WHY DO STARTUPS FAIL?

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Abstract

Startups play an important role in contemporary economies. Given the high risk associated with this business type, a significant proportion of these businesses fail within a few years of being founded. Our goal was to draw general experiences, which can improve the very low success rate of startups. In our research we identified the factors that have a significant impact on the survival of start-ups. We used a database that the authors made of 40 ICT startups in the liquidation phase. Our study sample included defunct startups between 2020 and 2023, a significant proportion of which received funding from venture capital. Our database was filtered from the answers to the questions in the semi-structured interviews. Subsequently, we reviewed the related literature and assessed the methodologies that have been used in the past to identify startup failures. For our analysis, we used an extended version of the SHELL model, which has been applied previously in similar research. Firstly, we created a problem map. The main groups of problem factors are funding and customer; business model; and management and product problems. Secondly, we found three groups of failed startups: "basic business model and financing problems", "failed product idea", and "looked promising" clusters. Thirdly, we examined the connection between the problem factors and the life cycle of startups. As startups evolve, the probability of some problems occurring increases, while others decrease. As the life cycle progresses, the following become less important: not feasible, no/wrong business model, and inexperienced management problems. While with the life cycle, the problems of a few customers become more significant. Financial and investment indicators improve, by definition, as the life cycle progresses. Fourthly, we found a positive and statistically significant relationship between the presence of female founders and survival. The results of our research can provide important findings for both startup founders and decision-makers responsible for the development of startup ecosystems.

Keywords ICT, startup success, startup failure, SHELL methodology, gender

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INTRODUCTION

In recent years, huge investments have flowed into startups. In many countries, significant public resources were channeled in addition to private investments. The literature focuses more on successful startups, although this is only a small percentage of cases. In our research we are examining failed startups. Our goal is to draw general rules, that can be used to improve the very low success rate in the startup ecosystem.

The reasons for failure can be diverse, according to the literature. Therefore, as a first research topic, we want to create a focused problem map. Secondly, we aim to investigate whether these potential problems depend on the startup life cycle. Thirdly, we want to typify unsuccessful startups using the problem map. Finally, the investigation is expanded by studying if there are women among the founders, it would have any influence on the reasons for failure and their timing.

Our sample contains 40 ICT startups in the liquidation phase. Following Cantamessa et al. (2018) we used the SHELL methodology to plan the semi-structured interview to identify startup failure causes in a structured way. The analysis of these interviews and the steps they actually took compared to what they had planned, can provide important lessons for future entrepreneurs. We wanted to evaluate in more detail whether, for example, inadequate assessment of market needs, lack of business plans, the relationship between startup team members, or other factors would play a crucial role.

1. LITERATURE REVIEW

One of the most important values of startup companies is that they are fast-growth-oriented. They achieve the velocity with money provided by forms of financing that have no place in traditional companies (business angels, seed capital companies, crowdsourcing platforms, etc.) (Condom-Vilá 2020). Another important feature is that these entrepreneurs constantly seek changes or make the most appropriate strategic choices as a means of overcoming problems, leading to business success (Hormiga et al. 2018).

Another important attribute is that the startup's organizational structure is incomplete and quasi-flat, and the number of operations in these companies is negligible. The lack of human and financial resources are the main barriers that limit their growth and innovation (Ojaghi et al. 2019). Due to their small size, startups may also suffer from a lack of structure and lack of tangible and intangible resources (Presutti et al. 2011). It is the combination of these challenges that makes the founders' personality, experience, and problem-solving skills important.

Also, the fundamental nature of startups is innovation to create new products or services, which carries significant risk (Bethlendi 2019. Innovative startups never grow in isolation, but by observing each other, often collaborating and competing in parallel. Startups can only grow if embedded in perfect functioning startup ecosystems (Jesemann 2020). Several research studies summarise that the main preconditions for creating a successful startup are an innovative and competitive idea, a supportive business and political environment, and the idea of skills and competencies to be successfully implemented (van Weele et al. 2018; Zhou and Verburg 2020).

