A Work Project, presented as part of the requirements for the Award of a Master's degree in M.Sc. Management (Double Degree Maastricht SBE) from the Nova School of Business and Economics.

Predicting Crowdfunding Survival

Analysis of the 500 most successful reward-based crowdfunding campaigns

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Abstract

Crowdfunding offers an alternative form of entrepreneurial finance for entrepreneurs to access capital and build a sustainable operating business with innovative ideas. Drawing on a dataset of the 500 most successful Kickstarter campaigns with combined funding of over $366mio, this paper elaborates on the core predictors for crowdfunding survival. The results show that projects with prototypes of products and first sales significantly impact survival. Similarly, a team size of at least two people promises significantly higher chances of crowdfunding project survival. Finally, contrary to findings in the existing literature on crowdfunding success, funding goals and visual signals do not significantly impact crowdfunding survival. The findings explain the success factors for successfully building a business from a crowdfunding campaign and shed light on an under-researched field of crowdfunding literature.

Keywords: reward-based crowdfunding, venture capital, crowdfunding success, crowdfunding survival

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Statement of Originality

By signing this statement, I formally declare that the submitted master thesis titled:
"Predicting Crowdfunding Survival - Analysis of the 500 most successful reward-based crowdfunding campaigns."
is original work and has been produced independently by me, without external help.
Wherever I paraphrased or cited literally, a reference to the original source (journal, book, report, internet, etc.) which is included in the thesis.
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1 Introduction

In today's business world, start-ups and young companies are essential sources of innovation and represent fast-growing business models with high potentia. They often face the challenge of improving performance and growth while dealing with strong external pressures as well as internal constraints. To best leverage growth and performance drivers, early-stage startups require financing. Especially in the first year after their foundation, it is challenging for startups to raise external capital (Zaleski 2011). Nevertheless, in recent years, particularly after the outbreak of the Covid-19 pandemic, we have seen a flood of money into the startup world. In 2021, with $621bn, 111% more venture capital investments were made than in the previous year (Wilhelm and Heim 2022). However, there are also various options for other startups primarily founded in the hardware sector that require financing. Crowdfunding is a well-known and increasingly used option. It offers young companies the chance to overcome funding difficulties early on and collect cost-efficient financing via crowdfunding platforms. However, hardware-focused ventures find it difficult to gain the trust of venture capital investors in the early stages. For example, Peleton Inc. launched its first campaigns on Kickstarter to get seed funding and free marketing opportunities for its hardware-heavy business model. Ten years later, the company is listed on the stock exchange and, following its campaign, has received a total of $1.9bn in venture capital from the world's best investors, such as Tiger Global Management, Fidelity and Kleiner Perkins (CrunchBase 2022). This campaign enabled the company to grow into a global player, creating several thousand jobs. The crowdfunding market has grown rapidly in recent years and is estimated to reach $43.48bn by 2028 with a cumulative annual growth rate (CAGR) of 16.5% (Vantage Market Research 2022). Despite the strong growth figures and the increasing attractiveness for founders, crowdfunding remains a complex process characterised by more failures than successes. As a founder, it is therefore vital to understand the crowdfunding process and consider success factors.

In recent years, increasing interest has emerged from entrepreneurial finance literature, and consequently, many campaign features that influence crowdfunding success have been researched (Allison et al. 2017; Belleflamme, Lambert, and Schwienbacher 2014; Colombo, Franzoni, and Rossi–Lamastra 2015; Kuppuswamy and Bayus 2017; Mollick 2014). For example, Kuppuswamy and Bayus (2017), as well as Allison et al. (2017), showed that the founders' communicated funding goal positively influences the probability of crowdfunding success. In contrast, Mollick (2014) and Colombo, Franzoni and Rossi-Lamastra (2015) prove

the opposite and show a negative effect on the campaign as the funding goal increases. Similarly, a long campaign duration is considered to negatively impact crowdfunding success (Cordova, Dolci, and Gianfrate 2015; Mollick 2014). It shows the complexity of crowdfunding and the different variables that can lead to success or failure. Often information asymmetries are the reason behind complex relationships in crowdfunding (Belleflamme, Lambert, and Schwienbacher 2014; Courtney, Dutta, and Li 2017; Mollick 2014; Schwienbacher and Larralde 2010). It is crucial to communicate soft factors such as the founders' experience, project quality and credibility of the founders correctly so that no information asymmetries occur. Kickstarter offers different options to place information about the founder and the product to mitigate this risk. Following the signaling theory, founders can use observable mechanisms to show unobservable qualities (such as product quality and founders' experience) and reduce the perceived uncertainty of potential investors (Ahlers et al. 2015; Belleflamme, Lambert, and Schwienbacher 2014; Connelly et al. 2011; Cumming, Johan, and Zhang 2019; Mollick 2014). Due to these uncertainties, research has begun defining project quality measurements, focusing on visual, textual, and linguistic signals. These indicators of project quality show positive effects on crowdfunding success. For example, the inclusion of video and images in the structure of a Kickstarter campaign shows a positive effect on the likelihood of crowdfunding success (Chan and Parhankangas 2017; Colombo, Franzoni, and Rossi–Lamastra 2015; Cordova, Dolci, and Gianfrate 2015; Hopp, Tykvová, and Kaminski 2019; Mollick 2014). Allison et al. (2017, 712) showed significant influence on crowdfunding success and defined project quality *"via ingredient branding, in which entrepreneurs use the products of other established organizations as components of their own market offerings."*

Furthermore, studies have shown that internal social capital in the form of serial crowdfunded campaigns are more successful than those launched by novice crowdfunders. This can be enhanced by prior experience with crowdfunding campaigns or by close contact with backers and interested parties (Colombo, Franzoni, and Rossi–Lamastra 2015). More recently, the focus has shifted to combining crowdfunding and venture capital literature. Advanced machine learning models show that crowdfunding helps venture capital investors to identify future trends (Hopp, Tykvová, and Kaminski 2019).

Due to the extensive focus on crowdfunding success and the different factors influencing it, there is little research on crowdfunding projects after they have been successfully completed. By definition, a campaign is successful if the funding goal is reached with the amount pledged (Belleflamme, Lambert, and Schwienbacher 2014; Kickstarter 2022). However, the real work begins after the closing of the funding, meaning the subsequent building of a sustainably profitable and solid company. Different funding stages can influence the company's further development if one draws an analogy to the venture capital scene. Often companies have completed their conception phase and try to enter the expansion phase of the company with growth financing.

However, the crowdfunding literature only considers early-stage companies and concludes with the analysis once the campaign is successfully completed. Due to the emergence and increasing importance of different financing options in the venture sector, this paper attempts to combine venture capital and reward-based crowdfunding approaches and literature. Therefore it fills the research gap concerning the role of reward-based crowdfunding projects and their development towards successful businesses. It is unclear from the literature how crowdfunding start-ups evaluate which factors have led to their survival. For this reason, this paper focuses on the 500 most successful crowdfunding projects in design and technology categories and examines the predictors of crowdfunding survival. Derived from the most successful campaigns and their success factors, the following research question emerges:

Based on the most successful crowdfunding projects, what factors predict the survival of reward-based projects?

Kickstarter, one of the world's largest and best-known reward-based crowdfunding platforms, is used to gather data on the 500 most successful crowdfunding projects in design and technology categories. The remainder of the thesis is structured as follows. Firstly, to elaborate on these emerging factors, I conduct an extensive literature review of the broadly researched crowdfunding environment and combine this with insights from the venture capital literature. The transition to crowdfunding survival and the connection to venture capital form the theoretical basis for this study. Based on the review, the hypotheses to be tested are formulated. Secondly, deriving from the hypotheses, I develop the most critical factors for the survival of crowdfunding projects. I study these in several logistic regression models on the binary variable crowdfunding survival, including different predictors retrieved from Kickstarter. The variable funding goal and its behaviour concerning survival is analysed in detail. Thirdly, I conduct an

extensive robustness check by creating a composite variable and performing a bootstrapped regression to artificially increase the sample size and check the results for internal validity. Finally, I provide a summary that highlights the theoretical contribution, identifies the limitations of the current research, and offers suggestions for future research.

2 Theoretical Background and Hypotheses Development

In this paper, (i) the 500 most successful reward-based crowdfunding projects are analysed to validate (ii) the predictors for the survival of crowdfunding projects. The goal is to validate existing success factors based on the most successful projects and elaborate on new variables to identify a successful project. The following sections provide an overview of the existing literature and explain the hypotheses development of this thesis.

2.1 Crowdfunding Background

Crowdfunding is a highly relevant topic in the literature, and the number of publications from last year shows an increasing academic interest. Especially in top-notch journals like Entrepreneurship Theory and Practice or Journal of Business Venturing, interest and publications shifted slightly from venture capital to crowdfunding. In entrepreneurial finance, crowdfunding offers a wide range of options for financing a young company and attracts increasing interest from the youth. The fact that a crowd invests can be traced back to approaches of crowdsourcing (Poetz and Schreier 2012) and microfinancing (Morduch 1999) in the field of entrepreneurial financing.

Even though various definitions and models are prevalent in the literature, a conclusive definition does not exist. However, leading literature refers to the description by Belleflamme, Lambert and Schwienbacher (2014, 5), which define crowdfunding as

> *"an open call, essentially through the Internet, for the provision of financial resources either in form of donation or in exchange for some form of reward and/or voting rights in order to support initiatives for specific purposes."*

In short, it is a type of financing where a large group of investors can make various investments to support smaller companies' projects, ideas, or products.

