



ARTICLE

Measuring project success: the fulfillment rate of crowdfunded projects on Kickstarter

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(First published online Dec 28 2022)

Abstract

Crowdfunding through platforms like Kickstarter is a common way to finance development projects for innovative products. These projects have a risk of failure that is not always communicated clearly to the people providing the money (backers). In this paper data from 35 crowdfunded projects is collected and analysed. It is used to estimate the probability that projects deliver the promised rewards to the backers, also known as the delivery rate or fulfillment rate. The results show that approximately 30 percent of projects are fulfilled or delivered on time or with less than six month delay. 40 percent of projects fail to deliver anything. This is in line with data about other IT projects. There are no significant relations between known project characteristics and the delivery status. The paper concludes with recommendations for crowdfunding platforms on how to improve transparency.

Keywords: Crowdfunding, project management, Kickstarter, project risk, fulfillment

1. Introduction

Crowdfunding is a method for creators to collect money from a large group of people (backers) for a specific purpose, such as realizing a project. To make this process fair, the backers should be accurately informed of the risk and rewards of pledging: there is a significant risk that the project fails and in this case they will not get the promised benefits. Potential backers should get accurate information on the risk of failure, so that they can make an informed decision whether to pledge money. The risk of failure does not have to be zero: it is good for society that people formulate innovative projects in which they try things they have not done before.

Whether a project delivers the promised results to backers is called fulfillment or delivery on a campaign. In project management one would typically call this project success. One can thus define the delivery status of a project based on whether and when results have been delivered, and the delivery rate as the percentage of a number of crowdfunded projects that have been delivered. The delivery rate of crowdfunded projects is an important research topic for two reasons.

- From a project management perspective, it is important to understand why projects fail so that the failure rate can be reduced.
- From the perspective of crowdfunding platforms, it is important that crowdfunding is seen as fair, transparent and overall trustworthy.

Research into project management is severely limited by a lack of data: companies are reluctant to publish details on their projects since these projects are strategic, and people are motivated to focus on their success stories and share less information on failed projects. This creates a bias in available data. The research in this paper addresses this problem by using an underused source of project statistics: crowdfunded projects. Crowdfunded projects provide a unique source of publicly available data on actual projects. In this research I select projects based on campaign pages, without any survivorship bias. Relevant project data is collected and used to determine which project management best practices are used in practice, and what the impact of project characteristics is on project success.

The second reason the research is important is to provide accurate information to potential backers on the risk of backing projects. There is a tendency in the crowdfunding field to not communicate the success rate clearly: many people use the word success to indicate that money was received, regardless of whether the project is actually realized. People sometimes seem to believe that collecting the money is the hard part of the projects, and thus speak about crowdfunding projects instead of crowdfunded projects. The fulfillment or delivery is seen as an afterthought. For some marketeers or marketing agencies it is true that they get paid immediately after a project is successfully funded. So from their perspective the project is completed and successful once the fundraising is successful. From the perspective of the creator or the backers who fund the project, the project is only completed if the promised product is developed, produced and received by the backers.

Definitions

A project is, according to Project Management Body of Knowledge [Pro17], a temporary endeavor undertaken to create a unique product, service, or result. Projects are essential in today's business environment. Businesses operate in a dynamic environment with customers with changing needs and expectations. Projects are formulated to make to meet these new needs, by creating innovative products or improved service.

Unfortunately, not all projects are successful. The Standish group has been collecting statistics on the successful completion of IT projects [Gro15]. They classify finished projects into three categories: successful, challenged and failed. Projects are successful if they deliver the planned result in budget, in time with a satisfactory result. Projects are challenged if they deliver a less than planned, later than planned or not in budget. Projects are classified as failed if the project is terminated before a result is delivered. The data on the success rate of software projects as collected by the Standish Group is shown in figure 1. One sees that the data distribution is stable over time. Only one third of projects is successful, one third is challenged and one third is failed.

Although these conclusions have been established through research on mostly non-crowdfunded software projects, it is a priori likely that crowdfunded projects have similar success and failure rates. A lot of research has been done on project management, with mixed results. Brooks [Bro95] has identified several failure patterns and identified that there is no 'silver bullet' method or tool that will solve all project management problems. Research by Capers Jones into software metrics and productivity have discovered that projects of all sizes and types suffer from delays. Practical initiatives have led to standards for project management such as Prince2 and PMI and the formulation of the project management body of knowledge. Professional organisations such as IPMA have formulated project manager certifications. Standard institutions such as NEN have created practical guidelines indicating common software project risks and controls [NEN19]. Despite all these efforts, the failure rate of IT project has remained constant throughout the years. As Brooks predicted, there is no 'silver bullet' tool or method that has had a drastic impact on success rates, despite frequently changing project management paradigms [Pol07].

