

First Updates to the New Theoretical Framework of Technology Start-up Lifecycle Stages⁴¹

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Synopsis

As a result of previous research and the outlined theoretical framework, the concept needs to be further developed, validated, and modified by further research. The technology start-up lifecycle is an area that is currently not well-defined. Thanks to further research, this theoretical framework can be developed to a more detailed classification of the stages and their more complex characteristics. Through a collaboration with several technology start-ups and based on qualitative interviews, we collect relevant data referring to the technology start-up lifecycle. As a result of feedback, we are able to test and develop the theoretical framework, as well as identify other possible directions or approaches. This framework is needed in the next step of research aimed at marketing strategies at a specific stage of the lifecycle of a technology start-up. The outcome of this research is to provide updates to the characteristics of each phase and to suggest directions for further research in this area.

Key words:

Technology start-up, start-up lifecycle, start-up funding, start-up stages, start-up development

JEL Classification: M13, O32

Introduction

The world of start-ups is an extremely turbulent, dynamic environment with a high level of risk. This risk is balanced by the potential interest of investors and possible appreciation in the future. Valuation is of interest to both the founders of start-ups, and investors or other stakeholders involved in the start-up during its lifecycle. The Czech start-up environment is very innovative, with a high level of involvement of external institutions, such as JIC in Brno, CzechInvest and others. To increase potential benefits of these entities and increase efficiency in the start-up environment in general, it is necessary to explore further this area and look for possible principles and approaches to achieve a successful journey through the technology start-up lifecycle. Marketing strategy is perceived by us as a key area in the operation of a start-up in the global market where, despite a very innovative solution, product, and service, a technology start-up may not find its potential customer. At a given stage, such a start-up may be focused on areas that are not relevant, have a problem with business activities, etc. When defining a start-up, we encounter the opinion that a start-up is not precisely definable and thus its lifecycle is perceived differently not only by professionals but also by others. When developing its market strategy, a technology start-up should be aware of its stage in the lifecycle, primary focus areas and its business and marketing strategy. We assume that based on the lifecycle, it is possible to monitor the optimal approach at a given stage to the marketing strategy when using

⁴¹ FP-J-21-7189 Marketing strategy of Czech and Slovak technology start-ups in individual stages of the start-up lifecycle, Junior Specific Research Project 2021

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traditional and digital communication channels, when defining the target group of potential customers, level of relevance of KPIs, and others. According to Nikofořovova (2018), marketing activities that support the start-up activities should be carried out in relation to their lifecycle stages.

To be able to monitor and explore these areas, we must first define the lifecycle of a technology start-up. Based on previous secondary research in this area, we obtained the theoretical framework of the technology start-up lifecycle, definition of the individual stages and their comprehensive characteristics (Ulč & Mandel, 2021). This theoretical framework needs to be closely developed, validated and modified in order to create a sound base on which the above marketing strategy research can be developed. Answers and feedback from practice will be most helpful to understand the perspective of technology start-ups on the given issue and to collect relevant data. The research findings will be used as a possible support for technology start-ups by means of business and scientific incubators, business support agencies, marketing specialists and consultants in the field of technology start-ups and marketing strategies and for internal use of knowledge by technology start-ups.

1 Methodology

Research involves an update of the theoretical framework of the technology start-up lifecycle, the characteristics of the individual stages and the graphical representation from previous secondary research based on qualitative research. The method of semi-structured qualitative interviews with several Czech technology start-ups is used to collect the required data. These start-ups designate themselves as technology start-ups. They are situated at a particular stage of their lifecycle. The questions in the semi-structured interview are based on the results of previous research on the theoretical framework. They were validated by pre-pilot research with one selected technology start-up active in the global market. Based on the results of the pre-pilot research, the questions were modified and further used in the interviews with several Czech technology start-ups. These start-ups are scaled on software development, AI and machine learning technologies, high-tech scientific devices, SAAS, SASE and more. The questions were divided into several areas according to previous research. The monitored technology start-ups are exclusively in the Seed / Launch and Growing / Scaling stages. As a result, much of the data collected is primarily focused on the first 3 stages of the theoretical framework.

