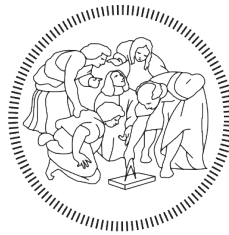


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“Innovation in reward-based crowdfunding
technological projects: An exploratory analysis”

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Abstract

This thesis is about the outcomes of crowdfunding projects with a focus on product development and innovation. The main goal is to find and apply a measure for the innovation that have been introduced in the products/services of technological reward-based crowdfunding projects, two points of measurement are taken into account, the recent moment at which the data about the campaign was collected and the preceding time the campaign was effective. We tested possible potential relationship between the introduced innovation and 24 of the characteristics of reward-based crowdfunding. To do so, we created different measures of content analysis applied on product descriptions in the crowdfunding campaign page and on company website, for that, we developed an algorithm to measure the text similarity between the past descriptions of projects and the present description for the same product/service. Then we followed a mixed study of qualitative and quantitative analysis; by adopting Tobit model as a multivariate linear regression model, we developed 12 models to test the relationship between innovation and 7 variables. Prior to that, we conducted a survey, in which we asked the 347 firms included in the study to answer to two questions, Also, we assessed 60 campaigns personally. Then we formed five hypothesis that will be tested by the models. In result of the study, it is found that past created projects and internal social capital to have a positive impact on innovation, in contrast, visuals are found to have a negative impact, while comments, awards, pledged capital and duration are found to have no clear impact on the innovation. We contribute to the literature in crowdfunding by paving the path for future analysis to find characteristics in crowdfunding that would enhance innovation. We discussed in the conclusion the implications for academic researchers and practitioners.

Keywords: Crowdfunding Industry, reward-based crowdfunding, Open Innovation, text similarity

Estratto

Questo elaborato analizza i risultati dei progetti di crowdfunding con un focus particolare sull'innovazione di prodotti/servizi. L'obiettivo di questo scritto è quello di poter trovare e applicare una misura per definire il livello d'innovazione nei prodotti/servizi dei progetti tecnologici in ambito reward-based crowdfunding. Vengono misurati due momenti della campagna crowdfunding, il momento attuale, quando la campagna viene lanciata nel mercato e il momento prima che la campagna venga attivata. Nello sviluppo di questa tesi abbiamo testato la possibile relazione tra le innovazioni introdotte nei prodotti/servizi delle campagne crowdfunding e altre 24 differenti caratteristiche del reward-based crowdfunding. Per far questo, abbiamo creato differenti misure per analizzare i contenuti presenti nelle descrizioni delle campagne e dei siti web delle società che promuovevano l'iniziativa crowdfunding. In seguito abbiamo sviluppato un algoritmo per misurare la similarità dei testi tra le descrizioni passate dei progetti e quelle attuali per lo stesso prodotto/servizio. Dopo lo sviluppo dell'algoritmo, abbiamo seguito uno studio in parte qualitativo e in parte quantitativo adottando il modello Tobit come regressione lineare multivariata, sviluppando 12 modelli per testare le relazioni tra innovazione e 7 variabili. Prima di tutto questo, abbiamo condotto una ricerca, in cui abbiamo chiesto a 347 società di compilare un survey. Alla fine di questo processo di ricerca e studio, abbiamo creato cinque ipotesi da testare attraverso l'utilizzo dei modelli creati. Come risultato di questa ricerca, si è evidenziato come i progetti creati in passato dalle società e il loro capitale interno abbiano un impatto positivo sull'innovazione, al contrario, i visuals impattino negativamente sull'innovazione, mentre i commenti, i premi, il capitale raccolto e la durata non hanno fornito un chiaro impatto sull'innovazione. Con il nostro contributo alla letteratura sul crowdfunding cerchiamo di spianare la strada per future ricerche che possano trovare quali variabili siano in grado di migliorare l'innovazione nelle campagne crowdfunding. In conclusione del nostro elaborato abbiamo discusso quali possano essere le implicazioni per tutti i ricercatori e quelle figure in ambito accademico.

Parole chiave: Crowdfunding Industry, reward-based crowdfunding, Innovazione, similarità di test

1. Introduction

Crowdfunding is a relatively new source of entrepreneurial finance, though the simple concept has been existing in the society for centuries. It's been known as the simple act of funding a public project for the benefit of the general public. Over the years, the concept has evolved to take a business nature as people started lending each other in anticipation of an interest rate. Another form of crowdfunding has emerged in different cultures, known as donations, a cultural act of donation-based crowdfunding, e.g. War bonds, and London's mercantile community, which supported the Bank of England in the 18th century, when customers demanded the conversion of their pounds into gold, the community supported the bank until the confidence in the pound was restored.

As the industry of crowdfunding evolves, our understanding of the phenomenon deepens, and followingly, the evolution of the research occurs in anticipation, that we can see from the evolution of definitions of crowdfunding through the past several years, from: *Crowdfunding is the practice of collecting small amounts of capital from the crowd of Internet users* (Lambert & Schwenbacher, 2010), arriving at the definition: *Crowdfunding is the act of collecting monetary contributions together with feedback and suggestions from a crowd of contributors (either in form of donation or in exchange for some forms of reward) through an open call on enabling web platforms* (Butticè, Franzoni, Rossi-Lamastra & Rovelli, 2016).

Despite the several models of crowdfunding that have emerged mainstream, and as mentioned before, two of them has been dominantly existing for a long time; lending-based and donation-based crowdfunding, the only difference now in these two models is that they have been disrupted by the internet and platforms that enhanced and improved the models to a point of gaining popularity enough to put them on top the two other models of equity-based and reward-based in terms of capital raised. Equity-based crowdfunding is the act whereby individuals invest in an early-stage unlisted company in exchange for shares in that company, while reward-based crowdfunding is the act of individuals pledging monetary contributions to project creators -in a call with predefined duration- in exchange for rewards (product, service or gadget) that will be delivered to the them after a predefined period. However, the focus of this study will be on reward-based crowdfunding, as we are

interested in exploring what concerns the products and services that are being delivered as rewards through these platforms in terms of innovation.

Crowdfunding differs from other sources of finance in several characteristics, the investors (project backers) are not professionals, they are individuals that share a passion or a purpose that derive their contributions, while in lending-based crowdfunding, they are investors that seek the mere financial return. On the other side, project creators (fundraisers) are individuals or firms that seek financing for their projects in exchange for rewards or shares and interest rates in case of lending-based crowdfunding.

Many journals (e.g. Journal of business research) has published a significant number of papers that study crowdfunding. However, most of these contributions -such as (Koch, Cheng, 2016; Por, Yang & Kim, 2016; Kromidha & Robson, 2016), and (Butticè, Colombo & Wright, 2017)- have focused on the concept of success and success factors in crowdfunding; resulting in several interpretations for what is meant by success and which factors play a role in it, and went on to suggest factors that can have either direct or indirect role in the defined concept of success in crowdfunding.

Nonetheless, Innovation that is brought by crowdfunding is a significant field of research that hasn't received enough attention from scholars, apart from some contributions that relate to other aspects of innovation and might be helpful if researched against crowdfunding; Product/service innovation (Chan & Parhankangas, 2017), process innovation and market innovation (Brown, Boon & Pitt, 2017) are areas that has been disturbed by crowdfunding. In addition to the innovation brought to entrepreneurial finance itself in terms of interrelations and double-sided implications between other means of entrepreneurial finance (like business angels and venture capitals) on one side, and crowdfunded entrepreneurs (Sorenson, Assenova, Li, Boada & Fleming, 2016).

In addition to that, as reward-based crowdfunding uses several means of communication (project descriptions, video pitches, forums, comments and updates) between both project creators and backers, the form of relationships that are being built on these platforms are extremely significant to deter the information asymmetry implications (e.g. less willingness by backers to contribute) (Thies, Wessel & Benlian, 2016), therefore concepts like social capital and quality signaling has

dominated a considerable amount of research to shed light on how to foster and strengthen the relations between the different parties in crowdfunding.

In general, the research efforts in crowdfunding have focused mainly on what happens before and during the crowdfunding campaign up to the moment of delivering the product or service, largely ignoring the aftermath of a crowdfunding campaign, its implications on the different activities in the firm such as future product development and adopted processes, and to some extent marketing, how changed these projects are now compared to the time they started? How the firm benefits from the crowd or other factors (e.g. awards, social capital, comments, past experience) in fostering innovation, the firm could gather information through communication tools, build a reputation as an award winner or use backers' technological feedback contributions to reshape a product/service that better fits their needs.

In this dissertation and in the second chapter, we reviewed the literature in crowdfunding, open innovation and crowdsourcing that we think is related to reward-based crowdfunding, highlight the gap we find that we tried to fill in this study, followingly, in the third chapter, we define the methodology we adopted for the models developed, hypotheses and results obtained in the fourth chapter. Eventually, we conclude by remarks on the purpose, path and results obtained, before closing by recommendations and future research directions.

Whether the firm needs to possess specific competences or resources to benefit from these factors and feedback? The shape of the interrelation between these factors and the innovation introduced by the final product/ service, and if it's mediated by other factors. The life span of these firms and if crowdfunding extends their life expectancy? By looking at the current state of literature in crowdfunding, these are valid questions that still awaiting answers in order to define the full dimensions of the phenomenon. Other means of entrepreneurial finance have their own implications and footprints that they leave on the blueprint of financed firms and lasts for substantially enough time to define and play a role in the future of these firms, these implications and footprints has received a considerable amount of research attention in comparison to crowdfunding, urging for more emphasis to fill the gap when it comes to crowdfunding. For all the past mentioned reasons, we would like to contribute to the literature in crowdfunding and open innovation by providing perhaps part of the answers to the questions we have posed.

2. Literature review

2.1 Crowdfunding

In this chapter, we will review the literature on crowdfunding in general, the evolution over time of the phenomenon in terms of definition, crowdfunding typologies and different models, the role crowdfunding has been playing. Then we review reward-based crowdfunding, what is success in crowdfunding and the success factors researchers have identified, in addition to that, we review how crowdfunding has disturbed different industries and if it follows particular patterns that are related to the geographical location. We conclude this chapter after reviewing the challenges crowdfunding is facing and the peculiarity of the phenomenon in Entrepreneurial Finance.

Crowdfunding is a significant phenomenon in Entrepreneurial Finance but not a new one anymore, the mean of finance has gained more and more popularity during the last 10 years. The most popular reward-based crowdfunding platform (Kickstarter) has risen in total almost \$3B dollars by April 2017 since its inception in 2009 with success rate of slightly over 35%. (Kickstarter, 2017). Such platforms have instantly turned into finance vehicles for innovative entrepreneurs and one of the rapidly growing finance sources that small innovative organizations has exploited to gain access to capital (Stanko & Henard, 2017).

To review the literature on the topic we followed the same methodology used in conducting “The Road to Crowdfunding Success: A Review of Extant Literature” by (Butticè, Franzoni, Rossi-Lamastra & Rovelli, 2016). We start by recalling the findings and outcomes of this review and then we continue with discussing the Crowdfunding phenomenon’s roles, characteristics and implications. We follow on reviewing the literature regarding the same topic of crowdfunding. Accordingly, therefore, we thought for all the articles found on SCOPUS, SSRN and Google Scholar using one keyword (crowdfunding), later we use (open innovation) and (crowdsourcing) to find literature on the same topics.

Previously, (Butticè, Franzoni, Rossi-Lamastra & Rovelli, 2016) succeeded in identifying several areas in need for further research and investigation which are: first, further exploration of the factors influencing funding success that have been largely neglected by that time. Second, it stressed the importance of conducting research -only few if any by that time- that studies what happens after the end of the

crowdfunding campaign as research has been only focusing on the main actors involved during a crowdfunding campaign. Third, by that time research was disregarding the role of the diverse menu of rewards in influencing the chances of success (deeper empirical investigation of the rewards), distinguishing rewards types. Fourth is studying the personal characteristics of fundraisers, which are not hard to investigate. Fifth, the post-campaign outcomes (relative efficiency of crowdfunding at financing deserving projects compared to relative channels of finance). Six, is delivery delay and whether or not crowdfunding would be comparatively more likely than other sources of finance to support high risk projects? Going through the research work highlighting the main contributions to the topic, first we discuss the main characteristics of crowdfunding, presenting the several models and the actors involved with elaboration of the motivation behind choosing those models.

2.2 Crowdfunding definition

Crowdfunding is an umbrella term used to describe diverse forms of fundraising, typically via the Internet, whereby groups of people pool money to support a particular goal (Block, Colombo, Cumming & Vismara 2017). The definition of crowdfunding has been evolving since the inception of the phenomenon, and with that it started to cover more of the aspects of the phenomenon. In their formal definition of crowdfunding, (Larralde & Schwienbacher, 2010) described it 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.”*, as we see from this definition, it lacks the non-monetary motivation for backers to support a project. Passing by the definition provided by (Rubinton, 2011): *“The process of one party progressing towards a goal by requesting and receiving small contributions from many parties in exchange for a form of value to those parties.”*, the definition suffers from the same shortcoming of (Larralde & Schwienbacher, 2010). Later, Another definition was introduced by (Marom & Sade, 2014): *“Crowdfunding is an innovative funding mechanism which leverages the internet and social networks in order to raise funds from a large number of investors, usually raising small amounts from each investor.”*, in this definition and the ones provided before, the authors didn't put much of emphasis on side of backers, as they also have motivations to

participate in the call of crowdfunding. In addition to that, it appears that backers do not only provide monetary support to fundraisers, but they also provide feedback that could be beneficial for fundraisers.

In general, as the definition of crowdfunding evolves, it covers more of the aspects of the phenomenon. However, the basic idea of crowdfunding is for an entrepreneur to raise external funds from a crowd where each individual helps provide a micro amount that goes towards the total budget of the project. In a typical scenario, the entrepreneur uses his/her social networks and joins established platforms on the Internet to directly interact with the crowd (Belleflamme, Lambert & Schwienbacher, 2012). The most recent definition was provided by our colleagues in "The Road to Crowdfunding Success: A Review of Extant Literature": *"Crowdfunding is the act of collecting monetary contributions together with feedback and suggestions from a crowd of contributors (either in form of donation or in exchange for some forms of reward) through an open call on enabling web platforms."* This definition covers the side of backers that was largely ignored in previous definitions and elaborates on the significance of backers' feedback.

2.3 Typologies of crowdfunding

Crowdfunding is not just built by one model, but there are different ways to characterize the phenomenon, there are different models of crowdfunding, the most important ones are those that describe what crowdfunders receive in exchange for their contribution. However, the four different typologies of crowdfunding models are: donation-based model, reward-based model, equity-based model and lending-based model -also called peer-to-peer lending-. This is not the only way to identify the different typologies of crowdfunding, but there are other taxonomies based on: the money collection scheme, timing of the process and also the presence or absence of an intermediary.

2.3.1 Donation-based crowdfunding

The donation-based crowdfunding is a model based on no-remuneration in exchange for money given by crowdfunders. This model offers to the entrepreneur -who came out with a great idea for a new product or a service- or the inventor, a new way to

raise money, in fact it is a way to source money for a project by asking a large number of contributors to donate a small amount to it. In return, donors may receive token rewards that increase in prestige as the size of the donation increases; for small sums, the funders may receive nothing at all (Butticè, Franzoni, Rossi-Lamastra & Rovelli, 2016). Sometimes referred to as rewards crowdfunding, the tokens for donations may include pre-sales of an item to be produced with funds raised or in other cases the “reward” could be a citation in the website or just a letter of thanks. Donation-based crowdfunding can also be used in an effort to raise funds for charitable causes. Due to the fact that this model of crowdfunding is based on donations, this makes it completely different from the other models, in fact through donation-based funders do not obtain any ownership or rights to the project, nor do they become creditors to the project.

Coming back to the social value of this crowdfunding model, sometimes local institutions or other companies with social intents use this way of funding not as an easy way out from the financial crisis, but as a sort of redemption for all the people that have needs, believe in some concrete ideas and have some specific social expectation (Tan, Lu & Tan, 2016). The most important aspect of the donation-based model is that the explicit collection of money doesn't depend on the achievement of a goal previously established, but on the contrary donation-based campaign sets goal not too high for avoiding discouraging potential donators from giving money for the projects.

This model is getting more and more recognized by the crowd also thanks to the growing popularity of the social media, but one of the most important factors that allow crowdfunders to pledge money for charitable projects is the reputation. Reputation is one of the main motivations that bring donators to make their donations, so the higher is the reputation; the higher is the acknowledgment of the crowdfunders and their project. This is the basis to create a trustworthy environment to attract more funders and create a sort of popularity effect that allows the crowdfunders to spread as fast as they can their idea or project to the crowd.

2.3.2 Equity-based crowdfunding

Starting from the definition, equity crowdfunding is defined as the offering of securities by a privately held business to the general public, usually -as a mediator-

through an online platform (Pierrakis & Collins, 2013). So basically, crowdfunders provide money in exchange of a share of the risk capital of a firm. The final goal of crowdfunders is to acquire ownership and voting rights with the intent to participate in the distribution of future profits. Therefore, in contrast to traditional equity financing sources for young ventures (i.e. business angels and venture capital), equity crowdfunding is specifically aimed at a large group of small “armchair” investors, who typically lack experience in evaluating investment opportunities (Ralcheva & Roosenboom, 2016).

This crowdfunding model is one of the most complex in the crowdfunding scenarios (Wilson & Testoni, 2014), especially talking from an investors perspective, this model is related to an investment that typically occurs in a very early-stage moment of the company evolution in which every possible results are completely uncertain, so this make the investor more prudent, and more likely not inclined to invest a huge amount of money. So for this reason there is usually a strong preference for funders to intimately know the entrepreneur and the business.

Equity-based crowdfunding as all the other models of crowdfunding is characterized by risks but at the same time also benefits. Started discussing about risks, a business funded by an equity crowdfunding has a higher risk of failure with respect to a business funded by a traditional way for financing a start-up such as a venture capitalist or a business angel. Moving to the investor side, there are other kinds of risks that could incur, for example returns may take years to materialize or may never accrue. This could happen because of the management if it tries to change the original business plan, presented during the crowdfunding campaign, moving to another one that could not fit with the requests of funders. Another relevant risk that could affect negatively the growth of a start-up is the fact that the money collected through the crowdfunding platform could bring a lower-quality investment with respect to the conventional start-up funding sources like angel investors and venture capitalists, reducing investment opportunities and limiting the growth potential.

For what concerns benefits, we could discuss about a higher level of satisfaction of investors that invest through a crowdfunding platform. This is because Crowdfunding can allow investors to choose a business or an idea that personally makes a fit to them or because there is something deeper that goes beyond just business. Another fundamental benefit could be the fact that investors could have the possibility to invest in any project or idea they prefer with no restrictions, so they

don't need specific credentials for being accredited investors. Another point is that investors can invest a small amount of money not precluding any kind of investments. Finally, enlarging the perspective not just considering the investors, through this model of crowdfunding it is easier to create greater businesses and more jobs. In fact, enabling easier access to investors' capital could stimulate the local and national economies through new business formation and more job creation.

2.3.3 Lending-based crowdfunding

An additional crowdfunding model is the peer-to-peer lending that is a particular model for some aspects quite far from the two previous crowdfunding models, but at the same time it can be considered as one of the oldest forms of crowdfunding also recognized with different names such as credit-based crowdfunding, social lending, P2P lending, debt crowdfunding and crowd lending (Everett, 2014). In fact in this case there is nor the donation of money neither the acquisition of a share of the capital risk of a firm, but the fundraisers look for to borrow money from the crowd in the forms of loans at the cost of an interest rate. This interest rate usually is structured through an algorithm that lowers the value of the interests when the number of lenders increase, this method is used to incentive people to lend money through crowdfunding platforms.

As already mentioned before, also referring to what said in the scientific paper "The Road to Crowdfunding Success: A Review of Extant Literature" (Butticè, Franzoni, Rossi-Lamastra & Rovelli, 2016) this model is quite distant from the previous two models for different reasons. At first this model reduces the potentiality of the phenomenon of crowdfunding, in fact the interactions between lenders and borrowers are reduced to the minimum, and what is missing is the collection of feedbacks or comments coming from the crowd that are fundamental for the development of a campaign launched by entrepreneurs. The second reason that makes this model distant respect to the previous two is that it could be considered as a normal off-line microcredit landing service. Basically it is a copy of the off-line model that replicates on the web the same functions; in fact the normal funding means are substituted by a peer-to-peer system through the usage of Internet. For all of these reasons, landing-based crowdfunding doesn't share lot of common points with all the other models such as the donation-based, equity and reward based

crowdfunding, but it is possible to say that lending-based crowdfunding runs in parallel with microfinance.

So basically the definition of peer-to-peer lending, it is a typology of a personal loan supply directly between private persons through web platforms. These systems allow people that are looking for funds and investors that are looking for different ways of returns, without passing through the traditional channels represented by banks and other financial institutions (Bruton, Khavul, Siegel & Wright, 2014).

The first substantial difference between P2P lending and the other traditional ways of lending it is related to the role that the intermediary perform in the meeting of demand and offer of funds. In all other consolidated systems, usually the intermediary is a legal subject that is committed in collecting capital and employs them, as it prefers.

Generally, a bank or a financial institution decides to use the collected funds on the basis of its own assessment of the financial credit. Instead the intermediary in the P2P lending, deal with keeping in contact the creditors and the investors through the platform and not dealing in any case with the sums provides by the other two actors. In fact the creditors and investors have the full availability of the sums and they can decide the allocation of them in a completely autonomous way. The intermediary of P2P lending is only in charge of making a financial analysis of the players assigning them a certain level of risk, on the basis of their financial capability. Then later, the investors can decide how to allocate their own resources, on the basis of the length of their investment and the interests they want to achieve.

The real innovation respect to the traditional lending systems is related to the remuneration of the invested capital, since the P2P platform doesn't intervene in any way to the assignment of the capital, every single users that have financed all the creditors will receive back the total amount of interests, that generally is the remuneration of the banks and other financial institutions. In other words, the passive interests that the debtors have to pay are directly transferred to all the creditors.

All the web companies of P2P are profit business oriented: they make revenues first from a commission perceived by people that will receive money as loans and another commission coming from the lender of money. In this way, the mechanism of lending among privates are, theoretically, more profitable than those that could be done with bank or other traditional financial markets.

The procedure of the process could be described in the following way: every single applicant, when they make the request for a loan, a rating is created and to all the creditors is assigned a value that usually is a letter (every platform has adopted its own). So for this reason there is not a standard that allows to compare the risk rate of every single lender through all the platforms. In any case, the lower the rating is, the higher will be the interests assigned to the lenders for compensating the risk of insolvency. Generally, the loans are supplied at a specific interest rate, through the contributions of hundreds of lenders, every single loan with a specific value and interest rate, calculated through a weighted average of the interests requested by every single lender. The applicant will pay back the loan with a monthly payment plus the interest.

2.3.4 Money collection models

For what concern the money collection models, there are two different types of crowdfunding campaigns, the first one is called “keep it all” in which the entrepreneurial firm can keep all the money raised even if the goal set was not reached, while the second model is called “all or nothing” in which the entrepreneurial firm raises nothing if the goal set is not reached. There are different views about the selection of one of the two models, but as discussed in the scientific paper called “Crowdfunding models: Keep-it-All vs. All-or-Nothing” (Cumming, Leboeuf & Schwienbacher, 2014) a consistent evidence that came out, is that the model “all or nothing” is a sort of positive and credible signal for the funders, in fact they know the entrepreneurs will not undertake the project if at the deadline of the campaign they will not achieve the goal previously set. So this could reassure the investors on the full commitment of the entrepreneurs to reach their goal and keep all the money collected after reaching the funding goal. We could also say that this kind of model reduces the risk to the crowd and at the same time it allows entrepreneurs to raise more money, setting higher goals, and be more likely to achieve the goals set. On the other hand, the “keep-it-all” model is less successful due to a lack of trust of the funders. This is because the backers don’t want to risk investing in a project that will be underfunded, so it will not reach the goals previously set and more likely it will fail after the campaign, because of the fact that the entrepreneurs will not have enough resources to face the launch of the project, product or service.

