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ICO or Crowdfunding? An empirical analysis of fundraising strategies

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To Giulia

Abstract

In the last years, many financing techniques alternative to the conventional ones emerged as possible financing options for the firms, especially for those firms, such as start-ups, that traditionally faced more difficulties in accessing the traditional financing techniques. Among those techniques, called alternative finance, are placed the Initial Coin Offerings (ICO), fundraising campaigns conducted online and based on the sale of tokens issued on the blockchain granting to the participants various rights, from the access to the service to dividends.

Despite the ICOs share some similarities with many financing techniques, crowdfunding is, by far, the source of funding most similar to the ICOs: both of them are online campaigns targeted to non-professional investors.

The existing literature regarding the ICO mainly focused on the regulatory issues and on the determinants of success, completely disregarding the determinants of the entrepreneur's decision of launching an ICO. The aim of this work is, due to the strong analogies between ICOs and crowdfunding, analyzing whether some characteristics of the entrepreneur, of the product under development and of the founding team, influence the choice between ICO and crowdfunding.

To do this, starting from the literature about the determinants of the funding decision with traditional techniques, we empirically analyzed the impact of some characteristics on a sample composed by homogeneous ICOs and crowdfunding campaigns.

The results showed that the decision is influenced by the tangibility of the product, the presence of prototypes, the entrepreneur's working experience and geographical origin and the presence of multiple or single founders.

Abstract

Negli ultimi anni, parecchie tecniche di finanziamento alternative a quelle tradizionali si sono rese disponibili per le aziende in cerca di fondi, specialmente per quelle aziende, come le start-up, che tradizionalmente trovano più difficoltà nell'accesso alle forme di finanziamento convenzionali. Di queste tecniche, conosciute come alternative finance, fanno parte le Initial Coin Offerings (ICO), campagne condotte online e basate sulla vendita di tokens emessi su una blockchain che garantiscono ai contributori svariati diritti, dall'accesso ad un servizio ai dividendi.

Pur condividendo parecchie analogie con svariate tecniche di finanziamento, il crowdfunding è, di gran lunga, la tecnica di finanziamento più simile alle ICOs: entrambe sono, infatti, campagne online a cui partecipano investitori non professionisti.

La letteratura accademica dedicata alle ICOs si concentra principalmente sugli aspetti giuridici e sullo studio dei determinanti di successo, tralasciando lo studio dei determinanti della scelta di lanciare un'ICO. L'obiettivo di questo lavoro, partendo dalle numerose analogie presenti tra ICO e crowdfunding, è di analizzare l'impatto di alcune caratteristiche dell'imprenditore, del prodotto e del team sulla decisione di finanziarsi tramite una ICO o una campagna di crowdfunding.

Per fare ciò, partendo dalla letteratura dedicata all'analisi dei determinanti della decisione relativa alle tecniche di finanziamento convenzionali, abbiamo analizzato empiricamente l'impatto di alcune caratteristiche su un campione composto da ICO e campagne di crowdfunding omogenee.

I risultati ottenuti mostrano che la decisione è influenzata dalla tangibilità del prodotto, dalla presenza di prototipi, dalla precedente esperienza lavorativa e dall'origine geografica dell'imprenditore e dalla presenza di un fondatore singolo o di un team.

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Executive summary

Since the first years of the second millennium, especially after the great recession, the entrepreneurs wanting to launch a new venture from zero faced more and more difficulties in accessing the conventional sources of capital that were usually available for the start-up companies, in particular, the bank loans. Despite this, many other new financing techniques became available to them, complementing the conventional techniques or even replacing them at all. To include all these new techniques into a unique category, it was spawned the term alternative finance that comprises all the financing techniques that were developed outside the traditional financial system, including innovations in the financial channel, in the processes and in the instruments used (Schueffel, 2017).

The rise of the alternative finance was favoured by the conditions of the financial markets after the great recession that consistently reduced the capability of the banks of financing the firms, especially the newly created ones that already suffered the lack of collaterals and a low profitability. The main reason that forced the banks to reduce their exposure towards companies was the approval of new stricter regulations by the governments, the central banks and the international institutions, such as the Basel III regulations that consistently tighten up the capital requirements of the banks. The reduction of the incidence of the bank loans in the start-up funding left the field to the alternative finance techniques that gradually increased their diffusion in the financing of new entrepreneurial ventures.

Secondly, the alternative finance rise was heavily promoted by the increasing trend of implementing the new technological developments in the financial markets, phenomenon that is known under the name of fintech, in fact, while from a theoretical point of view the alternative financing techniques does not always have to rely on the new technologies and could be even based on pre-existing paradigms, most of the

alternative sources of capital rely on recently developed technologies and are mainly conducted online.

Crowdfunding is the most glaring instance of a new financing technique alternative to the conventional ones that are mainly used by start-ups or by people with a business idea who have not even created their start-up yet and is totally online-based: the entrepreneurs publish online their campaign on a dedicated crowdfunding platform, together with any information that can be useful for the possible contributors to evaluate the goodness of the project, then, once the campaign is launched, anyone can access the crowdfunding platform, evaluate the project and contributing to it, completing all these steps online, without the need of any physical touchpoint with the entrepreneur or other people representative of the founding team.

Among the technologies commonly referred to the fintech, the one with the higher disruptive potential, both in the financial markets and in many other different contexts, is the blockchain. Initially known only by informatics and by a small group of enthusiast early-adopters, it originally experienced a slow and gradual growth of popularity; then, in 2017 its popularity knew a real boom, dramatically enlarging the audience of people interested in it, especially outside the informatics and crypto-enthusiasts environments in which the blockchain was already well known. This was primarily favoured by the surge of the price of the Bitcoin - the most well-known application of the blockchain technology - that rises from 1,000 USD at the beginning of 2017 to about 20,000 USD at the end of the year and that pulled up even the prices of many other cryptocurrencies, drawing the attention of the whole financial world, but even of the mainstream media and the politics. However, the growth of popularity of the blockchain technology was due even to the development of many new applications of this technology going beyond the mere use of the blockchain as underlying technology at the base of the cryptocurrencies.

The blockchain is a distributed, decentralized public ledger in which are recorded some transaction of various kinds, both financial and non-financial. The transactions are grouped together into blocks: once a block is added to the chain and validated, it cannot be eliminated or changed by anyone making indelible the transactions included in it. The blocks are linked one to each other by cryptographic keys (each block should include the key of the previous one) that make the chain practically unassailable by hostile attackers. Its intrinsic features of transparency, versatility, immutability, and immunity to hackers give the blockchain the capability of disrupting many industries.

The concept of the blockchain was firstly theorized in 1991 by Haber & Stornetta, however, its first actual application was the Bitcoin that was announced in 2008 in Satoshi Nakamoto's seminal paper. Then, after the theoretical presentation, the Bitcoin blockchain was effectively launched introducing a new online digital peer-to-peer currency without any central entity or third party in charge of issuing and controlling it and without being under the jurisdiction of any government. In parallel to the growth of popularity experienced by the Bitcoin, even the blockchain gradually gained its momentum: in the subsequent years many other cryptocurrencies – Ethereum, Ripple, Waves, Litecoin etc. - were launched; however, even some other projects based on the blockchain technology, but not aimed at creating a new cryptocurrency and not specifically targeted to the financial sector were born; this phenomenon is called blockchain 2.0.

The initial coin offerings (ICO) exactly stand at the point of intersection between the blockchain technology and the alternative finance: they are funding campaigns entirely launched and managed online in which a start-up issues a token – a newly created cryptocurrency that can either be based on an already existing blockchain such as Ethereum or Bitcoin or on an entirely new blockchain expressly developed by the start-up from scratch. This token is sold during a public offering in exchange for other cryptocurrencies or, more rarely, fiat currencies. At the end of the public offering, the tokens are sent to the contributors' wallets and they can be generally traded on specific cryptocurrency secondary exchanges. The tokens provide its holders different rights according to the campaign: from the possibility of accessing the service once it will be launched to the anticipated purchase of the product under development, from the possibility of receiving dividends and other monetary rewards to the voting right to influence the governance of the venture and the development of the product and the possibility of actively participating at the development.

The concept of the ICO was theorized in 2012 by J.R. Willet who also succeeds in launching the first ICO (Mastercoin) the subsequent year, collecting more than 5,000 Bitcoins that were equivalent to about 500,000 USD according to the exchange rate of the time. In 2014 the cryptocurrency Ethereum was launched through an ICO raising more than 18 million USD. Despite these lucky campaigns, in the years immediately after 2014, the number of ICOs slowly increased. Conversely, in 2017, in simultaneous with

the popularity boom experienced by the Bitcoin, even the number of ICOs faced a strong increase with more than 800 campaigns that collected about 6 billion USD.

The ICOs are a completely new way of financing characterized by some elements in common with other already existing financing techniques together with some elements typical of the ICOs only. They show points in common with the initial public offering (IPO) - whose name was, for sure, a source of inspiration for the name initial coin offering – such as the fact of being a public offering in which retail investors can participate, the existence of very liquid secondary markets in which the tokens/shares are traded and, only for some tokens, the profit and governance rights attached to tokens/shares. However, the IPOs are actually very far from the ICOs: in fact, the ICOs are mainly launched by start-ups, while a company can go public only some years after its establishment and only in presence of a consolidated business plan, a proven track record and a product/service appreciated in its market.

The ICOs share even some analogies with the venture capital funds: they are mainly related to the target companies that are in both cases high technological start-ups. Due to the similarity of the firms in which is invested, these two financing techniques share even the high level of risk faced by the investors and the possibility of obtaining very high returns in case the start-up turns out to be successful. On the other hand, disregarding the target companies, the ICOs, and the venture capital funds are extremely different in many respects: the venture capital is composed of professional investors, while the ICOs are primarily targeted to the retail public, the selection of the companies in which the venture capital will invest, is a long and structured process in which the company is studied in deep, conversely, the potential contributors in an ICO make their decision relying on an extremely limited amount of information and, finally, the liquidity that is higher for the ICOs that can rely on dedicated secondary markets.

Finally, the crowdfunding is the financing technique more similar to the ICOs for plenty reasons: both of them are funding campaigns entirely run online, targeted to the retail public and launched by start-ups at the first stages of their development or even by individual people with a business idea that could be, in the future, the base to launch a new venture. Other elements in common are the role attached to the tokens sold in the ICOs that correspond to the various types of crowdfunding campaigns as the case may be and the importance of the online communication instead of the traditional physical touchpoint. There are even some differences such as the intermediation activity made by

the crowdfunding platforms that is almost totally absent for the ICOs and the differences in the level of information or in the liquidity, anyway, these differences do not obscure the presence of many similarities among them.

The existing literature dedicated to the ICOs, due to the newness of this phenomenon, is still not developed: most of the published works are focused on regulatory issues such as the legality or not of the ICOs, the laws to be applied to them, the possibility of considering them as financial securities and the best jurisdictions to launch an ICO. Apart from this, another topic already covered by the existing literature in a quite complete manner is the study of the determinants of success: which characteristics of the campaign and the founding team that have a positive impact on the outcome of a campaign. Contrariwise, the study of the determinants that drive the entrepreneur's decision of launching an ICO instead of relying on another financing technique, both conventional or not, was not object of any work until now. This work is aimed at covering this lack in the existing literature.

Starting from the numerous analogies existing between the ICOs and the crowdfunding, we considered these two financing techniques as possible alternative options for an entrepreneur owning a start-up in the first phases of its development, thus, this work tries to formulate a deep research with an empirical analysis of the determinants of the entrepreneur's decision of resorting to an ICO or to a crowdfunding campaign to finance his/her start-up.

The topic of the capital structure of the firms was object of study by several scholars: the forerunners of this theme were Modigliani & Miller (1958) who stated the irrelevance of the capital structure in perfect markets under some hypotheses: the absence of taxes, information asymmetries and transaction costs, the presence of a unique interest rate for both the company and the investors and the possibility for the firm of choosing the financing technique without endogenous limit.

Several other works in the subsequent years covered this topic highlighting the main factors able to influence the capital structure of a firm: the agency problem arose from the conflicts between the various agents operating with different claims on the firm resources (Jensen & Meckling, 1976), the information asymmetries (Myers & Majluf, 1984), the nature of the products (Titman, 1984) or the competition in the product/input market (Brander & Lewis, 1986), the corporate control context (Harris & Raviv, 1988)

the taxation (DeAngelo & Masulis, 1980) and the size of the firm (Titman & Wessels, 1988).

In particular, many scholars focused their attention on the capital structure of the start-ups and their access to the various financing techniques in view of the fact that these firms present many peculiarities differentiating them from already established large firms: in fact, the start-ups are characterized by a higher information opaqueness than the large firms that makes much more difficult for them to access the conventional sources of capital (Berger & Udell, 1998), while being contemporarily less affected by the agency problems because of being generally managed directly by the owners (Berger & Udell, 1998).

Among the single determinants, the size of the firm acquires greater importance since bigger firms usually tend to be less opaque and, so, to have a better access to the external sources of funding (Berger & Udell, 1998). The tangibility of the product and the assets of the firm is characterized by a particular importance, indeed, since the presence of tangible assets positively influences the liquidation value, a start-up characterized by a high level of tangibility can better access the external sources of capital using its physical assets as collaterals to secure the debt (Harris & Raviv, 1991). Another important element typical of the start-ups only is the legal incorporation that, while being taken for granted for the large established firms, is not always present in the start-ups: the legal incorporation, due to the high costs and complex procedures related to it, can act as a signal credibility and formality and can indicate a higher potential of growth (Storey, 1994). Positive evidence between the legal incorporation and the access to the external sources of funding were also proved by Freedman & Goodwin (1994).

Finally, the last element that acquires a strong importance for the start-up firms are the personal characteristics of the entrepreneur that are usually disregarded for the large firms due to the low possibility for a single person of influencing the capital structure and the funding decisions (Cassar, 2004). Among the personal characteristics of the entrepreneur that can drive the financing decisions, there are his/her personal data (age, sex, geographical origin etc.), his/her academic background and his/her past working experience. Several empirical analyses studied the impact of these factors on the financing decision: according to both Storey (1994) and Bates (1997) a high educational level and/or a relevant past working experience of the entrepreneur increase the access of his/her firm to the debt capital market. Scherr, Sugerue & Ward (1993) find that the

leverage is negatively correlated to the age and the experience of the founder, positively correlated to the ownership experience and influenced even by the sex, the marital status and the percentage of the income expected. Conversely, Coleman & Cohn (2000) and Cassar (2004) find no significant effects of the entrepreneur's characteristics on the capital structure.

Starting from the empirical analysis made by Cassar (2004), Coleman & Cohn (2000) and Scherr, Sugrue & Ward (1993) aimed at studying the determinants of the capital structure and the financing techniques made by start-up firms, we decided to build an empirical analysis to ascertain the impact of the characteristics of the entrepreneur, both the personal data and the academic and working experiences, the characteristics of the product under development and some other peculiarities of the whole founding team on the decision between financing the start-up through an ICO or through a crowdfunding campaign. To do this, we adapted to the peculiarities of our research the methodologies used by Ahlers, Cumming, Guenther, & Schweizer (2015) in their work about the determinants of success for the crowdfunding campaigns.

Going more in detail this work is aimed at studying the influence of the entrepreneur's geographic origin on the decision between financing his/her start-up through an ICO or through a crowdfunding campaign, the same for his/her human capital considered in terms of level of education, years of working experience, number of past entrepreneurial ventures launched and top-roles experience. Regarding the product under development, we claim that its tangibility and the presence of a working prototype at the moment in which the campaign is launched can impact on the financing decision. Then, we want to understand if the presence of an individual founder rather than a team and the presence in the founding team of one or more individual with a proven blockchain capability have an impact on the decision of launching an ICO or a crowdfunding campaign. Finally, about the entrepreneur's social visibility, considered in terms of number of connections on the social networks, we posit that it could influence the financing decision.

To empirically test these research hypotheses, we manually built a database composed by the information related to all the ICOs run from 2014 to the end of 2017, including all the information related to the design of the campaigns, to their outcome and the personal data of the entrepreneurs. We contemporarily built a database containing the data of all the crowdfunding campaigns launched on kickstarter.com thanks to data-scraping. Due to the many differences in several relevant statistics of some parameters and to the huge

difference in the dimension of the two databases, in order to have a homogeneous sample composed by comparable campaigns, we decided to focus only on the campaigns aimed at developing products related to the technological field (software, hardware, fintech, IoT devices, mobile apps, electronic devices etc.). Doing so we obtained 383 ICOs and more than 9,000 crowdfunding campaigns; to reduce the number of the crowdfunding campaigns we applied the Propensity Score Matching (PSM) technique considering the financial target and the success or not of the campaign as variables to obtain 383 crowdfunding campaigns comparable to the ICOs.

Then, we started our empirical testing with a univariate analysis, firstly computing some univariate statistics related to the variables of our sample to have a first global overview of them. After that we performed a difference in sums/difference in means analysis to see if there are differences immediately visible between the characteristics of the ICOs and the ones of the crowdfunding campaigns. Finally, we made an inferential univariate T-Test on the means of each variable to verify the existence of a statistically significant difference between ICOs and crowdfunding campaigns. The result of these analysis underlined the impact of some variables on the nature of the campaign (ICO or crowdfunding), however this step was only a univariate analysis not taking into account the cross impacts between the variables, so we went on performing a multivariate analysis.

So, we executed a multivariate regression analysis to verify our research hypotheses. We built some Logit regressions in which the dependent variable was equal to 1 in case of an ICO and equal to 0 in case of a crowdfunding campaign. This dependent variable was regressed on several different sets of explanatory variables related to the research hypotheses we developed. We started with a limited set of regressors and, then, gradually added other independent variables until we arrived at our last model, the most complete one. We also repeated the regression analysis eliminating from the sample those ICOs whose tokens did not have the characteristics of utility token, were hardly comparable to the reward-based crowdfunding campaigns launched on kickstarter.com.

The results of the regressions show that the tangibility of the product under development and the presence of a working prototype at the moment of the beginning of the founding campaign are generally more related to crowdfunding campaigns, while the presence of a team composed by many people rather than a single founder and the past working experience, both in terms of past entrepreneurial experiences and top-roles covered, are

more related to the ICOs. Even the entrepreneur's geographical origin and his/her qualifications have an impact on the decision of launching an ICO or a crowdfunding campaign. Contrarywise, the blockchain capability, the years of working experience and the social connections seem to be not relevant. The results of the regressions made excluding some ICOs from the sample were substantially in line with the previous regressions providing the same results for eight hypotheses out of ten.

This work is composed by the following parts: in the introduction, we provide a general overview of the alternative finance phenomenon, of the blockchain and the ICOs. In the literature review we go in detail explaining what is an ICO and how it works relying on the literature dedicated to it, then we present in detail what is crowdfunding. After that, we focus on the literature regarding the comparison among these two financing techniques. Finally, we make a review of the literature dedicated to the capital structure of the firms, gradually going into detail and focusing on the start-up capital structure and financing decisions and, at the end, on the literature focused on the determinants of the entrepreneur's decision of launching a crowdfunding campaign. The chapter Scope definition and research problem description illustrates the aim of this work and formulates the research hypotheses, then, in the chapter dedicated to the empirical analysis, we describe the process of data collection, the variables made, the univariate and the multivariate analysis performed on the sample. Finally, in the chapter conclusion and further research, we highlight the results obtained and leave some suggestions for further researches.

1 Introduction

Starting from the first years of the second millennium, the traditional ways used by entrepreneurs to finance their newly constituted ventures (friends, family, business angels, venture capital funds, banks etc.) were more and more combined with many other innovative financing techniques that initially emerged to address specific needs in niche markets and, then, gradually increased their popularity becoming a relevant option for the entrepreneurs around the world. These new financing techniques are commonly known under the name of alternative finance. According to Schueffel (2017, p. 1), alternative finance can be defined as follows:

“Altfi (Alternative Finance) is a term describing financial channels, processes and instruments that have developed outside of the conventional finance system comprising regulated banks and capital markets”

From this definition, it is immediately evident that the concept of alternative finance is extremely broad and comprises all the financing techniques arose in the last years outside the traditional channels. This leads to the use of the term to comprise a multitude of different techniques, very far one from another, both from a conceptual and a practical point of view. The concept of alternative finance is commonly associated to the concept of fintech, however the two terms are not synonyms, in fact, according to the definition provided by Schueffel (2016, p. 32), fintech is “a new financial industry that applies technology to improve financial activities”. So, while it is glaring that many of the techniques comprised in the alternative finance rely on some new technologies and, so, are strictly related to the concept of fintech, not necessarily all of them are based on innovative technologies and can be considered an expression of the fintech. Moreover, the concept of fintech does not make any distinction between the traditional financial systems and the newly established ones.

The definition of which financing techniques can be considered as alternative financing techniques is an object of debate between the academics, so there is no a univocal list of these techniques. According to Baeck, Collins, & Zhang (2014), the main financing techniques part of the alternative finance are the peer-to-peer lending, the invoice trading, the community shares, the pension-lend funding, the debt-based securities and, the crowdfunding. Conversely, Bruton, Khavul, Siegel, & Wright (2014) consider alternative finance techniques the crowdfunding, the peer-to-peer lending and, the microfinance.

The success of the alternative financing techniques dramatically increased after 2010; according to Baeck, Collins, & Zhang (2014), who analysed the diffusion of these techniques in the UK market, they grew by about 150 % both between 2012 and 2013 and between 2013 and 2014. The reasons behind this consistent growth mainly rely on the characteristics of the conventional financing markets after the great recession. In fact, the measures taken by the governments, the central banks and the international financial institutions strongly reduced the ability of the banks of funding entrepreneurs in particular, the ones running small and medium enterprises or newly established ventures that were characterized by low collaterals and profitability. The changes in the way the capital requirements of the banks were computed after the approval of the Basel III regulations forced the banks to reduce their exposure towards companies with low ratings or unrated at all; this provision primarily affected the new entrepreneurial ventures that, are very commonly characterized by low ratings or are unrated at all (Kaal & Dell'Erba, 2017). This sort of credit crunch frustrated the entrepreneurs, but result even as push to them to start the search of financing techniques alternative to the conventional ones (Vien, 2015).

The effect of the credit crunch was even increased for a psychological reason: in fact, according to Fraser, Sumor, & Wright (2015), the entrepreneur's decision on the source of financing is influenced by his/her perception about the supply of capital: this increased the effect of the scarce supply of capital during and immediately after the great recession discouraging many entrepreneurs of even trying to collect the capital from the conventional channels. Conversely, the echo granted on the media to some successful crowdfunding campaigns and other innovative funding techniques can improve the entrepreneur's perception of the available supply of capital, leading them to the choice of being financed through an alternative financing technique.

This was, for sure, the main reason for the success achieved by the alternative financing techniques, however it was not the unique reason. An important edge of the alternative finance on the traditional financing technique is the possibility of financing even that segments that banks and other financial institutions did not traditionally serve, even in the periods characterized by a positive economic conjunction before the great recession, such as the individuals living in poverty in the developing countries who become the principal target for the microfinancing (Khavul, 2010).

Then, another relevant cause of the success of the alternative financing techniques has been the flexibility that enabled them to adapt themselves to contexts extremely different from the one in which they were originally born within, both in geographical terms and in terms related to the characteristics of the entity or individual that is looking for funding. Considering again the example of the microfinance, in few years this technique increased its diffusion not only in the developing countries, but even in the developed ones where it was used by many small entrepreneurs lacking an easy access to the conventional financing sources (Bruton, Khavul, Siegel, & Wright, 2014). Even the crowdfunding experienced a similar enlargement of its audience in parallel to the increase of its propagation: along time new types of crowdfunding more similar to the traditional financial instruments (lending-based and equity-based crowdfunding) were added to the reward-based and donation-based crowdfunding that initially were the only crowdfunding techniques and that were initially applied mainly on projects regarding the field of the arts and the entertainment (Bruton, Khavul, Siegel, & Wright, 2014).

Among the various alternative financing techniques, the crowdfunding is for sure the one that gained greater emphasis both between the insiders and the general public; the total worldwide crowdfunding volume increased from 2.7 billion USD in 2012 to 34.4 billion USD in 2015 (Statista, 2018) and this trend does not seem to be intended to stop. Every day tens of thousands of campaigns are available on the main platforms to be funded by thousands of individual backers.

As we have already mentioned above, the alternative finance is very often associated with the fintech, although the two phenomena are not necessarily always together, in fact, many of the new emerging digital technologies that are going to disrupt the whole financial world, included the financing techniques, are exploited even by some forms of alternative finance. The most immediate example of using of the technologies related to internet are the use of the online platforms to connect entrepreneurs and ventures in

need of financing with potential investors and savers who are prepared to take high risks (Ferrarini & Macchiavello, 2018). The most known platforms are the crowdfunding ones, however there are platforms providing different types of investments that do not necessarily contemplate the participation of the crowd (Ferrarini, 2017).

By far, the most widespread technology related to the fintech is the blockchain whose popularity gradually increased from the moment of its creation until the massive increment of its popularity experienced in the second half of 2017.

Despite the basic idea behind the blockchain was theorized by Haber and Stornetta as early as 1991, the blockchain made its first appearance only in 2008, in the seminal work published by an anonym under the pseudonym of Satoshi Nakamoto. In this article the concept of the blockchain technology was firstly theorized as the underlying technology behind the Bitcoin that was the first attempt of establishing a cryptocurrency, a digital asset aimed at being used as a medium of exchange and exploiting strong cryptographic techniques to secure the financial transactions, manage the creation of additional units, and verify the transferring of the assets.

In the following years the popularity of the Bitcoin, while remaining a niche phenomenon, gradually increased and some other cryptocurrencies were launched: some of them were based on a completely new blockchain, while some others were based on the Bitcoin blockchain to whom were added some incremental innovations to improve its performance and/or remedy its weaknesses. However, in this initial phase of the lifecycle of the blockchain, this technology was used and considered only as the underlying technology behind the cryptocurrencies having the only aim of validating and permanently recording all the transactions executed on the network.

Starting from 2014, the possibility of using the blockchain as a base for new applications outside the financial services sector and with no direct connection with the original Bitcoin protocol and with other cryptocurrencies emerged and rapidly gained popularity under the name of Blockchain 2.0 (Fanning & Centers, 2016). This was made possible even thanks to the launch in the same year of the Ethereum blockchain that provided to the participants the possibility of writing smart contracts that are scripts stored in the blockchain able to automatically execute certain actions, originally conceived of being the steps of a contract, in case some predefined conditions are met.

The possible fields outside the financial sector in which the blockchain technology can be applied obtaining considerable benefits are extremely various and range over many sectors: from the validation of information about the luxury-products to the management of loyalty-points programs, from the prevention of frauds in the ticketing industry to the storing of the patients' information in the healthcare sector; even some public administrations are closely looking the possibility of implementing a blockchain to record transactions and acts and to tamper-proof voting records (Fanning & Centers, 2016).

By way of example, the blockchain technology can be used in the biomedical/healthcare sector with the function of a ledger including all the patient care data. These data can, then, be shared, exchanged, analysed and recorded with many possible final aims: from the improvement of the management of the medical records between the various doctors and the various health facilities to the speeding of the claim management of the health insurances and the acceleration of clinical and biomedical researches and trials. Thanks to these interesting premises, a lot of applications of the blockchain technologies in the healthcare sectors were launched in the last years such as Fatcom, BitHealth, MedVault, Guardtime etc. (Kuo, Kim, & Ohno-Machado, 2017).

Another field in which the application of the blockchain technology can enable substantial benefits in terms of performances and costs is the management of the food supply chain, in particular the aspect of the traceability of the products and the ingredients used, especially in the case of valuable food to ensure their geographical origin or the use of quality ingredients. The English venture Provenance developed an app based on the blockchain technology to ensure the traceability of the fresh fish caught every day in every step of its supply chain, from the wholesalers to the transporters, from the fish shops to the restaurants until arriving to the final client. Immediately after the fish is caught, the fisherman can start its registration on a platform based on the blockchain technology simply sending an SMS. Then, all the movements and the transformations of which the fish is object are registered on the platform, keeping track of all of them (transfers, packaging, sales etc.). All the participants of the fish supply chain can verify all the data regarding a certain batch of fishes and can be sure of the absolute reliability of these data without the need of third-party certifier. Moreover, even the final customer who is going to buy the fish at the supermarket or at the restaurant

can use his/her smartphone to inspect the data related to the fish to be sure about its quality and origin, minimising the risk of being a victim of a fraud (Bellini, 2017).

These are only two examples of the possible fields of application of the blockchain technology outside its use as underlying technology behind the cryptocurrencies and, more in general, outside the financial services sector. The possibility of being used in contexts different from the original one for which it was developed contributed to push the increase of the popularity of the blockchain technology in the years after 2014. However, until 2017 the blockchain was still not so known among the general public and was confined to some niches, being known mainly by informatics, early-adopters who discovered the technology in its first steps and speculators aiming at becoming rich thanks to the Bitcoin. The definitive breakthrough of the popularity of the blockchain technology happened in 2017 mainly thanks to the parallel boom of the value experienced by the Bitcoin and the other main cryptocurrencies in the second half of the year. The dramatic proportions of these increase in popularity are immediately glaring looking at the data referred to the searches on Google of the keyword Blockchain (using the keyword Bitcoin the result is essentially analogous), during the entire 2016 the level of interest was lower than 10, at the half of 2017 it reaches 25 and before the end of the year it was 100.

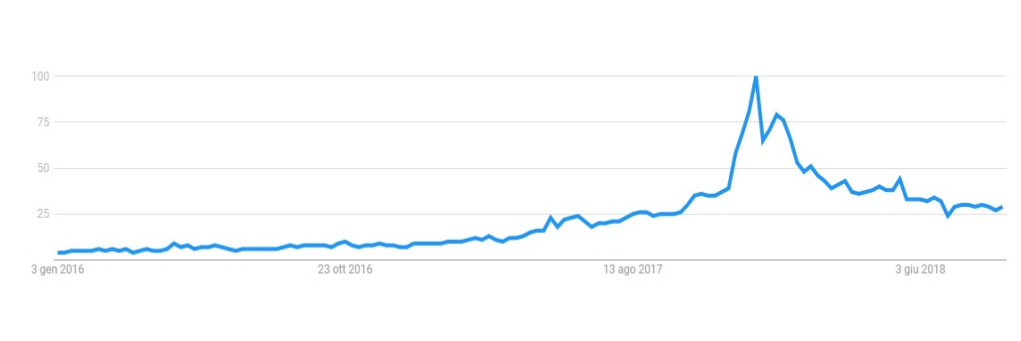


Figure 1.1: Daily trend on the search on Google of the keyword Blockchain from 01/01/2016 to 01/09/2018 (Source: Google Trend)

Even if, as we have just highlighted, blockchain and cryptocurrencies are not the same, it is indubitable that the increase in popularity of the blockchain technology was partially caused even by the dramatic increase of the notoriety of the Bitcoin after the boom of its market value that increased from about 1,100 USD per Bitcoin at the beginning of 2017

to slightly less than 20,000 USD per Bitcoin at the end of the year dragging even the other cryptocurrencies up with it, before suffering a fast decrease and stabilizing itself at a price around 6000 USD per Bitcoin.

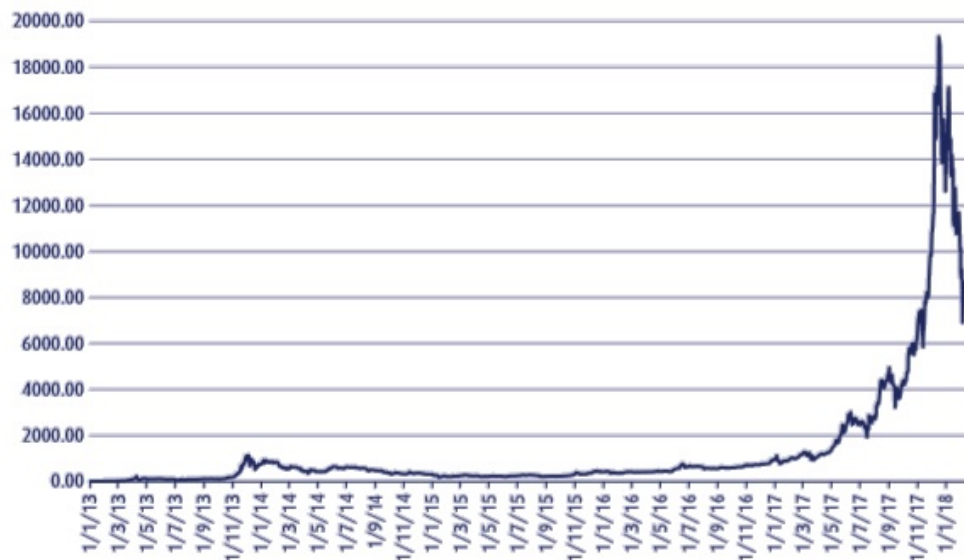


Figure 1.2: Bitcoin close price in USD from 01/01/2013 to 11/02/2018 (Source: Coindesk)

According to Lu (2018), the main reasons behind the increase of the value of the cryptocurrencies were the high incidence of speculative investments relying on its ever-growing intrinsic value that directly descends from the presence of a theoretical maximum number of circulating Bitcoins that will made the mining more expensive and time-consuming as time lapses, leading to high prices. Secondly, the increase of the controls regarding the foreign exchanges made by some countries such as China that made harder to transfer money between countries through the traditional financial channels led entrepreneurs to exchange their national currency in Bitcoin and, then, subsequently exchange these Bitcoins into the foreign currency. Finally, the last element that contributed to the price growth was the emergence of the Initial Coin Offerings (ICOs) as a new fundraising technique.

The ICOs are the conjunction ring between the alternative finance and the blockchain technology, they are funding campaigns launched by new entrepreneurial ventures on internet aiming at collecting funds from the retail public, usually in form of

cryptocurrencies, to develop their projects. The people participating in the offering receive a token granting to its holder some rights that vary offering by offering; the most common rights granted to tokenholders are dividends rights, governance rights and the right of accessing to the product/service once developed. The ICOs share some point of similarities with many other financing techniques, both the conventional ones and the ones commonly considered as alternative financing techniques; the financing technique that is by far more similar to the ICOs is the crowdfunding that shares important common points with them.

The ICOs are the main topic of this work; in detail we will focus our attention on a comparison between them and the crowdfunding campaigns to understand the determinants behind the decision made by an entrepreneur or a newly established venture of launching an ICO or a crowdfunding campaign, basing our analysis on some characteristics of the entrepreneur (or the leader of the venture), the team and the product under development.

2 Literature review

2.1 Overview of the blockchain technology

The initial coin offerings are based on the blockchain technology, so, prior to go in deep about the definition, the history and the features of the ICOs, we consider suitable to give a general overview of the technology behind them: the blockchain with its history, its main characteristics, its current and future applications and the main problems and challenges regarding it.

The blockchain is commonly associated to the cryptocurrencies, in particular to the most famous one, the Bitcoin, nevertheless the blockchain effectively is the technology on which all the cryptocurrencies are based, but they are not the only application of the blockchain.

The idea of a chain of blocks linked one to each other with a cryptographic key were firstly theorized by Haber and Stornetta (1991) as a mean to attach to a certain document a timestamp to certify the time frame in which that document was set up or modified. Their procedure already included many features that will be part of the blockchain such as the use of the hash function and a distributed trust instead of a central authority.

Then, the blockchain was theorized by an anonymous person or group of people under the name of Satoshi Nakamoto in 2008 and, then, implemented the next year as a main component of the cryptocurrency Bitcoin.

In the first definition of the blockchain, initially written as two separate words *block chain*, Nakamoto (2009) defined it as a structure with a tree shape; this structure begins with a genesis block, each block has got many other blocks aspirants to be the following block of the chain. The functions *pprev* and *pnext* connect the blocks in the longest chain. Each block can have many *pprev* pointing to it, but *pnext* can point only to a block in the longest chain or will be null in case that block is not a portion of the longest branch.

There are plenty of definitions of blockchain other than the original one made by Nakamoto and in many cases they discord one to each other, to start discussing about what effectively is the blockchain we cite the definition coined and used by Vitalik Buterin (2015), the founder of Ethereum:

“A blockchain is a magic computer that anyone can upload programs to and leave the programs to self-execute, where the current and all previous states of every program are always publicly visible, and which carries a very strong cryptoeconomically secured guarantee that programs running on the chain will continue to execute in exactly the way that the blockchain protocol specifies.”

This definition is obviously not rigorous (magic computer) and does not include references to the monetary and financial world, highlighting the fact that a blockchain might exist even in case of absence of an underlying token. It is greatly interesting because it underlines the plurality of possible applications other than the use for cryptocurrencies.

Moving to a more technical definition we can define the blockchain as a distributed ledger including all the transactions performed by the parties who are participating to the network. These transactions are validated using some types of mechanisms and cannot be altered, once added.

Having defined the blockchain a distributed ledger, we now need to define what is a distributed ledger: the Distributed Ledger (DL) is a distributed database spread across multiple sites without a single owner or administrator. All the members of the network across which the database is shared can have a copy of the ledger that is totally identical to all the other copies crosswise the network. Whichever change made in the ledger is shifted to all the copies within a short time interval (seconds or minutes). The ledger can hold a variety of assets both physical or electronic. The safeness and the precision of the assets inside the ledger are guaranteed thanks to the use of the cryptography, exploiting asymmetric cryptography systems with public and private keys (Hancock & Vaizey, 2017).

The concept of distributed ledger was born as contraposition to the concept of centralized ledger, commonly known even as general ledger, in which the entire database is managed and controlled by a unique body with the power of modifying the data inside it even without the consent of the entities to which the data refer. The enterprise resource planning (ERP) software and the database of the clients of a bank with their balance can be possible examples of centralized ledgers. The main weaknesses of a centralized ledger are the absolute power of the controlling entity to modify the data contained in the ledger, and the absence of any restriction that can be conducted by any user having the access to the database and the possibility that all the transactions shut down in case the entity controlling the ledger shuts down (Nair & Shoney, 2017). Furthermore, the presence of a central authority requires even the presence of middlemen in charge of performing some actions in place of the head entity. Their presence can be a possible weakness point for the security and the transparency of the ledger and a remarkable cost (Bolgar).

Conversely, a distributed ledger does not need any central authority and middlemen, and it is based on the peer-to-peer logic: the whole workload is divided between many computers that are providing resources to execute some activities. Each computer participating in the network is a node of it. Being part of a distributed ledger, the coordination of the activities performed is not assigned to a central authority, but depends on the information directly exchanged between the various nodes.

Any modification is independently recorded by each node, then it has to be validated by a consensus mechanism and, once included in the chain, cannot be erased or modified. In the blockchain the transactions are grouped in blocks that will be linked one to each other in chronological order (each block should include the hash of the previous block) forming the blockchain. A block can be broadcasted in the network only after a process of validation based on a consensus method used to allow all the participants in the network to reach an agreement about what information is true. This can be done by most of the network agreeing on the information presented.

There are many consensus methods used by different blockchains: the most used verification method, implemented even by Bitcoin is the Proof of work (POW): the concept of this method was firstly proposed by Dwork and Naor (1992) as technique needing the user to calculate the result of a hard function to prevent from shallow uses of a shared resource. Then, the Proof of work was coined and formalised by Jakobsson

and Juels (1999, p. 258) defining it as a protocol in which “...the prover demonstrates to a verifier that she has performed a certain amount of computational work in a specific interval of time..”. The Bitcoin uses a Proof of work derived from Hashcash an algorithm proposed by Adam Black in 1997 as a counter measure technique against a denial-of-service. This verification method contemplates the search for a value which hash begins with a number of zero bits. The workload needed is exponential in the number of zero bits required and can be easily checked performing a hash. It is implemented in the bitcoin by increasing a pseudo-random number in the block until the moment in which it is found a value giving that the hash of the block has got zero bits. After the computational effort solves the hash, that block cannot be modified unless the computational work is redone. When other subsequent blocks are linked in the chain after a block, the work to change that block would imply the repetition of the work related to all the blocks after it. So, the true information recognized by the whole network will be the longest chain with the greatest proof of work effort; if most of the computational power resides in honest nodes, an aggressor who wants to change some transactions inside a past block would need to do again the proof of work of that block and the ones of the subsequent blocks, reach and, then, outdo the work made by the honest nodes, making it practically impossible (Nakamoto, 2008). POW has been criticized for its being energy-intensive (King & Nadal, 2012), even if some studies came to the conclusion that the energy cost is not a primary concern for Bitcoins (Vranken, 2017).

Another consensus mechanism is the Proof of Stake (POS) which is increasing its diffusion in many new cryptocurrencies such as Waves; it was initially introduced by Peercoin in 2012 with the aim of solving the problem of energy-intensity typical of the POW. In the POS the consensus is reached staking the coins owned by the users as a collateral against the possibility of cheating and/or adding false information. This mechanism implies that an attacker who wants to add a false information needs to hold at least the 50 % of the total supply of coins and this would be extremely costly for him. To avoid a possible centralization determined by the fact that the single richest participant of the network would have an abiding power, many POS-based cryptocurrencies developed methods to define the next valid block to be added to the chain. Peercoin uses the concept of coin age that is the product between the currency amount and the times holding period (King and Nadal, 2012), a higher coin age means higher chances to sign the subsequent block of the chain, after having signed a block the coin age of that stake is set to zero and it could be used to sign new blocks at least thirty

days after the sign. Bitshares uses a variation of POS, the Delegated Proof of Stake (DPOS) in which some witnesses elected by the participants of the network have the task of signing the blocks, doing this the system achieve some advantages typical of a centralized system such as a transaction time considerably lower than POW and POS based cryptocurrencies.

POW and POS are the most spread consensus methods, but there is a plurality of methods other than them. The Proof of Authority is typical of the private blockchains and contemplates the presence of some authorities, generally preselected real entities, acting as trust signers. Then there is the Proof of Capacity in which the nodes have to commit storage space on their hard disks to mine instead of the computational power of the POW method. In the Proof of burn the miners have to burn some digital assets sending them to a defined address. Finally, there are many hybrid mechanisms combining together two or more of the mechanisms explained (Tasca & Tessone, 2018).

Once reached the agreement about the true information, that data are distributed throughout all the nodes part of the network and they will be transparently auditable. The use of the Hash function to link the blocks one to each other permit an efficient mean to the data searching in a set of records. In mathematics a hash function is a non-reversible function used to map a string of arbitrary length in a string of a lower fixed length (typically 128 or 256 bits): this second string (the output of the hash function) is simply called hash. The hash values are contained in a table, called hash table, that can be utilised as an indexing tool while executing searches. Matching the tables and the function with techniques of cryptography is possible to obtain a hash function that can be applied to institute the safeness and the privacy of the ledger technology. This is guaranteed by the features of the hash itself: in fact, it is very easy and quick to verify the hash of an input, while, at the same time, it is practically impossible to determine the original input knowing only the hash value (the average number of attempts needed to find the initial input starting from the hash value is $2^{128}/2$). Going back to the input from the hash value is made further hard since small changes in the input imply huge variations in the output of the hash function.

2.1.1 Permissionless and permissioned blockchains

Different blockchains can be categorized in many various modes, one of the most important is surely the one differentiating permissionless blockchains from

permissioned (private) ones: in a permissionless blockchain there is no owner and no one playing a regulatory role with the power of stopping the transactions of the other members; anyone with a pseudonym or remaining anonymous can join the network starting verifying the transactions and achieving the consensus. Since this verification work is crucial for the network, users are usually born up to exploit verifies with the emission of a certain amount of new currency. The main example of a permissionless blockchain is the bitcoin, designed to be as democratic and decentralized as possible (Catalini & Gans, 2017). To reach the consensus a permissionless blockchain has to rely on a consensus method such as the Proof of Work or the Proof of Stack with the possible related problems we highlighted before.

On the other hand, permissioned blockchains contemplate that only a reduced number of player can validate the transactions; even the possibility of accessing to the network to made transactions is limited: the users have usually to be identified and accepted before having the possibility of joining the network with a whitelisting procedure such as the *Know Your Customer* (KYC). The permissions to access to the network and/or validate the transactions come from a central authority. To complete the KYC process and giving the user the access to the blockchain, the authority needs to know the legal identity in the physical world of the player. In a private blockchain there is no more need of a consensus method since the transactions are validated by trusted nodes that are pre-selected by the main entity and they do not need to obtain the consensus of the other participants. Permissioned blockchains can be completely private and used only inside the organization owning the blockchain or can be created by a consortium made up by different organizations and shared between them. They are generally used by financial institutions, banks, stock exchanges and healthcare entities.

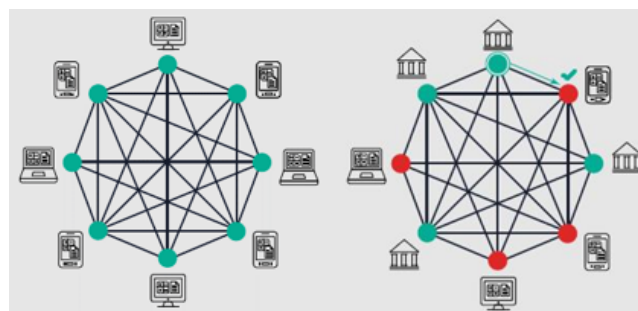


Figure 2.1: Permissionless and permissioned blockchains (Source: *Blockchain: Powering the Internet of Value*, EY Innovation Lab, 2015.)