Although there is a large body of knowledge containing experience based advice, there is not

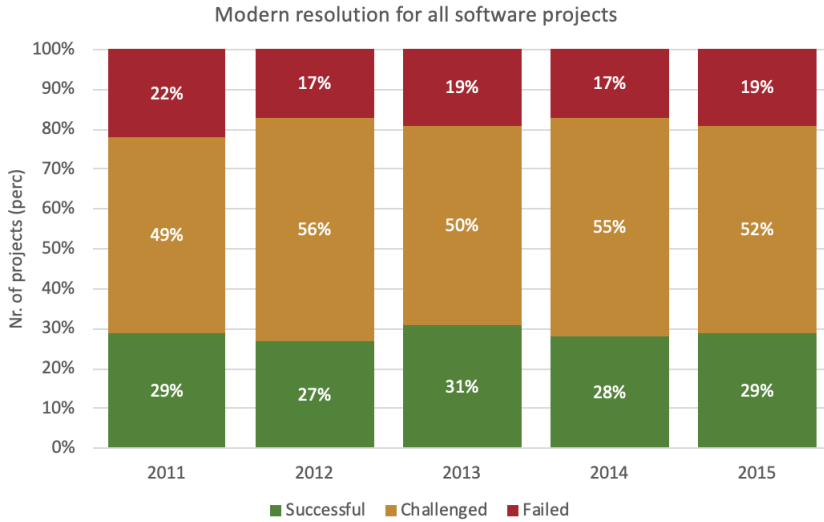


Figure 1. Data from the 2015 CHAOS report from Standish Group on the success rate of software projects: The Modern Resolution (OnTime, OnBudget, with a satisfactory result) of all software projects from FY2011–2015 within the new CHAOS database.

a lot of structured, scientific research into project management practices. The nature of projects makes it difficult to collect data and test hypothesis:

- Professionals only work on a limited number of projects (typically less than 5 per year) that are often very different. There is not a lot of room for people to experiment with project management ideas, and certainly not in a structured A/B setting with a control group.
- Even though professionals will do many projects over the years, older data is not necessarily reliable. Each project has a unique scope that is based on the current state of the art. As a concrete example: early infrastructure sizing was an important success factor when hardware was installed locally. Now that most software is cloud-hosted, this is no longer the case. Performance is still an important quality aspect, but the issues are different.
- Projects often have strategic value for companies, and any data on projects is therefore considered confidential. Companies are not willing to publish data on the real cost of projects.
- People are more willing to talk about their successful, completed projects than about failed projects. This leads to survivorship bias, a term more commonly used in finance [BGIR92]: there is a lot more information and stories about successful projects than about failed projects.
- Although many features are consistent across industries, some practices are field specific, making comparison challenging [BH08].

What is crowdfunding

According to the Merriam-Webster dictionary, the word crowdfunding was first used in 2006 in Wired magazine[MW22] and refers to the practice of obtaining needed funding (as for a new business) by soliciting contributions from a large number of people especially from the online community. Different types of crowdfunding exist[CLS20], with the main types being rewards-based crowdfunding, where people get a product in return for their contribution, equity-based-crowdfunding, where people get promised a share of future profits, and donation based crowdfunding where no rewards is promised. Different crowdfunding platforms exists where creators can launch a crowdfunding campaign. The platform sets the rules and collects and distributes the money in return

for a fee.

For this research we focus on rewards based crowdfunding, since this is one of the most popular forms of crowdfunding, especially for funding projects. Donation based crowdfunding is more suited for charity (e.g. funding medical costs) and less suited for financing non-charity projects since there is no incentive for backers to donate money. Equity based crowdfunding is less interesting from a project management perspective since the company receiving finance does not have to spend it on a single projects.

When debating the pros and cons of crowdfunding, one should compare it against alternative funding methods. Other ways in which companies raise money include using own funds or borrowing the money. The benefits of crowdfunding against borrowing is that there are no interest costs and no need to pay the money back. Crowdfunding has additional benefits: the backers often also provide input for design decisions, provide reviews and feedback and can potentially act as ambassadors for the product. Crowdfunding a project is thus not only a means to raise funds, but also a way to find an audience for a project. Some people even see crowdfunding as a way to measure interest for a project: they decide to continue with the project if the crowdfunding campaign is successful. While this can be valid way to measure interest, it is not necessarily the most efficient way. Creating a good campaign is a lot of work, involving creating video, writing text, making illustrations and making decisions on rewards to offer.

Crowdfunding via Kickstarter

Kickstarter was started in 2009 and is one of the largest platforms for rewards-based crowdfunding. Kickstarter itself has published documentation about their service aimed at creators, including the following basic definitions[Kic22]:

- A *project* is a finite work with a clear goal that you'd like to bring to life. Think albums, books, or films.
- The *funding goal* is the amount of money that a creator needs to complete their project.
- Funding on Kickstarter is *all-or-nothing*. No one will be charged for a pledge towards a project unless it reaches its funding goal. This way, creators always have the budget they scoped out before moving forward.
- A *creator* is the person or team behind the project idea, working to bring it to life.
- *Backers* are folks who pledge money to join creators in bringing projects to life. Kickstarter is not a store, backers support a creative process.
- *Rewards* are a creator's chance to share a piece of their project with their backer community. Typically, these are one-of-a-kind experiences, limited editions, or copies of the creative work being produced.

