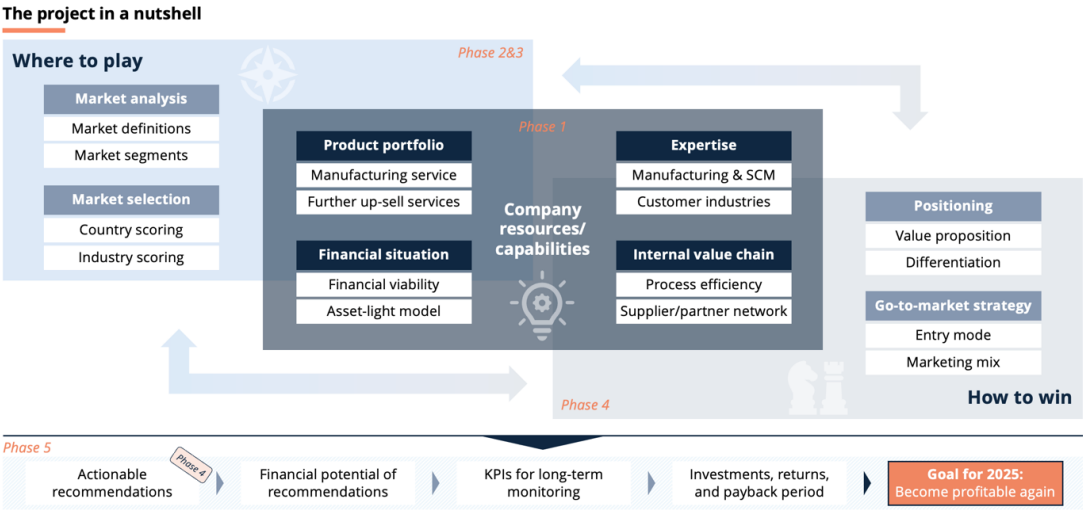


Figure 2: Solution framework for 3DWAYS' assetless internationalization plan

The first phase focuses on evaluating 3DWAYS' internal resources and core competencies,

including its product portfolio, expertise in industries like medical devices and consumer electronics, its asset-light business model, and internal value chain. Moreover, its financial statements from past periods are analyzed to gain a better understanding of the firm's current financial situation. This analysis identifies strengths and areas for improvement, forming the foundation for aligning internal capabilities with the external environment in the GTM strategy. Phases two and three focus on identifying "*Where to play*" by first analyzing and segmenting markets in scope before scoring potential European markets and industries based on quantitative and qualitative criteria. Phase two assesses macroeconomic opportunities and defines key segments, while phase three evaluates their attractiveness based on criteria such as market potential, industry fit, and cultural distance. This approach yields a shortlist of target segments aligned with 3DWAYS' strengths and strategic goals.

Phase four focuses on "*How to win*" by developing a tailored GTM strategy for the selected segments. It emphasizes strategic positioning, demand-generation strategies, and different entry modes. The plan includes building partnerships and distribution channels to overcome trust barriers, secure initial contracts, and establish a long-term market presence. Finally, an implementation roadmap and a risk assessment analysis are provided.

The final phase evaluates the internationalization plan's financial potential through revenue, cost, and profitability projections supported by scenario and sensitivity analyses to ensure robust financial targets.

At an overall level, these interconnected phases aim to achieve 3DWAYS' overarching objective of becoming profitable by the end of 2025 through successful expansion into at least two strategically selected European niche markets. Each phase is built upon the insights derived from previous stages, forming a cohesive, evidence-based roadmap that aligns with 3DWAYS' mission to facilitate efficient, resilient, and sustainable supply chain solutions across Europe.

1. FINANCIAL POTENTIAL ASSESSMENT – FLORIAN WACHA

The fifth and final phase of the project focuses on evaluating the financial implications of the proposed strategies and recommendations developed in *Chapters 3 and 4*. It particularly builds upon the concrete measures introduced in the marketing mix in *Chapter 4*, subsequently aggregated in the implementation roadmap in *Chapter 4*. Its primary goal is to assess the viability of 3DWAYS' European expansion by quantifying its potential financial outcomes. By providing a detailed forecast of incremental revenues, costs, and overall profitability, this phase ensures that the internationalization plan aligns with the company's strategic objective to successfully enter two European niche markets and become profitable again by the end of 2025.

Two major model characteristics need to be mentioned upfront. First, based on the project team's experience, it is rather common for market entry strategies to showcase negative profits in the first year(s). This is due to upfront investments and market penetration initiatives that particularly drive costs in the first year(s), on the one hand, and due to revenues usually taking some time until they gain traction in a new market, on the other hand. However, as mentioned before, 3DWAYS' situation is special in the sense that the proposed internationalization plan shall be of an assetless nature and be as lean as possible in terms of investments and costs due to the financial constraints 3DWAYS is facing (as shown by the high debt-to-equity ratio and rather low cash reserves in *Chapter 1*). These circumstances were considered when setting up the model. Second, the profit forecast is done on the EBITDA level which is used as a proxy for cash flow. To sum up the model in one single output variable, an approximated *Net Present Value* (NPV) has been calculated by discounting the sum of EBITDAs with an approximated discount rate of 10% reflecting the risk of future cash flows as well as accounting for the time value of money. However, it is important to stress that this percentage is just a high-level approximation of a proper, firm-specific, discount rate. Moreover, this NPV does not take into account a terminal value and is therefore merely a loose guideline value that describes the model

output. Moreover, it must be noted that holistic financial projections of the balance sheet, cash-flow statement, and full income statement have not been conducted. Thus, the final decision on whether to finance and carry out the proposed internationalization strategy is left to be made by 3DWAYS itself and, therefore, not in the scope of this financial projection model.

Having these circumstances in mind, the chapter is structured as follows. First, the methodology of the financial impact assessment model is introduced showing how profits are broken down into their revenue and cost drivers. Second, the results of the model are presented, showing how and to what extent the different revenue and cost drivers affect the incremental profits of the internationalization strategy. Third, the evaluation not only includes projections of key financial metrics but also incorporates scenario and sensitivity analyses to account for potential uncertainties, offering a robust framework for decision-making. Lastly, the different financial metrics will be aggregated to derive the overall financial impact of the proposed strategies. This phase serves as a critical checkpoint, validating the feasibility of the internationalization efforts and enabling 3DWAYS to proceed with confidence in its chosen course of action.

1.1 Methodology

This section presents the financial impact methodology, starting with a high-level overview before going into detail on the breakdown of incremental revenues and cost components.

1.1.1 Overview

The financial impact assessment for 3DWAYS is based on a systematic approach to model and evaluate the incremental financial effects of the proposed internationalization plan. The methodology consists of five core elements as introduced in the following paragraph.

First, a financial forecast for five years from 2025 to 2029 is built, focusing exclusively on the incremental profits at EBITDA level derived from the internationalization efforts. This ensures that the assessment captures only the new value generated by the proposed strategies without merging it with baseline operations that would have been conducted anyway. Second, to

enhance the precision of the forecast, the model relies on granular, data-driven assumptions. These include detailed inputs for revenue and cost drivers such as client acquisition rates, average revenue per client, retention rates, and operational expenses segmented into personnel and marketing costs. The assumptions have been made on a rather conservative level to make sure the model does not overestimate the financial impact of the proposed strategic measures. Third, three scenarios – base, optimistic, and pessimistic – are developed to account for variations in potential external and internal factors. These scenarios provide a range of possible outcomes, highlighting the resilience of the strategy under different conditions. Fourth, as outlined in *Figure 3*, the incremental revenues are categorized into three components. These are revenues from newly acquired clients, revenues derived from retaining existing clients, and revenues from additional services, i.e., product development, offered to retained clients. On the other side, the incremental costs are divided into two main categories – personnel and marketing costs. Lastly, the model includes sensitivity analyses to test the impact of changes in key assumptions on financial outcomes. This allows critical variables to be identified and provides a deeper understanding of the risks and opportunities of the internationalization plan.

To better visualize the high-level structure of the model, *Figure 3* shows the breakdown of incremental revenues and costs into their main sub-drivers.

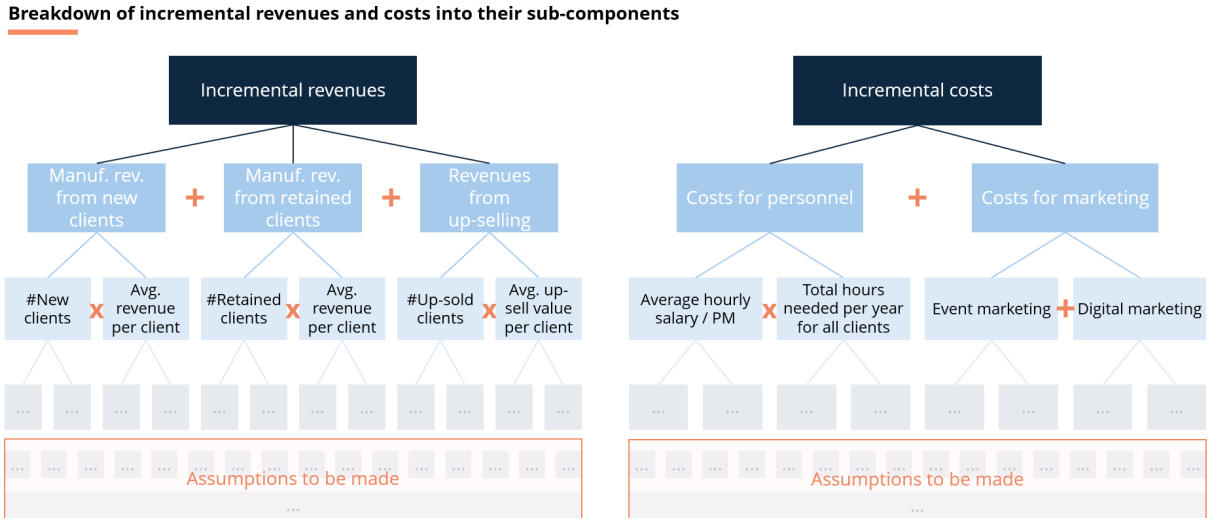


Figure 3: High-level breakdown of profit drivers

Figure 3 illustrates that these drivers are further broken down until assumptions need to be made at the most granular level. A list of all the assumptions and their descriptions used to feed the model can be found in *Appendix F* while the exact values that were taken for each assumption including a high-level rationale behind these numbers can be found in *Figure A-9* and *Figure A-10*.

While this provides a broad picture of the financial impact assessment model, in the following the breakdown of the revenue and cost drivers will be presented in more detail. More specifically, the issue trees starting from the second level of the revenue and cost drivers presented in *Figure 3* will be explained separately until the most granular assumption level.