Permissioned blockchains are conceptually more similar to the traditional databases used by companies, except for their being replicated and distributed, than to the common idea of blockchain. Notwithstanding, the use of a distributed ledger instead of a traditional centralized ledger can be useful to have more standardised operations and a higher compatibility between the different players without radically modifying the current framework. Since all the verification-related activities are competence of preselected trusted nodes, the system can easily be in compliance with the laws, however it re-establishes the presence of trusted intermediaries acting on behalf of a central entity with all the problems related to them, this will lead to a unlikely drastic innovations on the markets (Catalini & Gans, 2017). Regarding the scalability, a permissioned blockchain can have an advantage if compared to a permissionless one in which, as the dimensions increase, only a restricted number of players will keep the ability of verifying the transactions, leading to a centralization problem; instead, in a permissioned blockchain the number of participants who have to validate the transactions is defined by the central entity and their computational power can be increased to match a higher number of transactions (Peters & Panayi, 2015). Permissioned systems are also quicker in clearing and settling assets and less expensive to be maintained. Possible concerns for a permissioned blockchain are its sustainability once its dimension starts increasing, if the size of the network increases a lot, the scalability advantage highlighted by Peters and Panayi (2015) could be completely upset since it could result very hard to have an increase of the computational power of the verifiers in line with the increase of the size of the ledger, and the permission mechanism that can turn out to be a single point of failure from both an operational and business point of view (Bass, et al., 2017).

There is a plurality of trade-offs between permissionless and permissioned blockchains: rapidity, inexpensiveness, censorship, reversibility and finality that can be considered the most important (Swanson, 2015).

2.1.2 Blockchain advantages and disadvantages

The main advantages of the blockchain technology compared to a traditional centralized ledger are the subsequent: the trust relies on the consensus method and no central entity with the aim of validating all the transactions is needed, this will lead even to the absence of any middlemen figure delegated by the authority.

The use of the blockchain can entail the presence of more direct relationships with the final user in many markets (for example the financial markets or the energy market), reducing the role of the intermediaries (banks, clearing houses, trading platforms etc) leading to a considerable reduction of the transaction costs and, consequently, of the cost base (World Energy Council; Pwc, 2017).

Another advantage relies in the programmability of the blockchain: it can be specifically designed and programmed to a specific application resulting in a high flexibility and capability of adaption for a multitude of different uses in various fields from the cryptocurrencies to the digital identity providers and voting systems with possibility of being exploited in many sectors such as arts, tourism and sports (Pilkington M. , 2015).

Contemporarily, there are even some drawbacks that must be kept in consideration: the main drawback is the low transaction rate: Bitcoin has got a transaction rate between 3.3 and 7 transactions per second; this value is limited by the maximum number of transactions that can be included in each block and by the interblock time that is the average time occurring between one block and the following one that is close to 10 minutes for Bitcoin (Croman, et al., 2016), while payment services not based on the blockchain technology such as VISA can perform about 2000 transactions per second. Ethereum transaction rate is slightly higher than the one of Bitcoin, but is still very far from other services. Other cryptocurrencies have got higher transaction rates, Bigchain DB declares a rate of thousands transactions per second (Bigchain DB GmbH, 2018), but in many cases these results are obtained partitioning the blockchain: in this way each block contains only a part of the chain and not the entire one; this could generate problems: in fact, in case of a lying node all the connected nodes will receive the false block produced by that lying node.

A second disadvantage is the need for each node to store all the transactions, for the Bitcoin whose structure of the transactions is not so complex the size of the blockchain was about 180 GB at October 2018: a dimension not so relevant for a desktop computer, but quite impossible to be stored on a smartphone or a tablet and relevant even for a notebook. Furthermore, this number raised by 37 % in the last year and it is destined to continue increasing. The space needed is even higher for other blockchains such as Ethereum with its smart contracts. Even one of the main advantages of the blockchain, the absence of a central authority can come out as a drawback: if an absent-minded user loses its private key, he will not be able to ask to any authority a way to recover it or create

a new one and all the assets and cryptocurrencies in its balance will be mislaid forever. Similarly, if a hostile user takes possession of a private key, he can send all the assets in the balance of the keyowner to its balance without the possibility of recognizing the fraudulent transactions from the ones made by the effective owner of the key and reverting them.

Other disadvantages are related to the Proof of Work consensus method and not to the blockchain itself: for example, the chain can suffer a 51% attack in which attackers controlling the majority of the computational power can prevent some transactions to be validated and double spend their cryptocurrencies.

2.1.3 Smart Contracts

The initial application of the blockchain as a base for the Bitcoin and, after that first one, for other cryptocurrencies was originally the only possible application of this technology. During the years following the birth of the Bitcoin, many other applications other than the original one were deployed. A definitive boost to further expand the use applications of the blockchain came with the Smart Contracts, that are scripts stored in a blockchain automatically executing the steps of a contract.

The original idea of Smart Contracts was proposed by Nick Szabo in 1994, many years before the introduction of the blockchain technology, and, therefore, they were primarily completely uncorrelated with the blockchain: Szabo (1994) defined them as “a computerized transaction protocol that executes the terms of a contract”. In his vision they were created to have a mean to meet the majority of classic contractual clauses (terms of payment, non-disclosure agreements etc.) playing down both fraudulent and fortuitous exceptions and contemporarily reducing the use of trusted intermediaries. The advantages related to the use of smart contracts would have been a reduction of frauds, arbitrations and, in general, of the transaction costs (Szabo, 1994).

As we said before, the smart contracts on the blockchain are scripts on the chain, each smart contract has got its univocal address and can be started simply addressing a certain transaction to its address, then, depending to the input transaction, it automatically performs without any external intervention on each node of the chain. They can perform on the network various types of calculations, but they are extremely

efficient when there is the need of managing data-driven interactions among two or more participants (Christidis & Devetsikiotis, 2016).

There are some peculiarities typical of the smart contracts (Christidis & Devetsikiotis, 2016):

- Smart contracts are able to take custody of assets on the blockchain: for example, if British Airways deploys a contract to automatically reimburse its passengers in the form of digital assets usable to buy new air travels in case the delay of their flight is higher than thirty minutes, it has to include in the contract a “deposit” function allowing the flight carrier to deposit on the contract the digital assets that will be sent to the customers in case of delay. After having deposited the asset on the contract it will be not available for the depositor.
- Smart contracts are deterministic: same inputs always lead to the same outputs. In fact, in case of a non-deterministic contract, the execution of it throughout all the nodes of the blockchain could lead to a plenty of different results making impossible for the network to achieve the consensus about the result. To avoid the problem generated by non-deterministic contracts a blockchain can impose programmers to use a language not providing non-deterministic constructs or can turn down any endeavour to deploy a non-deterministic contract.
- The code of every smart contract publicly stands on the blockchain and every member of the network can view it.
- Smart contracts get always started from transactions recorded on the blockchain and even any other interaction occurs on the blockchain, as a consequence of this, all the activities of a contract can be verified by the members of the network.
- A smart contract can enable interactions even between counterparties that do not reciprocally trust themselves: the parties can verify the code of the contract before its execution and consequently decide if taking part in the interaction or not and verify each step of the execution of the contract. Moreover, litigations on the final outcome cannot rise since the smart contract acts independently of the parties and its outcomes are fully predictable.

The most well-known application of the smart contracts in the blockchain is for sure Ethereum: it was conceived by Vitalik Buterin during 2013, then it was better defined and conceptualized the following year with the publication of its white and yellow papers.

Buterin (2014, p. 1) defined it in the whitepaper as a “blockchain with a built-in Turing-complete programming language, allowing anyone to write smart contracts and decentralized applications where they can create their own arbitrary rules for ownership, transaction formats and state transition functions.”

The codes of the smart contracts are performed on the Ethereum thanks to the Ethereum Virtual Machine (EVM). It is a virtual machine that is a peculiar software able to emulate in all and for all a physical device through a virtualization process in which the shared physical resources are allocated to the applications performed on the virtual machine. EVM is a quasi-Turing complete machine (Wood, 2014) meaning that it is possible to create smart contracts able to resolve whatever rational computational problem. EVM is a quasi-Turing complete machine instead of a fully Turing complete machine due to the presence of a limitation of the overall amount of computation that can be done through the parameter *gas* (Wood, 2014).

The concept of gas was introduced to avoid the possibility that a hostile user could shut down full nodes and miners compelling them to go in an endless loop. This is avoided setting a threshold in the number of the computational steps that a transaction can take. If this maximum number is reached, the transaction is switched back, but the fees related to it (the gas) are paid anyway. By fixing a maximum gas to any transaction beyond which the transaction is reverted, it is possible to limit the maximum number of computational steps and, so, avoiding infinite loops.

According to State of The DApps, a non-profit directory developed with the aim of listing the projects built on the Ethereum blockchain, at October 2018 a total of 1936 projects based on Ethereum has been launched, about the half of these projects were active, the 34 % of them were still in some stages of the development path, while the remaining ones were not successful or broken. These apps cover a wide variety of segments: exchanges, gambling, videogames, social media, healthcare, energy, charity and many others. The number of new apps developed strongly increased from 2017 to 2018 passing from an average value between 15 and 20 apps each month at the beginning of 2017 to more than 100 apps per month released at the beginning of 2018.

Ethereum is the most spread blockchain in which smart contracts can be created and deployed, but it is not the unique one: many others blockchain came after Ethereum and

now offer the possibility of creating smart contracts: among the best known we can find Waves, NEO, Lisk and Bitshares.

An application of the blockchain including some features typical of the smart contracts and based on the Bitcoin blockchain is Colored Coins: Their concept was introduced at the end of 2012 by Meni Rosenfeld at the beginning they were conceived as Bitcoins with peculiar features granted by an issuing agent (the name colored was coined to highlight the presence of these features) and with an intrinsic value not directly related to the value of the Bitcoin. Thanks to these characteristics they could have been used to represent many types of digital assets, always keeping the features of the Bitcoin blockchain such as the easiness of storage and transfer (Rosenfeld, 2012). During the following years they evolved and in June 2015 Colu published a new open-source application of the Colored Coins including the possibility of issuing digital assets adding some rules existing outside the blockchain, the possibility for the users of inspecting them and a rule engine with some basic functionalities of the smart contracts (Colu, 2015).

2.1.4 Forks

The last concept we want to illustrate in this section is the forking: it can be briefly defined as a change in the software and in the implementation of the blockchain (Mell, Roby, Scarfone, & Yaga, 2018). Notwithstanding the fork is more than just a technical variation of the software or the way in which the blockchain is implemented, but it takes a really prominent place even in the ICOs, since many times the newly created coins distributed after an offering are generated after a forking. In fact, considering the Bitcoin as the first coin ever created and excluding some coins such as Ethereum or Waves that were based on completely new blockchains created ad hoc by their inventors, many coins were created forking an existing blockchain bringing some modifications to its code.

There exist two main types of forks: hard and soft forks. In the soft forks the modifications made to the technology do not inhibit the nodes that are not up to date from using the updated blockchain, in fact these nodes recognize all the new blocks as valid making the soft fork backwards compatible. A soft fork does only need that most of the nodes will adopt the new updates to enforce the new rules. Many soft forks occurred on the Bitcoin blockchain such as the update adding the pay-to-script hash in 2012.

Contrarywise, in a hard fork, users that do not adopt the changes in the technology will be completely impeded to use the blockchain with the new improvements. In case of a hard fork the participants are forced to decide if undertaking the new modifications and follow the main fork provided by the developers or refusing to adopt the new improvements and going on in the original path. After a hard fork, the participants of the network who have taken the new updates cannot interact with the one that do not take the and vice versa. A hard fork is necessary in case of a strong change in the structure of the blocks (e.g. in case of the decision of adopting a new hash algorithm).

After a hard fork with the consequent split of the blockchain in two parts, all the coins owned by the participants of the network will be present in both the old and the new fork. If the consensus among the fork is unanimous, all the activities will be transferred to the new one and the old fork will no more be used. Nevertheless, in many cases, the consensus about the hard forking is not so solid and the fork is called contentious hard fork: in cases such this there is a disagreement within the community between the ones wanting to implement the new modifications and the ones who do not want, as a result of this there will be two active blockchains: the one with the most consensus will keep the old name, while the other will have a new denomination.

The most famous contentious hard fork happened in the blockchain is for sure the one between Ethereum and Ethereum Classic. The origin of it relies on the fall of the DAO (Distributed Autonomous Organizations), a project built on the Ethereum blockchain whose aim was the creation of a venture capital firm not requiring any human intervention letting the investors able to take any kind of choices through the use of the smart contracts. Between April and May 2016, it succeeded in collecting about 150,000,000 USD from more than 10,000 investors.

On June 17th an attacker exploiting a loophole in the DAO, succeeded in stealing about 50,000,000 USD in Ether. After this event and despite the fact that the DAO was an autonomous start-up and was not directly related to Ethereum, Vitalik Buterin and the other members of the Ethereum core team opted for a hard fork rolling back the whole blockchain as a moment preceding the attack with the effect of erasing the DAO and invalidating all the transactions made by the hacker. Doing this a new version of Ethereum with norms different from the original one was established. However, they were not able to reach a unanimous consensus since some participants saw this decision as an attack to the pillars of a decentralized platform and decided not to join the fork. As

a result of this and after a vote open to all Ether owners in which the hard fork was approved by the 89 % of them, Ethereum was split into two different Blockchains: Ethereum with the new protocol and Ethereum Classic with the old one (Kar & Wong, 2016).

Many other contentious hard forks happened in the last years such as the one between Bitcoin and Bitcoin Cash in 2017.

Although the main papers consider only hard and soft forks, there is a third type of fork that has to be considered, the altcoin fork, that turns out to be particularly relevant when talking about ICOs. An altcoin fork is, technically speaking, not so different from a hard fork, in fact it starts from a pre-existing blockchain and makes some developments that are not backward compatible. The main difference is that the usual objective of an altcoin fork is not an evolution of the pre-existent network, but the creation of a new one.

In many cases, such as the one of Bitcoin and Bitcoin Cash we cited before, an altcoin fork is the result of a contentious hard fork, but, sometimes, they are directly conceived with the aim of creating a new coin. Obviously, after having put in practice the updates to the initial code, the new blocks will be no more compatible to the blocks of the pre-existing blockchain. Many famous cryptocurrencies were generated after an altcoin fork from the Bitcoin blockchain with the aim of improving the performances or modifying some characteristics of the Bitcoin, among of them there are Litecoin and Dogecoin.

To conclude it is possible to sum up the possible ways to issue a new coin according to the type of fork used and considering all the possibilities offered by the various blockchains:

- Coins based on a proprietary blockchain that has been developed starting from scratch. Being the first coin ever created Bitcoin obviously is a part of this class, while other examples are Ethereum, Monero, EOS and Waves. These coins have not a direct link to any other pre-existing coin and blockchain, but can, then be the basis, for the development of new coins.
 - Coins created after a contentious hard fork: these coins are created after a hard fork that was not able to reach a unanimous consensus and, so, led to the split of the blockchain into two different networks: the one with most of the users that keep on the original name and the other that take a new name. Examples of coins
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generated in this way are the already mentioned Ethereum Classic and Bitcoin Cash.

- Coins created after an altcoin fork: these coins are created after an altcoin fork, so they are an evolution of the code of an already existing blockchain, very commonly Bitcoin, with some improvements made to have better performances or to correct some possible criticalities.
- Coins created in an existing blockchain: these coins do not rely to their own blockchain, but are issued on an existing one, typically Ethereum, but there are many other platforms offering this feature, through the availment of smart contracts that enable their creation. The large majority of the ICOs are based on this procedure creating coins that are usually referred as tokens.

2.2 Initial Coin Offerings

2.2.1 A definition of Initial Coin Offerings

After having explained what effectively is the blockchain, its history, some of its mechanisms and its main features, we can now come back to the initial coin offerings as they are the central topic of this work. We firstly try to understand what effectively an initial coin offering is. Lipusch (2018, p. 3) provides the following definition of initial coin offerings:

“An initial coin offering also often referred to as “crowd sale” or “token sale” denotes an event in which a company decides to issue cryptographic tokens usually to a network of early adopters or developers in exchange for legal tender or other cryptocurrencies. The main idea behind this concept is to provide start-ups that pursue blockchain-type open-source projects with the necessary funding to build their services. The issued tokens can serve multiple purposes and mainly act as incentives that promise investors as well as developers access to a company’s future services. However, since most of these services are not built yet, currently tokens are mainly used for speculation.”

From this definition some characteristics elements of the ICOs can be deduced: firstly, the fact that for a start-up running an ICO the blockchain is not only a mean used to collect the funding, but it is the environment in which the whole project has been developed: hence it derives that running an ICO can be a valuable option only for companies blockchain native since it can be very hard to adapt a non-native project to finance it with an ICO.

Secondly, there is no fixed use of the tokens that are sent to the contributors and they can have a plurality of purposes differing one from each other; as example, they can be considered like shares involving to the token owners some rights typical of the shareholders (dividends, voting rights), they can grant the access to the online platform or to other services, once the project will be effectively launched, they can be used to

boost the participation of external developer in the building of the project or they can aim at becoming a completely new digital currency able to compete against Bitcoin, Ether and so on.

Finally, the definition points out that in the vast majority of the cases the financing occurs in an embryonal moment of the lifecycle of a start-up: it is extremely rare, even if it is not impossible, that projects already active decide to launch an ICO. In many cases the only thing available to the possible investors to make a decision about contributing or not in the call is an idea explained in some papers and publicly broadcasted in forums and social networks, in some other luckier cases a beta version of the final output can be disposable to try to verify the features, the strengths and the weaknesses of the project.

It is important to point out that the ICOs are a new innovative form of financing not directly descending from any other pre-existing one. However, they are characterized by a number of similarities with other financing forms, we will go in deep into this fact making a comparison between the ICOs and crowdfunding, venture capitals and IPOs in one of the following chapter, after having explained the history of the ICOs, their genesis and the conditions that permit their success.

2.2.2 History of the Initial Coin Offerings

The ICOs are a form of financing adopted by start-ups, generally already blockchain based, that are having an increasing diffusion, thanks even to the growing popularity of Bitcoin and other cryptocurrencies.

The ICOs were born in an early moment of the lifecycle of the blockchain, the first ever ICO took place in 2013, so, they were initially intended to a small public of people, in many cases computer programmers or crypto-enthusiastic. As the audience was highly restricted, even the amounts to be raised should initially be extremely restrained. Conversely, the amounts raised quickly increased enlarging both the audience that now includes plenty of investors, in some cases even not familiar with the blockchain technology, and the variety of the sorts of the start-up that are financed, placing the ICOs in a considerable position among the possible ways of financing for an early-stage start-up (Zetsche, Buckley, Arner, & Föhr, 2017).

This success was made possible by some intrinsic characteristics of the ICOs that provide them with some advantages if compared to other more traditional fundraising techniques, however, even some conjunctural traits of the finance market played a relevant role easing the rise of the ICOs.

The main features from which the ICOs take advantage against the more traditional financing forms such as going public through an IPO, being funded by a venture capital or being financed by banks are the cheapness, the absence of any regulatory complications and the openness to a new heterogeneous and wide public who was previously not reached by the other means of financing.

The cheapness of the ICOs mainly descends from the absence of a structured process before the effective contribution moment, unlike an IPO in which a company has to fill a multitude of requirements, both formal and substantial, such as audits on financial statements, strong profitability, a managerial organisation and a balanced financial structure – requirements that are quite impossible to be reached by a start-up at the beginning of its development – and to follow a long and complex path made up by due diligences, valuations and roadshows. The same goes for the comparison to the venture capital funds that are surely an easier way of financing for a new entrepreneurial venture if confronted to an IPO, but still contemplate a course to conquer the financing made by elevator pitches, presentations, meetings, business plans and, finally, in case the other steps went well, exhausting negotiations. Then, once obtained the financing, the presence of a cumbersome minority partner can undermine the freedom of the entrepreneur to lead the development of their project.

The substantial absence of regulations has been an advantage for the ICOs from the moment of their launch, after the boom of their diffusion many countries started trying to regulate them and some of them directly banned them, despite this many countries acted to attract the companies interested in launching an ICO, so we can conclude that it is still possible for a venture to take advantage of a favourable regulation. This allows swelling the advantages in terms of costs and time typical of the ICOs.

The last advantage is the public reached that is composed not only by institutional investors or other investors that are not professionals but on average have got some form of knowledge of the markets and the industry or can rely on consultants, but even by other people that otherwise could not contribute to the financing of any company. This

is possible thanks to the absence of higher minimal thresholds to invest the money – it is possible to invest even small fractions of Ether or Bitcoin – and to the possibility of getting in touch with the company simply through internet. In addition to this, the traditional financing forms can have some limitations in terms of the subjects who are authorized to do this imposed by the regulators that concur to further restrict the possible audience of investors (Robinson, 2017).

In addition to their intrinsic features, the market environment gave ICOs a strong help facilitating their diffusion: the new banking regulations imposed by the governments and the international councils after the great recession started in 2008 strongly reduced the investors capability of funding small and medium enterprises (SMEs), especially for newly created entrepreneurial ventures that suffered more than already established companies due to the lack of strong collaterals and low ratings. In particular, Basel III regulations, that were established in between 2010 and 2011 and started being implemented in the subsequent years, increasing the capital requirements and changing the calculations of the risk weighted assets enhanced the pressure on the bank forcing them to reduce the financing of companies with ratings below the investment grade, especially newly created ventures (Kaal & Dell'Erba, 2017).

This phenomenon had been partially counterbalanced by the emergence of new forms of financing that go under the name of shadow banking term including the crowdfunding, the peer-to-peer lending and the provision of banking services by non-banking company such as investment funds and insurances), nevertheless its impact on the creation of new entrepreneurial ventures and start-ups was almost negligible (Kaal & Dell'Erba, 2017).

Given these conditions, it is quite simple to understand the ease with which the ICOs spread around the world, in fact they permit to small companies to avoid the recourse to any form of intermediaries in the financing process. Doing so, they filled a gap that was created after the crises at the moment in which the banks started reducing their propensity of giving loans.

After this introductory hat, we can now see the key moments in the history of the ICOs starting from the beginning. In January 2012 an American informatic engineer J. R. Willett published on the Bitcointalk forum a paper called The Second Bitcoin Whitepaper in which he presented Mastercoin that would have been a “...protocol layer between the existing bitcoin protocol and users’ currencies are intended to be a base

upon which anyone can build their own currency...” (Willet, 2012, p. 3). Beyond the idea that was already revolutionary in itself – Ethereum was conceived the year after and launched only in 2014 -, the main innovation residing in his paper was the way to finance Mastercoin. He proposed the creation of a trusted entity that would have to collect the money to pay the developers to write the code of the software conceived by Willett. He fixed even some rules to regulate the behaviour of the trusted entity (publicly known identity and location, financial transparency, internal democracy...).

Then, this entity should have had to publish online a Bitcoin address and start selling MasterCoins in exchange for Bitcoins from the investors; anyone sending his/her Bitcoins before the expiry of the offering would have received an amount of MasterCoins equivalent to the number of Bitcoins sent.

Although it is possible to say with hindsight that Willett’s idea was a disruptive one, he encountered many difficulties before being able to effectively start the financing of Mastercoin, the token sale, indeed, started only on July 2013. The offering with a rate of 100 MasterCoins for each Bitcoin sent lasted a month and achieved an unlooked-for success, raising more than 5120 Bitcoins that were about 500,000 USD at the exchange rate of the time. After the sale, the price of the MasterCoins continuously increased reaching a value ten times higher the initial one on November 2013 (Buterin, 2013).

During 2014, after having published its yellow and white papers, Ethereum launched its sale selling Ethers, tokens initially thought to be used on the Ethereum platform to pay fees and to purchase other apps built on the same blockchain. It started on July 22nd and lasted until September 2nd with a threshold after which the exchange rate between Bitcoins and Ethers would have become less favourable for the investors (Ethereum.org, 2014). The offering went well and more than 30,000 Bitcoins (about 18.4 million USD) were collected parallelly to the issue of more than 60 million Ethers.

The successful offering of Ethereum was a turning point for the whole blockchain world and, in particular, for the phenomenon of the ICOs not only thanks to the considerable amount of money raised, but primarily because this new blockchain, putting into practice, through its Ethereum Virtual Machine and the possibility of writing smart contracts, some of the ideas initially conceived by J.R. Willett, made much more easier the creation of tokens on the top of the Ethereum blockchain eliminating the need of developing a completely new blockchain from scratch or modifying an existing one

through a fork. Besides, the smart contracts facilitated not only the creation of tokens, but even the collection of funds itself: in fact, a smart contract can receive the funds and automatically create the corresponding tokens that can, then, be sent to the contributor.

Despite of the great success achieved by Ethereum and the objective simplification permitted, the total number of ICOs launched in 2014 and 2015 was extremely limited with only 4 ICOs (Adhami, Giudici, & Martinazzi, 2018). The number started increasing during 2016 with more than thirty ICOs, with a 1000% increase, even if they were still not commonly known by the general public.

The campaign that raised the higher amount during 2016 was even the most significant failure of an ICO: The DAO initial coin offering, that we already cited as it originated the fork between Ethereum and Ethereum Classic, was able to collect the equivalent of 150 million USD between April and May to finance a decentralized anonymous organization operating as a totally automated investing fund not requiring any human intervention. A clearer idea of the success achieved by The DAO is given by the fact that, at half of the offering, it collected about the 14 % of all the Ethers issued until that moment (The Economist, 2016).

Notwithstanding, on June 17th a hacker succeeded in exploiting a loophole in the code of The DAO and stole about a third of the funds collected, this generated strong debates with contrasting positions related on how to consider the move made by the attacker and how to intervene after it. In the end, Ethereum core team opted to perform a hard fork transferring the funds collected by The DAO to a specific recovery address from which the contributors could take back their Ethers (Security and Exchange Commission, 2017a). The disagreement about the hard fork generated the birth of an Ethereum Classic whose members did not accept the decision made by the Ethereum core team. Within the next months The DAO was delisted by the principal secondary cryptocurrencies exchanges and become substantially inactive.

Despite this resounding negative event, the ICOs exponentially increased their success in 2017 enlarging their audience to a more mainstream public with slightly less than 900 campaigns launched during the year (Adhami, Giudici, & Martinazzi, 2018).

On February 2017 a group of 30 founders, including proven financial institutions with J.P. Morgan as a leader, together with some start-ups and other innovative blockchain

based companies, launched the Ethereum Enterprise Alliance (EEA), a non-profit organisation aimed at promoting the development of new technological solutions based on the Ethereum blockchain, the sharing of best practices, the definition of new open standards and the sharing of open architectures. Many other companies joined the organization after the initial founders; On May 2018 EEA counted over than 500 components. These members are extremely heterogeneous: among them it is possible to find financial institutions such as the aforementioned J.P. Morgan, consulting companies (Accenture), start-ups based on the Ethereum blockchain (AppCoins), technology companies (Intel), industrial companies (Shell), stock exchanges (Gibraltar Stock Exchange) and universities (Universidad Nacional De La Plata).

Starting from the middle of 2017, contemporarily to the rush of the value of the Bitcoin that on December 17th went beyond the psychological threshold of 20,000 USD per BTC and drew up the value of many other cryptocurrencies, some analysts analysing the ICOs predicted that they were a bubble that was going to burst. According to them, many bubbles companies were established and conducted ICOs with the only aim of making money off investors instead of making a profitable venture. High token prices may influence many investors to buy them in order to seize the day and make substantial gains and this can generate a vicious circle leading the prices to further increase (Nussbaum, 2017).

According to Ella Zhang, head of the blockchain-dedicated incubator and venture capital Binance Labs, a burst of the bubble can be an opportunity and not a critical issue for the development of the ICOs: she said that the valuations on the market were too high and, in general, the campaigns were overly promoted, very often exaggerating their outlooks. After the burst, the fraudulent campaigns or the offerings launched without a valuable proposition and a serious business model will be driven out of the market, while the truly good projects will still succeed in financing themselves. This will finally lead to an increase of the average quality of the offerings launched with the consequent possibility for the ICOs of attracting more investors (Russo, 2018).

During the first five initial months of 2018, the expansion of the ICOs continued increasing and the total collection of money surmounted the total amount raised until the end of 2017. During these months at least three ICO campaigns declared they collected more than 1 billion USD: Petro that was launched by the Venezuelan government and backed by its reserves of oil and minerals as a mean to support the local

fiat currency, the Bolívar against the economic sanctions imposed by the US. The tokens, based on the NEM blockchain, were sold between February and March with the official result declared by the government of 3.3 billion USD collected, however many independent analysts speculated about the veracity of this announcement (Mak, 2018). Moreover, on August 20th together with the introduction of a new fiat currency the Bolívar Soberano – Sovereign Bolívar in English – the Venezuelan government announced that this new currency would be linked to the value of the Petro, even if it is still not clear how this could be possible in practice (BBC, 2018).

Even EOS, a new blockchain infrastructure to build decentralized apps that collected about 4 billion USD - more than 1.2 million of Ethers - resulting as the most successful ICO ever, was the subject of many controversies, primarily justified by the abnormal duration of the offering that lasted more than one year during which their accounts carried some suspicious movements of Ethers feeding the suspect that not all the funds collected were actually used to finance the development of the project, but to a speculative end (Picchi, 2018). Apart from this, the development of EOS after the crowdsale faced many problems related to the governance of the blockchain caused by some technical choices of the EOS protocol that contemplates a very limited number of block producers who have to maintain the whole history of the blockchain (Brady, 2018).

A similar bumpy path characterized the offering launched by the popular messaging-app Telegram that launched its ICO on February and collected 1.7 billion USD in two private rounds open only to some accredited investors and, then, decided to cancel the public round that would have theoretically followed the private rounds (Cuthbertson, 2018). A possible cause explaining the decision made by Telegram can be the willingness of meeting a rule of the US Securities Act of Regulation that let companies selling unregistered securities in the US only if the funding round is limited to accredited investors who are subject to a vesting period and the results are reported to the SEC. However, no official communication to motivate this decision was made by Telegram or by its managers.

These cases, that are the most striking, but are not unique, clearly highlight both the vast potentialities of the ICOs that permit to pick up amounts of money otherwise unimaginable with other financing methods, but, on the other hand, are exposed to potential frauds or to unclear activities carried out by the company launching the offering.

ICO	Amount raised	Starting date	End date	Product	Country
EOS	\$4.1 billion	26/06/2018	18/06/2018	Smart contracts	US
Telegram	\$1.7 billion	01/2018	02/2018	Encrypted messaging & blockchain ecosystem	Russia
Dragon	\$320 million	15/02/2018	15/03/2018	Decentralized currency for casinos	Decentralized
Huobi	\$300 million	24/01/2018	28/02/2018	Cryptocurrency exchange	Singapore
Hdac	\$258 million	27/11/2017	22/12/2017	IoT Contract & Payment platform	Switzerland
Filecoin	\$257 million	10/08/2017	10/09/2017	Decentralized cloud storage	US
Tezos	\$232 million	01/07/2017	14/07/2017	Self-Amending distributed ledger	Switzerland
Sirin Labs	\$158 million	16/12/2017	26/12/2017	Open-source blockchain smartphone	Switzerland
Bancor	\$153 million	12/06/2017	12/06/2017	Prediction markets	Israel
The DAO	\$152 million	30/04/2016	28/05/2016	Decentralized VC	Decentralized

Table 2.1 The 10 most successful ICOs for the amount raised as of June 2018 (source www.bitcoinmarketjournal.com)

In the figure above, we provide a table indicating the ten most successful ICOs in terms of the amount collected; it does not contain Petro since the actual amount collected is unknown and the official data are not reliable. We point also out that the gathering of a huge funding it is not an assurance of a positive viaticum after the offering, in fact, The DAO is included in the table, despite its failure happened after the hostile attack suffered at the end of its offering.

The first four positions of the ranking are entirely occupied by campaigns conducted in 2018, while in the entire top 10 only one offering (The DAO) was launched before 2017,

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this acts a further confirmation of the continuing trend of growth of the ICOs and of the amounts raised during them.

Country	Amount raised	Closed ICOs	Planned ICOs
Cayman Islands	\$4.3 billion	10	16
British Virgin Islands	\$2.2 billion	16	2
Singapore	\$1.2 billion	53	52
US	\$1.1 billion	56	50
UK	\$507 million	48	51
Switzerland	\$496 million	28	36
Estonia	\$323 million	31	40
Lithuania	\$259 million	6	5
Israel	\$226 million	5	5
Hong Kong	\$223 million	20	15

Table 2.2 Countries with most ICO traction (as of June 2018) (source: Pwc - Initial Coin Offerings - A strategic perspective)

Looking up to the locations who were preferred while launching an ICO and focusing on the first two positions in terms of funds collected of the ranking related to the year 2018, some interesting elements need to be underlined: these two positions are occupied by two Caribbean Islands (the Cayman Islands and the British Virgin Islands), commonly known as tax havens. Both the countries hosted a limited number of ICOs if compared to US, UK or Singapore, however they respectively hosted the offerings of EOS and Telegram that considerably inflated the value of the money raised there.

This highlights the importance of running the offering in an ICO-friendly country, in fact neither EOS nor Telegram were effectively based in the Caribbean, but they ran the ICO under those legislations due to the advantages provided in terms of regulation and taxation.

The counterpart of the presence of these countries in the ranking, is the absence of the Russia, that considering the country of origin and not the country of incorporation would have been among the countries with most ICOs. We will deeply focus on the theme of the ICO-friendly jurisdictions in the chapter dedicated to the regulation of the ICOs.

The boom of the ICOs generated a possible disruption of the traditional entrepreneurial financing market offering a new possibility of seeking funds to many entrepreneurs who are trying to establish a new venture, especially for the ones native of the blockchain environment.

The category of financings that suffered more from the rise of the ICOs is the venture capitals, the asset class that was traditionally the most relevant player in the financing of the start-ups; more in detail, the features of the ICOs that made them preferable in comparison to venture capitals are the absence of complex accreditation procedures, the high liquidity provided by the online cryptocurrencies exchanges and the direct access to a potential worldwide pool of contributors without jurisdictional barriers. Finally, the most important strength is the opportunity of gathering funds to finance the activity without having to sell a part of the shareholder's equity. All these elements made possible the money collected through ICOs in the second trimester of 2017 higher than the financing granted to start-ups by venture capital funds for the first time in history.

While somehow disrupting by them, the ICOs was exploited as a mean of financing by some venture capital funds that organised their ICO collecting Ethers and Bitcoins that were lately used to invest in other crypto start-ups, at the same time, investing in this kind of start-ups enabled the funds to access to an early liquidity by exchanging the tokens into Bitcoins or Ethers and, then, into a fiat currency (Kaal & Dell'Erba, 2017).

2.2.3 The ICOs compared to other ways of financing

Although the ICOs are an entirely new phenomenon born on the blockchain environment and not directly descending from any of the pre-existing financing forms, they show some features that are common to the other methods and that are mixed together with some new innovative features. In this section we will briefly compare the ICOs to other traditional financing methods the IPOs, the venture capitals and the crowdfunding; the comparison between ICOs and crowdfunding that will be the fulcrum of this work is now done only in a preliminary way with the aim of providing a broad

view of the ICOs phenomenon. The comparison is not only made to highlight analogies and differences between the various financing forms but even to understand if the ICOs are going to replace them or if they will coexist.

2.2.3.1 ICOs and IPOs

We start the analysis comparing the ICOs to the IPOs, at a first sight, mainly thanks to the similarity of the denominations, this two financing forms could seem to be very similar one to each other: in both cases there is an offering made by the company and directed to the public, the offering has a predefined duration and the price is not subject to a bargaining between the entrepreneurs and the possible investors. Moreover, after the conclusion of the offering for both IPOs and ICOs it is possible to trade the shares (or the token) in the secondary exchanges, making them rather liquid and enabling the possibility of gaining an advantage from temporary overvaluations (Howell, Niessner, & Yermack, 2018).

According to Catalini & Gans (2018), ICOs can provide an early signal of the existence of a customers demand and this is similar with what stated by Subrahmanyam and Titman (1999) according to whose one motivation for going public is to learn the firm market value.

Notwithstanding the conceptual analogy between ICOs and IPOs, strengthened even by some similarities in the process of designing a campaign (Howell, Niessner, & Yermack, 2018), the IPOs are actually extremely different from the ICOs even in comparison with other financing forms. The first main difference is the absence of any ownership right related to the tokens: only in a residual quantity of sales, the token plays the role of a share and give its holders the right of vote and receiving dividends, while in most cases the token is a utility-token and can be used only inside the developing platform to power apps or to purchase products (Robinson, 2017).

Secondly, the process of setting up and launching an ICO campaign is much easier and does practically not contemplate requirements, despite the level of regulation is growing (Robinson, 2017). Conversely, to launch an IPO, it is necessary to follow the steps provided by the law, publishing an official prospectus including all the financial details and disclosing a relevant number of information about the company.

The more significant difference making the ICOs quite incomparable to the IPOs is the moment of the offering: while the ICO campaigns are mainly conducted by start-ups, that, in some cases, were still not legally established while running the offering, IPOs are done by already established companies that reached a considerable dimension and a strong profitability and are known by the public or, at least, by the insiders. This clearly is not the case of the companies that could be interested in running an ICO. So, despite the similarity of the names, ICOs and IPOs are two completely different ways of financing targeted to companies at different stages of their lifecycle.

2.2.3.2 ICOs and Venture Capital

Venture capitals shared with ICOs the same target companies: both these investments are focused on high technological ventures and start-ups; going more in detail, a company launching an ICO is usually at the business plan or it has released only a beta version of its product, so it is placed in the pre-seed stage. Sharing the same target companies ICOs and venture capitals share even a level of risk that is considerably higher if compared to investments in more mature ventures and in which the probability of losing the entire capital is not negligible. At the same time, they share even higher possible returns in case the ventures financed obtain positive results and successfully face the market. However, despite both these two funding techniques are used by start-up firms, there is a difference among them: the ICOs are very often launched by start-ups at the very beginning of their development without having already launched their product/service and in many cases without even having realized a working prototype, while, conversely, the venture capital funds usually invest in start-ups that have already attacked the market and that are trying to scale their dimension.

Apart from the target companies, venture capitals and ICOs are profoundly different: venture capitals are professional investors collecting the money to be invested mainly from institutional investors and administrated by expert managers. A venture capital fund is usually specialised in financing start-ups operating in a particular sector and, so, its managers show off a high level of competence. Contrarywise, ICOs are open to retail investors, very often with a limited knowledge of the technology and the riskiness of their investment, seeking easy money.

The main differences between them descend from this different structure: a VC fund investing in a start-up will enter in it with a minority, but relevant share and will actively

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influence the life and the decisions of the company, while tokenholders in an ICO in many cases do not even have any ownership right and are extremely fragmented, so, their conditioning power is almost null.

Secondly, the process undertaken by a start-up to be funded by a venture capital is long and complex and it includes in-depth screenings and due diligences making very hard for a start-up to obtain the funds, launching an ICO is infinitely much easier and the potential investors are more impressed by the idea, the website and the roadmap than by the financial projections.

Finally, the ICOs are more exposed to speculators, since the tokens can be traded on secondary exchanges after the end of the offering; this high liquidity makes them more attractive for speculators than VC funds (Metrick & Yasuda, 2011).

Because of their differences, ICOs are not going to supplant VC funds, but they can coexist in hybrid forms of financing in which the start-up is initially backed by a venture capital after the traditional valuation of the business plan, the team and the eventual prototype and, then, run an ICO to further increase their business and to raise more additional funds to definitively launch their product. The benefits of these hybrid schemes are more freedom for the founders if compared to the VC only financing and a higher financial security for the ICO participants who invest in a project that passed through rigid due-diligences. A possible negative aspect is the risk of conflicts between the shareholders and the tokenholders in case the role and the use of token is not clearly explained (Arslanian & al. 2018).

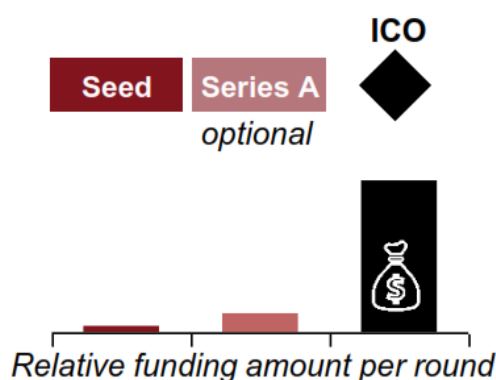


Figure 2.2: Hybrid financing with venture capitals and ICO (Source: PwC - Initial Coin Offerings - A strategic perspective)

Investments made by VC funds before the launch of the ICO to the public are valued as a positive signal and can positively influence the amount of funds collected, even if this positive effect does not seem to impact on the failure rate (Howell, Niessner, & Yermack, 2018).

2.2.3.3 ICOs and Crowdfunding

Crowdfunding is by far the financing technique mostly comparable to the ICOs, according to some definitions, the ICOs are no more than a new unregulated way to conduct a crowdfunding campaign (Yadav, 2017). This definition is enforced by the presence of many similarities: the funds are raised through an online campaign, the investors belong to the general public and are not professionals and the communication follows the same patterns with an extensive use of the accounts on the social networks and the publication of documentations (the whitepaper for the ICO, business plans and financial projections for the crowdfunding).

Moreover, for the equity crowdfunding only, there are secondary exchanges – such as Seedrs - in which trading the shares that perform the same function of the secondary exchanges of tokens making liquid the market after the campaign.

Finally, the different uses of the token are analogous to the different types of crowdfunding: tokens granting ownership rights can correspond to the equity crowdfunding and utility tokens can correspond to the reward-based crowdfunding (Howell, Niessner, & Yermack, 2018).

There are even some differences between them: firstly crowdfunding is already regulated by the law and, so, the information disclosed are more and the platforms have to meet some requirements to be able to operate, secondly the amount collected in the crowdfunding campaigns are generally much lower than the amounts raised in the ICOs (Yadav, 2017).

Despite these few differences, we think that crowdfunding and ICOs are comparable ways of financing and this will be the fulcrum of this work.

2.2.4 ICOs design and principal characteristics

In this chapter, we want to provide a complete overview of the whole process characterising an ICO, from the preliminary steps aimed at understanding if running an ICO is the proper way to finance the venture to the activities performed after the conclusion of the public token sale. Being in the initial phases of their lifecycle, the ICOs are not characterized by standard recognized practices, but display many differences between the various campaigns, moreover according to Dell'Erba & Kaal (2017), the context is constantly changing and the standard practices vary almost any quarter. Notwithstanding this, some structural practices are generally common between most of the offerings.

According to Momtaz (2018), the lifecycle of a cryptocurrency is composed by four main steps: project development, marketing and the Howey test (I), Pre-ICO (II), ICO (III) and listing (IV). However, before the first step it is possible to identify a sort of step zero in which the start-up has to understand if running an ICO is a suitable way of funding its business (Lipusch, 2018). The two main topics that the entrepreneur should consider in this preliminary step are the level of disclosure to the investors and the integration of the token inside the business.

The first consideration descends from the open-source nature of a vast number of companies running an ICO and from the high number of fraudulent campaigns that was launched, so, to properly convince a high number of potential investors, a company launching an ICO should be ready to disclose some crucial information such as its source code. The second question is related to the effective value of the token which will be sold during the offering, to convey a value the token should have a defined utility within the platform or should grant some rights to the tokenholders, otherwise it will be hard for the start-up to find a market for it and collect the funds needed.

After this preliminary step, the actual ICO lifecycle starts following the four phases defined by Momtaz (2018). The first stage is closely related to the technical development of the project and includes the first marketing activities: the design of a web page that has to show the main features of the project as well as all the information related to the offering that can be useful for the potential contributors, a social media campaign including the traditional social network (Facebook, Twitter, LinkedIn etc.), the crypto

platforms (Bitcointalk, Tokenmarket, ICO Bench etc.) and the channels in which the public can directly chat with the core team (Telegram, Slack etc.).

In this phase the team has to set all the characteristics of the campaign in terms of duration, price, level of information disclosed, bonuses, intrinsic characteristics of the token, legal concerns that we will extensively analyse one by one after having detailed all the phases. All these elements should be presented to the investors in the whitepaper, a sort of middle way between an offering prospectus and a business plan. Thus, a whitepaper usually contains both the details of the offering and the information on the project, its development and roadmap and the team behind it. In some cases, also a technical whitepaper and a sale agreement document are published together with the whitepaper.

If the offering is based on the US or if it is targeted to the American citizens, it becomes essential to run the Howey test to assess that the token is not a security for the American law and, so, it is not subject to the securities regulation. The test is founded on four main checks and was developed by the US Supreme Court in 1946, when neither the ICOs nor the blockchain or the modern computer science were born, and this could lead to different interpretations that can flow into litigations between the start-up and the SEC.