Note that the explanation of all-or-nothing given by Kickstarter is a bit misleading. Many creators circumvent the all or nothing requirement by setting an artificially low funding goal. This way they get the Kickstarter money even if it is not enough to actually start the project. E.g. the project Chessup[Wig21] had a funding goal of 30.000 dollars, which is much less than the actual funding required for their project (an advanced chess computer).

People decide to invest in a campaign based on the campaign page. An example campaign page is shown in figure 2.

The most prominent elements are a video that showcases the to be developed product and an option to get the product as if you are ordering the product. Most of the campaign page is used to describe product features and benefits like one would expect from an online store. Only in a few places it apparent that you are giving money towards a project.

Kickstarter itself takes care to emphasize that pledging is not the same as ordering a product. Before completing a transaction, you get the following message: *Your pledge will support an ambi-*

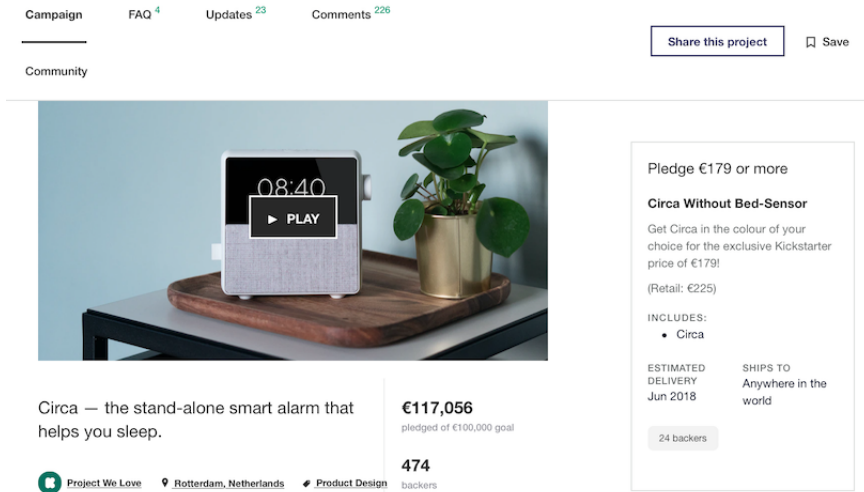


Figure 2. Example of a Kickstarter campaign page on one of the projects in the dataset (CIRCA). The main elements are a video showcasing the product and an ability to get the product for a reduced price, similar to how one orders product in an online store.

tious creative project that has yet to be developed. There's a risk that, despite a creator's best efforts, your reward will not be fulfilled, and we urge you to consider this risk prior to pledging. Kickstarter is not responsible for project claims or reward fulfillment.. Creators and their advertising agencies however do advertise their products in a way that it does sound as if you are ordering a product. Creators are not obliged to deliver rewards, but are obliged to send regular updates to backers. In the words of Kickstarter: *One of the best parts about being a backer and supporting creative projects on Kickstarter is getting a front row seat to the creative process..*

The crowdfunded project lifecycle model

As explained above, some people in the crowdfunding world focus on the campaign as a goal itself. They talk about crowdfunding projects instead of crowdfunded projects, and call a project a success when the campaign is funded. From a project management perspective, this is incorrect.

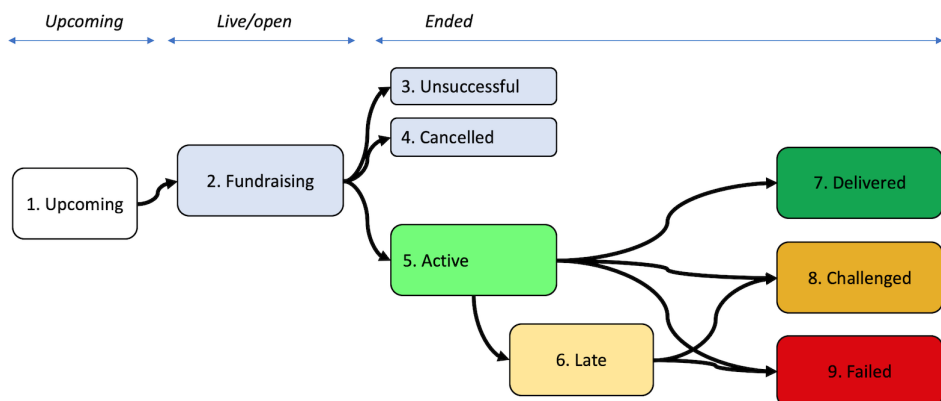


Figure 3. The lifecycle of a crowd funded project

To clarify the different phases of a crowdfunded project, this paper presents a simple project lifecycle model that shows all possible project states in 3. It is based on terminology from Kickstarter (phases 1 to 4) combined with terminology from project management (phases 5 to 8). Any crowdfunded project will be in one of the states at any point in time.

This model is based on combining lifecycle models from four different sources. For interested readers, one can see the sources in figure 4.