The interviews were recorded and subsequently transcribed. This data was analysed and evaluated by comparison and critical appraisal by the authors of the paper. The qualitative evaluation of the data is limited by the subjective assessment of the authors of this research. Based on research, the theoretical framework of the technology start-up lifecycle, the characteristics of the stages and the graphical representation can be updated, extended or modified. The aim is to test the theoretical basis, different stages of the technology start-up lifecycle and their characteristics for further research. This theoretical framework is critical for future research on the marketing strategy of a technology start-up depending on the specific stage of its lifecycle.

2 Results and Discussion

The comprehensive lifecycle theoretical framework outlined in previous research is unique in its own way. The authors primarily focus on one specific area when dividing the

lifecycle. Examples include the division from the investment perspective (Marcus et al., 2013; Bocken, 2015; Salamzadeh & Kawamorita Kesim, 2015; Tripathi et al., 2019), from the customer perspective (Blank & Dorf, 2012; Moore, 2014), from the product validation and development perspective (Crowne, 2002; Blank & Dorf, 2012) and others, whereas the division and name of each stage remains ambiguous. First and foremost, an effort was made to develop a comprehensive theoretical framework and define the different stages. Based on research, the lifecycle is divided into 5 stages – Pre-seed / Idea, Seed / Launch, Growing / Scaling, Maturity, Exit / IPO / Acquisition. These stages are defined according to 8 areas – Funding, Product, Type of Customer, Customer Development, Risk, Business plan / model, Main Focus and Notables, as illustrated Table 1.

Table 1 Characteristics of technology start-up lifecycle stages of first research