The second phase is the pre-ICO, known even as pre-sale, that is a preliminary founding round aimed at collecting a small of the total amount, usually at a price consistently lower than the following round. This step is not binding, nevertheless, about 45 % of the ICOs contemplates it before the real token sale (Howell, Niessner, & Yermack, 2018) (Momtaz, 2018). The pre-ICO can be open to the whole public or can be made in the form of a private sale targeted only to accredited investors. A company could run more than one pre-ICO rounds, typically one private open only to preselected investors and the following open to the general public.

There are several reasons behind the decision of running a Pre-ICO: the first is to use the proceeds collected during it to finance the actual sale and its advertising costs, then it could have a signalling function in case of a success or in case of the participation of celebrities, crypto-guru and proven investors, lastly, it enables the company to quantify the effective demand and to adjust the price playing a role analogous to the book-building during an IPO.

The lower prices are motivated by the need of convincing a remarkable number of contributors and to repay them for the high risk taken if compared to the following phase; Pre-ICOs are somehow similar to the convertible notes used by business angels while funding a start-ups that allow the investor to convert them into equity at the following stage with a considerable discount (Howell, Niessner, & Yermack, 2018).

According to Adhami, Giudici & Martinazzi (2018), running a pre-sale before the main token sale round positively affects the outcome of the ICO. However, in some cases, a negative pre-ICO not reaching its objective in terms of funding can force the company to postpone or even cancel the ICO.

The third stage is the actual ICO, during it the funds – typically Ethers or Bitcoin, but sometimes even other cryptocurrencies or fiat money, are sent by the contributors to a public address, that usually let them see all the movements of the currency sent. Thanks to a smart contract, the tokens corresponding to the amount received are sent to the address controlled by the contributor; the tokens can be instantly sent after the payment or can be sent at the end of the offering (Howell, Niessner, & Yermack, 2018).

The duration of a campaign does not follow fixed patterns: many campaigns lasted about one month, but there are many cases of shorter or longer campaigns – for example the offering of EOS lasted more than one year. The ICO can also finish before the predetermined date in case the hard cap is reached – in many cases of successful offerings the cap was reached in less than a day – or can be prolonged in case the funds collected are close to the minimum threshold (soft cap) to have a successful campaign, but close to it.

An ICO is considered successful if it reached its soft cap, in case this threshold was not reached the ICO is considered failed and the funds collected can be sent back to the contributors, however, in some cases, the companies decided not to refund the investors after an unsuccessful campaign and to use the amount collected to fund the developing of the project or the organization of a second ICO round.

The last stage, obviously done only in the case of a successful offering, is the listing of the token on a secondary cryptocurrency exchange. There are two different types of secondary exchanges: centralized and decentralized exchanges: the first are platforms analogous to the traditional stock markets and are owned and managed by a private

company controlling all the transactions and providing all the mechanisms to perform the trading activities. Contrarywise, in the decentralized exchanges there is no a managing company and they operate only as a matching between the trade orders from the investors. The centralized exchanges allow more liquidity, high trade volumes and permit even purchases made with fiat currencies, but, due to their centralized structure are more exposed to hostile attacks and more subject to the attention of the regulators (Hacken, 2018).

Thanks even to the high differences between the various exchange platforms the requirements for the listing might be quite different among the various platform and somehow opaque, but, generally they are not so rigorous. In case a project that was listed after its campaign, fails it will be delisted from the secondary exchange making the tokens impossible to be traded (Momtaz, 2018).

Sometimes, even after a successful offering, the tokens are not immediately listed on secondary exchanges and the tokens are submitted to a lock-up period in which they cannot be bought or sold; the smart contracts occasionally contemplate vesting period for the token owned by the founders to align the developers' and token owners' objectives in analogy to the 180-days lock-ups of insider shares existing in the IPOs that reduced the moral hazard problem (Brav & Gompers, 2003). In other cases, lock-ups are last until some milestones are reached or are finalized to enforce the active participation inside the network of the contributors (Howell, Niessner, & Yermack, 2018).

2.2.4.1 Main elements of an ICO

In this section, we analyse one by one all the characteristic elements that make up an ICO highlighting the various design choices left at the discretion of the core team and the possible implications of each of these decisions.

2.2.4.1.1 Underlying Blockchain

The underlying blockchain is the technology on which is based the token sold in the ICO; there are two main ways to create a token: the first is the creation of a new blockchain on which basing the token – either making few changes to a pre-existing one (altcoin fork) or designing an entirely new one from scratch –, while the second is leaning on an existing blockchain that contemplates the creation of tokens through properly designed smart contracts such as Ethereum or Waves.

Developing a new blockchain enables a higher level of customization granting a blockchain specifically suited for the project, but is, for sure, an expensive option both in terms of time and money; a new blockchain can also offer a greater potential and could increase its diffusion even outside the platform created by the project. On the other hand, issuing the tokens on the top of an existing blockchain is not expensive and time-consuming – an Ethereum based tokens can be created in a few minutes (Momtaz, 2018). Moreover, they could grant a high level of standardization (Howell, Niessner, & Yermack, 2018).

The decision about what blockchain using does not directly concern the ICO campaign, in fact it is more related to the technological features of the project itself than to the characteristics of the offering that can influence the potential investors' behaviour. Since most of the projects are already based on the blockchain independently from the decision of financing them with an ICO made by the entrepreneurs, the underlying blockchain is selected according to the characteristics of the products itself: if the creators aim at creating a token with currency functions they will be forced to develop their own blockchain, while if their project is a decentralized app needing a token acting as an internal currency they can create their token with the required functionalities on the top of an existing blockchain such as Ethereum thanks to the smart contracts.

As on February 2018, the vast majority of tokens were based on already existing blockchains, with Ethereum covering the lion's share having been selected for more than 80 % of the cases (Momtaz, 2018).

In some cases, the ICO can be conducted selling a pre-functional token based on an existing blockchain that will be subsequently exchanged for the new token based on a proprietary blockchain, once it would have been developed (Howell, Niessner, & Yermack, 2018).

2.2.4.1.2 Token role

According to Adhami, Giudici & Martinazzi (2018), tokens can serve for five different purposes: currency, access/service, governance, profit sharing and contributions.

Currency tokens are tokens aimed at being used as a digital currency in the wake of the growing popularity of the Bitcoin and the other cryptocurrencies. They are usually based on a proprietary blockchain and are designed to offer better performances if compared

to the one of the Bitcoin or the other already existing altcoins. Their usage is not limited to a specific platform, but they aim to become means of payment universally accepted.

Access or service tokens are the majority of the tokens sold through ICOs and grant to their holders the possibility of accessing to the products or services provided by the company running the ICO. In many cases, they are used on that platform as an internal mean of payment – the only one or in addition to the other most famous digital currencies - but they cannot be used for any transaction outside their native platform. These tokens are generally called utility tokens.

This type of tokens somehow forces the token holders to join the network created by the ICO venture creating a sort of virtuous circle for both the network and the investors: the latter one finance the company buying the tokens, then, they contribute to populate the network spending part of their tokens inside the platform, this leads to an increase of its usage and, consequently, of the value of the tokens. In other occasions, these tokens are used to finance the realization of a product and will, then, allow the owners to purchase that product.

Governance tokens give tokenholders the right of voting concerning the platform, the business decisions or the governance of the venture. In such way the investors actively participate to the development of the project they funded. Within this category of tokens, there are many differences in terms of the rights effectively granted to the holders, at one extreme they can have a strong capacity of influencing the overall business strategy of the venture (such as the case of The DAO) or can be considered like the shareholders (in these cases the governance role is generally coupled with the profit sharing role), while in many cases the only power left to tokenholders is a role in the process of creating and securing the blocks in a POS blockchain (Howell, Niessner, & Yermack, 2018).

Profit sharing tokens grant to the tokenholders the right of receiving part of the profits made by the company either in form of dividends or in form of a token buyback with strong similarities with shares, especially in that cases in which the token grants even governance rights. They can be seen as a pure financial investment, just as shares, and ICOs selling this kind of tokens are typically under scrutiny by the supervisory authorities such as the SEC in the US.

Finally, the last role, that is even the less widespread, is the contribution token that enables its holders to play an active role in the growth of the project. Usually, these contributors are rewarded in a way congruent to the effort they put in the development of the project. The main aim of these tokens is to put in contact the core team of the ICO with potential collaborators that can be involved in the project.

All these roles are not mutually exclusive and there are many examples of tokens characterised by two or more of them such as the tokens granting both government and profit sharing roles or tokens that can be used as a currency both inside and outside their native platform.

2.2.4.1.3 Whitepaper

According to Adhami, Giudici & Martinazzi (2018), the whitepaper is an unofficial prospectus published before the launch of the offering generally including the following information: technical IT protocols, underlying blockchain, total token supply, pricing and distribution mechanism, details on the project under development and, eventually, a business plan, including the description of the members of the core team and the advisors.

The quality and quantity of the information provided is quite heterogeneous between different offerings and some documents are extremely technical, while some others neglect these features and stress more other aspects such as the details of the token sale. Even the tone can considerably vary: there are whitepapers that are written as academic papers and other that are characterised by a tone near to the one of an advertising campaign.

The element that is almost always clearly explained is the role of the tokens and the underlying blockchain architecture. On the other hand, many information about the issuer such as contact address, locations and the legal entity running the campaign are not commonly disclosed (Howell, Niessner, & Yermack, 2018).

According to Adhami, Giudici & Martinazzi (2018), the mere presence of a whitepaper does not positively affect the result of an ICO, this can be ascribed to the different information quality of documents provided in different campaigns and to the absence of certifications from independent third-parties or external audits.

In many cases the whitepaper is not the only document provided by the venture before the beginning of its ICO: the yellow paper, also known as technical whitepaper, is a document focusing only on the technological aspects of the project under development explaining in detail the blockchain architecture adopted, how it will work, the current stage of the development phase and the possible upgrades that could be implemented in future.

This document is usually targeted to a niche public holding a deep knowledge of informatics and the blockchain technology who is able to understand the actual potentiality and feasibility of the project. A well-known example of yellow paper is the one of Ethereum published by Gavin Wood, at that time the CTO of Ethereum, who holds a PhD in informatics, contemporarily to the publication of the Whitepaper written by Vitalik Buterin. This document provided an extremely detailed and technical description of the Ethereum blockchain deeply explaining what was introduced at a lower level of details in the whitepaper.

Then, the venture can publish even the token sale agreement that is the contract implicitly subscribed by the contributors when they buy the tokens. It is usually written as a legal contract and, so, it includes any information that is generally neglected in the whitepaper such as the legal entity launching the offering with the address of its headquarters, the terms of use, the legal status of the tokens, the people enabled to participate in the token sale, the eventual *Know Your Customers* and *Anti-Money Laundering* checks, the applicable law and the process to be followed in case of legal disputes, the procedure of the sale and the way to be reimbursed if the minimum threshold of fund is not reached and, finally, a disclaimer highlighting the main risks related to the purchase of the tokens.

Many of these aspects are strictly related to the choice of the jurisdiction under which running the ICO that depends on the regulation regarding the ICOs adopted by the various countries.

2.2.4.1.4 Code availability

As already said, the ICOs similarly to the entire blockchain environment, are generally characterized by a high level of disclosure and their programs are very often released under open-source licences. While launching a campaign, the venture could decide to

publish a part or the entire source code of their tokens, usually uploading it on a Github repository or more rarely on the company website.

Making the code available enables all the potential contributors to inspect it to understand if it is effectively in line with what declared by the company in the whitepaper and on its marketing channels and to evaluate the actual feasibility of the project. Moreover, the code can be seen as proof of the seriousness of the project and to avoid any doubt that the project is a scam.

The importance of the publication of the code was higher at the origination of the ICO phenomenon while almost all the potential contributors owned the needed skills to understand and evaluate the code shared. Now, the growing popularity of the ICOs as an investment in the general public reduced the effective capability of the potential investors of properly evaluating the code. However, the availability of the code can be seen as a positive signalling even by potential contributors without advanced informatics skills.

A possible negative effect of this decision is the increase of the risk of being hacked by competitor project that can exploit the code to improve their own one; at the same time according to the literature in theme of open-source a publicly available code could be tested several times by freelance programmers who could flush out and fix some bugs that the internal developers were not able to find or to fix (Stamelos, Lefteris, Apostolos, & Bleris, 2002).

Contrarily to the presence of the whitepaper, the availability of the source code positively affects the outcome of an ICO, since it is a tangible proof-of-concept (Adhami, Giudici, & Martinazzi, 2018).

2.2.4.1.5 Token supply and distribution

Two important features characterising an ICO are the total token supply and the token distribution or rather the percentage of tokens that are sold during the public offering and the percentages of tokens that are intended for other purposes.

Regarding the token supply, the main decision left to the core team is whether it should be limited or not; many ICOs contemplate a fixed token supply meaning that the maximum total amount of circulating tokens is constrained to a determined amount –

this amount can be reached immediately after the ICO or can be subsequently reached after other rounds of offerings or after the mining of new tokens.

A limited supply is useful to avoid the inflation risk – as in the case of the Bitcoin (Nakamoto, 2008) – and to boost the value of the token. Moreover, in case the value of the token is linked to a physical asset, the circulating supply will be limited by the quantity of the underlying asset. On the other hand, a limited supply is more subject to speculation and high volatility.

The opposite choice is the unlimited supply of tokens – both at the moment of the public offering or through the possibility of mining an infinite number of new tokens – that is characterized by opposite features if compared to the limited supply; besides, the contributors cannot know in advance what share of the total supply a token represents (Howell, Niessner, & Yermack, 2018). The uncapped supply has been selected by only by a restricted number of ICOs.

Regarding the token distribution, it is rare that the entire token supply is distributed to the public in the sale, more commonly only a certain percentage of token is distributed analogously to the public float in an IPO. The remaining tokens can be reserved for the founders, the advisors, some eventual future rounds of the ICOs or to selected investors via a private deal such as crypto-guru or VC funds focused on ICOs.

A percentage of tokens can be reserved for the community to boost the participation of the users inside the network, sometimes these tokens are allocated to specially created non-profit foundations that are legally independent from the entity running the ICO to avoid an unfair use of them by the founder and the management (Howell, Niessner, & Yermack, 2018).

Finally, most of the offerings reserve a certain number of tokens for the bounty program; in a bounty program internet users receive tokens as a reward for having performed certain tasks such as advertising on the specialized platforms and on the social networks, acting as a moderator in the specialized forums, chats and websites, translating the whitepaper, the website and the thread on the forums and supervising the bounty campaign itself.

2.2.4.1.6 Hard and Soft Cap

Analogously to the crowdfunding campaigns, the majority of the ICOs define some targets in terms of funding; the success and the duration of a campaign depend on the achievement or not of these objectives.

Traditionally an ICO is characterized by two different caps: the soft cap that is the minimum amount of funds to be collected in order to consider completed the offering and the hard cap that is the maximum amount of funds that the venture will collect; in case this second cap would be reached before the end of the token sale, it will be anyway closed in advance. Both the two caps are not binding and there are many examples of ICOs without one of them or both.

The presence and the absence of a hard cap is strictly related to the supply of token, a fixed total supply can act as an implicit hard cap, even if in such cases the exact monetary value of the hard cap could be not defined due to the possibility of selling the fixed number of tokens at slightly different prices according to the bonus structure of the offering.

Contrarywise, an unlimited supply of token with the totality of them immediately available in the public offering means the absence of any sort of hard cap. These offerings are exposed to the risk of raising too much money, in cases such this the venture is exposed to a possible unwanted publicity and to agency problems linked to the width of the cash available for the founders in analogy to what stated by Gompers (1995) for the venture capitals.

In some cases, ICOs with a hard cap experienced massive oversubscription and a sold out within a small time lapse after the opening of the sale, this forced many potential investors to quickly buy their tokens just as the ICO starts with possible traffic congestion on the blockchain and the payment of high fees (Howell, Niessner, & Yermack, 2018).

2.2.4.1.7 Pricing mechanisms

The mechanisms to assess the price of the tokens sold in an ICO are quite heterogeneous and vary from simple fixed price schemes to extremely complex ones, the choice of the mechanism is also influenced by the decisions related to the bonus structure.

The simpler mechanism is the fixed price which contemplates the sale of the tokens at a pre-determined price according to a first come first served logic. A variation of this scheme that still follows the fixed price logic is the sale of a number of tokens proportional to the bid received. More complex mechanisms can have dynamic prices, usually tending to increase over time to force the interested potential contributors to participate at the first stages of the sale.

Finally, some ICOs were characterized by very complex pricing mechanisms in which the actual price is discovered during the sale: for example, the ICO of Polkadot was based on a spend-all second price Dutch auction, within this scheme the price at which the tokens are offered to the public starts high and gradually decreases throughout the offering period according to a predetermined schedule. The auction is closed and the tokens are sold at the moment in which the orders received at the current price are sufficient to sell all the supply offered in the auction (Helloweb3.Foundation, 2017).

2.2.4.1.8 Bonus structure

The actual price paid by the contributors in the offering depends also on the presence of bonus schemes that very often are contemplated by the ICOs. The two main kinds of bonuses are the early bird and the major contributors, but there are examples of ICOs with other different bonus opportunities for the contributors.

The early bird bonus scheme offers an amount of additional tokens as a reward for the contributors participating in the first stages of the sale; there can be only one threshold before that the tokens are sold at a discounted price or there can be many different discount percentages that gradually decrease as the sale goes on. The objective behind giving an early bird bonus to the investors is analogous to the one behind the reduced prices in the pre-ICO rounds.

The other main bonus scheme contemplates a percentage of discount for the contributors who invest in a stake of tokens that is higher than a certain threshold with the aim of persuading them to buy a higher number of tokens.

Other less widespread bonus schemes are the possibility of receiving a discount for the contributors who convince their friends to contribute – in some cases even these friends can buy the tokens at a discounted price -, bonuses for the contributors accepting to lock up their tokens for a determined time period, discounts for that participants who will

then actively participate in the growth of the community or discounts related to the currency used to pay the tokens.

Each bonus scheme can be applied alone or together with one or more of the other schemes increasing the possibility for the investors to further reduce the price of the tokens. According to Adhami, Giudici & Martinazzi (2018), the mere presence of a bonus scheme does not positively affect the results of the ICOs.

2.2.4.1.9 Fund Escrow

Some ICOs contemplate the figure of the escrow, a neutral third-party with a proven name, who is in charge of warding the funds collected from the contributors during the offering. Its role is an additional guarantee for the investors against fraudulent actions that can be done the core team and, more in general, scams, in fact, in an ICO without any escrow there is nothing that can prevent the founders from closing all the profiles, taking the money and running away.

With the escrow, the funds collected are not entirely sent to the wallets of the founders, but they are stored in wallets administrated by the escrow. Then, he will gradually make the money available to the team at the achievement of some milestones according to a predefined plan.

The escrow role can be played by financial institutions such as asset management companies or by single individuals; in many cases he has to govern a peculiar multi-signature address on the blockchain; this particular address is connected to a wallet requiring that require the authorization of a certain number of users to withdraw the funds. Without the approval of the escrow it will be impossible for the founders to draw the money from the wallet.

2.2.4.1.10 Advisors

Analogously to the financial world, in which all the extraordinary operations involving a company are run under the support of some advisors, many of the ventures that launched an ICO were helped in this process by an advisory board composed by consultants with a proven name in their field that were appointed to support the core team in leading the development of the venture.

The majority of the advisors are successful crypto entrepreneurs who already launched several start-ups and successful ICO campaigns, but there are even technical advisors specialized in the blockchain architecture, legal advisors and marketing advisors who deeply know the market in which the venture wants to enter and, in some cases, celebrities.

The presence of a board of advisors composed by experts well known in the sector acts as a positive signal for the potential interested contributors. An example of proven crypto entrepreneur who covered the role of advisor for many ICOs is Anthony DiIorio, cofounder of Ethereum and member of other entrepreneurial ventures.

2.2.5 ICOs and regulation

Together with the growing popularity of the Bitcoin and, more generally, of all the cryptocurrencies, the debate regarding their legal status arose; their characteristics, that did not fit to any pre-existing legal definition, and their innovativeness make the dispute about their nature very lively with a multitude of different positions both between the academics and between the lawmakers of different countries, the regulating authorities and the law courts.

The debate was further fomented by the growing popularity of the ICOs that added other elements typical of the securities if compared to the Bitcoin; before going in detail with the positions about the ICOs, we briefly revise the debate about the Bitcoin, its legality and its being or not a currency or a security, then, knowing the foundation we will focus on the ICOs.

Starting from the fact most of the countries have not any law specifically applying to the Bitcoin and the other digital currencies (Turpin, 2014), the main issue about the Bitcoin – that consequently involve even the other cryptocurrencies – concerns the definition under which it could be classified. Once defined it, the issue of its legality and the law to be applied could be solved. The main works regarding this issue were published by Americans and are referred to the US federal laws; only few works analysed the regulation of the Bitcoin in Europe.

According to Mandjee (2015), a precise and univocal definition of what effectively the Bitcoin could be is complicated by the fact that in its network there are many different

actors playing different roles and, so, using the Bitcoin in a different way and for different purposes: according to the different uses, the Bitcoin looks like a currency, a method of payment, a security or even a commodity. This led different countries to consider the Bitcoin in different ways: as an example, Canada treats it as a commodity, while Germany treats it as a unit of account.

The first issue is whether the Bitcoin can be classified as a currency or not, according to Turpin (2014) it should be considered as a private community currency – a currency specifically intended to be used only within a determined community. Mandjee (2015), instead, that the Bitcoin falls under the economic definition of money provided by the European Central Bank that is based on the concepts of store of value, medium of exchange and unit of account, but not under the legal definition of currency since it does not have the requirement of legal tender in any jurisdiction.

Mandjee (2015, p. 16) concludes stating that the Bitcoin could fall under the definition of a convertible virtual currency that is a currency without such attributes such as the legal tender “that has either an equivalent value in real currency or acts as a substitute for a real currency”. Anyway, both the works agree on the lawfulness of the Bitcoin against possible attempts by the governments to ban it. Kaplanov (2012), on the contrary, proposes to consider the Bitcoin as a foreign currency.

Regarding the possibility of classifying the Bitcoin as a security, its high volatility could characterise it as a mean of speculation and not as a currency. Literally applying the US securities law the Bitcoin cannot be classified as a security since it does not meet what stated in the definition of a security (Mandjee, 2015), (Turpin, 2014), however it can fall under this definition in case the law is widely interpreted. Furthermore, Turpin (2014) states that any investment opportunity available to Bitcoin users would be considered as a security by the market authorities.

All the legal uncertainties about the cryptocurrencies subsist even for the tokens that are sold during the ICOs; in fact, the tokens can be considered somehow analogous to the cryptocurrencies. However, the fact that these tokens are publicly sold to an audience of retail investors and the presence of secondary markets in which these tokens can be traded add new elements of similarities with the financial securities. Moreover, according to Chohan (2017), the ICOs are characterized by a level of risk that is higher than the established cryptocurrencies operating in a trust-less setting.

Firstly, the ICOs are very often characterized by the opaqueness: the information provided by the venture cannot be always verified by the contributors and, sometimes, there is a complete lack of information, also about relevant elements for the potential investors. This is strengthened by the absence of any guideline regarding the drafting of the whitepapers and the other additional documents. According to Kaal (2018), in some cases the rules of the offering were changed during the sale throughout the modification of the code of the smart contract used to generate the tokens.

All these elements were crucial to ease the rise of the so-called Zombie ICOs whose diffusion strongly increased during 2017. According to Kaal & Dell'Erba (2017), a Zombie ICO is an ICO with very little or no possibilities of success, with an inaccurate whitepaper that does not explain the relevant elements for the investors, a business plan that does not clearly articulate the use of the funds that are going to be collected and how the product and the company work and a team in which the identities of the members are hidden or made by unknowns without any serious professional experience. Zombie ICOs can turn out be a scam or can simply fail either without succeeding to complete the offering or after it, so, there are extremely high risks of losses for the investors.

However, the opaque information is not the only risk taken by the people investing in the ICOs, differently from the shareholders, the tokenholders has practically no power of control over the venture after the completion of the ICO, moreover there are no preemptive rights or anti-dilution protections against the risk of a dilution caused by the issue of new tokens that were initially not planned (Kaal, 2018). Even in case of bankruptcy, tokenholders have not any form of liquidity preference as a protection of their investment and they cannot recourse at all even on the remaining money after the reimburse of debt holders and other creditors.

Furthermore, a correct valuation of the tokens is practically impossible thanks to the high uncertainty and to the multitude of risks to which they are exposed (Kaal & Dell'Erba, 2017). This affects also the value of the tokens listed on the secondary exchanges after the completion of the offering that is subject to an extremely high volatility due to the absence of any form of assurance against upfronts and continuous disclosures (Kaal, 2018). This makes partially ineffective even the only move left available to the tokenholders to ward the capital they invested in the ICO that is the sale of their tokens on the secondary exchanges and that could lead them to substantial losses.

Finally, the ICOs are still subject to hostile attacks from hackers that could succeed in exploiting the weaknesses of the blockchain architecture and that can steal the tokens from the wallets of the contributors or directly steal the funds (Bitcoins, Ethers etc.) collected by the ICO venture leading it to a secure fail and the investors to a consistent loss. The most known case of ICO hacked is the aforementioned The DAO in which the attacker was able to steal about 50 million USD in Ethers. According to Jabotinsky (2018), the tokens can be even stolen from the secondary cryptocurrency exchanges, making subject to this risk even a token based on a practically inviolable and well-designed blockchain.

While the ICOs were practically unregulated until the last year, from 2017, contemporarily with their dramatic increase in popularity, many important jurisdictions started analysing them stating their legality or not and the laws that could be applied to them. Despite the complexity and the characteristics of uniqueness of the ICOs, the majority of the countries that somehow regulated them did not pass laws specifically targeted to them, but preferred using already existing laws, publishing only guidelines indicating which law applies to the ICOs (Kaal, 2018).

Now, we will review the different regulatory framework regarding ICOs in force in different countries, with a particular attention to the most important worldwide countries, the EU countries and to those countries known as ICO-friendly.

In the US, the regulatory authority involved in monitoring all the securities sold to retail investors is the Securities and Exchange Commission (SEC). On July 2017 the SEC concluded its analysis regarding the ICO of The DAO that began after the well-known hacker attack. In this report the SEC arrived at the conclusion that the DAO tokens were subject to the securities law since they met the three conditions of the Howey Test to consider them as investment contracts (Security and Exchange Commission, 2017a, p.1). Despite this the commission did not pursue an action against The DAO even if in the report it is stated that “Slock.it’s co-founders; and intermediaries may have violated the federal securities laws”.

After this report, that was accompanied by the publication of an investor bulletin including some guidelines for the potential contributors (Security and Exchange Commission, 2017b), the SEC created a special cyber-unit with the aim of focusing on all the possible misconducts related to distributed ledger and ICOs and intervened in some

cases to stop some ICOs that were violating the federal securities law or were suspected of frauds. The most notable among them was Plexcoin whose ICO was stopped on December 2017 with the double accusation of illegal offering of securities - their token was considered as a security - and being a scam – the founders had been already condemned in Canada with analogous charges and the information published on the website and the whitepaper were in large part false (Security and Exchange Commission, 2017c). On November 2017, the ICO of the Californian venture Munchee was stopped by the company itself after being advised by the SEC that the ICO was considered as an unregistered security offer and sale according to the Howey test. The commission decided not to undertake any action against the company after their timely decision of stopping the sale of the tokens (Security and Exchange Commission, 2017d).

However, not all the ICOs analysed by the FED was considered as illegal, for example the Basic Attention Token that was sold in a 35 million USD ICO on May 2017 was not considered as a security since they were utility tokens (Missan, 2018). Another ICO that did not get into legal actions was the one of Filecoin that, even if its token might be considered investment contracts, exploited the Regulation D that states that the SEC cannot apply the securities laws to the ventures that are collecting their capital only from accredited investors, the exception applies even if the entity is not effectively able of filtering the access to the offering only to the accredited investors if it succeed in demonstrating a reasonable care in try to prevent unaccredited investors from buying their tokens (Missan, 2018).

In the months immediately after the publication of the report regarding The DAO the total amount invested in the ICOs continued to increase meaning that the report was not perceived as a deterrent, however after it many non-US ICOs decided to prevent US citizens from participating in the token sale due to the uncertainty about the jurisdiction of the SEC (Missan, 2018).

The Canadian regulatory framework is quite similar to the US one, cryptocurrencies might be considered securities according to the result of a four-factor test developed by the Canadian Securities Administration (CSA); the CSA published also a regulatory sandbox to help fintech companies being compliant with the current regulation and allowing them to have a fast registration or exemption. Moreover, the CSA regulated also the secondary exchanges platforms: if they are considered marketplaces, or ATS by the authority, they need to be registered, however, at the beginning of 2018, no

cryptocurrencies marketplaces or ATS were registered in Canada (Canadian Securities Administration, 2017).

Conversely, China decided to completely ban the ICOs, including in its action even the secondary exchange platforms. The main reason behind this decision was the risk of hurting the market due to the high incidence of frauds. However, not all the territories controlled by China banned the ICOs; in fact, Hong Kong, that enjoys financial and political autonomy from Beijing, was not involved by the ban. From the second half of 2017 the local government made public its support to the blockchain technology and started the implementation of many blockchain-based projects, contemporarily it launched some guidelines regarding the ICOs stating that they might be considered securities and, in such case, they will be subject to a preliminary registration; the position of Hong Kong regarding the ICOs can be considered neutral (O'Neal, 2018).

A judgement analogous to the Chinese one was made by the South Korea's Financial Services Commission that banned the ICOs and all the other campaigns aimed at raising money through the use of cryptocurrencies on September 2017. The main reason behind this decision was the risk that the ICOs would degenerate into a speculative bubble and the high incidence of scams and frauds (Williams-Grut, 2017). However, during 2018 a National Assembly meeting participated by some government ministries including the Ministry of Science and Information and Communications Technology started a debate regarding the possible cancellation of the ban (Suberg, 2018a). After it, the commission launched a survey directed to some Korean based blockchain ventures and the chief of the Office for Government Policy Coordination Hong Nam-ki, during a parliamentary audit, announced that the new official position of the Korean government will be announced within November 2018, after the evaluation of the results of the survey (Sung-mi, 2018).

In Russia, the Central Bank, that is the regulatory entity involved, initially abdicated to try to regulate them since an eventual regulation was considered premature. However, after an intervention of the president Vladimir Putin who published some directives aimed at recognizing and regulating the technologies related to the blockchain, on May 2018 the Duma approved at first reading a law regulating the ICOs together with the smart contracts and the cryptocurrencies; according to this law both the cryptocurrencies and the tokens are considered as properties. This law received many

critics from many experts who stated that its approval will prevent any venture to conduct an ICO in Russia (Suberg, 2018b).

The Australian market authority ASIC (Australian Securities and Investment Commission) is still analysing whether the ICOs can fall under the Corporations Act; if it will get to the conclusion that the act should be applied to the ICOs, the campaigns should be analysed one by one to determine under which category of products falls the tokens sold in the offering (Managed Investment Schemes, shares, derivatives etc.); according to this, the ventures will be subject to different levels of disclosure and regulations. To help the ventures in correctly applying the regulations and ease their compliance, the ASIC established the Innovation Hub a program aimed at helping the new ventures and, contemporarily, keeping track of the behaviours of the ICO market. According to its promoters, this program will reduce the regulatory uncertainties for both the entrepreneurs and the authority (Australian Securities and Investment Commission, 2018).

Moving to the European Union, at the time of writing, there is no European regulation on the ICOs, however Valdis Dombrovskis, European Commission Vice-President for the Euro and Social Dialogue, announced the intention of providing a communitarian regulation by 2019 (Trappolini, 2018). In the absence of a comprehensive communitarian regulation the EU-countries autonomously dealt with the ICOs.

The United Kingdom Financial Conduct Authority (FCA) treats the ICOs in a way similar to the US; a token might be considered a security according to the rights given to the tokenholders, the analysis to understand whether a token is a security or not is performed by the FCA case by case. Moreover, the FCA admitted the lack of jurisdiction on the ICOs based abroad (Financial Conduct Authority, 2017). The BaFin, the German Federal Financial Supervisory Authority, published on March 2018 an advisory letter regarding the classification of tokens as financial instruments taking a position on the ICOs analogue to the British one (BaFin, 2018).

In France the Autorité Des Marchés Financiers (AMF), recognizing the difficulties in regulating the ICOs, launched a program called Universal Node to ICO Research & Network (UNICORN) aimed at defining the best way to regulate the ICOs. UNICORN considered three different alternatives: promoting best practices inside the pre-existing legislation, including the ICOs in the current security legislation or developing a new

legislation ad-hoc for the ICOs (AMF, 2017a). After a public consultation, the AMF board decided to pursue the last alternative with the aim of providing the needed guarantees, particularly regarding the information level, to the potential investors (AMF, 2017b).

Spain, instead, lacks an organic regulation regarding the ICOs, the only official intervention was made on February 2018 by Banco de España, together with the Comision Nacional del Mercado de Valores (CNMV), published some considerations about the cryptocurrencies and the ICOs providing an initial guidance to them and postponing to future national, communitarian or international laws a definitive regulation of the ICOs (Banco de España, 2018).

Italy is one of the less advanced EU countries in terms of regulating the ICOs that are practically unregulated, this makes almost impossible running an ICO in Italy and forced all the Italian ventures that aimed at launching an ICO to move abroad, in majority to Switzerland. Only on June 2018 the Italian market authority Consob announced the launch by the end of the year of a laboratory called RegTech aimed at analysing all the regulatory implications of the fintech, including blockchains, cryptocurrencies and ICOs with the final objective of regulating them by 2019. However, at the same time the CONSOB Commissioner Paolo Ciocca admitted the difficulties found by the authority in understanding the actual functioning of the technologies related to the blockchain, specifying anyway that the CONSOB was already monitoring them to expose the scams.

Moving to the so-called ICO-friendly countries and looking at them, it is immediately evident that they are a group quite heterogeneous in terms of size, geographical location and importance on the traditional financial markets. Among them we can find many microstates such as Liechtenstein, non-self-governing territories such as Gibraltar and countries commonly known as tax heavens, but even countries that are members of the European Union such as Estonia. Even the geographical distribution is scattered with countries located in Europe, in the Caribbean and in the Far East.

In Switzerland, the ICOs were regulated by the Swiss Financial Market Supervisory Authority (FINMA) through the publication of a specific guideline indicating all the documents needed by the authority to process a request and the principles followed by the FINMA in evaluating them. If an ICO is judged to be a security sale, FINMA will apply to it the securities law, however the general attitude of the FINMA towards blockchain and ICOs is positive, since in a previously published guideline the authority

stated that it will support the blockchain technology recognizing the advantages from its use for the financial markets. Even Gibraltar developed regulations to ease the launch of ICOs; these regulations are effective from January 1st, 2018 and are explicitly designed to facilitate the innovation. Since the context is still subject to many changes, Gibraltar decided to regulate it with some principles instead of strict rules.

The EU country with the most ICO-friendly position is Estonia: the official regulation of the ICOs in the Baltic country is not so dissimilar from the one of the US or the UK, the tokens may be considered securities by the Estonian Financial Supervisory Authority (EFSA) after an assessment done on a case by case basis and the tokens recognized as securities fall under the Securities Market Law (Finantsinspektsioon, 2018). The factor that made Estonia so attractive for the new ventures are the cheap and fast online process to incorporate and register a new venture, the absence of any limits on the amount of the investments in cryptocurrencies and the low level of taxation – Estonia does not apply VAT taxes on cryptocurrencies and ICOs (Schwartz, 2018).

Moving to the Far East, Singapore has one of the more permissive regulations for the ICOs: the Monetary Authority of Singapore released specific guidelines regarding the ICOs on August 2017. This document affirms that the tokens sold in an ICO are subject to the Securities and Futures Act (SFA). According to the SFA, there is no direct regulation “unless the currency is linked to an ownership or security interest in the issuers’ assets or property”. So, if the tokens are characterized by such rights the ICO has to be registered by the issuing entity to the MAS, while, in case the tokens do not fall under the SFA, there are practically no obligations for the issuers.

In conclusion, apart from those countries that decided to completely ban the ICOs, the majority of the countries that regulated them did not develop a specific legislation, but tried to suit the pre-existing securities laws to the ICOs stating that the tokens might be considered securities if some conditions, that vary country by country, are met; this happened both in ICO-friendly jurisdictions and in jurisdictions that are notoriously not favourable for the ICOs. The main difference among these jurisdictions, so, did not rely on the laws, but on its elastic or rigid application and on the effort made by the authorities to ease the procedures related to the launch of an ICO.

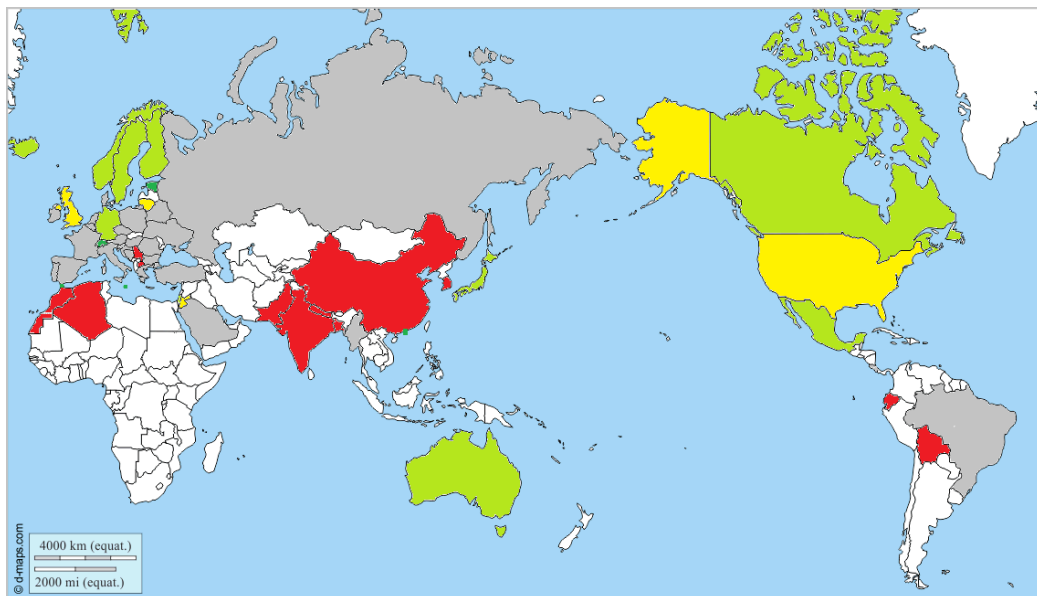


Figure 2.3: ICO jurisdictions in the world

The figure above highlights the position of many countries about the ICOs: the red countries banned the ICOs, the dark green ones are the so-called ICO-friendly countries. The light green and the yellow countries developed some forms of regulations regarding the ICOs: the light green ones were characterized by a positive attitude, while the yellow ones were more open to the ICOs. Finally, the grey ones did not yet develop a regulation.

2.2.6 Future scenarios and evolutions

At the writing, the ICOs environment is anything but static, there are no consolidated best practices and universally accepted standards and new changes, developments and improvements are continuously proposed by different players. These amendments are finalized to solve some of the problems typical of the ICO campaigns such as the cybersecurity risk, the inability of the contributors of monitoring the use of funds by the ventures, technical problems relying on the blockchain architecture and so on. If some of these new practices will catch on and become a standard the ICOs launched in the near future might be rather different from the ones launched until 2018.

Between 2017 and 2018, Vitalik Buterin, the founder of Ethereum, theorized two radical changes in the ICO paradigm, that if implemented could replace the traditional ICOs: the DAICO and the Interactive Coin Offerings.

The DAICO exploits some traditional elements of the ICOs together with other features typical of the Decentralized Autonomous Organizations (DAO) and it is aimed at minimizing the risk that the team improperly uses the funds collected in the campaign. Just like a classic ICO the DAICO is published by its development team to raise money to fund its project. Then the contract is set in a “contribution mode” in which the interested contributors can send their Ethers, receiving in exchange the tokens. At the end of the public offering, investors can no more contribute and the tokens become tradeable.

The funds collected are not immediately entirely available to the core team, but they become available in a gradual way according to a parameter of the contract called tap that is the

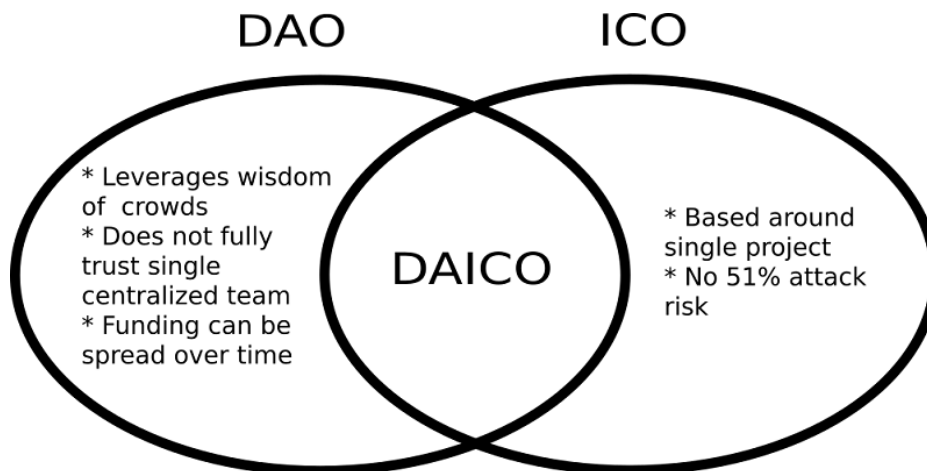


Figure 2.4: The main elements of a DAICO Source: Buterin, 2018

maximum amount per second that developers can withdraw from the contract. The developers cannot raise the value of the tap, but can eventually decide to autonomously decrease it, while the tokenholders, can vote to raise the tap or destroy the contract and withdraw their contributions. Doing this, the tokenholders can start giving the team an initial limited budget that can be gradually raised over time if the team makes a correct use of the funds and the development of the project goes on as planned. Otherwise, the tokenholders can vote to destroy the DAICO and get their money back. In this way a cheating team can be easily monitored by the contributors that can, at the limit, get back their money (Buterin, 2018).

Another innovation proposed by Buterin (2017), are the Interactive Coin Offerings that are aimed at permitting the participation in the offering to all the interested potential contributors and avoiding the risk of network congestion: these two risks are strictly interrelated and happen in the case in which there is a limited token supply paired with an exceeding demand, these two elements usually lead to a high number of offerings immediately after the opening of the sale that will congest the network and exclude many contributors.

In an Interactive Coin Offering the developers do not have to set a maximum token supply, but are the contributors themselves that can set thresholds over that their contribution is no more valid and, so, they will be automatically reimbursed in case the total contribution overcomes that amount. The sale will be divided into two stages: during the first, the contributors can decide to bring back their contribution in any moment, while, in the second stage, there will be only the automatic reimburses.

The advantages for the developers descend from the absence of a limit in the token supply that could have reduced the amount collected. The investors could participate at the sale in every moment without the risk that their contributions are rejected and can even change their mind after having sent the offering.

2.3 Crowdfunding

2.3.1 Overview

In a fast-paced, connected and globalized world, where people, through internet technology, may have immediate access to any information which was unthinkable fifty years ago, it is a logical consequence that also ideas and funds started spreading around the world with the same rapidity. The spreading of the ideas, or better the phenomenon of funnelling the crowd ideas to come up with something totally new, is known as crowdsourcing. The term was coined by J. Howe in his *the rise of crowdsourcing* issued by Wired magazine. According to him, crowdfunding describes a new web-based business model harness the creative solutions of a distributed network of individuals through what amounts to an open call for proposals (Howe, 2006).

Crowdsourcing is the merge between the words *crowd* and *outsourcing*, so it is the process of a company taking a function one performed inside the company's boundary and outsourcing it to the crowd. It is clear that to have an effective process we should have a mean to reach as many people as possible. Therefore, even though we have some examples in history which have witnessed this phenomenon, the rise of crowdsourcing coincides with the development of our technology. In other words, the process could not work if we were able to reach only a few people, this sourcing process takes advantage of big numbers of solutions which at the end could have mixed them up to reach a complete and homogenous proposal. Nowadays, the companies post a problem on the website, many individuals offer a possible solution, and normally the winning idea receives a discount or a bounty.

The theoretical idea which creates the framework for crowdsourcing is collected in *The wisdom of crowds* (Surowiecki, 2004), an important book where the author states that four elements must be present to form a wise crowd: diversity of opinion, independence, decentralization, and aggregation. The presence of these key elements should make a general crowd an "intelligent" crowd making its outcome more consistent than the individual's one. Surowiecki (2004) argues that the "wisdom" of the crowd derives from aggregating the solutions and not from averaging them.