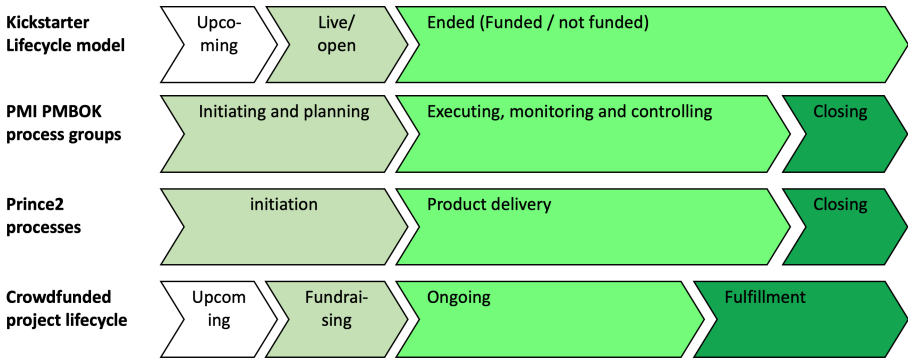


Figure 4. Comparison model of the lifecycle stages of project management stages.

1.1 Existing crowdfunding research

There is some existing research into the delivery phase of crowdfunding. Mollick has completed an earlier study into the characteristics of many kickstarter projects[Mol14]. This study is based on collecting data on projects that were fundraising on kickstarter from 2009 to 2012 and considers data from 48526 projects (of which 26017 were successfully funded). The paper analyses a lot of data that was collected from the kickstarter website and other online sources, such as spelling errors in project pitches and number of Facebook friends of creators. Most of the analysis however is focussed on fundraising success, not actual project delivery: The delivery status of projects is not directly visible from a kickstarter page, and therefore analysis is often skewed towards fundraising success. Mollick was able to determine the delivery status of 471 funded projects in the categories of design and delivery, by using two research assistants. According to this study the majority of studies were delayed: only 25 percent of projects was delivered on time 33 percent had yet to deliver. One positive note is that fraud seems rare: only 2.3 percent of projects showed indications of potential fraud. In a paper from 2015[Mol15], Mollick looks specifically at delivery rate and concludes that only around 9 percent of projects fail to deliver anything. Regarding factors leading to failure, he states that small projects are more likely to fail, as well as some project categories. The demographics of the project creators did not have any influence. The data for this study was collected in collaboration with kickstarter, through a very large survey among 450.000 backers that resulted in 47.000 responses (10 percent response rate). This paper, while interesting, seems to underestimate the overall failure rate. My conjecture is that people that have been disappointed by a failed kickstarter project are less motivated to respond to a survey. To measure that failure rate, it is necessary to look at datasets with the status of specific projects.

Francesco Appio and co-authors[ALPS20] used a dataset of 1567 technology projects from the period of 2009-2017. They also observe that prior research does not pay enough attention to what happens after a project is successfully funded. They try to remedy this by determining factors causing delays through text mining. The data regarding delivery status was collected by looking in the comments section of kickstarter campaigns, and looking for specific synonyms for the words

delay, incompetence and fraud. A key problem with their method is that it has no predictive value: the comments are made after fundraising is completed, while the project is active. This study shows that if a project is delayed, backers will complain about incompetence and fraud. They do not show that incompetence or fraud cause delays and their research is not relevant for potential backers that are interested in how to predict delays based on known characteristics of kickstarter campaigns.

1.2 Crowdfunded project examples

In preparation of this paper we looked at press coverage of the final results of large Kickstarter campaigns, such as Skully, Mighty No.9, Locomogo, Ouya and Pebble. These projects are however not used in the data analysis of this research, since the press coverage is by its nature focused on exceptional and unusual projects. Readers interested in learning about project management are strongly advised to select example projects in an unbiased way and not based on press coverage. To provide just one example project that was successfully funded but not delivered, we refer to Coolest cooler[Rog20].

One other example of a not-great project with a great analysis is Zano[Har16]. The report was commissioned and paid for by Kickstarter but conducted by an independent journalist. The Zano campaign raised 2.3 million British Pounds to develop and deliver innovative drones to 12.000 backers. The original funding goal / project budget was 125.000 British Pounds so the project creators received a lot more money than they budgeted. Nevertheless the project creators spent all the money without delivering any results to backers. This understandably left many backers upset. Kickstarter asked journalist Mark Harris to investigate the case and find out what happened. He produced a long story that was published at the online blog platform Medium[Har16]. We would like to thank Kickstarter for providing transparency about the result of this specific crowdfunded project, above and beyond what crowdfunded platforms typically do.

The conclusions of the report are surprising nuanced, especially with regard to the question of fraud. While parts of the campaign were fraudulent, the creators did make a real effort to deliver the project, and failed through incompetence. To quote the conclusions from the report in detail:

- There is convincing evidence that the Kickstarter campaign video, released in November 2014, was misleading as to the existing capabilities and readiness level of the Zano.
- The massive success of the Kickstarter campaign (20 times The creator's target) caused enormous difficulties for the Zano team, obliging them to develop additional features, as well as scale up communications and production by an order of magnitude
- The creator's directors may have awarded themselves higher salaries than necessary and spent money on superfluous items like cars, but there is no sign of sustained extravagance or criminal fraud.
- The creator did mount a serious, well-intentioned attempt to develop, manufacture, and deliver an intelligent autonomous consumer drone along the lines of their promises in the Kickstarter campaign. A seemingly dedicated staff couldn't, in any case, meet the over-ambitious deadlines and specifications.
- The liquidation is proceeding in a professional manner, but is unlikely to result in any refund, however small, to any Kickstarter backer.