1.1.2 Revenue drivers

As *Figure 3* already outlined, the three incremental revenue components this sub-chapter deals with are the manufacturing revenues from new and retained clients as well as the product development revenues from up-selling. Up-selling in this scenario refers to clients who previously purchased the manufacturing service offering from 3DWAYS and then decided to purchase the product development service offering on top of that. Each of the three revenue components will now be introduced in the following subchapters.

1.1.2.1 *Manufacturing revenues from new clients*

This revenue component represents the incremental revenues generated by newly acquired clients in the target markets per period. Therefore, the number of newly acquired customers in each period needs to be determined and multiplied by the average revenue made per client per year. However, the revenue per client exclusively refers to the revenue made from the manufacturing offering, as potential revenues from the product development offering will be covered in *Chapter 1.1.2.3*. To follow along with the subsequent paragraphs, *Figure A-1* shows the issue tree for the incremental revenues from newly acquired clients.

Starting with determining the number of newly acquired clients, a distinction between a direct

and indirect outreach channel needs to be made. While the indirect channel – currently the main distribution channel of 3DWAYS as already shown in *Chapter 1* – incorporates distribution partners such as certification agencies and startup incubators as intermediaries between 3DWAYS and its clients, the direct-to-customer channel represents sales made directly to clients without the partners as intermediaries. The number of new clients acquired through the indirect channel can be determined by multiplying the number of the established partners in the target markets with the average number of new clients one partner can bring to 3DWAYS per year. For these two metrics, assumptions were made based on client inputs from interviews, and a degressive growth rate was assumed for both metrics. On the other hand, the newly acquired clients through the direct-to-customer channel need to be further split up into outbound and inbound sales channels. While the outbound channel acquires new clients through cold outreach, e.g., via LinkedIn, e-mail, cold calls, or networking at conferences and other events, the inbound channel incorporates new client acquisition via Google Ads and LinkedIn Ads as well as referrals from existing clients. For both channels (outbound and inbound), assumptions on the number of leads generated per sub-channel as well as the conversion rates for each sub-channel needed to be made. The number of leads from the digital marketing channels – Google Ads and LinkedIn Ads – is implied from the costs side since a digital marketing budget has been set (will be further explained in detail in *Chapter 1.1.3.2*). A visualization of the sales/marketing funnel underlining the definitions of leads and conversion rates can be found in *Figure A-6* in the appendix. The number of clients from referrals is linked to the number of existing clients from previous periods, assuming an average referral rate that indicates what share of existing clients refers 3DWAYS to other potential clients. Regarding the conversion rates, while numbers for Google Ads were taken from Marino (2024) and LinkedIn Ads from Huber (2023), the conversion rates for direct cold-outreaches, conferences, and referrals were collected during client interviews (3DWAYS 2024c). In general, a degressive growth rate was

assumed for the conversion rates accounting for the fact that 3DWAYS gains experience in using these marketing tools, manages to better tailor the outreaches to the target audience, and becomes better in pitching 3DWAYS service offerings in demo calls (see *Appendix F*). For the exact numbers and growth rates used, see *Figure A-9*.

Now that the determination of the number of newly acquired customers per year in the target markets has been covered, the next step is to determine the average revenue each newly acquired customer generates for 3DWAYS per year. Therefore, three components need to be considered. First, the *Average Order Value* (AOV) per project, second, the average percent commission value per project, and third, the average number of projects per client per year. AOV refers to the value that the customer is paying the manufacturer for producing the respective product. A distinction between the AOV of large corporate clients and SMEs/startups has been considered, however, as stated in an interview, there is no significant difference in AOVs between these two company types or sizes (3DWAYS 2024c). As the AOV is not the amount that 3DWAYS receives, the second component – the average percent commission – needs to be considered. As described in *Chapter 4*, a flexible pricing scheme is introduced, which links the percent commission to the order value – the higher the order value, the lower the commission, and vice versa. Thus, the average percent commission value used to determine the average revenue generated with each client is dependent on the AOV. Lastly, the average number of projects ordered per client per year needs to be considered. As mentioned in an interview with 3DWAYS, some customers order two or even three times a year, while others only order every two or even three years (3DWAYS 2024c). Therefore, it was assumed that the average number of projects per customer per year is one.

This concludes the methodology for determining the incremental revenue from newly acquired customers. The breakdown of these revenues into sub-drivers shows that various components, from different direct and indirect channels to AOVs, have been considered to derive the number

of new customers acquired per year and the average revenue generated per customer per year.

1.1.2.2 Manufacturing revenues from retained clients

Having now covered the first of the three main revenue components – the revenues generated from selling the manufacturing service to newly won customers in each period – the second revenue component deals with the revenues generated from selling the manufacturing service to retained clients in each period starting in 2026. Therefore, the number of retained clients in each period needs to be determined and multiplied by the average revenue per retained client per year. The respective issue tree for that revenue component can be found in *Figure A-2*.

Starting with the number of retained clients per period, this metric is derived by multiplying the total number of customers¹ from the previous period with a customer retention rate. The total number of customers from the previous period is calculated by adding the new clients won in that period to the retained clients from the period before. The retention rate, however, is based on an assumption derived from a client interview and is assumed to be at 40% in the base case (3DWAYS 2024c). It is crucial to understand that the retention rate in that case refers to the share of total clients² from the previous period that purchases the manufacturing service from 3DWAYS in the subsequent period again. As it was stressed in an interview that almost every client stays with 3DWAYS after their first project together, accounting for the fact that some clients may only return after two or even three years, the retention rate was adjusted downwards, arriving at the aforementioned 40% (3DWAYS 2024c).

As this product – the total number of clients from the previous period times retention rate – yields the number of retained clients in a given period, in the next step, similar to the first revenue stream, this must be multiplied by the average manufacturing revenue per client. This revenue, again, only incorporates revenue made from the manufacturing service. Assuming that

¹ A firm is considered as customer if it purchased at least one service offering from 3DWAYS in a given year

² Total number of clients e.g. new/retained that purchased the manufacturing service offering in a given period

there is no difference in AOV, average commission, and average projects per year for retained clients compared to new clients, the average revenue per retained client is the same as the revenue generated per new client. This concludes the second revenue component.

1.1.2.3 Product development revenues from up-sold clients

Lastly, the third revenue component is the revenue from up-selling. Specifically, up-selling refers to existing clients, i.e., clients that purchased manufacturing services in the previous period, and that decide to purchase product development services on top of the manufacturing service in the current period. Thus, up-selling is assumed to not happen for newly won clients in the same period. To derive the revenue generated from these up-selling scenarios, the number of retained clients in a given period must be multiplied by an up-selling ratio³ and the average revenue generated from the product development service per client per year. Just like before, the respective issue tree, breaking down this revenue component into its sub-drivers allowing to better follow along the subsequent paragraphs, can be found in *Figure A-3*.

The methodology to determine the number of retained clients is taken from the second revenue component outlined in the previous *Chapter 1.1.2.2*. The up-selling ratio is an assumption coming from a client interview and was set to 30% in the base case (3DWAYS 2024c). A small variable one-to-two-digit growth rate has been assumed over the forecasting period, accounting for the fact that once 3DWAYS builds some kind of track record, existing clients may more often consider the product development service on top of the manufacturing service. Lastly, the average product development revenue per client needs to be divided into the AOV per project multiplied by the average number of projects a client orders per year. As a typical product development project takes, on average, longer than a manufacturing project – approximately nine to twelve months – and the up-selling ratio already accounts for the fact that only existing

³ The share of existing clients that decides to purchase the product development service in the current period

clients that purchase the product development service in the current year are considered, the average number of projects per client per year is again assumed to be one. Furthermore, just like before, the AOV for a product development project does not significantly differ between large corporate clients and SMEs/ startups (3DWAYS 2024c).

This concludes the third, and last, revenue component, and thus, completes the overall breakdown of the incremental revenues generated through the internationalization strategy. In the next chapter, light is shed on the cost side of the profit assessment model.

1.1.3 Cost drivers

As shown in *Figure 3* the incremental costs for the expansion are calculated by adding up the personnel and marketing costs, which will now be introduced in the following subchapters.

1.1.3.1 Costs for personnel

To successfully manage the new clients gained through internationalization, 3DWAYS will need to hire project managers or outsource them on an hourly basis. The total cost for personnel is calculated by multiplying the average hourly salary per project manager by the total hours needed per year for all clients. The average salary in Germany and the UK for a project manager with a supply chain background is expected to be around €30 per hour (Stepstone 2024; Talent.com 2024). To remain financially stable, a slightly lower hourly salary of €27 per hour will be paid in the base scenario. However, a yearly growth rate of 3% until 2029 was applied as the project managers will gain more experience in managing clients and become more efficient. Moreover, the 3% should also cover potential inflation in Germany and the UK. On the other hand, the average working hours a client project needs per year is expected to be 52 hours. According to 3DWAYS, an average manufacturing project takes around 6 months to finish whereas the first month requires the most attention of the project manager. In the first month, the project manager is expected to work 32 hours. For the remaining time, usually, 4 hours per month is sufficient (3DWAYS 2024c). As the project managers gain experience in

managing 3DWAYS' clients, the average hours per client are expected to gradually decrease by 2% per year. See *Figure A-10* for the exact numbers and growth rates used.

1.1.3.2 Costs for marketing

As 3DWAYS expands, it will not only be present in the digital world but also at events. Therefore, the total marketing costs are calculated as the sum of costs incurred in events and digital marketing. First, the event costs were calculated by multiplying the number of events 3DWAYS will attend per year times the average costs per event. Due to budget and time constraints, a maximum of one event per quarter is considered realistic (3DWAYS 2024c). Moreover, the average costs per event were computed by estimating the number of days 3DWAYS would stay times the average costs per day. As most conferences in Germany and the UK last two to three days, an estimate of three days per business trip was applied (*Figure A-10*). The average costs per day include cost positions such as flight, accommodation and other costs (*Figure A-8*). These costs are then added up and divided by the number of days to receive the average cost per day. It is important to note that the cost of event marketing is less significant than the cost of digital marketing, as it only accounts for around 20% of total marketing spend. The costs for digital marketing were computed by adding up the pre-defined budgets for Google and LinkedIn Ads as well as the costs for direct outreach (*Figure A-5*). According to Xometry's latest annual report, the company spent around 20% of its total expense on marketing (Xometry 2023). However, 3DWAYS is still considered a small company and cannot afford to spend the same percentage as Xometry in the first years of their expansion. Thus, a slightly lower percentage was applied, amounting to a budget of €2,000 for Google and LinkedIn ads in the first year. The budgets will increase proportionately to the revenue. On average, 3DWAYS will spend around 10% of their total revenue on marketing. Finally, the cost of direct outreach is the sum of the annual subscription costs for LinkedIn Premium and Apollo Professional. It will use these platforms to reach out to potential customers (3DWAYS 2024c).