At the end we could say that the “all or nothing” model offer a sort of guarantee to the backers that the entrepreneur will not start a project with unrealistic goals also due to low funding, while in the opposite side the “keep it all” model is suggested for scalable businesses, so those businesses that could be implemented time to time and they don’t require all the investment at the beginning of the launch of the project. So basically this model is attractive for those funders that can gain utility also in partially funded project and are aware of the possibility that a project could be stopped before its end.

2.3.5 Intermediary models

In a crowdfunding campaign usually three different actors are involved: fundraisers, investors and intermediaries. In this paragraph we will put our attention on the intermediaries that are necessary for defining another different crowdfunding model. For this reason, crowdfunding could be also divided in direct and indirect crowdfunding (Heminway & MacLeod, 2013).

The direct model consists in a direct funding appeal from fundraisers to the crowd, while the indirect one involves an intermediary between the fundraisers and the crowd; usually the intermediaries are specific platforms.

So we could say that in the direct crowdfunding there is a direct connection between the crowdfunders and the money raisers. Usually the intermediary is a crowdfunding platform that tries to offer advantages for both capital seekers and providers. Instead of being just a channel for connecting fundraisers and investors, this platform acts also as an information, communication and execution portal provider.

2.3.6 Timing models

Taking into account what Kappel said in his article "Ex ante crowdfunding and the recording industry: a model for the U.S.?" (Kappel, 2009) he distinguished two different typologies of crowdfunding that are “ex-post facto” and “ex-ante”. In the first case the crowd offers its financial support asking back a finished product or service that could be immediately usable, while in the second model the support is offered independently from the result achieved, by the support is given for a common goal. The ex-ante model was usually used for the artistic environment and in particular in the industry of filmmaking, but also it was used by writers and other

kind of artists. This model is continuously evolving especially in the musical industry, in which the backers are acting as if they are trying to invest on the career of the artists, following their success and progress with much more interest than a normal spectator. Finally, when we are talking about the ex-ante model, it is possible to define an additional internal division named “betting model” and “investing model”. The second one works through the sale of products with the goal to reach a set amount of money, while the first one describes how a crowd competes for the assignment of financial capitals that are assigned only if they can reach a pre-set threshold proportional to the initial amount of money that they declared to achieve. Always talking about the ex-ante model that could be also called “pre-selling” model, the promoter of a project could address the crowd for receiving the financial support necessary to the development, design and production of a new product or service, offering as a reward the same product at a lower price than the one that will be launched in the market.

The possibility to offer to the crowd the pre-selling of a product or a service creates some benefits, from one side to the consumers’ –bakers- and on the other side a benefit for the funding seeker. The utility of the entrepreneurs could rise due to the fact that they will not receive just funds from the crowd, but also for higher experience related to the mechanisms of the market in which the products or services will be offered. Another important benefit that could be gained by the funding seeking is the creation of a double relationship of financing and consumption that create a direct and exclusive connection between the consumer and the nascent entrepreneurial reality. This preliminary description of these benefits could lead to other three specific ones, the first one is a reduction of the market risk, so basically the main function of crowdfunding is based on the attraction of a community as wide as possible, that finds the idea interesting and if it decides to contribute in financing the project, also unconsciously, it will validate the project as able to face the real market. So the community allows unifying some phases of the launch process that normally could be separated and at the same time it allows to do a preventive feasibility test.

The second main benefit is that the seeking money through the crowdfunding campaign could do a valuable and preventive analysis of the market selected. The pre-order of the product allows capturing and defining the potential users, as well as generating aesthetics improvements or allowing the possibility to revise in time sales

and marketing strategies with the aim to increase the possibility of the product to be welcomed in the real market.

Finally the third benefit is related to the entrepreneurial possibility to make price discrimination between the crowdfunders that express a great appreciation of the product and for this reason they will decide to pre-purchase it, and those crowdfunders that are interested in sustaining the funding collection, but they are not interested in the purchase of the product.

The entrepreneur, through the remuneration mechanism expected by the reward model of crowdfunding, would define the reward categories that will allow increasing the availability of paying of the people interested in purchasing the product as first buyers, and at the same time they will increase the money collection thanks to the contributions of the consumers that will wait for the launch of the product before making their purchasing decision.

At this point, entrepreneurs could be able to segment the crowdfunders in two distinct groups, the first one formed by users that could be highly remunerative with a high willingness to pay reinforced by the perception to belong to an exclusive group of first consumers –early adopters-, while the second group could be useful exclusively for financial purposes, at least during all the duration of the crowdfunding campaign.

All these positive potentialities could be useful for the entire population of firms that could test their ideas collecting all the feedbacks coming from the crowd and in this way considerably reducing the cost for adapting the product to the market. While for young or small firms more interesting scenarios could raise, in fact all of these having less financial resources and being limited to the geographical area in which they operate, they could increase their capabilities of development and survival in the market approaching the crowdfunding as a valid alternative to catch new markets and potential customers.

2.4 The role of crowdfunding

Technological advances are disrupting Entrepreneurial Finance in the way that it is provided, the rapid growth of social networks and diffusion of online platforms has opened new prospects for entrepreneurs to raise seed capital and for non-professional investors to pledge their investments. Crowdfunding is the most important as it is emerging and growing rapidly – consequently research in crowdfunding is evolving fast as well - as backers incur insignificant transaction costs to pledge their contributions due to the inexistence of intermediaries, although some issues occur that we discuss in later chapters (Vismara, 2016) mentions that Equity crowdfunding can play a role in signaling as a predictor of crowdfunding campaign success, as the case in IPO, and that social capital plays a significant role in the success of a campaign.

Going deeper in the phenomenon, studying the role crowdfunding constitutes for the main actors involved implies studying the established relationship between the platform and the fundraiser, the platform and the crowdfunders and the fundraisers and the crowdfunders, these three relations demonstrate the mechanism of crowdfunding. Firstly, crowdfunding expands the access to financial resources to fundraisers (individuals or firms). (Fleming & Sorenson, 2016) suggests that starting from the hypothesis that good ideas emerge everywhere and from everyone against the fact that Venture Capitals are located in few locations and within a narrow segment of the population, if so, crowdfunding platforms would have found entrepreneurs that happened to be born in the wrong places. On the other hand, crowdfunding platforms provided crowdfunders with great help despite the quite low success rate of crowdfunding campaigns; they provide the crowd with a mean of investment that doesn't include the normal costs a business angel or venture capital occur in an investment. Therefore, crowdfunding sets both the creators and backers free from barriers that have largely held them down; (Younkin & Kashkooli, 2016) The paper Identifies four problems CF solves or four functions that these platforms offer which are; Gatekeeping by giving a mean of access to capital for creators , Coordination as a mean of building and enhancing existing networks, As creators can be first timers and so do not possess some competences, the platform gives solutions to common problems they can face, so platforms solves the problem of Inexperience, and Patronage as the product can go through radical changes. The article shows that Crowdfunding solves those problems differently in means of effectiveness, and so

some challenges arise like imitation and competition. Nevertheless, it points out the emergence of supporting services to crowdfunding platforms that help fundraisers in handling logistical and managerial difficulties; therefore, definitely this constitutes another area that draws attention to the effect of such services on crowdfunding performance. A distinction of Crowdfunding from other typologies of finance is its role in democratizing innovation as it provides a platform that is open to everyone to gain capital (Kaufman, Kassinger & Traeger, 2013). In addition to that, (Mollick & Robb, 2016) touches the same point and draws the attention to the role of crowdfunding in democratizing innovation in terms of commercialization and finance, and make it possible and accessible to everyone, also the paper sheds light on challenges that are proven to be evident in the context like the fact that 85% of large projects are delayed and increase in competition due to the recent market validation by the fundraiser of the project, in addition to the emergence of copycat products around it, so building a brand is crucial for such projects but it remains a challenge as much as it needs time. Thus, leveraging the campaign success to build a loyal group of customers and delivering a high-quality product on time are an imperative for long-term success.

Furthermore, the role that crowdfunding plays as a marketing tool has become a focus of studies although needs more attention, (Brown, Boon & Pitt, 2017) investigates the claim that now more startups are using crowdfunding platforms not as a mean of finance mainly but more as a marketing tool as a way to validate their market and ensure its presence when the product is launched, At the same time, we find that (Chemla & Tinn, 2016) claims that reward-based crowdfunding is nearly as efficient as surveys and full money back guarantees. (Block, Colombo, Cumming & Vismara 2017) also points out the fact that in reward-based crowdfunding platforms, it's very important to be fast as a project creator and engage with customers at an early stage because it's an opportunity as well to validate the product and enable a form of customer co-creation by leveraging the feedback coming from them so crowdfunding states a form of open innovation.

An exploratory study by (Cheng, Sriramulu, Muralidhar, Huang & Loh, 2016) points out that "Four critical factors contribute to the survival and success in the entrepreneurial process: (a) the ability to test and validate product ideas that resonate with customers ("product-market fit"); (b) the ability to raise capital at various stages of growth while the startup searches for the right business model; (c) the ability to

advertise and sell products to early adopters as startups seek growth; and (d) the ability to engage constructively with other players within the entrepreneurial ecosystem (e.g., partners, suppliers, and other resource providers)”. These factors are not static but dynamic and keeps evolving in the light of increasing usage of social media in various aspects of entrepreneurial activities, such as idea generation and validation – demonstrated by crowdsourcing and crowdfunding, raising capital (crowdfunding) and marketing (social media marketing, surveys and updates). It is evident now that startups are not solely depending on traditional sources or finance such as venture capital and government-sourced funding, or even conventional way of advertising, marketing, sales, product development and communicating with outside parties. Therefore crowdfunding gives a strong platform for startups to build a community that allows overcoming the critical factors to survive.

As we have already identified the different types of crowdfunding and mechanisms, we are still to clarify which one to pursue; in regards to the different strategies to take into account for both backers and project creators, several studies tried to identify mechanisms that both stakeholders can follow to fulfill their use of crowdfunding, one study (Bodily, 2016) conducted risk analysis models to identify five different strategies implied in mechanisms that exist in crowdfunding and that stakeholders can choose from in order to reduce the risk for backers and get the most of the funding channel for fundraisers. The four mechanisms are (a) the equity participation model predominant in start-up financing (equity crowdfunding), (b) outright incentive gifts (reward-based crowdfunding), (c) insurance against downside loss, and two new ideas: (d) swap hedge and (e) revenue contract.

2.5 Reward-based crowdfunding

According to (Belleflamme, Omrani & Peitz 2015), there are four types of crowdfunding: Equity-based crowdfunding, Lending-based crowdfunding, Reward-based crowdfunding and Donation-based crowdfunding, the focus of our study is on Reward-based crowdfunding and so many of the research contributions we’ve decided to include in our literature review are aligned with that aim. On reward-based crowdfunding the creators offer a list of rewards at different prices, called menu pricing. The backers evaluate the rewards on the list (as incentives) of a project to decide on their support of the project. Once decided, the backers fund the project

with amounts set on their selections of rewards. Finally, at a later time, the project creators deliver the promised rewards. Rewards play a significant role in the success of a project. (Block, Colombo, Cumming & Vismara, 2017) states that in a reward-based crowdfunding project, the most typical reward to backers is the delivery of a (sometimes customized) product or service, which makes this type of crowdfunding somehow similar to financial bootstrapping (i.e., crowdfunders are asking for payments in advance of production and delivery of the rewards so that they decrease the accounts receivables). Backers may also be offered ego-boosting rewards, such as a personal message or a picture signed by the photographer, or community-belonging rewards, such as the invitations in social events (e.g., events related to the product like parties) or the offering of symbolic objects (e.g., gadgets) that display support for a project. Project proponents are either individuals or companies. Although not enough research has been conducted yet in determining exactly the full role of rewards on the success of a crowdfunding campaign, but some are there, (Lin, Lee & Chang, 2016), they suggest that rewards with limited offerings usually achieve higher ratios between raised funds and the targeted goals (overfunding), whether these projects succeed or not. However another study (Thürriidl & Kamleitner, 2016) proposed a strategic toolbox to help fundraisers in selecting rewards for their projects, moreover the paper suggests that all reward-based crowdfunding platforms follow almost identical rewards strategy. Following the offering of rewards, the lateness in delivery of the rewards is another issue that needs deeper understanding, yet no significant attention has been given to this issue, although a study that links the lateness in rewards delivery time to the whole timeline of the campaign suggests that it is correlated with both the number of comments crowdfunders provide and the updates fundraisers provide on the status of the project, despite the fact it can be related to the raised funds as well as overfunding means higher demand and therefore higher production capacity is needed.

Some attempts to study legal implications of crowdfunding has been found such as (Cumming & Zhang 2016), it remains a topic that needs further research though due to the pattern of evolvement and design changes in crowdfunding platforms. Moreover, lately a scope of research in crowdfunding has been dedicated to better understand how crowdfunders use particular mechanisms such as video pitches and descriptions to decrease the information asymmetries between them and project creators (Cumming & Zhang, 2016). However most literature on Reward-based

crowdfunding focus on empirical research on subjects related to determinants of success, fundraisers and crowdfunders characteristics with not that much of emphasis on the rewards offered.

A total of 19 papers focused on reward-based crowdfunding in 2016 up to present, ranging from a focus on mechanisms that drive the success of a reward-based crowdfunding such as (Thürriidl & Kamleitner; Guan; Du & Wang, 2016) that investigates the impact of choice schema's two key features: the number of reward-based choices and the existence of lottery-based choice, the paper introduces a new type of rewards which is lottery-based rewards and its effect on the success of a crowdfunding campaign. Arriving at signaling (Kunz, Bretschneider, Erler & Leimeister, 2016) adopting a more general approach, the study uses signaling theory, coming up with results indicate that social ties, investment preparation and presentation, the supply of multiple rewards as well as endeavors to communicate and interact with the crowd positively influence the probability of success of a reward-based crowdfunding campaign. In contrast, the increase of funding goal, campaign's duration and the estimated time of delivery for the rewards has a negative impact on the successful completion of a campaign. (Kim, Buffart & Croidieu, 2016) stresses the importance of early-stage creative efforts, though the ability to succeed depends on their ability to overcome a variety of difficulties regarding newness and customers' ignorance of their project, the study address one aspect of such difficulties: the ability to communicate credible arguments about the merits and prospects of an idea when raising the funds required for execution. Moving on to campaign success factor, an area of crowdfunding research that has attracted the majority of scholars, such as (Bi, Liu & Usman, 2017), (Por., Yang & Kim; Zheng, Hung, Qi & Xu; Rakesh, Lee & Reddy; Koch, 2016), studies that are demonstrated in the next paragraphs of our review. Moreover very few papers investigated specific contexts that Crowdfunding has affected, like some geographical contexts (Europe, country specific like Czech Republic and Slovakia), (Šoltés & Štofa, 2016) or Industry specific like music industry (Gamble, Brennan & McAdam, 2017). The rest of the papers are related more the concept of success in a crowdfunding campaign including social capital, project quality and crowdfunders feedback, which will be reviewed in upcoming paragraphs.

Substantially, the emergence of reward-based crowdfunding has simplified the entrepreneurial process; nowadays entrepreneurs bear fewer costs, leveraging a direct

sales channel, benefiting from a community that is not bounded by investors or lenders. True that crowdfunding has its own problems (ex. information asymmetry), but a significant attention in research is brought to find solutions.

2.6 The concept of success in a crowdfunding campaigns and success factors

Moving on to discuss the points mentioned before regarding the success of a project, A significant attention to the concept of success of crowdfunding campaigns has been evident lately in crowdfunding literature, despite the focus on only one concept of success which is probability of reaching the funding goal, some attempts to unfold what happens after the end of the campaign until the delivery of the rewards but none about whether the projects survive in later stages of development or not. (Koch, Cheng, 2016; Por, Yang & Kim, 2016) has attempted to track the success until the delivery time. In regards of the campaign description and pitch, (Ishizaki, 2016) has carried on a Computer-Aided rhetorical model to analyze the speech pattern in each of the pitches resulting in categorized experience types, the findings suggest a strong correlation between the pattern of speech told in the video pitches and the success of a crowdfunding campaign. In general, research has focused on several determinants and factors that relate to a crowdfunding campaign's success such as funding goal, duration, and project category. Another study (Thies, Wessel & Benlian, 2016) finds that eWOM has a significant yet weaker predictive power than popularity information and that popularity information has a more immediate effect on backers' behavior, although that the effect decreases over time while eWOM effect slowly increases indicating that social interaction are perceived as a quality indicator that help backers' and project creators reduce information asymmetry at the same time which therefore, leads to the importance of enhancing social interaction within crowdfunding platforms.

The concept of crowdfunding is unsurprisingly dependent on the contribution of crowdfunders and their motivation to pledge and support a particular project. (Steigenberger, 2017), the paper uses a survey addressing supporters to find that the motivation can be demonstrated as illustrated in two groups, one with a single motivation for purchasing, the other with a purchasing motive alongside an altruistic and involvement motive. On the other side another study imposes a question of how does the contribution of a crowdfunder matter to a crowdfunding project

(Kuppuswamy & Bayus, 2017) predicting that support for a crowdfunding project will increase as the project funding approaches its target goal and that the motivation decreases after the project reaches its goal, moreover that the expected impact moderates the relationship and effects on goal proximity.

A crucial factor in the success of crowdfunding projects is crowdfunders' decision to invest or not, a good focus on the topic has been evident in the literature studying the how do crowdfunders make the decision and what are the deciding factors taken into account, firstly, (Bi, , Liu & Usman, 2017) points out contradicting findings to the ones shown by (Thies, Wessel & Benlian, 2016) as the first shows that the central route information (signals of project quality) and the peripheral route information (e-word of mouth) have almost equal effect on funders' investment decisions. Second, (Polzin, Toxopeus & Stam, 2017), helps in understanding and distinguishing between the two types of crowdfunders in the way they collect the information about the campaign and the decision they make to whether invest or not taking into account the different types of crowdfunding. It helps in distinguishing between the kinds of information input provided by the crowdfunders in terms of comments and how do they perceive the innovativeness of the project (How do they build their decision of how innovative the project is).

Another aspect the literature takes into account serial fundraisers and social capital of fundraisers including internal and external social capital and their role in the success of a crowdfunding campaign, (Butticè, Colombo & Wright, 2017) unfolds the tradeoff between social capital from previous campaigns and the one from fundraisers' network, suggesting that this internal social capital developed within the platform, which is not available to "normal" serial entrepreneurs, gives an advantage to serial fundraisers' campaigns that makes them more successful than those launched by novice fundraisers, Although this type of social capital and its advantages has a limited lifespan. In fact social capital in crowdfunding has dragged more attention lately with a little over 100 papers that addressed the topic from 2016 up to present, such as (Josefy, Dean, Albert & Fitza, 2017) tackling the relationship between crowdfunding and local communities, attempting to understand if whether crowdfunding campaigns in certain communities lead to better funding outcomes than others. (Skirnevskiy, Bendig & Brettel, 2017) addresses the topic of how internal social capital can develop through project track record and how

internal social capital can spill over to external online communities, focusing on the long-term implications of these manifestations of social capital.

By conducting social exchange theory, (Zhao, Chen, Wang & Chen, 2017) studies and examines the key factors influencing backers' funding intention. More than 204 experienced backers in Taiwan participated in this study, and structural equation modeling was applied for data analysis. Results show that commitment has a remarkable and positive effect on funding intention. Interestingly, perceived risk was found to be positively associated with funding intention, which challenges the conventional view of perceived risk having a negative effect on usage intention. (Giudici, Guerini & Rossi-Lamastra, 2017) discusses the altruism of localized social capital and claims that they have two dimensions among residents and their compliance with social norms, coming up with findings that social relations magnify the effect of local altruism, Conversely, compliance with social norms does not have any moderating effect.

Moreover, (Kromidha & Robson, 2016) suggests that funders and backers who identify themselves with the projects in their own social networks are associated with greater pledge/backer ratio. They also find that projects where the fundraiser and its backers exchange more signals in a joint forum, but not signals delivered unilaterally by the fundraiser, have a greater pledge/backer ratio. These findings, based on a scalable quantitative study, highlight the importance of a multi-theory approach, advance social identity theory and signaling theory in the context of crowdfunding, and could be applied to other entrepreneurial contexts as well. Moreover, several studies focused on the effect of information cues on ventures in crowdfunding, (Summers, Chidambaram & Young, 2016) deviated a little from other articles by shedding light on the interaction between social media and signaling, testing two hypothesis one assumes that greater social media buzz will leave a positive impact on project's signals outcome, and the other claims the greater the volume of social media buzz the stronger the backers' commitment signals effect on campaign's success which both have been supported by modeled findings of the analysis although the findings differ among different social media platforms. Another study (Ciuchta, Letwin, ,Stevenson & McMahon, 2016) posed several measures to quantify the willingness to invest, venture quality information, social information and regulatory focus, among the results of the study, an unexpected finding that social information can play an important role in altering individuals high in

prevention focus as social information is very attractive to them that only if they see the crowd has taken the initiative and already taking action.

Another aspect of research focus is on the delivery time of rewards, key variables and characteristics that derive the lateness in reward delivery. (Hauge & Chimahusky; Ishizaki, 2016) touched that aspect by introducing variables like lateness, preparedness (Chen, Yao & Kotha 2009) define preparedness as cognitive passion; (Baum, Locke & Smith 2001) define preparedness as related to motivation”, many factors can contribute to the preparedness of a project such prior experience, the entrepreneurial team, Characteristics of rewards (e.g. Hand Crafted, personal letter) and the recognition of the rewards. The findings were that 61.46% of projects delivered rewards after the promised date, what concern us in this chapter is that Preparedness represents the most significant predictor of reward delivery time.

(Calic & Mosakowski, 2016) examines the effect of sustainability in the success of a crowdfunding campaign, addressing social entrepreneurs and their ability to acquire financial resources through crowdfunding, the study comes out with results suggesting that sustainability orientation positively affects funding success and that the relationship is mediated by third party endorsements and project creativity.

Another dimension of success is cultural, (Cho & Kim, 2017), this article studies how culture influences the success of crowdfunding and message strategies, a total of 510 crowdfunding projects from both the US and Korea were analyzed for cross-cultural comparison. The research sought similarities and differences between the two geographical contexts that lead to the success of campaigns showing in the US positive correlation between the number of comments, update and given delivery schedule, and the success of a campaign. On the other hand the success of a campaign in Korea is influenced by a single different factor, which is the number of supporters; in contrast the number of comments and specifications on how to use the funds negatively influenced the success of a campaign. An interesting finding of the same study is that the more information on how the funds will be used negatively affects the success of a campaign.

Trust management is – among others - a significant factor in the success of a crowdfunding campaign, (Kim, Shaw, Zhang & Gerber, 2017) studies the effect of delay on trust, using a mixed method study, the researchers examine what factors influence backers’ trust in crowdfunding when products are delayed, the findings are that the funding goal, number of backers, percent of funding goal raised, number of

reward levels, and creator's previous crowdfunding experience (in terms of experience and social capital obtained) are associated with the duration of delay, in conclusion they discuss the implications of those factors for managing and maintaining trust in crowdfunding. Nevertheless, following the same goal of the past article, (Zheng, Hung, Qi & Xu, 2016) examines the relationship between trust management and campaign performance in reward-based crowdfunding and concluding for implications for practice for the different players in crowdfunding, (e.g. For projects that involve the development of a new product), in which trust management plays a crucial factor and so the importance of forums to enable rich-media interactions and the presence of a Q&A section to save the entrepreneur more time and effort from answering common questions to focus on more important interactions, accordingly, real-time communication tools and tutorials help entrepreneurs in learning how to accumulate social capital as past record can be of a great help to project creators.