It has been also found that the gender entrepreneurship gap in startups, which represents the difference between the start-up founding rates of men and women, is an issue of growing academic and societal interest. Related research has shown that the gender gap in entrepreneurship persists even within developed economies where gender gaps in wages or professional development have declined (Global Entrepreneurship Monitor 2017).

Given also that startups are typically high-risk businesses, as described above, it is important to analyse the underlying factors resulting from the failures. We reviewed and categorized the related literature on the failure factors of startups.

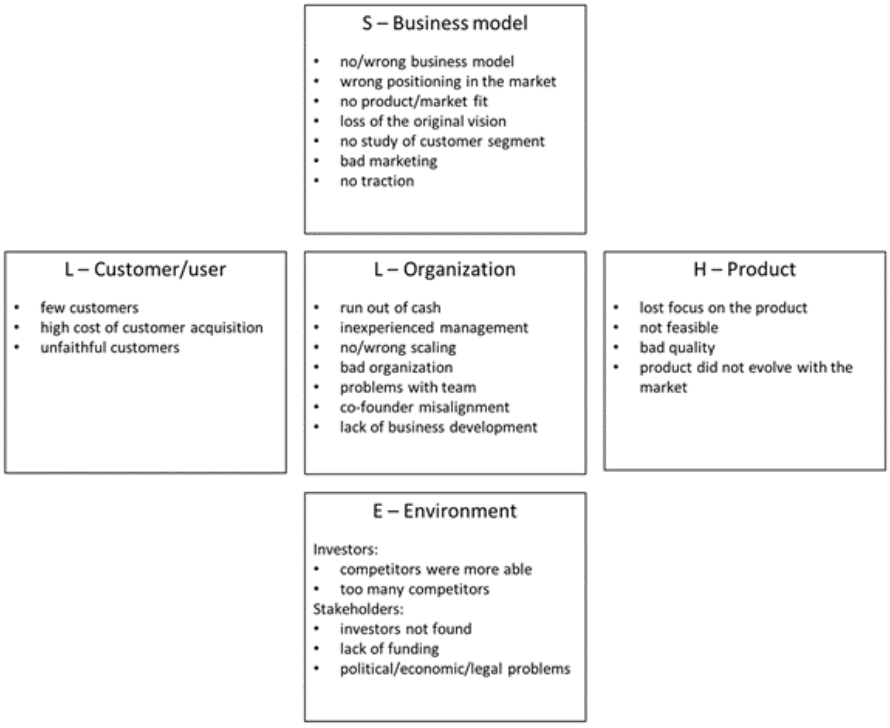
Consequently, the factors that influence the failure of startups can also be separated into internal factors (e.g. personal characteristics of founders, skill sets, development strategies) and external factors (e.g. characteristics of the ecosystem that supports startups).

As a next step, we define variables using the SHELL methodology to construct a semi-structured interview with startups that received venture capital funding but failed.

1.1. SHELL methodology and definition of variables in the questionnaire

As Cantamessa et al. (2018) we apply a modified model of SHELL methodology, which is an error-centred approach to the causes of (startup) failures. SHELL firstly has been adopted over 40 years ago in the aviation sector for describing accident causes. In the original methodology, the letters in the acronym stand for the following topics: Software, Hardware, Environment, Liveware People, and Liveware Environment. The method was designed by Hawkins to examine the impacts and risks of the human factor on other parameters. Cantamessa et al. (2018) modified this model in their research to fit the problem of entrepreneurial outcomes. They applied the SHELL model with some modification for the classification of startup failure and, similarly to the aviation field, the model has the aim to identify the relationships between the human factors and the other components of a startup e.g., technological, environmental, and organizational issues). This led to a repeatable and scalable methodology that can be applied to a database of unstructured post-mortem documents deriving startup failure patterns (Cantamessa et al. 2018).