Based on the annual budget available for advertising, the number of leads – which will be directly linked to revenue – can be calculated. This requires defining the *Cost per Lead* (CPL) for Google and LinkedIn. The CPL indicates how much a company is paying to capture a lead who may progress further in the sales funnel (see *Figure A-6* in the appendix for the sales funnel), representing an actionable opportunity to convert the lead into a paying customer. According to Marino’s (2024) benchmark study across all industries, the average CPL via Google in the industrial and commercial industry is around €78, whereas GrowthSalad – LinkedIn Marketing Agency (2024) suggests a range between €8 to €95 per lead. As 3DWAYS enters markets in new countries, the CPL for LinkedIn ads will likely be at the higher end of this range. Once this metric is defined, the budget can be divided by the CPL to arrive at the number of leads which are then used in the incremental revenue calculations.

1.2 Output of the financial model

The following sections delve into the financial implications of 3DWAYS’ internationalization strategy by quantifying the potential outcomes based on the established model structure. It is important to emphasize that these figures are grounded on various assumptions and are subject to inherent future uncertainties. Rather than focusing on absolute values, the true strength of the financial model lies in its robust logic and ability to capture the directional trends and relationships within the analysis. This dynamic framework enables adjustments to inputs, allowing for a deeper understanding of how different variables influence the outcomes and providing a flexible tool for strategic decision-making. Nevertheless, the following subsections explain the model output of three scenarios – base, optimistic, and pessimistic.

1.2.1 Base case

A high-level breakdown of the revenue and cost side will be shown to derive the EBITDA forecast from 2025 to 2029 for the base case. The model output can be seen in *Figure A-11*.

1.2.1.1 Revenue output

Starting with the revenue side, *Figure 4* illustrates the revenue growth over the five periods.

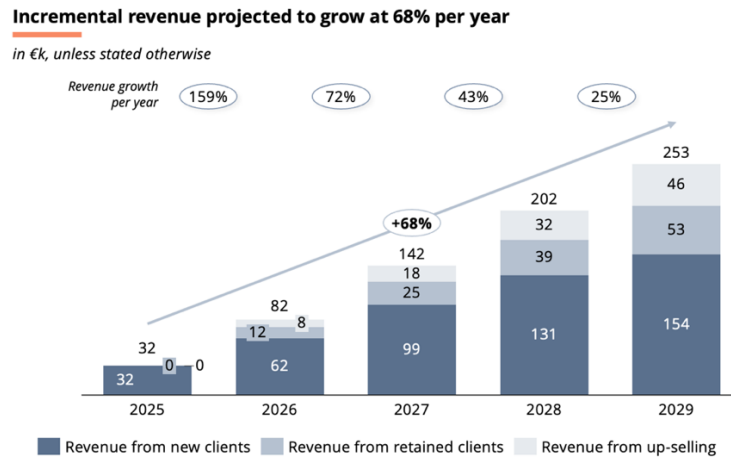


Figure 4: Revenue forecast 2025 to 2029 including growth rates

Assuming that 3DWAYS' revenue in 2025 would have been the same as in 2024 if it had not internationalized, an implied revenue growth of 23% is achieved through the internationalization strategy in 2025. However, this growth sharply increases in the subsequent period with revenues from retained clients and up-selling kicking in as well as a heightened awareness of 3DWAYS' services among potential customers further strengthening revenues over time. Over the 5 year-horizon, a CAGR of around 68% is achieved.

Recalling the breakdown of the three individual revenue components into its sub-drivers – revenues from new clients, retained clients, and up-sold clients – in the following, a deep-dive into each component is conducted. Starting with the revenues from new clients, the metric that is particularly driving the increase in revenue is the number of newly acquired customers per period. In fact, not only do the revenues generated by these new clients highly depend on that metric but also revenues from retained and up-sold clients are dependent on the number of new clients. For instance, the number of retained clients in a given period is calculated by applying a retention rate on the number of total clients from the previous period which, in turn, is the sum of new clients won in the previous period and clients retained from periods even before. The number of retained clients in turn influences the revenues from retained clients as well as

the revenues from up-sold clients since it is assumed that up-selling is only possible for existing clients. Furthermore, the average revenue made per client stays constant over time, as it is assumed that the AOV and number of projects per client per year do not change over time. This is the case for both services, manufacturing and product development and therefore has no impact on revenue growth in any of the three revenue components. Thus, the biggest lever for revenue growth is the number of new clients acquired per period.

The growth in the number of newly acquired clients from period to period is coming from assumptions made on the granular level where, e.g., degressive growth rates for the size of the partner network or the conversion rates on marketing efforts have been implemented (*see Figure A-10* for the detailed assumptions). As introduced in *Chapter 1.1.2.1*, the number of new clients is broken down into clients won through direct and indirect channels with indirect channels being sales through distribution partners, e.g., startup incubators, and direct channels being sales through outbound⁴ and inbound⁵ sales. *Figure A-12* in the appendix shows what share of the newly won customers in a given period comes from the direct and indirect channels. The biggest portion of new clients, 78% in the case of 2025, comes from the indirect channel. This does not come as a surprise since this is by far – if not almost the only – sales channel 3DWAYS is currently using as it was outlined in *Chapter 1*. Since 3DWAYS is tapping into four niche markets that are completely new to it, there is a substantial trust barrier for potential new customers. This trust barrier can partly be eliminated through the usage of distribution partners which is why one of the first crucial steps for 3DWAYS is to find suitable partners in the new markets, as it was already outlined in the implementation plan in *Chapter 4*. With increasing awareness of 3DWAYS' services among potential customers and an increasing track record, this trust barrier will likely be overcome in the long run which is why the share of direct

⁴ E.g., clients coming from direct cold-outreaches via LinkedIn or e-mail and conferences

⁵ E.g., clients coming from digital marketing, i.e., via Google and LinkedIn Ads, or client referrals

sales is slightly increasing over time before taking off in 2029 with an increase from 24% in 2028 to 29% in 2029. This is the point where client referrals and marketing activities in the direct-to-customer channel are becoming more efficient and overtaking the increase of newly won clients through partnerships.

While light has now been shed onto the model outputs for the first revenue component – the revenues from new clients – a quick look will now be taken into the two remaining components – the revenues from retained and up-sold clients – as well. As *Figure 4* already indicated and *Figure A-13* further illustrates, the share of total incremental revenues coming from these two revenue components is consistently increasing over time while that of the new client revenue component is decreasing, suggesting that these revenues are relatively more increasing than the revenues coming from new clients. This can mainly be explained by two levers accumulating over time. First, the number of retained clients is directly linked to the number of new clients acquired in the previous period utilizing a constant retention rate over time suggesting that the increase in revenue from retained and up-sold clients should be proportional to the increase in revenue from new clients. However, what further drives these two revenue components is the number of retained clients from the previous period. The number of retained clients in the current period is calculated by the sum of retained clients from the previous period and new clients from the previous period. This generates a multiplying effect over time, pushing the revenue growth coming from retained clients stronger than the revenue increase purely coming from newly acquired clients. Secondly, in the case of up-selling revenues, the average up-selling ratio is assumed to grow over time, as mentioned in *Chapter 1.1.2.3*, with 3DWAYS getting a more promising track record and reputation among potential customers, e.g., inducing clients to refer 3DWAYS not only for its manufacturing but also its product development service. This growth rate on a granular level further pushes the revenue growth from up-sold clients to a level higher than the revenue growth from new clients.

Having now described and interpreted the results of each revenue component, this concludes the model output analysis on the revenue side. In the next step, the cost side is being considered.

1.2.1.2 Operational expenses output

Similar to the revenues, the OPEX are growing steeply over time as outlined in Figure 5.

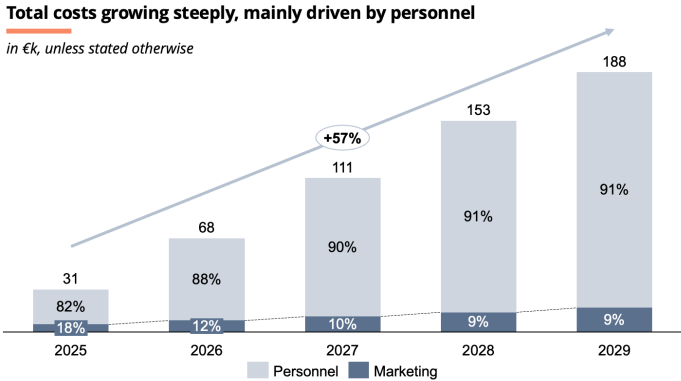


Figure 5: Total costs projected over time

In the base case, the operating expenses consisting of costs for personnel and marketing show a relatively high CAGR of 57% amounting to almost 190k in 2029. As Figure 5 indicates, the reason for this sharp growth is clearly due to the personnel costs. Drilling a bit further down, the cost of personnel is directly dependent on the number of clients 3DWAYS gains. Hence, the more clients, the higher the need for project managers. As the number of clients rises sharply from 18 in 2025 to 117 clients in 2029, the number of hours worked by project managers will increase and almost sixfold over this period. The number of clients is therefore the strongest driver for personnel costs. While in 2025 all clients can be managed with 936 working hours, by 2029 more than 5,600 working hours of project managers are needed. This means that the number of hours required grows in proportion to the number of clients. While it is expected that the average number of hours required per client will decrease slightly by 8% from 2025 to 2029 as project managers become more efficient, this reduction does not fully offset the increase in hourly wages. The hourly salary rises by 13% between 2025 and 2029 (from €27 to €30), contributing to the increase in personnel costs. Therefore, personnel expenses have a relatively high CAGR of 61.2% compared to the CAGR of total revenues of 67.8% until 2029.

On the other hand, marketing costs show a relatively slow, gradual increase over the years, with a CAGR of around 34%. This is due to the event marketing costs which remain at around €2k until 2029, thereby slowing down the cost increase. Drilling a bit further down, these €2k remain at the same level since the base case suggests that 3DWAYS attends not more than four events per year due to time and budget constraints. As the average costs per event are expected to remain the same until 2029, no increase in event marketing costs occurs. However, when looking at the cost of digital marketing, a CAGR of over 45% can be seen. As outlined in *Chapter 1.1.3*, digital marketing consists of the following two cost components: advertising budget and subscription costs. While the subscription costs for LinkedIn Premium and Apollo Professional are fixed and do not change over the years, the advertising budget shows a sharp increase until 2029. This is because the budget for Google and LinkedIn ads grows in proportion to the revenue to ensure that 3DWAYS invests approximately 10% of its revenue in advertising. In summary, while event marketing costs remain stable due to fixed constraints, the sharp rise in advertising budgets drives the overall increase in digital marketing costs.