Moving on to video pitches delivered by the entrepreneurs; it is a key factor in the success of crowdfunding campaigns and has received so far good attention, several papers investigated video pitches and their relation to the success of a campaign. (Ishizaki, Cumming & Zhang, 2016) and (Dey, Karahalios, Duff & Fu, 2017), the later suggests design implications to be taken into account when making the video as it finds six different factors related to video pitches that are predictive to the success of projects, for example, projects perceived to have a lower level of complexity were more likely to be successful; but in design and fashion campaigns, projects perceived to have a higher level of complexity - which perhaps reflected craftsmanship - were more likely to be successful. Following in the same point, (Reyes & Bahm, 2016) tried to track the effect of video pitches in the pledging decision of backers by examining the interactions between the fundraiser and crowdfunders in terms of emotions from a psychological point of view, coming out with a trace of emotional footprints in video pitches that would be of a help in future research to define emotional patterns in relation to given behaviors, and as well can be used by crowdfunding platforms to identify the factors that lead backers to pledge more of contributions to concerned projects. Several other contributions that tackle the same topic are to be mentioned in the next chapter. In addition to video pitches, the description of the project is an important element of success in crowdfunding as demonstrated by (Zhou, Lu, Fan & Wang, 2016), that introduce three factors related

to the project description which are (length, readability, and tone) and investigates their impact on funding success.

The interactions and offsets that can happen between several projects at the same time on a crowdfunding platform is an interesting topic that been investigated by (Solomon, Ma & Wash, 2016), which finds that the superstar project (the most popular project) affects backers' ability to coordinate and back other projects which imply that the most popular project sets a higher level or standard that leads to the underestimation of other projects by the backers. Following the same point, signaling theory has played a role in crowdfunding literature as it's been used to examine the relationship between the project creator and the crowd, specifically how do project creators convey the quality of their projects to the crowd and if there is any relation to the innovativeness and success of the campaign. It is evident from studies such as (Courtney, Dutta & Li 2016) that some factors like startup actions and founder characteristics, third party endorsements play a significant role in decreasing information asymmetries between fundraisers and the crowd that while start-up-originated signals offset each other's effects, third-party endorsements (sentiment expressed in backer comments) validate and complement startup-originated signals. Overall these studies investigate promising models that can be used in the future to decrease information asymmetries and better encouragement to the crowd to pledge.

In conclusion, Some attempts to formulate a recipe of success or pave the way towards it in crowdfunding are observed, (Li, Rakesh & Reddy, 2016) tried to figure out that by stating that new projects that take into account the outcomes of both past successful and unsuccessful campaigns (censored information) have a higher probability of success than others, and that social network-based features can help predict success better. In addition to that, temporal features that are set at the beginning of the campaign can improve the success prediction significantly. Furthermore, (Xu, Zheng, Xu & Wang, 2016) by applying asymmetrical tools, attempts to figure out how to satisfy backers and consequently reach success in a campaign using marketing methods, coming up with several variables that contribute to backers satisfaction, including delivery timeliness, product quality, project novelty, sponsor participation and entrepreneur activeness.

The question of what happens to entrepreneurial projects after crowdfunding is still to remain unanswered in the literature, though some attempts to answer the question are found, a very recent study by (Ryu & Kim, 2016) tried to evaluate the effect of

crowdfunding success on subsequent financing and exit outcomes of startups compared to the effect of business angel investment, finding that startups went through a successful crowdfunding are more likely to receive more investments from corporate venture capitalists as opposed to independent venture capitalists, and that CVC's approach crowdfunded startups differently from others that obtained investments from other financing sources due to the fact that crowdfunding gives more benefits such as market testing and demand estimation and that of course most of CVC's focus more on the viability of the product than on financial returns as in the case of IVC's.

2.7 Innovation influence in crowdfunding projects' outcomes

Crowdfunding literature up to date has covered many areas of the phenomenon but the area concerning what happens in project development after the raise of the necessary funds up to the time of delivery is still lacking enough efforts, by what happens in project development we mean the non-monetary effects of crowdfunding in the process of development, if innovation is better perceived in the project after the campaign and how project creators Absorptive Capacity can relate to the innovation perceived and offered by the project itself. Some attempts to tackle the issue is evident in the literature in this chapter we mention some of them.

Some papers tackled the issue from the outside as crowdfunding is a new source of entrepreneurial finance, how does it differ from other sources of finance and how does it contribute to the success and innovation of various projects. (Bellavitis, Filatotchev, Kamuriwo & Vanacker, 2017) points out that previous studies emphasized the peculiarity of the entrepreneurial settings to study mainstream theories such as agency theory (e.g. Burchardt, Hommel, Kamuriwo & Billitteri 2016).

Several financing models especially the new ones such as crowdfunding, new phenomena such as "unicorns", or generally ignored sources of finance such as bank debt provide valuable avenues to test existing theoretical foundations and eventually challenge the current wisdom. A great example is represented by Pebble Watch. The company succeeded in raising needed investments from business angels but failed at later stages in obtaining a VC on board. Therefore, the company headed towards crowdfunding through Kickstarter. \$10 million was raised for the first product, while

the second raised more than \$20M. At this point, that tremendous success attracted attention to crowdfunding leading to the article by Forbes² that questioned the necessity to raise VC financing anymore. The same article mentions, a key characteristic the author pointed out is how a number of researchers have underlined the diffusion of innovation coming from microfinance. Another question imposed by the author as well as if it is more valuable to pre-sell products in a crowdfunding campaign and establishes a relationship with customers early on, or is better to connect with a top VC? (Sorenson, Assenova, Li, Boada & Fleming, 2016) by comparing data from 2009 to 2015 on Kickstarter campaigns and on VC investments and by exploring the relation between Kickstarter and future VC investments in a particular region, the study comes out with an evidence that successful campaigns may attract the attention of VCs to innovators in the region so by that increasing the innovativeness of those campaigns through the involvement of VCs.

In contrast to the past mentioned contributions, a number of researchers tackled the concept of innovation from the inside, (Chan & Parhankangas, 2017), this paper suggests that the incremental innovativeness of campaigns leads to better funding outcomes, and that the radical innovativeness of campaigns resulted in less-favorable outcomes. This negative effect of radical innovativeness may be mitigated by incremental innovativeness, which may evoke increased understanding and appreciation of radical innovativeness among the crowdfunders, therefore, incremental innovations are significant for the appreciation of radical innovations. Another paper (Davis, Hmieleski, Webb & Coombs, 2017) analyzed the video pitches as well to find the positive relationship between perceived product creativity and the campaign performance.

Moving on to the role that crowdfunding plays in introducing innovation in many industries. As we will see in the next chapter, that crowdfunding literature has given a good amount of research to the application of crowdfunding in specific contexts (industrial and geographical contexts). What worth mentioning is the innovation introduced thanks to crowdfunding existence as presented in (Gamble, Brennan & McAdam, 2017) that crowdfunding is providing a platform for artists and music labels to adopt more open business models that include the crowd in crowdfunding, (Szopa, Marek & Fafrowicz, 2017) demonstrated how crowdfunding is disrupting the revenue model of media companies, and (López-Golán, 2017) clearly points out how

crowdfunding has provided a new platform for many to sell, buy and co-create cultural products in Spain.

2.8 Crowdfunding in different geographical contexts and other industries

In this chapter we investigate the influence and interruptions crowdfunding have caused in multiple industries and geographical markets. We demonstrate multiple studies to reflect the dimensions of the phenomenon and its expansion disrupting different areas in the economy.

As reward-based crowdfunding is growing rapidly in many industries and sectors as well as expanding to include more sectors, as an example in the music industry; (Gamble, Brennan & McAdam, 2017), the paper highlights by conducting an exploratory study the effects of reward-based crowdfunding on different players in the music industry and how does it influence the business model development. Moreover the paper claims that due to the strong competitiveness in the industry, many major record labels are re-positioning themselves in the market and are being more open to user involvement as a way to change and innovate in their business models, consequently crowdfunding have non-financial implications that would be beneficial to the company in terms of its attractiveness and employee quality, in addition to the creative contribution from fans to the music industry in the side of music production. Eventually the paper comes with a conclusion that crowdfunding has a significant impact on both artists' and major record labels' business models.

Moreover, (Szopa, Marek & Fafrowicz, 2017) examines the role of crowdfunding as a funding model for new media, imposing questions related to the media management practices taking into account crowdfunding as a revenue model for media. The existence of crowdfunding in other industries has attracted the attention of researchers as well such as (Honisch & Ottenbacher; Riley-Huff, Herrera, Ivey & Harry; Baker & McKenzie; Zhu, Zhang, Lu, McLellan & Pan 2016) that uses a three-level Stackelberg game theory to model the interactions between the three parties (electricity supplier, charging infrastructure operator and crowdfunders), to prove that crowdfunding is an effective and efficient way to promote the charging piles, not far away from that, (Vasileiadou, Huijben & Raven; Fonseca, Diz & Dos-Santos, 2016). Nevertheless, (Tanrisever & Wismans-Voorbraak, 2016) compares different crowdfunding platforms to investigate the investment decisions of

crowdfunders to see which one appeals better to wearable technologies. Furthermore, in scientific research crowdfunding is present, especially for students and early career scientists (Vachelard, Gambarra-Soares, Augustini, Riul & Maracaja-Coutinho, 2016) provides fundraisers with tips on how to pursue a successful campaign for their research projects.

Some issues may arise from the entrance of crowdfunding in some sectors such as demonstrated by some articles (Snyder, Mathers & Crooks; Snyder, 2016), and (del Savio, 2017) that studies the conflicts in using crowdfunding in the medical research, that the medical knowledge is a structured and intermediate public good and explains the funding systems as a whole not just expert-based reviews and that no one should be concerned that crowdfunding may supersede the expert-based reviews.

A recent study (López-Golán, 2017) sheds light on the changes in the behavior of the final consumer of the cultural products in the Spanish cultural sector due to crowdfunding and that it is an alternative for collaborative creation and production in that market as it affected all cultural sectors. Other studies such as (Cho & Kim; Snyder, Crooks, Mathers & Chow-White, 2017), (Chishti; Erdenebileg; Sanders; Gruzina, Zeinalov & Ilienkov; Déprés; Dollani, Lerario & Maiellaro; Beier & Wagner, 2016) focus on comparative analysis between two or more geographical contexts or explore a single one.

A focus on Europe has been observed as in articles like (Dibrova, 2016), and (Dushnitsky, Guerini, Piva & Rossi-Lamastra 2016) that unlike US centric studies, puts macro lenses to underline the determinants of crowdfunding platforms creation across 15 different European countries, pledging specifically that the creation of crowdfunding platforms varies across countries, by presenting 18 different independent and independent variables. (Zilber, Silveira, de Carvalho & Imbrizi, 2016) this exploratory research considered crowdfunding as an alternative mean of financing for new enterprises and its objective was identifying the main economic areas of the successful projects and describe the characteristics of the most successful crowdfunding projects.

Some studies regulated the research to more than one dimension such as (Snyder, Crooks, Mathers & Chow-White, 2017), (Swierczynska-Kaczor & Kossecki, 2016), and (Cockrell, Meyer & Smith, 2016), the latter limits the study of crowdfunding behavior of various business professionals in the service sector to Pittsburgh. Again in journalism (Orgeret, 2016), and (Hunter, 2016) the article explains how journalists

take advantage of crowdfunding to secure a second job and that they have to embrace entrepreneurial techniques to do so.

2.9 Crowdfunding challenges

Ethical concerns arise when crowdfunding is involved in some contexts like the medical sector, when as in this article (Shaw, de Wert, Dondorp, Bos & van Gelder, 2016) key considerations concerning payment for participation in trials, including patient autonomy, risk/benefit and justice, concluding that such trials could be ethical under certain strict conditions, but only if other potential sources of funding have first been explored or are unavailable. Also (Snyder, Crooks, Mathers & Chow-White, 2017) offers a first step towards addressing this knowledge gap by examining medical crowdfunding campaigns for Canadian recipients, Using 80 medical crowdfunding campaigns for Canadian recipients, analyzing how Canadians justify to others that they ought to contribute to funding their health needs. Then further discuss how these appeals can be understood in terms of ethical justifications for giving and how these justifications should be assessed in light of the academic literature on ethical concerns raised by medical crowdfunding.

Another challenge regarding crowdfunding novelty, some articles studied the novelty of crowdfunding itself represented by its various models (reward-based, equity-based...etc.) and argue that to what extent does crowdfunding relate to the concept of crowdsourcing claiming that only two are fundamentally novel. Research has already arrived at a point that it can distinguish crowdfunding as novel phenomena though.

Other issues concerning fake information, (Wessel, Thies & Benlian, 2016) studies the effects of fake information given in social media on the success of a crowdfunding project, stating that fake Facebook likes have a very short-term positive effect on the number of backers. However, this short-term peak is followed by an immediate, sharp drop in the number of backers funding the campaign leading to a total negative effect over time. Moreover, the same article tries to come up with circumstances and situations that influence the manipulation of signals being sent to the crowd. Though some contributions tried to find solutions to the ethical issues regarding crowdfunding, one of them is (Siering, Koch & Deokar, 2016) which states that the analysis of dynamic communication during the funding period might

be of a great help in order to detect fraudulent behavior instead of static information analysis.

Another article (Blanchard & Sabuncu, 2016) puts the recommendations of the Ethics Committee of the French Research Institute for Development on crowdfunding into perspective by comparing crowdfunding to classical fundraising campaigns for biomedical research. Another context where crowdfunding can raise ethical considerations is in Journalism, The study (Porlezza & Splendore, 2016) provides evidence about the ethical issues in crowd funded journalism projects, particularly in relation to production transparency and responsiveness. The study also shows that in some cases of crowdfunding (platforms), accountability is outsourced and implemented only through the audience participation.

One of the challenges that still remains is inequality in crowdfunding, while gender equality is less apparent in developed countries regarding access to financial resources in general, it is still more evident in developing countries, in fact crowdfunding shows that women are more successful than men in obtaining funds although they tend less to become serial entrepreneurs, that could be explained partially by linguistic differences in terms of language usage and that subsequently the institution of crowdfunding can reduce gender inequalities in entrepreneurial finance (Gorbatai & Nelson, 2015). Nevertheless, crowdfunding has given a new source of finance for many who weren't able to obtain funds due to poverty (ex. Kiva) (Asongu & De Moor, 2015) providing access to education, entrepreneurial skills and information literacy as well. In general very few papers tackled social issues like development and inequality in general with almost none after 2015.

2.10 Crowdfunding as a source of finance among others

As crowdfunding appears to have proven the legitimacy of its position as an entrepreneurial source of finance, a considerable amount of articles gave space to compare crowdfunding to other sources of finance (Fairchild, Liu & Yao, 2017) compared the entrepreneur's choice to either pursue crowdfunding or venture capital financing, using a game-theoretic analysis taking into account the effects of entrepreneurial overconfidence derived by the emotional excitement of a successful crowdfunding versus the benefits a VC can bring onboard like networks and coaching effects, highlighting that by choosing crowdfunding, the entrepreneur gets

to keep all the equity but have to deal with passive investors (backers), in contrast still remains to answer which is higher in value the overconfidence of crowdfunding or the one of the network and coaching provided by VC's?

(Chakraborty & Swinney, 2016) compared alternative sources of finance (equity or loans) to crowdfunding, one of the main differences is that in equity or loans financing, the total cost of the concerned product is unknown prior to the funding time, so if the investor or the bank perceive that the cost is going to be higher than the latter revenue then the decision will be not to invest, on the other hand as mentioned before that crowdfunding gives a unique advantage of testing the demand for the product before incurring the costs to produce it so that the risk is reduced, so that products associated with high risk like innovative ones that appeal to a niche market can only be funded by reward-based crowdfunding. On the other hand, on equity or loans, it is possible for the investor or the lender to provide personalized financing contracts, which is not the case in crowdfunding in which a certain fee occurs that derives from the information asymmetry incurred.

Crowdfunding plays an early role in the lifetime of startups, given what (Kaminski, Hopp & Tykvova, 2016) say that crowdfunding seems to help VC investors in assessing future trends rather than crowding them out of the market, that crowdfunding volume and VC investments volume are correlated, so the higher the fund raised from crowdfunding the higher the subsequent VC investment.

2.11 Conclusion

The literature in crowdfunding, though many studies resulted in opposing findings, and that the arguments are still open as doubts are arising and more questions are being asked, has contributed in understanding the peculiarity of the new mean of entrepreneurial finance and highlighted important dimensions of the phenomenon. Following the studies mentioned in the first chapter, most of this research limited their contribution to what happens during a crowdfunding campaign, a few extended the efforts to what happens after that in general. Despite the still standing need for further research in the previously highlighted topics, other topics have been neglected so far and therefore, need to be highlighted. The identification of these later topics is beyond the goal of this thesis and therefore we limit our study to one of them, that is innovation introduced by crowdfunding as an introduction to study the

peculiarity of this mean of finance in the study of mainstream models and theories like Open innovation (Chesbrough, 2011) and Absorptive capacity (Grant, 1996)

The study of innovation introduced by crowdfunding is a broad topic in itself, thus it received some scholars' attention like (Davis, Hmieleski, Webb & Coombs; Chan & Parhankangas, 2017), it is suggested that crowdfunding introduces different types of innovation to entrepreneurial ventures that use crowdfunding, product innovation (Poetz & Schreier, 2012), market innovation (Chemla & Tinn, 2016; Block, Colombo, Cumming & Vismara 2017), process innovation in supply chain (Younkin & Kashkooli, 2016), the latter will not be included in this study. In general, we claim that crowdfunding has aspects of open innovation in the form of crowdsourcing of ideas that firms can exploit in different ways.

The inclusion of social media as a source of social capital in crowdfunding platforms, (Butticè, Colombo & Wright, 2017) reflects the difference between social capital obtained on the crowdfunding platform and social capital gained from project creators' network including social media. At the same time, the importance of this social capital from social media is highlighted by (Ihl, Vossen & Piller, 2012), who argues that social media can make economic exchange relations more interactive, but also can turn the market into a more competitive one. Nevertheless, social media may increase the efficiency of co-creation in two dimensions, by cutting costs as more participants are involved in the process, and by increasing the heterogeneity of knowledge which is a main factor for success in innovation. (Chesbrough, 2011) claims that open innovation differs from closed innovation in contrasting principles, one of them is that external R&D can generate a significant value and that internal R&D is needed to perceive some of that value, and that open innovation comes from the notion that the firm doesn't have to originate the R&D in order to create value from it, in addition to the claim that having the right mix of open and closed innovation (internal and external ideas), will result in better outcomes than a pure model of one of them. (Laursen & Salter, 2006) argued that firms that are more open to external sources of ideas are more likely to have a better innovative performance, taking the assumption that these external sources will enlarge the pool of knowledge of the respective firm. In the next paragraphs, we explain the link between crowdfunding and the concept of open innovation originates from the exchange of information between project creators and backers on the platform.

In this literature review we have included the work of 118 articles from different sources obtained from Scopus, SSRN and Google scholar. We have used one keyword on all search engines, resulted in 442 articles. After the screening of abstracts and focus on recent contributions we selected the 118 articles and are included in this chapter. It is worth mentioning that 4 articles are published in international journals, the rest in either an independent publication or a proceeding for a conference. The sources are homogeneous as they include journals, independent publications and conference publications. We have tried to put more focus on the most recent research articles- published since 2016, nevertheless, we have included older articles that we believe need to be highlighted in our literature review (see figure 1 and figure 2 below).

The explored areas we have touched are areas that we thought of their importance to the research effort that has been observed, that includes (crowdfunding models and typologies, success factors, innovativeness influence, crowdfunding implications in industries and specific geographical contexts, and ethical, moral and legal complications, in addition to the efforts that tried to resolve these issues accompanying crowdfunding). On the other hand, the areas are still in need for further research appear to include some that was highlighted by few previous literature reviews which includes the blur vision of what happens to a project after the end of the crowdfunding campaign including (the contribution of the crowd in the later development stages of the product, what happens to startups after the end of the campaigns - how many die? when? And why? -, how to measure the innovativeness of a crowdfunding campaign, and the issues and concerns that challenge crowdfunding like ethical concerns in specific contexts, moral concerns and fake information).

The majority of the papers we screened focused on the period during the campaign, including qualitative and quantitative articles in social capital, signaling and success factors including trust management, campaign goal and delivery time. Some highlighted the interrelations between crowdfunding and other sources of entrepreneurial finance. And some focused on specific geographical or industrial contexts. Some articles attempted to resolve the challenges that are facing crowdfunding but the efforts are still in their infancy. In addition to that, some emerging services around crowdfunding are growing and need more attention from scholars to identify their role and contribution to crowdfunding. Nevertheless, the

innovativeness of crowdfunding campaigns is an area that has received some attention in evaluating the description and video pitches of the projects but none has included the firm or startup itself in the way the product/ service development is being executed.

In conclusion, we think of this thesis as a contribution to the crowdfunding literature in the period of after the end of a project, highlighting the nonfinancial impact of the crowd on the final product/ service of a crowdfunded project and an attempt to measure the impact in the innovativeness of the final product/ service.

Distribution of journals

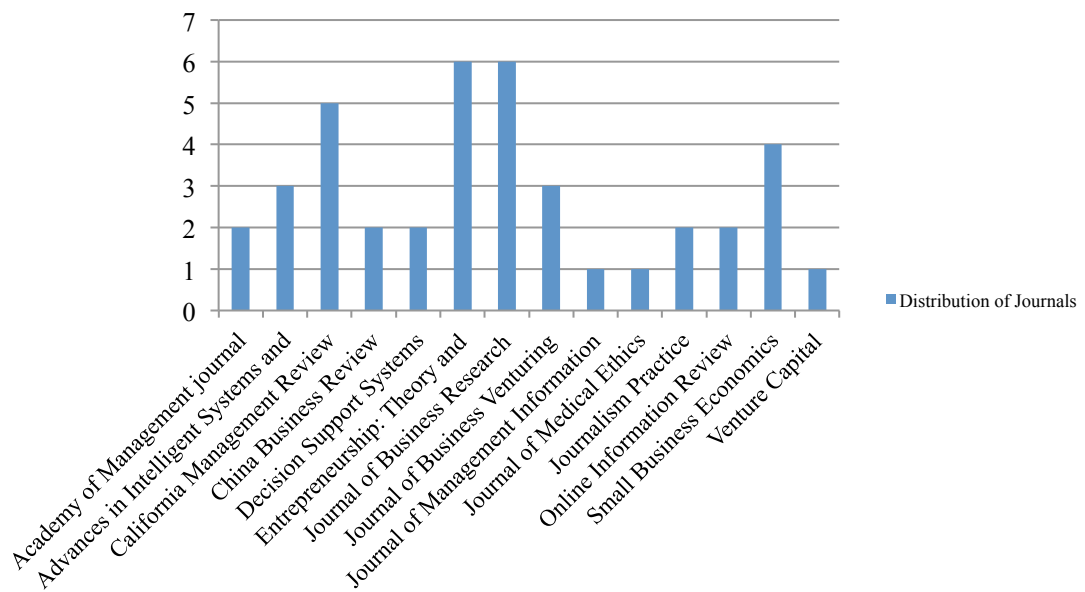


Figure 1: Distribution of journals

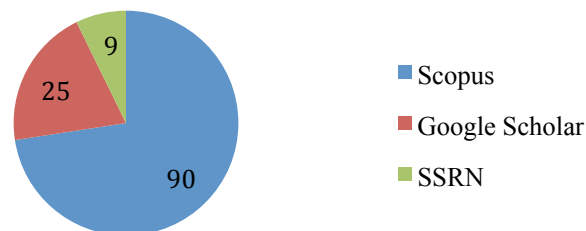


Figure 2: Distribution of articles by source

3. Methodology

3.1 Origination of the methodology adopted

Basing on the assumption that crowdsourcing and crowdfunding have mutual characteristics that allow generating the same type of knowledge that constitutes an input for the crowd funded firms' innovation processes. Though, the quality of this input could be different from the one obtained through crowdsourcing, an argument is valid as some of these characteristics are existing in crowdfunding.

(Poetz & Schreier, 2012) claims that customers can provide needs-based as well as solution-based information in the beginning stage of idea generation in the new product development process, this study compared the quality of ideas introduced by professionals and the ones from users. (Baldwin & von Hippel, 2010) by classifying the product innovation ideation sources as single user innovation, lead-users (open collaborative) innovations and producer (internal R&D) innovation, highlights that by monitoring lead-user innovations, producers can include the innovations into their product offerings and therefore, may improve them, while reducing their costs and improving their position in the marketplace.