Thinking about crowdsourcing, the aim is to propose a new product/service which suits the most the customer; to do that the best option is relying on the proposals of the

customer base, selecting the most feasible ones and, in the end, marketing it. Therefore, this process allows the company to collect many ideas, outsourcing the ideation part, and to shorten the distance from the company and the customer. In this way, the customer, through the crowd, enters the cycle of innovation of the company which will propose something for customer designed by the customer. It is a complete revolution of paradigm.

As crowdsourcing is revolutionizing the source of ideas, crowdfunding is disrupting the financing world. While crowdsourcing addresses the first part of the ideal cycle of innovation, searching for new ideas, crowdfunding focuses on the subsequent part, the financing problem. We are all accustomed to think to significant innovations, carried out by multinational companies which have large disposal of assets in order to invest in future products or services. Crowdfunding, clearly, does not address them. Instead, it addresses those many small entrepreneurs who had an idea to develop a product, or a concept, but they find difficulties to raise enough money to transform this invention into an innovation. Many of these projects could stay undone just because of the lack of funds which is the starting point for any development in any project. The aim of crowdfunding is exactly to fill the gap between actors with low capacity to raise funds in conventional ways and small investors who are interested in the innovation. Also, in this case, the crowd assumes the role of the judge, naturally deciding which project will be successful which will turn out to fail.

2.3.2 Milestones of the crowdfunding history

As already stated previously, the aim of our work is a comparison between the ICOs and the Crowdfunding world. In these following chapters, we want to present to the reader a clear and complete overview of the crowdfunding world, making a critical analysis based on the academic literature written on this emergent topic.

Although crowdfunding implies the use of modern technology, in the history we have already witnessed some examples of it. The oldest and most famous case is related to the construction of the pedestal of the Statue of Liberty. As we all know, France offered to The United States of America, the famous statue for centennial independence celebration, but the US country did not have enough money to realize the pedestal and ultimate the construction. The fundraising campaign was led by the renowned journalist

Joseph Pulitzer, publisher of the New York World. In this case the public was reached through the press. It was 1874, and the campaign was able to raise \$100,000.

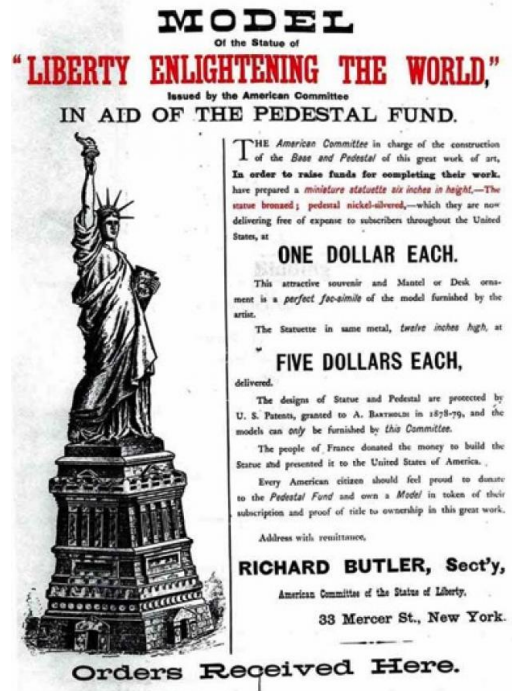


Figure 2.5: Front page of the fundraising campaign for the Statue of Liberty

Instead, the first example of crowdfunding managed via Internet, occurred in 1996, when the British rock band, Marillion was about to cancel its American tour due to the lack of funds and its fans raised \$60,000 to make the tour possible. Only in 2001, we witness the appearance of the first crowdfunding platform, its name was Artistshare and it was a platform dedicated to musical projects; the idea was so successful that the platform was able to raise funds for ten Grammy-winning music records. The disruptive year of the crowdfunding development was 2009 when two of the most famous platform were founded: Indiegogo and kickstarter.com Together, they have launched more than 400,000 projects, democratizing funding. These are the 4 milestones in the past and recent history of crowdfunding which have shaped the concept as it is known nowadays. It is interesting to notice that even though internet was not invented yet, anyway, crowdfunding found its way. Thinking about it, it seems that crowdfunding is inherent in the capitalist humankind, people are keen to help entrepreneurs move forward.

2.3.3 Definition

The definition of Crowdfunding, as we call it today, involves “an open call, mostly through internet, for the provision of financial resources either in form of donation or in exchange of the future product or some form of reward and/or voting rights” (Belleflamme, Lambert, & Schwienbacher, 2014, p. 4). The campaign to finance a project can address the public in two different ways, a direct or an indirect one. The direct way consists in creating its own website where the creator explains its project and ask for funds. The indirect way, instead, contemplates the presence of an intermediary, the so-called crowdfunding platform (CFP) that is an online platform which gathers the projects, sorts them by type of the project, funds required, and many other key features. CFPs help the projects to succeed in giving visibility to them.

In fact, while through the direct approach the founder can primarily relies on his/her personal connections and, at maximum, to people who are specifically looking for the concept which the owner is offering, through the CFPs you have access to a vast public who is interested in the crowdfunding world and which is more likely to give money because you are all part of the same community. Of course, this service is not for free, CFPs apply a fee to the funds raised which will turn out to be revenues for CFPs. This method helps the system to work in a more efficient way since it aligns the objective of the single campaign (raise money to fund the project) and the objective of the platform (earning money) as it is explained in the work of Cumming & Zhang (2018). Crowdfunding includes profit and non-profit projects in different areas such as business, technology, art, film, music, publishing, journalism, real estate, and social cause (Milosevic, 2015) (Martinez-Canas, Ruiz-Palomino, & Del Pozo Rubio, 2012).

The phenomenon of crowdfunding has started growing in 2011, where the volume of funds raised was about \$0.5 billion. From that moment the volume has incredibly increased at a rate of 250% per year, reaching the volume of \$250 billion in 2016, one of the fastest rates of growth of any type of financial innovation documented in the recent history. This growth has been primarily fuelled by the technology, hence giving rise to the term fintech (Rau, 2018).

Inside the crowdfunding world, we can find many different types of projects which can range from business and entrepreneurship projects to projects focused on social impacts or even projects in other categories such as film, music or more generally performing

arts. In fact, as of 2014, the whole crowdfunding market has raised the stunning amount of \$16,2 billion. This amount is broken down in 5 top categories, the first one is business and entrepreneurship with 41.3 % of the total value raised, followed by social cause with 18.9 %, furthermore we find films and performing arts with 12.13 % and at the end there are real estate with 6.25 % and music and recording arts with just 4.54 % (MassSolutions, 2015).

Billions raised per category in 2014

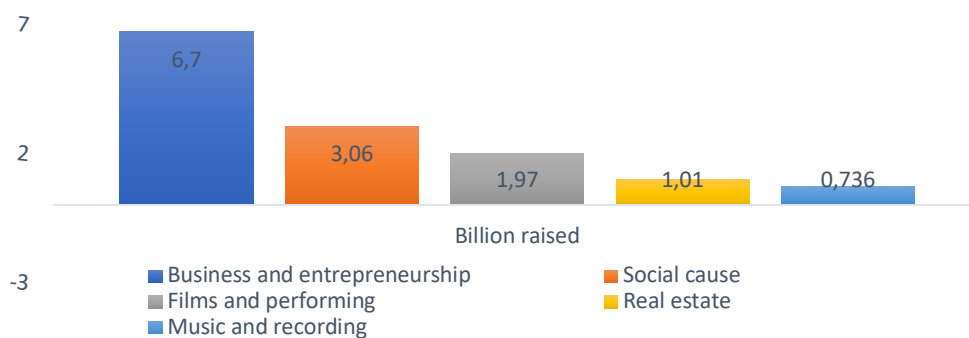


Figure 2.6: Billions per category raised in 2014 thank to crowdfunding

In the first position, as expected, we find business projects or projects which aim at innovating or offering a new service or products. What it is surprising, is to find the social cause projects in the second place, witnessing that crowdfunding has something in common with the charity and social world. It is unlikely to find any other form of financing this distribution, where social projects represent 50% of the funds raised by the business projects. Crowdfunding projects can be also categorized according to their financial goal during the raising campaign; three types of goal exist:

- All or nothing basis
- Take it all basis
- Soft and hard cap

The all or nothing basis consists in setting a financial goal, which is considered to be the necessary amount to carry out the project; the logic is that if the campaign does not reach the financial target, then the creator of the campaign gives backers the money back and the campaign is considered as unsuccessful. This way of funding is similar to tradition

equity capital issues where if the target is not reached, then either the underwriters buy the remaining shares, or the equity issue is withdrawn and marked as unsuccessful.

The take it all basis is the opposite compared to the previous philosophy; in fact, in this logic, the creator of the campaign does not set any financial target, but only the duration of the campaign. At the end of the campaign, the project will benefit from the amount given by the backers. This method is mostly used for donation-based crowdfunding where there is not a business project to carry on, but only a concept of improving some social issues. For an entrepreneurial project, it is not strategically correct using the take it all basis; the crowd could think that the entrepreneur does not have a clear business plan and has not studied the costs that the project may incur in. In addition to that, a choice like this could affect the trust toward the founder.

The third method, along with the first one, is the most common; the idea is to set a minimum target and maximum target. Once the minimum target is reached, the campaign is considered successful, and with this minimum amount the creator of the campaign promises he/she will do a certain list of investments; while if the maximum target has been reached, then he/she would plan other additional investments. In these campaigns, the owner has to prepare two business plans according to the two possible scenarios.

2.3.4 Models of crowdfunding

In addition to the different ways to propose the project to the public, another way to catalogue the projects is according to what the owner gives in exchange for funds. There are several differences which come along to being part of own type or another, these differences imply also different regulatory frameworks. The most exhaustive list we can find about is composed by:

- Donation-based
- Reward-based
- Pre-selling or royalty based
- Lending (P2P or social lending)
- Equity-based

Let us analyse one by one each form of crowdfunding to understand which features are distinctive of every single model.

2.3.4.1 Donation-based

It is considered the primordial form of crowdfunding; the investors provide a pure donation to the owner of the campaign which will not give them back any form of returns. This is not as weird as it looks like in a capitalist world where no one gives money for free, in fact the campaigns which are donation based, are non-profit or they are tackling social causes. Most of the investors participate in these campaigns because they want to be part of it; they think the project is addressing some important issues which need the solidarity of the crowd. This model of crowdfunding is the purest; it highlights the huge social value that crowdfunding could have in our society. Normally in this model, we never see and hard and/or soft cap, that is coming from the nature of the campaign: raising money to be able to face specific common problems. The non-presence of any financial objective has also another objective, to not discourage potential donators.

2.3.4.2 Reward-based

This is the most popular form of crowdfunding, it is used as a type of small-business financing in which entrepreneurs ask for financial donations in exchange of a future product or service. However, certainly depending on the amount of the contribution, they would offer different ranges of rewards (Mitra, 2012). These may vary from a thank you note to small tokens of appreciation. Of course, this model cannot be considered as “social” or as pure as the donation-based crowdfunding. Here, the backers are looking for something that most of the times is not a thank you, they are backing the project because they are really interested in the final output of the campaign. In addition to that, the backers in the reward-based system are normal investors while in the case of the donations based the backers are charitable people and that is why they are, most of the times, called donators.

A distinctive feature of the reward-based system is trust. As argued by Zheng, Hung, Qi, & Xu (2016), trust management has a strong impact on the possible success of the campaign. This trust is mainly based on two aspects: the first one is related to the past history of the founder, of course potential contributors are keener to trust, and so to give their money, to someone that already has a consistent experience in the

entrepreneurship world and which is not a novice. The second important aspect is related to relationship that the entrepreneur is able to build with its backers through the post of videos, images of prototypes, and, most importantly, through the comments and the answers that he gives the public (Zheng, Hung, Qi, & Xu, 2016). It is easy to understand why trust is so important; being an online business which connects people who do not know each other, the past history is the only parameter that can influence the first impression of the public about a certain entrepreneur. It is true that everyone online can sell an image of himself/herself different from the actual one, but in this case the community, the strength of the crowdfunding system, can show its power, denouncing any fraudulent behaviour. However, in his work Rau (2018) finds little evidence to support the thesis of Zheng, Hung, Qi, & Xu (2016), but it does not exclude that it has a significant impact, as logic says.

2.3.4.3 Royalty-based

Royalty-based crowdfunding is a particular model where investors finance a project in exchange of a part for the future profits. We have to make clear that the founder is willing to renounce to some parts of the profits, but the ownership structure of the company does not change. The backers will not become partners of the founders having shares of the company; they will only own shares of the profits leaving the ownership to the original founder. For the entrepreneur point of view, this solution could be risky in case the project will result to be successful with low profit margin. In this case, since the royalties have to be deducted from the revenues, increasing the costs, the owner could incur in a zero profit or even negative, while the backers will receive their payments. Instead, from the backers' point of view, who are looking for some returns, they could see their investment frozen since that the duration for a campaign could be as long as several months (Beaulieu, Sarker, & Sarker, 2015). This way of financing is typical of discrete products, such as record albums, music tours, or mobile apps.

2.3.4.4 P2P lending

The social lending crowdfunding, or simply lending crowdfunding, is a loan peer to peer (P2P); with the term P2P, we mean a disintermediation of the lending process, where an individual can decide how much and to whom lending its money. Even in this case, as in any lending transaction, who borrows the money has to give them back with an interest rate. In this context, we can notice as the backers become investors; most of the times

they do not focus on the project that the company proposes, however they are really interested in the return opportunities that this project could offer. One important aspect is the attribution of a rating to each single company or project seeking for money. The rating is fundamental to set the risk profile of the company in paying back the debts, and so to determine the interest rate. Normally, this process is carried out by the platform, which assesses each project, assign a certain rating and, at the end, a certain interest rate.

On the market, there are two types of platforms. The first type, ex. Borsadelcredito, consists in assessing the projects, shortlist them, collect the intents of the lenders and then match lenders and borrowers in a way to minimize the risk for the lenders. We can notice as the lenders do not choose to who lending the money, this is a decision made by the platform to optimize the risk profile of the system. The second type, ex. Lendix, shortlists a number of projects and assigns them a risk profile proxied by the interest rate, then the lender may decide to whom lending his money. In this case, the lender has more room to make decisions, and he has the power to lend up to \$2000.

2.3.4.5 Equity based

Equity crowdfunding is the process whereby the crowd invests in an early stage unlisted company in exchange for shares of that company. Comparing the equity-based crowdfunding to the royalty based, the major difference is that in the former one, investors become owners of a company's quota according to their shares, therefore they participate to the dividend distribution in case the company is performing well, and the profits are positive, otherwise investors could also lose their investment if the company's profit is negative. Previously only wealthy individuals, venture capitalists and, business angels, could invest in start-ups. Equity crowdfunding platforms helped democratize the investment process by opening the door to a larger pool of potential investors dubbed "the crowd". In addition to that, equity-based crowdfunding is a mechanism simpler than the regulated markets or the secondary markets in the stock exchange. This simplicity involves also lower costs to bare for the entrepreneur if compared to the conventional regulated stock markets; in fact, the fee applied by the CFP is between 4-7 % of the capital raised (Vv.Aa, 2015).

This type of crowdfunding is a purely financial investment and so it has to be treated, from a legislative point of view, in the same manner. Italy, for example, was the first

country in Europe to regulate the equity-based crowdfunding in July 2013, this regulation applies only to innovative start-ups and establishes a national registry for equity crowdfunding portals and disclosure obligations for both issuers and portals. Another example of a regulation is the USA; the former President of US, Barack Obama, signed in 2016 the so-called “Jobs Act’s regulation crowdfunding”. This act allowed equity crowdfunding participation regardless of net worth or income. Prior to this amendment, only wealthy people had the opportunity to invest their money in equity crowdfunding. Traditionally, many of these projects would not have had access to funds because banks considered them too risky, their returns were too low, and the transaction costs too high for private equity or venture capital funds; therefore equity-based crowdfunding could fill the gap at the pre-seed and seed stage of the funding cycle.

2.3.5 Major CFPs

As already discussed in the previous section, CFPs have a fundamental role matching the willingness of the backers to contribute to a project and the need of the projects to fund themselves. Each CFP is normally dedicated to a single model of crowdfunding. We now want to provide a holistic picture of the CFPs market, analysing the most famous ones:

- [Kickstarter.com](https://www.kickstarter.com)
- [Indiegogo](https://www.indiegogo.com)
- [AngelList](https://www.angellist.com)
- [JustGiving](https://www.justgiving.com)
- [Lending Club](https://www.lendingclub.com)

Kickstarter.com and Indiegogo are by far the most used platforms currently available, both of them are mainly focused on the reward-based crowdfunding, where the creator of the campaign can decide its length, setting a deadline, and decide the minimum financial goal. At a first sight, the two portals look the same, but there are some nuances: Indiegogo is more flexible, it allows creators to launch any type of project from hi-tech to social causes, while kickstarter.com is stricter in deciding which projects are allowed or not, and it prefers more tangible projects. Another difference between these two CFPs is that kickstarter.com allows creators which come from Canada, Australia, New Zealand, Denmark, Netherlands, Ireland, Norway, Sweden, Austria, Germany, France, Spain, Italy, Switzerland, Luxembourg, Belgium, Hong Kong, Singapore, and UK.

Indiegogo is instead more open, and it allows any creator provided that the country has not received any economic fine (Tecnologia.Libero).

Concerning the fee which is applied to the funds raised, no substantial differences emerge; in fact, both the platforms apply a 5 % fee. Finally, while in kickstarter.com the financial goal follows the minimum/maximum amount logic, in Indiegogo the creator of a campaign can choose also the take it all basis, which makes this platform more flexible.

While kickstarter.com and Indiegogo are mainly reward-based platforms, AngelList is primarily focused on the equity-based crowdfunding, where investors can buy shares of the company in exchange of their money (Bonucci, 2017). It is an American portal, and, thanks to the Jobs Act regulation of crowdfunding, offers several services other than the core business of matching demand and offer. In Europe, entrepreneurs may suffer some limitations due to the lack of regulation in their countries, but European investors have the same rights as the Americans do. The platform offers also the possibility that investors group up, forming a syndicate, which is, most of the time, a good way to be effective in investing in a company, and, at the same time, it limits the risk of each single investor since, in this way, he should have invested a little amount of money. However, AngelList is much more than this, it is also a social network for investors and start-up creators where everyone can also propose for a job, or if he/she is managing a start-up, post a new job position, moreover, there is also the possibility of asking advices to the community.

As of the donation-based crowdfunding, the most important and used CFP is JustGiving, which was founded in London in 2000. It is a portal which provides online tools and processing services to enable the collection of charitable donations. The company website allows people to donate to charities registered within the site with a credit or debit card online, and offered people doing sponsored events the chance to build their own webpage to collect sponsorship from supporters. As kickstarter.com and Indiegogo, JustGiving requests a 5 % fee on all the donations to cover the costs of running the business. Thanks to this system, the portal was able to become profitable in 2006, six years after its foundation.

The fee-based system was not always well accepted: in 2008, the Guardian showed an article which debated the high fees imposed by the platform considering them in contradiction with being a charity collection website (Inman, 2008). In our opinion,

even though this system could look to be controversial, overall it has improved the way of collecting money for charity events and even for catastrophic events such as tsunami or earthquakes.

The last CFP that we want to present in order to be exhaustive is Lending Club (McBride, 2014) (Schumpeter, 2013). It is a US peer-to-peer lending company, headquartered in San Francisco, California. It was the first peer-to-peer lender to register its offerings as securities with the Securities and Exchange Commission (SEC), and to offer loans traded on a secondary market. Lending Club is the world's largest peer-to-peer lending platform. The company claims that \$15.98 billion in loans were originated through its platform up to December 31st, 2015 (Lending Club). Lending Club enables borrowers to create unsecured personal loans between \$1,000 and \$40,000. Investors can search and browse the loan listings on the Lending Club website and select the loans in which they want to invest relying on the information supplied about the borrower, the amount of the loan, the loan grade, and the loan purpose. The investors make money from the interest that is paid to them. Lending Club makes money by charging the borrowers an origination fee and the investors a service fee. Since its foundation, that was firstly done through Facebook, as one of its services, Lending Club walked the road: in 2014, it filed an IPO, which turned out to be the largest in US in that year, raising \$1 billion.

2.3.6 Major Pro and Cons of Crowdfunding system

We now want to analyse the major pros and cons of the crowdfunding system, from the entrepreneurial point of view. We decided to wear the entrepreneur's shoes since our study is focused on the comparison between crowdfunding and ICOs on the project perspective and not the investors' one.

Here below we present the pro list (Roberts, 2016), and thereafter we briefly analyse each point:

- Low risk
- Increased exposure
- Technology
- Community
- Leverage small donations
- Validation

- Transparency

Starting a campaign through a CFP imply lower risks if compared to the foundation of a new company and the search for external capital. In facts, crowdfunding requires a low initial investment and the entrepreneur does not have to fulfil the rewards unless the campaign reaches its financial goal. This is very important because it means that he/she does not have any obligation to do anything if his/her campaign does not turn out to be successful. In addition to that, crowdfunding is characterized by negative cash to cash which means he/she receives the money before rendering the services. This helps to reduce the risks and the initial capital required to operate.

As already aforementioned, crowdfunding increases the exposure of the projects; in particular CFPs help to promote the campaigns and spread the idea even to people that otherwise the creator of the campaign would not have reached. Using a crowdfunding portal, he/she would benefit from the advertisement on the social media that the backers may do; this practice is very common because people who navigate the online platforms are usually digital enthusiastic and keener to use the social media. Regarding advertising, the campaign may also benefit from the press; in facts, it is likely that journalists and newspapers are interested in the crowdfunding world, and they often write articles about interesting or successful campaigns.

The technology is the third pros: crowdfunding platforms are built on requested technology solutions. This quality makes it easy to set up and launch a campaign even in case the creator is technically-challenged. Using a platform means that he/she does not have to set up the more challenging technical aspects of the online funding such as the payment processing, SSL or an online store. What marks crowdfunding is the community of which even the entrepreneur will become part: the community is built by crowdfunding enthusiastic people which are very interested in boosting the campaigns and the projects and it is always possible for the creator of a campaign to ask them for advices. Moreover, he/she can have the possibility of directly asking a feedback from his/her backers, this can be a critical advantage enabling to understand whether improve the product, change something or develop a new one to satisfy other customers' needs.

A feature that is sometimes underestimated is the possibility of leveraging on small donations; this means that the entrepreneur can collect many small amounts of funds to reach his/her large goal. Typically, this is not feasible outside the crowdfunding world,

where usually there is the possibility of taking a lot from few people, while in the crowdfunding world it is possible to take little amounts from many people. One of the most impacting characteristics of the crowdfunding is its ability to validate the concept of a project. People often spend great deals of money to build a product, service or idea and, then, they launch it into the world. The problem with this is that they do not know whether the other people are actually interested in their idea until after its launch. Thanks to the crowdfunding, the owner of an idea is able to validate his/her concept before actually spending time or money to fully complete the product. Finally, the last point we analyse is the transparency along the whole process: thank to it, is easy to communicate with the backers, this encourages updates throughout the whole process to engage the backers. Having easy conversations with the stakeholders increases the transparency by far.

So far, we analysed the advantages of proceeding with the crowdfunding option rather than through a traditional way of raising funds. Although, crowdfunding implies also some downsides as each economic decision. We now want to take a closer look at those aspects that still represent some disadvantages if compared to other forms of financing.

Here below there is a list of the most important ones (Roberts, 2016), which will be followed by a brief, but exhaustive description:

- Less flexibility in the project
- Rules
- Consumer-projects oriented
- Copycats
- Geographic limitations

The most stringent problem for the entrepreneurs who want to launch their project through a crowdfunding campaign is the less flexibility in the execution: once he/she has launched a crowdfunding campaign, he/she is promising something very specific to his/her backers. This promise makes difficult to change the major features of the project during the production. It is hard and unwise to promise something, take the money from the people, and then not deliver it. For this reason, it is crucial to fully think about the project and the potential issues or changes before launching the campaign.

A minor issue is, instead, represented by the rule of CFP. It is normal that CFPs set different rules to make the machine working. For example, kickstarter.com wants that each project fits one of its categories and another example is that the creator of the campaign cannot raise funds for charity purposes. Of course, certain rules are restrictive, but at the same time the crowdfunding campaigns do not have to comply with any stricter regulations set by the governments and the financial authorities. So far, crowdfunding's campaigns with more success have been the ones offering B2C services or projects. We remark that, for B2B service, the system does not work very well probably due to the lack of interest by the single investors who do not see any potentiality on the B2B services because they typically are less marketed, less known by the general public and/or less intuitive to be understood.

Another issue that entrepreneurs may face is the uncertainty on the rights of their idea: since when someone launches a campaign, his/her product is unfinished, he/she could risk a knowledge spillover enabling his/her competitors to understand what he/she is working on and how he/she is developing the future product. It is a major point. Finally, the last point we address is the aforementioned possible geographic limitations; as already discussed, not all the countries have prepared a focused law yet, this causes some limitations to the entrepreneurs, while, at the same time, it does not usually affect the investors' possibility of contributing to the campaign - except for the equity-based crowdfunding.

2.4 Initial Coin Offerings and Crowdfunding

As we briefly highlighted before, the crowdfunding is, by far, the way of financing most similar to the ICOs both from a conceptual and a practical point of view. In this section we aim at making a deep comparison of these two ways of financing highlighting the main elements of similarity together with the main differences according to the existing literature.

Due to the newness of the phenomenon of the ICO, the literature studying it is not wide, however a large part of the academics who studied the ICOs dedicated at least some paragraphs of their works to compare them to the other main ways of financing and, in particular, to the crowdfunding. Before going into detail on the comparison between the ICOs and the crowdfunding, we now want to analyse the relationship between the ICOs and the crowdfunding according to the existing literature, specially about whether the ICOs can be considered a new type of crowdfunding campaigns, an evolution of them or a completely new fundraising technique, not directly descending from the crowdfunding or from other already existing crowdfunding techniques.

As stated by the definition provided by Yadav (2017, p. 3), the ICOs are nothing else than “an unregulated mean of fundraising for new cryptocurrency projects via crowdfunding”. According to this definition, so, the ICOs are not a completely new way of financing, but only a different way to run a crowdfunding campaign relying upon the new technology of the blockchain and exploiting the lack of regulation to have some advantages in comparison to a traditional crowdfunding campaign.

However, this position was not shared with most of the other academics who dealt with the ICOs: according to Howell, Niessner & Yermack (2018) and to Kaal & Dall’Erba (2017) the ICOs and the crowdfunding are two different ways of financing that share some characteristics, but also many structural differences. A similar position was shared by Pilkington (2018), who, nevertheless, makes a further step coming to the conclusion that the ICOs have a series of advantages putting them in a position of favour compared to the crowdfunding that will be disrupted by the ICOs

Both Boreiko & Navroop (2018) and Zetsche, Buckley, Arner, & Föhr (2017) claimed that an ICO is neither a simple crowdfunding campaign run on the blockchain nor a completely new stand-alone way of financing. In Zetsche’s works the ICOs are defined as

the point of conjunction between the traditional crowdfunding techniques and all the new technologies related to the blockchain and the cryptocurrencies world, while Boreiko & Navroop stated that the ICOs are the direct evolution of the reward-based and equity-based crowdfunding.

Finally, Assadi (2018) is the only author who pointed out the difference between the ICOs and the so-called cryptocurrency crowdfunding that is a traditional crowdfunding accepting even contributions via cryptocurrencies instead of the traditional fiat currencies. Some platforms of cryptocurrency crowdfunding, such as Cryptstart, were born in the last years; quite often they were financed through an ICO increasing the confusion about the differences between ICOs and cryptocurrency crowdfunding. However, even if, the venture behind the new platform was financed through an ICO and the tokens sold in the campaign could be used as internal currency in the platform to finance the campaigns that will be hosted in the future, these campaigns hosted will not be considered ICOs because they will not issue tokens in exchange for the contributions received during the campaign.

2.4.1 Elements of similarities between ICOs and crowdfunding

After a global overview of the relation between the ICOs and the crowdfunding, we now start the comparison between them highlighting the main elements of similarities between the ICOs and the crowdfunding financing, with a particular focus on how these similarities change considering different types of crowdfunding.

The main similarities between the ICOs and the crowdfunding campaigns are the steps to be followed to run an offering, the public to whom the offering is directed, the stage in both the product and venture lifecycle in which the fundraising campaign is launched, some communication patterns and finally the almost exclusive use of internet to launch the campaign and to communicate with the potential contributors before and after the completion of the campaign.

The analogy between the structures of the ICOs and crowdfunding campaign is immediately evident: a campaign is launched online in advance of the actual beginning of the offering period. The creators of the campaign exploit this time period to make the possible contributors aware of the existence of the campaign and to convince them to

participate and give their money. To persuade the people interested in the offering to effectively contribute to it, the creators usually provide a documentation to show the quality of the project, its strengths, the main reasons according to which it will have success and the seriousness and expertise of the team behind the product.

The documents provided are slightly different between the ICOs and the crowdfunding, however, they are targeted to very similar goals and the information included in them – excluded the one that is radically diverse due to the intrinsic characteristics of the two ways of financing - are not so different. In detail, none of the campaigns hosted on kickstarter.com or Indiegogo provided a whitepaper to the potential contributors, however, the information provided by them is quite analogous to the one provided by most of the ICO ventures in their whitepaper.

Still regarding the documentation published and the level of information available for the people interested in contributing in the offering, another major similarity is the absence of any kind of regulation regarding them resulting in a very heterogeneous quality of the information provided that, quite often, are even very limited in their quantity (Hartmann, Wang, & Lunesu, 2018). Moreover, another important similarity is the use of the online channel to publish the offering, provide the useful documentations to the potential contributors, communicate with them and host the official communications, while almost all the other ways of financing (banks, venture capital funds, IPOs etc.) are based on more traditional communication channels and there the use of internet is only residual.

The public to which both the ICOs and the crowdfunding campaigns are targeted is somehow the same: they are open to the retail people instead of being dedicated only to professional investors, even if some ICOs were financed even by venture capital funds or by newly created funds aimed at investing only in blockchain based ventures. This public is, very often, composed of people that are really interested in the technology and in the product and strongly motivated to invest in it to encourage their development: the main motivation behind these investments, so, are not the financial ones such as the future return, but can be considered ideological motivations (Wilson & Testoni, 2014).

This motivation is immediately evident for the donation and reward-based crowdfunding and for the utility tokens, while for the equity-based crowdfunding and the tokens with voting and profit rights it loses part of its relevance and it is surpassed

by economic and financial reasons. The ideological reasons at the base of the contributing decision influence even the communications that usually neglect the financial data and the economic analysis preferring to focus on other aspects such as the potentialities of the technology, the possible use cases and the advantages for the final customer.

Even the stage of the lifecycle of the product under development is usually the same between an ICO and a crowdfunding campaign; most of the time the venture running these funding campaigns are start-ups at the seed or early stages of their lifecycle: their product is only a concept or a prototype/beta version – in any case it has not been launched on the market yet - and the ventures are still not generating any revenue or are generating not acceptable revenues. The investment at an early stage of the start-up lifecycle it is a point in common with the venture capital funds, however, VC funds invest only in equity, while most of the ICO and crowdfunding campaigns are more similar to a pre-sale of the product or service under development (Howell, Niessner, & Yermack, 2018).

Finally, the main similarity between ICOs and crowdfunding, that is even the much stressed and analysed in the literature dedicated to the ICOs, is the analogy that can be made between the role of the tokens sold during the offering and the type of crowdfunding technique. In fact, according to the rights that are granted by the token to its holders, an ICO campaign can be akin to almost any type of crowdfunding technique, from the donation-based to the reward-based, from the lending-based to the equity-based (Zetsche, Buckley, Arner, & Föhr, 2017).

According to Zetsche, Buckley, Arner, & Föhr (2017), it is possible to find examples of ICOs whose tokens give their holders rights and/or benefits analogous to the ones provided in every of the crowdfunding techniques that were theorized by Mollick (2014):

- Patronage-based crowdfunding (donation-based crowdfunding): ICOs not giving its participants any consideration- such as the one made for fun or for some charity objectives – are analogous to the donation-based crowdfunding in which the funders do not receive any form of direct return in exchange for their contribution, nevertheless Zetsche, Buckley, Arner, & Föhr (2017) pointed out that the percentage of ICOs whose tokens do not grant any right to the tokenholders is minimal (less than 5 % of their sample).

- Reward-based crowdfunding: ICOs whose tokens are defined as utility tokens can be assimilated to the reward-based crowdfunding in which the funders are rewarded in omnifarious ways according to the project and the entity of their contribution. These rewards are somehow analogous to the roles of the token inside the platform once developed. Within this category it is possible to find even the case of the pre-sale of the future product whose development will be funded by the amount of money collected during the campaign.
- Lending-based crowdfunding: ICOs selling their tokens and promising a buyback of those tokens at fixed time intervals can be assimilated to the lending-based crowdfunding, commonly known even as peer-to-peer lending. However, tokens with only this type of right are quite rare and very often the buyback is only an option for the venture to be exercised in the case the profits of the company overcome a certain predetermined level, making it much more similar to a share buyback than to a lending.
- Equity-based crowdfunding: ICOs selling tokens granting to their holders voting and profit rights can be assimilated to the equity-based crowdfunding, since that tokens are considered by the venture as shares; however, it is important to point out that these tokens are not actually shares from a legal point of view, unlike the shares sold in the equity crowdfunding that are shares to all the effects of law. In case the tokens grant only profit rights, they can be considered as analogous to the royalty-based crowdfunding that can be considered a hybrid form between the reward-based crowdfunding and the equity-based crowdfunding in which the funders receive part of the profit of the company, without being shareholders of it.

2.4.2 Elements of differences between ICOs and crowdfunding

After having analysed in detail the main similarities existing between the ICOs and the crowdfunding according to the existing literature, we now turn our attention to the analysis of the main differences that distinguish these two fundraising techniques.

The work of Boreiko & Sahdev (2018) provides a comparative table illustrating some of the main differences between ICOs and crowdfunding at a high level of detail, looking even for the differences in some details related to aspects that, at a first sight, seem to be

completely analogous between them. The first of these minor differences relies upon the public to whom the campaigns are targeted, in fact, notwithstanding the main characteristics of the targeted contributors are somehow similar, this work points out that the investor base of the crowdfunding is generally a local and exclusive groups, while the one of the ICOs is a global and inclusive group; this fact is immediately evident considering the nature of most of the crowdfunding platforms – excluding the leading ones - that are exclusively dedicated to their local national market; sometimes this is even an obliged choice, especially for the equity crowdfunding, due to the differences in the legislation among distinct countries. On the other hand, the ICOs rely on a global decentralized world and the potential contributors usually do not care about the physical borders. This decentralization is the direct consequence of the paradigms on which the blockchain technology is based and is enabled by the payments made with cryptocurrencies instead of the traditional fiat currencies; in fact, the cryptocurrencies can be instantaneously transferred worldwide without the problems related to the exchange rates and to the traceability of the payments. The collection of funds in form of cryptocurrencies allows the contributors of the ICOs to remain anonymous, even if many ICOs did not permit their contributors to be anonymously obliging them to pass through KYC procedures. In reverse, the contributors of the crowdfunding campaigns cannot remain anonymous – for example the profile page of each user of kickstarter.com indicates the campaigns in which those users invested his/her money.

Another odd highlighted by Boreiko's work is the level of information asymmetry that, despite being considered very high for both the fundraising techniques, is more prominent for the ICOs than for the crowdfunding. Then, Boreiko and Sahdev stress even the difference in the level of the protection granted to the investors, in fact, while the participants of a crowdfunding campaign enjoy a certain level of legal protection of the money they invested against scams and frauds and can summon the venture that launched the crowdfunding campaign on a court, the people investing money an ICO have no concrete forms of investor protection; this is a very relevant aspect, considering the newness of the ICO phenomenon and the high incidence of frauds and scams, however it is possible that in the near future, as the level of regulation regarding the ICOs will increase, some form of investor protection could be established by the regulators, at least in some jurisdictions that already showed the willingness of protecting the people investing in the ICOs against frauds and scams.

Another important point of difference stressed by Boreiko & Sahdev (2018) is the level of intermediation that is opposite between them: while the crowdfunding campaigns are always hosted on a platform that usually charges a fee on to the project creators, generally this fee is calculated as a percentage – the average value was 7 % in 2012 - of the total amount of funds collected in the campaign (Giudici, Nava, Rossi Lamastra, & Verecondo, 2012). Moreover, the platforms run even deep due diligences to ascertain the reliability of the campaign analysing the background of the proponents, the website, the account and third-party proof on funding projects (Cumming & Zhang, 2018). Parallely, the platforms provide even some services to the hosted campaigns; among them there are the outsourcing of some proprietary services to other platforms, the legal advice, the involvement in the definition of the agreements, the study of the best timeframes to schedule the campaign, the possibility of using dedicated escrow accounts and the control of the operations related to the payment methods made available to the potential interested contributors (Giudici, Nava, Rossi Lamastra, & Verecondo, 2012).

Contrarywise, the ICOs are almost always run on the proprietary website of the venture that is launching the campaign, with a complete lack of intermediaries playing a direct role; the platforms dedicated to the ICOs, in fact, mainly play only a marketing role emphasizing to the potential contributors some ICOs whose creators had paid for a more visible position instead of the others campaigns, but without any direct involvement in the design and management of the campaign and in the operations of the venture after the completion of the ICO. The different role played is much more evident looking at the way these platforms are paid for the services provided, in fact, while the crowdfunding platforms usually received a percentage of the sum collected in the campaign, the ICO-dedicated platforms simply sell their services at a fixed price before the launch of the offering.

In partial contradiction with what we just highlighted, some platforms whose aim is providing a centralized hub able to host many ICOs and offer some related services to the ICO creator as well as a sort of guarantee for the potential interested contributors were born in the last year, in many cases after having launched their own ICO, so, it is not possible to exclude that the level of intermediation of the ICO market will be destined to increase in the following years, making the ICO dedicated platforms much more similar to the crowdfunding ones.

Howell, Niessner & Yermack (2018) state that the most relevant difference between the ICOs and the crowdfunding, but even between the ICOs and the VC funds, is the level of liquidity, in fact, thanks to the large diffusion of the secondary cryptocurrency exchanges, most of the tokens sold during an ICO are tradable on these secondary exchanges, keeping the liquidity at high levels and giving the ICOs a substantial advantage over the crowdfunding. However, Howell's work considers even that the tokens can be not liquid for various reasons: the presence of lock-up periods, the absence of listing on the secondary cryptocurrency exchanges or the difficulties in finding interested counterparties to make a transaction in the case the token is listed, but it has not a real market.

Actually, even some secondary exchange platforms dedicated to the equity-based crowdfunding were established in the last years making these investments more liquid and much more similar to the ICOs, however, the transactions in these exchanges platforms are very infrequent – for example in the Australian platform ASSOB, now known as Enable Funding, that is one of the biggest equity-based crowdfunding platforms of the world, only 5 secondary market transactions occurred from its launch in 2007 to February 2014. So, these secondary exchanges can hardly be compared to other forms of secondary exchanges granting high levels of liquidity (Ahlers, Cumming, Guenther, & Schweizer, 2015). Moreover, these secondary platforms are limited only to the equity-based crowdfunding, whereas in the secondary cryptocurrency exchanges tokens of every type are exchanged, even the ones that are more similar to the donation-based and reward-based crowdfunding.

Kaal & Dell'Erba (2017) pointed out another important difference between the ICOs and the crowdfunding campaigns: the presence of speculative purposes as a base for the decision of investing in the ICOs: these purposes were helped by the high liquidity granted to the tokens thanks to the presence of the secondary cryptocurrencies exchanges; they enable gambler investors to buy the tokens during the offering campaign, maybe exploiting the discounts granted to the early investors, and, then, selling them immediately after the listing to take advantage from the underpricing phenomenon that is quite common for the ICOs as stated in the work of Adhami, Giudici & Martinazzi (2018). The speculations about the ICOs were encouraged even by the forceful growth of the prices of the cryptocurrencies during 2017 that added a further chance of rewards for aggressive investors. Conversely, this phenomenon is practically

unknown for the crowdfunding, primarily thanks to the low level of liquidity after the completion of the offering.

According to Yadav (2017), one of the most relevant elements of diversity is the amount collected by the campaigns that are consistently higher for the ICOs: one of the most successful crowdfunding campaigns ever done was the one of Paradox Interactive a company aimed at developing and publishing video games that raised more than 11.8 million USD on the Swedish-based equity crowdfunding platform Pepins in 2016 (Kamps, 2016). As a comparison, we already cited at least three ICO campaigns that declared of having collected more than one billion USD in 2018. Going more in detail with this topic, the work of Belleflamme, Lambert, & Schwienbacher (2012), empirically found from their sample made by 44 crowdfunding campaigns an average amount collected of 150,000 euros and a median of the amounts collected of 6,400 euros, while the average value of the amounts collected by the ICOs forming the sample analysed by Adhami, Giudici & Martinazzi (2018) was 7.66 million USD, but the authors specified that this amount was certainly lower than the actual one since the value of the amount collected by some ICOs that successfully completed the sale was not disclosed after the completion of the offering. They highlighted even that 50 ICOs part of the sample – slightly less than 20 % - collected more than ten million USD.

Finally, the last relevant dissimilarity between ICOs and crowdfunding is the applicable legislation, indeed, while for the ICOs the legal picture is highly fragmented and most of the countries, except the ones that decided to ban them, have not a specific dedicated legislation, but only some forms of guidelines indicating whether the ICOs can be considered securities or not, many countries including Italy, Germany, US, Canada and Austria have laws that contemplate the crowdfunding campaigns usually providing exemptions and relaxations of the constraints required by the securities law. These facilitated procedures are generally guaranteed only if some requirements are met (e.g. the maximum size of the offering and/or the maximum amount investable by each contributor); these requirements, however are almost never met by the ICOs making not applicable for them the laws that regulate the crowdfunding campaigns.

2.5 Firm Capital structure

2.5.1 Theories about the firm capital structure

In this section we made a global overview of the literature about the capital structure of the firms from its origin up to now, then, we will turn our focus on the start-up financing analysing more in detail how start-ups find their sources of capital and the main differences between a start-up and an already established company. Finally, we will focus on the determinants of the decision of the funding technique made by start-up companies both considering the conventional fundraising techniques and the ones considered part of the alternative finance.

The capital structure is the way a firm finances its operations and its growth exploiting different sources of funding; the two main sources of funding are debts and equity. The debt can take the form of bonds or bank loans, while the equity is primarily made up by the common stocks, even if there can be also other types of stocks such as the preferred shares and the saving shares. There exist even some hybrid forms of financing sharing similarities with both debts and equity such as the mezzanine debts.

The modern literature about the capital structure was originated by the seminal work of Modigliani & Miller (1958), that stated the irrelevance of the capital structure in perfect markets under some hypotheses. Modigliani and Miller's hypotheses were the absence of taxation, the presence of a unique interest rate for both the company and the investors, the absence of any form of information asymmetry and transaction costs and the ability of the firm of choosing the financing technique without any endogenous limit. Under these assumptions the capital structure of the firm does not influence its value. Obviously, relaxing some of the hypotheses, the propositions made by Modigliani and Miller are no longer valid. The most famous case of relevance of the capital structure is the case in which there are taxes: in this case the levered firm (the one that is financed even with debts and not only with equity) generated yearly an extra cash flow thank to the possibility of deducing the interests from the net profit on which is computed the amount of taxes to be paid and, thus, an additional value compared to the unlevered case is created.

After this seminal paper, many economists focused their attention on the capital structure topic; according to Harris & Raviv (1991) there are four main forces driving the

capital structure: the conflicts of interest between different agents with different claims on the resources of the firm (Agency approach), the asymmetries of information, the nature of the products or the competition in the product/input market and, finally, the corporate control contests. We now briefly revise all the main works related to each one of these forces.

The literature related to the agency approach started with the work of Jensen & Meckling (1976) who identified two main types of conflict of interests inside the firms. The first one was the conflict between the shareholders and the managers that arises from the fact managers hold less than 100 % of the residual claim: in fact, while suffering the entire cost related to the profit enhancement activities, managers do not capture the whole benefit generated by them. This can lead managers to try to transfer part of the resources of the firm to their personal benefit, instead of trying to maximise the firm value for the shareholders. The way to reduce this conflict and the inefficiencies that descend from it, is the increase of the fraction of the equity investment made by the managers. This can be done without increasing the amount invested by the managers by increasing the fraction of the firm financing made with debts. Moreover, as highlighted in the work of Jensen (1986) the debts, obliging the firm to have more cash outflows to pay the interests, decrease the amount of the free cash available to the managers to pursue their interests.

The second main conflict is the one between the equityholders and the debtholders: it is originated from the incentive given the equityholders by the debt contract: in case an investment is very risky, but it can grant a large return, the equityholders can benefit from it in case of a positive result, while, in case that investment fails, the consequences will be borne by the debtholders thanks to the limited liability. This can force equityholders to invest in projects characterized by a high level of risk, even if these projects are value-decreasing. In fact, the loss in the equity value suffered in case the investment turns out to be negative will be more than offset by the gain achieved in case the investment turns out to be positive. To reduce this conflict, obviously, the level of debt should be reduced.