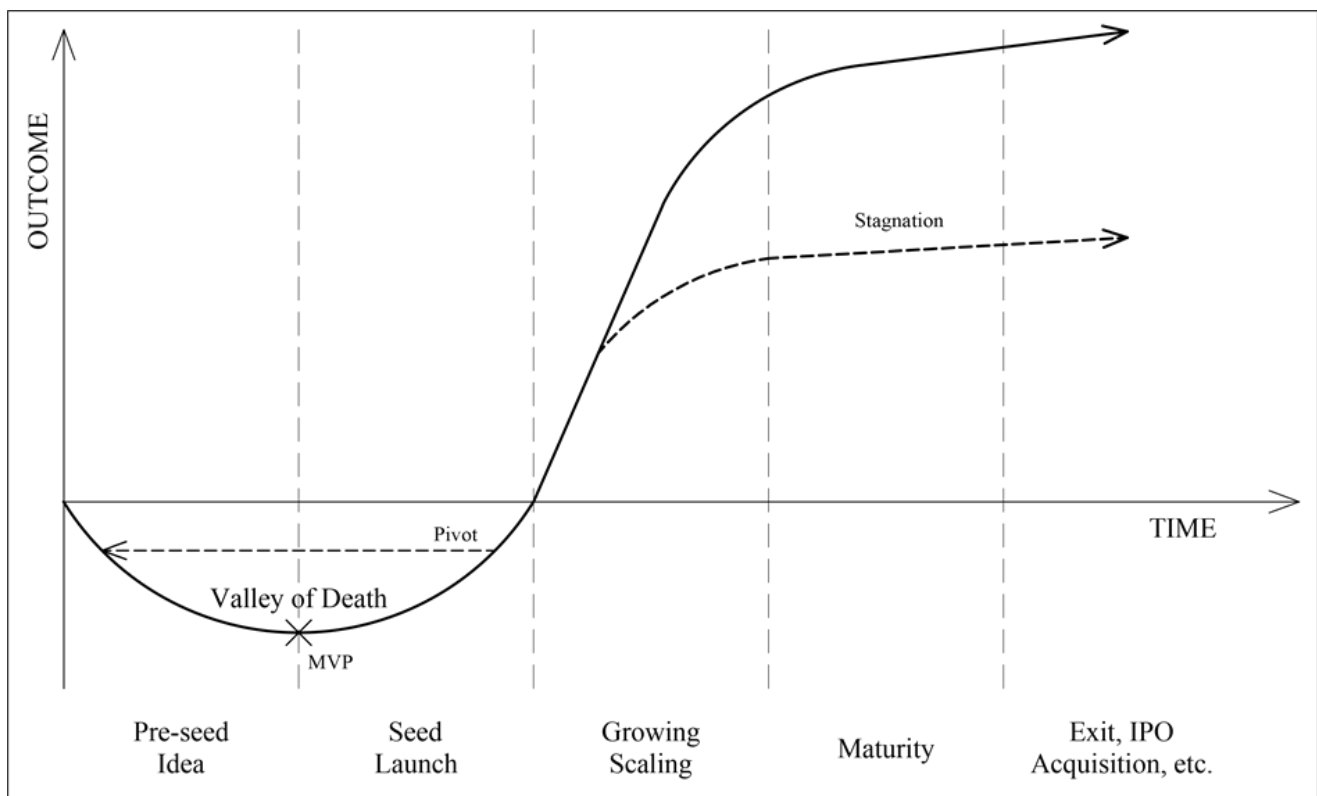
Objective	Pre-seed Idea	Seed Launch	Growing Scaling	Maturity	Exit, IPO, Acquisition
Funding	Bootstrapping, FaF, own resources, incubators	Angel investment, accelerators, crowdfunding	Venture capital, accelerators	Late VCs, Private Equity firms, Banks, Hedge	IPO, Acquisition
Product	Preparing MVP	Validate MVP	Continuous improvement of product	Stable high-quality product	Depends on the situation of exit
Type of Customer	Innovators	Innovators Early-adopters	Early-majority	Early-majority Late-majority	Late-majority Laggards
Customer Development	Customer Discovery	Customer Discovery / Validation	Customer Creation	Company-building	Depends on the exit situation
Risk	High risk	High risk	Medium risk	Medium risk	Medium risk
Business plan / model	Preparing business plan	Preparing business model and iterated it	Working business model	Repeatable business model	Working high-level business model
Focus on	Problem / solution fit	Customer / market	Increase market share, revenues	Retain customers, preparing for exit	Evaluation of a start-up
Notables	Idea	Pivot, Lean principles, Valley of Death	Exponential growth, scaling, stagnation	Expansion	Depends on the exit situation

Source: Ulč & Mandel, 2021, (*IN PROCESSING*).

The outcome of previous research also features the graphical representation that demonstrates a simplified general technology start-up lifecycle and its particular stages, as illustrated Graph 1. These graphs are often used in the business literature and sought after

by firms in practice. The vertical axis of the outcome represents the theoretical start-up growth rate or revenue growth over time, the horizontal axis represents an indefinite time period of several years. Following Salamzadeh & Kawamorita Kesim (2015), there is a critical risk area of start-ups that fail in the first two stages. This period is referred to as the “valley of death”. Thanks to the feedback during product testing, the entrepreneur / founder can persevere with the current business model, make a pivot to change the model and some of its elements or perish a new start-up (Eisenmann et al., 2018). Failing to achieve scaling or rapid growth in the short term, the technology start-up as such goes into stagnation. Over time, we can then call this business a “traditional company”, without the start-up label.

Graph 1 Technology Start-up lifecycle of first research



Source: Ulč & Mandel, 2021, (*IN PROCESSING*).