2.1.1 Different Crowdfunding Models

The literature distinguishes between different models of crowdfunding. Following the research of Mollick (2014), the difference between these models can be explained by the objectives of the entrepreneurs and supporters. There are options with relatively traditional investment mechanisms and different approaches to back early-stage companies. According to Lehner (2013) and Mollick (2014), the most traditional variant describes donation-based crowdfunding. Support based on conviction or positive influence - here, donors do not receive anything in return for their support. Another option is loan-based crowdfunding, where the backer receives a monetary reward (i.e. a share of the profits) (Wierzbicka 2018).

Furthermore, the literature describes the substantially growing segment of equity-based crowdfunding. This can be understood as a regular investment in a company, as in a venture capital deal, and the investor receives shares in the company after the financial transaction. Due to the high incentive of the investor, access to his network or other support is regularly offered by investors to advance the project (Hörisch, 2015; Mollick, 2014). Lastly, reward-based crowdfunding is currently the most frequently used option for entrepreneurs and creators to back their vision. After a detailed analysis of crowdfunding-related publications in two of the most renowned journals in entrepreneurship studies, as well as the high availability of data on the Kickstarter platform, this paper focuses on reward-based crowdfunding (See Appendix A).

2.2 The Role of Reward-based Crowdfunding

Reward-based crowdfunding is currently the most common variant, as described by the well-known crowdfunding researcher Mollick (2014) from the Wharton School of the University of Pennsylvania. Kickstarter offers the possibility of using reward-based crowdfunding with its platform (Kickstarter 2022). It is considered a sub-model and offers backers a reward such as pre-orders or pre-sales opportunities (Lehner 2013; Wierzbicka 2018). This results in a broader exchange of resources between all stakeholders and forms an ecosystem. This ecosystem can contribute to the iterative development and improvement of the business plan, as product orders and proximity to the project helped shape the business plan. In comparison, traditional investors evaluate it through a strict investment criteria framework. Participants enable price discrimination among early adopters through the product pre-order model, such as on Kickstarter (Belleflamme, Lambert, and Schwienbacher 2014). Early supporter trust can keep working capital and start-up costs comparably low. Similarly, a positive effect of increasing awareness can provide an excellent boost to the company and cost

efficiency. This zero-cost capital management technique enables organic growth in the early stages of the business (McKelvie and Wiklund 2010; Vanacker and Manigart 2010).

2.3 Factors influencing Crowdfunding Success

The definition of success of a crowdfunding project is clearly defined on platforms like Kickstarter. Fixed terms, e.g. 40 days, and a communicated funding goal, e.g. $50,000, provide the basic framework of a campaign. If the goal is not reached in the specified term, the campaign is considered a failure and the funding is withdrawn. If the funding goal is reached, the campaign is successful and, in some cases, infinitely oversubscribed. This means that the funding can close significantly and limitlessly above the pre-defined goal - unlike in venture capital, where a signed term sheet from an investor limits the number of investors and funding size. Since the majority of researchers link the success of crowdfunding to the parameters described above, *crowdfunding success* is defined in the further course as closing the funding goal of a crowdfunding campaign.

The crowdfunding literature offers a wide range of crowdfunding success factors. Leading researchers such as Mollick (2014) and Colombo, Franzoni and Rossi-Lamastra (2015) use crowdfunding success as a dependent variable in their studies and examine factors that have maximised the likelihood of successful completion in the past. It is striking that there are multifaceted factors that influence the success of a campaign. Lagazio and Querci (2018) describe these factors as being divided into organisational and marketing categories. The former category includes variables such as the communicated funding goal, the duration of the campaign, the product stage and the size and experience of the founding team. Chan and Parhankangas (2017a) have already explored a similar theme in their study on how radical and incremental innovations influence crowdfunding decisions. Innovations with a more significant incremental effect offer more consumer benefits, which can lead to more favourable funding results (Chan and Parhankangas 2017). Oo et al. (2019a) researched determinants for crowdfunding success. As has already been researched in other literature from the venture capital field, providers with start-up experience have a higher probability of venture success (Oo et al. 2019b). In short, there is a large body of literature on crowdfunding success. From intrinsic and extrinsic motivation fields, the right crowd, and information asymmetry to classic success factors, the topic is extensively researched (Allison et al. 2015; Belleflamme, Lambert, and Schwienbacher 2014; M. Lin, Prabhala, and Viswanathan 2011; Mollick 2014; Ward and Ramachandran 2010; Zvilichovsky, Inbar, and Barzilay 2013).

2.4 What matters - Crowdfunding Survival

After the crowdfunding campaign has been completed, the founding team's work begins. In most cases, prototypes, A/B tests, and production establishment are on the team's agenda. Therefore, with the comprehensive research on crowdfunding success, the question arises: How do crowdfunding projects perform afterwards? Leading to the perspective on successful crowdfunding projects and their development afterwards - *crowdfunding survival*. This is particularly important to ensure the development and growth of the venture and attract potential professional investors. According to an analysis by Sorenson et al. (2016), a more significant number of successful crowdfunding campaigns can lead to a higher number of venture capital (VC) investments. Similarly, Kuppuswamy and Roth (2016), as well as Ryu and Kim (2016), demonstrate that successful reward-based crowdfunding campaigns have a high probability of attracting external VC investors after building momentum. Other researchers have shown that venture capital investors use crowdfunding to predict future trends (Hopp, Tykvová, and Kaminski 2019).

2.4.1 Crowdfunding and Venture Capital Success Factors

In the field of venture capital, different stages require funding opportunities from pre-seed to Series A-F (Adhanan 2022). Most crowdfunding projects are in the early stages of funding. The field of venture capital and the critical factors of a successful startup have been widely researched. Song et al. (2008) studied the success factors in new technology ventures and found that supply chain integration, market scope, and size of the founding team are the essential variables for venture success. Furthermore, other studies select and analyse individual variables in more detail. As Hyytinen, Pajarinen and Rouvinen (2015) prove in their paper, innovativeness is negatively associated with ventures' subsequent survival.

However, if we look at the current state of crowdfunding literature and its focus, we can see that (i) there is significantly more literature in the venture capital space and that (ii) the term 'venture' and 'venture success' are highly discussed topics, whether in venture capital or crowdfunding literature. This raises the question of what exactly determines the survival of successful crowdfunding campaigns and their development into an operating business. In the case of a venture capital-financed start-up, it is often clear that it comes from the derivation of venture capital and the fact that professional investors finance it. However, this definition is not transferable to crowdfunding. In particular, reward-based crowdfunding offers various ways to support a project or business. More specifically, as Beaulieu, S. Sarker and S. Sarker (2015) describe, reward-based crowdfunding projects can be classified into project status, operating

business model, and founding team experience. So different facets of investment criteria to start a campaign on websites like Kickstarter compared to classic professional investments.

Given the crowdfunding literature, several observations can be made. In different studies, the communicated funding goal shows a significant negative influence on the success of a crowdfunding campaign (Colombo, Franzoni, and Rossi–Lamastra 2015; Mollick and Kuppuswamy 2014). The funding goal implies the ambition of the founders but also the level of risk. With a high funding goal, the venture needs a more significant push to take off. Mollick (2014) proved that campaigns funded at ten times their goal are half as likely to deliver a product at a given time compared to projects funded at their goal. However, looking at the crowdfunding literature and the connection to venture capital issues, I examine the variable funding goal and its influence on the survival of a successful crowdfunding project and hypothesize:

H1: A higher funding goal decreases the likelihood of the survival of a crowdfunding project.

The proof of concept, or the production stage, is one of the essential variables in most crowdfunding studies and venture capital literature. The venture capital literature also points out that a lack of product-market fit is one of the top five reasons for start-up failure (Cantamessa et al. 2018). The same applies to the financing of product development. Before massive investments are made, a minimum viable product should exist to move to the next stage, meaning product-market fit should be given (Tripathi et al. 2019). Considering crowdfunding, Schwienbacher and Larralde (2010) have already analysed the business model and product variables. They found different business models and product stages depending on the reward type, especially in the reward-based area. In addition, Mollick and Kuppuswamy (2014) have provided evidence of prototypes or early versions of projects and mentioned past successful projects by name. In crowdfunding, especially in the technology and design categories, many projects do not yet have a prototype or A/B tests available or have set up initial production processes.

Since venture capital investment stages are broader than crowdfunding financing, it is not easy to draw a clear comparison between them. In the professional environment, it is easier to assess the state of technology and the product market fit. To increase the probability of success of a crowdfunding investment, a certain investment size should be reached. An insufficient investment size is among the top reasons for failure. For this reason, I hypothesize that:

H2: A higher technology readiness level increases the likelihood of the survival of a crowdfunding project.

Finally, the founding team and it's experience represents the third crucial building block. Coakley (2022) has found that experienced founder teams have more success since the quality of their human capital may likely appeal to professional investors, which can result in a certification effect. In addition, Leatherbee and Katila (2020) show in their study of the lean startup method that startup founding teams average 2.5 founding members. Supporting this, a team around the world's leading strategy consultancy McKinsey & Company Inc. argues in their analysis of 100 unicorns[1] that the majority (75%) of successful start-ups were launched with two or more founders (Berger-de León et al. 2022). Likewise, on the side of successful crowdfunding campaigns, Li, Cao and Zhao (2018) argue that a larger team size means a higher willingness of investors to invest. The team is more diverse, more broadly positioned and has more capacity for execution. From this, I conclude that a founding team has a positive influence on crowdfunding success as well as on survival and subsequent VC investment and hypothesize:

H3: A larger founding team size increases the likelihood of the survival of a crowdfunding project.