1.2.1.3 EBITDA output

Having now examined the model’s output on the revenue and cost sides, *Figure 6* provides an overview of the EBITDA projections showcasing a sharp increase over the forecast period.

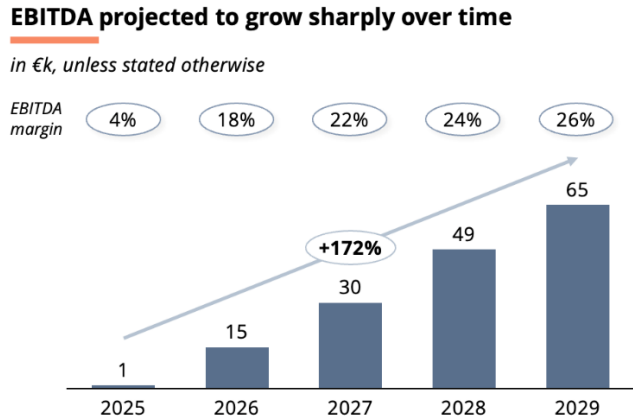


Figure 6: EBITDA forecast in the base case

While in the first year, the break-even point is reached with a 4% EBITDA margin, the second

year already puts out €15k in profits yielding an 18% EBITDA margin in the base case scenario. By the end of the forecast period, a cumulative undiscounted EBITDA of €161k will be generated through the internationalization efforts. Moreover, the P&L waterfalls in *Figure A-17* and *Figure A-18* show that 3DWAYS will achieve a contribution margin of 22% in the first year of its expansion which will increase to up to 33% by 2029. The increase of 11 percentage points is mainly due to proportionally faster growing sales compared to variable OPEX. These variable costs are personnel costs. Although in practice personnel costs are usually fixed costs, in the case of 3DWAYS the project managers are employed on an hourly basis and are therefore not employees on a fixed but rather variable salary. More significantly, 3DWAYS' core EBITDA margin is expected to increase from only 4% in 2025 to 26% in 2029 as the fixed costs (marketing costs) grow slower than its revenue. This means that 3DWAYS will be able to cover its fixed and variable costs already in 2025 in the base case.

Finally, looking at the approximated NPV in *Figure A-11*, it is at around €110k fulfilling the basic requirement of being above zero and hence recommending to progress with the internationalization.

1.2.2 Optimistic and pessimistic case

The scenario analysis is introduced as a hypothetical model to check how sensitive the financial forecast is to internal and external changes. It must be stated that the optimistic and pessimistic cases are two extreme points since it is highly unlikely that all assumptions appreciate or depreciate at the same time. To be more specific, the scenario premium/discount is set to plus or minus ten percent compared to the base case. *Figure A-16* compares the EBITDA forecast of the three scenarios and shows huge upside potential in the optimistic case, however, negative profits in the pessimistic case. Although absolute profits get increasingly negative over time in the pessimistic case, starting from €-8k in 2025 and leading up to €-19k in 2029, the EBITDA margin becomes less negative, thus showing an overall positive trend in the long run. Also, the

NPV varies drastically, showing around €386k in the optimistic case and around €-53k in the pessimistic case, meaning that in the latter case, the project would not be recommended.

Drilling down a little further, the overall picture does not change much in terms of patterns on the revenue side. In both cases – pessimistic and optimistic – revenues from new clients still make up the highest share of total revenues and are decreasing over time while the revenue shares of the revenues from retained and up-sold clients are consistently increasing. In the first year, the incremental revenue generated from the internationalization efforts amounts to €20k in the pessimistic case and €49k in the optimistic case constituting an increase of 14.6% and 35.8% respectively, compared to the average of the 2023 and 2024 revenues. For comparison, in the base case, it grew by 23.1%. In terms of amplitude, the revenues vary a lot with the three different scenarios, as seen in *Figure A-11*.

Looking at the cost side, the operating expenses across all scenarios behave relatively similar without showing large swings like the EBITDA and revenues (*Figure A-15*). This is because the marketing costs – especially the costs for digital marketing – grow proportionately to the revenue while the cost for event marketing does not change at all. In addition, personnel costs show a similar, albeit slightly lower, CAGR compared to total revenues. The only notable change in the graph (*Figure A-15*) is the steeper decline in OPEX in the pessimistic scenario between 2027 and 2029, reflecting the disproportionate reduction in personnel costs as fewer project managers are required due to the lower number of clients.

1.3 Sensitivity analysis

To further test the robustness and sensitivity of the model, sensitivity analyses were performed to show how changes in key variables affect the model output. For the output variable, the approximated NPV (see introduction to *Chapter 1*), being the discounted sum of EBITDAs, was chosen. For the input variables, a set of revenue and cost drivers, that were deemed most important, were chosen. In the following subsections, five sensitivity analyses are described.

1.3.1.1 Average order value

The sensitivity of the model to changes in AOV for manufacturing services was analyzed first, as it is a key revenue driver alongside the number of clients. The AOV varied by 80% to 120% of the baseline volume, being €17,719. The output, which can be found in *Figure 7*, shows that overall, a change in AOV entails an overproportioned change in NPV, e.g., a 20% increased AOV brings a 78% increase in NPV indicating high sensitivity of AOV. Furthermore, it must be noted that a 20% reduction of the AOV also entails a 78% increase in NPV. The reason for this inverse relation is the degressive pricing model, which states that for lower AOVs a higher commission rate is implemented. Since the pricing model states that the commission is 15% up to an AOV of €15,000 and 10% from AOVs between €15,000 and €30,000, this means that a 20% reduction in the base AOV will fall into the 15% commission bucket and therefore will increase the NPV. Overall, it can be stated that the model is highly sensitive to changes in AOV, which is why it is recommended to examine both AOVs as well as the degressive pricing model and its thresholds on a regular (e.g., yearly) basis.

	NPV	110,162	Var in %
	14,175	195,878	78%
Average	15,947	67,303	-39%
order	17,719	110,162	0%
value	19,490	153,020	39%
	21,262	195,878	78%

Figure 7: Sensitivity analysis for AOV manufacturing

1.3.1.2 Number of partners and new clients per partner per year

Furthermore, the indirect distribution channel, mainly driven by the number of partners and new clients per partner per year, was tested. In this case, a two-dimensional table was created with variances of plus or minus two for both variables. Looking at *Figure 8*, especially on the percentage changes of the NPVs, the number of clients brought in per partner per year has a higher impact than the number of partnerships (*ceteris paribus*).

NPVs in €						Percentage change old vs. New NPV, in %							
		Clients per partner							Clients per partner				
		0	1	2	3	4			0	1	2	3	4
# Partners	5	-7,137	35,641	76,991	119,549	162,522	-106%	-68%	-30%	9%	48%		
	6	-7,137	42,961	92,386	144,941	194,168	-106%	-61%	-16%	32%	76%		
	7	-7,137	52,248	110,162	169,647	228,618	-106%	-53%	0%	54%	108%		
	8	-7,137	61,562	127,816	194,168	260,609	-106%	-44%	16%	76%	137%		
	9	-7,137	67,482	144,941	218,088	296,851	-106%	-39%	32%	98%	169%		

Figure 8: Sensitivity analysis for number of partners and clients per partner

This is illustrated by the fact that, e.g., an increase of one client per partner per year increases the NPV by 54%, whereas an increase of one partner per year increases the NPV by only 16%, as the number of partnerships in the base case is already quite high. This indicates that 3DWAYS should optimize clients per partner per year rather than maximize the number of partnerships, once a certain number of partnerships has been established.

1.3.1.3 Retention

The retention rate as input variable was tested in a sensitivity analysis using increments of plus or minus five percentage points. Figure 9 shows that the model is slightly more sensitive to increasing retention rates than to decreasing them, as a ten-percentage point increase entails a 21% increase in NPV, while a decreasing retention in the same manner brings around the same decrease in NPV of 20%. Overall, changes in retention have a high impact on the model output.

	NPV	110,162	Var in %
Retention	30%	88,651	-20%
	35%	99,509	-10%
	40%	110,162	0%
	45%	120,888	10%
	50%	132,757	21%

Figure 9: Sensitivity analysis for retention

1.3.1.4 Upselling ratio and average order volume product development

The next analysis examines the sensitivity of the up-selling ratio and the AOV of the product development service line to the NPV. While the up-selling ratio varied in increments of plus or minus 5 percentage points, a range of 80% to 120% of the baseline AOV was chosen.

NPVs in €						Percentage change old vs. New NPV, in %							
		Average order value product development							Average order value product development				
		2,916	3,280	3,645	4,009	4,374			2,916	3,280	3,645	4,009	4,374
Upselling ratio	20%	77,422	82,099	86,776	91,453	96,130	-30%	-25%	-21%	-17%	-13%		
	25%	86,776	92,623	98,469	104,315	110,162	-21%	-16%	-11%	-5%	0%		
	30%	96,130	103,146	110,162	117,177	124,193	-13%	-6%	0%	6%	13%		
	35%	105,485	113,669	121,854	130,039	138,224	-4%	3%	11%	18%	25%		
	40%	114,839	124,193	133,547	142,901	152,255	4%	13%	21%	30%	38%		

Figure 10: Sensitivity analysis for upselling ratio and AOV product development

Figure 10 shows that both higher upselling ratios and higher AOVs logically lead to higher NPVs. Thus, the NPV varies between -30% and 38%, suggesting a stronger upside if the upselling ratio and the AOV for product development can be increased.

1.3.1.5 Average hours needed per client and hourly rate per project manager

The final sensitivity analysis was performed on the average project management hours needed per client and the hourly rate of a project manager in 2025. In this regard, increments of plus or minus two for both variables were chosen. Figure 11 shows the absolute NPVs for changes in both variables, as well as the change in percentage. While 3DWAYS has little control over the project manager's hourly rate, the average number of project management hours required per client appears to be a promising lever, as a reduction of e.g. two hours per client results in a 12% increase in NPV. To achieve this, automation through AI tools can be explored.