Innovation introduced to crowdfunding projects could be pragmatic, as it included the two sides, the firms, which we don't know much about their internal processes, new product development processes and their marketing strategies. The size and the knowledge possessed by these firms and its relevance to the market and product/service introduced. On the other hand, the quality of information provided by the crowd and its relevance.

In contrast to what we have mentioned before, we adopt a methodology that may allow us to indicate and measure the innovation that might be introduced to firms by crowdfunding. Researching the existence of nonfinancial relationships between the firms and the crowd, the relevance of the feedback provided to the final product/service. We attempt to track relevant projects to this study from inception to the current state. Therefore, we start by collecting the data needed for the study.

3.2 Data collection

This section is meant to introduce and describe the process that we have been through analysing in details everything regarding data gathering and elaboration. Before moving directly to the analysis of the data, trying to resume some results, we

would like to describe the logical path that we have followed for the analysis of the data.

The data analysis we have run originates from the dataset that was initially created by the group of Entrepreneurial Finance at Politecnico di Milano since 2012 and then filtered, cleaned and added to it the attributes of the data collected to run the analysis, it includes technological crowdfunding campaigns on Kickstarter that were run during the period from 2009 to 2012. After a preliminary analysis of the data, being two students, when it comes to data collection, we split the workload, but the analysis part is made by the two of us together.

The dataset that was given by professor is based on 1697 crowdfunding campaign taken from the Kickstarter -an American based in New York- that runs a global crowdfunding platform focused on creativity. The company's stated mission is to "help bring creative projects to life". Since its inception on April 28, 2009, Kickstarter has received around \$3.1 billion in pledges from almost 13 million backers to fund creative projects, such as films, music, comics, journalism, video games, robotics, sports, technology and food-related projects. The main goal of Kickstarter is to give people the opportunity to pursue their creative ideas and above all, it tries to build a community around people helping them to sustain and develop their ideas. Therefore, Kickstarter has helped people bringing to life around 125 thousand creative projects that were successfully funded projects.

Moving our attention from Kickstarter and discussing generally crowdfunding, it is a phenomenon that is increasingly drawing attention, not only for its possible role in providing equity funding to start-ups, but also for the social role that it achieved in helping people to spread their ideas and projects. Since the beginning of the born of crowdfunding, two elements sustained the growth and the diffusion, both elements were enabled by the development of the Internet. These elements are first of all the decrease of the transaction costs for the start-ups, but another more important element is the possibility to have a direct connection with the funders, without the necessity of an active intermediary. In this case the crowdfunding platforms assume the role of facilitators, however nowadays there are hundreds of crowdfunding platforms offering different types of activities. In fact some of them just provide a portal and automatically post every project, while others screen and make a pre-selection of projects based on a set of criteria.

This relatively new financing model is facing an exponential growth all around the world, between 2009-2013, the compound annual growth rate (CAGR) of the funding volumes was around 76% with an estimated total funding volume of 5.1 \$ billion in 2013.

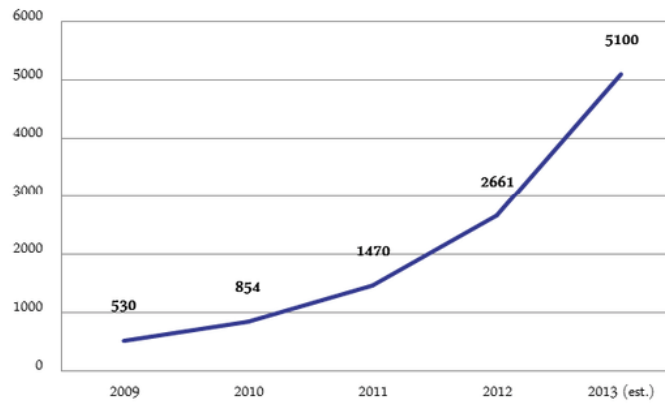


Figure 3: Evolution of the CAGR between 2009 and 2013

Analysing the phenomenon through a geographical perspective, North America and particularly U.S. are the biggest market with 60% of the market volume, followed by Europe, which has 36%.

Discussing about some data regarding the four different types of crowdfunding (donation-based, reward-based, lending-based and equity-based), already deeply discussed in the previous chapter of literature review, between the periods 2010-2012, the industry was dominated by the donation-based model, while starting from 2012 crowd lending was the largest category in terms of volumes, signalling that financial return motives were increasing in importance. The following chart describes how the four different types of crowdfunding were divided considering the volumes of money invested in million dollars.

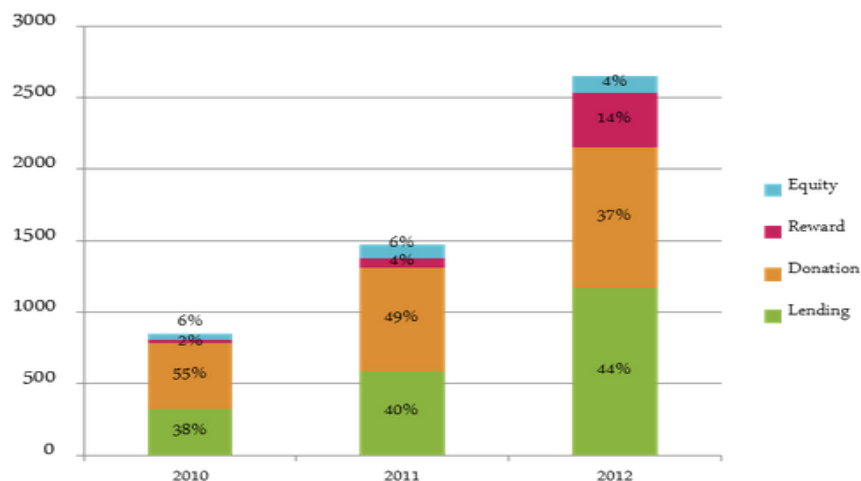


Figure 4: Distribution of the four different types of crowdfunding considering also the volumes of money invested

Entering in detail and analysing some researches did for two of the main important crowdfunding platform, based in US, which are Kickstarter (red histogram) and Indiegogo (black histogram), some interesting insights raised comparing the successfully-funded types of projects and the dollars pledged to each category. The category took in consideration in the analysis are: art, comics, crafts, dance, design, fashion, film & video, food, games, journalism, music, photography, publishing, technology and theatre.

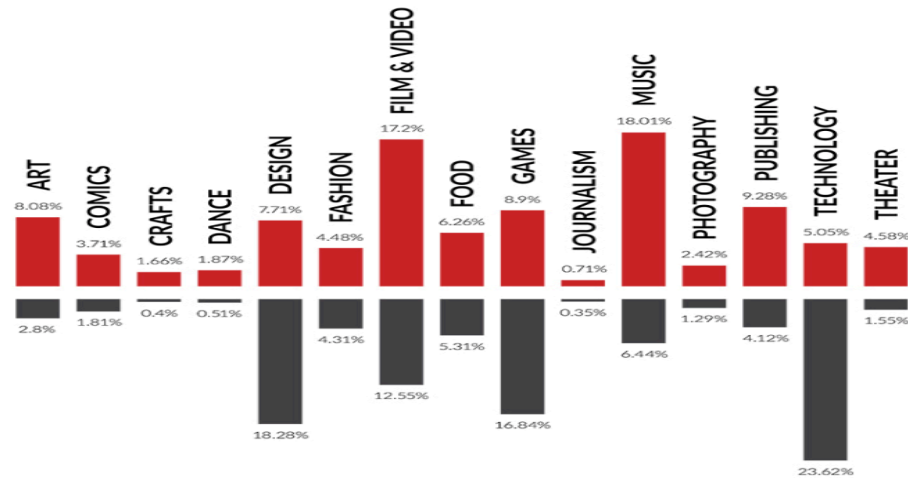


Figure 5: Detailed types of projects funded on Kickstarter (red histogram) and Indiegogo (black histogram)

One of the most interesting insights coming from this analysis is related to the technology, in fact this category represents only the 5.05% of the project funded, but at the same time, it represents 23,62% of the money pledged.

For what concerns some demographical aspects, analysing gender and age, men represent the majority of crowdfunders with 64%, while most of the crowdfunders are aged between 25-34.

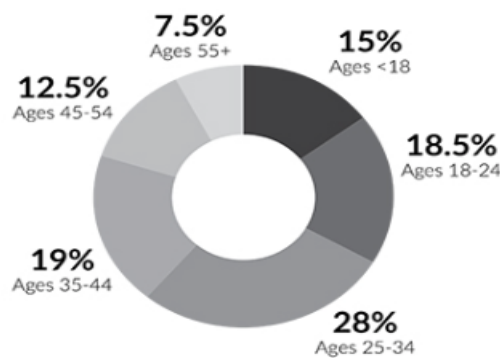


Figure 6: Demographic distribution of the crowdfunders

Coming back to the analysis of our data, all the campaigns in the data set have existed between 2009 and 2012 and most of them are related to American companies, with some exceptions that come from European companies. However, the data is a collection of URL's that links directly to crowdfunding campaigns launched on Kickstarter.

URL campaigns
https://www.kickstarter.com/projects/jpwain/awesome-icons-for-your-iphone-apps
https://www.kickstarter.com/projects/149390786/a-new-web-video-concept-telegraph21
https://www.kickstarter.com/projects/mnemnion/makerbeam-an-open-source-building-kit
https://www.kickstarter.com/projects/1379937313/getting-your-sh-t-together-business-of-art-softwar
https://www.kickstarter.com/projects/stiv/an-environmental-research-mission-to-explore-plast

Table 1 Example of the URL list of the crowdfunding campaigns

After splitting the workload, the first step was to identify who launched the company, so if it was a company or a single person that was supported by a company. In parallel to this research, we also tried to analyse if the campaign was successful in raising the money asked to the crowd. So basically, the first step for identifying who launched the campaign we indicate with number 1 if the campaign was launched by a company, while number 2 indicated any other entity that is different from a company, for example an individual. Finally, for what concerns the success of the company we used 3 for identifying all the campaigns that were unsuccessful, so were not able in reaching the funding goal.

The second step of the data analysis was to understand if the company that launched the campaign was still alive or closed down regardless of the reason. Putting in mind that the dataset refers to a specific period for 3 years and lasts until 5 years ago, therefore, some of the companies in 2017 could have been shut down for multiple reasons. However, for every campaign still alive we used 1, while for the companies not more alive we indicate 0.

These first two analyses helped us in narrowing down the dataset from 1697 campaigns to 352, just taking in consideration companies still alive and were successful in raising funds for their projects.

URL campaigns	Who	Still-Alive
https://www.kickstarter.com/projects/jpwain/awesome-icons-for-your-iphone-apps	1	1
https://www.kickstarter.com/projects/1803756771/trebuchette-the-snap-together-desktop-trebuchet	1	1
https://www.kickstarter.com/projects/1561238414/tapose-bringing-the-courier-to-the-ipad	2	1
https://www.kickstarter.com/projects/ari-krupnik/iphly-radio-control-with-iphone	1	0
https://www.kickstarter.com/projects/1134219811/flight-commander-launch-first-modules	3	0

Table 2: Example of the crowdfunding campaigns distinguishing who launched the campaign and if it is a company and if it is still alive

Accordingly, using the new dataset, the next step was for unfolding campaigns' details to better understand the nature of each one of them, thus we categorized them in relation to the product/service offered to the crowd by the campaign. The categories are application, software, hardware and others.

The first category refers to all of those applications that can be downloaded by smartphone or tablet and could be bought on the main application market, for example referring to this campaign:

www.kickstarter.com/projects/jpwain/awesome-icons-for-your-iphone-apps

The company developed an application in which people could download icons or images for developing their own application. For what concerns the second category, we identified different software developed by the company, for example in this campaign:

www.kickstarter.com/projects/1379937313/getting-your-sh-t-together business-of-art-software

The company was developing a software addressed to artists that were looking for a platform to organize and store better their job. The third category is related to hardware and the main products we found analyzing the campaigns were 3D printers, Arduino, Robots, and other robotics components. Eventually, for the fourth category

we considered all the products and services that were not included in the previous categories, so for example musical instruments and other tools for music, tools for bikes or motorbike and other kind of services.

URL campaigns	Who	Still-Alive	Categories			
			Apps	Software	Hardware	Others
https://www.kickstarter.com/projects/jpwain/awesome-icons-for-your-iphone-apps	1	1	x			
https://www.kickstarter.com/projects/mnemion/makerbeam-an-open-source-building-kit	1	1			x	
https://www.kickstarter.com/projects/1379937313/getting-your-sh-t-together-business-of-art-software	1	1		x		
https://www.kickstarter.com/projects/sightunseen/sight-unseen-a-new-online-magazine-that-lets-you-0	1	1				x
https://www.kickstarter.com/projects/grndlabloveslions/open-source-lion-tracking-collars	1	1			x	

Table 3: Example of categorization of the crowdfunding campaigns

After having categorized all the campaigns with the four different categories, we moved our attention to other different aspects of the campaigns, so firstly we collected and analysed the number of updates made by the company on the crowdfunding campaigns. This analysis was done to understand how much the company was interested in maintaining adjourned the users that were following the campaign. The updates are used by the company to adjourn the campaign, to show the new version of the product to the crowd and also to announce the release of new features of the product or service, so basically updates is a very important tool that companies utilize to maintain the crowd and their interest on the campaigns; they are important for the crowd for following the evolution of the campaign.

In the analysis of the campaigns we identified a wide variety of results, in fact we found campaigns with 1 update, but others with very high number of update such 196.

Later on, after this analysis we decided to develop another investigation, so we started collecting all the names and emails of every single company that later will be

useful to contact and send to them a small and simple survey with only two specific questions. Before sending the survey, we decided to collect all the descriptions of every single campaign. For doing so, we checked all companies' websites looking for the descriptions of the product or service launched in the market through Kickstarter. After identifying the descriptions of the products or service we created a file for each description using text format (.txt) linking them to the campaigns with specific IDs. This research will become useful later when we will compare the descriptions of the campaigns coming from the companies' websites and Kickstarter platform with the aim to understand the difference of those description before and after the crowdfunding campaign. However, as will be explained later in details, the main goal of this analysis was to measure the difference between the first description used on Kickstarter and second description used on the companies' website for launching the product in the real market.

By the end of this step, we prepared a survey aiming for a better understanding of the role of the crowd in the development of products and services from the companies' side. The first question was specifically related to how much the product or service was change since the launch of the crowdfunding campaign and we asked to the companies to reply to this question selecting a value in a scale from 0 to 5. The worst value was 0 and it means that the company didn't notice any changes in the product since the beginning of the crowdfunding campaign, while in the opposite 5 means a great change in the features of product or service.

The second question was related to how helpful were the comments or feedback received from the crowd in the realization of the final product. Also in this case we asked to companies to reply selecting a value in a range between -3 and +3.

After sending the survey and collecting all the replies coming from the companies. We tried to conduct a personal analysis on 60 campaigns selected randomly to confirm the results coming from the survey. So basically, we structured our analysis as to evaluate two specific aspects of the campaigns, the first one is the level of innovation of the product after it was launched in the market, while the second aspect and measure was to count the features before and after the launch of the campaigns with the aim to understand which was the effect of the campaign on the evolution of the product or service. For what concerns this investigation and the evaluation of the two previous aspects, we set two different scales, we assign a value from 0 to 3 for the level of innovation for the set of campaigns selected randomly and then we

assign a value from 0 to 10 for the evaluation of the evolution of the features of the concerned products after the end of the campaign.

URL campaigns	Categories						Other Information		
	Who	Still-Alive	Apps	Software	Hardware	Others	Updates	Company name	Contact
https://www.kickstarter.com/projects/jpwain/awesome-icons-for-your-iphone-apps	1	1	X				13	Glyphish	
https://www.kickstarter.com/projects/mnemnion/makerbeam-an-open-source-building-kit	1	1			X		26	MakerBeam	info@makerbeam.com
https://www.kickstarter.com/projects/1379937313/getting-your-sh-t-together-business-of-art-software	1	1		X			2	Gyst-ink	info@gystink.com
https://www.kickstarter.com/projects/sightunseen/sight-unseen-a-new-online-magazine-that-lets-you-0	1	1				X	1	Sightunseen	hello@sightunseen.com
https://www.kickstarter.com/projects/grndlabloveslions/open-source-lion-tracking-collars	1	1			X		10	GRND lab	

Table 4: Detailed information of the crowdfunding campaigns

By the end of this phase, the final dataset of 352 campaigns will later be used for running our econometric model.

Illustration of the steps taken:

In this section, we will show step by step what we discussed above taking as an example a campaign picked randomly among all the campaign that we have in our dataset.

We will analyse this campaign coming from the dataset:

<https://www.kickstarter.com/projects/mnemnion/makerbeam-an-open-source-building-kit>.

Entering this link in any search engine, it will direct to the Kickstarter page of this campaign.

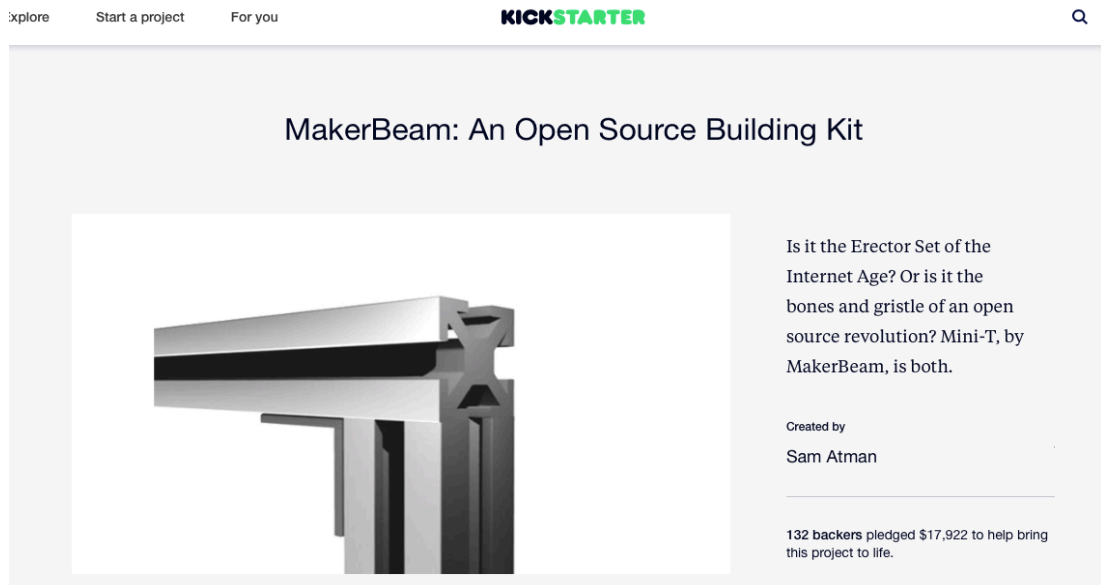


Figure 7: Homepage of the crowdfunding campaign launched by the company MakerBeam

The first step as mentioned before is to understand if a company or a person was the one to launch the campaign and more importantly, whether the campaign was successful or not. First of all, the easiest part is to understand the success of the campaign and in this case as we can see in the picture above, it is written that 132 backers investing \$17,922 to help bring the project to life. Accordingly, this means that the campaign was successful and the product was launched in the market. On the opposite side for recognizing an unsuccessful campaign as shown in the following picture, instead of a statement in which is written that the project was brought to life, there is another statement saying that the project was unsuccessful and that the project was not able to reach the funding goal.

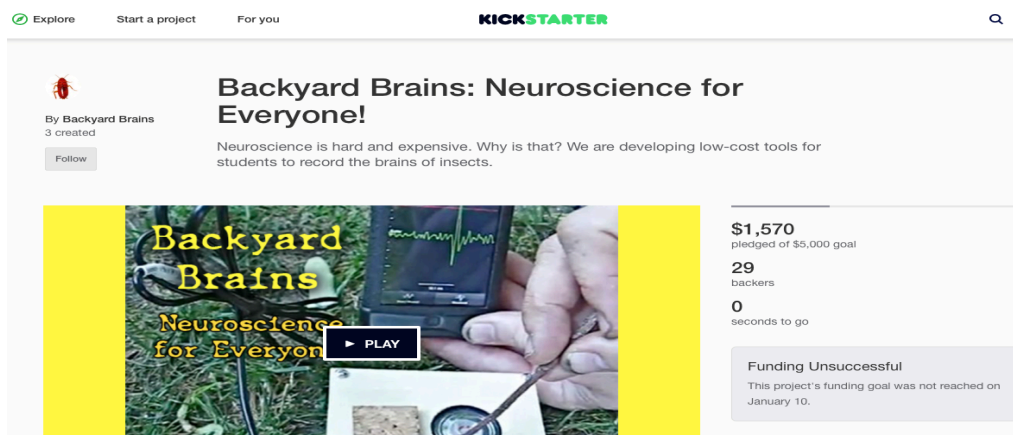


Figure 8: Example of unsuccessful crowdfunding campaign

After the recognition of the success of the campaign that we took as an example, we had to understand if the project was run by a company or a physical person. For this task also referring to the previous picture we have to enter in the section “Created by”. Entering that section, we are linked to the official website of the product that we are analysing.

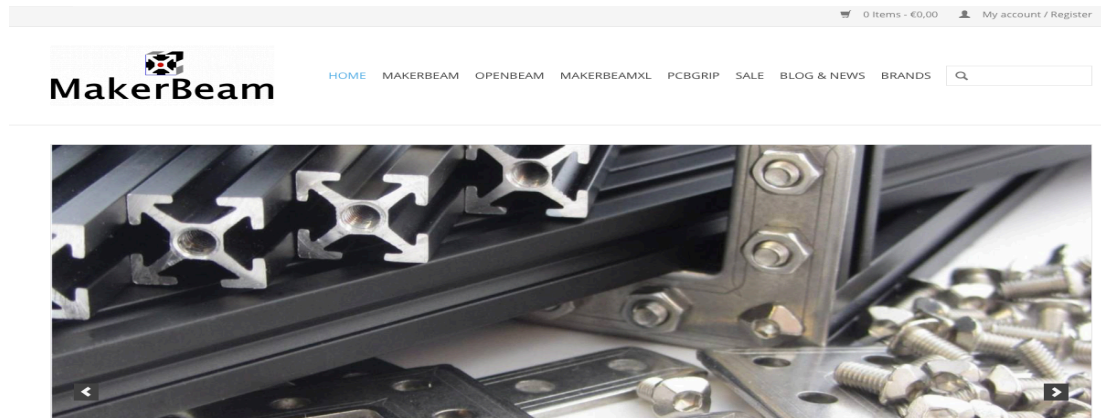


Figure 9: Website of the company MakerBeam that launched a crowdfunding campaign

Browsing the website, we can understand that the campaign was launched by a company named MakerBeam and it is still alive since the fact the website is still available, in fact sometimes moving from Kickstarter to the official website of the companies, it was impossible to browse the website as many were closed. Moreover, that shows the company is still alive is the possibility to order some products from the e-commerce section or the possibility to create an account. Moving on, the next step was to categorize the product realized by the company and looking in the offer presented on the website we decided to put the product in the hardware category.