2.4.2 Visual Signals and Project Quality

In addition to the team, the ambitions and the state of the technology, the sales skills of the founders are decisive for the success of a venture. Purchase of the product or investment into the company is unlikely if consumers and potential investors do not understand the product/idea. For this reason, the elaboration of pitch decks is shot in multiple iterations, and

[1] Start-ups with valuations of $1bn or more

the presentation is prepared down to the last detail in order to convince investors of an investment (Leatherbee and Katila 2020).

The same motives prevail in the crowdfunding sector. However, other methods are used to address the crowd. Creators and founders can design their homepage and the Kickstarter campaign page. From images, videos, product explanations and team introductions, different possibilities are being presented by Kickstarter. The literature shows that the higher the level of detail of the crowdfunding campaign, the higher the probability of success (Xiao et al. 2014). The information provided on the homepage can reduce backers' uncertainty and their perceived psychological distance from the offered campaign. Mollick (2014) emphasizes the quality of the project and its influence on crowdfunding success. Mollick (2014) describes quality as a level of preparedness. Besides spelling errors and updates, he investigated whether the preparation of a video and the addition of images influence crowdfunding success. The result is that especially the inclusion of videos and images positively influences successful funding (Colombo, Franzoni, and Rossi–Lamastra 2015; Mollick 2014; Mollick and Kuppuswamy 2014). Images and videos can quickly improve the communication between founders, potential customers, and investors. Therefore it is reasonable to investigate an influence on the survival of crowdfunding projects based on the dataset of the top 500 crowdfunding projects and to formulate the following hypotheses:

H4a: Using videos in Kickstarter campaigns increases the likelihood of survival of a crowdfunding project.

H4b: Using images in Kickstarter campaigns increases the likelihood of survival of a crowdfunding project.

3 Methodology

To investigate the predictors for the survival of successful crowdfunding campaigns, I, like many other researchers, used data from the well-known crowdfunding platform Kickstarter (See Appendix A). The majority of the state-of-the-art crowdfunding research relies on data from Kickstarter, but it is also one of the most essential and significant platforms and is instrumental in the success of campaigns and startups in a wide range of sectors.

Kickstarter is a reward-based crowdfunding platform that acts as an intermediary between project creators looking for funds and backers who contribute to a project in return for a

"reward". To date, approximately 230,000 projects have been supported on Kickstarter, and a total of €6.4bn has been pledged. A total of over 22 million different people have backed projects. With a success rate of 40%, many projects have been successfully implemented (Kickstarter 2022). Kickstarter relies on the principle of all-or-nothing, meaning the entrepreneur receives nothing if the funding goal is not met. As described in the literature, it pushes entrepreneurs to take a higher risk and encourages backers to pledge more capital, enabling entrepreneurs to set bigger goals (Cumming, Leboeuf, and Schwienbacher 2019). Bragi, Inc. developed wireless headphones with their successful project and thus successfully financed the market launch. The same applies to Apple accessory manufacturer Elevation Lab (Feldman 2016).

For the analysis of the 500 most successful crowdfunding projects, I focused on the categories of design and technology for several reasons. Firstly, these two categories represent the highest total funding, $1.51bn and $1.31bn, respectively, assuming a high degree of professionalisation (Kickstarter 2022). Secondly, the most successful projects come from the abovementioned categories, leading researchers to focus on these categories (Colombo, Franzoni, and Rossi–Lamastra 2015; Mollick 2014). Lastly, the categories mentioned reflect the highest similarity to hardware-focused venture capital investors.

3.1 Data Collection

As mentioned above, I drew the sample from the reward-based crowdfunding platform Kickstarter. The analysis considers projects from January 2009 to June 2020 and includes 13,526 projects. Since I am focusing on the 500 most successful projects, I have filtered out the top 500 projects regarding the amount of money raised. In total, 500 crowdfunding projects have raised a total amount of $366,596,212.69. From this dataset, only one project has failed, according to the definition of crowdfunding success and the all-or-nothing method. This project could only reach 68% of the funding goal of $900,000, reducing the extended version of the data set to 499. The other 499 projects were successfully completed on Kickstarter and raised, on average, 1,702% more than their funding goal. Consequently, these are the top-performing and most successful projects on Kickstarter in the abovementioned categories.

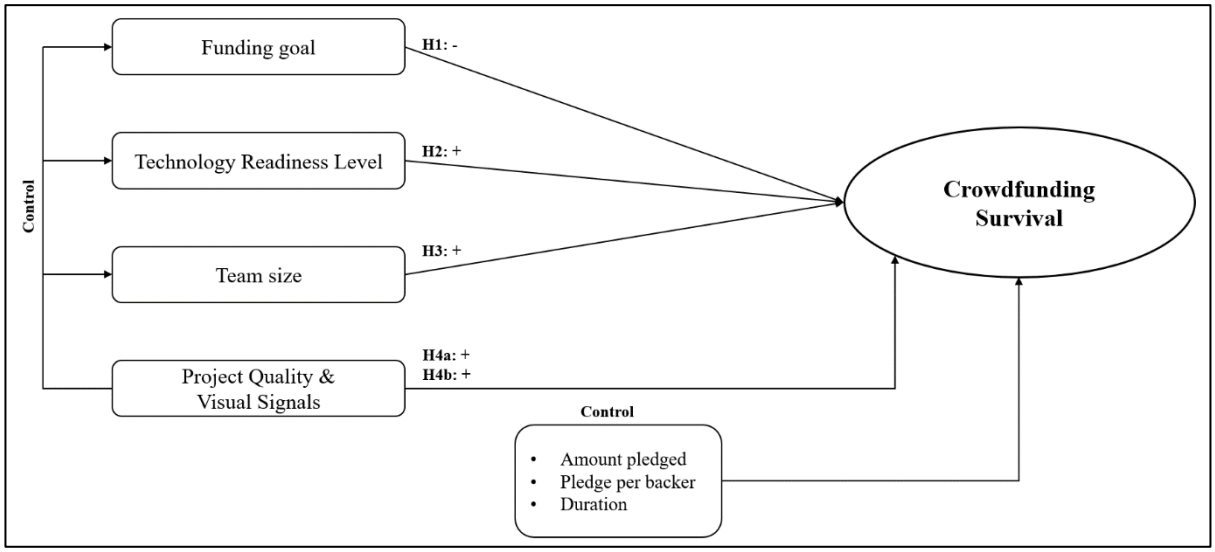
In the next step, the data set was enriched by manually incorporating information points such as the team size, the project's technology status and the duration of the company's existence as an operating business. Furthermore, calculations were made to show the projects' duration, the companies' existence in years and the average funding per backer. The dataset was divided into

two sub-datasets to be used for the analysis. The first one, following criteria by Mollick (2014) and the similarity to the venture capital scene, was created with a funding goal of at least $50,000 (A. Davis 2021). This is due to the rudimentary comparability to the venture capital scene, in which a median of $0.7mio -2.7mio was invested. The resulting 240 data points represent ambitious founders with significantly increased funding. The second dataset represents the recoding of the funding goal variable to a binary, 1 for a funding goal >= $50,000 and 0 for a funding goal below $50,000. This dataset tests the initial model through a robustness check and a broader dataset. Finally, both datasets were winsorized at the top 5% highest amounts to exclude strong outliers.

3.2 Variable Description

The conceptual model is presented below and shows the hypotheses put forward and their direction of effects on the dependent variable crowdfunding survival. In total, five different variables are set up, which are controlled in the model by four variables. The convergence of the first three variables also represents the creation of a composite variable, which is created for the robustness check. The variables and academic elaboration of the results are explained in the following paragraphs. (see Appendix C for a detailed Description)

Figure 1 *- Conceptual Model for Crowdfunding Survival*



3.2.1 Dependent Variable – Crowdfunding Survival

To examine the performance of the top 500 most successful crowdfunding projects and to achieve comparability with different investment levels in venture capital, it is crucial to focus on the ongoing existence of the campaigns after crowdfunding success. Therefore, as described above, I have examined the current existence of crowdfunding projects, which serves as a binary dependent variable for *crowdfunding survival*. Overall, 52.4% (118/227) of the campaigns to be analysed are still existing and successful companies today.

3.2.2 Independent Variables

Funding goal: The amount founders set to achieve crowdfunding success in the All-Or-Nothing approach of Kickstarter. If the goal is reached, the money can be used. Frequently used in the literature as an independent or control variable, it should not be missing from any study on crowdfunding survival (A. Davis 2021; Mollick 2014; Mollick and Kuppuswamy 2014; Schwienbacher and Larralde 2010). Further, it serves as an assessment of the project's ambition and risk factors. If the goal is too low, the ambitions are not considered high, and the project appears riskier and more unrealistic. However, it is influenced by several variables, but it is an elementary variable. Especially in comparison to venture capital scenarios, where larger amounts of money are raised.

Technology Readiness Level: Used to measure the technical status of the project. A metric from a technical environment was deliberately used due to the practical relevance in the design and technology categories. Developed at NASA (National Aeronautics and Space Administration) and widely used in other industries, I transformed the original scale[2] of 1-9 into a binary variable (Mollick and Kuppuswamy 2014; Rybicka, Tiwari, and Leeke 2016; Salazar and Russi-Vigoya 2021). The cut was made between levels 7 and 8. With coding ***1***, which shows a prototype and first sales and ***0*** for missing prototypes and/or first sales.

Team size: As already mentioned, the experience of the team and the size of the team are fundamental to the success of a crowdfunding campaign. As many sources from crowdfunding and venture capital literature report, the critical size of a team is at least two people. For this reason, I have defined the binary variable team size >=2 (Berger-de León et al. 2022; Leatherbee and Katila 2020; Li, Cao, and Zhao 2018; Mollick and Kuppuswamy 2014).