Fraud in the case of a Kickstarter campaign should be defined as a creator creating a campaign with the intention of keeping the money without starting a project to deliver the rewards. This did not happen in the case of Zano and did not seem to occur in our datasets. The lack of evidence in any of the projects studied by us suggests that outright fraud is rare. This is also concluded by Mollick[Mol14]. In many campaigns there are elements of unwarranted optimism, such as creators being too optimistic about their experience or capabilities.

2. Methods

The method used for this paper is data analysis on a dataset of individual projects.

2.1 *research steps*

The following steps were taken:

1. Determine selection criteria for campaigns to be included. The criteria were determined jointly by Sieuwert van Otterloo and Stan Eveleens. Only projects were selected that were launched on kickstarter in 2018 and that were successfully funded. The year 2018 was chosen to make sure each campaign had enough time to deliver. Only campaigns were chosen from the categories Design, Games, Technology since these categories are likely to contain projects comparable to IT projects.
2. . Campaigns were chosen at random based on the criteria by searching on kickstarter.com. A total of 39 campaigns were chosen. Determining the delivery status of a project is very time consuming so this was the maximum number of projects that could be analysed with available resources.
3. Exclude campaigns that are not aimed at developing and delivering rewards. Four campaigns have been excluded (Mine Kafon drone, Openbook, VoDOO, Halzae) since the rewards are not the focus of the project or there is no product development. After exclusion, there are 35 projects remaining
4. Collect data from the campaign page. The campaign page contains all information that backers had in order to make a decision on whether to back this project. Information collected includes funding goal, country of origin, number of backers and estimated delivery date, team size, planning steps, words in risk section and retail price
5. Determine the actual delivery date. This was done by reading the updates from the creator during the project as well as the comments from backers. All comments were read looking for both positive comments (reward delivered) and negative comments (reward not delivered or not meeting expectations at all). In all cases we searched for confirmation from at least one other comment, since a single backer could be affected by a local issue. Using this approach it was possible to determine the month in which each campaign had delivered the majority of rewards.
6. Based on the delivery date, the delivery status was determined. This status was either 'A Delivered on time' (less than 1 month delay), 'B 1-6 month delay', 'C +6 month delay' or 'D not delivered'.
7. Data analysis. We assigned scores 1,2,3, 4 to the possible values A,B,C,D of delivery status. This allowed us to measure correlation between the collected campaign page data and the delivery status.

The data collection was initially started by Eveleens and Van Otterloo, and completed in 2022 by Van Otterloo and Atkins. The data analysis was done by Van Otterloo and Atkins. It should be noted that data collection was more labour intensive than expected: each campaign is unique and one must read the whole campaign page and multiple updates in order to understand the campaign goals and main events. Determining the status can also be tricky since most campaigns offer multiple rewards options.

2.2 *data collected from kickstarter*

From the Kickstarter pages of individual projects, the following information was acquired:

- Project name
- Project URL

- Launch date
- Location (city of the creator)
- Category. We selected projects from Design, Games and Technology
- Funding goal in euros, or converted to euros.
- Funding raised (all projects met their target, many exceeded it);
- Number of backers;
- Estimated delivery date;
- Planned project duration;
- Retail price of the item. This is the price from which discounts are computed. Backers typically get the item for less than the retail price.
- Team size; This is the number of people listed as creators.
- Number of earlier crowdfunded projects that has been created under the same account.
- Planning steps given; The campaign page format invites creators to publish a high level project plan, including already completed and to be completed steps. We count the number of to be completed steps since these are relevant for the delivery phase.
- Number of words in the project risk assessment. This is used as a proxy for the effort spent on analysing, mitigating and communicating project risk.

The team size and experience metric were chosen to assess if previous project management experience had a noticeable impact on delivery. Technical and entrepreneurial experience have previously been shown to positively impact the growth of technology firms [CG05]. Since growth cannot occur if an enterprise fails to deliver, we hypothesise that the same should be true for crowdfunded projects. However, this does not tell us anything about the composition of the team. Teams should perform better than individuals, but only if the team is balanced to counteract the weaknesses of individuals [FGHH08]. We therefore expect projects with larger teams to perform better than one or two person teams, but there may well be an upper limit. Above this limit problems such as communication overheads grow exponentially [Bro95]. The limit is generally considered to be nine people, but varies depending on project type [Put78; RSGH12].

We collect data on the project management steps and number of words in the risk assessment to attempt to build a quantitative overview of the state of project management within the team. Risk awareness, assessment and mitigation is an important factor in project management [HASK12; Boe91]. We therefore expect projects with limited risk assessment to be less likely to succeed. We collect the project steps because previous research suggests that having goals is an important part of successful software development [AHSS99]. We also collect data on the number of backers and funding committed.