When outlining a comprehensive theoretical framework, it is evident that some areas cannot be defined solely on the basis of a search of available relevant sources. Furthermore, it cannot be concluded that the 8 objectives mentioned above are all the objectives that are appropriate or necessary to note when defining the technology start-up lifecycle and its comprehensive approach from multiple perspectives. In initial research, we encountered not only a lack of these resources, but also a low level of their comprehensiveness. It should be noted that the authors of this paper are aware of the fact that it is not possible to develop an adequate theoretical framework within one research. Therefore, the outline distribution of the individual stages, their feature and graphical representation must continue to be tested. The following information is divided into sections that are confirmed by qualitative research and sections that are refuted, updated or completed.

2.1 Positive feedback from qualitative research results

A technology start-up devotes almost 100% of its time to product development. In the case of some start-ups under survey, this period lasted longer but during their development they tried to validate the idea in cooperation with the customer. Investments at this start are, with exceptions, equity, which we refer to as FFF (Fools, Friends and Family) or Bootstrapping. In the initial phase, we also encounter the investment of own funds raised from previous business. The MVP validation is confirmed in the next Seed / Launch stage. As for investments, the search for a potential angel investor or external support by a business accelerator is developed. Additional capital can also be raised in the form of grants and projects. As the start-up continues to grow, there is positive feedback for continuous product improvement with potential investment in the form of venture capital. Interestingly enough, one of the start-ups under survey has already gone through an IPO at the Seed / Launch stage. However, this case is unique and, according to the authors and founders, it is due to a very specific innovative high-tech technology, which on the one hand requires the highest possible available funding in a short timeframe and on the other hand is very interesting for investors. Getting an angel investor in many cases is not only about financial support, but also about providing know-how thanks to which marketing and sales were often supported in the start-ups under survey.

Each of these start-ups developed or changed their product over time during the MVP preparation and validation. Some start-ups have gone through a Pivot strategy, where they have changed based on disproving at least one of the basic hypotheses about the customer or product, and, as a result, the technology start-up in question has reacted to that fact. In practice, technology start-ups have often encountered a situation where, thanks to feedback, they have transformed their product into a different market with different characteristics and possibly different customers. Primary targeting on the B2B market, transformation of targeting on the B2C market and development of a product with different sub-features with the same basic need can be used as an example. Continuous improvement of their product is visible in each of the start-ups that were under survey. This need is often driven not only by customer feedback but also by competition in the market. When competing in the market, a given product has the technological added value of a particular sub-feature or generally a higher level of agility, systems integration, unique innovativeness, etc.

It is rather difficult to verify the objective such as the type of customer due to the fact that it varies case by case. In this research, the features of innovators - customers in the first Pre-seed / Idea stage were confirmed. In a large number of cases, start-ups have confirmed that the first potential customers often have a positive approach to technology and look for an innovative solution to their problem. The technology start-ups under survey are focused on solving some particular problem with an innovative solution and investments in this solution in the first stage. They also focus on the customer and the product in the Seed / Launch stage. Over time, there is a drive for scalability and increased revenue.

The business model is created by these technology start-ups in accordance with the outlined theoretical framework. In the first stage, a start-up is primarily focused on an idea, product development, or development of a simple business plan. However, the business model as such only starts to take shape after the MVP is launched in the market and after the first validation. The business model is also developed thanks to pressure from external investors who want to see the potential appreciation of their investment over time. With a well-designed business model, there is a better chance of convincing potential investors and capital funds. Different results appear in the case of a possible change in the business model,

where one part of the technology start-ups surveyed has a stable business model that has not been changed since its development. The second part of start-ups is changing or expects to change its business model in the near future based on the market situation or expansion of the business model to other markets.

In the graphical representation, distribution of the different stages is positively accepted. Some of the start-ups surveyed describe the graphical representation as the best they have ever seen, or one of the best. Nevertheless, we update one part of the graphical representation based on our research. When crossing the theoretical break-even point, a technology start-up may not immediately scale successfully and grow rapidly in a short period of time. In practice, technology start-ups often experience a slowdown in their growth, stabilization and ongoing preparation for the scaling process. The aforementioned exponential rocket growth of the technology start-up and successful scaling will only occur afterwards in positive cases. One of the technology start-ups surveyed referred to the graphical situation as a "hockey stick", i.e. the start-up then slows down in its growth again and sustainability occurs. The Lean Start-up principles were presented in previous research and some of the ideas form part of the theoretical framework. These principles are used, or at least known, by technology start-ups in practice and largely confirmed.