Visual Signals & Project Quality: To focus on crowdfunding in isolation, I have included additional variables for project quality. The variable *videos_count* describes the number of

[2] Basic principles observed and reported - actual system "flight-proven" through successful mission operations

videos published for the campaign on Kickstarter, and the very often used variable *images_count* describes the total number of published images for the campaign. Both were considered in detail by Mollick (2014) and Colombo, Franzoni and Rossi-Lamastra (2015).

3.2.3 Control Variables

To control the model, I selected different variables of the Kickstarter campaign setup. Like Mollick (2014) and Colombo (2015), the variables are divided into classic campaign characteristics, visual signals and project quality. Since all the analysed campaigns were successfully completed, I turned the logic around and included the amount *pledged*. It can serve as a sign of the hype, ambition and conviction of the backers, as well as a mark of the project's success. Similar to Mollick (2014), Colombo, Franzoni and Rossi-Lamastra (2015) and Kuppuswamy and Bayus (2017), I use the terminology “backers”. I explicitly use the ratio between the pledged amount and the total amount of backers - *pledge/backer*. This can indicate how convinced individual backers are about the project. To include another performance indicator and a variable often used in the literature, the number of days the project accepts funding is included - *duration*. The limit is 60 days, whereas Kickstarter encourages 30-day funding windows.

3.3 Summary Statistics and Correlations

Statistics for all 214 campaigns in the data set are presented in Table 1 below.

Table 1 *- Summary Statistics*

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
Survival	227	0.52	0.50	0.00	0.00	1.00	1.00
Team	227	0.78	0.42	0.00	1.00	1.00	1.00
TRL	227	0.22	0.41	0.00	0.00	0.00	1.00
pledged [in $k]	227	637.72	361.66	282.16	371.56	740.29	1,815.08
funding goal [in $k]	227	160.99	125.83	50.37	95.50	200.00	1,000.00
funding level [in %]	227	432.46	400.04	0.95	167.75	552.32	2,338.97
pledge_per_backer [in $k]	227	0.39	0.38	0.03	0.16	0.45	2.51
backers_count	227	3,099.44	3,129.27	182.00	1,,163.50	3889.50	2,3331.00
images_count	227	27.89	16.82	1.00	14.00	36.50	84.00
videos_count	227	0.63	1.32	0.00	0.00	1.00	8.00
Duration [in days]	227	38.68	9.86	21.00	30.00	45.00	60.00
Existence [in years]	227	7.95	1.35	5.80	6.90	8.95	11.40

Analyzing the summary statistics, I can see that of the most successful crowdfunding projects, 52% are still active and appear as operating companies. In contrast to Kickstarter's statistics, already successful projects perform above average. In the technology category, only 22% succeed, whereas the design category has a success rate of 41.44%. In addition, it is particularly striking that larger teams carry out almost 80% of the projects. Looking at the technology level of the projects, only 22% have a degree of maturity that can show prototypes and first production possibilities. Once again, this is a sign of the early stage of the start-ups/projects. The amount pledged and the funding target set by the founders are presented in thousands for simplified interpretation. They reflect ambitious goals of up to $1mio and amounts pledged to $1.8M. Particularly striking are the respective standard deviations, which range between $125,000 and $360,000. This is because these are the top 500 crowdfunding projects, which are, by definition, comprised of outliers. On average, 3,099 backers have supported a project and contributed $390 each. Regarding campaign signals, 100% use at least one image and 63% use at least one video in their campaign presentation. The average campaign duration is about 38 days, whereas the maximum is 60 days. Furthermore, all surviving companies are active for at least 5.8 years after their successful crowdfunding campaign.

Appendix B reports the correlation matrix and the variance inflation factors (VIFs). The maximum VIF was below 2. From this, I can conclude that multicollinearity is not a problem in our estimates.

4 Results

In order to test the hypotheses, various logistic regressions are carried out on the binary dependent variable *survival*. Three logistic models with several control variables are set up for each hypothesis. These are divided according to classical characteristics such as *pledged, pledge per backer* and the indicators for project quality. To examine the influence of project quality on survival, *duration*, *videos count*, and *images count* were used as control variables. Then, after each logistic regression model, an in-depth analysis of the independent variable funding goal, in which a potential u-shape relationship is analysed. Finally, a multi-part robustness check is performed to demonstrate the robustness of the initial model.

Table 2 *- Logistic Regression Analysis Coefficients (Models A-D)*

	Coefficients											
	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3
loggoal	-0.25 (0.24)	-0.28 (0.24)	-0.29 (0.25)								-0.24 (0.24)	-0.29 (0.25)
TRL				2.26*** (0.46)	2.48*** (0.49)	2.46*** (0.50)						
Team							1.08*** (0.34)	1.05*** (0.35)	1.02*** (0.35)			
static_images_count			0.02* (0.01)			0.01 (0.01)			0.02* (0.01)	0.02** (0.01)	0.02** (0.01)	0.02* (0.01)
videos_count			0.02 (0.11)			0.01 (0.11)			-0.01 (0.11)	0.02 (0.10)	0.03 (0.10)	0.02 (0.11)
logpledged		0.36 (0.28)	0.39 (0.29)		-0.40 (0.33)	-0.38 (0.34)		0.16 (0.29)	0.17 (0.29)			0.39 (0.29)
pledge_per_backer		0.93** (0.41)	0.85** (0.41)		0.94** (0.43)	0.88** (0.43)		0.89** (0.40)	0.83** (0.40)			0.85** (0.41)
duration			-0.01 (0.01)			-0.01 (0.02)			-0.003 (0.01)			-0.01 (0.01)
Constant	1.32 (1.17)	-1.16 (2.03)	-1.40 (2.11)	-0.29* (0.15)	1.82 (2.10)	1.59 (2.16)	-0.75** (0.30)	-2.10 (1.82)	-2.44 (1.87)	-0.40 (0.26)	0.76 (1.21)	-1.40 (2.11)
Chi	1.1054	8.3329	12.4555	34.7725	42.1584	44.7571	10.8674	16.4507	19.7917	4.7665	5.7307	12.4555
p	0.2931	0.0396	0.0525	0	0	0	0.001	0.0009	0.003	0.0923	0.1255	0.0525
Pseudo R	0.0035	0.0265	0.0396	0.1107	0.1342	0.1425	0.0346	0.0524	0.063	0.0152	0.0182	0.0396
Observations	227	227	227	227	227	227	227	227	227	227	227	227

Note: *p<0.1, **p<0.05, ***p<0.01

4.1 Crowdfunding Survival predictor funding goal

Hypothesis 1 states that an increasing funding goal negatively influences the likelihood of survival of successful crowdfunding projects. To test the hypothesis, I created three logistic regressions that build on each other. The binary variable *survival* is defined as the dependent variable. The independent variable *funding goal* is highly right-skewed and is, therefore, log-transformed. The model is controlled in the second step (Model A2) by the log-transformed variable pledged and pledge per backer. Model A3 represents the complete logistic regression, in which the variables' duration, the quality indicators' videos count, and the images count are inserted to control for the predictor.

When analysing the three regressions in Table 2, none of the variables listed is a meaningful predictor for the survival of crowdfunding projects. In contrast to the findings of Mollick (2014) and Colombo, Franzoni and Rossi-Lamastra (2015) and their statements on crowdfunding success, the probability of survival cannot be increased with ambitious funding goals. Although we cannot prove the significance of the independent variable funding goal, we can identify the key performance indicator pledge per backer as a significant predictor of crowdfunding survival. With a unit increase, the log odds for survival increase by 0.85 with a **95% significance level**. (see Model A3). The alternative indicator of model fit, McFadden R^2, shows

a low model fit of 0.04. In summary, we find statistically significant evidence that increasing pledges per backer predicts crowdfunding survival.

4.1.1 Testing for a U- or inverted U-shaped relationship

Based on the above findings and findings of Colombo, Franzoni and Rossi-Lamastra (2015) and Mollick (2014), the question arises about the optimal funding goal for crowdfunding success and, more importantly, for crowdfunding survival. Following the findings of Mollick (2014) and Colombo, Franzoni and Rossi-Lamastra (2015), one could conclude that the log odds of survival increase as the funding goal decreases. However, it is against the theory of signalling to declare the lowest possible funding goal. Many Kickstarter campaigns are capital-intensive projects that require a minimum amount of funding. Consequently, it would presuppose a linear relationship with the dependent variable. The logic that an ambitious funding goal decreases the log odds of survival does not mean that the lower the funding goal, the higher the log odds. There are various examples in practice where non-linear relationships exist. One of the best-known is the *'Kuznets curve'* (inverted U between income and inequality) and the *'Environmental Kuznets curve'* (inverted U between income and pollution) (Grossman and Krueger 1995; Kuznets 1984; Selden and Song 1994). The same logic could also apply to the variable *funding goal*.

For this reason, the variable funding goal is examined in detail to understand the effect of the predictor on crowdfunding survival. More specifically, based on findings by Haans, Pieters and He (2016) and Lind und Mehlum (2010), a 3-step approach is performed to test the variable for a u-shape or inverted u-shape relationship. The former relationship describes a non-linear relationship where the independent variable X influences the dependent variable Y to decrease at a decreasing rate down to a minimum, after which Y subsequently increases at a higher rate while X continues to increase. The opposite case occurs when the dependent variable Y increases with the independent variable X at a decreasing rate up to a maximum, after which Y decreases at an increasing rate (Haans, Pieters, and He 2016; Lind and Mehlum 2010).

In the first step, the funding goal squared is regressed on the dependent variable survival (Haans, Pieters, and He 2016). This quadratic equation aims to demonstrate the significant influence of the two variables on Y.