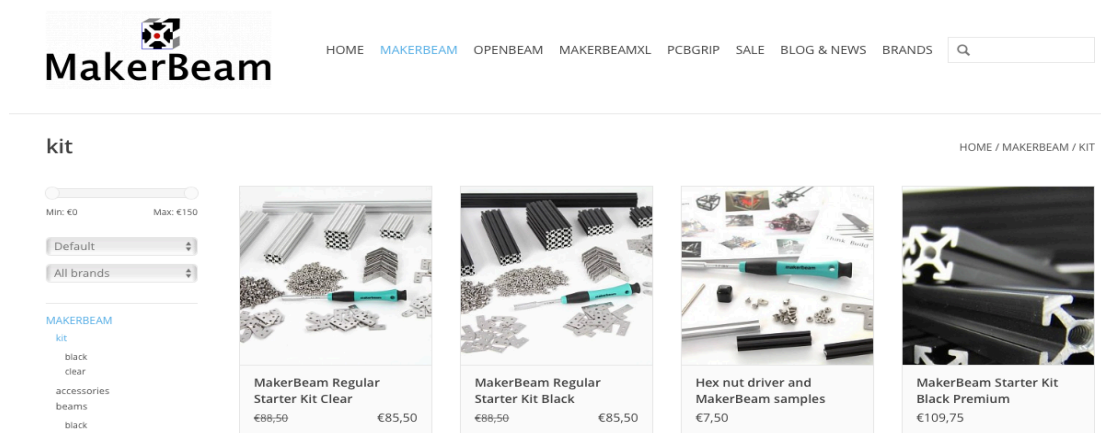


Figure 10: Detail of the product realized by MakerBeam

The following step is to analyse and collect the description of the products launched on Kickstarter, so for this task we enter in every single section of the company's products and we copy the description.

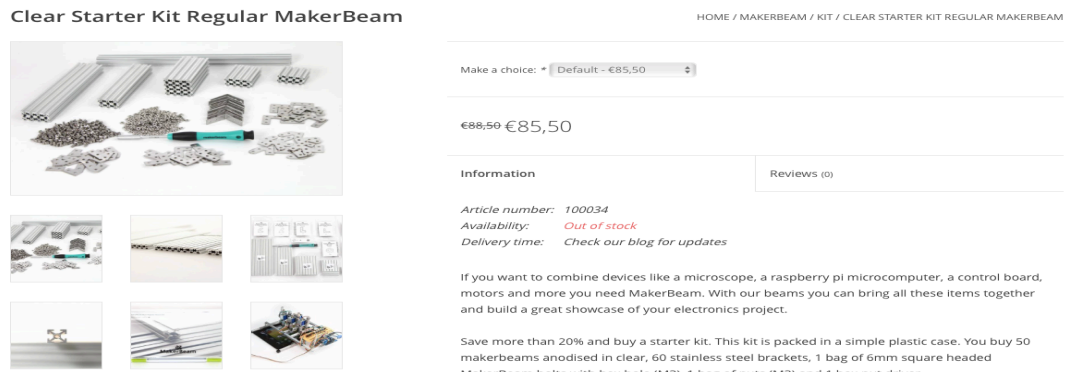


Figure 11: E-commerce of the company that confirm the product is available in the market

As shown in the previous picture, entering in the section of the concerned product, we can see all the characteristics of the products such as the price, the article number and even the general description. As said before this description will be compared with that one released on Kickstarter before the launch of the product in the market.

Moving on to the next step, we look for other information like the name and the email of the company, the number of updates realised by the company on Kickstarter, but also more importantly, we will do manually the analysis of the level of innovation and the features evolution of the launched product/service, following the successful campaign on Kickstarter.

Eventually, after the end of the data collection phase, we apply the main measure of the study, which is the text similarity, adopting two methods, which are the Tf.idf method, and the Cosine similarity method.

3.3 Text similarity

Before starting the implementation of the measure of innovation we adopt in this study, we define the measure; go through which are the ways it could be performed, and how they differ from each other, arriving at type of text similarity that we adopt, explaining the steps we followed in detail.

Text similarity is a measure of similarity between a number of texts; depending on the meaning of similarity, the way it is measured and the type of model adopted differ. In general, there're two types of text similarity, which are Lexical Similarity and Semantic Similarity. When Lexical Similarity is the case, what is meant is how similar a number of texts are at the surface level (with no attention to the meaning or order of the words), simply by comparing the words or characters they are formed of in one text against the each of the other texts, assigning a score of similarity that varies between 0 to 1, 0 for no similarity existence and 1 for full similarity. As Lexical Similarity could be computed at different levels or "granularity", (e.g. character level, word level or at a phrase level), it could be used in performing several data analytics operations (e.g. Clustering, Redundancy Removal or Information Retrieval).

On the other hand, Semantic Similarity, the other notion of text similarity, basically measures how similar a number of texts are to each other in meaning, as the order of words in a phrase of text can play a significant role in identifying the meaning of the phrase or text, it requires a more sophisticated method that involves the meaning of these phrases or texts in order to disentangle the ones that could give less accurate distinction if a Lexical Similarity measure is used. As an example, in Semantic Similarity, to disentangle the different meanings, it requires a deeper level of analysis, in such a case, it is needed to define the subject, object, adjectives and adverbs of each sentence, allowing limited probability of similarity in the case of word ordering in a sentence, (e.g. The house is bigger than a tent, which significantly differs in meaning from the sentence The tent is bigger than a house), therefore, the probability of occurrence in different places for the words "house" and "tent" are limited to 1 for full similarity.

In this study, we use two Lexical Similarity measures (Tf-idf, cosine similarity) as mentioned before; the two measures are not the most accurate to apply (due to limitations in resources we decided to implement these two), but they do give results that are close enough to indicate patterns if occurred. In the next paragraph, we go

through the origination of our measures, explaining step by step how we will apply them to our dataset.

3.3.1 The vector space model for scoring

The representation of a set of documents as vectors in a common vector space is known as the vector space model, it is an algebraic model for representing text documents, it was first used in the SMART Information Retrieval System developed at Cornell University in 1960's.

In the vector space model, texts are represented by a vector of terms (could be words or phrases), as an example, if the terms are words, then each word represents a dimension for the vector. Following this logic, every text could be represented by a vector with high number of dimensions depending on the number of terms included. If a term is present in the text, it gets a non-zero value in the vector in the dimension for the term. Once the text is represented by a vector, a score can be assigned to it.

To develop the vector space model, we need to go through several steps. First let's define some terms that we need in each step to assign a score to the similarity of a text to another.

Term frequency and weighting (*tf*): It is the assignment of a weight to each term in the text, depending on the number of times that the term has occurred. It is a score between a query term t and the document d . The simplest way to quantify term frequency is to use a raw count of the number of times that a term t occurs in document d .

Document frequency (*df*): is the number of documents that a certain term occurs out of the total number of documents included in the analysis.

Bag of words: is the number of occurrences of each term in the set of documents. It is a simple representation used in Information retrieval and many document classification models.

Inverse document frequency (*idf*): in term frequency (*tf*), all terms are considered equally important and relevant to the query. In fact, some terms have little or insignificant contribution to the relevancy. Therefore, the inverse document frequency is important as it measures the effect of terms more frequently mentioned in several documents and that they are more relevant than others. This measure could be used to normalize both term frequency and document frequency to. For the

document frequency, such a mechanism is called Inverse document frequency and is shown by the below formula:

$$idf_t = \log \frac{N}{df_t}$$

Where N is the number of all documents.

3.3.2 Tf-idf weighting

Tf-idf weighting is the combination of the definition of both term frequency and inverse document frequency to compute a score for each term in each document. It assigns to a term a weight in each document, resulting in a more accurate result as the new weighting takes into account the relevance of the term and if it occurs several times.

$$tf - idf_{t,d} = tf_{t,d} \times idf_t$$

Now we can represent a vector for each document in dimensions of the different terms assigned by the query and a *tf-idf* as a component for the vector.

$$Score(q, d) = \sum_{t \in q} tf_{t,d} - idf_t$$

Term frequency	Document frequency	Normalization
n (natural): $tf_{t,d}$	n (no): 1	n (none): 1
l (logarithm): $1 + \log(tf_{t,d})$	t (idf): $\log \frac{N}{df_t}$	c (cosine): $\frac{1}{\sqrt{w_1^2 + w_2^2 + \dots + w_M^2}}$
a (augmented): $0,5 +$	p (prob id): $\max(0, \log \frac{N-4h}{4h})$	b (byte size): $1/CharLenght^\alpha, \alpha < 1$
b (Boolean): $\begin{cases} 1, if\ tf_{t,d} > 0 \\ 0, otherwise \end{cases}$		
l (log average): $\frac{1 + \log(tf_{t,d})}{1 + \log(ave_{ted}(tf_{td}))}$		

Table 5: All the different element for computing Tf-idf weighting

Where tfd is the term frequency in a particular document d , $CharLength$ used in character level similarity or string similarity that is based on bytes as a unit of measure to determine the length of a string accompanied with character as a ISO synonym for char, normally using Jaccard coefficient, Dice, besides cosine similarity as metrics for text similarity.

The advantages of vector space model are that it is a simple model based on linear algebra (easy to understand and conclude), the weights assigned to the term are not binary which makes it appropriate as an input for many data analysis models, besides that it allows to measure a continuous degree of similarity between queries and documents which makes it a good distinction measure for applications in complicated hard to quantify measures, and that it allows partial matching.

3.3.3 Example of a similarity scoring representation of two texts similarity

Let's take two texts that contain two short sentences, first text: "John plays football at the sports club", second text: "Michael plays volleyball at the sports club". To measure the cosine similarity between these two texts. We follow the following steps:

Define terms: The terms to compare are all the words mentioned in the first text (John, Plays, football, at, the, sports, club).

Define documents: The documents are the two texts so we have two documents.

Calculate the term frequency in both texts following the definition provided in point 1 above, assigning a weight of 1 if the term exists in the second document and 0 if it doesn't.

Document frequency is either 1 or 0 following the same logic for term frequency.

Calculate the inverse document frequency following the definition provided above.

Calculate wt,q which is the same as the idf but we put zero when the term in the query is nonexistent in the other document as the log of such a case doesn't have a value.

Calculate the score assigned to each term against the second document.

The results of the steps above are shown in the below table.

Term	tf	df	idf	wt,q	tf x idf
John	0	0	N/A	0	0
plays	1	1	0.301029996	0.301029996	0.301029996
football	0	0	N/A	0	0
at	1	1	0.301029996	0.301029996	0.301029996
the	1	1	0.301029996	0.301029996	0.301029996
sports	1	1	0.301029996	0.301029996	0.301029996
club	1	1	0.301029996	0.301029996	0.301029996
			Score		1.50514998

Table 6: Example of calculation of a similarity scoring representation between two texts

By doing as in the steps above, we have the other document represented by a score of similarity against the first one and thus can be represented by a vector.

The steps above could be calculated using software like Python with additional libraries as is used in this study.

3.3.4 Cosine similarity

Compared documents could be similar to each other but represented by very distant vectors, this could happen due to the fact that one text could be longer than the other, therefore we need a way to compensate for the length of texts. The cosine is a better representation than the tf.idf one. Therefore, we calculate the cosine similarity of the compared vectors using the following computation:

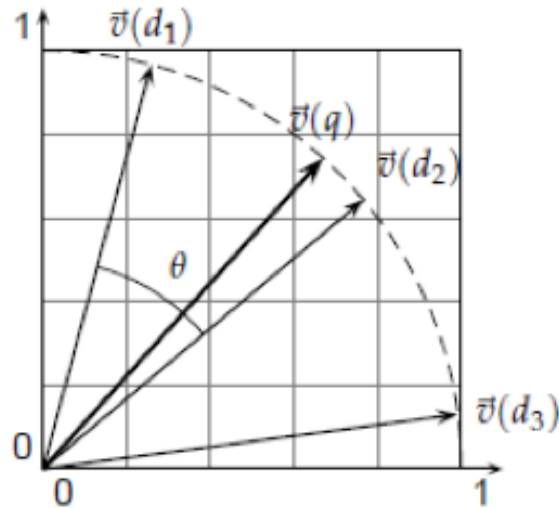


Figure 12: Cosine distance similarity illustrated: $sim(d_1, d_2) = \cos \theta$, $sim(d_1, d_2) = \frac{\vec{v}(d_1) \cdot \vec{v}(d_2)}{|\vec{v}(d_1)| |\vec{v}(d_2)|}$

Cosine similarity is a measure of similarity between two non-zero vectors of an inner product space that measures the cosine of the angle between them. We define some terms that are relevant to the computation of cosine similarity.

Dot product: also known as scalar product or inner product, is the numerator of the computation above, which is the inner product of the vectors. The geometric definition of a dot product is based on the notion of vectors (angle and distance), relying on the definition of Euclidean geometry and Euclidean space (multi-dimensional space named after Euclid the ancient Greek mathematician, modernly known as real coordinate space R^n). The length of the vector is defined by the root square of the dot product, while the cosine represents the angle between two vector lengths. The dot product is defined as:

$$\sum_{i=1}^M x_i y_i$$

Euclidean Length: also called as Euclidean norms the denominator of the equation above. Defined as the distance between two points in Euclidean space. Its effect is to normalize the text length to unit vectors as below:

$$\sqrt{\sum_{i=1}^M \overline{V_i^2(d)}}$$

resulting in the vector:

$$\vec{v}(d_1) = \vec{V}(d_1)/|\vec{V}(d_1)|$$

Normalized to offset the effect of vector length (text length in our case).

3.4 Running the measures on the data collected using Python

After the collection of the current and past descriptions of the final list of projects on the dataset. We run both the measures of *tf.idf* and cosine similarity, using a code we developed on Python. The results will be shown and discussed in the next chapter. However worth mentioning that both the current description and the past ones were categorized and assigned an ID for each couple representing a single campaign to keep track of them through the analysis. Below is the code we developed and run with an explanation of the role of the important parts.

```
import os
```

To interact with the operating system, we are running python on (windows).

```
from os import walk
```

it generates the the files names, directory path and directory names of our input data.

```
from sklearn.feature_extraction.text import TfidfVectorizer
```

Sklearn.feature is used to extract features from the dataset in a format supported by machine learning algorithms such as *tf.idf* and cosine similarity that are being used in this study.

```
from xlwt import Workbook
```

This command is to create a spreadsheet file that is compatible with MS excel to host the output results ordered against the IDs given.

```
import re, math
```

The *re* term gives expression tools that are used for advanced string processing (vectors and angles of the different texts in Euclidean space).

```
from collections import Counter
```

To keep track or bags of words that are being used in the analysis and that they are being used in an equivalent manner, suitable for multiset data structures as the one that is being analyzed in this case.

```
import sys
```

To gain access to the variables and functions that represent the tf.idf and cosine similarity formulas.

```
WORD = re.compile(r'\w+')
```

A tiny language imbedded in Python used to set a rule for specified strings (text vectors) that we need to match.

```
def get_cosine(vec1, vec2)
```

A command to define the variables *vec1* and *vec2* used for the calculations below based on the formula of cosine similarity explained before. Calculating the numerator and denominator of the equation

$$\text{Similarity} = \text{Cosine}(\theta) = \frac{(\text{Vec1} \cdot \text{Vec2})}{\|\text{Vec1}\|_2 \cdot \|\text{Vec2}\|_2} = \frac{\sum_{i=1}^n \text{Vec1}_i \text{Vec2}_i}{\sqrt{\sum_i^n \text{Vec1}_i^2 \sum_i^n \text{Vec2}_i^2}}$$

```
intersection = set(vec1.keys()) & set(vec2.keys())
```



```

numerator = sum([vec1[x] * vec2[x] for x in intersection])
sum1 = sum([vec1[x]**2 for x in vec1.keys()])
sum2 = sum([vec2[x]**2 for x in vec2.keys()])
denominator = math.sqrt(sum1) * math.sqrt(sum2)

```

if not denominator:

```

return 0.0

```

else:

```

return float(numerator) / denominator

```

By this recent command, the cosine is calculated.

```

def text_to_vector(text):
words = WORD.findall(text)

```

By these last two lines, we define the texts to turn into vector and we search for the concerned words in the whole text.

```

return Counter(words)

```

Here we keep track of the result found and go back in a loop to the next pair of texts.

```

mypath = []
mypath.append(os.path.dirname(os.path.realpath('__file__')) + '\Past')
mypath.append(os.path.dirname(os.path.realpath('__file__')) + '\Present')

```

By these three lines, we give a path track to the algorithm to follow to find both texts to compare at the specific ID and to make sure no iteration or missing couples occur.

```

f = []

```

```
dicc = {}
```

Here we use the command to create the first dictionary we need to assign IDs to the paths of one side of the texts files (past descriptions), the walking path is given below in the following steps.

```
for (dirpath, dirnames, filenames) in walk(mypath[0]):  
    f.extend(filenames)  
    break  
    #print(f)  
    #nametest=f[0]  
    for name in f:
```

For each name in the dictionary f defined before:

```
dicc[name] = []
```

Create a new dictionary for the other side of the input text files (current descriptions).

```
ff = open(mypath[0]+'\\'+name, 'r')  
dicc[name].append(ff.read())  
ff.close()
```

For the iteration loop we add:

```
ff = open(mypath[1]+'\\'+name, 'r')  
dicc[name].append(ff.read())  
ff.close()  
dicc2 = {}
```

for d in dicc:

```
print(d)
```

Now we create a new dictionary for the output results of the algorithm.

```
tfidf = TfidfVectorizer().fit_transform(dicc[d])  
pairwise_similarity = tfidf * tfidf.T
```

In this step, the algorithm calculates the if.idf for each pair of texts in the order specified before according to the given IDs and prints the outcome to the dictionary d.

```
sim_score = pairwise_similarity[1,0]
```

The algorithm assigns a score to each pair of texts which is equal to the *pairwise_similarity*.

```
#print(.decode('utf-8'))  
vector1 = text_to_vector(dicc[d][0])  
vector2 = text_to_vector(dicc[d][1])
```

The algorithm defines the vectors of the pair of texts to compare using the cosine similarity command below

```
cosine = get_cosine(vector1, vector2)  
dicc2[d] = []  
dicc2[d].append(sim_score)  
dicc2[d].append(cosine)
```

By the last three lines we create the dictionary to export to the excel file containing the similarity score obtained from tf.idf method and the cosine obtained from the cosine similarity method.

```
print(dicc2)  
wb = Workbook()
```

Create the workbook excel file to host the output results.

```
sheet1 = wb.add_sheet('Sheet1')
    row = 0
    sheet1.write(row, 0, 'ID')
    sheet1.write(row, 1, 'Similarity score')
    sheet1.write(row, 2, 'Cosine')
```

The last 5 lines are to define the worksheet and columns to put the output results in.

```
    for d2 in dicc2:
        row += 1
        sheet1.write(row, 0, d2[0:d2.index('.')])
        sheet1.write(row, 1, dicc2[d2][0])
        sheet1.write(row, 2, dicc2[d2][1])
```

Keeping the iteration loop for printing the results

```
wb.save('scores.xls')
```

Saving the files with the name scores and extension of xls.

3.5 Other studies

Through the evolution of the analysis and parallel to the text similarity study, we tried to use two other methodologies to test and verify the results we would get from the main study of project description evolution after the crowdfunding campaign.

A quantitative study was run in order to check the change in product features at the moment compared to the time of the crowdfunding campaign. We manually checked 60 projects -from the same list of projects that we run the description text similarity on- against two variables: the change in features shown as delta features and the perceived innovation introduced after the crowdfunding campaign (purely based on our personal judgment). The results are indicating changes in the features in many of these products suggesting that crowdfunding might have played a role in it.

In order to verify if crowdfunding was a variable in the formula that reshaped these products, we run a small survey targeting the same sample of firms that we used for the two prior studies asking them a couple of questions regarding the changes in their current products, the first question was to verify if there are changes in the first place, and the second one was to see if the input from the crowd in terms of feedback played a role in the evolution of these products.

The results from the two studies wasn't robust enough to derive a conclusion, but they gave an indication that crowdfunding might have contributed to the improvements that were realized in firms' products. However, the two small studies have given us an incentive to suggest the two hypotheses - shown in the next chapter- that if verified by the results of the main study, might open the door for further research in this area in the future.

3.5.1 Descriptive studies

In the data set we adopt in all studies performed as shown earlier in this chapter, as we first thought for the creators of the projects, if they are a firm or individuals, the ones that were created by firms are shown earlier in this chapter, but an interesting finding is that some are run by firms but through individuals that in many cases are co-founders or CEO's of these firms.

Furthermore, in an attempt to analyze the nature of these projects, we categorized the alive firms' products in four categories Apps, hardware, software and others. In general, all the projects in our final dataset (347) are technological projects. An

observation that deserves to be mentioned is that the majority of these projects pursued a hardware product, precisely 245 projects, the rest of the projects are distributed between Apps category (17 projects), 23 projects are software and 62 falls in the category of others that include (platforms, educational projects, etc.).

Nevertheless, as shown by Kickstarter the general success rate of projects run on the platform is around 36%; but this rate is among all categories and all types of project creators. Regarding the projects that were run on the platform by firms, the results are very impressive as among 357 projects found to be run by firms that are still alive at the moment, only ten were unsuccessful in raising the amount targeted by the campaign raising the success rate to around 97%, taking into account that the dataset include only technological projects run in the period between 2009-2012 and that these firms are passed 8 years alive at least, therefore it might be worth exploring the relationship between life expectancy of technological firms and the probability of running a successful crowdfunding campaign in the future, the results might include non-technological projects as well.

During the small survey we run, some firms' left us comments on how their products have changed, "The original vision for the Civility is that we would update it as yoyo trends change, we have currently changed the yoyo twice", "I have revised the design to improve the reliability, performance, and quality, but functionally it is identical to what I delivered to KS backers", and "For hardware projects it's just impossible not to change something halfway". And on how backers' feedback helped in the realization of the final product, "Our customers helped a lot with testing out the product and making improvements", "To have a clue, just consider that UDOO X86 Ultra and all the reward tiers including such product have been added at a later stage on backers' suggestion", and "Most people's ideas are economically impractical or impossible from a technical perspective. KS backers are not unique or different in this regard". Most of the comments indicate that firms take into account backers' feedback and they might have included them in further improvements.

4. Results & Hypotheses

In this chapter, we will go through the analysis of the results achieved running a regression linear model, but just before moving to the results, we will describe briefly the main characteristics of the two models that we think are appropriate for this type of analysis. After that we will move on to the model selected for our analysis describing its characteristics and also the software we used for running the model. We will focus on the different steps that brought us to the final results starting from how the models were built, how we defined the variables arriving at the final result. Lastly, we will comment on the results achieved.

4.1 Model selection

4.1.1 Brief description of regression models

Regression is a statistical technique usually used to determine a linear relationship between two or more variables or in other words as mentioned in the book “Business Intelligence” (Vercellis, 2009), basically regression tries to identify a functional relationship between a target variable and other attributes contained in a specific dataset. In our case the dataset started from the one we have already developed in the second chapter, in which we described all the characteristics of the campaigns that we wanted to be considered as our variables while the attributes are all the variables considered for every single campaign, later on some transformations have been applied to the dataset that we will explain shortly. The two main roles of regression are, firstly define prediction and secondly to identify causal inference. This could be associated on one hand with the interpretation of the dependency of the target variable on the other variable; on the other hand, regression is used to predict the future value of the target attribute. In its simplest form, regression shows the relationship between one independent variable (X) and a dependent variable (Y), as in the formula below, it is represented a simple linear regression:

$$Y = \beta_0 + \beta_1 X + u$$

Once again from the same book, the figure below shows an example of simple linear regression where Y depends on the variable X according to a relationship that is well approximated by a linear function.

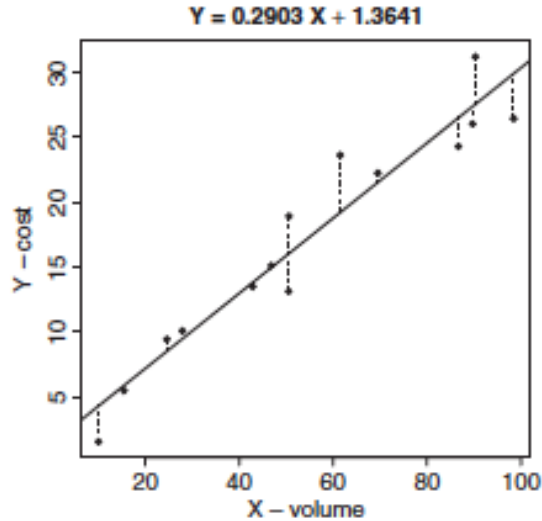


Figure 13: Example of simple linear regression

Analysing every single element of the equations, β_1 is a slope parameter that defines the magnitude and direction of the linear regression. Discussing about β_0 , it defines the value of the dependent variable when the independent variable is absent and finally u is an error term and it captures the amount of variation not predicted by the slope and intercept terms.