Figure 1: **A modified version of the SHELL model applied to startups**



Source: Cantamessa et al., 2018

2. DATA AND METHODOLOGY

In the following, the databases compiled from these interviews and the methodologies applied for their analysis are presented.

2.1. Presentation of the test sample

In our research, we processed semi-structured interviews with startup founders. The share of women among the founders was 35% of the businesses analyzed. The next step was to isolate 40 explanatory variables based on the SHELL model and the literature review. For each variable, if the phenomenon associated with the variable was present as a cause of failure, we answered yes, while if it was not a factor, we answered no. In addition, our sample included variables representing the number of female owners, capital raised and turnover achieved.

2.2. Research objectives and methodologies

Our research objectives are the followings:

1. To identify and typify the problem map leading to failure.
2. To differentiate and identify failure factors by stages of the startup life cycle.
3. To investigate the gender effect in business failure.

The first methodological step is creating an interview template, conducting interviews, and compiling the database. The second task is filtering and narrowing of variables. The last one is PCA (principal component analysis) and hierarchical cluster analysis and the usage of explanatory methodologies.

3. FINDINGS

3.1. The applied SHELL model

As part of our analysis, we have added a few points to the SHELL model of Cantamessa et al. (2018). In the business model (S) block we added the variables “Wrong customer development” and “Has the business model changed?”. The variables “Covid, war, macroeconomic problems”, “Slow decision process of VC”, “Other” and “Legislation” were added to the Environment (E) block. And in the Organization (L-O) block, we added the variable “Disappointment of the team”. The responses given for each variable were then aggregated to determine the most important factors. Based on all this, it was already clear that a common problem for the startups studied was

- S: identifying the right market demand,
- H: The product did not involve the market,
- E: the impact of the global pandemic, war, and macroeconomy,
- L: attracting customers,
- L: running out of funding.

Figure 2: **Extended version of the SHELL model and percentage of startups, where the variable was valid.**

Business Model - S	
No business traction	100,00%
No market fit	95,00%
Wrong positioning in the market	70,00%
Wrong customer development	60,00%
No product fit	52,50%
No/Wrong Business Model	42,50%
Has the business model changed?	27,50%
Bad marketing	25,00%

L-Customer/User	
Problems in customer acquisition	85,00%
Few Customers	42,50%
Unfaithful customers	7,50%

L- Organization	
Run out of cash	57,50%
Lack of business development	35,00%
Inexperienced management	30,00%
Problems with team (disharmony)	22,50%
Co-founder misalignment	22,50%
Disappointment of the team	20,00%
Bad organization	12,50%

Product - H	
Product did not evolve with the market	90,00%
Not feasible	72,50%
Lost focus on the product development	35,00%
Bad quality	15,00%

Environment - E	
Covid, war, macroeconomic problems	52,50%
Competitors were more able / new competitor	47,50%
Too many competitors.	45,00%
Lack of funding	30,00%
Legislation	10,00%
Slow decision process of VC	2,50%
Other	2,50%

Source: own research, 2024

As a next step in our research, we defined additional variables to get a more complete picture of the startups under study. We first identified variables related to the circumstances in which they were founded.

The startups surveyed were founded between 2014 and 2021 and the average number of founders was 2.8 (only two startups were founded by 1 person and the highest number of founders was 7). The share of women among the founders was 35% of the businesses analysed. On the question of whether the startup had participated in an accelerator program or had received support from an angel investor, the answer was yes in only 27.5% of cases. The number of investment rounds ranged from 1 to 4, with an average of 1.8 investments per company. Given the fact that the startups in the database were unsuccessful, it is not surprising that only 15% received an exit offer.

For the startups examined, the average time between founding and termination of activity was 4.25 years (between 1 and 9 years of operation). The average time from founding to MVP creation was 1.1 years, but only 34% of the database studied had reached the "product-market fit" stage. Only 2 startups reached the "Chanel market fit" stage and none achieved the "Growth/business traction" phase.