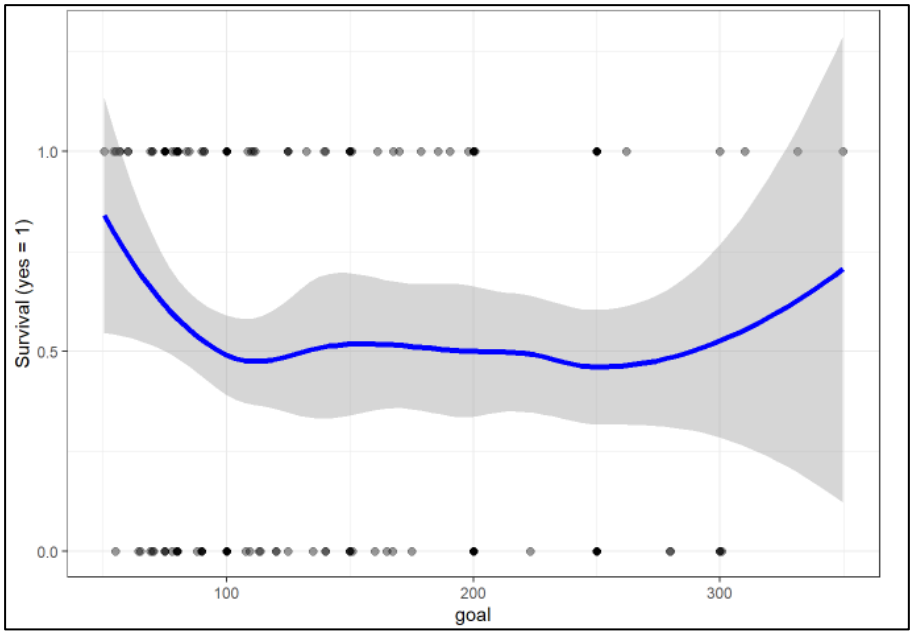
$$Survival\ (Y) = \ ß_0 + ß_1 \times funding\ goal + ß_2 \times funding\ goal^2 \qquad (1)$$

The regression outputs show a slightly significant ß$_1$ of -0.00156 and a slightly significant ß$_2$ of 0.0000023 with a **p-value below 1%.** Even though these are low estimates, they provide a first indication of a u-shape relationship. The second step is to prove that the slope is sufficiently steep at both ends of the data range. For a u-shape relationship, this means that a negative slope must be detected at the minimum of X (X_L) and a positive slope at the maximum of X (X_H) (Haans, Pieters, and He 2016; Lind and Mehlum 2010).

$$ß_1 + 2ß_2 X_L < 0 < ß_1 + 2ß_2 X_H \quad (2)$$

The calculation shows no positive slope with a corresponding significance that can be attributed to the upper end. A slight tendency for u-shape-relationship can be detected through visual evaluation. However, there is a risk that the interval band will be misinterpreted. The frequency of the campaigns clearly shows that the majority of all campaigns are below the $200,000 funding goal. Only the last three campaigns, with a funding goal of over $300,000, give rise to the apparent u-shape. Many campaigns appear to be extreme outliers using Kickstarter's top 500 most successful crowdfunding projects. Therefore, considering the calculation and visualisation, no sustainable u-shape relationship can be determined.

Figure 2 *- Visualisation of the interaction effect between Survival and funding goal*



To finish the approach, the turning point for this relationshhip needs to be checked. For this, I have taken the derivative of equation (1) and set it to zero so that the turning point of the quadratic equation can be calculated as follows:

$$\frac{-ß_1}{2ß_2} = 0 \qquad (3)$$

$$\frac{1.563e{-}03}{2\times 2.336e{-}06} = 334.55$$

According to mathematical calculation, the turning point of the u-shape relationship is $334,550 in communicated funding goal of $334,550. Therefore, applying Haans, Pieters and He (2016) and Lind and Mehlum (2010) as well as a visual cross-check, it can be said with reasonable certainty that there is no statistically significant u-shape between crowdfunding survival and communicated funding goal. The first calculations indicate a non-linear relationship between these variables and the communicated funding goal. However, it is essential to note that the number of data points on the interval band is low on the right-hand side. Hence it does not consitute as a statistically sound proof of a u-shape relationship.

4.2 Crowdfunding Survival predictor Technology Readiness Level

Hypothesis 2 asserts that a particular technology level of the product/service must exist to increase the likelihood of survival of the venture after crowdfunding success. Like a product-market fit, the founders should prove that customers accept a prototype and that technical know-how and production capabilities exist. The binary variable survival serves as a dependent variable, and the influence of the binary independent variable TRL on survival is tested (Technology Readiness Level). In addition, the logistic regression is constructed in three steps with the addition of the control variables mentioned. Model B1 shows the isolated effect of an existing TRL on the survival of successful crowdfunding projects with already highly significant log odds. Suppose founders build prototypes and sell them in small batches to first customers, companies' log odds of survival increase by 2.26 after a successful campaign on Kickstarter. With a McFadden Pseudo-R^2 test, which reflects the degree of improvement of the whole model compared to the null model, the informativeness of the models can be determined. It serves as a model-fit test for logistic regressions and improves from 0.11 to 0.14. Therefore, Model B3 explains 14% of the variation in survival after a successful crowdfunding campaign. As verified in the previous model, a backer's average pledge significantly influences the probability increase of crowdfunding survival. The coefficient log odds can also be converted

into odds ratios. This coefficient indicates the influence on the dependent variable. In our example, we can say that for a one-unit increase in TRL, the odds of surviving after a successful crowdfunding campaign increase by a factor of 10.48. By the same logic, the odds increase by a factor of 2.7 for an average funding increase of $1,000 per backer. Of course, this is a high increase on a per-person basis. However, it represents a similarity to venture capital funding. Oversubscribed start-ups can choose the best investors at the best valuation, thus limiting the cap table. In mathematical terms, it would translate into an increase in the amount per investor ratio. Accordingly, it can be confirmed with a high significance of **p<0.001** that with existing TRLs, the companies' log odds of survival increase by 2.37. Adding the control variables in Model B2 and Model B3 increases the log odds, with a maximum value in Model B2 of 2.48. However, the Pseudo R^2 test reflects a lower model fit of 0.13 than Model B3 with 0.14.
Hence the error reduction attributable to TRL is 32, and the increase in the pledge per backer reduces the error. The model's overall fit is 44.76 and is a chi-squared statistic for one degree of freedom. As we can see, this is significant, so the overall model is better than the previous models. Therefore, we can reject H_0 of hypothesis 2 and conclude that technological maturity, i.e. a product prototype and first sales, is a statistically significant predictor of crowdfunding project survival.

4.3 Crowdfunding Survival predictor Team size

The analyses for hypothesis 3 test whether a team size of two or more founders positively influences the survival of successfully completed crowdfunding projects. Especially in the early stages of a start-up, it can be helpful to make decisions as a team and to look at critical situations from different perspectives. In difficult times, responsibility and uncertainty can be shared among several people. As a result, better decisions are made, which explains why over 75% of unicorns were founded in teams larger than two (Berger-de León et al. 2022). Analogous to the previous models, I built the logistic regression in three steps. First, the isolated effect on survival in teams of two or more is analysed, then the factor of the amount of money raised is influenced, and finally, the effect of visual signals and project quality in the crowdfunding environment is added. Table 2 displays the results and positive significance, especially for the independent variable Team.
In contrast to the previous analyses, it is noticeable that the significance and the log odds decrease in the structure of the models. In Model C1, the log odds for survival increase by 1.08 with a **p-value of 10%** and a team size of at least two people. In odds ratio terms, the probability

of crowdfunding survival increases by a factor of 2.7 for a project/founding team of two or more. In Model C3, the log odds for survival only increase by 1.02, although with a higher significance considering the development of the McFadden R^2 value from 0.04 (Model C1) to 0.05 (Model C3). Like the previous model, the variable pledge per backer significantly impacts the log odds of 0.83 for crowdfunding survival. The result confirms the venture capital environment and shows that team size also plays a fundamental role in successfully developing a project/company in the crowdfunding environment. Accordingly, we can thus confirm hypothesis 3 and establish a significant positive influence on survival through a minimum team size of two people.

4.4 Crowdfunding Survival predictors Visual Signals & Project Quality

Finally, the last two hypotheses 4a and 4b are tested. They state that using visual signals will increase the survival of successfully completed Kickstarter campaigns. As Colombo, Franzoni and Rossi-Lamastra (2015) and Mollick (2014) have already shown, the perceived distance between the product and potential backers through the presentation of video and photographic material can increase success. Therefore, as in the previous sections, the model was built in three steps. In addition to the independent variables *videos_count* and *images_count*, the logistic regression is enriched with control variables. The logarithm is used due to the right-skewed distribution of *amount pledged*. Similar to the studies of crowdfunding authors Mollick (2014), Colombo, Franzoni and Rossi-Lamastra (2015), Allison (2017) as well as Chan and Parhankangas (2017), the logarithmic variable *funding goal* is used as a control variable. Furthermore, the variables duration and pledged per backer act as control variables.

The resulting models show that the coefficient for *images_count* is positive and significant in all three Models D1, D2 and D3. Even though the coefficient is low across the models, a high degree of significance can be observed. Model D1, which tests the isolated effect of project quality on crowdfunding survival, shows the highest significance. This means that an increased number of edited images in the campaign positively influences the campaign's survival. As an indicator of the project quality of a Kickstarter campaign, Mollick (2014) has already shown a positive effect on crowdfunding success. Unlike the studies on success, no significant influence can be detected using videos.