2.2 Negative feedback from qualitative research results

The surveyed area of risk appears to be interesting. Where does a technology start-up perceive risk and its level? The answers of the founders were truly remarkable, yet different. In the current theoretical framework, risk is defined only as High risk / Medium risk, with no area perceived as critical to the founder. Again, it depends on the situation and stage of the given technology start-up, as well as on the group of customers and target markets. Risk according to the results of this research was recorded in or arises from the following areas:

- External Threats - External threats such as COVID-19, technology hacking / misuse and others may lead to delays in orders and fading interest from prospects. This situation then results in lack of cash flow which can kill the entire start-up. This type of risk may be present throughout the lifecycle.
- Product validation - During the initial product validation, a technology start-up is not aware of the way of testing its hypotheses and the basis for further steps. Risk is perceived as a waste of time in developing the idea and MVP that are not accepted in the market. Thus, there is also a risk of losing the capital invested in the start-up by the founder.
- Investor input - When bringing in an investor, some start-ups are concerned about the pressure on financial results, which may be inefficient in the long run from the founder's perspective. The investor input is perceived by some founders not only as a risk of destroying the start-up vision, but also as pressure and commitment. There should always be a visible synergy between the two entities and a common direction towards a win-win situation.
- Failure to meet customer expectations - As a start-up grows, a loss of focus on the customer can have a negative effect, where growth in sales levels may not be supported by sufficient service and support from the start-up, created for example by a lack of workforce and its quality.

- Loss of innovative competitive advantage - The technology environment is turbulent and without a sufficient level of innovation, a start-up may therefore fail. Some start-ups refer to this situation as a race against time and technology. In these situations it is still essential to find the right customer with the right business model. In general, loss of adaptation to new situations in a given area is perceived as a risk.
- Recruitment - As a start-up grows, the number of employees who were not part of the founding team increases. Founders often don't have the experience of selecting quality employees, having the same vision, and employee leadership. Risk in this case means internal disruption due to the human factor.

The theoretical start-up end during its lifecycle is an unknown area. Along with the problems consisting in the start-up definition and different public opinions, the definition of its end logically seems to be a mystery. In the outlined theoretical framework, we have introduced the last stage as Exit / IPO / Acquisition in the secondary research. The opinions of the surveyed technology start-ups vary. Some of them share the idea of a founder exit, IPO or Acquisition. Interesting data based on qualitative research and turning points the founders of technology start-ups perceive as their exit are as follows:

- A start-up falls apart if the number of employees is more than 50.
- If the non-founder has 100% control of the product and business strategy.
- If investors condition their investment by the CEO position in a start-up.
- If a large number of people in a start-up feel they know what to do. If it is already a stable small or medium-sized company.

The above points are possible directions for further research questions. One of the responses of a technology start-up is extremely inspiring for the authors of this paper. The notion that a start-up should never end. Even in any of the above situations describing the start-up end, the company should continue to have at least one department based on the start-up principles. Furthermore, this department would demonstrate innovative activity in a small team of technology idea holders, without external interference from the company.

With the possible end of a start-up, its possible transition to a traditional form of business at earlier stages of its lifecycle may also be a consideration. This situation is referred to in the theoretical framework as stagnation, where a technology start-up is unable to successfully scale its business. In terms of technology start-ups, potential investors want to see the scalability perspective. If this perspective is missing, it theoretically means that the entity is not a start-up but a standard company. However, this logic may differ referring to other market sectors. After evaluating qualitative research results, the question is whether or not to keep the area of stagnation as part of the theoretical framework.