The average amount of capital invested was €397,000 (with a minimum of €28,000 and a maximum of €1,425,000). Almost three-quarters of the startups surveyed had some revenue, with an average cumulative revenue of €144,000. At liquidation, a market value could only be established for two companies. We also looked at which startups had plans for international expansion from the beginning (and not just at a later stage). In this question, 17.5% of the database surveyed had planned an international market presence from the start.

3.2. Principal component analysis

In the principal component analysis, the following steps were used to reduce the initial large number of variables to 9 dichotomous and 3 metric variables:

1. Low variance variables were excluded from the 40 variables (where more than three-quarters of responses are identical),
2. Subsequently, narrowing was done based on covariance,
3. Then, variables were excluded in the principal component analysis in an attempt to maximize the KMO (Kaiser-Meyer-Olkin) value.

The resulting variables are summarized in Table 3 below. The variables examined included financial and investment variables (shown in grey) and dichotomous variables describing the manifestation of a state or characteristic. All elements of the SHELL model are covered by at least one variable.

Tables 1: **Shortlisted variables and their place in the SHELL model**

Name of variable	**Place in the SHELL model**
Not feasible	Product - H
No/Wrong Business Model	Business model - S
Wrong positioning in the market	Business model - S
Bad marketing	Business model - S
Lack of funding	Environment - E
Few Customers	Customer - L
Inexperienced management	Organization - L
Problems with the team (disharmony)	Organization - L
Lack of business development	Organization - L
Normalised invested capital	-
How many rounds of investment have you received from VCs?	-
Normalized cumulated turnover	-

Source: own research, 2024

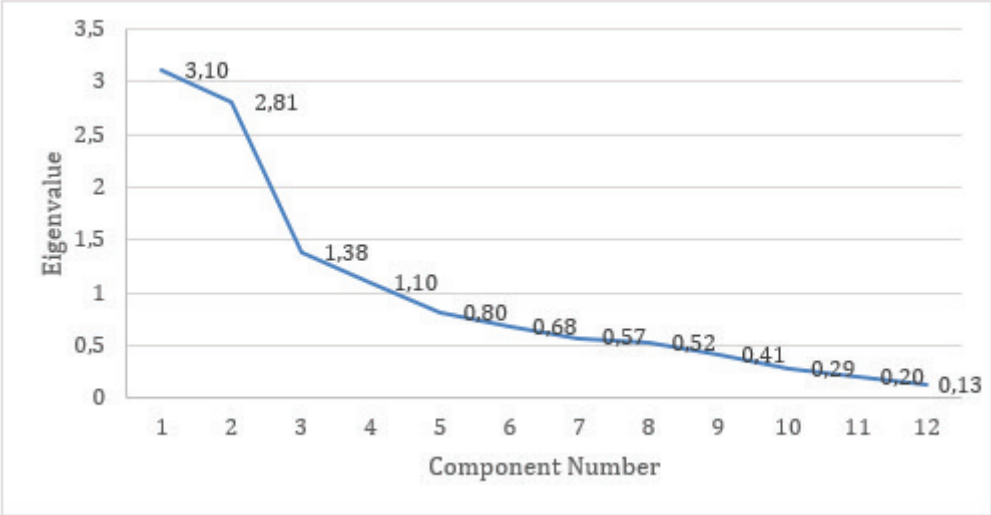
The KMO score is 0.623, indicating that the variables under study are more than moderately suitable for principal component analysis. The significance level of the Bartlett test confirmed that the principal component analysis was successfully performed (Table 2).

Tables 2: **Examining the conditions for principal component analysis**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	Bartlett's Test of Sphericity	Values
	Approx. Chi-Square	172,227
	Df	66
0,622	Sig.	0

Source: own research 2024

Figure 3: **Visualization of the eigenvalues of principal component analysis with an elbow diagram**



Source: own research, 2024

Based on the chart, it can be seen that the eigenvalue falls below 1 for principal component 5, hence the creation of 4 principal components was considered appropriate. The explained variance was 70%, thus the data loss was acceptable based on our analysis. Table 3 presents the characteristics of the principal components.