Finally, a logistic regression model was created, including all variables measuring technology status, funding goal and team size. The output can be found in Table 3. The significance of the final model, considering the McFadden R^2, shows a slightly better explanatory power from

Model 1 to Model 3 than the other models. Model 3 of the final logistic regression has the highest significance level with a model fit of 0.16, especially compared to the other models.

Table 3 *- Logistic Regression Analysis Coefficients (Models 1-3)*

	Coefficients:		
	(1)	(2)	(3)
loggoal	-0.09 (0.26)	-0.09 (0.26)	-0.01 (0.28)
TRL	2.16*** (0.47)	2.12*** (0.47)	2.43*** (0.51)
Team	0.91** (0.36)	0.88** (0.36)	0.97** (0.38)
static_images_count		0.01 (0.01)	0.01 (0.01)
videos_count		0.02 (0.11)	-0.003 (0.12)
logpledged			-0.54 (0.36)
pledge_per_backer			0.84** (0.43)
duration			-0.004 (0.02)
Constant	-0.52 (1.30)	-0.89 (1.33)	1.89 (2.42)
Observations	227	227	227
Chi	41.7049	44.1169	51.7178
p	0	0	0
Pseudo R	0.1328	0.1404	0.1646
Note:			*p<0.1, **p<0.05, ***p<0.01

As in the isolated model, we cannot detect any significance for the funding goal. Despite the negative influence on crowdfunding success, no statistically significant influence can be observed when analysing the most successful crowdfunding projects on Kickstarter. If we compare the level of technology in the final model with that in the isolated regression, there is a slight change in the log odds, but still with a high significance of **p<0.01**. (2.43 instead of 2.48) The size of the team as a predictor for the survival of crowdfunding projects loses significance, and log odds influence the survival rate. This may be due to the technological level of the project. A single founder with a proven prototype probably has better starting conditions than a team of founders with just concepts. It may be that the individual founder has good mentors or has gained specific experience in his segment. Consequently, the company of a single founder has a better technology status at the campaign's launch. To verify this claim, the variables influencing crowdfunding survival are visualised below.

Figure 3 *- Visualization of predicted probabilities of Survival influenced by TRL*

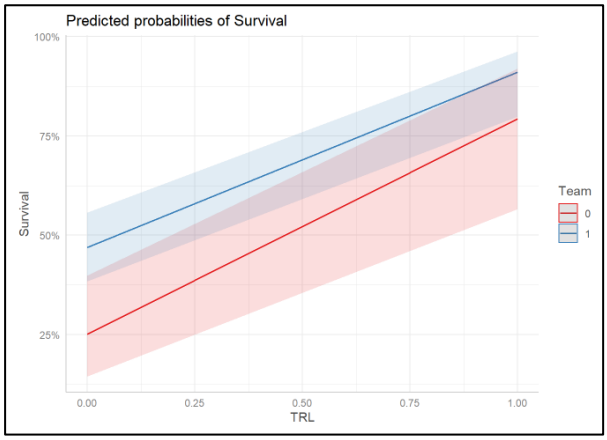
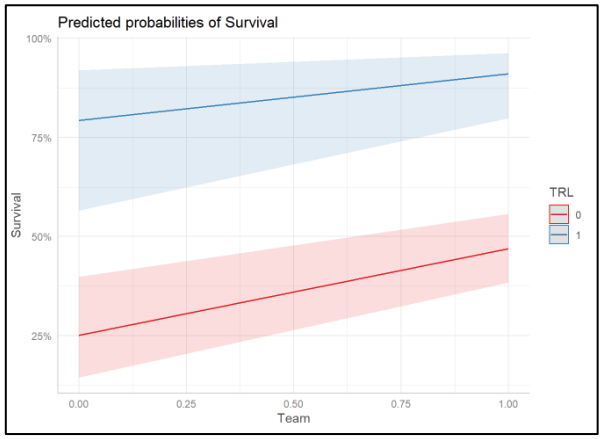


Figure 4 *- Visualization of predicted probabilities of Survival influenced by Team*



As visualized in the figures, the TRL significantly influences crowdfunding survival. Despite team size's significant influence (see Figure 3), Figure 4 on the right shows the massive difference in crowdfunding survival with an existing or non-existing technology readiness level. The claim that individual founders with a current TRL have an equally high probability of crowdfunding survival can be accepted.

The last hypotheses 4a and 4b, also stated that using visual signals as a project quality indicator positively influences the project's continued existence. Derived from the crowdfunding literature, which proves that the use of visuals has a significant positive impact on the successful completion of a crowdfunding campaign, we investigated whether this is also the case for crowdfunding survival. If we look at Table 3, we cannot detect any significant influence on the survival of crowdfunding projects. Contrary to models D1 to D3, the use of image material shows no influence on survival. This may be because the independent variables used have too much weight on the prediction that visual signals do not show a highly significant influence. In addition, we can see a higher significance of Model 3 of 0.16 McFadden R^2 value. Similarly, the analysis of variances (ANOVA) shows a significant Chi^2 coefficient of 51.7, speaking for its overall model fit.

This paper aims to analyse the 500 most successful crowdfunding projects on Kickstarter and to work out factors influencing the survival of successful projects. Based on the literature, hypotheses were developed to test the influence of team size, the state of the technology and the funding goal of the founders as predictors for crowdfunding survival. In addition, the influence of visual signals and project quality indicators from the literature on the survival of crowdfunding projects was examined.

4.5 Robustness Check

As a robustness check, I created additional models and estimates to assess the robustness of the original model and the results. The first, with a newly created composite variable, to pre-empt multicollinearity of the independent variables and to check robustness. The second, a bootstrapped logistic regression model, was set up to expand the sample data artificially and validate estimates of standard errors and confidence intervals. Bootstrapping is a robustness check of logistic regressions and aims to test internal validity through stable estimates and low bias.

The first model was applied to a comprehensive data set and regressed with a newly created composite variable. As a composite variable is more robust than a one-dimensional variable, I tested the pooled effect of the independent variables on the binary dependent variable crowdfunding. By recoding the independent variable funding goal, which is now set up as a binary variable, the sample size was increased from 227 to 446 campaigns. The cut is no longer made at a >=$50,000 funding goal (as a continuous variable in the initial model), but a dummy variable is created that equals **1** if the funding goal is above $50,000 and **0** if below. To create a composite variable, it is usually necessary to standardise the variables to ensure their comparability. However, this does not apply to binary variables, so the sum of the three values is formed as a new composite variable. This results in a three-level categorical variable that influences the dependent variable, crowdfunding survival. The results obtained with this method of increasing the data set are entirely consistent with the results presented earlier and show significance in two more predictors, as seen in Table 4. Expressed in odds ratio, the probability of crowdfunding survival increases by a factor of 3.3 if the composite variable increases by one unit. In other words, if one criterion of the independent binary variables is valid, the probability of survival increases significantly.

Table 4 *- Logistic Regression Analysis Coefficients with Composite Variable*

	Coefficients:		
	CO1	CO2	CO3
composite	0.90***	0.89***	1.20***
	(0.13)	(0.13)	(0.16)
static_images_count		0.004	0.003
		(0.01)	(0.01)
videos_count		-0.02	-0.02
		(0.07)	(0.07)
log(`funding level`)			0.35***
			(0.09)
log(pledged)			-0.74***
			(0.23)
pledge_per_backer			-0.03
			(0.40)
duration			-0.01
			(0.01)
Constant	-1.41***	-1.48***	0.87
	(0.25)	(0.29)	(1.30)
Chi	53.2941	53.6445	75.7922
p	0	0	0
Pseudo R	0.0864	0.087	0.1229
Observations	446	446	446

*p<0.1, **p<0.05, ***p<0.01

We can observe an increase in log odds of 0.35 ($p<0.001$) by the funding level variable, which was included as an additional control variable. This means that the log odds for survival of crowdfunding campaigns increase by 0.35 with a funding level increase of 1%. Interestingly, the model also shows a significant decrease in log odds of -0.74 by the amount pledged ($p<0.001$). Accordingly, an increase of 1% in the amount pledged causes the log odds for crowdfunding survival to decrease by 0.74. Hence, it could be inferred that more money raised leads to more growth and better implementation. However, the small data set on the most successful crowdfunding projects shows the opposite, and this could be due to the overwhelming amount of money that the founders collected at that moment.

Nevertheless, there are always cases of fraud on Kickstarter, where founders embezzle the collected money and do not use it for the designed project or company. However, expanding the dataset can make both variables more meaningful. It also proves that founders with a higher funding level, i.e. the ratio of funding goal to amount pledged, have a higher probability of survival. Therefore, it can only be caused by the variable funding goal in the fraction's numerator because an increased amount pledged negatively influences crowdfunding survival. This result about the relationship between the amount pledged and the funding goal provides

the information that a high funding level significantly increases the probability of survival of a crowdfunding project. This may be because of the weighting and importance of the primary independent variables, such as the created composite variable. Conclusively, a McFadden R^2 model-fit of 12.3% of the variance explanation can be detected and indicates a meaningful and statistically robust model.

In a second model, the computer-intensive resampling technique bootstrapping was performed on the initial logistic regression model. Given the small data set, bootstrapping is an excellent way to check the internal validity of the model robustness, and Steyerberg et al. (2001) claim it is the most efficient way of validation. By sampling from the original dataset that replaces the same size as the original dataset, bootstrapping allows repeating the process of sampling from an underlying population. Consequently, *"models can be developed in bootstrap samples and tested in the original sample or in subjects not included in the bootstrap sample."* (Steyerberg et al. 2001).