Coming back to a preliminary definition of regression, it is important to highlight that regression is fundamentally different from verifying correlations among different variables. In fact, correlation determines the strength of the relationship between variables, while regression attempts to describe that relationship between these variables in more detail.

After having considered the description of simple linear regression model, it is possible to move on to the definition of a multiple linear regression, where the number n of independent variables is greater than one. The following formula shows a representation of a multiple linear regression:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + u$$

As mentioned in the book “Business Intelligence” (Vercellis, 2009) “It is possible to derive a simple interpretation of the slope coefficients β_j appearing in the multiple regression models. Indeed, if a single explanatory variable X_j is increased by one, while all the other explanatory attributes remain unchanged, the response variable Y

is affected by a variation in value equal to β_j . Therefore, it can be claimed that the regression coefficient β_j expresses the marginal effect of the variable X_j on the target, conditioned on the current value of the remaining predictive variables. Obviously, this information may prove very useful for the interpretation of the regression model and can provide a measure of the relative importance to the response variable of the various predictors”.

It is, however, necessary to keep in mind a few conditions that limit the validity of the interpretation illustrated above. First, the value of each coefficient depends on the whole set of explanatory variables. As a consequence, the removal of some variables or the introduction of new predictors implies a change in all the regression coefficients and therefore can also alter their relative ranking. Furthermore, the scale of the values assumed by a predictor, and therefore also the measurement unit in which the values are expressed, influence the value of the corresponding regression coefficient. For this reason, it might be useful to perform a preliminary standardization of all the independent variables before proceeding with the development of a regression model. The standardization of variables is a fundamental step for obtaining correct and aligned results, later it will be mentioned how we modified some variables in our models.

After describing the main characteristics of the regression model another important step is the validation of the regression models and as mentioned in the book “Business Intelligence” (Vercellis, 2009), there are different diagnostic measures that enable the quality and the predictive accuracy of a linear regression model to be evaluated. These measures are the normality and independence of the residuals, the significance of the coefficients, the analysis of the variance, the coefficient determination, the linear correlation coefficient, the multicollinearity of the independent variables and finally the confidence and prediction limits.

The main important coefficients that we will analyse for evaluating the regression models are the correlation coefficient, the standard error, t value and the p-value, though more measures can be applied such as R squared and F factor.

Starting to analyse the coefficients in simple or multiple linear regression, they indicate the size of the effect that a variable is having on your dependent variable, and the sign on the coefficient (positive or negative) gives you the direction of the effect. In regression with a single independent variable, the coefficient tells you how

much the dependent variable is expected to increase (if the coefficient is positive) or decrease (if the coefficient is negative) when that independent variable increases by one. In regression with multiple independent variables, the coefficient tells you how much the dependent variable is expected to increase when that independent variable increases by one, holding all the other independent variables constant.

Moving on to the description of p-value, basically it tells you how confident you can be that each individual variable has some correlation with the dependent variable, which is the most important thing for having robust results. For each term tests the null hypothesis that the coefficient is equal to zero (no effect). A low p-value (< 0.05) indicates that you can reject the null hypothesis. In other words, a predictor that has a low p-value is likely to be a meaningful addition to your model because changes in the predictor's value are related to changes in the response variable. Conversely, a larger (insignificant) p-value suggests that changes in the predictor are not associated with changes in the response. Finally moving to the definition of R-squared of a regression, it is the fraction of the variation in your dependent variable that is accounted for your independent variables.

After having introduced the definition of simple and multiple linear regression models and having described the main characteristics, we will move on to the description and definition of Tobit, the model that we will use for running our analysis.

4.1.2 Tobit model

As mentioned by (McDonald & Moffitt, 2001) in their paper “The uses of Tobit Analysis”, the Tobit model, also called a censored regression model, is designed to estimate the linear relationships between variables when there is either left- or right-censoring in the dependent variable. It is a model devised by Tobin (1958) in which it is assumed that the dependent variable has a number of its values clustered and limited in a specific range. The model has been used in many fields like biometrics and engineering.

The Tobit technique uses all observations, both those at the limit and those above it, to estimate a regression line, and it is to be preferred, in general, over alternative techniques that estimate a line only with the observations above the limit.

Discussing the mathematical relationship involved in the decompositions, the Tobit model could be expressed by the following relationship:

$$\begin{cases} y_t = X_t + \mu_t & \text{if } X_t\beta + \mu_t > 0 \\ y_t = 0 & \text{if } X_t\beta + \mu_t \leq 0 \end{cases} \quad t = 1, 2, \dots, N$$

N is the number of observations, Y_t is the dependent variable, X_t is a vector of independent variables, β is a vector of unknown coefficients, and μ_t is an independently distributed error term assumed to be normal with zero mean and constant variance σ^2 . Thus, the model assumes that there is an underlying, stochastic index equal to $(X_t\beta + \mu_t)$ which is observed only when it is positive, and hence qualifies as an unobserved, latent variable.

In Probit model, the dependent variable can take one of two values only, it is based on a binary response model (either 0 or 1), as an example it can only indicate that a project is either innovative or not innovate without referring to the degree of innovation that it has introduced and for that it loses any sensitivity for the magnitude. Several methodologies are used to estimate model value, could be by an estimation of the likelihood of association, Perkson's minimum chi-square or Gibbs sampling. This model can only be tested by checking the results against the true observations, which depends on human factor more than Tobit model (Bliss, 1934).

A Tobit regression is very similar to a Probit regression, but still there are some differences, for what concerns Probit model, it hypnotises Y being a Gaussian variable with mean $Y = \beta_1 X'$ and a variance conventionally fixed to 1 as an identification constraint. All we observe in the Probit model is the signs and make use of the standard Gaussian function to define probabilities for the Bernoulli likelihood. While in Tobit model we can observe that the actual values of Y is above a certain threshold (conventionally 0) but can only observe if a case is below the threshold, without seeing its magnitude. The likelihood is a censored Gaussian, which has a Bernoulli part for the censoring and a modified Gaussian for the rest. These models have very similar math, though the Probit model is less sensitive to the distributional specification than the Tobit model, by which you observe part of the actual variable.

4.1.3 Modelling process

In this section, we will describe all the steps that we followed for reaching the final results. Firstly, we will describe how we set the “stage”, describing which software we used for running the models. After that we will describe the process that brought us to the definition of the variables and the analysis of the results achieved.

Stata is the software we used for running the models, basically Stata is a statistical software that is most used in the research field, especially in the fields of economics, sociology, political science, biomedicine and epidemiology. The main capabilities that Stata has are data management, statistical analysis, graphics, simulations, regression, and custom programming. There are four major builds of each version of Stata; Stata/MP for multiprocessor computers (including dual-core and multicore processors), Stata/SE for large databases, Stata/IC, which is the standard version by Stata. It supports any of the data sizes listed above in an embedded environment and since some years ago there is available a student version for educational purposes.

Stata has a simple data structure and storage, it can open one dataset per time and the most important thing is that it should be rectangular in format, so it means that all variables hold the same number of observations, in other words, all vectors should have the same length, although some entries may be missing values.

One of the positive aspect of Stata is about its compatibility in terms of format, in fact it can read and process different types of format such as ASCII data formats like CSV or databank formats, but also spread sheets format like Excel.

After this brief introduction on Stata, we will describe how we will use it, describing how we prepared the dataset and how we run the model.

4.1.4 Selection of variables

Starting from the dataset described above in the second chapter, it will be used for running the Tobit model on Stata, but before entering the dataset as it was prepared, after the firsts analysis we did, we decided to modify part of the dataset; aggregating and eliminating some variables and adding some information that was not present in the dataset before.

First of all, we controlled again all the dataset checking if the entire arrays were filled with the same number of observation, because as said before, the dataset should be filled in all its part for avoiding problems in the processing of the software.

After this first control, we decided to eliminate some variables that we considered useless and not value adding for the undertaken analysis, for example we started eliminating the variable “Currency” since the fact the majority of the campaign were done in US, so the main currency was the US dollar and it couldn’t pose any effect on any of the other variables in the model. We applied the same reasoning for the variable “Country” that basically had one value, which is US in most of the cases. However, these first two steps allowed us to clean the dataset and have more effective and clear dataset to start running the model.

After the elimination of two variables that were “Currency” and “Country” we decided to aggregate some other variables in just one attribute called “Categories” as the variables were the categories we identified for each campaigns, taking into account the nature of the intended product/service, so as described before, we mainly categorized the campaigns in four different types that were hardware, software, app and other, for this reason we decide to create just one variable called “Categories” that gathered the previous four different variables; after this clustering we also decide to eliminate category attribute that was existing in the dataset, which became useless after the merger of the previous four, that is “Other categories” in order to have a single unified cluster for the category.

After managing all the variables, we also add two new variables that were not present in the original dataset, these two variables are the “Comments” and “Staff pick” the first one refers to the number of comments left by users in the campaign webpage of Kickstarter while the second one is the number of employees in the firm that launched the crowdfunding campaign on Kickstarter.

After researching for these two variables, and creating a small dataset, we merged the new variables into the dataset with all the campaigns. Stata allows users merging dataset, as said before both dataset should have the same references and numbers of observations. As the last step for setting up the dataset we decide to transform some variables into natural logarithm variables, which will help us in better fitting the variables into the model, eliminating some issues that would arise during the analysis regarding the scales of different variables’ values. In fact, Log transformations make positively skewed distribution more normal. Also, when a change in the dependent variable is related with percentage change in an independent variable, or vice versa, the relationship is better modelled by taking the natural log of either or both of the variables.

Followingly, after preparing the final dataset and uploading it on Stata, the main goal was to define which were the dependent and independent variable so we could start processing the regression model.

All of this study is set for analysing the evolution of crowdfunding campaigns and as analysed previously, and among different approached, we picked the measure that helped us in doing that. The measure we started using was the cosine distance. For this reason, we decide to consider cosine distance as our main variable and as our intention is to analyse how this distance could change in relation to the changes of other variables. For defining our dependent variable, we decide to consider just one, but with three different declinations in terms of dimension and limitations. The variable that we will use as dependent variable is the distance between texts as mentioned before not just considering the cosine distance, but also defining the distance in angle degrees and also in radians, so finally these three variables will be the three dependent variables. Starting from these three different dependent variables we will create three different models, every model will have one of the previous dependent variable, so our goal will be to analyse how the value of this variable will change considering different types of independent variables contained in the dataset. Another important consideration that should be taken into account while analysing these three variables is that those three variables have the same purpose, so measuring the distance between two texts, but in this case with three different unit measures that are the cosine, the angle degree and radiant degree, so this main difference has an important implication that is related to the limitation of the models. For having reliable and controlled result on Stata, before running a model, it's necessary to define some controls and limitation. Accordingly, for the three different variables those controls will be different as shown in the following table.

Dependent variable	Unit measure	Upper limitation	Lower limitation
Cosine	Absolute value	1	0
Degree	Angle degree	90°	0°
Radian	Radian degree	1,5708	0°

Table 7: Dependent variable selected for running the model

At this point we set everything for running the model and see which results we were able to obtain using those dependent variables. We start running the model using as dependent variable the cosine distance trying to change the independent variable

looking at some interesting and robust results. After using the cosine distance, we moved to the other two variables of angle degree and radian until as said before we found interesting and robust results.

Screenshots below illustrate the starting dataset and the final one as an input for the analysis on Stata.

The screenshot shows the Stata Data Editor window titled 'Data Editor (Edit) - [data thesis1.dta]'. The main window displays a dataset with 24 rows and 6 columns. The columns are: TotalBakers, tfidf, cosine, angle_rad, angle_deg, and name. The data is imported from a URL: https://www.kickstarter.com/projects/1025570204/fargo-control-electrical-devices-over-the-internet. The 'Variables' panel on the right shows a list of variables with checkboxes for Name and Label. The status bar at the bottom indicates 'Page 8 of 9', '2855 words', 'English (United Kingdom)', 'Length: 244', 'Vars: 52', 'Order: Dataset', 'Obs: 328', 'Filter: Off', 'Mode: Edit', 'CAP', 'NUM', and '84%'. The first few rows of data are as follows:

TotalBakers	tfidf	cosine	angle_rad	angle_deg	name
182	.70873735	.72767737	-.75886664	43.307968	Linar Technology Inc. Gary S. Nalven
1249	.55326956	.64592277	.8685649	49.765103	Evan Blaustein
3080	0	0	1.5707963	90	VideoLAN
309	.53790412	.61891624	.90343416	51.762964	Seth Herr
1991	.50163613	.53709646	1.0038052	57.5138	Charlie Corry
501	.86264008	.90219829	.44595703	25.551456	Nuand
125	.57203192	.64861285	.86503583	49.562902	Jayson Guzman
118	.70779361	.73189119	.74970314	42.954826	Guitar Kits USA
94	.89728484	.91094813	.42521969	24.363294	Synesthesia Mandala Drums
1058	.44639177	.57039187	.96381346	55.222444	PowerCloud Systems
711	.6941884	.74070554	.7366764	42.208449	LM Engineering Designs LLC
1556	.79975149	.83133801	.58928546	33.76357	PSY Corporation LTD
63	0	0	1.5707963	90	Robogaisa Industries , LLC
124	.42759426	.4619924	1.0905559	62.484252	Robogaisa Industries , LLC
72	.5539283	.66220192	.84704239	48.531979	Vision Aerial
73	.75030259	.78355937	.67042227	38.412367	Perception Engineering, LLC
60	.79187455	.78090219	.6746875	38.656746	Dana Ray Denton
52	0	0	1.5707963	90	LANDMARK WEST!
1281	.88861457	.90111561	.44846062	25.694901	BubblePix
171	.80130435	.84041337	.57275081	32.816204	Roy Cortes
1268	.55810308	.59203643	.93721295	53.698347	Mesh Motion Inc
470	.54945474	.61290645	.91106269	52.200044	Laridian, Inc.
984	.5955843	.67702667	.82708132	47.388269	Shailendra Suman
1268	.7400398	.7806533	.67508585	38.67957	Jacques, Fabrice, Andrew & the HAPI team

Figure 14: Screenshot of the first dataset upload on Stata

The screenshot shows the Stata Data Editor window titled 'Data Editor (Edit) - [data thesis1.dta]'. The main window displays the same dataset as in Figure 14, but with 52 variables instead of 6. The 'Variables' panel on the right shows a list of 52 variables with checkboxes for Name and Label. The status bar at the bottom indicates 'Page 8 of 9', '2855 words', 'English (United Kingdom)', 'Length: 244', 'Vars: 52', 'Order: Dataset', 'Obs: 328', 'Filter: Off', 'Mode: Edit', 'CAP', 'NUM', and '84%'. The first few rows of data are as follows:

TotalBakers	tfidf	cosine	angle_rad	angle_deg	name
182	.70873735	.72767737	-.75886664	43.307968	Linar Technology Inc. Gary S. Nalven
1249	.55326956	.64592277	.8685649	49.765103	Evan Blaustein
3080	0	0	1.5707963	90	VideoLAN
309	.53790412	.61891624	.90343416	51.762964	Seth Herr
1991	.50163613	.53709646	1.0038052	57.5138	Charlie Corry
501	.86264008	.90219829	.44595703	25.551456	Nuand
125	.57203192	.64861285	.86503583	49.562902	Jayson Guzman
118	.70779361	.73189119	.74970314	42.954826	Guitar Kits USA
94	.89728484	.91094813	.42521969	24.363294	Synesthesia Mandala Drums
1058	.44639177	.57039187	.96381346	55.222444	PowerCloud Systems
711	.6941884	.74070554	.7366764	42.208449	LM Engineering Designs LLC
1556	.79975149	.83133801	.58928546	33.76357	PSY Corporation LTD
63	0	0	1.5707963	90	Robogaisa Industries , LLC
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72	.5539283	.66220192	.84704239	48.531979	Vision Aerial
73	.75030259	.78355937	.67042227	38.412367	Perception Engineering, LLC
60	.79187455	.78090219	.6746875	38.656746	Dana Ray Denton
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171	.80130435	.84041337	.57275081	32.816204	Roy Cortes
1268	.55810308	.59203643	.93721295	53.698347	Mesh Motion Inc
470	.54945474	.61290645	.91106269	52.200044	Laridian, Inc.
984	.5955843	.67702667	.82708132	47.388269	Shailendra Suman
1268	.7400398	.7806533	.67508585	38.67957	Jacques, Fabrice, Andrew & the HAPI team

Figure 15: Screenshot of the final dataset used on Stata for running the model

```

Tobit regression
Number of obs = 347
F( 3, 339) = .
Prob > F = .
Log pseudolikelihood = -130.21452
Pseudo R2 = 0.0585
(Std. Err. adjusted for 4 clusters in category)

```

cosine	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
d_award	-.3212375	.1558352	-2.06	0.040	-.6277632	-.0147118
d_education	-.015244	.0189173	-0.81	0.421	-.052454	.021966
createdprojects	-.0422285	.0100197	-4.21	0.000	-.0619371	-.022252
d_US	-.0383537	.026367	-1.45	0.147	-.0902172	.0135098
ln_visual	.0474836	.005771	8.23	0.000	.0361322	.058835
int_social_capital	.0096491	.0117908	0.82	0.414	-.0135433	.0328415
ext_social_capital	.0023779	.0034881	0.68	0.496	-.0044832	.0092391
ln_backers	-.0046277	.0114507	-0.40	0.686	-.027151	.0178957
_cons	.488167	.0392375	12.44	0.000	.4109874	.5653465
/sigma	.2997153	.0217017			.2570284	.3424022

Figure 16: Middle results obtained running the Tobit model

```

Tobit regression
Number of obs = 347
LR chi2(7) = 24.69
Prob > chi2 = 0.0009
Log likelihood = -1474.0889
Pseudo R2 = 0.0083

```

angle_deg	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
createdprojects	1.532034	1.16763	1.31	0.190	-.7646546	3.828722
d_nofacebook	.9243885	1.856915	0.50	0.619	-2.7281	4.576877
ln_visual	-1.569038	1.250929	-1.25	0.211	-4.029574	.8914968
ln_pledged	-2.46225	1.116673	-2.20	0.028	-4.658708	-.265792
ln_backers	2.258445	1.087166	2.08	0.039	.1200266	4.396864
d_award	16.66206	8.670358	1.92	0.055	-.392241	33.71635
other	6.139854	2.393056	2.57	0.011	1.432794	10.84691
_cons	70.01089	8.479385	8.26	0.000	53.33223	86.68954
/sigma	17.05023	.648904			15.77386	18.3266

```

1 left-censored observation at angle_deg <= 3.9115713
346 uncensored observations
0 right-censored observations

```

Figure 17: Middle results obtained running the Tobit model

4.2 Comments on coefficients

	d_award	createdprojects	ln_visual	ln_comment	PledgedCapital	duration	int_social_capital
Coef.	(0,3104668)***	(0,043035)*	0,0365344	0,0099692			
	(0,3081983)***	(0,043733)*	0,0369198*	0,013234*	-4,72E-08		
	(0,3084904)***	(0,0436997)*	0,0372768*	0,013108*	-4,78E-08	0,0002372	
	(0,3128008)***	(0,0486488)*	0,037158*	0,0110501*	-4,96E-08	0,0003188	0,0142593*
Std. Err.	0,1370979	0,0095531	0,0076306	0,0032688			
	0,135053	0,0096916	0,0076886	0,0023142	1,58E-08		
	0,1357121	0,0097338	0,0054459	0,0018546	1,18E-08	0,0017989	
	0,1322483	0,0085835	0,0065358	0,003146	9,35E-09	0,0017545	0,0110422
P>t	0,024	0	0	0,002			
	0,023	0	0	0	0,003		
	0,024	0	0	0	0	0,895	
	0,019	0	0	0,001	0	0,856	0,198

Table 8: Cosine model

	d_award	createdprojects	ln_visual	ln_comment	PledgedCapital	duration	int_social_capital
Coef.	20,98545***	2,916014***	(2,348904)***	(0,4882744)***			
	20,84983***	2,957563***	(2,372002)***	(0,6832726)***	2,82E-06		
	20,85392***	2,957097***	(2,37714)***	(0,6814709)***	2,83E-06	(0,0034062)*	
	21,09701***	3,235187***	(2,370563)***	(0,5659828)***	2,93E-06	(0,0080193)*	(0,8008103)***
Std. Err.	8,81889	0,617832	0,635615	0,171813			
	8,699135	0,6261572	0,644819	0,1369782	1,13E-06		
	8,752382	0,6271193	0,4784642	0,1333777	8,71E-07	0,1184116	
	8,549307	0,5477507	0,5386887	0,2284055	7,18E-07	0,1160343	0,6654759
P>t	0,018	0	0	0,005			
	0,017	0	0	0	0,013		
	0,018	0	0	0	0,001	0,977	
	0,014	0	0	0,014	0	0,945	0,23

Table 9: Angle degree model

	d_award	createdprojects	ln_visual	ln_comment	PledgedCapital	duration	int_social_capital
Coef.	0,2783884***	0,0417966*	(0,0355442)*	(0,005732)*			
	0,2766482***	0,0423704*	(0,0358284)*	(0,0081958)*	3,55E-08		
	0,2762609***	0,0424084*	(0,0355017)*	(0,0083226)*	3,50E-08	0,0002231	
	0,2797637***	0,0464774*	(0,0354039)*	(0,0066348)*	3,65E-08	0,0001619	(0,0116874)*
Std. Err.	0,0850187	0,0091169	0,0106528	0,0019093			
	0,0830105	0,0092503	0,0108036	0,0018375	1,56E-08		
	0,0838713	0,009251	0,0088302	0,0020324	1,30E-08	0,0016017	
	0,0800343	0,0076348	0,0095574	0,0033143	1,12E-08	0,0015546	0,0085046
P>t	0,001	0	0,001	0,003			
	0,001	0	0,001	0	0,023		
	0,001	0	0	0	0,008	0,889	
	0,001	0	0	0,046	0,001	0,917	0,17

Table 10: Radiant model

In regard to the models developed, we developed in total 12 models that we think reflect the results we have observed and about to interpret. It is worth mentioning that the three dependent variables the models are built on, are the cosine of the degree between the two vectors of the past and present descriptions, the angle in between (the angle of the same cosine), and third is the angle in radians as shown in the tables above (Table 8-9-10).

As some of the independent variables are normalized and the fact that the dependent variable angle degree is controlled to represent the angles between 0 and 90 degrees, that the reason we find in general the dependent variables in the model of angle degree to be higher in number.

The dependent variables will be described in the following section:

d_award

The variable d_award is the first to include in the models, though it represents the highest coefficient in our models and shows a very high association with the dependent variables, we don't think that the results achieved in these models are considerably enough to claim such a relation as shown by the coefficients marked with ***. The awards earned by the firms included in the models are just 4, and the firms included are 348, so there's no enough distribution of awards among the companies, despite that, apparently the four firms have achieved good results in terms of innovation according to the measure and having in mind the assumption that the change in project description is for the better.

created_projects:

The coefficients among the three models marked with * are the second in significance regarding the positive effect relationship with the angle. As we can see from the coefficients, past created projects of firms have a positive effect on the innovation introduced by these firms in the future. In general, one past created project can increase the innovation introduced by around 3 degrees. The effect could be a result of the participation benefits that the firm has gained though the prior experiences it had with previously created projects. In addition to that, previously created projects give a positive reputation of the firm (of course only in the case of successful created projects). Moreover, the practical experience of development

processes and cost cuts allow the firm to be more efficient in future projects in terms of cost of R&D and selling prices.

The effect of past created projects is expected to be positive as has been shown in several studies before, such as (Kromidha & Robson, 2016) and (Kim, Shaw, Zhang & Gerber, 2017). Nevertheless, previously created projects are associated with other success factors such as social capital and backers' trust on the firm or entrepreneur.

ln_visual:

ln_visual coefficients in the three models are around 0.036 which gives it a significance of *. The effect of ln_visual as supported by model results, are to have a negative effect on innovation. The reason behind that could be the fact that posting more visuals, increases the probability of success of the project, and that backers trust the product/service as it is, thus it makes it harder for the project creator to make any changes in the product in the future which hampers the willingness to innovate, held back by the risk of disappointing the backers by introducing changes that they might like. Such an effect could be explained more by theories like opportunity cost, examining the opportunity costs of project creator in taking a single way of either to try to innovate or to keep the product/service as it is.