The following information was collected from the *updates* subpage and *comments* subpages on the Kickstarter platform. This information was not part of the original campaign page but added later. The updates are placed by the creator and intended to inform backers on the progress of the delivery. The comments are placed by backers and often used to ask questions or express dissatisfaction.

- Whether the items have been delivered.
- In which month and year the delivery was completed.
- Details on problems, This is a short quote or summary from the update or comment that was used to decide on the delivery status

Based on this we compute the planned duration, the slippage (additional days to deliver) and delivery status.

We consider projects a success if the backers receive the promised rewards with a delay of less than 180 days (six months), delivery status *A on time*. We consider a project challenged if there is a delay between 180 days and 720 days (approx 6 and 24 months). This corresponds to delivery

status *B 6-24 month delay*. If a project has a delay of more than 720 days, we consider it a failure. In theory there is a difference. between delivery status *C 2 year delay* and *D Not delivered*. In practice category C is empty: if a project has more than 24 months delay the funds are often exhausted and creators give up. The reason why we consider projects with a delay of less than 180 days to have been delivered *on time* is that the planned delivery date on Kickstarter is not a guarantee, but only an indication. Backers should expect a small delay.

2.3 Data analysis

The data was analysed using correlation and visualised using scatter plots. These methods were deemed appropriate given the small amount of data used.

3. Results

3.1 success and failure rate of crowdfunded projects

The main goal of this research was to estimate the success rate and failure rate of projects. Using our sample size of 35 projects, we can determine this probability within 10 percent of accuracy. In our view these are the optimal definitions taking into account that Kickstarter is meant for innovative projects where some delay is acceptable. Using these definitions, we conclude that between 30 percent and 50 percent of projects funded on Kickstarter are successfully delivered, 20 to 40 percent of projects are challenged and 20 percent and forty percent of projects are failed. The detailed results for the dataset of this paper are shown in figure 5.

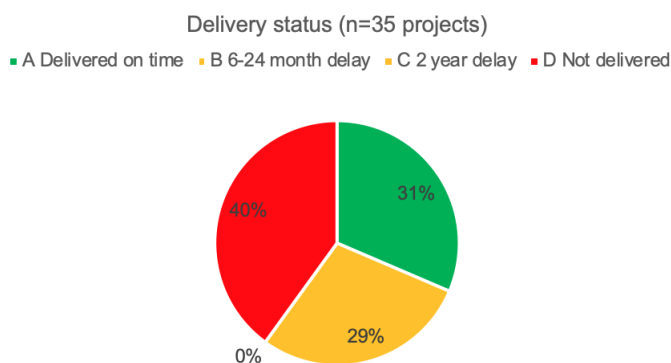


Figure 5. Delivery rate for Kickstarter projects. Approx 30% of projects are delivered without or with acceptable delay. Approx 30% have a delay between 6 and 24 months. Approximately forty percent of projects do not deliver any of the promised rewards

3.2 predicting success

We use correlation to check whether the information available to backers could be used by backers to identify which projects are likely to fail, so that they can make an informed decision whether to back the project. The results are shown in figure 6.

The strongest indicator a project will be delivered successfully is that the team have already been involved with previous Kickstarter projects. This is unsurprising, given that previous experience is a deciding factor in the success of most entrepreneurial endeavours, and is in agreement with previous studies. Higher funding rates are also more likely to produce successful projects. Surprisingly, projects that are planned to take longer are more likely to overrun.

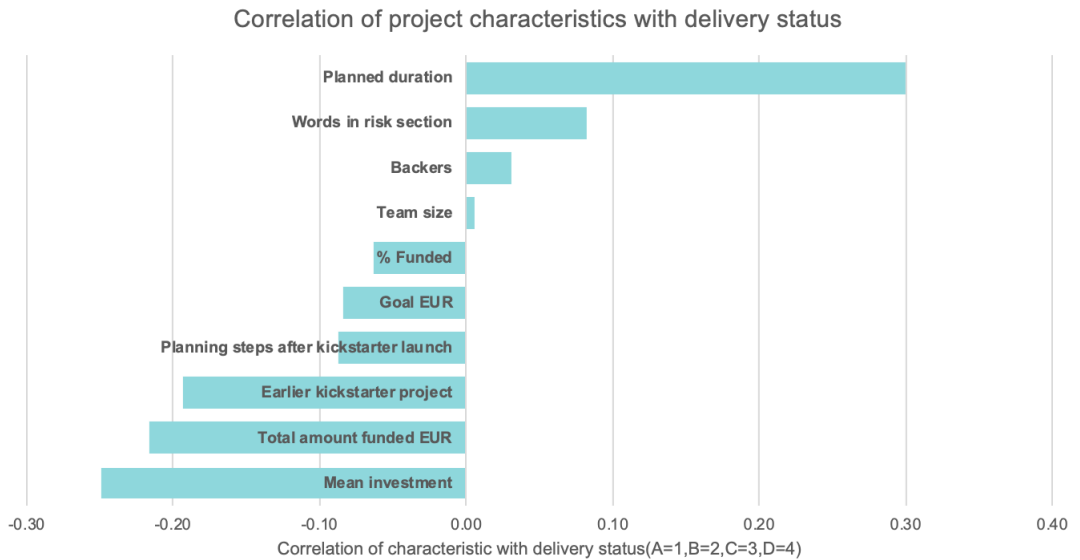


Figure 6. Correlation between various project characteristics and delivery status. The lowest delivery status (1) indicates delivery on time, the highest status (4) indicates the project is not delivered. Projects with a long planned duration have a larger probability of delivery problems.