To build up a proper size for our small data set, I chose an iteration of 5,000 for the bootstrapping process. Through frequent repeating, estimates and confidence intervals can be derived from the artificially enlarged data set and consequently, the statements already made can be examined in terms of robustness. The analysis shows significance for all independent variables from the empirical output. Thus, with 95% probability, the log odds lie in the evaluated range. Similar to the initial model, we can recognise a significant effect of the log odds from the funding goal. As the 95% confidence interval (-4.16, -037) shows, an increasing funding goal reduces the log odds for crowdfunding survival. The intercept resulting from the initial model represents the log odds of a team's survival probability after a successful crowdfunding campaign. Although the intercept is almost significant, a more stable distribution of the individual variables on the dependent variable can be tested in the bootstrapping procedure. Looking at the 95% confidence interval of the intercept, the log odds are similarly high. However, as shown in Figure 5 (see Appendix D), a more stable distribution of the log odds effect on the model can be recognised through bootstrapping.

As the theory of the central limit theorem describes, many independent samples approach a normal distribution, even if the underlying population is not normally distributed (Hoeffding 1951). Consequently, the log odds effect on the dependent variable approaches a normal distribution through the replication of the sample distribution. In summary, the bootstrapping procedure underpins the internal validity of the elaboration and the robustness of the individual variables in the model.

5 Discussion

Within the entrepreneurial finance literature, the crowdfunding shand of literature has recently been steadily growing. This form of financing offers a versatile and, in the early days, cheaper alternative to venture capital financing. On the one hand, founders can protect their shares and voting rights in the company through diverse incentive options and build up their business in a capital-efficient way. On the other hand, it offers the crowd an attractive investment opportunity or first-hour participation in a promising business idea. For these reasons, much like the growing venture capital industry, crowdfunding is being explored from various angles. Different perspectives influence the success of young companies, and crowdfunding projects can contribute to their success. Reward-based crowdfunding is the most prominent and relevant form, which has become known to young founders via the Kickstarter platform.

Similarly, most of the research focuses on reward-based crowdfunding and explores success factors and variables that have a positive respectively negative influence on the success of a campaign. Here, quality features and project durations play a significant role in successful completion (Mollick 2014). In addition, it has been shown that the amount of capital raised and backers mediate the effect of internal social capital on the campaign's success in the project's early days (Colombo, Franzoni, and Rossi–Lamastra 2015). In contrast to venture capital and business angel investments, building a community is vital for reward-based crowdfunding projects (Belleflamme, Lambert, and Schwienbacher 2014). Similarly, a successful crowdfunding campaign can attract follow-up investments from venture capital investors (Hopp, Tykvová, and Kaminski 2019).

However, most leading researchers focus on the term crowdfunding success, which describes the successful completion of a campaign on Kickstarter. The resulting question, especially regarding follow-up investments from the venture capital sector, is aimed at the time after the campaign. Building on predictors and success factors for crowdfunding success, this thesis analyses the influence on the survival of crowdfunding projects. In addition, essential success factors from the venture capital world are considered to include the most critical variables in entrepreneurial finance.

5.1 Theoretical Contribution

The study contributes to crowdfunding and entrepreneurial finance research in several ways and adds to the theoretical richness of the crowdfunding literature. The three leading contributions are listed below, followed by a detailed elaboration of the main findings, limitations and future research areas.

First, the study builds on the work of Mollick (2014), Colombo, Franzoni and Rossi-Lamastra (2015) and Belleflamme, Lambert and Schwienbacher (2014) and expands the observation horizon of crowdfunding projects. The analysis of the success of a campaign has been extensively researched, and all relevant predictors have been determined. This study focuses on the survival of successfully completed campaigns on Kickstarter and develops predictors and factors that make survival more likely. Further, this study broadens the horizon of the literature in crowdfunding research and identifies key factors that have ensured long-lasting economic survival for the most successful crowdfunding projects.

Second, this study offers a distilled view of Kickstarter's top 500 most successful crowdfunding projects in design and technology categories. In contrast to the existing body of research, which uses extensive data sets, this approach allows for comparability with venture capital literature. According to the Kickstarter definition, 499 of the 500 most successful crowdfunding projects have been successfully completed, meaning that a comparison can be made with successfully financed start-ups. Of course, the 500 campaigns also include hypes and outliers. However, the focused view of crowdfunding and venture capital literature has identified the most critical factors for crowdfunding and startups' survival. In addition to no failed campaigns in the data set, significantly above-average amounts of money were raised. This presupposes a higher degree of professionalism on the founders' end, which reflects the main drivers for successful financing in the venture capital field.

Third, this paper combines the findings from the crowdfunding literature with the findings from the venture capital literature and applies them to the dependent variable, crowdfunding survival. For the successful completion of a campaign on Kickstarter, isolated factors were considered that play an essential role in the campaign set-up and the crowd's decision-making process. Similarly, the venture capital literature focuses on deep factors such as the experience or educational background of the founders. Combining factors from both areas could validate results, specifically for crowdfunding survival, because factors such as a diverse and aligned team or a certain level of technology play an essential role in the transition from a project to an operating company.

5.2 Main Findings

In my analysis of the 500 most successful crowdfunding projects on Kickstarter, I identified variables that significantly positively influence the survival of crowdfunding projects. Contrary to previous research on crowdfunding success, no significant impact of the communicated funding goal on crowdfunding survival could be proven. As tested by Mollick (2014), Colombo, Franzoni and Rossi-Lamastra (2015) and Allison et al. (2017), the independent variable shows no significant impact on crowdfunding survival. Even in the robustness test and bootstrapping of the model, the variable remains insignificant. Therefore, we cannot reject hypothesis 1 and prove no relationship between funding goal and crowdfunding survival.

In contrast to the previous variable, the examination of the technology readiness level of the project shows a high significance in predicting crowdfunding survival. Due to the choice of the design and technology categories, these are mainly hardware-intensive projects/business ideas. If a prototype and preparations for large-scale production exist, the probability of survival increases significantly after the end of the campaign. Accordingly, hypothesis 2 is confirmed, and all its decisive variables are verified. Especially in comparison with the team size, the influence of the technology level turned out to be very important. The investigation of hypothesis 3 showed how important team size is for the long-term survival of crowdfunding projects. Team size has a significant influence on survival. Both venture capital-oriented analyses and the models developed in this thesis consistently show a high significance for crowdfunding survival. Similar to the venture capital literature, it has been shown that a team size of at least two people significantly increases the probability of crowdfunding survival.

Success factors from the crowdfunding literature were used to formulate hypotheses 4a and 4b. The consideration of visual signals and project quality of the respective campaigns comes from studies of Mollick (2014) and Colombo, Franzoni and Rossi-Lamastra (2015). Both claim that using video and image material has a significant positive influence on crowdfunding success. Nevertheless, the variables videos_count and images_count, defined as project quality, showed no significance in Models G1 to G3. Only Models D1 to D3 showed significance, with low log odds coefficients for the variable images_count. The low significance and the underrepresented results could be the above-average influence of technology and team size. When looking at other studies, it is noticeable that the variables mentioned were only tested in isolation and on extensive data sets. Though, in the most successful crowdfunding projects, the independent variables of technology readiness level and team size were significantly more critical in comparison to the average of all Kickstarter campaigns.

5.3 Limitations and Future Research

Due to the limited scope of this thesis, it does not aim to cover the survival factors of crowdfunding entirely. However, the limitations of this analysis provide promising starting points for future research. First, I rely solely on data from Kickstarter, the largest crowdfunding platform in the world. Consequently, only reward-based crowdfunding from a single data source is analysed. Besides Kickstarter, other reward-based crowdfunding platforms have their justification and produce exciting companies (e.g. Indiegogo) and enrich the data set. Similarly, focusing on one funding type limits the perspective for funding types such as equity crowdfunding. The fast-growing crowdfunding subform offers more parallels to venture capital financing (Ahlers et al. 2015; Pollack et al. 2021). Buying shares in the company requires more thorough due diligence on the part of the backers, which demands a more professional environment. Due to new regulatory changes, this type of financing is becoming more popular and attractive for both parties, founder and backer (Cumming, Johan, and Zhang 2019; Pollack et al. 2021). Consequently, the identified survival factors cannot be generalised for the entire crowdfunding industry. It is recommendable for future research to (i) broaden the horizon to several reward-based crowdfunding platforms and (ii) include other types of funding, such as equity crowdfunding, to develop predictors for crowdfunding survival.

Second, this paper focuses exclusively on the 500 most successful projects in Kickstarter's design and technology categories. With only 32,165 projects in these two categories and 230,711 successfully completed projects on Kickstarter, this data set reflects a rather small and concentrated sample size (Kickstarter 2022). The reasoning was to analyse the above-average projects and derive conclusions from them. Finally, a certain comparability to venture capital financing was necessary, where significantly higher investments are made (Berger-de León et al. 2022; A. Davis 2021). In addition, the focus was on design and technology categories, as Mollick and Kuppuswamy (2014) proved in their paper that most overachievers are in hardware and product design (Mollick and Kuppuswamy 2014). Statically, these projects can also reflect a form of outliers that have pledged above-average amounts due to factors that are difficult to measure, such as hype or exceptional timing. This leads to the assumption that survivorship bias makes replication of the results difficult, and the findings cannot be extended to an entire group (Brown et al. 2015; Carpenter and Lynch 1999). For this reason, the results are limited to the aforementioned categories and a group of successful Kickstarter campaigns. In the future, the research could expand the dataset by including other categories and campaigns to create a

broader database, consequently leading to more robust statements for the survival of reward-based crowdfunding. The results obtained so far can be interpreted as a guide, and the findings can be validated with a data set extension.