2.3 New objectives in the theoretical framework

Initial research did not find a source that would directly address the start-up lifecycle and the number of founders or recruitment. Based on the data collected from qualitative research, the inclusion of this area in the theoretical framework can be outlined. The technology start-ups surveyed were founded by up to 5 founding members who were largely innovative idea creators. Recruitment is a minority in the first stage. The period of the first major recruitment occurs in the second Seed / Launch stage often characterised by

strengthening of the development area (programmers, IT specialists), but also marketing and sales. The number of hired employees depends on the number of founders. In the case of the technology start-up with 5 founders there are immediately finance and business specialists in the team. Their need to expand their team was not necessary from their perspective. Outsourcing is often used in terms of marketing activities. In the next Growing / Scaling stage, start-ups focus more on strengthening back office support as well as administration.

Conclusion

In our qualitative research on technology start-ups, we encountered again the problem involving the start-up definition. The lack of definition limits other related areas. The technology start-ups surveyed describe a start-up as a company that delivers something innovative quickly, with passionate founders and a potential vision for rapid growth. Interestingly enough, a large number of technology start-ups engaged in software development often struggled with hardware in the market that was not technically adequate according to the founders. As a result, the technology start-up changed its focus and expanded its output to hardware.

Through qualitative research, we obtained information directly from technology start-ups in the market. Thanks to their feedback, we had an opportunity to update our outlined theoretical framework from previous research. This update is visible in the first 3 stages where we have verified, refuted or completed information to increase the level of validity of the theoretical framework. Much of the characteristics of the Pre-seed / Idea, Seed / Launch, Growing / Scaling stages have been confirmed during research. For future research, it is important to confirm the division into these lifecycle stages, with the exception of the last exit stage. As for the risk area, we have disproved the existing characteristic through feedback and changed it to specific risk areas, the most critical in each stage. The technology start-ups under survey are not situated in the later lifecycle stages. Therefore, we have only reported risk based on external threats for these stages. A new additional area is featured by the characteristics of workers and founders. The founders are often the carriers of the technological (innovative) idea. The next stages include recruitment and expansion in the areas of development, marketing and sales at Seed / Launch and back office and administration at Growing / Scaling. The information confirmed by our research is highlighted in blue in Table 2. Information which was either replaced or newly generated as a result of research is highlighted in green. The graphical representation based on our research is changed in the sub-section in the Growing / Scaling stage and the question is whether to leave the stagnation area or not.