Tables 3: **Rotated component matrix**

Rotated Component Matrix	PCA Component			
Variables	Investment and financial data	Funding and customer problems	Business model problems	Management and product problems
Normalised invested capital	0.889	0.068	-0.088	-0.071
How many rounds of investment have you received from VCs?	0.735	-0.166	0.266	0.228
Normalized cumulated turnover	0.713	0.178	-0.099	-0.034
Lack of funding (Environment - E)	0.012	0.82	0.226	0.324
Lack of business development (Organisation - L)	-0.11	0.766	0.392	0.153
Few Customers (Customer - L)	0.241	0.734	-0.127	-0.033
Bad marketing (Business model - S)	-0.435	0.537	0.278	0.352
Wrong positioning in the market (Business model – S)	0.152	0.082	0.884	0.06
No/Wrong Business Model (Business model – S)	-0.195	0.129	0.749	-0.011
Problems with the team (Organisation - L)	0.256	0.243	-0.132	0.824
Inexperienced management (Organisation - L)	-0.394	0.052	0.211	0.552
Not feasible (Product – H)	-0.514	-0.532	0.161	0.345
Extraction Method: Principal Component Analysis.				
Rotation Method: Varimax with Kaiser Normalization.				
a Rotation converged in 11 iterations.				

Source: own research, 2024

In the first principal component, the variables with a high positive weight are mainly the amount of investment and the cumulative income from operations, as well as the number of investment rounds. Hence, this principal component is called investment and financial data. In the second principal component, the lack of funding, lack of business development, and few customers are the main influencing factors. This is followed by bad marketing. Therefore, this set of variables has been named funding and customer problems. The third principal component is characterized by inadequate market positioning and a poor or inappropriate business model. Thus, this has been summarised as business model problems. The fourth principal component included two organizational characteristics, i.e. disharmony within the team and inexperience, compounded by fundamental product problems. Therefore, this variable group was named management and product problems.

3.3. Results of the cluster analysis

For our study, we chose a ward-based hierarchical cluster analysis. The clusters created were selected by dendrogram (see in the Appendix). Our analysis produced three clusters that were well separated from each other by analysis of variance based on the principal components. Our goal with cluster analysis is to identify the problem, so we look at the clustering from this perspective (Table 5). We also evaluated the clusters using the original variables. In the results obtained, the values shown represent the proportion of the phenomenon from which the most important ones have been highlighted in grey (Table 6). There is a statistically detectable relationship between the variables (cluster and the respective explanatory variable), except for the variable inexperienced management.

Tables 4: **Results of the cluster analysis**

Ward Method		PC1 Investment and financial data	PC2 Funding and customer problems	PC3 Business model problems	PC4 Management and product problems
CL1	N	10	10	10	10
	Mean	- 0,33	1,26	0,66	0,27
	Std. Deviation	0,76	0,58	0,47	1,66
CL2	N	26	26	26	26
	Mean	- 0,24	- 0,56	- 0,17	- 0,18
	Std. Deviation	0,50	0,60	1,06	0,59
CL3	N	4	4	4	4
	Mean	2,40	0,47	- 0,55	0,47
	Std. Deviation	0,79	0,86	0,90	1,05

Source: own research, 2024

The first cluster included 10 companies. The average scores show that funding and customer problems were the main reasons for failure. Business model difficulties were also important to a lesser extent. To a minor level, management and product problems also contributed to the failure. Negative investment and financial data indicate that they received relatively little funding and achieved virtually zero sales. An examination of the variables behind the main components confirms the former. Inadequate market positioning and weaknesses in business development were common to all firms in this cluster. Low customer numbers and problems with the business model are also common. The cluster was labelled “basic business model and financing problems”. In this cluster, the founders could not manage the project adequately in several aspects besides the product development problems.