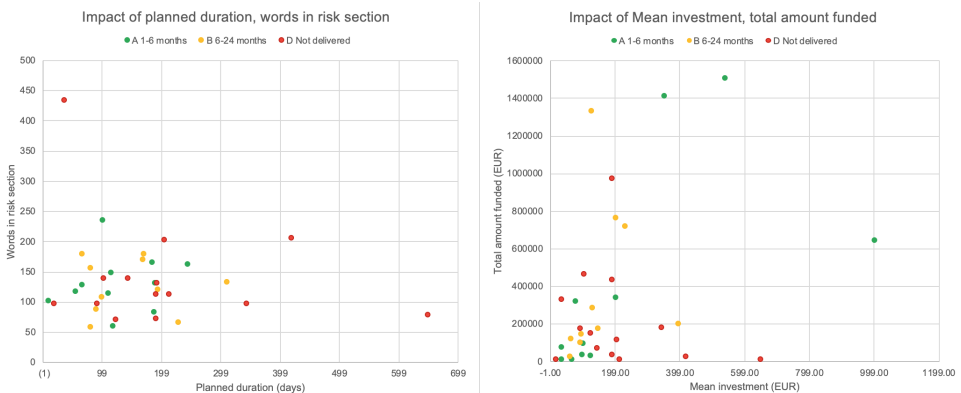


Figure 7. Scatter plots that show the characteristics of individual projects are shown, with color used to indicate delivery status. The scatter plots do not show a clear pattern that could be used to predict delivery status. It rather shows that the datasets contain outliers that have a large impact on the correlation.

To validate whether the correlations are caused by usable patterns, one can use scatter plot. In figure 7 one can see two scatter plots for the factors with the most correlation. In the scatter plots one cannot separate the projects based on delivery status using simple curves. It is thus not possible to accurately predict the delivery status of crowdfunded projects based on campaign characteristics. Apparently, more or different information is needed for backers to recognize high risk projects.

4. Conclusion and Discussion

4.1 Conclusions

Crowdfunding platforms provide a wealth of open access data for the study of project management. Importantly, they also feature failures of all sizes, which would not necessarily be included in classic project management studies. We have been successful in collecting data from technology projects from the website, including data on project characteristics and the success status (delivery status in crowdfunding terminology). The data collection is labor intensive, which explains why only data of 35 projects was collected in the dataset for this article. From a project management perspective this is however a large number of projects, especially since this is a diverse set of independent projects.

The analysis from this paper shows that the success rate and failure rate of crowdfunded technology projects is similar to software projects in general. About one third of projects fails completely and does not deliver anything, while only one third of projects is completely successful.

The information about projects that is published on crowdfunding platforms (we looked specifically at Kickstarter, but other platforms have similar requirements) is not sufficient for potential backers to recognize high risk projects. Campaign pages focus on 'selling' the non-existent product by listing features and benefits and promising discounts versus a hypothetical retail price, and provide only very basic project plan details.

This study used only a small data set. We have found some correlations between characteristics and success that are however not significant and not usable yet to predict success. The results are valuable as a proof of concept on how Kickstarter data can be collected and used.

4.2 Recommendations for crowdfunding platforms

Crowdfunding platforms should do the following to increase transparency and ultimately trust in crowdfunding:

- in order to communicate to potential backers that they are investing in a project and not buying a product, crowdfunding platforms should design their campaign page to focus on project plan information, instead of product features. At minimum they should require backers to publish a detailed roadmap with activities and deliverables.
- Crowdfunding platforms should require a breakdown of the project budget. This should include how much money will be spent on each research and development activity and what part of the budget is allocated for external production, shipping and taxes.
- Crowdfunding platforms must require creators to provide information on previous projects, project management methods, team members and partners
- Crowdfunding platforms should check the accuracy and quality of project information, including whether there is a clear roadmap, a good risk analysis, a realistic and detailed budget.
- Crowdfunding platforms should collect information from creators and backers whether the rewards have been delivered. This information should be used to accurately state whether projects are successfully delivered.
- Crowdfunding campaigns should make all updates to backers public so that they are available for research and for potential backers in future projects.

- Finally, crowdfunding platforms should audit at least one in ten failed projects to make sure that creators did not mismanage the project or commit fraud. This should be done similar to the Zano investigation[Har16].