<u>NPVs in €</u>		<u>Hourly Rate Project Manager</u>				
	110,162	23	25	27	29	31
Avg. hours needed / client	48	184,514	160,721	136,928	113,136	89,343
	50	173,113	148,329	123,545	98,761	73,977
	52	161,712	135,937	110,162	84,386	58,611
	54	150,312	123,545	96,778	70,012	43,245
	56	138,911	111,153	83,395	55,637	27,879

<u>Percentage change old vs. New NPV, in %</u>		<u>Hourly Rate Project Manager</u>				
	110,162	23	25	27	29	31
Avg. hours needed / client	48	67%	46%	24%	3%	-19%
	50	57%	35%	12%	-10%	-33%
	52	47%	23%	0%	-23%	-47%
	54	36%	12%	-12%	-36%	-61%
	56	26%	1%	-24%	-49%	-75%

Figure 11: Sensitivity analysis for avg. hours needed per client and hourly rate project manager

1.4 Success and risk metrics

To ensure that the market entry proceeds as planned and achieves the best possible outcome, it is essential to track certain KPIs on a regular basis. When monitoring the following KPIs, on the one hand, the absolute value is of importance and can be benchmarked against competitors or different markets – e.g. 3DWAYS’ home market Portugal versus Germany or the UK. On the other hand, the analysis of the development of these values over the years is essential to ensure that the measures taken have the desired effect. It is therefore recommended that 3DWAYS monitors these KPIs on a year-on-year, month-on-month or quarter-on-quarter basis. The KPIs chosen for 3DWAYS to monitor are (i) average hours needed per client, (ii) various conversion rates, (iii) upselling ratio, (iv) retention rate and (v) marketing and sales cost per project/client and can be found in Table A-1 of the appendix including some further KPIs that

may be helpful. These variables⁶ have either shown to have a high impact on the NPV in the aforementioned sensitivity tables or indicate overall efficiency and are hence considered.

Firstly, it is crucial to monitor *(i)* the average number of hours required per client, as the marginal change in this variable indicates whether efficiency in day-to-day operations has increased. As indicated in the financial model, 3DWAYS' cost structure is largely influenced by its variable cost being personnel (i.e. project managers) and comprising nearly 80% of the total OPEX. This underlines the importance of achieving efficiency gains in the handling of projects as this entails an overproportioned increase in profitability, and hence NPV. To additionally evaluate operational efficiency the KPI EBITDA per FTE⁷ can be analyzed.

Secondly, *(ii)* various conversion rates are recommended to be measured regularly, to ensure marketing efficiency. Especially in 3DWAYS' situation, where financial resources are particularly scarce, investments in various marketing channels must be closely evaluated to avoid spending money on channels that do not show adequate returns. Another KPI that could be tracked in this regard – especially in digital marketing – is the *Return on Ad Spent (ROAS)*, which shows the return 3DWAYS gets on its marketing investments, i.e. marketing budget.

Moreover, *(iii)* upselling to the product development service line is a critical revenue driver, accounting for approximately 10% of the incremental revenue projected for 2026 which is growing to 18% in 2029 in the base case implying a CAGR of 79% – a substantially stronger growth than the two other revenue drivers⁸ exhibit. Furthermore, it has a substantial impact on the NPV, as highlighted in the sensitivity analysis. Given its significant contribution to overall financial performance, the success of the internationalization project depends partly on the effectiveness of upselling efforts. Therefore, the upselling ratio should be monitored

⁶ These KPIs are not exhaustive but highlight key priorities; tracking others may also be valuable.

⁷ At the moment, it is assumed, that FTE are outsourced on an hourly basis so are not hired by 3DWAYS

⁸ Revenues from newly acquired clients: CAGR of 48%; revenues from retained clients: CAGR of 62%

consistently to ensure the project's success and maximize its financial outcomes.

Fourthly, the (iv) retention rate, similar to upselling, shows a high impact on NPV and therefore should be tracked. As mentioned in *Chapter 1*, the strategic shift towards the manufacturing service was mainly influenced by a higher expected CLV due to the relational nature of this business. Since this rationale mainly hinges on high retention rates, this KPI is recommended to be monitored and analyzed closely. Additionally, it is suggested that client and partner satisfaction, which can be measured by the *Net Promoter Score* (NPS) as well as through regular interviews, is analyzed, since satisfaction is assumed to be a significant driver of retention.

The last proposed KPI, (v) marketing and sales cost per project/client can be used as a proxy of the customer acquisition cost, when applied to newly won projects/clients, to understand how much marketing and sales effort on average must be given to winning one client. This – especially connected with the AOV and retention rate – can provide an input-output relation of marketing and sales activities and therefore valuable insights for future adaptations. All the above-mentioned KPIs, a description, and their calculation can be found in *Table A-1*.

Additionally, firm risk should be evaluated regularly. Especially, in 3DWAYS' case with high leverage and a slim cash reserve on the balance sheet, solvency risk (long-term) and liquidity risk (short-term) but also revenue concentration risk should be evaluated. To monitor 3DWAYS' risk on a regular basis, further proposed metrics can be found in *Table A-2*.

1.5 Financial potential

To finalize *Chapter 1*, the financial impact for 3DWAYS in the first projected year (2025) is illustrated. Therefore, the most recent available EBITDA figure (2023) was taken and assumed to be steady until 2025. The three scenarios – optimistic, base and pessimistic – and the projected EBITDA in 2025 were then constructed as a range of max (optimistic) and min (pessimistic). With a stable home market EBITDA, *Figure 12* shows that internationalization to Germany and the UK is projected to bring 3DWAYS an additional EBITDA of €1k to €17k

in the base and optimistic case, but also decrease the EBITDA by around €-8k in the pessimistic case. This would mean, that while in the base case, EBITDA would stay approximately the same (i.e., internationalization is a zero-sum game for 3DWAYS in 2025), in the optimistic case 3DWAYS would see a 36% increase, but also a 17% decrease in the pessimistic case.

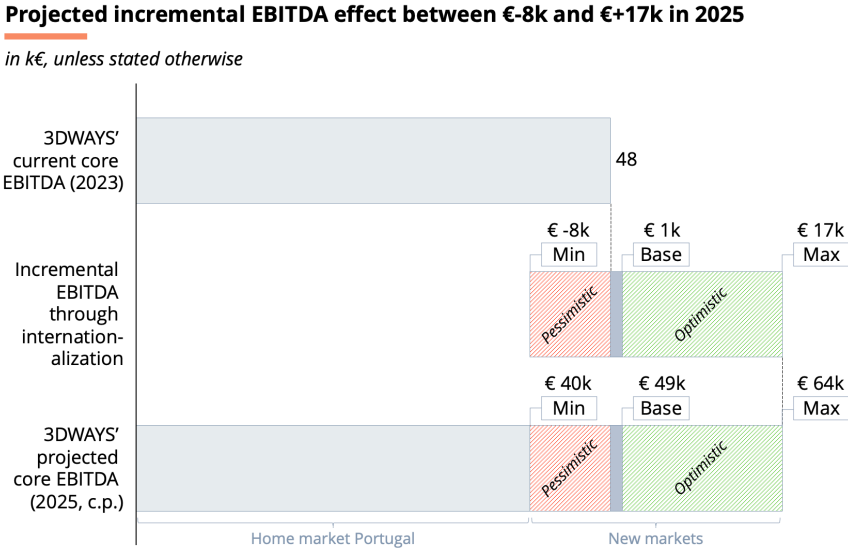


Figure 12: Projected EBITDA impact in 2025

In 3DWAYS' situation, further considerations should be made concerning the risk-reward relation. As shown in *Figure 12*, a hypothetical 10% discount on all input variables results in a negative EBITDA effect, and given 3DWAYS' constrained financial situation, the risk of falling into the unprofitable zone must be outweighed by the reward of future profits. Levers that 3DWAYS can pull to reduce this risk are, for example, reducing marketing costs by cutting the budget for both digital marketing and event marketing, as these are the costs that do not scale with revenue growth (i.e. fixed costs). However, 3DWAYS should be aware, that due to the revenue-cost linkage in the financial model – meaning that the marketing budget shows impacts on the revenue side due to assumed CPLs, leads and conversion rates – reducing the marketing budget does not automatically make 3DWAYS more profitable. However, as the model is built dynamically, it can easily be used to simulate different situations and their respective outcomes. Since financing (e.g., balance sheet and cash flow forecast) was not within the scope of this project, it is recommended that 3DWAYS performs these considerations.

2. CONCLUSION – GROUP PART

This thesis raised two guiding questions – *"Where to play?"* and *"How to win?"* – in the context of 3DWAYS' ambition to expand into the European sustainable manufacturing market. Through a structured analysis presented in five project phases, a comprehensive internationalization strategy has been developed. This has been achieved by, first, properly segmenting the sustainable manufacturing market, second, targeting the most promising market niches through ranking models and in-depth niche market analyses, and third, by choosing a suitable entry mode combined with a positioning and marketing strategy that differentiates 3DWAYS from its direct competitors and raises awareness among potential customers in the target markets.

The inside-out analysis highlighted 3DWAYS' core strengths in helping startups and large companies identify optimal manufacturing solutions, secure competitive prices, and achieve sustainability goals. Transitioning to an assetless model enhances flexibility and efficiency but increases reliance on partners. With a 29% EBITDA margin, the company demonstrates profitability, however still financially constrained due to high financial leverage and slim cash reserves. Furthermore, its concentrated customer base underscores the need for diversification. Additional challenges are the trust barrier faced by clients and the inflexible 10% commission. The outside-in analysis identified favorable macroeconomic conditions for international expansion into the sustainable manufacturing market, with strong growth in Europe in industries such as healthcare, electronics, and consumer goods aligning with 3DWAYS' expertise. However, challenges like geopolitical risks and stricter regulations require proactive management. The outside-in analysis was concluded with the segmentation of the sustainable manufacturing market using three segmentation criteria, (i) country, (ii) industry vertical and (iii) company size and complexity.

The targeting process identified the most attractive market niches by leveraging qualitative and

quantitative attractiveness scoring models for industries, countries, and a combination of them. This resulted in targeting the medical technology and smart home niche in both Germany and the UK with a focus on large corporates and SMEs/startups with complex supply chains.

The go-to-market strategy centers on building credibility through partnerships, leveraging networks for client acquisition, and adopting tailored entry modes and marketing tactics to meet the specific needs of each market. These steps, paired with a refined positioning strategy, are designed to overcome trust barriers, ensure alignment with the overall business strategy, and differentiate 3DWAYS from competitors. Moreover, a robust risk management framework addresses the dependencies of the assetless model.

Finally, financial projections highlighted the attractiveness of the proposed strategy, forecasting profitability from year one, with robustness being tested using scenario and sensitivity analysis.

While the strategy and methodology are believed to be robust, this thesis also shows some limitations. Firstly, the chosen approach relied primarily on secondary data, limiting the precision of insights. Conducting primary research, such as interviews with potential clients and suppliers, would enhance the depth of the analysis. Additionally, the financial decision-making process for funding the expansion was not covered, leaving a critical aspect of strategic planning for future action. Finally, the implementation and monitoring phases were beyond the scope of this work, necessitating further efforts to validate and refine the proposed roadmap.