This result supports our first hypothesis regarding visuals in crowdfunding projects, opening the door for more studies to examine exactly how does the relationship work, introducing the concept of trust management.

ln_comments:

The independent variable of ln_comments appears to be disturbed a bit by the introduction of pledged capital, duration and internal social capital variables into the models, though the coefficients increase a little by that. The coefficients come with a significance of *, and the variables are around 0.01 in all three models. The effect of ln_comments appears to be negative, as more comments are provided by the crowd, leading to less innovation to be introduced by the firm in the future.

This result can be interpreted in different ways; first, as a direct intuition from the findings, we can say that if project backers liked the product or service that was introduced by the firm at the time of the campaign, they will provide more comments and therefore the firm will be less prone to make any changes in the future (same hypothesis as pointed out regarding visuals). This interpretation contradicts the 5th

hypothesis and assumes that all the comments are positive and supportive which increase the confidence of project creators on the success and quality of their projects, while in fact, backers can provide positive, negative or even irrelevant feedback. Accordingly, the patterns of comments are important to be understood better in future research.

The second possible interpretation is that firms get overwhelmed with the amount of comments provided and that it's really hard for them to anticipate the inflow of information and feedback from backers' side, due to the immature nature of these firms regarding innovation and size which plays a role in their ability to absorb knowledge coming from their backers. This interpretation originates from open innovation and Absorptive capacity theory. Taking into account the number of comments that could be provided, it is possible that a project can totally change due to comments provision, if a thousand comments provided, that can possibly change a project from success to total failure, which is quite high effect from a qualitative point of view. Despite the unexpected result regarding comments' relation with innovation, this finding can still be challenged as we know that the nature of the comments matter, therefore, in order to understand the effects of comments more clearly, we need to distinguish between comments typologies and try to see the effect of each typology in innovation, this requires further studies to find ways to classify the comments provided by the crowd or find pattern within that could help in finding relations with innovation. However, by both possible interpretations, the hypothesis appears to be unsupported and as well for a robustness issue regarding the results obtained for the variable $\ln_comments$, we arrive at the same outcome.

pledged_capital and duration:

The two independent variables pledged capital and duration of the campaign appear to have very marginal impact on innovation, with coefficients less than 0.005. Apparently in our models, the innovation introduced by firms in later stages doesn't have a significant relation with both money collected through the crowdfunding campaign and the duration of the campaign. These two results appear to make sense as all projects under research are successful projects, therefore the capital needed for the development of the product/service is already raised regardless of the duration of the campaign.

int_social_capital:

The variable appears to have a significant impact on innovation, as shown by the coefficient around 0.014. As suggested by the third hypothesis that the more internal social capital a firm possesses, the more innovation is introduced in future projects, the hypothesis cannot be sufficiently supported by the models as the robustness of the result can be challenged when adding the internal social capital variable to the models, though in the next paragraph we will elaborate more on this matter.

4.3 Hypotheses formulation

As a result, from the analysis, and on the way to formulate our hypothesis for this study, we think it is important to highlight the main standing points that might be of significance as observed in the models developed and the interpretation of the results we've done so far in the last section. These standing points are not new to applied economics and management literature, however, it might play a role in the explanation we seek for the expected results of the study. Therefore, we take some space to shed light on the linkages of such topics with innovation in firms' crowdfunded projects connecting both by the relationships found in the models between innovation measure and the different dependent variables.

As we can see from variables like visuals and past created projects; some factors or determinants of success in a crowdfunding campaign can have an extended effect (positive or negative) in the innovation introduced by firms in later stages of the development of a product or service that was initially funded through capital raised from project backers on the platform.

Some factors could be associated with the founders of the firms, as well as some could be associated with the crowd that backs the project or the characteristics of the platform and launched campaign. Factors associated with the founders are the level of education founders have, the awards the company or the project has won in the past, the geographical location of the project, the description of the project, the created projects by the founders or the firm in the past including the successful and unsuccessful ones and the social capital possessed. From the backers' side, we can find the comments provided by the backers, the money pledged, the duration of the campaign and funding goal (all factors were tested in the models and came short in robustness has been excluded and only left the ones included in the final model).

Some of these factors are found to possibly have an extended impact on the future of the project or the firm who launched it.

Bearing in mind that sustaining the success of a project to last for a longer period that extends after the delivery of the product/service requires more than the effect of the factors mentioned before and might have no association with some of them. As an example, to leverage the network of social capital gained through the campaign, we think that a firm needs to develop crowdsourcing capabilities as probably internally developed innovations are too expensive for such small firms. Therefore, firms can leverage on the “idea market” as it is a cheaper source for innovative ideas, though these ideas need to be reshaped and refined after being gathered. This idea market is full of potential ideas that are both low and high quality, although contributors of low quality ideas tend to leave the market quicker than others as claimed by (Huang, Singhand & Srinivasan, 2011). Then, the role of the firm comes to identify and develop the ideas that could be viably designed and developed and has the potential to succeed in the market. These ideas are found to be significantly higher than others in terms of novelty and customer benefit and somehow lower in terms of feasibility, although that feasibility haven’t constituted a holding back factor to these ideas as revealed by the study of (Poetz & Schreier, 2012). Interestingly this opens the door for further investigation regarding crowdsourcing of ideas in crowdfunding and how firms can leverage on it from an open innovation perspective.

Moving on, as firms carry on with their projects after delivering the rewards to the backers, there comes the need for scaling up the production and introducing more innovative features as the market expands and many competitors may join in the race. Aligned with that idea, gained experience and crowdsourced ideas can serve as an input to an open innovation approach that might involve as an example co-creation with the customers. However, in all cases internal efforts in R&D are still needed in order to increase the Absorptive Capacity to be able to spot and absorb the useful knowledge gathered, many studies associated internal R&D spending with Absorptive Capacity in order to effectively exploit the ideas crowdsourced by the firm. Despite the controversy in the antecedents of Absorptive Capacity in the literature, (Van Den Bosch, van Wijk & Volberda, 2003) and previously by (Lane, Salk & Lyles, 2001) provide as empirical contributions to the models of Cohen & Levinthal (1989, 1990), results that reflect the importance of the ability to recognize

and the ability to assimilate new external knowledge. In addition to (Zahra & George, 2001) that distinguished between potential and realized capacity.

4.3.1 Communication by visuals (images and videos) in crowdfunding

Crowdfunding campaigns main goal is indeed to raise the capital that is needed to perform the activities required to bring the product or service to light (might be also the reason to execute a single or multi step sub-goal or milestones of the final product or service). However the centroid of all the efforts being put by the firm associated with the campaign is to arrive at the point of a successful crowdfunding campaign, therefore, visuals (images, videos or pitches) being posted by firms to communicate the description of the product/service are meant to deliver a message regarding the development stage or simply used as a marketing tool, at the end all these reasons -beside founders' characteristics and third party endorsements- fall in the efforts to decrease information asymmetries, mitigating the perceived risk from a backers' side (Courtney, Dutta, and Li 2016). (Kunz, Bretschneider, Erler & Leimeister, 2016) based on Signaling theory, points out the importance of communication tools as they positively influence the probability of success of a crowdfunding campaign. Moreover, signaling theory plays an important role in explaining the need for project creators (firms in our case) to communicate the quality of their projects to the crowd. However, before this study, we've known much about the effect of visuals posted by creators on the success of a crowdfunding campaign than what we knew about their effects on future developments, from an innovation point of view. Of course, the impact cannot be direct as more and better-quality visuals are evident more in successful projects, (Kim, Buffart & Croidieu, 2016) demonstrates the difficulties creators have to overcome in order to communicate credible arguments that help in eliminating their liability of newness. Nevertheless, what we might now know more about is when the projects succeed in reaching the funding goal, if the effect of these visuals extends for a longer period or not and it may be the case as seen in the results obtained.

1st hypothesis: The more visuals a successful campaign posts, the less innovation is introduced by the project in the future.

When a project creator posts more visuals in a crowdfunding campaign, the communication and proof of concept of the project is better, therefore information asymmetries decrease and backers are more prone to pledge as their perceived risks decrease. Hence, when the project reaches its goal, the project creator is more confident about the product/service developed and is less prone to make drastic changes or developments. Held down by the risk of losing customers, project creators don't want to jeopardize the trust they have built with their backers. This decreases the motivation for innovation in the future. The hypothesis is supported by the results from the model.

4.3.2 The effect of previously created projects in crowdfunding

One of the deciding factors in the decision of entrepreneurs or firms to pursue innovation and to conduct R&D activities is the cost associated with such activities, raising the question of the economic viability of developing a more innovative product or service. (Raasch & Hippel, 2013) defines "participation efforts" as all the benefits to get for an innovator only from participating directly in the innovation process, and that it's not existent in the solution if handed over from someone else to the innovator. The benefits can include reputation among the community, it is important to completely distinguish between the participation benefits and other benefits obtained from the sale of product. The benefits from participation are evident in many examples like in the case of online consumer product design and online open source communities. Therefore, the participation in more projects increases the reputation of the entrepreneur or firm, and additionally, it decreases the costs associated with innovation as (Raasch & Hippel, 2013) claim that participation benefits outweigh the pure consumption of innovation.

We know from (Butticè, Colombo & Wright, 2017) that serial crowdfunders' projects are more successful if compared with novice crowdfunders due to the internal social capital developed within the crowdfunding platform. (Himam, 2017) points out the informal learning that entrepreneurs get at their workplace, they learn through the interactions within their inner circle, they learn how to optimize the available resources for self-development, share knowledge and skills which creates a positive learning atmosphere, and they get highly emotionally attached to their jobs and roles as entrepreneurs. These factors push the entrepreneur to learn more through

the process of development, which reflects better, results when put in work in following projects.

2nd hypothesis: The more projects a company has created in the past, the more innovation is introduced by the project in the future.

When a company creates a crowdfunding project, among the determinants that can decide whether it will succeed or not are the number of created projects before, the social capital the firm possess and of course the legitimacy of the project and several other determinants. Through prior created projects, a firm gains experience in the development process which reflects in a reduction in cost and an increase in outcome quality as serial entrepreneur can leverage on their participation benefits from preceding projects. In addition to the popularity among its internal social capital as next projects unfold. Therefore, we think that the more projects a company has created in the past, the more innovation is introduced in future projects. The hypothesis is supported by the model results.

4.3.3 Internal social capital in crowdfunding

Internal social capital develops through projects track record as (Skirnevskiy, Bendig & Brettel, 2017) says. Building a community in crowdfunding platforms is a crucial factor in funding success, as project creators that identify themselves by the projects they created in the past raise more money, alongside the fact that projects that encounter an exchange of signals between creators and backers in forums succeed in raising more capital than others who don't (Kromidha & Robson, 2016). Many studies have shed a light on the significance of social capital in general and internal social capital specifically.

In crowdfunding projects, fundraisers seek to build a community within the platform that would be beneficial to future projects in the two dimensions of raising capital and provision of feedback, this community is called internal social capital, although the effect of internal social capital has a limited life span as explained by (Butticè, Colombo & Wright, 2017), and it regards only the social capital gained through interactions on the platforms and not by backing others' projects, that the entrepreneur needs to maintain that asset by keeping the interaction alive as long as

possible, bearing in mind its possible implications in trust and what could negatively happen in the case of delay.

However, what we mentioned so far supports the notion of being positively associated with funding success and capital raised, but no association to the innovation has been introduced in the literature we have been through so far. Conversely, if we look at the period after the success of a campaign, and approaching the period of the launch of a new project, in order for the firm to leverage on their internal social capital, it needs to adopt an open innovation approach, crowdsourcing ideas from the crowd and co-creation while interacting with them, and that can only be achieved if the firm possess enough Absorptive Capacity that is capable of analysing and learning from the feedback provided by the crowd.

3rd hypothesis: The more internal social capital a company possesses, the more innovation is introduced by the project in the future.

As social capital in general has been observed as associated with the willingness of backers to pledge money to a project, internal social capital has a peculiarity as explained in the last paragraph. Social capital plays a significant role in the success of a crowdfunding campaign (Vismara, 2016), and found positively associated with funding success. In fact, real time communication tools and tutorials on crowdfunding platforms are created to help entrepreneurs in acquiring the social capital they need within the platform. Therefore, we propose that the more internal social capital a company possess, the more innovation is introduced in future projects. The hypothesis is supported by the model.

4.3.4 Awards

In fact, awards won by entrepreneurs or firms could be a measure of innovation itself, but due to the limited number of awards, and the fact that assumingly, awards are won by the best projects in their fields, we find that there's no sufficient distribution of awards among projects or firms to indicate any sense of innovation, however, awards still to be an important factor in identifying the best projects, a signaling factor and reputation wise kind of certification to projects or entrepreneurs.

(Solomon, Ma & Wash, 2016) mentions that superstar projects have the ability to influence backers' decision and moreover to affect other projects by setting higher standards. For the mentioned reasons, and by signaling theory, awards can have a positive impact on innovation as award winning firms or entrepreneurs would have better experience and more social capital that constitutes a good input for innovation. For the mentioned reasons, we suggest the hypothesis:

4th hypothesis: The more awards a project wins, the more innovation is introduced by the project in the future.

The hypothesis can't be supported by the model as for the reason mentioned before.

4.3.5 Comments provided by the crowd to a crowdfunding project

(Summers, Chidambaram, Young, 2016) claims that social media buzz impacts positively projects' signals outcome, and for that they claim also that the greater the social media buzz, the greater the commitment of backers and subsequently the better the campaign outcomes. However, as we mentioned in chapter 2, the comments provided by the crowd can play an important role as an input for innovation in an open innovation model. Despite the argument that we represent, the results obtained do not support the argument, but that could be explained as concluded in the closing chapter, despite that, we build the below hypothesis:

5th hypothesis: The more comments backers post to a project; the more innovation is introduced by the project in the future.

The hypothesis is not supported by in need for further research as explained in the last chapter.

4.4 Quality and predictive accuracy of the models

In the last section, we discussed the significance of each variable in the models from the perspective of the effect of the variable on the dependent variable, but in this section, we discuss the robustness of the models and their predictive accuracy (e.g. the coefficient of a variable could be high but not accurate). Therefore, in this section

we discuss the accuracy of the coefficients obtained from the model and their predictive power of the actual values that could occur.

In the third column on each one of the models (Table 8-9-10) we find the standard error for each of the coefficients, the values of standard errors for the variables Awards and Pledged Capital appear to be significantly high compared to the coefficients obtained, in the Awards variable, the standard error is exceeding one third of the value of the coefficient, the same case is apparent in Pledged Capital variable standard error. Regarding the other variables, In Visuals, Created Projects, In Comments and Duration, the standard errors appear to have a sufficiently low value.

In regard to the t value (the z index of the coefficient at the null hypothesis that the actual value of the variable is equal to zero), the value is considered robust if higher than 2, which is the case observed in all variables under investigation but two (Duration and Internal Social Capital), therefore, the conclusion that can be drawn is that the values of the two variables do not differ significantly from the zero which could be the case in some observations. Interestingly, we observe the behaviour of the same two variables in the stages of modelling, that the introduction of Internal Social Capital in the model, disturbs the other variables, specially, the In_Comment, decreasing the t value of the latter dramatically.

In the fourth column, we find the P value, which is the probability that the actual value of the variable is equal to zero, the only considerably high P value is associated with the variable Duration, Similarly, the same conclusion is reached from the t value and the confidence intervals the value would be found within. Accordingly, in this case the P value has no significance of indication of robustness whatsoever, the same is evident in the variables Duration and Internal Social Capital, which leads to mark the variables insignificant in this model.

In relation to the confidence intervals mentioned in the last paragraph, it is the model confidence that all values of the variables will be within certain intervals, and to have a robust result, the intervals should never cross the 0, which is evident in the case of Duration, there's a 95% confidence that the values will lie within a negative and positive interval, which means that the interval include the value 0 and some values could be zeros. Conversely, the case in other variables is different as we observe either only negative or only positive intervals with 95% confidence, which, in result

indicated solid ground for robustness if the values of t were more than 2, the same conclusion could be drawn if the P value is lower than 0.05.

For what concerns the rest of the variables we observe relatively strong robustness as the t values all exceed 2, P values are all below 0.05 and the confidence intervals do not include the zero. Therefore, we consider the models robust until the point before adding the Duration and Internal Social Capital variables as for the reason mentioned in the section.

4.5 Recent studies findings on the same characteristics

Social Capital

Many studies took into account social capital as a success determinant, emphasizing the role of social networks in affecting the pledged capital from backers in reward-based crowdfunding, and the percentage of equity offered in equity crowdfunding campaign. Some of these studies are (Shane & Cable, 2002), which points out the importance of the ties between entrepreneurs and potential investors in the choice of which type of ventures are selected to be funded, therefore it is important for entrepreneurs to strengthen their ties within the network of investors.

This approach extends to more specific and new sources of entrepreneurial finance like crowdfunding, as highlighted by (Mollick, 2014), in which we find that the size of social network connections affects positively the pledged capital and subsequently affects the success of the campaign, this evidence is from Kickstarter which is a reward-based crowdfunding platform.

Same conclusion was pointed out by (Kromidha & Robson, 2016) and (Summers, Chidambaram & Young, 2016). However, while concluding the results of this study, (Wang, Guidice, Zhou & Wang, 2017) has recently suggested that there is a curvilinear relationship between innovation and internal social capital, with some moderation effect from vision sharing among employees, a nonlinear relationship might be the most robust one as many studies see the relationship as either a positive or negative linear relationship. Though the methodology pursued in this study and the type of firms associated with the questionnaires and interviews, nonetheless, the significantly low sample of companies taken into account, in addition to the measure of innovation that was chosen by the scholars which is the number of new products

and services introduced in the last three years, taking into account all these factors, the results and conclusion could be challenged by further research and that can explain the difference in outputs between our study and (Wang, Guidice, Zhou & Wang, 2017).

However, (Colombo, Franzoni & Rossi-Lamastra, 2014) suggests that internal social capital is crucial for crowdfunding campaigns in early days to accelerate the success and that the effect of internal social capital is mediated by the capital asked for and the number of backers a firm of an entrepreneur has had their support in the same early days.

Pledged Capital and duration

As crowdfunding business model, depends on the pure need of both fundraisers and backers to either raise capital or to invest or support a project, then both of the pledged capital from the crowd and the duration of the campaign play a role in the success of raising the needed funds at the end of the campaign period.

Both pledged capital and duration are seen in prior studies as determinants or factors that influence the success of a crowdfunding campaign. The results of studies on these two factors are quite distant; (Kunz, Bretschneider, Erler & Leimeister, 2016) claims that as the duration of the campaign increases, the probability of project success decreases, by that the paper suggests that there's a negative relationship between the duration of a campaign and the pledged capital to it. In contrast, (Beier & Wagner, 2016) emphasizes the importance of the first days in the campaign, pointing out that most of the pledged capital comes from backers in the first days.

However, all research efforts have focused on the relationship between the two of pledged capital and duration as duration is a determinant of success that is measured by pledged capital. Nevertheless, we emphasize on the point that both factors need to be studied in relation to the innovation introduced in future products or services after the end of the crowdfunding campaign.

In addition to that, it is important to take into account the correlation between the two factors as seen in Appendix B that seems to be significant and could be the source of weakness in our models with respect to innovation measure adopted.

Comments

(Thies, Wessel & Benlian, 2014) has highlighted the significance of social buzz and contribution behaviour of backers, though this study seems to be focused on social capital but it also provides an introduction of understanding the behaviour of backers which is illustrated by the comments and feedback they provide more than the amount they pledge to the project. (Yang & Hahn, 2016) has used the behavioural theory to build up a performance feedback model for the firm in crowdfunding projects; by monitoring the behaviour of backers during the campaign by taking daily snapshots of the campaign page and then empirically tested the hypothesis.

In general, backers' comments in crowdfunding projects are barely mentioned in a few studies, and was not taken into account as an input for innovation in any case, in fact, in most cases it was taken as a social buzz and interpreted either with a positive effect on the success of a project or has no effect at all and in addition to that, it was seen and studied from the perspective of social capital and signalling theory, therefore, we cannot find any supportive results from prior studies that would give an indication of the nature of relationship between the comments provided by the crowd and the innovation introduced either in later stages or future products or services.

Though the results obtained from our studies are not sufficient to draw any conclusions, in the next chapter we will give recommendations for future studies in this direction.

Visuals

In contrast to what conclusions our analysis has drawn, many studies have come across the visuals in many ways, as a success determinant, passing by studying the patterns communicated in project pitches, arriving at visuals as a risk mitigatory.

In accordance with the aim of each study, many methodologies were adopted such as empirical studies as in (Ishizaki, 2016), in which a Computer-Aided rhetorical model was used and claims a strong correlation between the pattern of speech communicated through the pitch and the success of the project in raising capital, though this study is basically examining the pattern of project description communicated but it still testing the videos which is the visual used to deliver the description of the project. Other studies like and (Dey, Karahalios, Duff & Fu, 2017) have followed the same track using a mixed approach of qualitative and quantitative

analysis, the qualitative analysis was done by Amazon Mechanical Turk, while the qualitative analysis through a survey, while the quantitative analysis was done through regression using the subjective ratings provided by the survey itself, concluding with video design implications and factors to take into account by project creators.

In general, as was observed in other factors we have studied, the research efforts regarding visuals has largely ignored the extended effect on visuals on innovations, limiting the vision to the success in raising targeted capital. Nevertheless, the images are largely ignored as well, as the focus of the majority of the studies was related to the project description and motivated by the fact that video pitches are increasingly being used as a mean of communicating project descriptions.

Given all that, the results obtained from our study could be considered novice in their nature when it comes to visuals and future research is needed as we will elaborate on in the next and final chapter.

Created projects

Regarding this factor, the majority of past studies has focused in trust managements as past record (past created projects by fundraisers) is a strong signal of trust or as called by others reputation. (Kim, Shaw, Zhang & Gerber, 2017) has used interviews with crowdfunding participants and conducted a regression analysis with more than 4000 delayed projects, the results suggest that previous crowdfunding experience are associated with the delay in delivery of rewards and that decreases backers trust. While (Zheng, Hung, Qi & Xu, 2016) has constructed a model that in based on Elaboration Likelihood Model (ELM), claiming that entrepreneurs' prior success crowdfunding records positively moderate the effect of the relationship between project creator and backers on capital raise success, by studying the relationship between trust management and the performance of a campaign and provides practical implication to help managing backers' trust.

In accordance with prior studies, come the results obtained from our model, despite the fact that we examined the past created projects against innovation introduced while other studies took into account only the success in raising capital or the delay in delivery. Therefore, we find our results as a more emphasis on the importance of past experience gained from past created projects.

Awards

Studies like (Marek & Grys 2016) point that out saying that brand recognition and brand identity is important for small space projects as it originates a lot of opportunities, setting as an example of a space project that has won an award after raising 25,000 USD through crowdfunding, which is quite the opposite to the case in our study. Another paper (Hung, Yeh & Chen, 2016), that studies two cases of successful entrepreneurs, pointing out that the two entrepreneurs has won two design awards which helped them in the development of self-brand products in the first year of their design start-ups.

Nevertheless, worth mentioning that awards are quite rare in crowdfunding projects as many entrepreneurs are novice and have no prior experience, in addition to that, it is more the case that crowdfunding projects success leads to awards, not the other way around, however indeed winning an awards helps the firm in introducing innovation in later stages of the product as shown in our models, though the results are not robust, but it can be observed in the few award winning projects included in our study.

5. Conclusions

5.1 Purpose, Research Methods and Key Results

The main purpose of this study was to tap into the undiscovered areas of the extended effect of crowdfunding on firms, as in many other sources of entrepreneurial finance, there are studies that contributed to the literature in many ways identifying the effects of VC's, Business Angels and Seed Financing in the innovation that would be introduced by these firms as a consequence, however, we tried in this master dissertation to unfold the effect of crowdfunding in the innovation in later stages of product development. In doing so, we identified several factors in crowdfunding that would affect firms' performance in terms of innovation.