4.3 Suggestions for further research

The most important next step to enable further research is to make data available. The dataset of this paper will be made available on the journal website and on Kegggle. More data, including the data on crowdfunded video game projects by Jasser Bakridi, will also be made available. We hope other research will add to the data in a compatible format so that all datasets can be combined. Once data is available, the data should be useful in improving future versions of software project management standards such as [NEN19]. The insights from delivery status data should also be used by crowdfunding platforms to further improve information to backers and to provide project management guidance to creators.

Author Contributions

This paper has benefited from the results of thesis research by Gijs van dongen, Stan Eveleens and Jasser Bakridi at the Vrije Universiteit Amsterdam between 2018 and 2022 and from analysis by Suzanne Atkins in 2022.

References

- [AHSS99] Terek K Abdel-Hamid, Kishore Sengupta, and Clint Swett. The impact of goals on software project management: An experimental investigation. *MIS quarterly*, pages 531–555, 1999.
- [ALPS20] Francesco Paolo Appio, Daniele Leone, Federico Platania, and Francesco Schiavone. Why are rewards not delivered on time in rewards-based crowdfunding campaigns? an empirical exploration. *Technological Forecasting and Social Change*, 157:120069, 2020.
- [BGIR92] Stephen J Brown, William Goetzmann, Roger G Ibbotson, and Stephen A Ross. Survivorship bias in performance studies. *The Review of Financial Studies*, 5(4):553–580, 1992.
- [BH08] Claude Besner and Brian Hobbs. Project management practice, generic or contextual: A reality check. *Project management journal*, 39(1):16–33, 2008.
- [Boe91] Barry W. Boehm. Software risk management: principles and practices. *IEEE software*, 8(1):32–41, 1991.
- [Bro95] Frederick P Brooks. *Mythical Man-Month, The: Essays on Software Engineering*. Addison-Wesley Longman, 1995.
- [CG05] Massimo G Colombo and Luca Grilli. Founders’ human capital and the growth of new technology-based firms: A competence-based view. *Research policy*, 34(6):795–816, 2005.
- [CLS20] Douglas J Cumming, Gaël Leboeuf, and Armin Schvienbacher. Crowdfunding models: Keep-it-all vs. all-or-nothing. *Financial Management*, 49(2):331–360, 2020.
- [FGHH08] Nikolaus Franke, Marc Gruber, Dietmar Harhoff, and Joachim Henkel. Venture capitalists’ evaluations of start-up teams: Trade-offs, knock-out criteria, and the impact of vc experience. *Entrepreneurship Theory and Practice*, 32(3):459–483, 2008.
- [Gro15] The Standish Group. Chaos report 2015. <https://www.standishgroup.com/>, 2015.
- [Har16] Mark Harris. How zano raised millions on kickstarter and left most backers with nothing. <https://medium.com/kickstarter/how-zano-raised-millions-on-kickstarter-and-left-backers-with-nearly-nothing-85c0abe4a6cb>, 2016.
- [HASK12] Stefan Hoermann, Marco Aust, Michael Schermann, and Helmut Krcmar. Comparing risks in individual software development and standard software implementation projects: A delphi study. In *2012 45th Hawaii International Conference on System Sciences*, pages 4884–4893. IEEE, 2012.

- [Kic22] Kickstarter. Kickstarter help - what are the basics. <https://help.kickstarter.com/hc/en-us/articles/115005028514-What-are-the-basics->, 2022.
- [Mol14] Ethan Mollick. The dynamics of crowdfunding: An exploratory study. *Journal of business venturing*, 29(1):1–16, 2014.
- [Mol15] Ethan R Mollick. Delivery rates on kickstarter. https://repository.upenn.edu/mgmt_papers, 2015.
- [MW22] Merriam-Webster. Crowdfunding-definition. <https://www.merriam-webster.com/dictionary/crowdfunding>, 2022.
- [NEN19] NEN. NPR 5326 - Risicobeheersing bij ontwikkeling en onderhoud van maatwerksoftware. <https://www.nen.nl/npr-5326-2019-nl-262885>, 2019.
- [Pol07] Julien Pollack. The changing paradigms of project management. *International journal of project management*, 25(3):266–274, 2007.
- [Pro17] Project Management Institute. *A Guide to the Project Management Body of Knowledge, sixth edition*. Project Management Institute, Pennsylvania, 2017.
- [Put78] Lawrence H. Putnam. A general empirical solution to the macro software sizing and estimating problem. *IEEE transactions on Software Engineering*, SE-4(4):345–361, 1978.
- [Rog20] Mike Rogoway. Coolest cooler, in final accounting, cost its kickstarter backers more than 4 million. <https://www.oregonlive.com/business/2020/12/coolest-cooler-in-final-accounting-cost-its-kickstarter-backers-more-than-4-million.html>, 2020.
- [RSGH12] Daniel Rodríguez, MA Sicilia, E García, and Rachel Harrison. Empirical findings on team size and productivity in software development. *Journal of Systems and Software*, 85(3):562–570, 2012.
- [Wig21] Jeff Wigh. Chessup | level up your chess game. <https://www.kickstarter.com/projects/bryghtlabs/chessup-level-up-your-chess-game/posts>, 2021.