So, since the optimal structures to reduce the two different types of conflicts that can arise are opposite, the optimal capital structure according to Jensen & Meckling (1976) is the result of a trade-off between the agency costs related to the debts and the benefits granted by an increased level of debts.

Regarding the asymmetry of information, there were two main different approaches regarding the asymmetric information, defined as the managers' and insiders' possess of private information about the characteristics of the firm return stream or investment opportunities, and the capital structure of the firm. In the first one the decision about the capital structure are considered as a signal made by the insiders and directed to the external investors, while, in the second approach, the capital structure is adapted to minimize the inefficiencies in the decisions related to the investment to be made that are a consequence of the presence of information asymmetries.

The capital structure as a signal of private information owned by the insiders was treated in the work of Ross (1977), in his model the investors do not know the actual distribution of the returns generated by the firm, while, on the contrary, the managers are aware of it; the managers benefit from highly evaluated firm securities, conversely, they suffer if the firm goes bankrupt. In this context, the investors transpose high level of debts as a signal of being a high-quality firm, indeed, due to the fact that a low-quality firm suffers higher marginal expected bankruptcy costs whichever is the amount of debts, the managers of the low-quality firms find not convenient to imitate the high-quality firms increasing their debt exposure. The theoretical model developed by Ross is confirmed even by the empirical results that underline a positive correlation between the value of the firm and the debt-to-equity ratio.

Even the model made by Poitevin (1989), despite being substantially different from the one of Ross, contemplates the use of the debt level as a signal: in this model there are two firms, an incumbent and a newcomer whose marginal costs are known only inside the firm. A newcomer characterised by low marginal costs can exploit a high level of debts to signal it, in fact, the high costs related to the issuance of debts make the firm issuing it potentially vulnerable to a predation by the incumbent that could finally lead the newcomer to the bankruptcy. So, a high level of debt can be seen by the market as a signal of being a low costs firm, since a high cost firm will not issue debt to finance itself because the resulting odd of bankruptcy due to the predation made by the incumbent firm makes the cost of misleading the capital market too high.

The capital structure to reduce the inefficiencies derived from the asymmetric information was the main topic of the work by Myers and Majluf (1984) that showed that in case the external investors are characterized by a low level of available information about the actual value of the assets of the firm, the price of the equity on the stock market

can be erroneous. In those cases, if the firm finances a new project characterized by a positive net present value through equity, the new shares can suffer a severe underpricing offsetting the NPV of the investment and leading to a loss for the old shareholders. This could lead the old shareholders not to invest in projects characterized by a positive NPV. The solution against this phenomenon is the financing through securities not undervalued by the market: so, in this situation a firm will prefer the internal capital and the debt to the equity.

The Pecking Order theory (Myers, 1984) directly descend from it; according to this theory, the capital structure of a firm is driven by its wish of funding its new projects and investments firstly relying on the internal capital, then with debts and, finally, with the equity that is considered only as the last resort available. Despite the importance of the Pecking Order theory, that was subsequently expanded in the works made by other authors, some works came up with results opposite to the ones of this theory: in the work of Brennan & Kraus (1987) the firms issue new equity and finance the investment with the positive NPV without suffering the underinvestment result of Myers and Majluf (1984). Furthermore, in this model, the firms could issue new debts instead of the equity, but they decided not to issue it. Even the works of Constantinides & Grundy (1989) and Noe (1988) obtained results in contradiction with the Pecking Order theory: the key to make not valid this theory is considering a wider range of financial choices available for the firms, instead of considering only the issuance of new equity as done in the work of Myers and Majluf (1984).

The third force driving the capital structure of a firm is related to the product/input Market interactions and is located in the point of conjunction between the industrial organization literature and the finance literature. Even in this case the main works can be divided in two main groups: the first aims at evaluating the connections among the capital structure of a firm and its strategy, while the second is dedicated to the relations between the capital structure and the main features of the product/input of the firm.

The more relevant work owing to the first group is the one made by Brander & Lewis (1986) who developed an oligopoly model in which a firm decides to undertake high level of debts as a signal of the commitment to pursue an aggressive strategy. The use of the financial structure for strategic aims in this model is purely predatory and, while in the case in which only one firm increases its debt level, that firm would exploit an advantage

from this decision, if both the firms use the debt for strategic aims, the results of both of them will be poorer.

Regarding the capital structure determination according to the characteristics of the product/input or their market, are shown in some works that, rather than building up an organic model, only provide some examples of markets in which this fact happens. The work of Titman (1984) is focused on the effect on the capital structure on the decisions related to the liquidation of a firm: since the liquidation implies some additional costs to the customers and the suppliers that are, then, moved to the liquidating firm under the form of low prices, the shareholders of that firm are likely to liquidate the firm only in that countries where the net profit from the liquidation is higher than the costs related to it, however, at the moment of the liquidation choice, these costs are unsuspected by the shareholders.

According to Titman (1984), the decision of the optimal capital structure can be taken in a way to implement the optimal liquidation policy; if the capital structure is appropriately designed, the equityholders will not want to liquidate until the firm is not in bankruptcy, while the bondholders will always want to liquidate when the firm is in bankruptcy. Thus, the eventual liquidation will be controlled by the bondholders who will take the decision to liquidate only in that countries where the liquidation choice is consistent and advantageous.

Another effect of the capital structure on the relations with other players of the market is highlighted in the work of Sarig (1988). According to him, a high level of debts gets stronger the position of the equityholders in the bargaining with their suppliers, in fact, most of the risk related to a failure in the bargaining phase is suffered by the debt holders who, contemporarily, benefit only of a limited part of the rewards of a successful deal. In this work, the debt holders play the role of an insurance for the equityholders against unsuccessful trades with the suppliers. Obviously, the more the leverage, the more the extension of this sort of insurance. Relying on this during the negotiations, the equityholders can move further their threat point with the final result of an increased value.

Finally, the last models are related to corporate control considerations: the roots of these models rely on the fact that the shares carry with them the voting rights in the shareholders' assembly, while the debts do not carry them. In this context the capital

structure can significantly influence the outcome of a takeover. In the model of Harris and Raviv (1988) an incumbent manager can influence the odds of a takeover through the variation of the percentage of equity owned by him. The quantity of shares personally owned by the manager are crucial for the final outcome that can be the retention of the control by the certain incumbent manager, the certain taking of control by his/her rival or the determination of the outcome according to the votes of the passive shareholders who will vote for the better candidate. The optimal number of shares is computed by the manager as a result of a trade-off between the capital gains on his/her stake and the possible loss of the benefits related to the control of the company.

Despite the good level of completeness, some other important determinants of the optimal capital structure were not considered in the work of Harris & Raviv (1991): the first one was the taxation; to highlight its effect, going beyond the mere release of the no-taxation assumptions from the propositions of Modigliani & Miller, we now highlight the work of DeAngelo & Masulis (1980) who developed a model in which the effects of any type of taxations – both corporate taxes, personal taxes and corporate tax shields not related to the debt – were considered in order to determine the optimal capital structure: in their conclusion the presence of other tax deductions such as the ones related to D&A or the investment tax credits act as substitutes of the tax shield granted by the debt financing, so firms characterized by high tax shields will include a low level of debt in their capital structure.

Another element to be considered in the determination of the optimal capital structure is the size of the firm; this topic was the main object of many works: according to Titman & Wessels (1988) who rely on pre-existent works, three elements related to the size can directly influence the capital structure of a firm; the first descend from the bankruptcy costs that constitute a larger proportion of the value of a firm as this value decreases, the second is the fact that wider firms tend to be characterized by a high level of diversification and, so, they are less inclined to the bankruptcy. These two elements suggest that the dimension of the firm should be directly proportional to its leverage. The last element, however, has an opposite effect: in fact, since, the smaller firms have to pay relatively higher amount of money to issue new equity if compared to larger firms, they will prefer to issue new debt instead of new equity. However, the empirical analysis made by them does not confirm their hypothesis about the statistical relevance of the size of the firm in the determination of the optimal capital structure.

2.5.2 Start-up financing

After having made a global overview of the main models related to the capital structure of a firm and how various determinants influence the choice of the optimal capital structure for a certain firm, we now focus our attention on the start-ups. We briefly provide a definition of it and, then, we explain the main theories about the start-up financing and capital structure.

Despite the term start-up dramatically increased its popularity in the recent years, mainly thanks to the huge success achieved by some internet-based start-ups that were able to disrupt their markets or create completely new markets, there is no a univocal definition of what a start-up is. There are two main definitions of start-ups, the first can be presented highlighting the definition of start-up according to Steve Blank (2010), a retired entrepreneur and adjunct professor of entrepreneurship at the Stanford University, stating that a start-up is “an organization formed to search for a repeatable and scalable business model”. This definition refers to firms that are located before the birth or start-up stage of the firm lifecycle and, together with the other definitions substantially analogous to it, is very restrictive, in fact, according to Blank, many firms that are commonly known or define themselves as start-ups could not be considered start-ups due to the fact that they have already defined their business model.

The alternative definition of start-up refers to firms that already started carrying their operations but have still not achieved the status of a small developed and an operating firm. Beyond these two main definitions, there are plenty other possible ways to define a start-up, from the more rigorous ones based on the number of employees and the amount of the revenues to the more philosophical ones stating that being a start-up is a state of mind.

Although the definition of start-up is not clear, the literature related to the way start-ups finance themselves and their capital structure is widely developed. According to Cassar (2004), despite many of the determinants explained by the main capital structure models, the start-ups are characterized by some aspects of financing that are not shared with already established firms. One of the main determinants that can influence the capital structure of a start-up is the entrepreneur himself/herself, his/her personal traits, risk propensity, exposure to financial discriminations and network resources. All

these elements are generally not taken into account for large firms since the single individual's ability of influencing the capital structure is consistently reduced for them.

The main features of the founder of a start-up that are able to affect the capital structure of his/her firm are the past working experience and the educational level; however, many works analysed even the personal data of the entrepreneur (sex, age etc.). According to Storey (1994) and Bates (1997) a high educational level and/or a relevant past working experience of the entrepreneur increase the access of his/her firm to the debt capital market. Regarding the personal data, according to Coleman & Cohn (2000) the gender of the entrepreneur could affect the capital structure for three different reasons: the credit discrimination, the different risk propensity or the different needs in terms of capital related to the different ventures established by men or women.

The work of Scherr, Sugrue & Ward (1993) deeply analyse the impact of many features related to the founder of a start-up in the determination of its capital structure: the age, the education, the business education, the past business experience inside the family, the managerial experience, the business ownership experience, the percentage of the income expected from the business, the marital status, the gender and the ethnicity.

However, despite from the theoretical findings, the empirical data do not confirm at all these hypotheses: while Scherr, Sugrue & Ward (1993) find that the leverage is negatively correlated to the age and the experience of the founder, positively correlated to the ownership experience and influenced even by the sex, the marital status and the percentage of the income expected, while the other variables are not statistically significant. Coleman & Cohn (2000) find no significant effects of the educational level, the gender and the past working experience on the leverage, but only a positive relation between the education and the level of the external loans. Even in the work of Cassar (2004) the personal features of the entrepreneur (gender, tertiary education and years of working experience) are substantially not statistically relevant regarding the financing structure of the start-ups after having considered the other determinants of his model (assets, legal organization and intention of growth). Despite being not statistically significant, Cassar highlights the interesting negative correlation between the bank financing and the year of experience of the founder that could be explained by the low risk propension of the more expert entrepreneurs or by the high level of personal wealth that can be available to an entrepreneur with a long working experience behind.

Berger & Udell (1998) highlights another important difference between start-ups and already established firms: due to the higher level of information opaqueness of small firms in comparison to large firms, the start-ups at the initial stages of their lifecycle mainly rely on internal finance – money provided to the entrepreneur by himself/herself, his/her family and friends. Then, when the start-up moves along its lifecycle the sources of funds change: the internal finance is substituted by the equity-side intermediated finance (VC funds) and by the debts (bank loans or other financial institutions). If the firm does not fail and its growth goes on for some years, finally, it could have access to the public market of equity and debts (shares and bonds). The information opaqueness, together with other characteristics typical of the start-ups can limit the use of venture capitals as source of funding, contrariwise, they can enlarge the role of the banks in the financing.

The fact that at the beginning of their lifecycle most of the start-ups could not rely on the conventional external sources of finance, but are somehow forced to resort to the internal finance or to other unconventional sources of capital is highlighted in the bootstrapping theory (Bhide, 1992) that states that the vast majority of the start-ups are launched with the minimum capital needed and in many cases this capital comes from the personal resources of the owner or his/her friends and relatives. Furthermore, the fact of being rejected by a venture capital fund does not automatically imply that the start-up is doomed to fail due to the restrictive criteria applied by most venture capital funds in their selection process.

Another element sharpened by the work of Berger & Udell (1998) is that most of the small firms are owner-managed, so, the agency problems that could be key factor to drive the optimal capital structure for large firms, are generally irrelevant. On the other hand, the communion between the ownership and the management can generate some other agency problems such as the pursuing of actions that do not maximise the added value only to reduce the risk taken by the owner.

Going in detail analysing the single determinants of the capital structure of a start-up, the effect of the size should be more prevalent for start-ups than for already established firms, due to their high opaqueness, this will lead small size start-ups to be offered less capital at higher interest rates, and, so, discouraging them from the use of the external finance (Berger & Udell, 1998). Contemporarily, the higher relative incidence of the transaction costs on the total costs associated to the financing choice can strongly reduce

the financing options available for a small size firm. Finally, since the bankruptcy costs are generally considered as an inverse function of the size of the firm, smaller firms will rely less on the external finance, especially on the debts, resulting in a lower leverage in comparison to start-ups with a larger size.

The second main determinant, that, in particular, is much more important for start-ups than for larger firms, is the asset structure, in fact, according to Harris & Raviv (1991) the liquidation value of a firm is directly proportional to the level of tangibility of its assets since they can be easily sold by the bank in case of bankruptcy minimizing the financial loss, moreover, these assets can reduce the costs related to the adverse selection and moral hazard problems being used as collaterals in the debt contracts. All these factors result in an easier and cheap access to the external finance, especially the debts, for the firms with more tangible assets, leading them to a higher leverage. The low level of information available regarding the start-ups and the substantial absence of alternative options to reduce the financial risk dramatically increases the effect of the asset structure in the capital structure of a start-up.

The legal status of the venture, in particular its incorporation, is an element that can affect the financing structure of a start-up, while, on the contrary, it does not influence the capital structure of large firms since all of them are already incorporated firms. According to Storey (1994), the incorporation can act as a signal of credibility and formality and can indicate a higher potential of growth. This effect is empirically confirmed in the work of Storey and in the work of Freedman & Goodwin (1994) who get to the result that the incorporation is associated to a high use of the bank financing. A similar result was obtained even by Coleman & Cohn (2000) who find a positive relationship between the leverage and the incorporation.

In his work Cassar (2004) considers all these possible determinants of the capital structure of a start-up adding to them the intention of growth and the growth opportunities. In fact, according to Myers (1977) the intention of growth can increase the agency costs related to the financing by increasing the conflicts between equityholders and debtholders. However, according to Michaelas, Chittenden & Poutziouris (1999) the agency problem can be reduced issuing short term debts instead of long term debts, as a consequence of this there is a positive correlation between the future growth opportunities and the short-term leverage. Moreover, the choice of being financed by banks is strictly related to the intended growth since the choice about the

financing structure can be based on the beliefs regarding the future financing needs. So, if a firm will reasonably need additional capital in the future, it can have an incentive to build credit relations with banks, indeed, the fact of building a strong relation in an early moment of the lifecycle of the firm can lead to greater benefits for it in terms of availability and cost of the future financing.

The result of the empirical analysis made by Cassar shows that the size of the start-up is statistically significant and positively correlated with the leverage, the outside financing, the long-term leverage and the bank financing. Even the asset structure is significant, however its contribution is opposite according to the different variables considered: it is positively correlated to the leverage and the outside financing, while being negatively related to the long-term leverage and the bank financing. Finally, both the incorporation and the growth intentions are significant only regarding the bank financing, both of them with a positive correlation.

The works cited, until this point, studies of the determinants of the capital structure of a start-up only in terms of leverage and bank financing, completely neglecting the role of venture capital funds in the financing of the start-up firms. Landier (2003) developed a model explaining the choice of being funded through bank debts or venture capital funds: the main determinants behind this decision is the exit option of the entrepreneur; if he/she has a good exit option he/she will prefer being financed by a venture capital since it protects the investor through control rights, technological monitoring and staged financing. Conversely, if the exit option is bad, the entrepreneur will opt for a bank debt that protects him/her as it contemplates lower technological monitoring, restricted control rights and committed finance. The main determinants behind the exit option are the legal environment and the stigma of failure. Two different equilibria can result from this model: a low-risk one and a high-risk one: in the first equilibrium the entrepreneurs prefer to undertake safe investments, the failure is highly stigmatized thus the bank debt is the optimal financing technique. On the contrary, in the second equilibrium the entrepreneurs undertake risky investments and the optimal way of financing is the venture capital.

The last relevant determinant of the capital structure and the fundraising technique of a start-up is the geographical location, in fact, despite this element has been practically neglected by most of the authors who focused their attention on the capital structure of the start-ups; indeed, they do not never cite the geography among the possible

determinants and do not include it in their empirical analysis, this is probably a consequence of the use of data mainly extracted from national-specific databases that prevented any possible analysis of this type. The only work trying to consider the implications of the geographical location on the start-up financing is the one made by Tariq (2013), who describes the main financing trends across five countries. Despite this analysis is not rigorous and is based only on qualitative observations, the differences between the various countries in the start-up financing are glaring and are explained by many causes: from the differences between the financial systems to the cultural and religious customs.

2.5.3 Crowdfunding and ICOs

The literature regarding the determinants of the decision of the fundraising technique made by an entrepreneur who is looking for a technique to fund his/her start-up is not so developed regarding the non-conventional techniques such as the ICOs and the crowdfunding; very few articles and papers treated this argument in detail, while some other publications marginally addressed this topic within more general works about the ICOs and/or the crowdfunding. The shortage of academic publications on this topic is more evident considering the decision of running an ICO due to the newness of this phenomenon; until now no one explicitly covered this topic, since the majority of the publications focused on the ICOs dealt only with the legal aspects related to them and the determinants to explain the success or the failure of an ICO campaign. Anyway, we now try to provide an overview as complete as possible on the reasons that can explain the decision of an entrepreneur to choose a crowdfunding campaign instead of another financing technique or another type of crowdfunding and even to adapt the conclusions of the various works to the peculiarities of the ICOs.

The work of Wilson & Testoni (2014) makes a brief comparison between the reasons behind the decision made by an entrepreneur to launch an equity-based crowdfunding campaign instead of trying to be financed by business angels and venture capital fund: the main elements considered in this work are the investment size, the investment motivations, the risk/return profile, the investment model and the investors' characteristics. Regarding the investment size it highlights that the amount of funds needed is one of the main discriminants among the decision of launching a crowdfunding campaign or being financed by a venture capital fund: the money collected by the

crowdfunding campaigns is considerably lower than the one provided by venture capital funds.

Even the characteristics of the product under development strongly influence the decision: the products financed through a crowdfunding campaign cover a broad investment spectrum (food, hi-tech, music, art, real-estate), while the entrepreneurs who decide to be financed by VC funds mainly are high risk- high technology-based companies. Finally, since a crowdfunding campaign requires a lot of information to be publicly disclosed, the presence of an innovative technology could force the entrepreneur not to launch a crowdfunding campaign because of the fear of being imitated by the competitors, so the crowdfunding is usually chosen by entrepreneurs whose intellectual capital can be protected with means different from the secrecy or based on non-innovative technologies.

This point was covered even by O' Connor (2014) whose work particularly covered the consequences of a crowdfunding campaign for an innovative start-up and its intellectual property: in his conclusion he states that a start-up with a consistent IP portfolio will be less inclined of collecting funds via a crowdfunding campaign due to the risk of compromising its IP assets and to the higher cost in which it would incur to defend its IP assets.

This conclusion could apparently be effective even for the ICOs that are characterized by a quite high level of disclosure about their underlying technology (e.g. the decision of making publicly available the code before the beginning of the ICO campaign) that would make very hard for the venture that is launching the campaign to protect its innovative technology from thefts and imitations, however this problem is generally not so stressful for most of the ventures running an ICO since the majority of them already released their content with an open-source license.

One of the few works explicitly aimed at analysing the rationale behind the decision made by the entrepreneur of launching a crowdfunding campaign, although it is focused on an extremely specific niche analysis, is the one made by Belleflamme, Lambert, & Schwienbacher (2014), that is aimed at explaining the determinants of the decision made by an entrepreneur of choosing a reward-based crowdfunding instead of crowdfunding techniques that give the funders part of the future profits that will be earned by the venture, once the product will be launched on the market (equity-based crowdfunding)

or royalty-based crowdfunding). The article develops a theoretical model regarding the entrepreneur's choice between the two crowdfunding techniques according to the amount of funds needed and considering even the effect of various types of asymmetry of information; in these cases the entrepreneur is supposed to be better informed than the funders. The work is only theoretical and it is not supported by empirical evidences.

The conclusion of the article, according to the model developed, is that the entrepreneur prefers a reward-based crowdfunding (in detail they considered the pre-sale of the product as a form of reward) when the amount of capital to be collected is somehow small; in fact, the pre-ordering can be used as a mean to make a price discrimination between the participants in the crowdfunding campaign and the other people who will buy the product, once developed, at the traditional market channels. As the initial amount of capital needed increases, the pricing scheme has to be strongly sprained by the entrepreneur to attract enough contributions to fund his/her venture. When the amount to be collected outdates a certain threshold, the effect of this distortion in the pricing raises so much, damaging the profitability of the reward-based crowdfunding campaign.

Contemporarily, the convenience for the entrepreneur to run an equity/royalty-based crowdfunding campaign increases hand in hand with the increase of the amount needed. This effect is caused by the lower fraction of the total profit that has to be given up by the entrepreneur to repay the backers who invested in the campaign. The presence of information asymmetries does not lead to results conflicting with the ones of the perfect information case, however, in some cases, such as the one in which the funders have no information about the actual quality of the product under development, the equity/royalty-based crowdfunding is favoured, since the inability of ascertaining the true quality of the product constraints the entrepreneur more when he/she is attempting to persuade people to pre-order the product than when he/she is attempting to persuade people that will not necessarily use the product to invest in its development in exchange of part of the future profits of the venture.

However, this model considers the amount of funds needed as the only driver behind the decision of the entrepreneur of choosing one crowdfunding technique instead of another, completely neglecting the characteristics of the product under development, of the venture behind the campaign and of the entrepreneur who is leading it.

Gerber, Hui & Kuo (2012) in their work tried to analyse the rationale behind the decision of launching a crowdfunding campaign on some of the leading portals (kickstarter.com, IndieGogo, and RocketHub), however the work is mainly focused on the psychological motivations at the base of the decision and not on the characteristics of the product, the venture and the creator of the campaign. So, their results are practically useless for our purposes.

Paschen (2016) analysed the best crowdfunding technique according to the position of the start-up in its lifecycle: a start-up at the initial stage of its development should mainly rely on the donation-based crowdfunding due to the impossibility of giving a tangible reward to the contributors, moreover, the donations permit a high level of flexibility in the use of the funds collected in the crowdfunding campaign and practically set to zero the odds of disappointing the contributors. Then, once developed a prototype, the entrepreneur should finance his/her venture through the lending-based crowdfunding relying to the existence of a product to provide the contributors with some forms of returns and trying to exploit the crowdfunding campaign to build a strong community of early-adopters. Finally, when the venture is going to attack the market, the equity-based crowdfunding is the most suitable technique due to the high requirements in term of capital to collected typical of this stage.

We can conclude this section stating that the topic of the rationales behind the choice of the fundraising technique made by the entrepreneurs is practically uncovered by the existing literature, in particular for the ICOs that already suffer a shortage of dedicated literature.

3 Scope definition and research problem description

3.1 Introduction

Starting from the available literature regarding the ICOs and the crowdfunding campaigns, the aim of this work is a deep analysis about the determinants behind the choice made by an entrepreneur owning a start-up between launching an ICO or a crowdfunding campaign to finance his/her rising business. The scope of the work is to understand which characteristics influence this decision and in which way.

This work is based on the existing literature about the determinants of the choices about the capital structure and the financing techniques made by the start-up firms; in the definition of the determinants to be considered we tried to adapt the more relevant elements from the theoretical frameworks from the academic literature to the peculiarities of the ICOs and the crowdfunding campaigns.

Despite the growing popularity of both the crowdfunding campaigns, that have already been the object of several works, and the ICOs, that are a much more recent phenomenon that grabbed the attention of the academics only since 2017, there are no other works addressing the topic of the decision between the crowdfunding and the ICOs and, more in general, regarding the determinants behind the financing technique decisions considering techniques belonging to the alternative finance instead of the conventional ones. Regarding the crowdfunding, there are only few works that cover this topic analysing the choice between different crowdfunding techniques, while, for the ICO, the available literature was mainly focused on a preliminary general analysis of the phenomenon, regulatory issues and the analysis of the determinants of success. Thus, this work is aimed at covering this lack in the literature about ICOs and crowdfunding.

3.2 Goal of the work

The main theme of this work is the identification of the determinants that explain the decision made by an entrepreneur – or a person with an idea to be turned out into a new business - of launching an ICO or a crowdfunding campaign to finance the development of his/her project. During the last years of 2000s and the first years of 2010s crowdfunding has been established as a consistent alternative to the conventional informal finance and the bootstrapping to fund start-ups at the first stages of their lifecycle. The phenomenon of the ICOs is much more recent and gained popularity from 2017 contemporarily with the dramatic increase in the diffusion of the blockchain technology and the cryptocurrencies. Starting from the first half of 2017 plenty newly created ventures launched their ICO campaign to obtain the funds needed to finance the development of their product.

The ICOs and the crowdfunding campaigns emerged as possible alternatives to the pre-existing financing techniques already available for the start-ups: owner's capital and other informal finance techniques, bank debts, angel investors and venture capital; sometimes replacing them at all and sometimes being used before or after another more traditional financing technique.

The topic of the financing of the start-up companies directly descend from the main theme of the capital structure of the firm whose modern theory started with the famous propositions of Modigliani & Miller (1958) about the irrelevancy of the capital structure; however, the start-ups show some peculiarities that lead to works expressly dedicated to the start-up financing theme; the main element differentiating the start-ups from the other firms is high information opaqueness and, so, the consequent problems related to the asymmetric information (Berger & Udell, 1998) (Cassar, 2004). The main reasons for this opacity rely upon the absence of disclosure about the track record and the financial data of the start-ups company. This lack of information can increase the difficulties in obtaining an access to the financing sources.

This problem is still more relevant for the ventures running an ICO or a crowdfunding campaign which are usually characterized by a high innovativeness; according to Backes-Gellner & Werner (2007), the start-ups characterized by a high level of innovation experience more difficulties in the financing due their intrinsic characteristics: first of all, the absence of a previous history makes very difficult for the possible investors to

Goal of the work

evaluate the business plan proposed by the start-up, contemporarily, even the value of the project itself, relying on an uncharted technology can be very hard to be assessed, furthermore, the information asymmetries are expected to be wide. The possible results of these factors on an innovative start-up trying to be funded are the adverse selection and the credit rationing since the investor cannot tell good investments from the bad ones and, so, his/her propension to invest will be lowered by the lower expected payoff of his/her investment due to the higher risk of choosing a low-quality start-up to invest in.

Moreover, the people investing in ICOs and/or crowdfunding campaigns are generally not professional investors, so their ability of assessing the potentiality of the start-up in which they are going to invest is further reduced in comparison to a start-up financed by professional investors such as banks, business angels and venture capital funds (Ahlers, Cumming, Guenther, & Schweizer, 2015).

Due to these characteristics the start-ups characterised by a high level of innovation, category on which most of the ventures running an ICO or a crowdfunding campaign belong, experience higher default risk than the other start-ups (Audretsch, 1995).

So, the entrepreneur's choice about the way his/her start-up should be financed acquires a critical importance since trying to be funded through financing techniques that do not fit with the features of the entrepreneur himself/herself, of the product under development and on the firm can compromise any possibility of success. For the above-mentioned reasons, the financing choice is even much more critical for the highly innovative start-ups.

In many cases, the ventures launching an ICO or a crowdfunding campaign are in an early stage of their lifecycle making unavailable for them many options of funding such as the venture capital funds that usually invest in already established start-ups (Maier & Walker, 1987), and the bank loans, that may be available for these particular start-ups, but with low amount or high interest rates due to the high risk of moral hazard that may arise thanks to the high percentage incidence of the external funding that may induce the entrepreneur to misuse or misallocate the funds for his/her personal benefit (Denis, 2004). So, ICOs and/or crowdfunding can remain as the only viable alternative in case the personal funds of the entrepreneur and the money from his/her family and friends are not enough to totally fund the development of the venture. In this context the ICOs

and the crowdfunding campaigns turn out to be two options of funding that are alternative one to each other and the choice among them is one of the most crucial decision that an entrepreneur has to take at the beginning of his/her experience at the lead of a newly created company. This decision can be influenced by the personal characteristics of the owner of the start-up and by the characteristics of the industry and the product under development.

As showed in the literature review, many works empirically analysed the impact of the characteristics of the founder, of the industry in which the firm operates and of the product under development as determinants of the decision of financing the start-up with debts instead of equity, in this work we want to build a framework analogous to the ones of that works to study which are the main determinants able to influence the entrepreneur's decision between launching an ICO or a crowdfunding campaign to finance his/her start-up and which of these determinants are associated with the choice of an ICO and which others are associated to the choice of a crowdfunding campaign.

3.3 Research hypotheses

Starting from the empirical works aimed at finding the determinants behind the decision regarding the funding technique made by start-up companies (Cassar, 2004) (Klačmer Čalopa, Horvat, & Lalic, 2014) (Scherr, Sugrue, & Ward, 1993) (Sanyal & Mann, 2010) that took as inputs the personal data of the entrepreneur, together with some features related to the firm and the product under development, to try to understand their statistical significance in the decision and, for those characteristics that turned out to be relevant, their impact in favour of one technique instead of another. All these works were mainly based on the conventional techniques used by the start-ups to finance themselves, primarily bank loans and equity via business angels and venture capital funds, without analysing the influence of the same determinants on the more recent financing techniques alternative to the conventional ones.

Thus, we decided to make an analysis on the influence of those characteristics on the decision of the entrepreneur of being financed through an ICO or a crowdfunding campaign; we choose these two financing techniques relying on the presence of many similarities among them, enabling us to better compare the ICOs to the crowdfunding than to other more conventional techniques. We took some of the main elements considered as possible determinants of the financing choice by the existing literature and, then, we added even some other possible determinants, relying on the peculiar features of the ICOs and the crowdfunding and on some determinants considered in other works aimed at different scopes, but that we considered that are likely to be even determinants of the fundraising technique decision.

The main possible determinants we considered were related to the geographical origin of the entrepreneur, his/her academic background and past working experience, some characteristics of the product/service under development, some features related to the numerosity, the capability and the organization of the founding team and, finally, the social visibility of the entrepreneur himself/herself.

3.3.1 Entrepreneur's related features

Regarding the characteristics of the entrepreneur that may influence his/her decision about the financing technique, we mainly considered two different elements: the personal data and the human capital; regarding the personal data we collected the

information about the age, the sex and the geographical origin of the entrepreneur, while, regarding the human capital, we collected the information about the academic background and the past working experience.

3.3.1.1 Entrepreneur's personal data

Starting from the entrepreneurs' personal data, the main contributions in the existing literature come from the works of Cassar (2004) and Scherr, Sugrue & Ward (1993): the first considered the gender among the possible determinants of the capital structure of a start-up, however, in his work, he came at the conclusion that the gender of the entrepreneur does not influence the decisions regarding the capital structure of a start-up, while the second considered among the possible determinants the age, the marital status and, the ethnicity, founding significant the contributions of all these factors.

Thanks to the result obtained by Cassar (2004), we decided not to consider the gender among the possible relevant determinants able to influence the financing decision, moreover, this choice was also supported by the fact that the vast majority of our sample was composed by male entrepreneurs, with an extremely low percentage of females, fact that would have made statistically irrelevant any possible conclusion. Concerning the age of the entrepreneurs, despite the work of Scherr, Sugrue & Ward (1993) highlighted the relevance of this characteristic in the decision of the financing technique, we did not consider it primarily due to the lack of an acceptable number of observations, since we could not infer this information from the LinkedIn profiles of many of the people who launched a financing campaign. Moreover, the age was considered among the possible determinants even by Åstebro & Bernhardt (2003) who did not find any explanatory power related to this variable. These two arguments stand even for the marital status, whose irrelevance was one of the conclusions made by Åstebro & Bernhardt (2003) and for which we were not able to collect the information at all from the LinkedIn profiles.

The last determinant considered in the work of Scherr, Sugrue & Ward (1993), the ethnicity was particularly interesting and grabbed our attention, however we could not directly implement it as a possible determinant for our analysis due to the substantial differences between the composition of our sample and the composition of the sample analysed by Scherr: indeed, the analysis conducted in this work was based on a sample took from the Characteristics of Business Owners (CBO) database made available by the US Census Bureau and, so, including only data from US-based companies. Conversely,

our sample, both for the crowdfunding and the ICOs parts, included campaigns worldwide distributed; it is immediately evident that starting from a sample including data from a single country the information about the ethnicity can be meaningful, while, relying on a sample with data from different countries it loses its meaning.

So, we decided to consider the geographical origin of the entrepreneur among the possible determinants able to influence the financing decision. This decision was supported also by the existing literature: in his work Tariq (2013) underlined the differences in the preferred financing techniques among the start-ups coming from different countries due to multitude of reasons: ongoing financial trends, the structure of the financial system, cultural and religious beliefs and, finally, and the lack of knowledge of some financial options that were available. The work of Korosteleva & Mickiewicz (2008) states that the level of access of the start-ups to the different sources of external financing depends by the local financial environment of the country in which they operate: more in detail the start-up financing is eased in the countries characterised by a higher level of financial liberalisation and financial openness.

The geographical origin has a relevant impact on the financing decision not only thanks to the different financial markets of the various countries that affect the supply of the financing techniques and make easier for an entrepreneur to choose to be funded in a way instead of another, but even for the differences in the entrepreneurs' behaviour that can be found in different geographical regions: according to Autio (2007) the incidence of the entrepreneurs characterized by high-growth ambitions strongly varies worldwide: Oceania and North America show the highest rates of entrepreneurial activity, while Europe and the highly-developed part of Asia show the lowest levels. This result can lead to a strong impact on the entrepreneurs' financing decisions since a different level of growth ambition can significantly affect the choice of a financing technique instead of another.

Finally, the importance of considering the impact of the geography in the process of the firm financing was particularly stressed in the theoretical work of Pollard (2003) who defined the firms as spatial since they are materially part of a geographical constellation of relationships that have to be produced and reproduced for the firm to function. According to this view, the activities of a firm are strongly affected by the geographical locations that *ceteris paribus* can influence all the relevant decisions related to the development of the firm. Pollard (2003) provided even a simple example related to the

small firm financing: when asking for a bank loan to finance his/her start-up, it is very common that the bank grants the loan to the entrepreneur only if he/she is able to provide some collaterals to secure the loan. Among the collaterals, private houses and factory buildings are the most widespread: the value of these buildings is strictly related to the geographical location in terms of the workings of property developers, policy-makers and real estate markets and significantly varies from country to country, even for very similar buildings, making the loan more or less convenient for the entrepreneur.

Thus, the first research hypothesis to be tested is:

H1: The geographic origin of the entrepreneur influences the decision between an ICO and a crowdfunding campaign

3.3.1.2 Entrepreneur's human capital

After considering the personal data of the entrepreneur, we moved to the information regarding his/her human capital considering the academic background in terms of qualifications, field of study and alma mater and the past working experience in terms of years of experience, number of past entrepreneurial experiences and top roles covered in the precedent occupation.

The importance of the of human capital, whose concept was initially theorized by Becker (1964), in the start-up financing is due to its use as signalling. This means. being able to tell high ability workers from low ability workers (Spence, 1973), this signalling capacity can be critical in the start-up financing due to the high information opaqueness that generally characterizes the small newly created venture, in fact, due to the difficulties that a potential investor can face in the valuation of the business plan, the product and the technology of the start-up, the human capital can be used as a criteria to select the firm in which invest in starting from the assumption that a start-up characterized by a higher level of human capital is more likely to achieve a good level of success and, so, grant an adequate return to the investors. As an example, a high human capital positively influences the valuation of the start-up made by venture capital funds before their final decision about investing or not in the entrepreneurial venture (Hsu D. H., 2007).

Due to the high importance of the human capital factor in the process of the selection of the start-ups in which invest in made by the funders, we decided to build hypotheses related to the impact of the human capital on the entrepreneur's decision of the financing

technique to investigate if, due to its importance in the valuation to whom the start-up will be subject, the level of human capital is able to drive the choice of the financing source.

According to the definition of Becker (1964) the human capital includes all the expertise and the acquaintance that a person acquires across the scholastic experience, the job training and any other type of experiences; starting from this, we decided to use the academic background and the past working experience as proxies of the level of human capital of each entrepreneur.

Regarding the relationship between the academic experience of the entrepreneur and the capital structure of a start-up, the existing literature already covered this topic for the conventional sources of financing: according to the empirical analysis made by Bates (1990) and based on a sample of US-based business start-ups were, the education level is one of the major determinants of the financial structure of a start-up. Scherr, Sugrue & Ward (1993) considered the owner's education in terms of the sum of the studying years and the presence of a business education among the possible determinants of the use of debt in the start-ups finding a significant, but unexpected result regarding the years of academic experience: in fact, the coefficient related to this variable turns out to be negative, meaning that the capital structure of the start-ups run by less learned entrepreneurs experience a high percentage of debt, in contradiction to the result of researches that studied the same phenomenon for already established small firms (Ando, 1988); the authors tried to explain this apparently meaningless result considering that the high complexity inherent to the start-up financing led the lenders to consider the education of the entrepreneur not in terms of the sum of the years in which he attended school and universities, but looking for other aspects. Even Cassar (2004) considered the academic background of the entrepreneur, evaluating if the presence of tertiary education could affect the capital structure of the start-up, however in his work that variable turned out to be not significant. Finally, Burton, Sørensen & Beckman (2002) found no relevancy on the impact of a degree as a determinant for the external funding for a start-up company.

Despite the high interest and the fact of being analysed in several works, there are no univocal results regarding the actual influence of the academic background on the capital structure and the choice of the financing techniques for the start-ups; moreover, the peculiarities of the topic of the decision between an ICO or a crowdfunding campaign

can enlarge the importance of the effect of the academic background on this choice, in fact, going beyond the importance of the human capital as a signal directed to the possible lenders and investors, the intrinsic higher technical complexity of the ICOs in comparison to crowdfunding campaigns can constitute a barrier for the less educated entrepreneur who are not in possession of the sufficient skills to launch such a campaign, so we can expect that the low qualified owners should be more likely to launch a crowdfunding campaign than the highly qualified ones who, on the contrary, should be more likely to launch an ICO.

Thus, the second research hypothesis we want to test is:

H2a: Entrepreneurs characterized by a higher level of education are more likely to launch an ICO rather than a crowdfunding campaign.

The second main element we considered among the human capital is the past professional experience; similarly to the academic background, even this topic was intensively covered by the existing literature dedicated to the start-ups capital structure. The work of Chandler & Hanks (1998) considered the human capital only in terms of past professional experience, disregarding the academic contribution, analysing if the level of human capital could imply differences in the amount of capital directly invested by the entrepreneur and, so, could affect the capital structure of the start-up. Despite the premises, the result was that the human capital was not significant. A similar result was obtained by Cassar (2004) who considered the past professional background of the entrepreneur in terms of sum of working years without finding significant that variable. Conversely, Scherr, Sugrue & Ward (1993) found that the business experience, both the one of the founder himself/herself and the one of his/her family were statistically significant and positively related to the incidence of debt on the capital structure of the start-up, while the managerial experience did not turn out to be relevant at all.

The work of Burton, Sørensen & Beckman (2002) found that the number of start-ups founded in the past was not a significant determinant regarding the access to the external capital: this fact can descend from two reasons: first of all, the effect of the past entrepreneurial experience strongly depends on the outcome of those attempts since the investors will be more likely to fund an entrepreneur who successfully founded many start-ups, while negative past experiences could compromise the capacity of obtaining new funds. Secondly, there is also the possibility that a successful past entrepreneurial

experience provides the internal funds to the entrepreneur to launch another venture, counterbalancing the effect signalling effect of the positive start-up experiences to obtain external funds. Conversely, the past experience in terms of the typologies of roles covered was significant: people with a previous senior management experience were more likely to rely on external sources of funds. The work of Gimmon & Levi (2010) found that the business expertise had a significant positive effect on the possibilities of accessing to the external sources of funding, while the technological expertise did not. Colombo, Delmastro & Grilli (2004) empirically studied the relation between both the presence of a past entrepreneurial experiences – considered in their analysis through a binary variable according to the presence of at least one past entrepreneurial experience – and the fact of having covered top managerial roles and the size of the new start-up founded: both the determinants turned out to be statistically significant, positively influencing the size of the new venture. The precedent top-management experience was considered among the possible determinants related to the access to the loan market of technological start-ups in the work of Colombo & Grilli (2007) who empirically analysed a sample of 386 Italian start-ups, however, in this analysis, it turned out to be not statistically significant. Despite this empirical result, since a strong difference in the size of the start-up may be related even to a difference in the way the start-up is funded, due to the different capital needs of start-ups characterized by different sizes, it is still interesting to analyse the impact of these determinants on the decision about the financing technique.

One of the main reason behind the importance of the past working experience on the capital structure of the start-up can descend from the fact that it is one of the most important criteria used to evaluate a start-up, both by the professional investors such as business angels and venture capital funds (Carpentier & Suret, 2015) (Maidique, 1985) and by non-professional investors such as the people investing in the crowdfunding campaigns (Pila & Rossi-Lamastra, 2018). Exploiting the topic of the criteria of selection of the start-ups by the venture capital funds more in detail and, in particular, referring to the elements we highlighted before, it was empirically proved that the leadership experience is a knock-out criterion in the evaluation process: a founding team without at least a member who already covered a top role position is more likely to be refused by a venture capital fund; however, this benefit is not proportional to the number of team members who covered top roles position in their past working experience since not all

the members of the founding team should cover leadership roles (Franke, Gruber, Harhoff, & Henkel, 2008).

Based on these works, we decided to verify the relevance of the past working experience of the entrepreneur on the decision between the launch of an ICO or a crowdfunding campaign: for such a decision the past experience of the entrepreneur can take action as a determinant on two parallel fronts: from one side the higher skills needed to launch and manage an ICO can be an incentive for the less talented entrepreneurs to decide for alternative financing options, while the second side is strictly related to the signalling role of the past working experience to the possible lenders and investors that acquires a greater importance in a context in which many of the ventures are characterised by a high technology at an earlier stage of its development.

Thus, the third, fourth and fifth hypotheses to be tested are:

H2b: A higher working experience of the owner influences the decision between an ICO and a crowdfunding campaign

H2c: The past top roles covered by the entrepreneur influence the decision between an ICO and a crowdfunding campaign

H2d: The past entrepreneurial experience of the owner influences the decision between an ICO and a crowdfunding campaign

Regarding the past working experience of the entrepreneur we collected even the information related to the last city in which he/she worked before launching the funding campaign, however we decided not to use this information to test a specific research hypothesis due to the absence of any index about its relevance on the entrepreneur's funding decision in the existing literature and due to the low statistical relevance of the variables built from this information in the first preliminary analysis we made.

3.3.2 Products related features

Regarding the characteristics of the product under development that could influence the financing decision made by a start-up company, the existing literature was mainly focused on the effect of the industry in which the start-up operates on the capital structure of the firm, obtaining in many cases relevant results Scherr, Sugrue & Ward

(1993). However, we did not consider this element among the possible determinants to verify, since we had already used the typology of the product under development as a criterion to build a sample composed by more homogenous sub samples in order to obtain more relevant results not influenced by the wide variety of products that are financed through ICOs and crowdfunding campaigns.

The first characteristic we decided to consider as a possible determinant of the decision between launching an ICO or a crowdfunding campaign was the tangibility of the product: many works among the existing literature faced up this topic: according to Gompers (1995) and Harris & Raviv (1991) the tangibility or not of the product under development was one of the main drivers of the choice between being financed through venture capital funds or through bank loans: this result descends from the higher value of the tangible assets of a venture characterized by a tangible product; since these assets can easily be used as a collaterals, those kinds of start-ups are more likely to be financed by bank loans, while the start-ups characterized by an intangible product mainly tend to be financed by venture capital funds.