In conclusion, the strategy provides clear answers to "*Where to play?*" and "*How to win?*". By targeting specific niches in Germany and the UK, leveraging its assetless model, and implementing a structured roadmap, 3DWAYS is well-positioned for sustainable growth. With further validation and execution, 3DWAYS can successfully tackle these niches and strengthen its position as a reliable partner in sustainable manufacturing and supply chain solutions.

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1.3.1.4	<i>Upselling ratio and average order volume product development.....</i>	<i>25</i>
1.3.1.5	<i>Average hours needed per client and hourly rate per project manager</i>	<i>26</i>
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Appendix B. List of Abbreviations

AOV*Average Order Value*

CPL..... *Cost per Lead*

GTM*Go-To-Market*

NPS.....*Net Promoter Score*

NPV*Net Present Value*

SCM*Supply Chain Management*

Appendix C. Issue trees for revenue breakdown

Breakdown of incremental revenues from new clients into its sub-revenue drivers

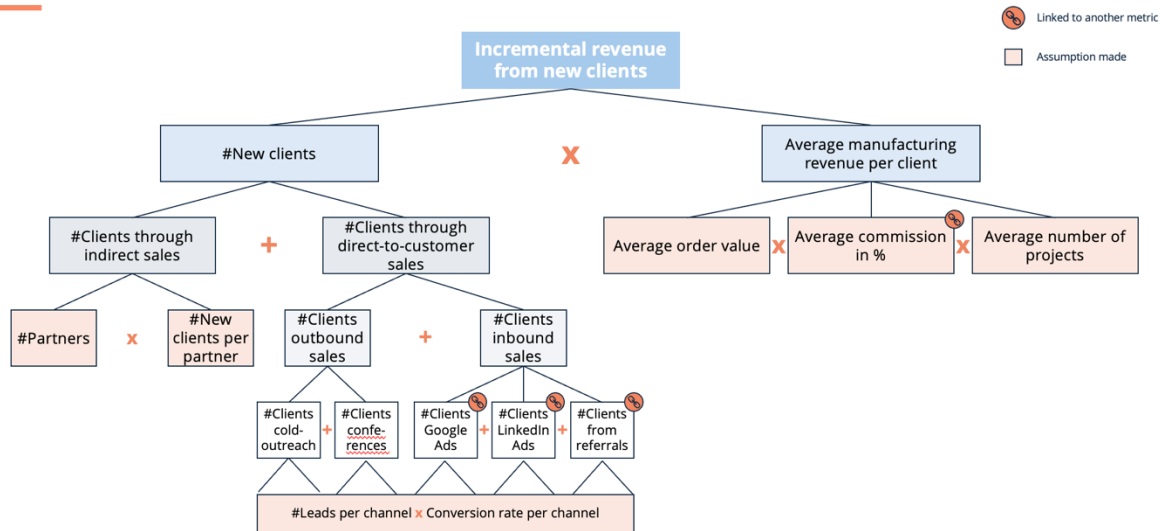


Figure A-1: Issue tree incremental revenue from new clients

Breakdown of incremental revenues from retained clients into its sub-revenue drivers

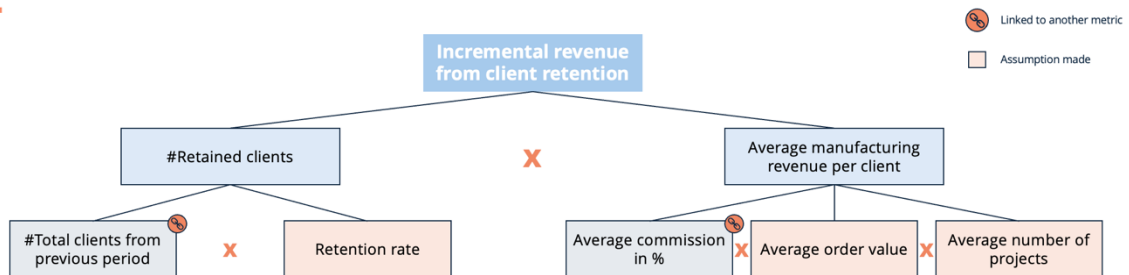


Figure A-2: Issue tree incremental revenue from retained clients

Breakdown of incremental revenues from up-selling into its sub-revenue drivers

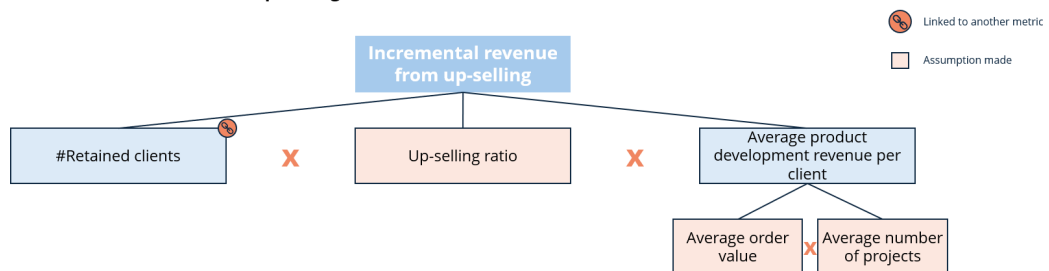


Figure A-3: Issue tree incremental revenue from up-sold clients

Appendix D. Issue trees for cost breakdown

Split up of incremental costs for personnel

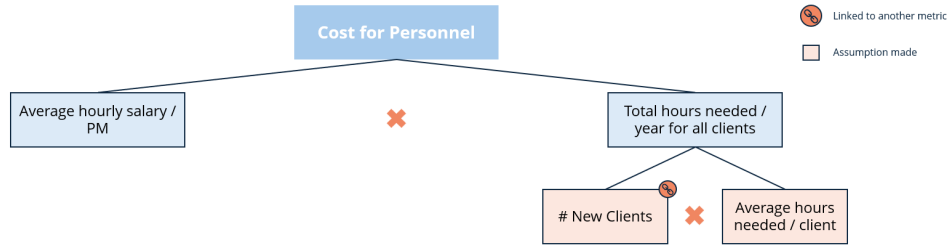


Figure A-4: Issue tree for breakdown of costs for personnel

Split up of incremental marketing costs

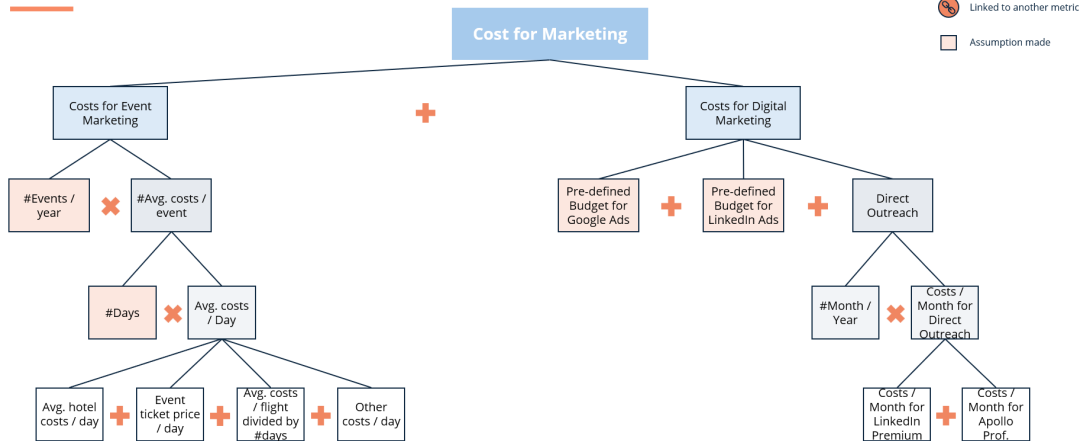


Figure A-5: Issue tree for breakdown of costs for marketing

Appendix E. Sales/marketing funnel

Sales/conversion funnel including word definitions

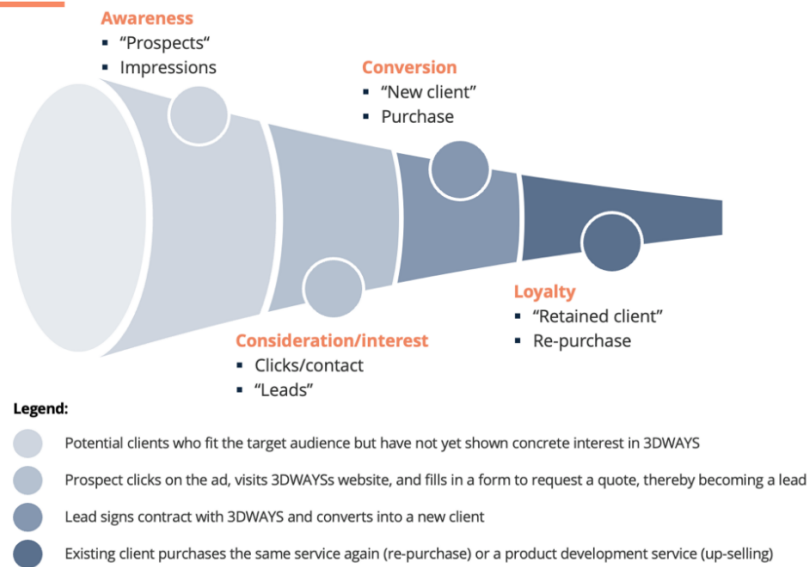


Figure A-6: Sales/marketing funnel

Appendix F. Assumptions for financial forecast model

Assumptions for the revenue side of the financial forecast model

Metric	Description	Source
Number of new partners	Number of new distribution partnerships established in the target markets, e.g., with startup incubators	Comparison to total partners
Clients per partner	Number of clients one partner brings 3DWAYS on average per year	Client interview
Number of direct cold-outreaches	Number of direct cold-outreaches via LinkedIn, e-mail, or coldcalling, e.g., using Apollo.io	Client interview
Response ratio of direct cold-outreaches	Share of outreached companies responding to the cold-outreach	Client interview
Conversion rate of direct cold-outreaches	Share of companies who responded to the cold-outreach and subsequently became actual customers	Client interview
Number of conferences visited per year	Number of events such as conferences visited by 3DWAYS to connect to potential partners and clients	Client interview
Number of conversations per conference	Number of companies 3DWAYS is able to seriously talk to about a potential business opportunity	Client interview
Conversion ratio of conferences	Share of companies 3DWAYS talked to at a conference that subsequently became actual clients	Client interview
Number of leads from Google Ads	Number of potential clients that clicked on the Google ad and subsequently contacted 3DWAYS	Linked to costs side
Conversion rate of Google Ads	Share of leads from Google Ads that subsequently became actual customers	External research
Number of leads from LinkedIn Ads	Number of potential clients that clicked on the LinkedIn ad and subsequently contacted 3DWAYS	Linked to costs side
Conversion rate LinkedIn Ads	Share of leads from Google Ads that subsequently became actual customers	External research
Referrals and references ratio	Share of existing clients that referred 3DWAYS to other potential clients in the previous period	Client interview
Conversion rate referrals and references	Share of firms that contacted 3DWAYS upon referral and subsequently became actual clients	Client interview
Average manufacturing order value	Average order value per manufacturing project	Average of past 3 years
Average manufacturing projects per client	Average number of manufacturing projects per client per year	Client interview
Customer retention rate	Share of clients from previous period that purchase the manufacturing service in the current period	Client interview
Average product development order value	Average order value per product development project	Average of past 3 years
Average up-sell ratio	Share of clients from previous period that buy product development on top of manufacturing service	Client interview
Average product development projects per client	Average number of product development projects per client per year	Client interview