The second cluster has the largest number of elements (26 firms), where we see a lack of principal components. This suggests that the principal components and the variables remaining do not sufficiently explain the reasons for failure. Based on the variables examined, infeasibility of the product or service is the only general characteristic of this group. Thus, the product idea failed. In addition, the related market positioning failure is also common. Hence the term “failed product idea” has been applied to this group. We can consider this failure as a natural consequence of start-up activity.

For the smallest, third cluster’s companies (4) were the most successful in terms of investment and financial attraction. If we assess the problems, we can see the presence of financial and customer problems, as well as management and product problems. Despite successful capital raisings and relatively positive revenue results, faulty market positioning and few customers made this group unsuccessful. Therefore, we have labelled this group as “looked promising” due to the relative success of this group.

Tables 5: **Results of the cluster analysis for the basic variables**

	Investment and financial data			Funding and customer problems				Business model problems		Management and product problems		
Cluster 1												
Cluster 2												
Cluster 3												
	VC Investment round	Normalised invested capital	Normalized cumulated turnover	Lack of funding	Lack of business development	Few Customers	Bad marketing	Wrong positioning in the market	No/ Wrong Business Model	Inexperienced management	Problems with the team (disharmony)	Not feasible
Cluster 1	1,6	0,2	0,0	0,9	1,0	0,8	0,7	1,0	0,8	0,5	0,4	0,6
Cluster 2	1,7	0,2	0,0	0,0	0,1	0,2	0,1	0,6	0,3	0,3	0,1	0,9
Cluster 3	2,8	0,9	0,4	0,5	0,3	0,8	-	0,8	-	-	0,8	-

Source: own research, 2024

3.4. The relationship between clusters and life cycles

Based on the literature, three main life cycle phases have been identified. The first is the minimum viable product (MVP) phase. The second is the product market fit (PMF) phase, while the third phase is the channel to market (CHMF) phase. This is followed by the growth phase (business traction), but none of the samples reached this phase. The cross-table analysis found no significant relationship among clusters and variables describing life cycle success. However, the presentation of the results is relevant to our research.

Tables 6: **The success of clusters by the life cycle**

	Total N	**MVP success**	**PMF success**	**CHMF success**
CL1	10	90%	40%	0%
CL2	26	80%	30%	0%
CL3	4	100%	80%	50%

Source: own research, 2024

The data show that the highest proportion of firms in the MVP phase were in the third cluster. The highest failure rate was in the second cluster. The failure rate in the PMF phase was higher in the second and first clusters. It can be seen that half of the firms in the third cluster reached the CHMF phase. This finding also confirms the "looked promising" nature of the cluster.

In the following, we run the cross-table analysis for the variables identified in the principal component analysis (Table 9). A significant relationship is indicated at the value in the Sig column. The values in the table indicate the incidence rate for failure. The table identifies the causes of failure that are more prevalent in some life cycles and less prevalent in others. That is, as startups evolve, the probability of some problems occurring increases while others decrease. For example, the most prevalent variable of non-viable product failure occurred at 100% of MVP failures, with later stages the prevalence of this variable decreased to 80%, where other problems also occurred.

- Decreasing importance with life cycle: not feasible, no/wrong business model, inexperienced management
- More significant with life cycle: few customers, investment and financial indicators

The other variables could not be characterized by life cycle.

Tables 7: **Failure as a variable in the different life cycles**

	MVP failure	**Sig**	**PMF failure**	**Sig**	**CHMF failure**	**Sig**
Not feasible	1		0,8		0,8	0,02
No/Wrong Business Model	0,6		0,5		0,4	
Wrong positioning in the market	0,8		0,7		0,7	
Bad marketing	0,4		0,3		0,3	
Lack of funding	0,4		0,2		0,3	0,03
Few Customers	0	0,04	0,3	0,04	0,4	

	MVP failure	Sig	PMF failure	Sig	CHMF failure	Sig
Inexperienced management	0,6		0,3		0,3	
Problems with the team (disharmony)	0,2		0,2		0,2	0,01
Lack of business development	0,4		0,3		0,3	
VC investment rounds	1,6		1,62		1,74	
Normalised invested capital	0,04		0,21		0,25	
Normalized cumulated turnover	0,00		0,01		0,03	

Source: own research, 2024

2.5. The impact of gender on the survival of startups

In our study, we investigated whether female founders have an impact on the progression of a company. The cross-tables show that startups with female founders were more successful at all stages compared with cases of only male founders.