The hypothesis of the relevance of the tangibility of the product in the capital structure decision for a start-up was tested in the empirical analysis made by Cassar (2004) who considered the percentage of the non-current assets on the total assets as a proxy of the level of tangibility of the assets themselves. The analysis gave as a result a strong statistical significance of the variable measuring this information: more tangible assets had a positive relationship with the high long-term leverage and the level high bank financing while contemporarily having a negative relationship with the leverage and the outside financing: the high level of bank loans is completely in line with the conclusion made by Gompers (1995) and Harris & Raviv (1991), but even the result of the long-term leverage can be brought back to them, in fact, using these assets as collaterals can enable the firms to obtain longer loans at a more favourable conditions than the firms that cannot use the assets as collaterals.

The tangibility or not of the product under development acquires further relevance for the ICOs and the crowdfunding campaigns due to the high diffusion among them of a consistent number of ventures aimed at developing online platforms and/or software and, so, characterised by an extremely limited level of tangibility. This could be particularly evident for the ICOs that, due to the necessity of relying on the blockchain technology to issue the tokens to be sold in the offering, could more easily attract

entrepreneurs aimed at launching products and/services based on the blockchain technology and, so, characterised by a low level of tangibility.

So, the sixth hypothesis we want to test is:

H3a: The tangibility of the product under development increases the likelihood of launching a crowdfunding campaign rather than an ICO

The second element related to the product under development we took into account was the presence of a working prototype or a beta version before the moment in which the funding campaign was launched, we used this information as a proxy of the position of the venture looking for funds in the start-up lifecycle with the final aim of understanding if the level of development of the firm itself was a relevant determinant in the choice between an ICO or a crowdfunding campaign.

According to the framework developed by Paschen (2016) that originated from the pre-existing work of Lewis & Churchill (1987) the lifecycle of a start-up can be divided into three main phases, the pre start-up stage in which the founder develops his/her business idea and starts the evaluation of the feasibility of a business plan based on this idea, developing a solution to a problem currently faced by the possible customers and identifying all the other players involved: customers, partners, suppliers and competitors. The second phase is the start-up stage in which the venture is focused on the realization of a prototype/minimum viable product and on the implementation of a detailed business model with a particular focus on the revenues. Finally, the last stage is the growth stage in which the firm has become an established entity and has obtained the validation from the market, in this phase the firm is focused on scaling its operations to grow and earn an economic return above the average.

Most of the start-ups launching an ICO or a crowdfunding campaign are placed in the first two stages of the lifecycle: thus, the presence of a working prototype/beta version can be a good proxy to ascertain the position of the start-up in the lifecycle.

The existing literature shows that start-ups occupying different stages of their lifecycle are generally more likely to be financed through different funding techniques and to have different capital structures: in the first stage the entrepreneur mainly relies on his/her capital and on other forms of informal capital (provided by the family, the friends etc.), in the second stage the preminent founding techniques are banks and business angels,

while in the last stage it is very relevant the contribution of the venture capital funds (Berger & Udell, 1998) (Tariq, 2013).

The work of Paschen (2016), going beyond the mere definition of the stages of the start-up development, focused its attention on the decision of the crowdfunding technique most suitable to each stage of the lifecycle: according to her, a start-up in the first stage should rely on the donation-based crowdfunding since there are no very low possibilities to offer a tangible reward to the contributors, the donations grant a high degree of flexibility and reduce the chances of disappointing them. In the second stage, entrepreneurs should launch lending-based crowdfunding campaigns due to the presence of a prototype able to grant some forms of return and to the possibility of exploiting the campaign to build a community of early adopters. Finally, in the last stage, the best choice is the equity-based crowdfunding that is the only crowdfunding technique able to meet the higher capital requirements needed in this stage. This work does not consider the reward-based crowdfunding, however, due to its characteristics, the motivation to choose the lending-based crowdfunding for the start-ups in the start-up stage can be valid even for the reward-based crowdfunding.

Despite the ICOs and the crowdfunding campaigns are usually considered to be two funding options available to start-ups in the same stage of the lifecycle, we want to investigate if the choice between them is influenced by the position in the lifecycle, meaning that the ICOs and the crowdfunding campaigns are not perfect substitutes.

So, the seventh hypothesis to be tested is:

H3b: The presence of a working prototype influences the decision between an ICO and a crowdfunding campaign

Regarding the characteristics of the product under development, we collected even the information about the presence of a patent or some other forms of intellectual property rights (e.g. a licence) attached to the product under development.

Despite being substantially neglected by many works that empirically studied the start-up financing (e.g. by Cassar (2004) and Scherr, SUGRUE & WARD (1993)), the impact of the patents on the start-up financing was object of some works: Hsu & Ziedonis (2007) empirically studied the influence of patents in acquiring the financial capital: the results obtained confirmed the relevance of patents as a positive signal to the venture capital

funds, especially for the firms at the earlier stages of their development, so the presence of patent can be a strong determinant of the entrepreneur's decision of trying to be financed by venture capital funds.

Regarding the effect of patents on a firm wanting to launch a crowdfunding campaign, the work of O' Connor (2014) states that a start-up with a consistent IP portfolio will be less inclined of collecting funds via a crowdfunding campaign due to the risk of compromising its IP assets and to the higher cost in which it would incur to defend its IP assets, practically confirming the preference for being financed by venture capital of the start-ups owning a patent. Thus, starting from this evidences from the existing literature stating that start-up firms owning a patent prefer other financing techniques and considering even the low incidence of patents in the ICO world that mainly relies on open-source licenses, we decided not to build a research hypothesis to test the influence of the presence of a patent on the entrepreneur's decision between an ICO and a crowdfunding campaign.

3.3.3 Single creator or team

The fact that the funding campaign is launched by an individual creator or by a founding team composed of more than one person can influence the decision of the funding technique according to two different aspects: from one side, the size of the team can be another proxy of the different stage occupied by the start-up in its lifecycle, while, on the other side, the legal incorporation, that is usually associated with organized teams with many components rather than to single creators, can act as a positive signal to the potential investors and/or lenders.

We assumed the presence of a multiple team as a proxy for the occurred legal incorporation of the venture due to the objective difficulties in founding more reliable information about the actual legal incorporation of the venture both for the ICOs and for the crowdfunding campaigns due to the high level of information opaqueness typical of these financing forms.

The effect of the size on the decision of the financing technique were analysed in the works of Cassar (2004) and Berger & Udell (1998): both these papers agreed in stating that the start-ups characterized by a higher size were more likely to be financed through external finance techniques and, in particular, through bank loans. This result is in line

with the use of the size as a proxy of the position occupied by the start-up in its lifecycle considering that the start-ups characterised by the presence of a core team composed by many people occupy a more advanced position.

As introduced before, the presence of a founding team composed by many people can be considered even as a proxy of the occurred incorporation of the start-up as a legal entity, a fact that is rarely associated with campaigns launched by a single person. According to Storey (1994), the legal incorporation of the entity can act as a signal to the potential lenders/investors communicating them a high level of credibility, formality of operations and future growth, in fact the legal incorporation implies higher costs to the venture due to the increased taxation, the need of statutory audits and the more information disclosure: due to the presence of this costs that make the incorporation not convenient to bad quality ventures, it can properly act as a positive signal. This theoretical consideration was empirically confirmed by the analysis of Storey himself, Coleman & Cohn (2000) and Freedman & Goodwin (1994) who found that the legal incorporation was associated with increased leverage and bank financing, while Cassar (2004) found that the incorporation affected only the level of bank financing and not the leverage and the level of external financing.

We considered that both these two possible relationships between the composition of the founding team and the decision of the financing technique may affect the entrepreneur's decision between launching an ICO or a crowdfunding campaign: in case the precedent hypothesis related to the effect on the financing decision of the presence of a prototype would emerge as relevant, we expect that even the hypothesis related to the presence of a single founder or a multiple team would be accepted; contemporarily, the effect of the presence of a multiple team as a proxy of the legal incorporation of the venture can be very relevant for ICOs and crowdfunding campaigns due to the need of the founding team to give interested contributors adequate signals of seriousness, ability and professionalism to convince them to participate in the funding campaign and invest their money in the venture.

So, our eighth hypothesis to be tested is:

H4: The presence of a team instead of a single founder influence the decision between an ICO and a crowdfunding campaign

3.3.4 Blockchain capability

Disregarding whether the product under development is based on the blockchain technology or not, the ICOs are always based on the technology of the blockchain, at least for the part regarding the tokens to be sold to the investors. The blockchain technology is characterized by a high level of intrinsic complexity: despite the smart contracts developed on the Ethereum blockchain automatized the execution of many tasks on the blockchain and significantly reduced the effort needed by the software developers, launching an ICO campaign requires in any case some specific informatic abilities, including the knowledge of the solidity programming language.

Solidity is a programming language specifically developed to write smart contracts, initially it was aimed of being used only on the Ethereum blockchain and, then, even in other blockchains, that is characterised by some specific characteristics that are different from most of the other programming languages. So, there is the need of including in the core team of the venture that is launching the offering someone with a specific capability related to the blockchain field.

Conversely, it is extremely easy for an entrepreneur to launch a crowdfunding campaign without having any specific informatic competence relying on a platform that provides all the expertise needed and some additional services.

The existing literature already studied the relationship between the presence of specific abilities to influence the success of a start-up: according to Cooper, Gimeno-Gascon & Woo (1994) the presence of industry-specific abilities positively influences the performances of the venture enabling it to understand in advance the key of success in that industry and providing a useful knowledge of the specific products and technologies. The results of their empirical analysis confirm that the previous experience in similar businesses positively influences the survival and the growth of the start-ups. This result is probably due to the fact that the industry specific experience may counterbalance the liabilities of newness of the new ventures. Similar results were obtained even by Brüderl, Preisendörfer & Ziegler (1992). Thanks to the high influence of the industry-specific knowledge on the success of the venture, we considered that such a knowledge can influence even the decision of the entrepreneur regarding the financing technique. Colombo, Delmastro & Grilli (2004) found that a specific professional experience achieved by the founders of a new venture in the same sector of activity of the new firm

positively influences the size of the firm; two of the authors of the precedent work, Colombo & Grilli (2007) empirically found that the specific professional experience influences even the amount of capital collected by a start-up.

We want to investigate whether the presence inside the founding team of people characterised by a strong blockchain capability, both due to precedent working experiences and to a specific academic background, increase the likelihood of choosing an ICO instead of a crowdfunding campaign: in this case the presence of someone owning a specific blockchain capability could be interpreted as a needed prerequisite to launch an ICO, so it would act as a barrier preventing the teams without a member with this specific ability to select this financing method. On the other hand, if this capability would not turn out to be a mandatory prerequisite to launch an ICO, it could be interpreted as a sort of commodity available on the market, maybe thanks to the high number of developers who are looking for ventures to cooperate with.

Thus, the ninth hypothesis we want to test is:

H5: The presence of a member of the founding team with a specific blockchain capability increases the likelihood of launching an ICO rather than a crowdfunding campaign

3.3.5 Social visibility

Finally, the last element we considered as a possible determinant of the entrepreneur's decision between launching an ICO or a crowdfunding campaign to finance his/her start-up, is the social visibility of the entrepreneur himself/herself.

The existing literature already analysed in deep the relationships between the social visibility of the entrepreneur measured from the number of Facebook friends, Twitter followers and other social networks connections and the success of the venture financing campaign. Both Mollick (2014), Colombo, Franzoni & Rossi-Lamastra (2015) and Vismara (2016) found that a positive relationship between the social connections and the success of the venture launching a crowdfunding campaign.

The social visibility, however, does not influence only the results of the funding campaign, but can even influence the decision of the financing technique: according to Nofsinger & Wang (2011), since the informal investors are more likely to have a social

relationship with the entrepreneur and to consider as slightly less important his/her entrepreneurial experience due to the high importance given by them to the information about his/her personal skills and characters. Thus, the entrepreneurs characterised by a high social visibility are more likely to be financed by informal investors than by professional investors such as business angels, venture capital funds and banks.

The importance of the social visibility is further increased in the decision between being financed through an ICO or a crowdfunding campaign since in both these funding techniques the entrepreneurial venture is financed by a large number of informal investors who may not have an adequate specific knowledge of the industry in which the venture will operate and of the technology on which the product/service will be based. So, these people are more likely to base their decision about the participation or not in the funding campaign on the information extrapolated from the social network profiles of the entrepreneur. Thus, it could be even more likely that an entrepreneur wanting to launch a campaign to finance his/her venture can base the decision even on his/her social visibility in order to exploit the benefits related to the visibility to have a successful campaign.

So, the tenth and last hypothesis we want to test is:

H6: The online social connections of the entrepreneur influence the decision between launching an ICO or a crowdfunding campaign

3.4 Methodologies used

Due to the almost complete lack of pre-existing literature about the entrepreneurs' choice between launching an ICO or a crowdfunding campaign to fund the development of their project, in order to define a methodology that was robust and already used by the academics, but even suitable for our research purposes, we enlarged our horizons and analysed many works related to the field of the ICOs and the crowdfunding, even if their goal was not analogous to our goal, to understand the methodologies they used and decide which methodology apply.

We finally came up to the decision of following a methodology substantially analogous to the one used in their work about the determinants of success for the crowdfunding campaigns by Ahlers, Cumming, Guenther, & Schweizer (2015) who applied a methodology deriving from the one used by Baum & Silverman (2004). The main steps of this methodology are shown in the figure 3.1.

The first step of our work was the identification of the main theme of the work: we opted for the ICOs due to the newness of this phenomenon that is a conjunction between the emerging technology of the blockchain and the entrepreneurial finance. Moreover, the moment of the explosion of the popularity of the cryptocurrencies and the ICOs exactly coincided with the moment of our decision about the theme of the work, making this topic much more interesting for us. Regarding the specific scope of the work, we decided to compare the ICOs to the crowdfunding campaigns to understand which are the main characteristics of the team, the product under development and the creator of the campaign that influence the decision between running an ICO or a crowdfunding campaign. Due to the absence of relevant literature dedicated to the problem, we decided to follow the methodologies of the works made by Ahlers, Cumming, Guenther, & Schweizer (2015), even if that work was aimed at empirically studying the determinants of success of the crowdfunding campaigns.

We collected the data related to all the ICOs until the end of 2017 and the ones related to all the crowdfunding campaigns launched on kickstarter.com between 2016 and 2017. Except for the general data related to the crowdfunding campaigns, that were automatically scraped from kickstarter.com, the collection of the data was entirely done manually. Due to the presence of some remarkable differences between the data regarding the ICOs and the data regarding the crowdfunding campaigns, before starting

the empirical analysis, we needed to use the Propensity Score Matching (PSM) as a tool to obtain two sub samples comparable both in terms of dimensions and in terms of some characteristics that were quite inhomogeneous between the two sub samples; this step was added to the methodologies followed by Ahlers, Cumming, Guenther, & Schweizer (2015) who did not face this problem.

As done in the work of Ahlers, Cumming, Guenther, & Schweizer (2015), we performed two mathematical analysis on the samples of the data: a univariate and a multivariate analysis. In the univariate analysis we started with a global overview of the data, then we calculated the main univariate statistics. Then, we performed a difference in means analysis to look if the characteristics of the ICOs were different from the one of the crowdfunding campaigns. Finally, we made the T-tests to evaluate if the differences emerged from the precedent analysis were statistically significant.

Finally, as a last step we performed a multivariate analysis to verify the actual statistical significance of the effect of the variables that we previously chose on the entrepreneur's decision between financing his/her start-up by launching an ICO or a crowdfunding campaign and, in doing so, to verify the research hypotheses that we had made.

Methodologies used

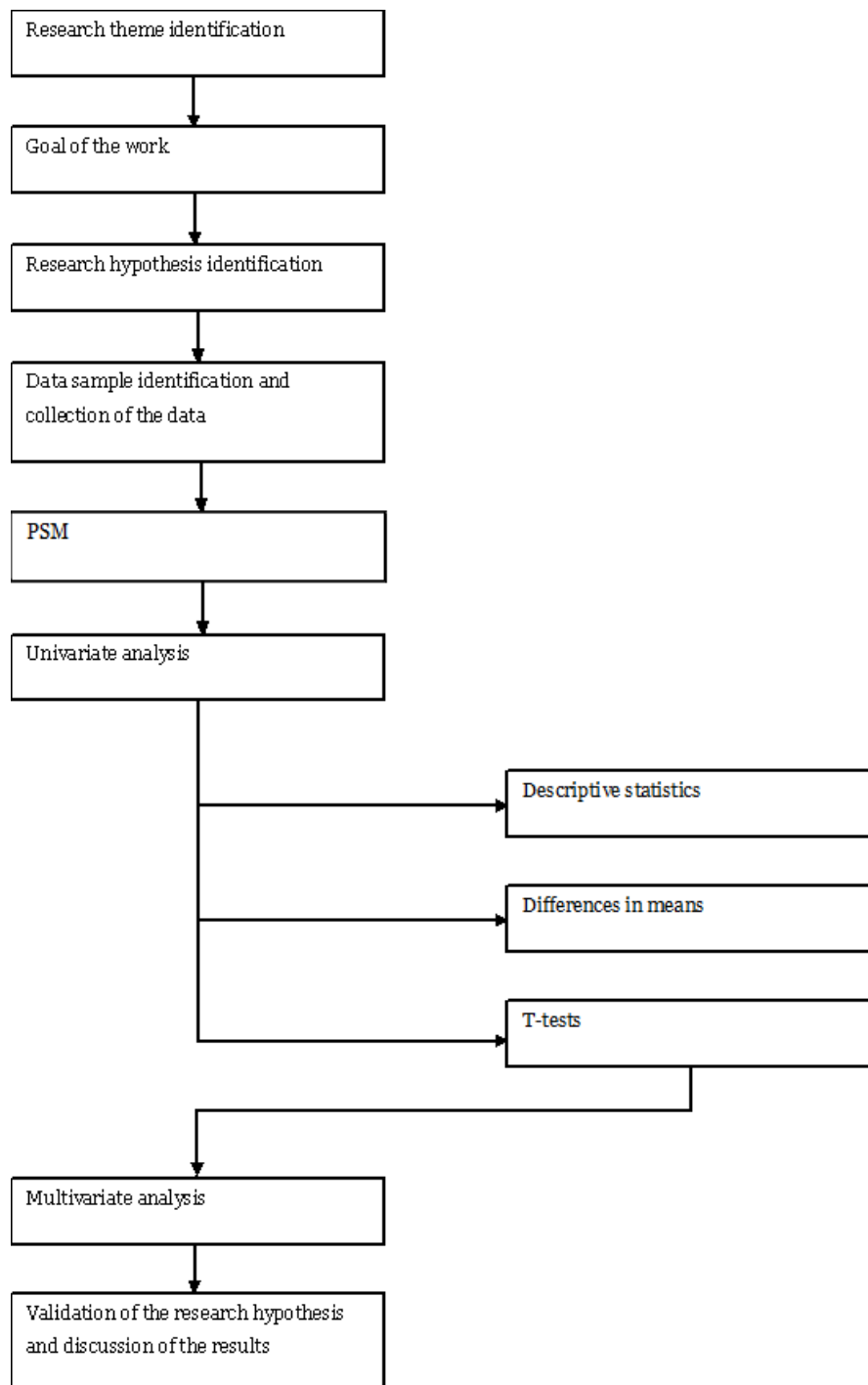


Figure 3.1: Steps of the methodologies used

4 Empirical Analysis

4.1 Data collection process

The information we had collected refers to two samples: one made up by the ICOs campaigns and the other made up by the crowdfunding campaigns. The work started from the ICO sample: we made up it by collecting the data of 922 ICO campaigns from 2014 to the end of 2017. Since the popularity of the phenomenon dramatically increased during 2017, about 95 % of the whole sample is composed by ICOs run in 2017; especially in the second half of the year, coinciding with the increase in value and popularity of the Bitcoin and, more in general, of the cryptocurrencies.

The growing trend of the diffusion of the ICOs becomes immediately glaring, looking at the figure 4.1, which highlights the growth of 2500 % between 2016 and 2017.

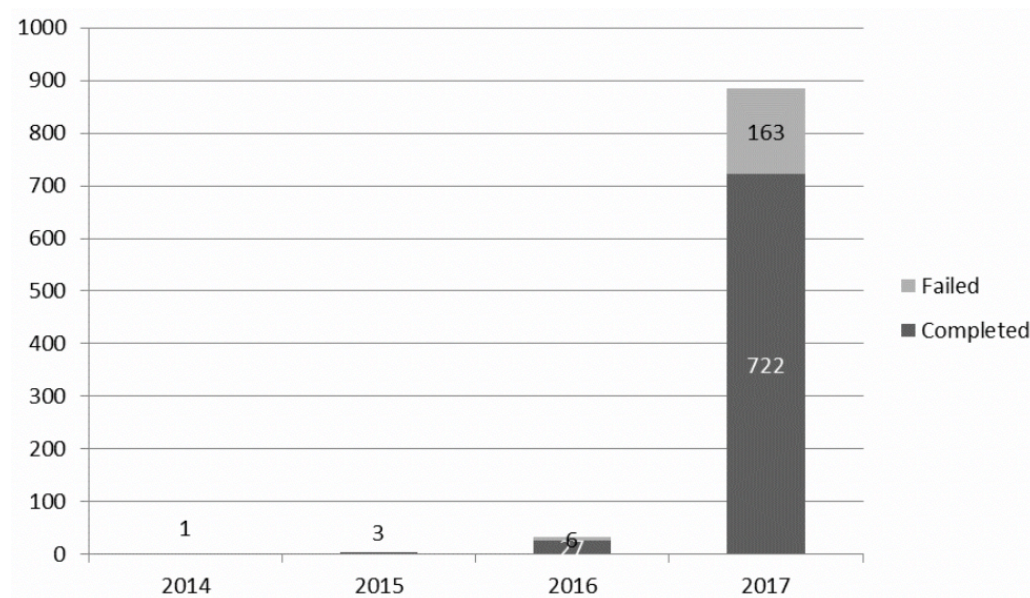


Figure 4.1: ICOs time flow from 2014 to 2017

On the other hand, the crowdfunding database was collected scraping the data of all the crowdfunding campaigns run on kickstarter.com between 2016 and 2017, the decision of shrinking the time interval excluding the campaigns run in 2014 and 2015 relies upon the fact that the number of ICOs in that two years was practically null, since, at that moment, the ICOs were still in a germinal state of their development.

The decision of comparing the ICOs to the reward based crowdfunding campaigns launched on kickstarter.com was made after an evaluation of the role granted to the tokenholders. According to the literature, the ICOs were considered either analogous to the equity-based crowdfunding in the cases in which the tokens provide the investors with governance and profit rights (Yadav, 2017), the donation-based crowdfunding, in case the ICOs takes the form of a donation or the reward-based crowdfunding in the case the token provides the investors with direct non-financial benefits such as the access to the platform or the rights of receiving the product once developed; according to Zetsche & al. (2017), most of the campaigns offer non-financial benefits instead of financial ones.

The conclusion of Zetsche was confirmed by the empirical results found up by Adhami, Giudici & Martinazzi (2018), that pointed out that the majority of the ICOs analysed in their sample offer tokens giving the investors the right of accessing to the platform, while the governance and profit rights are granted only by a minority part of the tokens. This result was also empirically confirmed by our sample in which more than three tokens out of four provided access rights, while only a residual part granted rights analogous to a share. These conclusions led us to the decision of comparing the ICOs to the reward-based crowdfunding.

Regarding the decision of the platform from which taking the crowdfunding campaigns, we opted for kickstarter.com since it is universally known as the most prominent reward-based crowdfunding platform (Belleflamme, Omrani, & Peltz, 2015) with more than 15 million contributors. Moreover, it is one of the few platforms with a global geographical diffusion, while many platforms such as Ululu in France and BoomStarter in Italy are characterised by a local diffusion and, so, cannot be compared to the ICOs that were widespread around the world in 2017. The main possible alternative to kickstarter.com could have been Indiegogo.com which is spread on more than 235 countries and hosted more than 9 million backers from 2008. However, we decided on focusing only on one portal instead of collecting data from different platforms to have greater uniformity in the data collected.

Kickstarter.com is a reward-based crowdfunding platform based on Brooklyn, NY, that was officially launched on April, 28th 2009 by three co-founders: Perry Chen, Yancey Strickler, and Charles Adler. It rapidly became popular in the US, being appointed by The Times as one of the “Best Inventions of 2010” and one of the “Best Websites of 2011”. In the subsequent years the platform experienced a strong growth both in terms of number of projects and in terms of money raised passing from 1,788,654 USD pledged during 2009 to 692,476,203 USD pledged during 2015 and from 874 campaigns launched in 2009 to 76,867 campaigns launched in 2015 (Bidaux, 2016). Hand in hand with the increase of popularity, kickstarter.com expanded outside the US opening new offices in Canada, Europe and Asia. After 2015 the growth started to slow down with a consistent reduction of the number of projects that failed their funding (Bidaux, 2018), this fact can be the first index of the maturity achieved by the platform.

The initial width of the sample scraped from kickstarter.com was more than 75,000 campaigns; this number would have been subsequently reduced to make the two samples consistent one to each other both in terms of their width and in terms of the characteristics of the campaigns.

Except for some intrinsic characteristics of the ICOs (e.g. the token role and the blockchain technology), we collected the same information for both the samples; the data collected can be roughly divided in two different parts: the characteristics of the founder/leader of the ventures that stand behind the campaigns and the information related to the campaign itself and to the product whose development will be funded by the campaign.

4.1.1 Campaign related information

4.1.1.1 General information regarding the venture and the campaign

- Name of the company or the person that is launching the campaign. Together with the name, we collected even the information whether the campaign was launched by a single individual or by a team composed by many people or an organized venture.
- Starting date, closing date and duration of the campaign.
- The country in which the campaign is launched – for the ICOs we separately collected the information of the country in which the venture had its

headquarter and the country in which the venture was incorporated due to the diffusion of the phenomenon of transferring the registered office in an ICO-friendly jurisdiction, while, for the crowdfunding campaigns, we collected only the country of the operational headquarters due to the substantial absence of legal issues.

- Goal: information regarding the funding goal of the campaign. This information is slightly different for the two samples, in fact, while each campaign hosted on kickstarter.com has to communicate only one goal that is the minimum amount to reach to consider successful the campaign, the ICOs are not bound to provide any cap and, in case they decide to set a cap, can set either a soft cap (the minimum amount of money to be collected to consider the campaign completed), an hard cap (the maximum amount of money that can be collected in the campaign that will be immediately stopped after this cap is reached) or both. So, while for all the crowdfunding campaigns we collected one value, for the ICOs we either collected one, two or zero values.
- Token role: information available only for the ICOs that describes the use of the tokens sold in the campaign, once the business of the venture will be established. According to Adami, Giudici & Martinazzi (2018), we collected the information considering five possible roles for the tokens: a new currency, access to the platform and internal money, voting rights, profit rights and contribution rights.

4.1.1.2 *Information regarding the product under development*

- Name and description of the product.
- Product type: the products that are developed by the ventures that decide to run an ICO or a crowdfunding campaign are extremely sundry; among them it is possible to find high-tech devices, apps, online platforms, social networks, films and financial investments, but even charity initiatives and not serious projects. We divided all the campaigns in five clusters:
 - Technology: in this cluster we considered both tangible products, so high-tech devices such as new hardware and IoT objects and new tools invented for various applications, and the intangible products such as software and mobile apps.
 - Gaming: in this category we included all the campaigns whose aim was the development of a videogame or a platform for video gamers.

- Advertising: here we included the platforms that are aimed at host other products to advertise them and all the projects related to the marketing field.
- Media and entertainment: under media and entertainment we grouped all the campaigns in which the products were related to music, videos, films, news and publications.
- Others/miscellaneous: finally, we included in this cluster all the products that were not part of one of the four clusters listed above.
- Tangibility or intangibility of the product: independently from the clusters related to the type of products under development, we collected even the information about the tangibility or not of the product.
- Presence of some patents/license: information on the presence or not of a patent, or others forms of intellectual property included the licensing from an external patent-owner, to protect the underlying technology of the product. Copyrights on the logo, the name or the design were not considered as patents.
- Presence of a working prototype/beta version before the beginning of the campaign: information about the presence or not of a working prototype (for the tangible products) or an alpha/beta version (for apps, software and, more in general, all the intangible products) or any kind of minimum viable product (MVP).
- Blockchain/informatic capability: information regarding the presence inside the founding team of someone with a computer science/informatics academic background, other studying experiences related to the blockchain technology or past technical working positions in ventures linked to the blockchain technology.

4.1.1.3 *Information regarding the outcome of the offering*

- Outcome of the campaign: information regarding whether the campaign was a success or a fail. Regarding the crowdfunding campaigns, the outcome of them was directly available on kickstarter.com, in case the campaign was cancelled by the creator before its conclusion, we considered it as failed. On the other hand, since there is no a central platform stating the outcome of the ICOs, we considered an ICO successful if it reached its soft cap – in case the soft cap was present – otherwise the outcome of an ICO can be deduced according to the communications made by the venture after the completion of the offering,

finally, in case of complete lack of official communications an ICO is considered completed if the amount raised is much higher than zero.

- The amount of funds raised during the campaign, both in the original currency (EUR, GBP etc. for the crowdfunding campaigns, ETH, BTC etc. for the ICOs) and in USD, considering the average exchange rate during the offering period.
- The number of backers who contributed to the campaign.

4.1.2 Founder's related information

This second set of information refers to the leading entrepreneurial figure of the campaign: we considered as leading figure of a campaign the founder or the CEO of the venture that launched the offering – in case of presence of more than one co-founders we collected the data of the one between them who covered the most senior corporate officer (e.g. in case of two co-founders whose roles respectively are CEO and CTO we collected the data of the CEO) . In case this role was not shown, we considered people covering other top managerial roles or, in a subordinate position, the inventor of the product under development or the creator of the campaign published on kickstarter.com. Despite the level of disclosure regarding the team members for most of the ICOs was quite high and the identities and the backgrounds of all the components of the team were publicly available, we decided to focus only on the leading entrepreneurial figure to have more comparable data between the ICOs and the crowdfunding campaigns, since many campaigns launched on kickstarter.com were not funded by a structured team or venture, but came from the work of a single individual. For each entrepreneur, we collected information about their personal and geographical data, academic background, past professional experience and profiles on the main social networks.

4.1.2.1 Personal data

- Name
 - Sex
 - Age: since for most of the cases the date of birth of each person was not available, we used the year of the high school graduation or the year of entry to the university as a proxy to determine the age.
 - Nationality
-

4.1.2.2 Academic background

- Qualification: information regarding the highest qualification achieved by each entrepreneur. We set four clusters corresponding to different academic qualifications that respectively are bachelor's degree, master's degree, doctorate (PhD) and Master in Business Administration (MBA). In collecting this information, we considered only the completed courses of study and, so, we completely neglected interrupted and ongoing courses of study.
 - Area of study: information regarding the field of the study carried out by each person considered; we split up this information into five clusters:
 - Economics: in this cluster we considered all the people with an academic background in the field of economics, managerial sciences and business administration.
 - Finance: in this cluster we considered all the people with an academic background in the fields of finance and accounting.
 - Technical studies: in this cluster we included the people with an academic background in the fields of engineering, computer science, information systems and other applied sciences.
 - Pure sciences: in this cluster we included the people with an academic background in the field of the pure sciences such as mathematics and physics.
 - Other area of study: finally, in this cluster we grouped all the people with an academic background in a field of study not belonging to the previous four clusters (psychology, medicine, law, literature etc.)
 - Top 50 universities: information regarding whether the university where the entrepreneur achieved its highest qualification is one of the top 50 universities of the world according to the 2016-2017 QS World University Rankings. In the table below, we listed all these universities (QS Quacquarelli Symonds Limited, 2017).
-

Ranking	University	City	Country
1	Massachusetts Institute of Technology	Boston	US
2	Stanford University	Stanford	US
3	Harvard University	Boston	US
4	University of Cambridge	Cambridge	UK
5	California Institute of Technology	Pasadena	US
6	University of Oxford	Oxford	UK
7	University College London	London	UK
8	ETH	Zurich	Switzerland
9	Imperial College	London	UK
10	University of Chicago	Chicago	US
11	Princeton University	Princeton	US
12	National University of Singapore	Singapore	Singapore
13	Nanyang Technological University	Singapore	Singapore
14	Ecole Polytechnique Federale de Lausanne	Lausanne	Switzerland
15	Yale University	New Haven	US
16	Cornell University	Ithaca	US
17	Johns Hopkins University	Baltimore	US
18	University of Pennsylvania	Philadelphia	US
19	The University of Edinburgh	Edinburgh	UK
20	Columbia University	New York	US
21	King College London	London	UK
22	The Australian National University	Canberra	Australia
23	University of Michigan	Ann Arbor	US

Data collection process

24	Tsinghua University	Beijing	China
25	Duke University	Durham	US
26	Northwestern University	Evanston	US
27	The University of Hong Kong	Hong Kong	Hong Kong
28	University of California Berkeley	Berkeley	US
29	The University of Manchester	Manchester	UK
30	McGill University	Montreal	Canada
31	University of California Los Angeles	Los Angeles	US
32	University of Toronto	Toronto	Canada
33	Ecole Normale Supérieure	Paris	France
34	The University of Tokyo	Tokyo	Japan
35	Seoul National University	Seoul	South Korea
36	The Hong Kong University of Science and Technology	Hong Kong	Hong Kong
37	Kyoto University	Kyoto	Japan
38	London School of Economics and Political Science	London	UK
39	Peking University	Beijing	China
40	University of California San Diego	San Diego	US
41	University of Bristol	Bristol	UK
42	The University of Melbourne	Melbourne	Australia
43	Fudan University	Shanghai	China
44	The Chinese University of Hong Kong	Hong Kong	Hong Kong
45	University of British Columbia	Vancouver	Canada
46	The University of Sydney	Sydney	Australia

47	New York University	New York	US
48	Korea Advanced Institute of Science and Technology	Daejeon	South Korea
49	The University of New South Wales	Sydney	Australia
50	Brown University	Providence	US

Table 4.1: 50 best universities of the world according to the 2016-2017 QS World University Rankings

4.1.2.3 *Past professional experience*

- Years of professional experience: information regarding the length of the professional career before the beginning of the offering; to determine the outset of the professional career we did not consider the university studies, except for the doctoral/research activity, unless, in that moment, the student was already working outside the university. Analogously, we did not care about curricular stages or summer internships to determine the beginning of the working career.
- Number of past entrepreneurial experience: information regarding the number of past entrepreneurial experiences. To determine this number, we considered only the entrepreneurial experiences in which the person covered a leading role (founder, co-founder, president, CEO) and not his/her mere presence in a start-up with other roles.
- Top role experience: information regarding whether the person covered top roles (CEO, CTO, CFO, president, vice-president) in his/her last job experience disregarding whether he/she was a founder/co-founder of the firm.
- Last professional city: information regarding the last city in which the person worked. We used this information to make up some clusters. We decided not to refer to the geographical location of the cities not to have a possible overlap of the data with the nationality and/or the country in which the campaign was launched. So, we classified the cities in three clusters according to their population: less than one million inhabitants, between one and five million inhabitants and more than five million of inhabitants.

4.1.2.4 *Profiles on the social networks*

We collected the data related to the profiles on the social network as a proxy for the level of social visibility of the entrepreneur. We decided to collect this information from the

personal profiles of the people behind the funding and not from the official profiles of the venture running the campaign to have a proxy of the social visibility that was not influenced by the campaign itself. We decided to focus on LinkedIn and Twitter since they are the most widespread social networks in the cryptocurrencies world.

The information we collected was:

- Twitter profile
- LinkedIn profile
- Number of followers on Twitter
- Number of connections on LinkedIn

4.1.3 Sources of data

We separately made our databases collecting the data related to the ICOs and the data related to the crowdfunding campaigns using quite different proceedings due to the intrinsic characteristics of these fundraising methods and to the differences in the communication process that made impossible for us to follow the same method for both of them.

Starting from the ICOs, we manually collected all the data regarding them, both the ones related to the campaign itself and to the product under development and the data regarding the leading entrepreneurial figure of the venture; we were forced to this way by the huge dispersion of the data across various sources (institutional websites, whitepapers, profiles on the social networks, ICOs-dedicated platforms, forums etc.) that prevented us from trying to automatically scrape the data. Moreover, in many cases the platforms and the forums were in disagreement with the official communication made by the ventures on their websites and social networks account, so we had to carefully verify the reliability of the data every time we found a discordance, obviously, this step could not be automatically done, since it comprehended a manual check of the various sources one by one.

The main sources we used to collect the information related to the campaign itself and the product were the following ones:

-
- Institutional website of the venture running the ICO: assuming that there were huge differences between different websites, usually we collected here the basic information regarding the product under development (we usually used this information to determine the tangibility of it and to classify the product under one of the clusters), the official communication from the team about whether the campaign was successful or not and the amount raised. The website was also the priority way to download the whitepaper that was one of the other main sources of data and the token sale agreement. However, most of the failed ICOs did not have the website online yet, obliging us to find other sources in which looking for these data and the whitepapers.
 - Whitepaper: from the whitepaper we usually collected more detailed information about the product under development such as the existence of pending patents and/or licensed technologies and the presence of an already working MVP, prototype or beta version. We collected also the information regarding the function of the tokens sold in the campaign after its completion, the starting and finish dates of the campaign and the presence of a soft and/or a hard cap. From the whitepaper (or from the token sale agreement if available), we could also extract the information related to the country in which the ICO venture was based and to the country of jurisdiction. Since for most of the cases it was published before the launch of the campaign and no more updated, we could not find on the whitepaper any information about the outcome of the ICO.
 - ICO-dedicated platforms:
 - TokenData: we used this platform to extract the complete list of the ICO campaigns launched in the time interval we had decided to analyse, since it was the platform that listed the higher number of campaigns for that time interval.
 - IcoBench: it is one of the leading platforms dedicated to the ICOs. For each campaign it gives potential contributors information about the product, the team and the advisor, including their photographs, the links to their social network profiles, their past ICO experience and a KYC report for the members of the core team to ascertain their identity in order to unmask potential scams. Then, there are the roadmap, some financial data including the prices, the bonuses, the caps and the number of token available for the contributors, the link to the whitepaper and to the social network profiles and, finally, the rating,
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that is the flagship of IcoBench and it is a weighted average of the grade assigned to the ICO by some recognized experts of the world of the ICO after a deep analysis. After the completion of the ICO, it will show even the results of the campaign in terms of tokens sold and money raised and the price of the token on the secondary exchanges if listed. We used IcoBench to collect the information in the case the website was no more online, to have an alternative way to find the whitepaper and to check the official data communicated by the developing team in case we had suspects about them

- Since not all the ICOs were listed to ICOBench, we consulted even other dedicated platforms providing more or less the same typology of data; among them, we mostly extracted information from IcoDrops, TokenMarket, TrackICO, ICOHolder, CoinSchedule and CryptoSlate.
 - Some other platforms – ICOBazaar, ICO’sBull, Longcatchain etc. – instead they generally provided less precise information if compared to the other platforms we already cited, came out to be very useful for us since they did not only provide a link to the whitepaper, but they usually saved a copy of it on their servers, making available for us many whitepapers from failed campaigns that otherwise we could not examine since their websites were no more online.
- Official profiles on the social networks: the social networks mostly used by the ventures running an ICOs were Twitter, Facebook, Reddit and Telegram. The first two were used to have the official communication from the team even in those cases in which the websites were no more online, while, the last two, particularly spread in the world of the cryptocurrencies, provided a touchpoint between the developing team and the contributors and were used to unravel the issue generated by the presence of discording information. Another source of direct information from the team was the bog, generally hosted on Medium, that provided many day by day updates from the team, including useful information about the product and the outcome of the ICO.
 - Official thread on BitcoinTalk: BitcoinTalk, established in 2008 by Satoshi Nakamoto, is, by far, the leading forum of the cryptocurrency world. Almost all
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the ICOs published an announce thread on it to advertise their offering and to meet the potential contributors. Besides, most of the bounty campaigns run to increase the popularity of the ICOs are managed on thread hosted on BitcoinTalk. We used it as a source for all the data we were not able to find from the other sources: in fact, in many cases, some information that we had been not able to find since they were not communicated on the official websites, whitepapers and portals, were disclosed in the thread after a specific question made by a potential contributor who complained about the impossibility of finding that information on the other channels. Moreover, the personal experience of the contributors who participated in the offering was used by us to understand the actual outcome of the ICO in presence of discordant communications. Finally, in case of absolute lack of the whitepaper, we sometimes succeed in finding some translated version of it in the thread of bounty campaigns or we deduced some information in the text published to announce the ICO.

Moving to the data referred to the entrepreneur, we primarily used the profile of the ICO on ICOBench to find the name of this person and the links to his/her social network profiles. As an alternative to it, we used other dedicated platforms, the whitepaper and the official website of the ICO; the decision of using the official website only as a last resort could seem meaningless if we consider that it is a primary source directly coming from the developing team and that the platforms we used collected their information for sure from it, however, since after the offering the team of the venture could be subject to many changes, we decided to take the information from the platform that collected it before the starting of the campaigns and not some months after their completion.

After having determined the identity of the leading entrepreneurial figure of the ICO, we collected his/her data primarily via his/her LinkedIn profile, if available, thanks to the fact that, for most of the cases the link was directly provided on ICOBench or other platforms or on the official websites. In case the link was not provided, we tried to find the profile making some researches on the search engines using some keywords such as the name of the venture running the ICO, the name of a previous working experience and or the university that he/she attended – in the case these data were available on the official website or on the whitepaper – or making the search directly on LinkedIn exploiting the filter function. All the data from the LinkedIn profile were manually

collected since we did not succeed in scraping the data from the social network due to the presence of barriers against data scraping. Moreover, we decided not to pursue the way of the data scraping after considering the risk that the effort needed to check, correct and homogenize the data scraped could be significantly higher than the effort needed to manually collect the same information.

The main information we collected from LinkedIn were the age, the nationality, the academic background (qualification and alma mater), the past professional experience (number of past entrepreneurial experiences, years of working experience, experience on top managerial roles), the last city in which each one worked and the eventual presence of a specific working and/or academic experience in the field of the blockchain technology.

Other sources of data that we used parallelly to LinkedIn or alternatively to it as appropriate, were the other social networks profiles – in some cases the platform and the institutional website proved links to the Twitter and Facebook profiles, but not to the LinkedIn one -: from Twitter we could usually find the nationality and the age, while on Facebook it was sometimes possible to find the previous working experience and the academic background. Sometimes the information was directly available on the Whitepaper and/or the official website of the venture; in these cases, we basically tried to analyse the LinkedIn profiles if available and secondarily analyse the description on the whitepaper.

Some of the entrepreneurs had also a personal website different from the one of the ventures, we usually used it to find the links to their social networks profiles and to find some personal information that was not always shown on their LinkedIn profiles. Finally, for a very small minority of people that were very well known we found a page of the English version of Wikipedia, these were the only cases in which we decided not to use LinkedIn as our preferred source.

Regarding the database related to the crowdfunding campaigns launched on kickstarter.com, thanks to the presence of all the campaigns on the same platform we could automatically scrape the data from kickstarter.com without suffering the problem of the uniformity of the data between the different campaigns and the problem of the reliability of the data regarding the outcome of the campaign that we faced with the ICOs. However, not all the data we needed to complete our sample could be collected through

the scrape since many of them were highlighted only in the description of the project on the platform making completely useless any form of data scraping of them, in fact, after the scrape, we would still have to manually read the text to extract the information, so we decided not to scrape them in order to avoid a meaningless and time-wasting passage.

Moreover, for the data regarding the creator of the campaign, most of the useful information was not directly available on the profile of the creator on kickstarter.com. So, from the scrape we obtained the information about the name of the person/entity that launched the campaign, the starting and ending dates, the country, the goal, the outcome, the amount of money collected, the number of backers, the description of the product, the category according to the categorization implemented on kickstarter.com that we subsequently had to adapt to our clusters.

The presence of patents or licensed technologies, working prototypes and beta version and the tangibility /intangibility of the products were inferred starting from the description of the product on the crowdfunding page on kickstarter.com, making searches based on keywords and evaluating the eventual presence of photographs, video and roadmaps.

The information regarding the entrepreneurs was predominantly collected via LinkedIn analogously to the same data for the ICOs. Unlike the ICOs, the crowdfunding campaigns very rarely provided the direct links of the LinkedIn profiles of their creators, so we had to manually look for them starting from the name of the creator and the description provided on its profile page on kickstarter.com or from the name of the company that launched the campaign. In case of lack of the LinkedIn profile we used as a primary source the information provided on the profile of the creator on kickstarter.com, even if their quantity and quality was not always satisfactory.