To develop the methodology that we followed, we relied on literature in several fields, first, we reviewed the literature in crowdfunding and by doing so, we identified the gaps in research, and one of them was the effect of crowdfunding in firms and projects after the success in raising the capital needed. as mentioned in the first chapter, we reviewed literature in all four typologies of crowdfunding (i.e., Donation-based, Reward-based, Equity-based and Lending), we have chosen Reward-based crowdfunding as a context for our research, accordingly, we thought for Kickstarter projects as input data for the models we have developed. Then we reviewed the literature in innovation, open innovation including crowdsourcing and Absorptive Capacity in order to identify linkages and theoretical ground for our study.

In accordance with the literature reviewed, we proposed several methodologies that would form the research framework we have adopted. The research framework we adopted was a mixed study that include qualitative and quantitative studies, first we conducted a survey that was sent to 347 firms that had projects on Kickstarter between the year 2009 and 2012, asking them to fill out the survey with the questions shown in Appendix C, we received only 32 responses from the firms, though the replies were not sufficient to draw any scientific conclusions but it was helpful in giving indications, results collected are shown in Appendix C.

Next, we conducted a qualitative study by reviewing a randomly selected sample of 60 projects from the same dataset, we have given them scores regarding innovation introduced within the period after the end of the campaign and up to the moment of

conducting the study. This study is meant to work as a supportive study to the main study.

Eventually and based on the research framework adopted, we run the main study using the same dataset, as shown in chapter 3 and 4, arriving at the results shown in chapter 4. This study has provided the main contributions to this research, as several factors that influence innovation introduced by crowdfunding have been identified. A total of 28 factors and characteristics has been studied, some factors were found to have non-significant effects to ones that would have a very marginal effect on innovation, and by running all the variables that were not excluded for another reason as mentioned in chapter 4 (e.g. d_US), we reached the model with the 7 factors shown.

The study of these factors has been done using Tobit model as the regression model, and Stata14 as a software to run the model. Three main hypotheses were identified on the impact of social capital developed within the platform, past experience of firms or entrepreneurs in crowdfunding and the visuals communicated by the project creator during the crowdfunding campaign, the impact of the three on the innovation introduced in later stages of product/service development was hypothesized.

First, the role of visuals has been observed to hamper innovation. Second, past created projects are seen to have a positive effect on innovation. Third, the support for the claim that internal social capital has a positive effect on innovation is not sufficient as shown by our models. Fourth, the effects of awards won by the firms or the entrepreneurs within the firms are not clear in our models and in need for further research. Fifth, the effect of pledged capital and the duration of the campaign appears to be weak on innovation. Sixth, the comments provided by the crowd appear to have no significance in the models but it is indeed in need for further studies that would elaborate more on the effects of different feedback coming from the crowd.

In the first hypothesis, the result show that visuals have a negative impact on innovation introduced in later stages of product/service development, as the literature reviewed e.g. (Dey, Karahalios, Duff & Fu, 2017) and (Ishizaki, 2016) point out a positive impact on the success of a crowdfunding campaign. The results from our study could be explained by the fact that visuals increase the trust of backers on the product and that makes it harder for the entrepreneur or the firm to consider changing any aspects or features which hampers innovation in later stages of development.

Regarding the second hypothesis, we find that past firms' experience in crowdfunding projects have a positive impact in innovation introduced in later stages of development. This result comes aligned with the literature on past-created projects, as has been shown in several studies before, e.g. (Kromidha & Robson, 2016) and (Kim, Shaw, Zhang & Gerber, 2017), though these studies have dealt with past-created projects solely as a determinant of success not taking into account future innovation introduction.

In the third hypothesis, the results were not sufficient to draw any conclusion, however, many studies have suggested that social capital has a positive impact on innovation, e.g. (Mollick, 2014), (Kromidha & Robson, 2016). It is still unclear the effect of social capital in general and internal social capital on innovation introduced in the future.

For what concerns pledged capital and duration, we couldn't find any significant relation between the two and innovation introduced in later stages, this can be interpreted by the fact that pledged capital and duration are correlated somehow, as we can see in the correlation table in chapter 3, there's almost a 0.16 correlation coefficient between the two and that might affect the impact of the two in our model by introducing multilinearity. In fact, many studies have studied pledged capital and duration of the campaign, their role in the success of the campaign, e.g. (Kunz, Bretschneider, Erler & Leimeister; Beier & Wagner, 2016), though our results cannot be compared to theirs.

With respect to the fourth hypothesis and the variable awards, the result obtained is not sufficient enough to draw a conclusion that rewards have a positive effect on innovation from our model though studies like (Marek & Grys; Hung, Yeh & Chen, 2016), have reached the same result though the methodologies adopted (e.g. interviews with entrepreneurs) were different, but the result could be challenged in many ways as only two entrepreneurs were interviewed. However, the hypothesis is not supported but further research is requested.

In regard to the fifth hypothesis, comments provided by the crowd, the results obtained show insignificance of the factor in the innovation later introduced, and subsequently, the 5th hypothesis is not supported. Despite that, we think the matter is in need for further studies that would explain peculiarities in the comments and impacts that different types would have on the final results.

In despite of the studies that we compare our results to, we think none of them has considered the extended effect of crowdfunding factors on the innovation introduced in later stages, and therefore we would like to stress the point that some factors could have a positive impact on the success of a campaign and have a negative impact on innovation and vice versa. This could be seen in Visuals as an example.

5.2 Contribution to academic literature and implications

This study has implications on both academic literature, crowdfunding platforms and users (creators and backers). On the side of academic literature, the study contributes to the literature in Crowdfunding and the literature in Open Innovation.

In regard to crowdfunding literature, we contribute to fill the gap in literature for what concerns the period after the success of a campaign and the delivery of the product/service (Butticè, Franzoni, Rossi-Lamastra & Rovelli, 2016). First, in terms of determinant of innovation, we contribute by introducing a new measure for innovation that is text similarity, finding the relationship between the innovation introduced in later stages of development and factors that influence crowdfunding in general, though these factors -in past studies- were only considered for what concerns the success of a campaign in terms of capital raised. However, this study tackles the innovation in crowdfunding from the inside and measures innovation in terms of degrees, which gives more accuracy than any categorical attribute measurement. In general, the outcomes of this study should be taken into account carefully, as text similarity could create some bias in terms of accuracy as it depends on nature and order of words in project descriptions. Second, the study accounts only for firms not individuals, so the study treats project creators as organization entities, unlike observed on most of the literature on crowdfunding (Davis, Hmieleski, Webb & Coombs, 2017) and (López-Golán, 2017) that treats firms and individuals as the same in project creation, which opens the door for the use of theories like Agency Theory and Open Innovation.

In the stream of Open Innovation literature, again the study contributes to the literature by the introduction of text similarity as measure for innovation. Second, the study unfolds the close nature of Open Innovation in firms seeking other sources of finance and firms seeking crowdfunding, (Sorenson, Assenova, Li, Boada & Fleming, 2016) concludes that crowdfunding success attract VCs to innovators in the

region. Third, some firms might take advantage of comments provided by the crowd urging for more open business models as in the music industry (Gamble, Brennan, McAdam, 2017) and as a co-creation tool for cultural products (López-Golán, 2017). Nevertheless, the study contributes to the practice of crowdfunding by creators and backers and the platform itself; first, the study recommends the platforms to urge project creators to post as less visuals as possible to their backers, not to create a too strong bond between the backers and the product/service which will make it harder for the firm to introduce any changes in the product in the future, project creators can depend on teasers as example. Second, the study urges the platforms to enhance the experience of project creators to be in charge of the management and development of the project in a more interactive way by enhancing the forums and have built-in operations services and Open Innovation tools that would make the project creators' experience more consolidated and rich in terms of innovation introduced in later stages, these recommendations are meant to increase the likelihood of more innovative projects.

5.3 Study Limitations and Future Research Directions

This study has limitations due to several factors, first, we used only one keyword (Crowdfunding) to search for crowdfunding literature, in addition to (Open innovation) and (Crowdsourcing) to find literature in Open Innovation, this could have imposed a limitation to the literature reviewed and highlighted in this study.

Second, for what concerns the data collected, we have started from 1697 technological campaigns that were run on Kickstarter between 2009 and 2012, then we thought for ones that were run only by firms, were successful and still alive which narrowed the sample to 372 campaigns and then to 347 campaigns after the removal of duplications missing data ones. This might impose a limitation and generalization for some of the factors studied like awards, in which only 4 campaigns were award winning. In following research efforts, a bigger sample would give clearer vision and more robust results.

Third, the measure of innovation adopted which text similarity by cosine distance, through the development of the algorithm -shown in chapter 2 is a quite new measure and has implications as it takes into account only the similarity in words and order of words, which might result in the exclusion of implicit similarities, therefore more

accurate measures could be adopted. Machine learning techniques (e.g. Model-based clustering text classifier) could be a good way to better measure the distance and type of change in product descriptions.

Fourth, Tobit is a good measure of multivariate linear relationships and can be controlled more than other linear regression models, but lacks the nonlinear relationship that could occur between some variables and fails in the prediction of multilinearity or in existence of correlations, therefore other nonlinear regression might be used to represent nonlinear relationships, for example, Negative Binominal Regression models.

Fifth, the comments provided by the crowd are in need for further investigation, as apparently for our study, we can't take the comments as a one variable, alternatively, future research should try to distinguish between different typologies of comments as they might have different impact on innovation and even the success of the campaign in the first place, for that future studies can use data mining techniques such as Association Rules, Classification or Feature Extraction.

Sixth, another limitation of this study is the fact that we have considered the major reason for innovation that might be introduced by these firms to be solely crowdfunding, while in reality there might be other causes and sources of innovation, could be the firms' staff, regional characteristics; e.g. innovation hubs, incubators or even being acquired or merged into by another firm, in addition to industry characteristics as innovation might be different in nature give different industries, therefore further research regarding specific industries or regional contexts is encouraged.

So far by this study, we hope to answer to the question of how changed crowdfunding projects are now compared to the time they started? But in contrast, still remains the question of how the firm benefits from the crowd in fostering innovation (e.g. the use of backers' technological feedback contributions in reshaping a product/service that better fits their needs), if this type of input has any contribution to the sales made, does the firm need to possess specific competences or resources to benefit from that? We hope further research would provide answers to these questions.

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Appendix A – Sample of the dataset collected

	URL Crowdfunding Campaign	Firm	Still-alive	Apps	Software	Hardware	Others	Updated	Launch date	Company name	Contacts
1	https://www.kickstarter.com/projects/jvrain/awesome-icons-for-your-iphone-apps	1	1	x				13	29/04/09	Glyphish	Website contact form
2	https://www.kickstarter.com/projects/mmenimon/makerbeam-an-open-source-building-kit	1	1			x		26	05/09/09	MakerBeam	info@makerbeam.com
3	https://www.kickstarter.com/projects/1379937313/getting-your-shit-together-business-of-art-software	1	1		x			2	22/10/09	Gys-Ink	info@gys-ink.com
4	https://www.kickstarter.com/projects/signhuseen/signt-unseen-a-new-online-magazine-that-lets-you-0	1	1				x	1	23/10/09	Signhuseen	hello@signhuseen.com
5	https://www.kickstarter.com/projects/gmndlabovestions/open-source-iron-tracking-collars	1	1			x		10	04/03/10	GRND lab	-
6	https://www.kickstarter.com/projects/nordlaser/semi-open-source-laser-cutter-0	1	1			x		10	24/05/10	labs nord	-
7	https://www.kickstarter.com/projects/jvwarren/gasstools-mapping-the-gulf-oil-spill-with-balloon	1	1			x		9	29/05/10	Public lab	staff@publiclab.org
8	https://www.kickstarter.com/projects/930368578/6openpcr-open-source-biotech-on-your-desktop	1	1			x		11	08/06/10	OPEN PCR	support@hahbio.com
9	https://www.kickstarter.com/projects/1218102091/first-ever-iphone-walking-tour-app-for-nycs-apper	1	1	x				7	17/07/10	LANDMARK WEST	landmarkwest@landmarkwest.org
10	https://www.kickstarter.com/projects/mokdt/electronics-arduino-for-everyone	1	1		x			13	01/09/10	MODKIT	support@modkit.com
11	https://www.kickstarter.com/projects/530263804/jeepneec-nagc-school-bus-for-the-philippines	1	1			x	x	33	15/10/10	Jeepneec	team@jeepneec.com
12	https://www.kickstarter.com/projects/421256045/diy-desktop-enc-machine	1	1			x		76	04/12/10	M-DY/CNC	Website contact form
13	https://www.kickstarter.com/projects/mgeedtruits/arduino-drum-machine-step-sequencer-goove-box	1	1			x		8	24/02/11	RC Ruggedtruits	Website contact form
14	https://www.kickstarter.com/projects/1803756771/rebuchette-the-snap-together-desktop-trebuchet	1	1			x		49	22/03/11	E&M labs	-
15	https://www.kickstarter.com/projects/156123844/tapose-bringing-the-courier-to-the-ipad	2	1		x			44	22/03/11	Tapose	support@tapose.com
16	https://www.kickstarter.com/projects/ronberg/keyboard-wearable-input-device	1	1			x		24	27/03/11	Keyglow	Website contact form
17	https://www.kickstarter.com/projects/308542211/libricheck-the-digital-blood-tester-for-your-car	1	1			x		38	08/04/11	Waveon Technologies Inc	info@waveon.com
18	https://www.kickstarter.com/projects/jmcrabe/b-squares-modular-solar-powered-electrics	1	1			x		19	01/05/11	OCTO23 Technologies LLC	Website contact form
19	https://www.kickstarter.com/projects/791396812/minihq-geographical-programming-environment-for-ard	1	1		x			40	02/05/11	Robotgroup	info@robotgroup.com.ar
20	https://www.kickstarter.com/projects/498101635/soundjay-ipad-2-sound-booster-and-audio-enhancer	1	1			x	x	26	04/05/11	Soundlaw LLC	-
21	https://www.kickstarter.com/projects/patricio/olclip-iphone-4-quick-change-camera-lens-system	1	1			x		20	08/05/11	Ollclip	Website contact form
22	https://www.kickstarter.com/projects/938329399/makerslide-open-source-linear-hearing-system	1	1			x		19	09/05/11		-
23	https://www.kickstarter.com/projects/eshwardford/project-shapeoko-a-300-complete-enc-machine	1	1			x		19	26/06/11	Carbide 3D LLC	support@carbide3d.com
24	https://www.kickstarter.com/projects/790206393/rockit-8-bit-synth-kit	1	1			x		9	28/06/11	HACKME	Website contact form
25	https://www.kickstarter.com/projects/photocritic/trigger-trap-the-universal-camera-trigger	1	1			x		23	29/06/11	TRIGGERTRAP	hello@triggertrap.com
26	https://www.kickstarter.com/projects/ridanher/cee-the-usb-analog-electronics-multitool	1	1			x		17	30/06/11	Nonolithabs LLC	-
27	https://www.kickstarter.com/projects/1517658569/smart-radiation-detector	1	1			x		1	08/07/11	Radiation watch UK	Website contact form
28	https://www.kickstarter.com/projects/1342192419/pulse-sensor-an-open-source-heart-rate-sensor-that	1	1			x	x	15	19/07/11	World Famous Electronics llc	-
29	https://www.kickstarter.com/projects/211644115/geocatche-in-space	1	1				x	8	21/07/11	Groundspeak, Inc	Website contact form
30	https://www.kickstarter.com/projects/flg/quadsbot-an-aerobatic-blend-of-rc-helis-and-planes	1	1				x	25	04/08/11	Transition Robotics Inc	quadsbot-team@transition-robotics.com
31	https://www.kickstarter.com/projects/rev01ights/rev01ights-join-the-revolution	1	1				x	51	09/08/11	Rev01ights	ken@rev01ights.com
32	https://www.kickstarter.com/projects/surfteasy/surfteasy-plug-in-privacy	1	1			x		18	15/08/11	SurfTeasy	-
33	https://www.kickstarter.com/projects/danefoster/hilypad-using-light-to-power-all-our-mobile-device	1	1			x		13	4/07/84	-	-
34	https://www.kickstarter.com/projects/minimonokey/mini-monkey-light-wheel-lights-for-bicycles	1	1				x	11	14/09/11	Monkey Light Bike Lights	Website contact form
35	https://www.kickstarter.com/projects/psochij/waibooststrapsolar-portable-power-pack-kit	1	1				x	32	18/09/11	Boostrapsolar LLC	info@boostrapsolar.com

	ln_bac~s	d_educ~n	d_award	d_US	country	int_so~l
ln_backers	1.0000					
d_education	0.0483	1.0000				
d_award	-0.1039	0.0857	1.0000			
d_US	0.0189	-0.0409	0.0502	1.0000		
country	0.0309	-0.0482	0.0461	0.9193	1.0000	
int_social~l	0.1929	0.0868	-0.0116	0.0534	0.0188	1.0000

Appendix C – Survey template and answer collected

Survey template

Beyond Kickstarter campaign

* Required

On a scale of 5, how much your crowdfunded product/service is changed since the campaign up to present? *

	0	1	2	3	4	5	
Remained the same	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Drastic change

Feel free to add a comment on the previous question

Your answer

On a scale of -3 to 3, how helpful was the input (comments/forums) from your crowd (backers) to your realization of the final product/service? *

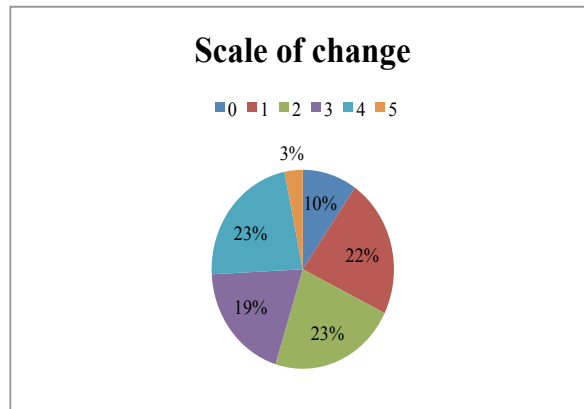
	-3 Extremely harmful	-2	-1	0	1	2	3 Extremely helpful
Backers' input was	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Answer collected from the survey

Question 1

On a scale of 5, how much your crowdfunded product/service is changed since the campaign up to present?

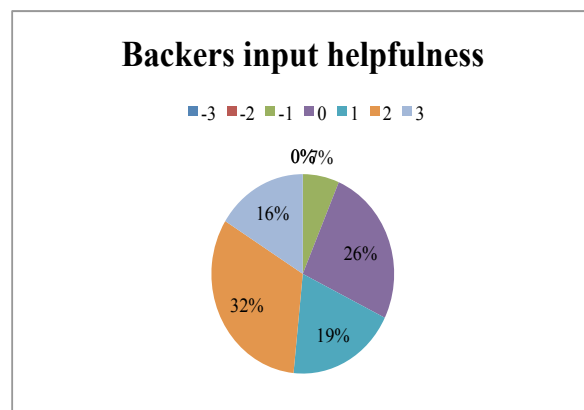
	Scale of change
0	3
1	7
2	7
3	6
4	7
5	1



Question 2

On a scale of -3 to 3, how helpful was the input (comments/forums) from your crowd (backers) to your realization of the final product/service?

	Backers input helpfulness
-3	0
-2	0
-1	2
0	8
1	6
2	10
3	5



Timestamp	On a scale of 5, how much your crowd-funded product/service is changed since the campaign up to present?	Feel free to add a comment on the previous question	On a scale of -3 to 3, how helpful was the input (comments/forums) from your crowd (backers) to your realization of the final product/service? [Backers' input was]	Feel free to add a comment on the previous question
4/11/2017 14:45:14	4		2	
4/11/2017 15:40:54	3		1	
4/11/2017 16:18:40	4	We have changed our software entirely and developed a new product, while improving the original kickstarted product.	2	
4/11/2017 17:51:17	1	Minor improvements	0	not much input
4/11/2017 18:18:25	4		-1	
4/11/2017 19:48:38	0		0	
4/11/2017 19:51:04	2		1	
4/11/2017 20:19:36	2		2	
4/11/2017 21:03:39	3		2	
4/11/2017 21:29:51	3		1	
4/11/2017 23:04:58	2		2	
4/12/2017 10:48:48	4		2	
4/12/2017 12:27:47	1		1	
4/12/2017 18:30:45	2	The original vision for the Civility is that we would update it as yoyo trends change, we have currently changed the yoyo twice.	0	
4/12/2017 18:59:29	5	The first iteration of the product taught us many things and we have changed the product a lot. It has become a lot more reliable, long lasting and stable.	3 Extremely helpful	our customers helped a lot with testing out the product and making improvements
4/13/2017 10:42:30	1	For hardware projects it's just impossible not to change something halfway	2	To have a clue, just consider that UD00 X86 Ultra and all the reward tiers including such product have been added at a later stage on backers' suggestion.
4/13/2017 22:32:16	2		2	
4/13/2017 23:07:38	2		2	
4/13/2017 23:42:47	1		0	
4/14/2017 3:17:34	4		3 Extremely helpful	
4/14/2017 9:54:37	2	I have revised the design to improve the reliability, performance, and quality, but functionally it is identical to what I delivered to KS backers.	0	Most people's ideas are economically impractical or impossible from a technical perspective. KS backers are not unique or different in this regard.
4/14/2017 21:14:06	1	We are still in the development phase, so the design could still change more.	0	
4/15/2017 2:49:57	1		1	
4/15/2017 11:23:28	0		3 Extremely helpful	
4/17/2017 16:57:01	3		0	
4/17/2017 17:04:56	0		1	
4/17/2017 19:17:15	3	Updated SDK, new applications, Bridge mixed reality headset option	-1	
4/18/2017 12:05:35	3		3 Extremely helpful	
4/19/2017 22:30:53	4	No production to shipping finished product is a big change.	0	
4/24/2017 9:25:51	1	We are currently updating our product portfolio, e.g. by increasing battery capacities and updating the designs of our products.	2	
4/24/2017 10:28:33	4		3 Extremely helpful	

Appendix D – Definition of the variables used for running the model

Term	Explanation
LocationCountry	The location the campaign was launched from
PresentationDate	The date of the launch of the campaigns
ExpirationDate	The date the campaigns expires, backers can no more pledge money and the success of the campaign is decided according to the money collected up to the expiration date
rewardcount	The number of rewards a project creator offers to the backers of the campaign
minimum_reward	The minimum amount asked from the backers for a single reward
maximum_reward	The maximum amount asked from the backers for a single reward
PledgedCapital	The amount of capital backers pledged to a campaign up to the expiration date
TargetCapital	The amount of capital a project creator asks for at the beginning of a campaign
TotalBackers	The total number of backers that contributed to the campaign
tftdf	Term frequency-inverse document frequency (a measure of text similarity)
Cosine similarity	A measure of text similarity on Euclidean space
angle_rad	The angle of cosine similarity in radians
angle_deg	The angle of cosine similarity in degrees
ext_social_capital	The social capital of project creator from social networks outside the crowdfunding platform environment
int_social_capital	The social capital of project creator from inside the crowdfunding platform environment
backedsuccessproject	The successful projects the projects creator has backed in the past
createdprojects	The past created successful projects by the project creator
successcreatedproject	The past successful projects created by the creator
enddate	The date the campaign expires, backers can no more pledge money and the success of the campaign is decided according to the money collected up to the expiration date
success	1 if the project was successfully funded, 0 if it wasn't successfully funded
duration	The number of days the campaign lasts or the number of days backers can pledge money to the campaign
ln_visual	The natural logarithm of the sum of both images and videos posted in a campaign
ln_pledged	The natural logarithm of the pledged amount of capital to a campaign
d_education	1 if the project creator has higher education, 0 if not
d_award	1 if the project has won a design award, 0 if not
d_US	1 if the campaign is launched from the US, 0 if not
country	The country the project is launched from