Figure A-7: Revenue assumptions (based on: 3DWAYS 2024c; Marino 2024; Huber 2023)

Assumptions for the cost side of the financial forecast model

Metric	Description	Source
Average hours needed / client	Working hours needed to manage one client	Client interview
Average hourly salary / PM	Average hourly rate in Germany and the UK for a project manager with supply chain background	External research
Average hotel costs / day	Average costs for staying at a hotel / night in Germany or the UK	External research
Event ticket price / day	Price a ticket of an exposition or conference costs in Germany or the UK	External research
Average costs per flight / day	Average costs per flight from Lisbon to London / Munich divided by the number of days staying there	External research
Other costs / day	Other costs that may occur during the business trip such as food, beverages, uber, sightseeing, [...]	Estimation
#Days attending at events	Number of days staying at the event	Estimation
#Events / year	Number of event visiting in Germany or the UK	Client interview
Budget for Google Ads	Predefined budget to be used for Google Ads	Percentage of revenue
Budget for LinkedIn Ads	Predefined budget to be used for LinkedIn Ads	Percentage of revenue
Cost per Lead (Google)	Cost per person who visited 3DWAYS' website and requested a quote (scheduled a meeting)	External research
Cost per Lead (LinkedIn)	Cost per person who visited 3DWAYS' website and requested a quote (scheduled a meeting)	External research
(Fixed) Costs / Year for LinkedIn Premium	Fixed monthly subscription rate for using LinkedIn Premium	External research
(Fixed) Costs / Year for Apollo Professional	Fixed monthly subscription rate for using Apollo Professional	External research

Figure A-8: Cost assumptions (based on: 3DWAYS 2024c; Stepstone 2024; Talent.com 2024; BetterTravel 2024; Budget Your Trip 2024; TAP 2024; Marino 2024; LinkedIn 2024; Apollo 2024b)

Appendix G. Base case assumptions incl. rationales

Revenue Side						
Incremental revenue from new clients						
Number of partnerships	7.0	9.1	10.9	12.0	12.6	Compared to the current 50+ partnerships
Growth rate	30%	20%	10%	5%		Degrressive because no unlimited number of suitable partners
Clients per partnerships	2.0	3.0	3.9	4.7	4.9	As stated by 3DWAYS: Around 1-3 clients in first year
Growth rate	50%	30%	20%	5%		As stated by 3DWAYS: Afterwards growing to 3-5
#Direct cold-outreaches	1000	1000	1000	1000	1000	Around 20 outreaches per week doable without hiring salesperson
#Response ratio cold-outreaches	1.5%	2.3%	2.7%	3.0%	3.1%	Based on 3DWAYS experience with Apollo.io around 1-2%
Growth rate	50%	20%	10%	5%		Strong learning curve; better tailoring messages to the prospect
Conversion rate direct cold-outreach	8.0%	9.6%	11.5%	12.7%	13.3%	Around 8% from the prospects who responded actually buy
Growth rate	20%	20%	10%	5%		Assuming 3DWAYS gets better in pitching its services in demo calls
#Conferences visited per year	4	4	4	4	4	Stated by 3DWAYS
#Conversations per conference	42	42	42	42	42	Stated by 3DWAYS
Conversion ratio conferences	1.0%	1.0%	1.0%	1.0%	1.0%	Stated by 3DWAYS
#Leads Google Ads	12.8	30.8	49.2	68.9	89.6	Coming from the costs side
Conversion rate Google Ads	3.4%	4.1%	4.7%	5.0%	5.1%	
Growth rate	20%	15%	5%	3%		Strong learning curve after some experience using Google Ads
#Leads LinkedIn Ads	14.3	34.3	54.9	76.8	99.8	Coming from the costs side
Conversion rate LinkedIn Ads	6.4%	7.6%	8.8%	9.2%	9.4%	
Growth rate	20%	15%	5%	3%		Strong learning curve after some experience using LinkedIn Ads
Referrals & references ratio	10.0%	13.0%	16.9%	22.0%	28.6%	Stated by 3DWAYS
Growth rate	30%	30%	30%	30%		Assuming increased customer satisfaction with recurring projects
Conversion rate referrals & references	15.0%	18.0%	20.7%	21.7%	22.3%	Stated by 3DWAYS
Growth rate	20%	15%	5%	3%		Assuming 3DWAYS gets better in pitching its services in demo calls
Average order value per project	17'719	17'719	17'719	17'719	17'719	Average manufacturing project value from last three years
Average projects per year per client	1	1	1	1	1	A newly acquired customer usually stays at one project in that same year
Incremental revenue from retained clients						
Average customer retention rate	40%	40%	40%	40%	40%	As stated by 3DWAYS around 40% of customer order again in the subsequent year
Incremental revenue from up-sold clients						
Average order value per project	3'645	3'645	3'645	3'645	3'645	Average product development project value from last three years
Average up-sell ratio	30%	32%	35%	40%	42%	Stated by 3DWAYS
Growth rate	5%	10%	15%	5%		With increased track record and customer satisfactions the up-sell ratio grows
Average projects per year per client	1	1	1	1	1	Product development projects usually take 9-12 months

Figure A-9: Numerical revenue-side assumptions and rationales

Costs Side						
Costs per Personnel						
Average hours needed per client	52.0	51.0	49.9	48.9	48.0	Stated by 3DWAYS
Growth rate	2%	2%	2%	2%		Learning curve effect due to more experience, efficiency, etc
Average hourly salary per Project Manager	27.0	27.8	28.6	29.5	30.4	Average hourly rate for supply chain PM: Approx. €30
Growth rate	3%	3%	3%	3%		Yearly salary increase due to more experience & potential inflation rate
Costs per Marketing						
Average hotel costs per day	130	130	130	130	130	€130 / day (average of Germany & UK combined) based on desk research
Event ticket price per day	10	10	10	10	10	Most events are for free with some exceptions (assumption: €10/day)
Average costs per flight divided by #days	40	40	40	40	40	Average of €120 for a flight (round trip)
Other costs per day	50	50	50	50	50	Assumption: €50 / day for food, beverages, uber, etc.
#Days attending at events	3	3	3	3	3	Assumption: 3 days-business trip
#Events per year	4	4	4	4	4	Stated by 3DWAYS
Budget for Google Ads	1'000	2'400	3'840	5'376	6'989	Based on revenue
Growth rate	140%	60%	40%	30%		Based on revenue
Budget for LinkedIn Ads	1'000	2'400	3'840	5'376	6'989	Based on revenue
Growth rate	140%	60%	40%	30%		Based on revenue
Cost per Lead (Google)	78	78	78	78	78	Based on benchmark study: €78 per lead for industrial & commercial
Cost per Lead (LinkedIn)	70	70	70	70	70	Based on LinkedIn between €8 to €95. Took higher-end as 3DWAYS is new in these markets
(Fixed) Costs per Year for LinkedIn Premium	420	420	420	420	420	Subscription per month: €35
(Fixed) Costs per Year for Apollo Professiona	948	948	948	948	948	Subscription per month: €79

Figure A-10: Numerical cost-side assumptions and rationales

Appendix H. Overall model output

Financial Forecast

in €, unless stated otherwise, incremental impact only

Starting year	2025
Choose Scenario ->	Base
Scenario discount (+/-)	10%
Approximative discount rate	10%

Revenue

	1	2	3	4	5	
	2025	2026	2027	2028	2029	CAGR
Direct	7,087	14,175	23,034	31,893	44,297	58.1%
% of revenue from new clients	22.2%	22.9%	23.2%	24.3%	28.7%	
Indirect	24,806	47,840	76,190	99,224	109,855	45.1%
% of revenue from new clients	77.8%	77.1%	76.8%	75.7%	71.3%	
Revenue from new clients	31,893	62,015	99,224	131,118	154,152	48.3%
% of revenue	100.0%	75.2%	70.0%	64.9%	60.9%	
Revenue from retained clients	-	12,403	24,806	38,981	53,156	62.4%
% of revenue	0.0%	15.0%	17.5%	19.3%	21.0%	
Revenue from up-selling	-	8,037	17,681	31,952	45,749	78.6%
% of revenue	0.0%	9.7%	12.5%	15.8%	18.1%	
Total revenue	31,893	82,455	141,711	202,050	253,057	67.8%
YoY Growth		158.5%	71.9%	42.6%	25.2%	
Implied revenue growth from 2024	23.1%					

OPEX

	2025	2026	2027	2028	2029	CAGR
Personnel						
Total cost for personnel	25,272	59,522	100,136	138,621	170,532	61.2%
% of OPEX	82.3%	87.8%	90.0%	90.7%	90.7%	
Marketing						
Event Marketing	2,070	2,070	2,070	2,070	2,070	0.0%
% of total marketing	38.1%	25.1%	18.6%	14.6%	11.9%	
Digital Marketing	3,368	6,168	9,048	12,120	15,346	46.1%
% of total marketing	61.9%	74.9%	81.4%	85.4%	88.1%	
Marketing	5,438	8,238	11,118	14,190	17,416	33.8%
% of OPEX	17.7%	12.2%	10.0%	9.3%	9.3%	
Total OPEX	30,710	67,760	111,254	152,811	187,948	57.3%
YoY Growth		120.6%	64.2%	37.4%	23.0%	
EBITDA	1,183	14,695	30,457	49,240	65,109	172.3%
EBITDA margin	3.7%	17.8%	21.5%	24.4%	25.7%	
Cummulative undiscounted EBITDA	1,183	15,878	46,335	95,574	160,683	
NPV	110,162					