4.2 Data manipulation and analysis

4.2.1 Propensity Score Matching

Once we had at our disposal the two datasets, the first one including the ICO campaigns and the second one containing all the kickstarter.com projects between 2016 and 2017, we faced a major problem: the two datasets were very different in many aspects. The kickstarter.com database had a very large sample size, about seventy-five thousand campaigns, while the ICOs one included less than thousand projects. In addition to that, we noticed that the success rate of the Crowdfunding campaigns was 38 % which was much lower than the one of the ICOs which reached the 82 %, a huge difference which could have created biases in the further analysis. Another structural problem that we found, was related to the financial target that the founders set to be able to carry out their entrepreneurial venture; on average, the crowdfunding dataset had a financial target of about fifty thousand USD, while the ICO's average value was eighteen million USD. Finally, the third major difference was related to the typology of projects that we encountered in the 2 datasets. These issues could have limited by far the significance of our study, we would have risked comparing an ICO project which on average is successful, plans to raise millions, and it is technology oriented with a crowdfunding campaign which has usually a greater chance to fail, raises thousands of USD instead of millions and that very often offers products not technology oriented.

For these reasons we had to find a way to match the two datasets, having a more comparable and reliable overall database. The first solution we implemented has been an R code which set a lower and upper bound for each ICO, taking its soft and hard cap, and finding one crowdfunding campaign which respected these boundaries. In this way, we found a much smaller crowdfunding dataset, containing 325 campaigns which satisfied the criteria set. After an analysis of the descriptive statistics, we found that our code was not good enough to solve the aforementioned problems. Then, we addressed the problem using the propensity score matching algorithm (PSM) which is a statistical matching technique that assumes that an unbiased comparison between samples can only be made when the subjects of both samples have similar characteristics.

As stated by Randolph, Falbe, Austin Kureethara, & Balloun (2014), this algorithm matches a treatment case (in our case an ICO campaign) with one or more control cases

based on each case propensity score. Of course, this algorithm reduces the selection bias which would influence all the further analysis. Adelson (2013) confirms in her work that a structured algorithm such as the PSM is fundamental to match datasets according to a pre-set of characteristics. We have to mention that in our work the PSM has been used as structured way to sub-select our sample, while in the aforementioned works and even in the work of Crown (2014), it was used also for the analysis.

Knowing the substantial difference of the projects typologies we decided to select only the ICOs and the kickstarter.com campaigns which could be categorized as technology-oriented, as we defined it in the previous chapter. As a result of this, we had 383 ICOs laying in the technological category to be matched with 383 crowdfunding campaigns to be selected from a dataset of about 9,500 technological crowdfunding campaigns. This choice was done to have a homogenous pool in term of type of project to whom apply the PSM.

The variables on which we based our matching algorithm were:

- The success of the campaign: this would allow to have a much similar percentage incidence of successful projects reducing the bias on the result. Without this criterion, we probably would have run analysis with an inner difference since the majority of the kickstarter.com campaigns failed, while the majority of the ICOs succeeded.
- The financial target: as financial target we considered the soft cap of each ICO trying to reply its distribution among the kickstarter.com sub-set.
- A binary variable C which takes the value of 1 if the financial target is above fifty thousand USD that is the average value of the goal of the overall kickstarter.com database. We decided to add this variable because we noticed that the financial target criterion alone was not sufficient; in fact, since its median was about six thousand USD, we understood that that the mean value was strongly influenced by some projects outliers planning to collect many millions. So, we decided to introduce this variable because we considered that comparing an ICO willing to raise several million with a crowdfunding campaign willing to raise six thousand USD could have strongly affected our results.

In the table 4.2 we summarized the characteristics of the two samples according to the variables we introduced. As already mentioned, the ICO sample is composed by 383

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technology ICOs while the Crowdfunding sample is composed by 9481 technological campaigns. As we can see, the differences between the samples are relevant: the ICO success rate is four times the crowdfunding one, while the percentage of campaigns with a financial target higher than fifty thousand USD is about 5 times smaller.

	Mean ICO	Mean Crowdfunding	Mean difference	SD Crowdfunding
Success rate	0.81	0.21	0.61	0.41
Financial target	4.7E06	6.5E04	4.6E06	3.4E05
C	0.96	0.22	0.74	0.41

Table 4.2 descriptive statistics pre-PSM

PSM is an algorithm which allows matching one ICO to one or more crowdfunding projects. We decided to keep the ratio 1:1 so once the PSM has been used, we would dispose of a sample whose size is 766, 383 ICOs and 383 Crowdfunding campaigns.

In the table 4.3 we can find the results of the application of the matching process. The percentage of projects whose financial target is above fifty thousand USD is 96 % for both ICO and crowdfunding which started from a value of 22 %, considering the success rate we notice an improvement of 3 times on the crowdfunding dataset, making it reaches 63%. Also, the financial target mean has been improved in facts, we passed from 6.5E04 to 6.5E05, which is a change of one order of magnitude.

	Mean ICO	Mean Crowdfunding	Mean difference	SD Crowdfunding
Success rate	0.81	0.63	0.18	0.48
Financial target	4.7E06	6.5E05	4.0E06	1.5E06
C	0.96	0.96	0.0	0.18

Table 4.3 descriptive analysis post-PSM

Even though the two datasets are not identical according to the financial target criteria, we think that this difference is not so relevant for our further studies. In fact, the aim of

our study is an analysis on the rationale which leads to finance a project through a crowdfunding campaign or through an ICO and not an analysis which links the financial target to other variables, so the important thing is the comparison between projects which aimed at raising relevant amounts of money and the exclusion from the sample of the ones with an extremely low and, so, not comparable financial target.

4.2.2 Variables definition

After the process of collection of the data about the ICOs and the crowdfunding campaigns and the process of matching of the two samples to have more comparable data, we performed on them some transformations to obtain numerical variables useful to run the mathematical analysis required to reach the aim of this work. We turned most of the information we collected into mutually exclusive binary variables describing all the features related to the campaigns we mentioned above.

First of all, we modelled a binary variable called “*ICO/Crowdfunding*” to separate the initial coin offering campaigns from the crowdfunding campaigns: the value of this variable was 0 for the crowdfunding campaigns and 1 for the ICOs. This variable would afterwards be used as a dependent variable for our mathematical analysis.

Regarding the product under development, we built the variable “*tangible_product*” whose value was 1 if the product under development was a physical product and 0 otherwise. The variable “*prototype*” was equal to 1 if, before the starting date of the funding campaign, the venture had already a working prototype or a beta version and 0 otherwise. The variable “*patent*” was equal to 1 if the technology underlying the product under development was protected by a patent, another form of intellectual property or there was a license from a patent-owner and 0 otherwise.

Regarding the team composition, the variable “*blockchain_capability*” was equal to 1 if among the founders there were at least someone with a proven informatic and/or blockchain competence developed along his/her academic and working experience and 0 otherwise. The variable “*multiple_founder*” was equal to 1 if the proponent of the campaign was a team with more than one component or an established venture and 0 otherwise.

Variable	Definition
ICO/Crowdfunding	Variable equal to 1 when the founding campaign is an ICO
Multiple_founder	Variable equal to 1 when the proponent of the campaign is a team or an organized venture
Prototype	Variable equal to 1 when a working prototype/beta version already existed before the starting date of the campaign
Patent	Variable equal to 1 when the technology is protected by a patent/license
Blockchain_capability	Variable equal to 1 when one of the founders has a proven informatic/blockchain competence
Tangible_product	Variable equal to 1 when the product under development is a physical product

Table 4.4: Variables related to the campaign, the venture and the product under development

Regarding the personal characteristics of the entrepreneur, we modelled the subsequent variables: the variable “Sex” was equal to 1 if the entrepreneur was a woman and 0 otherwise, the variable “Age” was equal to his/her age at the beginning of the funding campaign. For the nationality we built eight binary mutually exclusive variables: one for each country among the five with more entrepreneurs for both the ICOs and the crowdfunding campaigns and one for all the other countries. So, we made up the variables “US”, “France”, “Italy”, “UK”, “Russia”, “Canada”, “Germany” and “other_country” whose value was 1 if the nationality of the entrepreneur was the one of the variables and 0 otherwise. In parallel we defined even clusters based on the continents and/or homogeneous geographic regions as a possible alternative to the one based on the countries. So, we built even the variables “Western_EU”, “Eastern_EU”, “Asia”, “North_America”, “South_America”, “Africa” and “Oceania” whose value was 1 if the nationality belongs to the continent that gave the variable the name and 0 otherwise. In making these classifications, we neglected the possibility of having a double citizenship and considered only one nationality for each person.

Variable	Definition
Sex	Variable equal to 1 when the entrepreneur is a woman
Age	Variable equal to the founder's age
US	Variable equal to 1 when the entrepreneur is a US citizen
France	Variable equal to 1 when the entrepreneur is a French citizen
Italy	Variable equal to 1 when the entrepreneur is an Italian citizen
UK	Variable equal to 1 when the entrepreneur is a British citizen
Russia	Variable equal to 1 when the entrepreneur is a Russian citizen
Canada	Variable equal to 1 when the entrepreneur is a Canadian citizen
Germany	Variable equal to 1 when the entrepreneur is a German citizen
Other_Country	Variable equal to 1 when the entrepreneur is not a citizen of the previous countries
Western_EU	Variable equal to 1 when the entrepreneur comes from Western Europe
Eastern_EU	Variable equal to 1 when the entrepreneur comes from Eastern Europe
Asia	Variable equal to 1 when the entrepreneur comes from Asia
Oceania	Variable equal to 1 when the entrepreneur comes from Oceania
North_America	Variable equal to 1 when the entrepreneur comes from North America
South_America	Variable equal to 1 when the entrepreneur comes from South America
Africa	Variable equal to 1 when the entrepreneur comes from Africa

Table 4.5: Variables related to the entrepreneur's general characteristics.

The academic experience of the entrepreneur originated the variable “*Top50_universities*” whose value was 1 if the person achieved his/her highest qualification in a university belonging to the top 50 universities of the world according to the 2016-2017 QS World University Rankings. Then, we made up four binary variables: “*Bsc*”, “*Msc*”, “*PhD*” and “*MBA*” according to the highest qualification achieved by the leader of each campaign. The variables “*economics*”, “*finance*”, “*technical*”, “*scientific*” and “*other_fields*” referred to the five clusters described above that we built. These variables were mutually exclusive since we considered only the highest qualification achieved by each person; in case of a qualification achieved after a multidisciplinary course of study, we considered only the major (primary focus of study) and not the minor (secondary focus of study).

Variable	Definition
Top50_universities	Variable equal to 1 when the entrepreneur achieved his/her highest degree in Top50 university
Bsc	Variable equal to 1 when the highest degree is a bachelor's degree
Msc	Variable equal to 1 when the highest degree is a master's degree
PhD	Variable equal to 1 when the highest degree is a PhD
MBA	Variable equal to 1 when the highest degree is an MBA
Economics	Variable equal to 1 when the field of study was economics
Finance	Variable equal to 1 when the field of study was finance
Technical	Variable equal to 1 when the field of study was technical
Scientific	Variable equal to 1 when the field of study was scientific
Other_fields	Variable equal to 1 when the field of study was different from the previous ones

Table 4.6: Variables related to the entrepreneur's education background

Regarding the professional experience of the entrepreneur, the variable “*Years_job_experience*” was equal to the years of experience starting from the first

working experience until the beginning of the funding campaign, the variable “*entrepreneurial_experience*” was equal to the number of past entrepreneurial experiences, the variable “*past_top_roles*” was equal to 1 if the person covered a top managerial role in his/her last job experience and 0 otherwise.

The last information related to the entrepreneur was the one about the last working city that was used to create three variables referred to the subdivision of the cities in clusters according to their population. The variable “*last_job_city_lower_1M*” was equal to 0 if the population of the city was lower than one million of inhabitants and 0 otherwise, the variable “*last_job_city_between_1M_5M*” was equal to 1 if the population of the city was between one and five million of inhabitants and 0 otherwise and the variable “*last_job_city_higher_5M*” was equal to 1 if the population of the city was higher than five million of inhabitants.

Variable	Definition
Years_job_experience	Variable equal to the years of working experience
Entrepreneurial_experience	Variable equal to the number of past entrepreneurial experiences
Past top roles	Variable equal to 1 when the last working position was a top managerial role
Last_job_city_lower_1M	Variable equal to 1 when the last city of working had a population lower than 1 million inhabitants
Last_job_city_between_1M_5M	Variable equal to 1 when the last city of working had a population between 1 and 5 million inhabitants
Last_job_city_higher_5M	Variable equal to 1 when the last city of working had a population higher than 5 million inhabitants

Table 4.7: Variables related to the past working experience of the leading figure of the campaign

Finally, we built the variables related to the profiles on the social networks of the entrepreneur: the variable “*LinkedIn*” was equal to 1 if the LinkedIn profile was available and 0 otherwise; the variable “*Twitter*” was equal to 1 if the Twitter profile was available and 0 otherwise; the variable “*LinkedIn_connections*” was equal to the number of LinkedIn connections in case the LinkedIn profile was available and the variable “*Twitter_followers*” was equal to the number of followers on Twitter in case the Twitter profile was available.

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Variable	Definition
LinkedIn	Variable equal to 1 if the founder's LinkedIn profile is available
Twitter	Variable equal to 1 if the founder's Twitter profile is available
LinkedIn_connections	Variable equal to the number of connections on LinkedIn
Twitter_followers	Variable equal to the number of followers on Twitter

Table 4.8: Variables related to the entrepreneur's social visibility.

Finally, for the ICOs only, we built even five binary variables related to the rights granted by the token to its holders according to the possible different rights highlighted by Adhami, Giudici, & Martinazzi (2018).; the variable “*currency*” is equal to 1 if the token can be used as a new cryptocurrency even outside the project and 0 otherwise. The variable “*service&Access*” is equal to 1 if the token is used to access to the service and/or as an internal currency and 0 otherwise. The variable “*governance&voting*” is equal to 1 if the token grants to its holders the right of taking part in the corporate governance and 0 otherwise. The variable “*profit*” is equal to 1 if the token is used by the company to allocate a part of its profit through dividends payments and tokens buyback. Finally, the variable “*contribution*” is equal to 1 if the token is used to take part in the development of the project with various roles.

Variable	Definition
Currency	Variable equal to 1 if the token can be used as cryptocurrency
Service&Access	Variable equal to 1 if the token can be used to access to the service
Governance&Voting	Variable equal to 1 if the token can be used to take part in the corporate governance
Profit	Variable equal to 1 if the token grants the right of receiving dividends
Contribution	Variable equal to 1 if the token is used to contribute in the project

Table 4.9: Variables related to the role of the token of the ICOs.

4.3 Univariate analysis

4.3.1 Overview of the samples

Prior to start the actual univariate analysis of the variables we listed in the previous chapter, we provide a preliminary overview of the general characteristics of the two samples referring to the ICOs and to the crowdfunding campaigns in order to achieve a first global understanding of the main characteristics of the two phenomena.

Before starting analysing some characteristics in common between the two samples, we analysed for the ICOs only the role of the tokens sold in the campaigns, according to the different rights granted to the tokenholders. This preliminary step was done to ascertain the actual number of ICOs selling tokens that are characterized by rights somehow analogous to the ones granted by the shares of a company to the shareholders and, consequently, more similar to the equity-based crowdfunding than to the reward-based crowdfunding that is the object of our crowdfunding sample.

Roles	Yes	No	NA
Currency	47	325	11
Service&Access	276	97	10
Governance&Voting	67	305	11
Profit	128	244	11
Contribution	30	342	11

Table 4.10: Data sample ICOs token roles

According to the data highlighted in the table 4.10, the Service&Access right is by far the most common between the ICOs part of our sample; more than 70 % of the campaigns sold tokens according to their holders this type of right making these ICOs easily comparable to a reward-based crowdfunding campaign. The contribution right is the less common between the different rights that can be attached to the token; it can be considered as a peculiarity of the ICOs only without a direct counterpart among the crowdfunding techniques, however most of the times it is not the only right attached to that token, but it is coupled to the Service&Access right or, much more rarely, to other rights, so, most of the campaigns selling tokens offering this right can be anyhow

considered analogous to the reward-based crowdfunding. The Currency role is offered by a little bit more than 12 % of the campaigns of the sample, even in this case, however, most of the times it is coupled with the Service&Access right, while it is coupled with the Governance&Voting and/or Profit rights only in an extremely limited number of campaigns.

Moving to those rights that are similar to the ones granted by the shares to its holder, the data highlight that the Governance&Voting right is offered by about 17,5 % by the ICOs, while the Profit right is much more common as it is granted by about one token out of three. Moreover, these rights are generally offered by tokens not granting Service&Access rights, even if there are cases of tokens granting both the Service&Access right and Governance&Voting or Profit right. Due to this high incidence, we decided to repeat twice our multivariate analysis: the first time considering the complete sample of the ICOs and the second time considering only that ICOs providing to the tokenholders the Service&Access rights.

After this preliminary data, we now begin the comparison between the two samples looking at the country of origin of the entrepreneurs in order to get a picture of the geographical distributions of them in the two samples.

As shown in the two figures above, respectively concerning the ICOs the table 4.11 and the crowdfunding campaigns the table 4.12, in both cases, the US is the country with the higher number of campaigns, however, the percentage is considerably different in the two cases: for the crowdfunding 32.6 % of the campaigns are led by a person owning the US citizenship, while for the ICOs this percentage decreases to 18.8 %. The more glaring difference between the two samples is the data referring to Russia; in fact, Russian citizens are the second widespread nationality among the leaders of the ICO campaigns with a relative incidence of 12.3 % of the total sample, while they are not even in the top ten nationalities of the leaders of the crowdfunding campaigns (less than 1 % of the crowdfunding campaigns of the sample are led by Russian citizens). Conversely, United Kingdom and Germany position themselves in positions somehow analogous in both the rankings – they are among the top four positions for both the ICOs and the crowdfunding campaigns -. Their relative contribution, however, is consistently higher in the crowdfunding sample (more than 5 %) than in the ICOs sample (between 3 and 4 %).

It is interesting even the case of Italy that can be seen as the counterpart of the Russia, obviously with a number of campaigns much lower. In fact, Italy is the fifth country by the number of entrepreneurs who launched crowdfunding campaigns with a percentage of 3.4 %, while the number of ICOs launched by Italian citizens is much lower (only two ICOs of our sample were launched by Italian citizens). Finally, disregarding the value of the single countries, it is interesting to point out that, net of the higher percentage of unavailable data for the ICOs, the origins of the leaders of the crowdfunding campaigns are more geographically concentrated than the ICOs: about 52 % of the leaders come from the top 5 countries for the crowdfunding campaigns, while the respective percentage for the ICOs is about 40 %.

Country	Number of campaigns	Percentage over total
US	72	18.80%
Russia	47	12.27%
UK	15	3.92%
Germany	12	3.13%
Canada	9	2.35%
India	7	1.83%
France	7	1.83%
Ukraine	7	1.83%
Poland	6	1.57%
Slovenia	6	1.57%
Australia	6	1.57%
China	6	1.57%
Other	72	18.80%
NA	111	28.98%

Table 4.11: Data sample ICOs country of the entrepreneurs

Univariate analysis

Country	Number of campaigns	Percentage over total
US	125	32.64%
Germany	24	6.27%
UK	20	5.22%
France	17	4.44%
Italy	13	3.39%
China	10	2.61%
Israel	6	1.57%
Canada	6	1.57%
Switzerland	6	1.57%
Sweden	5	1.31%
Spain	5	1.31%
Netherlands	5	1.31%
Austria	5	1.31%
Other	55	14.36%
NA	81	21.15%

Table 4.12: Data sample crowdfunding country of the entrepreneurs

Looking again at the information about the nationality of the leader of the campaign, but making clusters according to geographical macro areas, instead of the single countries, it is possible to find some other additional information. As shown in the tables 4.13 and 4.14, respectively concerning the ICOs and the crowdfunding campaigns, the number of campaigns launched by the North American citizens is somehow equal to the one of the US citizens, meaning that the contribution of Canadians, Mexicans and other Central American countries is almost negligible. Without the division between Eastern and Western Europe the leading continent for the ICOs would have been the Europe with a combined percentage of about 35 % of the campaigns, conversely, the number of

crowdfunding campaigns launched by North American citizens is still higher than the number of campaigns launched by European citizens.

Within Europe, the incidence of the Western and Eastern parts of the continent is completely different in the two samples: in the one referred to the ICOs Eastern Europe accounts for more than 21 %, while Western Europe accounts only for 13.6 %, while, on the other hand, Western Europe accounts for more than 28 % of the crowdfunding campaigns and Eastern Europe accounts only for less than 4 %. This is in line with what already pointed out regarding Russia and Italy, but it goes beyond underlining the inclination of launching ICOs in the whole Eastern Europe (Russia accounts only for 57 % of the total ICOs launched in the Eastern Europe) and, in parallel, the substantial disinterestedness of that part of Europe for the crowdfunding campaigns, while for the Western Europe it is possible to talk about a predilection for the crowdfunding campaigns, but even a considerable interest for the ICOs. Finally, the numbers referring to the other continents are somehow analogous for Oceania and Asia, while the Africans seem to prefer the ICO instead of the crowdfunding campaigns and the South Americans seem to do the opposite choice, however, due to the smallness of the numbers of campaigns referring to both the continents, these conclusions cannot be considered significant.

Geographical Area	Number of campaigns	Percentage over total
North_America	83	21.67%
Eastern_EU	82	21.41%
Western_EU	52	13.58%
Asia	38	9.92%
Africa	10	2.61%
Oceania	6	1.57%
South_America	1	0.26%
NA	111	28.98%

Table 4.13: Data sample ICOs geographical area of the entrepreneur

Univariate analysis

Geographical area	Number of campaigns	Percentage over total
North_America	134	34.99%
Western_EU	108	28.20%
Asia	33	8.62%
Eastern_EU	15	3.92%
Oceania	5	1.31%
South_America	5	1.31%
Africa	2	0.52%
NA	81	21.15%

Table 4.14: Data sample crowdfunding geographical area of the entrepreneur

Looking at the characteristics of the goals of the campaigns that are shown in the tables 4.15 and 4.16, it is immediately evident that the goals of the ICOs are on average higher than the one of the crowdfunding campaigns: more than 70 % of the ICOs of the sample that communicated a goal for their campaign – either a soft or and hard cap or both of them – set a threshold higher than five million USD, while only eight of the crowdfunding campaigns belonging to our sample set a goal overcoming that amount. Most of the crowdfunding campaigns, in fact, set a goal between 50,000 USD and 500,000 USD (about 62 % of the sample) or between 500,000 USD and 5,000,000 USD (about 32 % of the sample). The main similarities between the two samples are the low frequency of campaigns declaring a goal lower than 50,000 USD: only five ICOs and 14 crowdfunding campaigns set their cap to such small amount of money, with a relative incidence respectively of 1.9 % for the ICOs and 3.6 % for the crowdfunding campaigns.

Goal	Number of campaigns
<50000	5
>50000&<500000	14
>500000&<5000000	54
>5000000	190

Table 4.15: Data sample of ICO goal

Goal	Number of campaigns
<50000	14
>50000&<500000	238
>500000&<5000000	123
>5000000	8

Table 4.16: Data sample crowdfunding goal

4.3.2 Variables univariate statistics

After the global overview done in the previous chapter, we now provide some univariate statistics related to the variables formerly defined that will be used for the next steps of this work. Conversely to the previous chapter in which we divided the whole sample in two samples, the one related to the ICOs and the one related to the crowdfunding campaigns, in this section we provide univariate statistics referring to the whole sample including both ICOs and crowdfunding campaigns.

We firstly provide in the table 4.17 the univariate statistics for the dependent variable and for the characteristics related to the founding team behind the campaign. The variable “*ICO/Crowdfunding*” is the dependent variable, and, obviously, its percentage of non-disclosure is null. According to the way we used to model the sample both its mean and standard deviation are equal to 0.5. Even for the other two variables the percentage of non-disclosure is null: for the variable “*multiple_founder*” this descends from the fact that we were always able to collect the information whether the project was the work of a single person or not, even in the cases in which the personal data of these people were not available. Regarding the “*blockchain_capability*”, the lack of non-disclosed data descends from the facts that the past experience related to blockchain projects was strongly sharpened, so we were able to collect this information disregarding the availability of the detailed profiles of the single people. The values of the mean show that many of the campaigns were launched by teams composed by more than one person and that the team members with a strong blockchain experience were part of the team only for 13 % of the campaigns of the sample.

Univariate analysis

Variable	Number of observations	Percentage of non-disclosure	Mean	Standard deviation
ICO/Crowdfunding	766	0.00%	0.50	0.50
Multiple_founder	766	0.00%	0.80	0.40
Blockchain_capability	766	0.00%	0.13	0.34

Table 4.17: Main univariate statistics of the dependent variable and the variables related to the team.

Then, we provide the main univariate statistics for the variables related to the product under development; these statistics are displayed in the table 4.18. We succeeded in gathering rather inclusive information, with a percentage of non-disclosure always below 10 %. This value is much lower for the variable “*tangible_product*” since, for collecting that information, we needed only a description of the de product under development; for the other two variables the number of observation is lower, due to the need of having more detailed information about the product, its technology and its development, in some cases, this was not possible due to the unavailability of the documentation related to the product, such as the whitepapers for some ICO campaigns that were failed. From the values of the mean it is immediate to see that the campaigns whose technology is protected by a patent are much rarer than the campaigns that already developed a working prototype or a beta version before starting the fundraising. Regarding the tangibility of the products, slightly less than 40 % of the whole sample developed tangible products.

Variable	Number of observations	Percentage of non-disclosure	Mean	Standard deviation
Tangible_product	762	0.52%	0.39	0.49
Patent	731	4.59%	0.13	0.34
Prototype	700	8.62%	0.37	0.48

Table 4.18: Main univariate statistics of the variables related to the product under development

Regarding the personal data of the founders, the percentage of non-disclosure is consistently higher if compared to one of the variables related to the product, however, except for the variable “*Age*”, whose percentage of non-disclosure is higher than 44 %, it is still acceptable. The percentage is much lower for the variable “*Sex*” since we needed

only the name of the leader of the campaign to ascertain his/her sex without having the need of looking to his/her LinkedIn profile or website. From the mean it is possible to see that the presence of women on the top position of a campaign is quite rare, only in the 8 % of the cases.

For the variables related to the geographical origin we could not determine it only on the base of the name, so we needed a profile on a social network or, at least, a brief description on the website of the ICO or on the profile of the creator of kickstarter.com and this explains the higher level of non-disclosure. Finally, regarding the age, in many cases it was not indicated even on the profiles from which the high non-disclosure percentage. The average age is little more than 35 years, however, due to the very high number of campaigns of which we could not collect the data, we decided not to use this variable in the subsequent steps of our mathematical analysis.

Variable	Number of observations	Percentage of non-disclosure	Mean	Standard deviation
Sex	650	15.14%	0.08	0.27
Age	428	44.13%	35.08	9.74
Western_EU	574	25.07%	0.28	0.45
Eastern_EU	574	25.07%	0.17	0.38
North_America	574	25.07%	0.38	0.49
South_America	574	25.07%	0.01	0.10
Asia	574	25.07%	0.12	0.33
Oceania	574	25.07%	0.02	0.14
Africa	574	25.07%	0.02	0.14

Table 4.19: Main univariate statistics of the variables related to the personal data of the entrepreneur

Regarding the variables related to the academic background of the leader of the campaign, whose main univariate statistics are shown in the figure 19, the percentage of non-disclosure is quite high, due to the need of having a LinkedIn profile to collect this information, but still acceptable. More in detail the percentage is about 37 % for the

variables related to the qualifications achieved and the field of study and it is about 39 % for the variable related to the Alma Mater. This slight difference descends from the fact that sometimes the profiles on LinkedIn reported the information about the field of study and the qualifications achieved without the indication of the university where that qualification was achieved or vice versa. Looking at the information provided by these data, most of the leaders of the campaigns hold a bachelor's degree (34 % of the sample) or a master (36 % of the sample), while PhD and MBA are less common and are settled around 10 %. The sum of the mean of the four variables is not one, since some campaign leaders hold only a high school diploma, or even a lower qualification, or other qualifications such as a professional certification.

Regarding the field of study, the technical background that includes engineering, computer science, information systems and other analogous courses of study, is the most widespread (36 % of the sample), followed by economics, that comprises even marketing, management and business administration, (27 % of the sample), while the scientific, including mathematics, physics and other pure sciences, and the finance field, respectively 7 and 5 % of the sample, are less common, finally a relevant percentage of the leaders (26 % of the sample) followed university courses related to fields different from the ones considered in our clusters (as an example medicine, law, literature, psychology etc.).

Finally, the variable "*Top50_universities*" related to the achievement of the qualification at a university belonging to the best fifty universities in the world according to the 2016-2017 QS World University Rankings, has an average of 0.18, meaning that 18 % of the campaign leaders studied in a university among the fifty best universities in the world; this percentage, that is quite high considering the limited number of universities considered among the multitude of universities active worldwide, is an index of a relatively high presence of highly-educated people among the leaders of a funding campaign.

Variable	Number of observations	Percentage of non-disclosure	Mean	Standard deviation
Bsc	480	37.34%	0.34	0.47
Msc	480	37.34%	0.36	0.48
PhD	480	37.34%	0.10	0.31
MBA	480	37.34%	0.09	0.29
Economics	480	37.34%	0.27	0.44
Finance	480	37.34%	0.07	0.25
Technical	480	37.34%	0.36	0.48
Scientific	480	37.34%	0.05	0.21
Other_fields	480	37.34%	0.26	0.44
Top50_universities	465	39.30%	0.18	0.39

Table 4.20: Main univariate statistics of the variables related to the academic background of the entrepreneur

As of the variables related to the past professional experience of the entrepreneur, whose main univariate statistics are shown in the table 4.21, the percentage of non-disclosure is about 15 % for the variables “*past_top_roles*” and “*entrepreneurial_experience*” and between 30 and 35 % for the variables related to the last working city and for the variable “*years_job_experience*”. Although all the information related to these variables was entirely collected on the LinkedIn profiles, this strong difference in the number of observations collected descends from the fact that, in many times, the city of working and the first job after the university path was not reported on the profile, so, we were not able to obtain the information; on the contrary, for the information regarding the top roles covered and the past entrepreneurial experiences we could make the hypothesis of no top roles covered and no entrepreneurial experiences in the past in case the LinkedIn profile did not include job experiences of that type (unlike the first jobs after the university experience, the top roles covered and the companies founded are usually always included in the past working experiences on the profiles on LinkedIn).

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The average years of experience is slightly less than fourteen years, despite the information of the age was not always indicated, this value is fairly in line with the average age of the leaders of the campaign that was 35 years, however the dispersion of the values is quite high as highlighted by the value of the standard deviation. The average number of past entrepreneurial experiences is 0.67 meaning that, on average, not all the entrepreneurs has already had such type of working experience, moreover, considering that in the sample there are many people with multiple past entrepreneurial experiences, it is evident that for a relevant part of the sample the funding campaign was his/her first entrepreneurial experience. Regarding the information about the top roles, 55 % of the sample already covered one of those roles in his/her past working experience.

Finally, more than half of the sample (54 %) had his/her last working experience in a city with less than one million of inhabitants; the 25 % of the sample had his/her last working experience in a city with population between one and five million inhabitants and the 21 % of the sample had his/her last working experience in a city with more than five million of inhabitants, index of the geographic dispersion of the people launching a funding campaign that are not concentrated only in the metropolis.

Variable	Number of observations	Percentage of non-disclosure	Mean	Standard deviation
last_job_city_lower_1M	525	31.46%	0.54	0.50
last_job_city_between_1M_5M	525	31.46%	0.25	0.43
last_job_city_higher_5M	525	31.46%	0.21	0.41
Top roles	642	16.19%	0.55	0.50
Years of professional experience	498	34.99%	13.72	8.81
Past entrepreneurial experience	649	15.27%	0.67	1.15

Table 4.21: Main univariate statistics of the variables related to the professional background of the entrepreneur

The last category of variables are the ones related to the profiles on the social networks of the leaders of the campaigns, whose main univariate statistics are shown in the table 4.22. Regarding the percentage of non-disclosure, the variables related to the presence or not of a profile have obviously a null percentage of non-disclosure, while the

percentage for the variables related to the number of followers/connections directly descends from whether that person has his/her profile on the social network or not.

LinkedIn results as much more common than Twitter: 72 % of the people art of the sample have a LinkedIn profile, while only 34 % of them has a Twitter profile. The average number of connections on LinkedIn is 384 – it is important to point out that if someone has more than 500 connections on LinkedIn, the social network does not publish the actual number, but it only reports that there are more than 500 connections, so we were forced to consider 500 connections even if they were probably much more -. Conversely, the average number of followers on Twitter was 8445, a value extremely high, but not so relevant considering that the standard deviation was about eight times it. This can be explained by the fact that, even in presence of a consistent number of people with a limited number of followers, the average was pushed up by 15 people with more than 10,000 followers and 3 people with more than 100,000 followers. If we consider even the scarce width of the sample for this variable, it is evident that this value cannot be considered significative.

Variable	Number of observations	Percentage of non-disclosure	Mean	Standard deviation
LinkedIn	766	0.00%	0.72	0.45
Twitter	766	0.00%	0.34	0.48
LinkedIn number	548	28.46%	384.56	174.10
Twitter number	264	65.54%	8445.39	66904.84

Table 4.22: Main univariate statistics of the variables related to the social visibility of the entrepreneur

4.3.3 Difference in sums

In order to better understand our sample, in line with the framework of Ahlers, Cumming, Guenther, & Schweizer (2015), we performed an additional univariate analysis on the difference in sums. We chose to run a difference in sums analysis for all those variables which are binary since a difference in means analysis would have led to a less understandable result. Instead, for the not binary variables we conducted the traditional difference in means analysis; even though the two statistics are different, the

message they carry out is the same, so they are comparable. We split our sample containing 766 projects in two sub-samples accordingly to their funding nature, crowdfunding or ICO. We will now present the analysis divided by the category of variables we defined.

4.3.3.1 *Team and product related features*

The main difference in sums for the variables related to the team and the product under development is on the tangibility of the products. This is something we expect, since the ICOs are more likely to offer services related to the online world or software and platforms dedicated to particular issues while the crowdfunding projects are usually more product-oriented. Overall, in this cluster of variables there are other differences among the two sub samples; while the difference in patents seems to be not relevant, the presence of prototypes and the kind of ownership behind the project seem to be important. ICOs holding a patent is 12 % of the sub sample, while the crowdfunding projects holding a patent represent the 14 %; this difference may be not relevant, nevertheless the percentages are interesting. Considering the variable prototypes, which also includes beta versions for intangible products, the difference is impressive: in our opinion this difference could be linked to the fact that the ICO business is still in an initial phase of its development, in which many entrepreneurs, before investing their own resources, want to understand whether their idea could work or not. Another possible explanation of this difference can be the high incidence of “scams” in the ICO world, this variable could help signalling the probability that an ICO turns out to be a scam. Another difference which does not surprise us, is the result of the variable “*multiple_founder*”, we remember that this variable takes the value of 1 if the entrepreneur is backed up by a team, and 0 otherwise. We can notice that almost each ICO has a team behind the figure of its founder; this is probably due to the more complex structure of the projects in comparison to the ones of the crowdfunding in which is not unusual to find single individuals who propose their own ideas. In the table below, it is possible to look at these results.

	ICO sum	Crowdfunding sum	Difference in sums
Team and product related variables			
Tangible_product	14	283	-269
Patent	45	53	-8
Prototype	43	214	-171
Multiple_founder	381	228	153
Blockchain_capability	69	31	38

Table 4.23: Difference in sums for team and product related variables

4.3.3.2 Entrepreneur's personal data related variables

We now move to the cluster related to the entrepreneur's personal data; starting from the bottom of the table 4.24, we notice that the entrepreneurs who choose the ICO way have a stronger blockchain capability than the ones choosing the crowdfunding way. It seems that this variable could have an impact on the model we are building, but we wait for the overall results to draw any conclusion about it. This variable is also one of our research hypotheses as we mentioned in chapter 3. The second thing that we want to point out is the presence of a non-binary variable related to the age of the founder. For this particular variable, as we previously mentioned, we performed a difference in means instead of a difference in sums. Comparing this cluster of variables with the previous one, we can immediately say that the amplitude of the differences is much more relevant. As already presented in the univariate analysis, we chose two sets of variables to study the geographical origin of the entrepreneurs. Considering the country-variable, the only that could be significant seem to be the ones related to US and Russia, the former in favour of crowdfunding and the latter in favour of ICO. Considering the continent-variables, Europe presents a singular distinction: while ICO entrepreneurs are more likely to come from Eastern Europe, crowdfunding entrepreneurs are more likely to come from Western Europe. The value of the Eastern Europe can be explained by the strong development that the ICOs are experiencing in Russia, where a strong informatic competences has become peculiarities of the country. Instead, North American presents

Univariate analysis

the highest absolute values with 83 ICO entrepreneurs coming from US and 134 Crowdfunding entrepreneurs born as US citizens. This could be a signal that US is always at cutting edge of the innovation, event in the field of alternative finance.

In the table below, the results are presented.

	ICO sum	Crowdfunding sum	Difference in sums/means
Entrepreneur's personal data			
Sex	22	29	-7
Age	34.42	35.67	-1.25
US	72	125	-53
Germany	12	24	-12
UK	15	20	-5
Italy	2	13	-11
Canada	9	6	-3
France	7	17	-10
Russia	47	2	45
Other_country	110	95	15
Western_EU	52	108	-56
Eastern_EU	82	15	67
Africa	10	2	8
Asia	38	33	5
North_America	83	134	-51
South_America	1	5	-4
Oceania	6	5	1

Table 4.24: Difference in sums for entrepreneur's personal data variables.

4.3.3.3 *Academic background related variables*

The third cluster of variables we analysed is the one concerning the academic background of the entrepreneurs. Analysing table 4.25, the qualifications that the entrepreneurs gained in their academic experience, we notice ICO entrepreneurs are more likely to stop at the Bachelor level if compared to crowdfunding entrepreneurs who are more likely to follow up their studies till the PhD. Instead, ICO entrepreneurs go for an MBA more often, maybe to fill the gap of knowledge generated by the interruption of their studies at the Bachelor. However, the differences do not seem to be relevant. Moving to the field of study, it is interesting to point out that those who choose crowdfunding are more likely to study in the engineering or technology field, this could be explained by the fact that many of them will raise their company on their own, and many of them are able to produce a prototype in advance: these two elements of course involves some technical skills. In both the sub samples we can find a very broad range of fields of study, in fact we notice that 67 ICO entrepreneurs and 57 crowdfunding entrepreneurs have a background different from the STEM one. Finally, even if the number of entrepreneurs who had studied in a university belonging to the top 50 universities of the world is not small, the difference seems to be not relevant.

Here below data about the education related variables are presented.

Univariate analysis

	ICO sum	Crowdfunding Sum	Difference in means
Academic background related variables			
Bsc	85	79	6
Msc	81	94	-13
PhD	20	30	-10
MBA	26	19	7
Economics	67	62	5
Fianance	26	7	19
Technical	72	99	-27
Scientific	16	7	9
Other_fields	67	57	10
Top50_universities	43	41	2

Table 4.25: Difference in means for the academic background related variables

4.3.3.4 Entrepreneur's past experience related variables

The second-last cluster for which we performed our difference in sums analysis, is the one related to the entrepreneurs' working experience. We point out that for the variables related to the entrepreneurial experience and to the years of working experience we did a difference in means analysis since these two variables are not dummies. The first variable we want to comment is the one related to the last job of the entrepreneurs, trying to understand whether it was a top role or not; we immediately notice that most of ICO entrepreneurs have covered a top role before launching their own business. Instead, the entrepreneurs who choose to finance their venture with crowdfunding have previously covered a top role with a ratio of 1:3 respect to ICO's ones. This seems to be a relevant parameter for the further analysis, in fact, the difference in sums is 191 which is quite high. Even the last city where entrepreneurs worked seems to be significant, in particular, in the case where the last city counts less than one million of inhabitants and in the case where the city counts more than five million of inhabitants. It is interesting

to note that, while the information about the city with less than one million people is significant for crowdfunding, the variable about cities with more than five million people is significant for the ICOs. An explanation could be that the phenomenon of ICO is recent, and it has diffused faster in cities with a broad openness to world, which generally are the bigger cities. Concerning the entrepreneurial experience measure, we see that, on average, each two crowdfunding entrepreneurs one has already previously founded a start-up; the average doubles for ICO entrepreneurs. Overall, ICO entrepreneurs seem to have more working experience than crowdfunding ones, even though the average of working experience is slightly more favourable for crowdfunding entrepreneurs.

The table 4.26 provides the results of this cluster.

	ICO sum	Crowdfunding sum	Difference in sums/means
Entrepreneur's past experience related variables			
Past_top_roles	273	82	191
Years_job_experience	13.04	14.40	-1.36
Entrepreneurial_experience	0.84	0.45	0.39
last_job_city_lower_1M	83	202	-119
last_job_city_between_1M_5M	52	77	-25
last_job_city_higher_5M	81	30	51

Table 4.26: Difference in sums of entrepreneur's working experience variables

4.3.3.5 Social visibility related variables

Concerning the social visibility analysis, we did not find much difference in the presence or not of LinkedIn accounts. This similar result also helped us to collect all the useful data that we employed for our analysis, in fact, as already mentioned, LinkedIn accounts have been our primary source of information for the entrepreneurs' backgrounds. We

Univariate analysis

want to remark that here we performed a difference in means analysis on the variables “*LinkedIn_connections*” and “*Twitter_followers*” since they are not binary variables. The differences for the Twitter followers seem to be favourable to ICO entrepreneurs even though a clear conclusion cannot be drawn since the number of Twitter accounts represent just a third of our overall sample.

The results are listed in table 4.27:

	ICO sum	Crowdfunding sum	Difference in sums/means
<hr/>			
Social visibility related variables			
<hr/>			
LinkedIn	279	269	10
Twitter	146	118	28
Linkedin_connections	398.69	369.90	28.79
Twitter_followers	14928.68	545.59	14383.09

Table 4.27: Difference in sums for Social visibility variables

4.3.4 T-Test

The analysis we conducted so far gave the opportunity to have a general overview of our data sample; firstly, we made a global overview of the whole sample, whose size is 766, then we computed the main univariate statistics for the two sub samples referred to the ICOs and the crowdfunding campaigns, then, in the previous chapter, we performed a difference in sum analysis on the two sub samples. In this chapter, instead, we go in deep with the results of the previous chapter performing an inferential univariate T-Test on the means of each variable to verify the existence of statistically significant differences. The sample we considered is the same employed for the difference in sums. This process will provide a better understanding of the phenomenon, and it will be helpful in the construction process of our final model. The results of our analysis are presented in table 4.28.

Considering the cluster including the variables related to the team and the product under development, the T-Test analysis confirmed what we presented in the previous chapter. The variable “*patent*”, despite the slight difference in the percentages that are

respectively 13 % for the ICOs and 14 % for crowdfunding, is not statistically relevant. In fact, the two means are very similar making this variable probably not interesting to build our model. Instead, the variables “*tangible_product*”, “*prototype*”, and “*multiple_founder*” have a strong statistical significance. All their p-values are much below the threshold of 0.001 which make them valid candidates as independent variables for our model. As we said in the previous chapter, while the variable “*multiple_founder*” is unbalanced toward the ICO projects, the variables “*tangible_product*” and “*prototype*” are more favourable towards crowdfunding projects. Looking at the last variable of this cluster, the result of the T-tests confirms the strong significance of the variable “*blockchain_capability*”, that was already anticipated by the results of the difference in sums.

Moving our analysis to the cluster related to the entrepreneurs’ personal data, we immediately notice that the personal information regarding the gender and the age of the entrepreneurs are not statistically significant. This could be interpreted as a good signal from a diversity point of view, indeed, the choice of the funding technique does not seem to be influenced by whether the entrepreneur is young, old, male or female. Conversely, the geographic country-variables present some interesting results; both “*US*” and “*Russia*” are statistically significant, confirming what we inferred from the difference in means analysis, also “*Italy*” is significant at 99% confidence level which indicates that Italians are more likely to launch crowdfunding campaigns than ICOs. Another variable that resulted significant is “*other_country*”: this confirms that ICO entrepreneurs are more “global”, since they come from all around the world with less concentration than crowdfunding entrepreneurs; this fact is also confirmed by the significance of the continent-variable “*Africa*”. Considering the geographic continent-variables, we found a strong statistical significance in the variables “*Western_EU*”, “*Eastern_Eu*”, and “*North_America*”, these results are explained by the strong significance that we had noticed in the variables “*US*” and “*Russia*”.