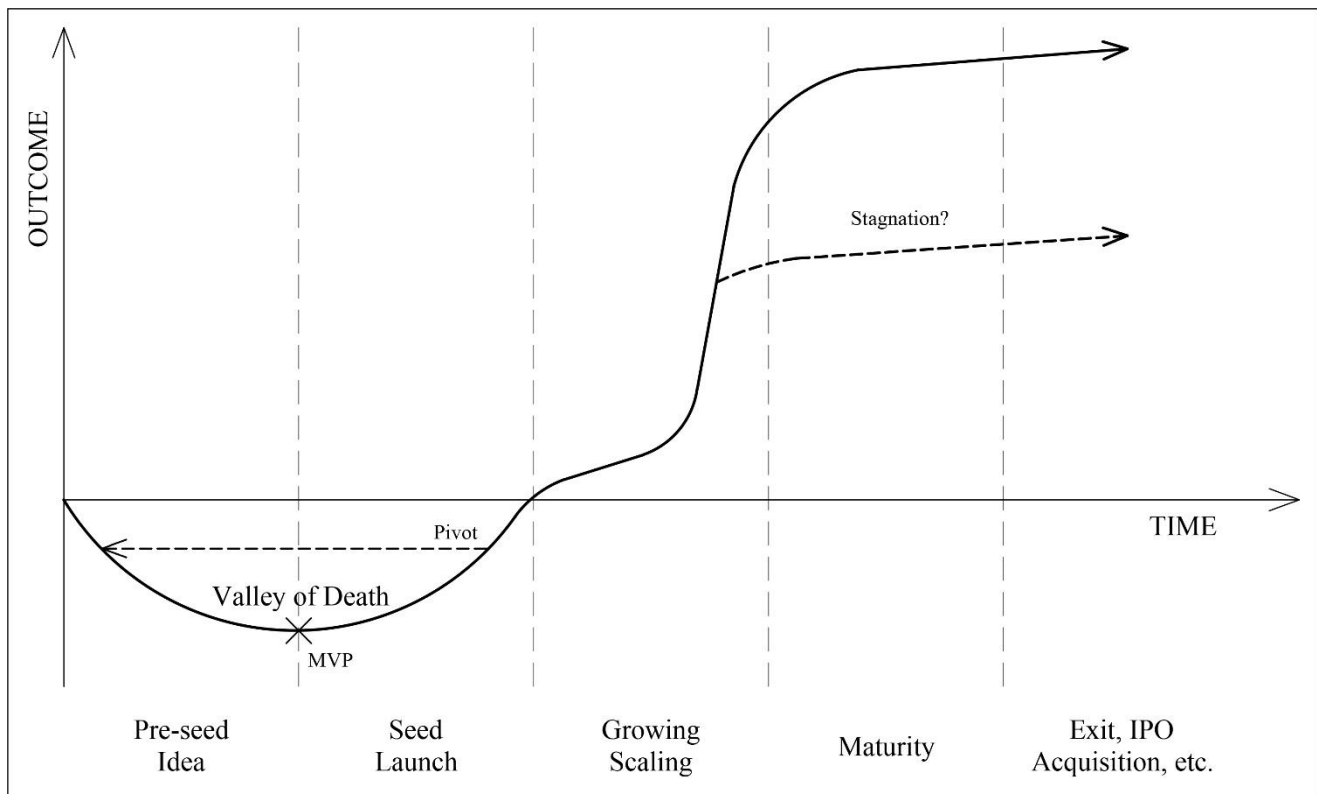
Table 2 Updated characteristics of technology start-up lifecycle stages

Objective	Pre-seed Idea	Seed Launch	Growing Scaling	Maturity	Exit, IPO, Acquisition
Funding	Bootstrapping, FaF, own resources, incubators	Angel investment, accelerators, crowdfunding	Venture capital, accelerators	Late VCs, Private Equity firms, Banks, Hedge	IPO, Acquisition

Product	Preparing MVP	Validate MVP	Continuous improvement of product	Stable high-quality product	Depends on the situation of exit
Type of Customer	Innovators	Innovators Early-adopters	Early-majority	Early-majority Late-majority	Late-majority Laggards
Customer Development	Customer Discovery	Customer Discovery / Validation	Customer Creation	Company-building	Depends on the exit situation
Risk	External threats, False idea risk	External threats, Investor entry risk, Product validation risk, Human factor risk	External threats, Investor entry risk, customer expectations risk, Innovative advantage risk, Human factor risk	External threats,	External threats
Business plan / model	Preparing business plan	Preparing business model and iterated it	Working business model	Repeatable business model	Working high-level business model
Focus on	Problem / solution fit	Customer / market	Increase market share, revenues	Retain customers, preparing for exit	Evaluation of a start-up
Notables	Idea, development	Pivot, Lean principles, Valley of Death	Exponential growth, scaling, stagnation	Expansion	Depends on the exit situation
Founders / Employees	1-5 founders, Innovative idea creators	development, marketing, sales,	back office, administration		

Source: Own processing, 2021

Graph 2 Updated Technology Start-up lifecycle of first research



Source: Own processing, 2021

The research objectives have been met. However, it is advisable to test further the theoretical framework of the technology start-up lifecycle and continuously push it to a higher level. In terms of research on the marketing strategy of a technology start-up, this division will be used depending on the specific stage of its lifecycle. At the same time, we can determine the exact stage of the technology start-up. From our point of view, the stage and its characteristics are crucial for the marketing strategy that changes during the lifecycle.

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