Third, I have introduced new variables into the crowdfunding literature. In this composition, and by combining venture capital and crowdfunding literature, a variable set has emerged that has not yet been explored in the crowdfunding field. It starts with the technology readiness level, derived from technical rocket science. It serves as an interpretation of a technical product market fit. I made a manual assessment of the 500 projects. This assessment was limited to a binary variable and can only be applied to hardware-focused products. Accordingly, it is advisable to define this variable more thoroughly. Due to the high relevance of this variable, findings can be transferred to other regions in entrepreneurial finance. For the variable team size, refining the definition and including softer factors could be relevant. For example, as Allison et al. (2017) have already investigated, the founders' education and experience influence success. Finally, the u-shape relationship examination of the variable funding goal showed that the distribution is right-skewed and does not allow a definitive statement. It is, therefore, worth analysing this variable in more depth in the context of crowdfunding survival. A new evaluation and, consequently, a better distribution of the interval band, e.g. $0 to $200,000 funding goal, would possibly shed more light on the u-shape relationship of the funding goal.

Finally, this study represents solid and extensively robustness-tested results. Nevertheless, it is recommended that future research reinforces findings with a broader focus on other crowdfunding types and expansion of the dataset. By including different types of funding and expanding the data points, the research allows for more robust statements about crowdfunding survival and consequently applies the developed framework more broadly. Moreover, the variables used can be expanded by including softer factors and a scaling measure. These steps can contribute to further research and the ongoing convergence of the entrepreneurial finance topics of crowdfunding and venture capital.

6 Conclusion

Crowdfunding, especially Kickstarter as a platform, has grown significantly in recent years in terms of popularity and attractiveness for a founder. The main reasons for the possibility of cost-efficient financing in the early stages and the chance for efficient marketing, Kickstarter offers promising opportunities for early-stage ventures. Pebble, Oura Ring or Peleton Inc. started on Kickstarter and were able to raise seven-figure investments from professional venture capital investors in subsequent funding rounds. In addition to collecting money, crowdfunding allows for market research regarding consumers' needs and demands. As a result, product market fits can be achieved, and companies can be built for the long term. Crowdfunding offers an alternative way for early-stage ventures to position themselves for venture capital investors further down the line (Hopp, Tykvová, and Kaminski 2019). Through extensive research on the success of crowdfunding campaigns on Kickstarter, I have explored predictors for the survival of crowdfunding projects in this paper. I focused on the 500 most successful projects and examined the effect of the funding goal, technology readiness level, team size and visual signals on survival.

In contrast to the existing crowdfunding literature on crowdfunding success, I could not identify statistically significant evidence for funding goals as a predictor. Interpreting the crowdfunding literature in a novel way, I found that prototypes and first sales significantly increase the likelihood of crowdfunding survival. In addition, the hypothesis from the venture capital literature that a team with two or more people is significantly more successful was confirmed. In contrast to the findings of Mollick (2014) and Colombo, Franzoni and Rossi-Lamastra (2015), I was unable to provide conclusive evidence for a positive influence of visual signals and project quality on crowdfunding survival. An isolated logistic regression with low significance showed that the use of images could have a positive effect on crowdfunding survival.

This study provides a bridgehead for further research of entrepreneurial finance topics to improve the learning trajectories of entrepreneurs on crowdfunding platforms. The comprehensive findings can serve entrepreneurs as well as researchers to understand better crowdfunding and the process of creating a successful business. Additionally, this thesis provides extensive opportunities to deepen the research on crowdfunding and its positive and negative aspects.

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Appendix A: Literature Review

Authors	Title	Key Findings	Platform	Methodology
Mollick (2014)	The dynamics of crowdfunding: An exploratory study	Dynamics of success and failure among crowdfunded ventures	Kickstarter (48,526 campaigns)	Reward-based Exploratory empirical study
Wessel, Thies and Benlian (2022)	The role of prototype fidelity in technology crowdfunding	Role of prototype fidelity and resource acquisition of nascent technology ventures in online CF	Kickstarter (7,776 campaigns)	Reward-based Exploratory empirical study
Lin and Pursiainen (2022)	Regional social capital and moral hazard in crowdfunding	Relationship between entrepreneurs' home-county social capital and their crowdfunding performance	Kickstarter (223,679 campaigns)	Reward-based Exploratory empirical study
Davis et al. (2017)	Funders' positive affective reactions to entrepreneurs' crowdfunding pitches: The influence of perceived product creativity and entrepreneurial passion	Funders' perceptions of product creativity and entrepreneurial passion	Kickstarter (1,020 campaigns)	Reward-based Exploratory empirical study
Allison et al. (2017)	Persuasion in crowdfunding: An elaboration likelihood model of crowdfunding performance	Elaboration likelihood model of persuasion (ELM) to develop and test a model of persuasive influence in crowdfunding	Kickstarter (383 ventures)	Reward-based Exploratory empirical study
Hopp, Tyková and K(2019)	Launching for success: The effects of psychological distance and mental simulation on funding decisions and crowdfunding performance	Backers form mental representations of crowdfunding campaigns	Kickstarter (961 campaigns)	Reward-based Exploratory empirical study
Kukk (2022)	Predicting business failure after crowdfunding success: Are platforms the unsung heroes?	How the uniquely restrictive initial ruleset fared, focusing on business failure as a straightforward measure of investment losses	Kickstarter (380 campaigns)	Reward-based Exploratory empirical study
Chan and Parhankangas (2017)	Crowdfunding Innovative Ideas: How Incremental and Radical Innovativeness Influence Funding Outcomes	The effect of innovativeness on crowdfunding outcomes	Kickstarter (334 campaigns)	Reward-based Exploratory empirical study
Josefy (2016)	The Role of Community in Crowdfunding Success: Evidence on Cultural Attributes in Funding Campaigns to "Save the Local Theater"	The effects of community context on crowdfunding success.	Kickstarter & GoFundMe (176 campaigns)	Reward-based Exploratory empirical study

Appendix B: Correlation Matrix

Table 5 *- Correlation Matrix*

Means, standard deviations, and correlations with confidence intervals

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Survival	0.52	0.50									
2. Team	0.78	0.42	.22** [.09, .34]								
3. TRL	0.22	0.41	.37** [.25, .48]	.15* [.02, .27]							
4. pledged	637.72	361.66	.06 [-.07, .19]	.14* [.01, .26]	.36** [.24, .47]						
5. goal	160.99	125.82	-.03 [-.16, .11]	-.01 [-.14, .12]	-.12 [-.24, .01]	.16* [.04, .29]					
6. funding level	432.46	400.04	.17** [.05, .30]	.13 [-.00, .25]	.38** [.27, .49]	.67** [.60, .74]	-.44** [-.54, -.33]				
7. plegde/backer	385.32	376.49	.15* [.02, .28]	.04 [-.09, .17]	.02 [-.11, .15]	-.02 [-.15, .11]	-.05 [-.18, .08]	-.00 [-.13, .13]			
8. static_images_count	27.89	16.82	.14* [.01, .27]	.08 [-.05, .21]	.10 [-.03, .23]	-.02 [-.15, .11]	-.04 [-.17, .09]	.00 [-.13, .13]	.07 [-.06, .20]		
9. videos_count	0.63	1.32	.04 [-.09, .17]	.06 [-.07, .19]	.02 [-.11, .15]	-.01 [-.14, .12]	.06 [-.07, .19]	-.05 [-.18, .08]	.08 [-.05, .21]	.17* [.04, .29]	
10. duration	38.67	9.86	-.01 [-.14, .12]	-.01 [-.14, .12]	.06 [-.07, .19]	.17* [.04, .29]	-.16* [-.29, -.04]	.22** [.09, .34]	-.08 [-.21, .05]	.06 [-.07, .19]	.08 [-.05, .20]

Note. M and SD are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$.

Appendix C: Detailed Variable Description

Table 6 *- Detailed Variable Description*

Variable	Description
Survival	Dummy =1 if the successful crowdfunding campaign is an active operating company; 0 if not existent anymore
Team	Summy = 1 if the founding team is larger than two people; 0 if only one person
TRL	Dummy = 1 if the technology level of the product of the campaign had a prototype and first sales; 0 if not (Analogy from rocket science, to evaluate the technical status of hardware-focused product)
pledged [in $k]	Amount raised by the founding team via Kickstarter (calculated to thousands)
funding goal [in $k]	Funding amount which was set as an objective to raise (calculated to thousands)
funding level [in %]	A mathematical relationship between the amount pledged and the funding goal
pledge_per_backer [in $k]	A mathematical relationship between the amount pledged and total backers per campaign
backers_count	Total number of backers for each campaign Total
images_count	Total number of images used for a campaign
videos_count	Total number of videos used for a campaign
Duration [in days]	Campaign duration in days
Existence [in years]	Existence of an operating company after successful campaign closure on Kickstarter

Appendix D: Results Robustness Check

Table 7 *- Bootstrapping Statistics*

	:			95% Confidence Interval	
original	Original	Bias	Std. Error	5%	95%
t1*	4.2459	-5.7208	3.2734	3.4820	10.6290
t2*	0.9650	-0.0466	0.3997	0.2462	1.8552
t3*	2.4122	-0.0260	1.0677	1.5270	4.0650
t4*	-0.9060	0.9083	0.8290	-3.5794	-0.2468
t5*	-0.0054	-0.0021	0.0169	-0.0356	0.0314
t6*	0.0029	-0.0042	0.1304	-0.2402	0.2873
t7*	0.0139	-0.0001	0.0094	-0.0038	0.0327
t8*	-0.4866	0.4867	0.4526	-2.2894	-0.1388
t9*	0.2069	-0.2071	0.7432	-0.9975	1.9509
t10*	0.8531	0.1037	0.5116	-0.1615	1.7799

Figure 5 *- Visualizations Bootstrapped Regression*