Figure A-11: Output of financial model, base case

Appendix I. Base case model outputs

Large proportion of revenue from new clients comes from indirect channel

in €k, unless stated otherwise

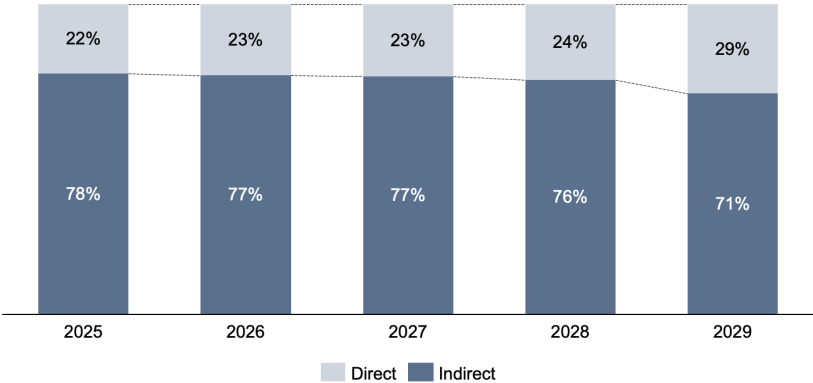


Figure A-12: Channel mix of revenue from new clients

Revenues from retained and up-sold clients gain more importance over time

in €k, unless stated otherwise

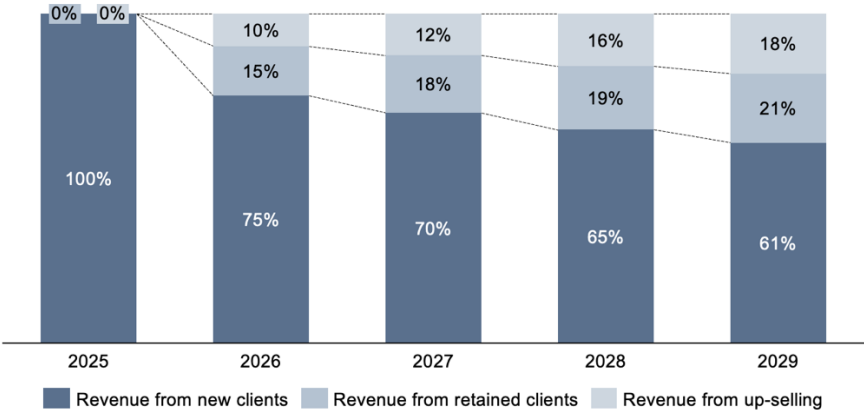


Figure A-13: Revenue streams

Appendix J. Model output across all three scenarios

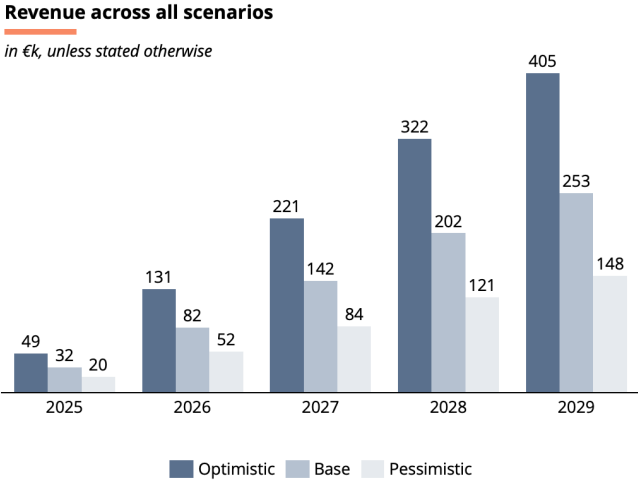


Figure A-14: Revenue across all scenarios

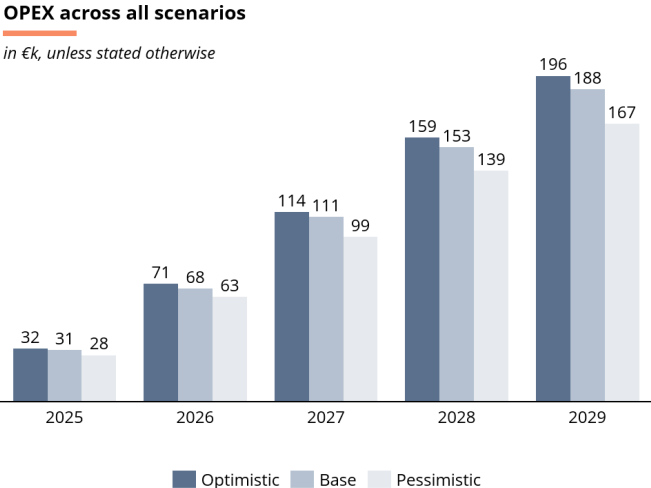


Figure A-15: OPEX across all scenarios

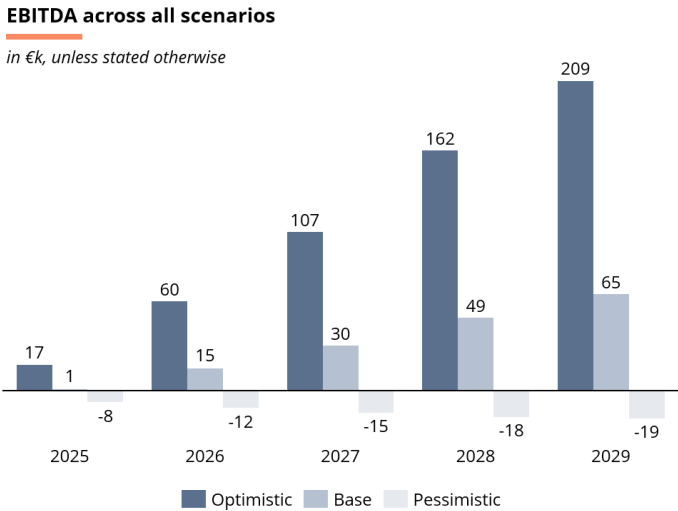


Figure A-16: EBITDA across all scenarios

Appendix K. Incremental P&L waterfalls – 2025 and 2029

Incremental profit & loss waterfall for 2025 – base case (in k€)

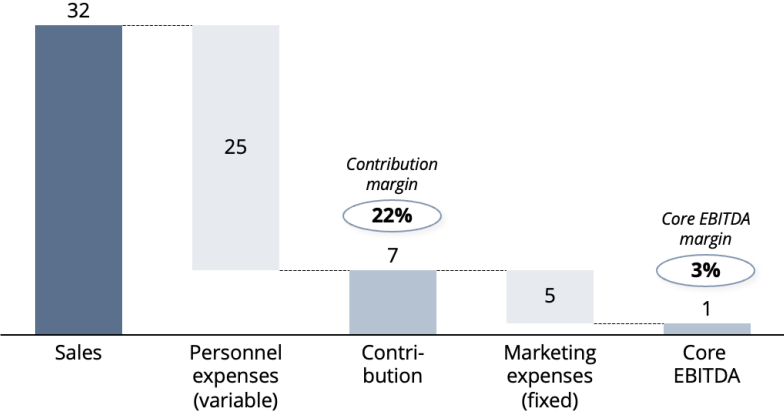


Figure A-17: Incremental P&L waterfall 2025 – base case

Incremental profit & loss waterfall for 2029 – base case (in k€)

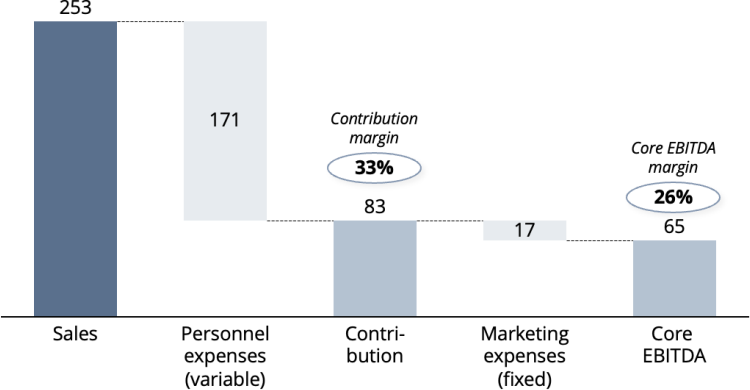


Figure A-18: Incremental P&L waterfall 2029 – base case

Appendix L. Success and risk metrics

KPIs to track progress and success of the proposed strategies

KPI	Description	Calculation
Average hours needed per client	Average hours needed to manage and complete a project	Total #hours / Total #clients
EBITDA per Full-Time Equivalent	Profit generated per project manager in terms of FTE	EBITDA / FTE
Conversion rates direct cold-outreaches	Conversion rate of prospects who answered to first outreach/contacted 3DWAYS	#New clients from cold-outreach / #Interested clients
Conversion rates Google Ads	Conversion rate of prospects who clicked on the Google ad/contacted 3DWAYS	#New clients from Google ads / #Interested clients
Conversion rates LinkedIn Ads	Conversion rate of prospects who clicked on the LinkedIn ad/contacted 3DWAYS	#New clients from LinkedIn ads / #Interested clients
Return on Ad Spent (RoAS)	Return generated from marketing investments (marketing budget)	(Revenue dig. marketing / Investments dig. Marketing) -1
Up-selling ratio	Share of clients who additionally purchase the product development service	#Existing clients buying product development service / #Total clients previous period
Retention rate	Share of clients who bring in another project within one year from last purchase	#Existing clients buying manufacturing service again / #Total clients previous period
Net Promoter Score (NPS)	Measures the customer loyalty using a single question survey	% Promoter (rating 9-10) - % detractor (rating 0-6)
Marketing & sales costs per client/project	Used as a proxy for customer acquisition costs in the case of newly won clients	Total marketing expenses / #clients or #projects

Table A-1: Success metrics

Metrics to track 3DWAYS' risk

Risk metric	Description	Calculation
Solvency risk – whether the firm has a sustainable amount of leverage to finance its activity		
Leverage ratio	How much net debt (debt minus excess cash) a firm has compared to its equity	Net debt / Equity
Net debt to EBITDA ratio	Measures how many years with stable EBITDA it would take to pay back net debt (debts minus excess cash)	Net debt / EBITDA
Solvency ratio	Indicates the firm's ability to meet its obligations using the capital that has been invested or generated by the firm; banks mostly are willing to give out loans for companies with ratios above 0.5	Equity / Liabilities
Liquidity risk – whether or not the firm has enough cash flow to meet its short term obligations		
Current ratio	Shows if a firm can cover all its current liabilities, if being able to sell all its current assets; ideally higher than 1	Current assets / current liabilities
Cash ratio	How much of a firm's current liabilities, its cash on the balance sheet can cover	Cash / current liabilities
Concentration risk – whether the firm is dependent on a small number of clients		
Dependency ratio	Shows how much a firm is dependent on its largest clients	Revenue of largest clients / total revenue
Pareto principle	20% of total clients should bring in 80% of total revenue. This relation should be monitored over time	1) Rank clients by revenue contribution 2) Calculate cumulative revenue and client percentages 3) Look for approx. 20% of clients and read cum. Revenue (%)

Table A-2: Risk metrics