Tables 8: **Failure as a variable in the different life cycles**

	MVP_succ		PMF_succ		CHMF_succ	
Are there any women among the founders?	No	Yes	No	Yes	No	Yes
No	4	22	20	6	26	0
Yes	1	13	6	8	12	2

Source: own research, 2024

In the MVP phase, the survival rate for startups with women is 93%, in the PMF phase it is 53%, while in the CHMF phase is 14%. The same rates for male-only companies are 85%, 23%, and 0% respectively.

However, a link between the presence of a female founder and the life cycle variable only in the case of the PMF phase was statistically verified, while no significant correlation was found for the other two phases.

Tables 9: **Chi² test of Gender and the PMF success variable**

Gender vs PMF_succ	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4,642a	1	0,031

Source: own research, 2024

4. DISCUSSION AND CONCLUSION

In our research, we identified a problem map that led to startup failures. Using principal component analysis, we shortlisted the problematic areas. The groups of these factors are:

1. Funding and customer problems: lack of funding, lack of business development, few customers, bad marketing;
2. Business model problems: wrong positioning in the market, no/wrong business model;
3. Management and product problems: inexperienced management, problems with team (disharmony), not feasible product.

In the study of Cantamessa et al. (2018) the lack of business development was the most pronounced predictor of startup failure, which was followed by no product/marketing mix, few customers, and no/wrong business model. These factors all are included in our results as well[1].

Goswami et al. (2023) highlighted inadequate sales and marketing, and running out of money, which is our first group of causes. Product viability risks are also revealed in the literature (Bednár and Tarišková 2017; Chakraborty et al. 2023) as well as lack of funding (Díaz-Santamaría and Bulchand-Gidumal 2021).

[1] More precisely instead of no product/marketing we used bad marketing indicator.

Failed startups are not a homogeneous group. The following types have been identified:

1. In the group with the characteristics of "basic business model and financing problems" the founders could not manage the business properly in several aspects, and in many cases, there were also fundamental problems with the product. In hindsight, from an investor perspective, this cluster should have been the least financed; and the founders should have prepared more before launching the project. The efficiency of the start-up ecosystem can be improved by filtering out such projects, which bleed from multiple wounds. Incubation and/or mentoring programs could help these entrepreneurs to overcome these difficulties.
2. The only general characteristic of the "failed product idea" group is the infeasibility of the product or service. Thus, the product idea has failed. Also common is the related problem of inadequate market positioning. This reason for failure can be seen as a natural in start-up activity.
3. Projects that "looked promising" started more successfully than average, raised more capital, generated revenues, and progressed further in the life cycle, but then their development was halted due to inadequate market positioning, few customers, and management problems.

As startups evolve, the probability of some problems occurring increases while others decrease. As the life cycle progresses, the following become less important: not feasible, no/wrong business model, and inexperienced management problems. While with the life cycle, the problems of a few customers become more significant. Financial and investment indicators improve, by definition, as the life cycle progresses.

Women-owned businesses are more likely to survive each phase. In the sample, there is statistically significant evidence that startups with female founders in the PMF phase are more successful in making it through this life cycle. This also induces that startups are more likely to receive an exit offer. The results confirm the branch of the literature (Ong et al 2016; Kee and Rahman 2018) which found a positive relationship between startup performance and female entrepreneurship.

The existence of an exit offer is an indicator of viability, which is typically found in companies with more successful financial parameters. Our study revealed that the factors influencing the exit offer depend on the life cycle and the gender composition among founders. Other influencing factors of exit offers are the level of funding and the market value.

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APPENDIX