Regarding the academic background of the entrepreneur, what we can point out is that, while none of the variables is strictly significant, the variables “*Msc*” and “*PhD*” are significant at 90 % confidence level, which is not as strong as other cases, but can still be relevant for our model. Instead, considering the university courses attended by the entrepreneurs, we notice that the entrepreneurs with a financial background are more likely to fund their start-ups through ICOs, while the entrepreneurs with a technical

background would opt for crowdfunding campaigns. Looking at the entrepreneurs' past working experience cluster what we immediately notice is that there are four variables which are statistically significant. The variable "*past_top_roles*" confirms that those entrepreneurs who had covered C-level position before launching their start-up are more likely to fund their enterprise through an ICO. The same result is confirmed by the "*entrepreneurial_experience*" variable which counts the number of start-ups previously founded by the entrepreneurs. Considering the variables related to the last city where the entrepreneurs worked, the bigger cities, with more than five million inhabitants, and the smaller cities, with less than 1 million inhabitants, resulted statistically relevant confirming what was said in the difference in sums analysis. Finally, in the social visibility cluster there is only one variable significant at 95% confidence level while the other three variables are not significant at all. This could indicate that the social visibility of the entrepreneur is not so important in the choice of the funding technique.

We want to remember that this is a univariate analysis which does not take into account the cross impacts between the variables. It is certainly a good starting point to build the model, but it is not sufficient to draw any conclusion on our sample.

	ICO average	Crowdfunding average	T-test	P-value	
<i>Team and product</i>					
Tangible_product	0.037	0.745	-29.17	5.102E-111	***
Patent	0.127	0.140	-0.505	0.614	
Prototype	0.134	0.566	-13.60	2.31E-37	***
Multiple_founder	0.995	0.595	15.74	9.76E-44	***
Blockchain_capability	0.180	0.081	4.11	4.34E-5	***
<i>Entrepreneur's personal data</i>					
Sex	0.069	0.088	-0.93	0.352	
Age	34.42	35.67	-1.33	0.183	
US	0.263	0.414	-3.88	1.15E-4	***
Germany	0.079	0.044	1.79	0.073	
UK	0.066	0.055	0.58	0.564	
Russia	0.171	0.007	7.08	1.05E-11	***
Italy	0.007	0.043	-2.80	5.5E-3	**
Canada	0.033	0.02	0.96	0.335	
France	0.026	0.056	-1.88	0.06	
Other_country	0.401	0.315	2.17	0.03	*
Western_EU	0.191	0.358	-4.56	6.3E-6	***
Eastern_EU	0.301	0.05	8.24	2.9E-15	***
Africa	0.037	0.007	2.440	0.015	*
Asia	0.140	0.109	1.10	0.272	
North_America	0.305	0.444	-3.46	5.8E-4	***
South_America	0.004	0.017	-1.57	0.118	
Oceania	0.022	0.017	0.48	0.634	

Univariate analysis

<i>Entrepreneur's academic background</i>					
Bsc	0.343	0.341	0.05	0.96	
Msc	0.327	0.405	-1.79	0.07	
PhD	0.081	0.129	-1.73	0.084	
MBA	0.105	0.082	0.86	0.389	
Economics	0.270	0.267	0.07	0.942	
Finance	0.105	0.030	3.32	1E-4	***
Technical	0.290	0.427	-3.14	1.8E-3	**
Scientific	0.065	0.030	1.78	0.075	
Other_fields	0.270	0.246	0.612	0.541	
Top50_universities	0.181	0.181	1.6E-2	0.998	
<i>Entrepreneur's past working experience</i>					
Past_top_roles	0.723	0.317	10.69	2.5E-24	***
Years_job_experience	13.04	14.40	-1.71	0.087	
Entrepreneurial_experience	0.836	0.450	4.59	5.3E-6	***
last_job_city_lower_1M	0.384	0.653	-6.29	7.5E-10	***
last_job_city_between_1M_5M	0.241	0.249	-0.22	0.824	
last_job_city_higher_5M	0.375	0.097	7.50	6.3E-13	***
<i>Entrepreneur's social visibility</i>					
LinkedIn	0.728	0.702	0.80	0.424	
Twitter	0.381	0.308	2.13	0.03	*
LinkedIn_connections	398.69	369.90	1.94	0.053	
Twitter_followers	14928.68	545.59	1.93	0.056	

Table 4.28: T-Tests

4.4 Multivariate analysis

In the previous chapter, we performed a first step of the analysis to dive deep into our data sample using some univariate statistics; in this chapter, we analyze some selected variables exploiting several multivariate regressive models.

The precedent step of the analysis was an exploratory study of an unknown phenomenon, aiming at understanding the data distribution and gaining insights regarding the statistical significance of the data sample variables without considering the cross-relations between them. Conversely, the purpose of this second step of analysis is to directly test the research hypotheses formulated in the chapter 3, regarding the determinants influencing the entrepreneur's financing decision.

We used binomial robust logistic regressions, given the binary nature of the dependent variable. We regressed the variable "*ICO/Crowdfunding*" which, we remember, is equal to 1 when the entrepreneur chooses an ICO as method to finance his/her venture and equal to 0 when he/she chooses a crowdfunding campaign, over a set of selected independent variables. These independent variables have been selected according to the research hypotheses formulated in the chapter 3.

The goodness of the models has been evaluated in term of McFadden pseudo – R^2 and in term of two different information criteria, the Bayesian Information Criterion and the Akaike Information Criterion. Regarding the independent variables, we considered the p-value for the statistical significance of each variable and the standard error of the observations as proxies of their dispersion.

We built the models in a progressive way: starting from a base model, containing only some project-related independent variables, then, we added in a sequential way the variables related to the entrepreneur's general characteristics, then the education related variables, the experience related variables and, finally, the social visibility related variables. Each time we added a group of variables, we checked their impacts to the previous set according to the three aforementioned criteria.

For every regression it has been done a multicollinearity test analyzing that the mean variance inflation factors (VIFs) of the set of variables was below the conventional threshold of 5, and that the maximum VIF was below the conventional threshold of 10 (Belsey, et al., 1980).

4.4.1 Dependent variable

As we already mentioned before, we exploited the logit regression to check the research hypotheses on our sample. The dependent variable “*ICO/Crowdfunding*” assumes the value of 1 if the project is financed through an ICO and a value of 0 if the project collects the capital through a crowdfunding campaign. Our sample is constituted of 766 observations, 383 projects exploited the potentialities of the ICOs and the remaining 383 exploited the opportunities of crowdfunding.

4.4.2 Independent variables

The set of independent variables was chosen in light of the research hypotheses presented in the chapter 3.

Considering the product related variables, we used the variables “*tangible_product*” and “*prototype*” to measure the presence of working version of the product at the launch of the campaign and to analyse whether the tangibility of the product influences the funding choice. These variables have been chosen because they are related to the hypotheses H3a and H3b. Regarding the variables related to the founding team, we considered the variable “*multiple_founder*”, which indicates whether the founder was a single person, or he/she was backed up by a team. Finally, there is the variable “*blockchain_capability*” whose aim is to study the research hypothesis H5 which states that a higher level of understanding of the blockchain topic would increase the probabilities that the funding will be carried out through an ICO.

Looking at the second cluster of variables, related to entrepreneur’s general characteristics, we decided to add to our model three variables useful to understand the impact of the geographic origin of the founder. These variables are “*Western_EU*” if the founder comes from this part of Europe, “*Eastern_EU*” if the founder’s origins are in the oriental part of the European continent and, finally, “*North_America*” if the founder comes from either US or Canada. This information is connected with the research hypothesis H1.

The third set of independent variables we chose is related to the cluster of variables which regards the entrepreneur’s academic background. It will help to study the research hypothesis H2a which wants to understand the impact of the education level on the choice of the fundraising model. We expect that a higher level of education increases the

possibilities that a project will be financed through an ICO. The higher level of education will be studied with help of four variables “*Bsc*”, “*Msc*”, “*PhD*”, and “*MBA*” which are all dichotomous variables with a value of 1 if the entrepreneur’s highest qualification corresponds the name of that variable.

Regarding the cluster related to the entrepreneur’s working experience, the set of independent variables chosen is composed by three variables which will test three research hypotheses. The variable linked to the hypothesis H2b is “*years_job_experience*”, while the variable “*past_top_roles*” is linked to the hypothesis H2c and finally the variable “*entrepreneurial_experience*” is linked to the research hypothesis H2d.

Finally, to test the hypothesis H6 the variable “*l_linkedin*” has been added. “*l_linkedin*” is the log-transformation of the variable which indicates the number of connections that a founder has on LinkedIn. This variable will be useful to understand whether the online social connections have an impact on the fundraising decision.

In the following table, we present the main descriptive statistics of the variables used in the model.

Multivariate analysis

Variable	N	Mean	Median	St. Dev.	Min	Max
ICO/Crowdfunding	766	0.5	0.5	0.5	0	1
Tangible_product	762	0.4	0.0	0.5	0.0	1.0
Prototype	700	0.4	0.0	0.5	0.0	1.0
Multiple_founder	766	0.8	1	0.4	0	1
Western_EU	574	0.3	0.0	0.4	0.0	1.0
Eastern_EU	574	0.2	0.0	0.4	0.0	1.0
North_America	574	0.4	0.0	0.5	0.0	1.0
Bsc	480	0.3	0.0	0.5	0.0	1.0
Msc	480	0.4	0.0	0.5	0.0	1.0
PhD	480	0.1	0.0	0.3	0.0	1.0
MBA	480	0.1	0.0	0.3	0.0	1.0
Past_top_roles	642	0.6	1.0	0.5	0.0	1.0
Entrepreneurial_experience	649	0.7	0.0	1.1	0.0	9.0
Blockchain_capability	766	0.1	0	0.3	0	1
Years_job_experience	498	13.7	12.0	8.8	0.0	54.0
L_linkedin	548	5.6	6.2	1.3	0.0	6.2

Table 4.29: Model variables univariate statistics

4.4.3 Results

In this section we will present the results of the Logit regressions, shown in table 4.30, used to study our set of research hypotheses. As we can notice from the table, we firstly created a simple model (model 1) constituted by just three variables, the ones corresponding to the two project related variables plus the variable “*multiple_founder*” to deep dive into the hypotheses H3a, H3b and H4. Then, we added the variables related to the entrepreneur’s geographic origin, building the model 2 to test even the hypothesis H1. In the model 3 we added the variables connected to the entrepreneur’s academic background, which are important to test the hypothesis H2a. Then, to build the model 4, we added the variables “*past_top_roles*” and “*entrepreneurial_experience*” whose results will be used to study the hypotheses H2c and H2d. The Model 5 takes into account also the effect of the variable “*blockchain_capability*”, related to the hypothesis H5 and, finally, the model 6 contains all the variables presented in the previous chapter and, in particular, it includes even the variables “*l_linkedin*” and “*years_job_experience*” to respectively explore the hypotheses H6 and H2b.

The number of observations it is not constant along all the models; this fact can be explained by the impossibility of collecting all the information for all the funding campaigns. From this descends that the number of observations is decreasing along the models.

The table 4.31 shows the correlation matrix between all the variables and table 4.32 presents the Variance inflation factors analysis. The results suggest that the multicollinearity is not a problem in our estimates, since the mean VIF is below the threshold of 5 and the maximum VIF is below the conventional threshold of 10 suggested by Belsey et al. (1980).

Generally, we notice a strong increase in all the statistics used to measure the effectiveness of the models; the McFadden R^2 passes from 0.735 in the first model to 0.943 in the model 6, reaching a high level of overall model explanation. Also the information criteria improve along the models, showing that each built model improves the performances and the understanding of the phenomenon in comparison to the previous one.

We now turn our attention to the significance of the independent variables to study the hypotheses presented in chapter 3.

The model 1 is constituted by the variables “*tangible_product*”, “*prototype*”, and “*multiple_founder*”; all these three variables are statistically significant at 99.9 % confidence level. In particular, the coefficient associated to the variable “*tangible_product*” is negative and, so, it confirms the hypothesis H3a which states that it is more likely that a project, offering a tangible product, is financed through a crowdfunding campaign. According to Gompers (1995) and Harris & Raviv (1991) the tangibility of a product will rather lead the project to be financed through a bank loan than through a venture capital fund. Since our analysis is focused on other two types of fundraising strategies, it is interesting to notice that, just for this variable, crowdfunding is considered to be more similar to a bank loan than to a venture capital.

In regards of the hypothesis H3b, the variable “*prototype*” is characterized by a negative coefficient, meaning that a start-up owning a working prototype is more likely to be financed through a crowdfunding campaign than through an ICO. According to the three stages of the start-up development as presented in the work of Paschen (2016), this result affirms that start-up located in the pre-start-up stage, in which a working prototype has not yet been developed, are more likely to launch an ICO, while start-ups located in the start-up stage are more likely to launch a crowdfunding campaign.

The last variable used in the model 1 is “*multiple_founder*” that is characterized by a positive coefficient. This means that ICOs are more likely to be launched by entrepreneurs backed up by a founding team, while single individuals are more likely to launch a crowdfunding campaign. This could be explained by many factors: first of all, the intrinsic complexity of the funding technique, which is certainly higher for an ICO than for a crowdfunding campaign. Then, there is the complexity of the product/service under development that is, on average, higher for the ICOs than for the crowdfunding campaigns and, so, it implies the presence of a team composed by many people with different skills (technical, informatics, economic, marketing etc.). Finally, considering the presence of a team composed by many people as a possible proxy for the legal incorporation of the venture, we can infer that the venture that already completed the incorporation process are more likely to launch an ICO, while the crowdfunding campaigns are quite often launched without the formal step of the legal incorporation, this result can be interpreted considering the legal incorporation as a sort of mandatory

prerequisite to launch an ICO effectively able to show its goodness and convince the potential investors who can be very reluctant to participate in an ICO that did not complete yet the incorporation process due to the fear that this offering could turn out to be a fraudulent one. On the contrary, for the crowdfunding campaigns, the signalling effect of the legal incorporation is less important due to the intermediary role played by the crowdfunding platforms.

We point out that the significance of the results and their impacts is confirmed along all the models analysed, meaning that these results are robust.

Regarding the hypothesis H1 which tries to establish a relationship between the fundraising decision and the entrepreneur's geographic origin, looking at the results provided by the model 2, the only significant variable is "*Eastern_EU*". This one, at 99.9% confidence level, states that entrepreneurs coming from the Eastern Europe are more likely to launch their project through an ICO. Comparing this result with the one of the model 6, in which all the variables are included, we can notice that "*Eastern_EU*" is still strongly significant. Furthermore, we notice that also the variable "*North_America*" becomes significant at 99 % confidence level with a positive coefficient. It, therefore, appears that the geographic origin is relevant in the choice of the fundraising strategy. This result sustains the hypothesis H1 and confirms the work of Pollard (2003) in which is stated that the characteristics of the firms are strongly influenced by the geographic location. Moreover, from the signs of the statistically significant coefficients it is possible to understand that the entrepreneur's countries of origin are more concentrated for the ICOs than for the crowdfunding campaigns: this can be explained considering the different level of maturity of these two fundraising techniques, in fact, while the ICOs gained their popularity only in 2017, the crowdfunding is a more mature technique, so, while the geographic diffusion of the ICOs is still limited to some areas in which they reached a high popularity level, the crowdfunding is already known worldwide.

Moving to the hypothesis H2a, we can look at the result of model 3 in which the variables related to the academic qualification were added. Only the variables "*Bsc*" and "*Msc*" are significant at 95 % confidence level, and both of them suggest that those entrepreneurs in possession either of a bachelor's degree or a master's degree will be more likely to finance their projects through a crowdfunding campaign. Considering that these two variables correspond to lower qualifications than the other two variables that take the

value of 1 in presence of an MBA or a PhD, the hypothesis H2a could seem to be verified, however the not relevance of the variables “*MBA*” and “*PhD*” that, what is more, are characterized by negative coefficients, leads us to consider the result as in contradiction to the hypothesis H2a; moreover it could have been a forcing to consider a bachelor or a master’s degree as a low level qualifications. Moving to the results of the model 6 we see that they are still consistent to the findings of the model 2, moreover, even the variable “*MBA*” turns out to be statistically significant with a negative coefficient making the hypothesis H2a definitively rejected. The idea behind that hypothesis was that the technical complexity necessary to develop an ICO requires a higher level of education of the founder; according to the results this seems not to be relevant meaning that there are no barriers in launching an ICO, from an educational point of view. Moreover, the results of the models suggest that entrepreneurs’ with high qualifications (from a bachelor’s degree onwards) are more likely to launch a crowdfunding campaign: considering that the crowdfunding campaigns are more likely to be launched by single individuals it is possible to infer that the academic background of the founder acquire a high importance if compared to the ICOs in which eventual lacks in the founder’s academic background can be offset by the abilities and the expertise of the other members of the founding team. Regarding the result that the higher complexity of the ICOs is not coupled with higher academic qualifications, this leads us to consider the peculiar skills needed to launch an ICO as commodities available on the market and not as prerequisites mandatory for an entrepreneur wanting to launch an ICO. A possible alternative explanation of the fact that entrepreneurs with high qualifications are not more likely to launch an ICO, even if this financing technique needs a dedicated ability and expertise, can descend from the fact that the development of the abilities related to the blockchain technology is not done attending university courses, but, in many cases, it is obtained studying the topic alone.

Regarding the hypotheses H2c, which is related to the past managerial experience of the founder, is studied through the variable “*past_top_roles*”. According to the hypothesis, we expect that this variable turns out to be relevant in the choice of financing. Looking to the results of the model 4, the variable is significant at 99.9 % confidence level. This result is confirmed also in the model 6, showing its robustness. Thus, the hypothesis H2c is confirmed. Analysing the hypothesis H2b, which is studied through the variable “*years_job_experience*”, that is not statistically significant, leading us to reject the research hypothesis. Finally, we consider the hypothesis H2d which is connected to the founder’s past entrepreneurial experience. We again expect that the variable

“entrepreneurial experience” will have an influence on our model. This is confirmed by the models 4, 5, and 6; thus, confirming what Colombo, Delmastro & Grilli (2004) found. It is interesting to notice that only the entrepreneurial experience and the fact to have covered a top role in the past have turned out to be significant, while the years of experience are not relevant, and they do not have an influence in the process. This result can descend from the fact that the years of working experience, in many cases, included even experiences in fields very different from the one related to the project that is going to be financed and, so, this information has not a strong influence on the entrepreneur’s decision. Furthermore, this result can be interpreted starting from the fact that the potential contributors are more interested in the quality of the past working experience than in its quantity and this can lead entrepreneurs not to consider their years of experience as a discriminant for the financing technique decision. Finally, considering that the average age of the entrepreneurs is not so high, it is anyway hard to have relevant differences in terms of the years of experience of the different individuals.

Then, the analysis focuses on the hypothesis H5, the one connected with the presence of a proven blockchain capability inside the founding team. We expect that this hypothesis will be confirmed considering the presence of such ability as an incentive to choose the ICO as a mean for the fundraising. However, looking at the models 5 and 6 where the variable *“blockchain_capability”* was added, we notice that this variable is not statistically significant and, thus, not relevant in the financing choice. This, similarly for the results related to the hypothesis H2a, is very interesting since it looks like that there are no entry barriers in the ICO market from a knowledge point of view. It could be explained by the fact that the specific informatic competences needed to launch an ICO can be considered commodities to be acquired in the market and, therefore, it is not necessary for the founder to be in possession of all of them. This finding is in contrast with the work of Cooper, Gimeno-Gascon & Woo (1994) and the work of Brüderl, Preisendörfer & Ziegler (1992) that showed that the presence of industry-specific abilities influences the financing decision: this result leads not to consider the blockchain skills as belonging to the industry-specific skills and, so, directly related to the development of the product/service, but only as skills needed to properly design the funding campaign.

Finally, looking at the hypothesis H6, we expect that the social visibility of the entrepreneur, that in our model is measured by the variable related to the LinkedIn

connections, will have an influence in the choice of the financing technique. This hypothesis is not confirmed by the results of our model; in fact, the model 6 shows that the variable “*l_linkedin*” is not statistically significant in determining the financing choice. This apparently goes, again, against the findings of the existing literature, in particular, the work of Nofsinger & Wang (2011) that shows a relationship between a high social visibility and the funds received by informal investors. However, considering that both the ICOs and the crowdfunding are targeted to retail investors, the results, firmly remaining that the hypothesis H6 is rejected, cannot be considered in contradiction with Nofsinger & Wang (2011), since the influence of the entrepreneur’s social connections achieve a higher importance when the financing decision is made between a technique targeted to professional investors and a technique targeted to retail investors and not in the case such this in which the financing decision is made between two techniques that are both targeted to retail investors.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-3.394*** (0.719)	-3.552*** (0.867)	-1.518 (1.262)	-8.948*** (2.923)	-9.303*** (2.970)	-11.129** (5.348)
Tangible_product	-4.778*** (0.361)	-5.130*** (0.515)	-5.340*** (0.612)	-7.294*** (1.384)	-7.243*** (1.390)	-7.746*** (1.621)
Prototype	-1.311*** (0.357)	-1.350*** (0.448)	-1.453*** (0.502)	-2.602*** (0.849)	-2.611*** (0.866)	-2.484*** (0.947)
Multiple_founder	6.188*** (0.753)	5.868*** (0.798)	5.578*** (0.840)	7.711*** (1.530)	7.737*** (1.548)	7.695*** (1.662)
Western_EU		-0.404 (0.552)	-0.388 (0.630)	1.613 (1.302)	1.602 (1.300)	1.878 (1.406)
Eastern_EU		2.318*** (0.770)	2.183** (0.897)	5.118*** (1.595)	5.108*** (1.617)	4.904*** (1.741)
North_America		0.461 (0.545)	0.694 (0.636)	3.215** (1.338)	3.165** (1.354)	3.122** (1.398)
Bsc			-1.867* (1.002)	-2.612 (1.672)	-2.493 (1.639)	-4.235** (1.977)
Msc			-1.802* (0.967)	-3.183* (1.735)	-3.036* (1.706)	-4.263** (1.952)
PhD			-1.642 (1.178)	-1.580 (1.764)	-1.506 (1.754)	-1.620 (1.918)
MBA			-1.304 (1.161)	-2.962 (1.882)	-2.636 (1.874)	-3.501* (2.024)
Past_top_roles				6.516*** (1.380)	6.576*** (1.403)	7.440*** (1.636)
Entrepreneurial_experience				0.869* (0.480)	0.813* (0.476)	0.890* (0.518)
Blockchain_capability					0.839 (0.779)	0.851 (0.969)
Years_job_experience						-0.079 (0.053)
L_linkedin						0.568 (0.680)
McFadden R-squared	0.735	0.823	0.862	0.933	0.934	0.943
AIC	289	202.5	169.1	96.8	97.6	92.3
BIC	307.2	232.4	213.4	148.6	153.4	155
Observations	700	528	418	399	399	372

Note:

p*p**p***p<0.01

Logit regression where the dependent variable is equal to 1 if it is an ICO project and equal to 0 if it is a Crowdfunding campaign.

Table 4.30: Multivariate regression results

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 ICO/Crowdfunding	1	-0.76	-0.50	0.43	-0.17	0.29	-0.11	0.04	-0.08	-0.07	0.03	0.69	0.35	0.19	-0.06	0.13
2 Tangible_product	1	0.59	-0.14	0.11	-0.21	0.11	-0.04	0.05	0.07	0.07	-0.02	-0.54	-0.27	-0.17	0.06	0.01
3 Prototype	1	0.59	1	-0.04	0.09	-0.12	0.10	-0.07	0.05	0.09	-0.01	-0.34	-0.19	-0.14	0.05	0.02
4 Multiple_founder	1	-0.01	1	-0.01	0.15	-0.17	-0.04	0.03	-0.03	-0.04	0.26	0.13	0.09	-0.16	0.22	
5 Western_EU	1	-0.26	1	-0.26	-0.48	-0.21	0.26	0.03	-0.13	-0.13	-0.18	-0.03	0.01	-0.01	-0.03	
6 Eastern_EU	1	-0.33	1	-0.33	-0.05	0.02	-0.02	0.05	0.19	0.08	0.04	-0.12	0.02			
7 North_America	1	0.28	1	0.28	-0.24	-0.07	0.03	-0.02	-0.05	-0.01	0.15	0.01				
8 Bsc	1	-0.59	1	-0.59	-0.25	-0.23	-0.00	0.01	0.10	-0.03	0.06					
9 Msc	1	-0.28	1	-0.28	-0.25	-0.05	0.04	-0.11	-0.10	-0.09						
10 PhD	1	-0.11	1	-0.11	-0.09	-0.05	0.01	0.06	0.00							
11 MBA	1	0.11	1	0.11	0.02	-0.06	0.14	0.09								
12 Past_top_roles	1	0.36	1	0.36	0.11	0.11	0.07									
13 Entrepreneurial_experience	1	0.07	1	0.07	0.10	0.13										
14 Blockchain_capability	1	-0.06	1	-0.06	0.06											
15 Years_job_experience	1	0.01	1	0.01												
16 L_linkedin	1		1													

Table 4.31: Correlation matrix for selected variable

Variable	VIF
Tangible_product	4.62
Prototype	1.64
Multiple_founder	3.25
Western_EU	2.40
Eastern_EU	3.51
North_America	4.20
Bsc	8.15
Msc	7.26
PhD	2.68
MBA	4.37
Past_top_roles	3.85
Entrepreneurial_experience	1.49
Blockchain_capability	1.22
Years_job_experience	1.90
L_linkedin	1.23
Mean VIF	3.45

Table 4.32: Variance Inflation Factor analysis

4.4.4 Robustness check

What we presented so far is an analysis which tries to determine the factors that could affect the fundraising strategy of an entrepreneur. To do that, we built a sample composed of 766 observations, 383 related to crowdfunding campaigns and 383 related to ICOs; for each observation we collected several explanatory variables related to the product under development, the founding team and the entrepreneur's characteristics. We ran a univariate analysis on our variables and, then, a multivariate analysis. The results of our regressions are presented in the previous chapter.

In this section, we want to perform a robustness check to ensure the reliability of our results.

As described in the section 4.1.3, we collected the data related to the crowdfunding campaigns from kickstarter.com. The projects available on kickstarter.com are reward-based; meaning that individuals contribute comparatively small amounts of money to projects in return for some kinds of rewards. The size of the rewards is usually a reflection of the amount contributed. They can range from something simple such as a thank-you postcard to a production version of the crowdfunded product. Regarding the ICOs, the clusterization of the sample can be made on the function associated to the token of the campaign. As we presented in the chapter 4.3.1, the most common token function is the one giving the opportunity of accessing the service offered by the project. Generally, this kind of tokens is named “*utility token*”. The ICOs which deliver these tokens are not considered as financial investments. This does not happen for the ICOs whose tokens give portion of the ownership of the firm or give the rights of receiving dividends. This distinction can be made also in the crowdfunding landscape, where the reward-based projects do not give any right on the ownership or on the dividends, while the equity-based campaign does. For this reason, the reward-based crowdfunding is comparable to the ICOs issuing utility tokens. Therefore, from our sample of 383 ICOs, we took out all the ICOs whose tokens could not be considered as utility tokens.

In the following table 4.33, we present the main univariate statistics for the new sample, that, this time, is composed by 383 crowdfunding campaigns and 285 ICOs with utility tokens.

.	N	Mean	Median	St. Dev.	Min	Max
ICO/Crowdfunding	668	0.4	0	0.5	0	1
Tangible_product	664	0.4	0.0	0.5	0.0	1.0
Prototype	623	0.4	0.0	0.5	0.0	1.0
Multiple_founder	668	0.8	1	0.4	0	1
Western_EU	515	0.3	0.0	0.5	0.0	1.0
Eastern_EU	515	0.1	0.0	0.3	0.0	1.0
North_America	515	0.4	0.0	0.5	0.0	1.0
Bsc	427	0.4	0.0	0.5	0.0	1.0
Msc	427	0.4	0.0	0.5	0.0	1.0
PhD	427	0.1	0.0	0.3	0.0	1.0
MBA	427	0.1	0.0	0.3	0.0	1.0
Past_top_roles	544	0.5	1.0	0.5	0.0	1.0
Entrepreneurial_experience	553	0.7	0.0	1.2	0.0	9.0
Blockchain_capability	668	0.1	0	0.3	0	1
Years_job_experience	447	13.6	12.0	8.8	0.0	54.0
L_linkedin	489	5.6	6.2	1.2	0.0	6.2

Table 4.33: Descriptive analysis for the subsample with utility tokens

Looking at the table 4.33, we notice that number of observations has decreased due to our sub split, but the size is still significant to run a new Logit regression. Performing this new analysis, we expect that each statistic, meaning McFadden R², AIC and BIC will improve in comparison with the ones obtained in table 4.30 due to the more similarity between the two samples. Furthermore, we also expect that the results presented in the previous chapter will be sustained by the new results of our robustness check.

Here below we present the correlation matrix of the new sample:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 ICO.crowdfunding	1	-0.75	-0.49	0.42	-0.18	0.26	-0.08	0.07	-0.09	-0.07	0.01	0.68	0.35	0.22	-0.08	0.12
2 Tangible_product		1	0.59	-0.12	0.11	-0.20	0.09	-0.06	0.05	0.07	0.00	-0.53	-0.26	-0.19	0.06	0.01
3 Prototype			1	-0.02	0.09	-0.10	0.07	-0.07	0.05	0.10	-0.02	-0.34	-0.19	-0.15	0.05	0.01
4 Multiple_founder				1	0.01	0.13	-0.17	-0.04	0.03	-0.03	-0.03	0.25	0.13	0.09	-0.16	0.23
5 Western_EU					1	-0.23	-0.50	-0.21	0.26	0.04	-0.13	-0.18	-0.05	0.00	-0.04	-0.04
6 Eastern_EU						1	-0.31	-0.05	0.01	-0.05	0.11	0.18	0.06	0.05	-0.13	0.02
7 North_America							1	0.27	-0.23	-0.07	0.02	0.00	-0.03	-0.01	0.17	0.02
8 Bsc								1	-0.60	-0.26	-0.22	0.01	0.03	0.11	-0.03	0.07
9 Msc									1	-0.28	-0.24	-0.05	0.03	-0.13	-0.09	-0.09
10 PhD										1	-0.10	-0.09	-0.07	0.01	0.07	-0.00
11 MBA											1	0.10	0.01	-0.07	0.15	0.08
12 Past_top_roles												1	0.36	0.12	0.10	0.06
13 Entrepreneurial_experience													1	0.06	0.09	0.13
14 Blockchain_capability														1	-0.05	0.08
15 Years_job_experience															1	-0.01
16 L_linkedin																1

Table 4.34: Correlation matrix for the subsample with ICO issuing utility tokens

We now turn our attention to the results of the Logit regression presented in table 4.36. As we did in the chapter 4.4.3, we built our final model, the model 6*, in a progressive way, following the same logic used before.

In the following table we present the comparison obtained with the model 6* and the results obtained with the model 6.

Variable	Model 6 – significance	Model 6* - significance
Tangible_product	***	***
Prototype	***	***
Multiple_founder	***	***
Western_EU		
Eastern_EU	***	*
North_America	**	**
Bsc	**	
Msc	**	
PhD		
MBA	*	
Past_top_roles	***	***
Entrepreneurial_experience	*	
Blockchain_capability		
Years_job_experience		*
L_linkedin		

Table 4.35: Comparison between the independent variable's significance

At a first look, we immediately see that some differences between the two models occurred. Looking at the variables “*tangible_product*”, “*prototype*”, and “*multiple_founder*”, we notice that all the variables are still significant at 99.9 % confidence level, confirming the results obtained in the model 6. This means that our findings in relation to the hypotheses H3a, H3b, and H4 are sustained also by the model 6*. In relation to the hypothesis H1, related to the geographic origin of the founder, we witness a decrease in the significance of the variable “*Eastern_EU*” while the variable “*North_America*” is still significant at 99 % confidence level; therefore, we will confirm

also the hypothesis on the influence that the origin of the founder has on the financing decision.

Instead, looking at the academic background of the founder, we see that none of the variables related is significant in the model 6*; this, of course, marks a strong difference in the model but not in the findings: in fact, the hypothesis H2a expected that a higher level of education will influence the fundraising choice in favour of the ICOs. The results of the model 6* are against this hypothesis as well as the results of Model 6; the main difference among them is that, from the model 6*, is not possible to infer that entrepreneurs with higher qualifications are more likely to launch a crowdfunding campaign. Conversely, analysing the hypothesis H2b related to the influence of the past working experience, we find different results for the two models; while for the model 6 the variable “*years_job_experience*” was not statistically significant, the results of the model 6* for the same variable are opposite. The significance is at 95 % confidence level, so the lowest level. The finding of the model 6* would back up the hypothesis H2b, however, considering the low level of significance and the results previously found in the model 6, we consider that H2b is rejected even though without a strong back up. A contradiction between the results of the models can also be found in the significance of the variable “*entrepreneurial_experience*”, in fact, in the model 6 it presented a significance at 95 % confidence level, while in the model 6* it is not significant. Again, we think that considering the combination of the results we are keener to reject the hypothesis H2d.

This is curious since that it appears that a previous entrepreneurial experience does not influence the fundraising strategy of the founder. Considering, instead, the hypothesis H2c, that is connected to the influence that the past managerial roles could have, we notice that it is sustained by both the models at a 99.9 % confidence level, confirming the finding presented in the previous chapter. We now turn our attention to the hypothesis H5; the variable “*blockchain_capability*” turns out to be not significant also in the model 6*. This means that it is not relevant in the definition of the fundraising strategy. This result confirms again what we analysed in the previous chapter and so we reject the hypothesis H5. Finally, concerning the hypothesis H6, related to the influence of the online social connections, we again confirm the aforementioned results and we reject H6.

Overall, we could state that the results derived by the model 6 are robust since that the model 6* confirmed the findings on eight hypotheses out of ten. The only two hypotheses whose findings were in contrast were H2b and H2d. Moreover, looking at the statistics of the models, we notice that the McFadden R^2 for the models based on the sub sample with ICOs selling utility tokens, is always greater than the corresponding model based on the whole sample. The same thing could be seen also for the information criteria, AIC and BIC which are always smaller than the corresponding in the previous model. This would confirm our hypothesis that reward-based crowdfunding is in some ways more comparable to the ICOs issuing utility tokens.

Multivariate analysis

	Model 1*	Model 2*	Model 3*	Model 4*	Model 5*	Model 6*
Constant	-4.117*** (1.009)	-4.216*** (1.131)	-2.535 (1.614)	-11.874*** (3.944)	-12.931*** (4.031)	-16.688** (6.688)
Tangible_product	-5.766*** (0.565)	-5.414*** (0.602)	-5.588*** (0.704)	-7.767*** (1.565)	-8.013*** (1.675)	-8.572*** (2.047)
Prototype	-0.890** (0.447)	-1.251** (0.491)	-1.416*** (0.540)	-2.525*** (0.877)	-2.586*** (0.913)	-2.754*** (1.048)
Multiple_founder	6.538*** (1.031)	6.397*** (1.069)	6.075*** (1.093)	8.557*** (1.820)	8.935*** (1.972)	9.458*** (2.269)
Western_EU		-0.574 (0.579)	-0.654 (0.660)	1.222 (1.293)	1.248 (1.284)	1.545 (1.378)
Eastern_EU		1.812** (0.852)	1.912* (1.025)	5.041*** (1.795)	4.998*** (1.884)	4.139* (2.203)
North_America		0.497 (0.581)	0.719 (0.672)	3.768** (1.532)	3.862** (1.620)	4.144** (1.697)
Bsc			-1.416 (1.213)	-0.718 (2.497)	-0.548 (2.178)	-1.033 (3.082)
Msc			-1.228 (1.199)	-1.127 (2.542)	-0.955 (2.224)	-1.019 (3.086)
PhD			-0.987 (1.380)	0.631 (2.617)	0.898 (2.353)	2.730 (3.494)
MBA			-1.459 (1.408)	-1.835 (2.663)	-1.358 (2.409)	-0.623 (3.254)
Past_top_roles				6.787*** (1.537)	7.109*** (1.672)	8.772*** (2.150)
Entrepreneurial_experience				0.470 (0.454)	0.389 (0.441)	0.384 (0.466)
Blockchain_capability					1.433 (0.890)	2.045 (1.256)
Years_job_experience						-0.134* (0.072)
L_linkedin						0.625 (0.732)
McFadden R-squared	0.768	0.824	0.861	0.934	0.937	0.947
AIC	219.9	174.7	148.9	85.9	85	80.7
BIC	237.6	204	192.3	136.6	139.6	142.2
Observations	623	483	382	365	365	344

Note:

*p**p***p<0.01

Logit regression where the dependent variable is equal to 1 if it is an ICO project and equal to 0 if it is a Crowdfunding campaign.

Table 4.36: Results logit regression with sub-sample utility Tokens

5 Conclusion and further research

An ICO is an innovative fundraising technique adopted by start-up firms to finance their development and based on the blockchain technology. Initially relegated to the small niche of the informatics and the blockchain enthusiastic, it experienced a dramatic increase in popularity from the beginning of 2017. The number of the ICO campaigns launched climbed up from about thirty in 2016 to slightly less than 900 in 2017; this growth went on during the first half of 2018 with more than 800 funding campaigns launched in half a year.

There are two main reasons behind the success experienced by this financing technique: the first, that is common to other financing techniques such as the crowdfunding, relies on the continuous growth of the non-conventional financing techniques, commonly known as alternative finance, due to the conditions of the traditional financing that are still suffering the consequences of the great recession started in 2008 making very hard for a start-up firm to access the traditional sources of capital such as the bank loans. The second reason is the parallel increase of popularity experienced by the blockchain technology that became on everyone's lips during 2017, grabbing the attention of media, companies, governments, universities and, more in general, of the whole crowd, even for possible applications that are very distant from the original application of the blockchain as underlying technology behind the Bitcoin.

Due to the newness of this phenomenon, the literature dedicated to this topic is not wide and mainly focused on two arguments: the first one is the regulatory framework related to the ICOs, so the differences among the various jurisdictions and whether the ICOs should be considered as a financial investment or not. While, the second one is represented by the determinants of the success of an ICO campaign, so the impact of some structural characteristics of the campaign itself and of the members of the funding team on its outcome.

On the contrary, regarding the study of the determinants behind the entrepreneur's decision of funding his/her start-up by launching an ICO campaign, there was a lack in the existing literature.

The aim of this work was to fill this lack and empirically analyse the determinants behind the entrepreneur's decision of launching an ICO to finance his/her venture; to reach this objective, we decided to compare the data from a sample of ICO campaigns to the corresponding data from a sample composed by start-ups financed with the financing technique that we considered more similar to the ICOs according to the kind of start-ups involved, the target of possible investors and the similarities of the steps contemplated by the financing technique. Considering all these elements, we came to choose the crowdfunding as the financing technique most similar to the ICOs. To the best of our knowledge, this is the first empirical analysis of the determinants behind the entrepreneur's decision of launching an ICO, one of the first empirical analysis behind the same decision but referred to crowdfunding campaigns and the first work to compare the ICOs to the crowdfunding campaigns.

Starting from the available literature regarding the capital structure and the decisions related to the financing of the start-up firms, we built ten research hypotheses related to the effect of some characteristics of the entrepreneur, of the founding team and of the product under development on the entrepreneur's decision of financing his/her start-up firm through an ICO rather through a crowdfunding campaign. Going more in detail, the hypotheses were related to the tangibility of the product under development, the presence of working prototypes at the beginning of the founding campaign, the academic background and the past working experience of the entrepreneur, the presence of an individual creator rather than a team composed by many people, the presence of someone owning specific blockchain capabilities inside the founding team and, finally, the social visibility of the entrepreneur.

In order to reach this result, we used a sample composed by 383 ICO campaigns obtained extracting from the whole sample including all the ICOs until the end of 2017 only the campaigns aimed at the development of a technological product or service. Then, starting from a database including all the campaigns launched on kickstarter.com in 2016 and 2017, we applied the Propensity Score Matching technique to extract 383 campaigns homogeneous to the sample of our ICOs according to some parameters. On this sample composed in total by 766 funding campaigns, we ran a univariate and a

multivariate analysis: we started computing the main univariate statistics, then we performed a difference in sums analysis and a T-Test analysis and, finally, we run some multivariate logit regressions; according to the results of the regressions, we accepted or rejected the research hypotheses made.

The results obtained lead us to accept some hypotheses and reject some others, obtaining in some cases, evidences of effects opposite if compared to the one we have supposed before starting the analysis. Analysing more in detail the results, the tangibility of the product affects the decision of the funding technique: start-ups developing tangible products, in fact, are more likely to launch a crowdfunding campaign rather than an ICO. We found exactly the same evidence for the presence of working prototypes at the beginning of the offering: this result induced us to suppose that the crowdfunding campaigns are usually launched by start-ups occupying a more advanced stage in the start-up lifecycle if compared to the start-ups launching an ICO.

The presence of a founding team instead of an individual creator turned out to be statistically significant, in detail individual founders are more likely to finance their ventures by launching a crowdfunding campaign rather than by launching an ICO. Even some of the variables related to the geographical origin of the entrepreneur resulted significant, leading us to accept the hypothesis that the geographical origin influences the decision of the funding technique.

On the contrary, the hypothesis that the ICOs, due to their higher intrinsic complexity, could be launched by the entrepreneurs who achieved the highest academic qualifications was rejected: the empirical evidence suggests that some of the variables related to the different qualifications (Bsc, Msc and MBA) are statistically significant, however, the entrepreneurs owning that qualifications are more likely to launch a crowdfunding campaign than an ICO, meaning that the expertise needed to launch an ICO are not directly requested to the entrepreneur himself/herself, but can be acquired on the market or can be acquired outside the traditional academic backgrounds.

Regarding the entrepreneur's past working experience, the number of past entrepreneurial experiences and the top roles covered turned out to be statistically significant, in both cases entrepreneurs with a higher experience are more likely to launch an ICO, while, on the contrary, the cumulated number of working years turned out to be not significant. Contrarily to what expected, the presence of a proven

blockchain capability inside the founding team resulted as not significant in the selection of the funding technique, further confirming the fact that the peculiar informatic abilities needed to design an ICO campaign are not directly requested to the entrepreneur owning the start-up, but can be acquired on the market, relying on the large number of programmers who are available to support the firm in the informatic steps of the design of an ICO. Finally, the social visibility of the entrepreneur, measured according to the number of LinkedIn connections, turned out to be not significant at all.

We repeated the regressions excluding from our sample the ICOs characterized by tokens that did not provide to its holders the rights of accessing the product/service under development and, so, were less comparable to the reward-based crowdfunding campaigns launched on kickstarter.com.

The results of this further regressions were in line to the previous ones, excluding some determinants: the academic qualifications turned out to be not statistically significant at all, so, confirming the rejection of the hypothesis stating that, due to their higher complexity, entrepreneurs owning a higher qualification should be more likely to launch an ICO instead of a crowdfunding campaign, without even suggesting the possibility that the entrepreneurs owning higher qualifications are more likely to launch crowdfunding campaigns as done by the results of the previous models. The other differences between the different models are related to the past working experiences of the founder: the number of past entrepreneurial experiences is no more significant, while the sum of the working years is significant with an opposite effect if compared to the other variables related to the past working experience: in fact, according to this model, entrepreneurs with more years of working experience are more likely to finance their start-up firms by launching a crowdfunding campaign.

Regarding the possible limitations related to our work, the first can be, for sure, the fact of having used in most of the cases variables that were used to perform analogous analysis not regarding the ICOs and, more in general, the alternative finance, but more traditional sources of capital such as the bank loans and the venture capital funds: due to the strong differences between these financing techniques, a further development of this study could include some variables specifically developed looking at the world of the ICOs and/or the crowdfunding such as the information from the social networks used by the crypto-community (Reddit, Telegram etc.) instead the ones taken from the LinkedIn and Twitter profiles that are certainly much more known by the general public, but are

less used by the people interested in contributing in an ICO. Another element that could be considered is the specific working experience, for example the number of crowdfunding campaigns or ICO launched before the one considered or the years of working experience in the specific industry of the start-up to be financed or in the blockchain sector, and the non-academic background since, in particular fields like the blockchain one, an online course focused on the blockchain may be more relevant to influence the decision of launching or not an ICO than a bachelor's degree achieved in a totally unrelated field.

Another main limitation of this work is the different level of maturity of the two financing techniques compared, in fact, while crowdfunding has now reached a good level of maturity, attested even by the fact that specific regulations dedicated to it were approved in many countries since the first years of 2010s, the ICOs are still in a seminal phase of their development and are still subject to many changes in the way they are designed, launched and advertised, in the way the potential contributors approach them and take the investment decision, in the way the regulators deal with them and, finally, in the way the entrepreneurs communicate with all the other actors interested in the ICOs. Moreover, due to the high number of ICOs launched in 2018, the total cumulate number of ICOs doubled in less than a year. As a consequence of this, a further research could replicate our analysis, maybe adding even other research hypotheses, on a sample including more campaigns, with the possibility of obtaining more reliable results due to the advancement of the ICO to their maturity.

The third possible limitation of this work can be the decision of comparing the ICOs with the reward-based crowdfunding campaigns launched on kickstarter.com, as explained in the work, the decision was led by the fact that the more widespread right attached to the tokens sold in the offerings is the Service&Access that grants the tokenholders the possibility of accessing to the product or services developed by the venture and, secondly, considering that the geographical distribution of the kickstarter.com campaigns was somehow analogous to the one of the ICOs, while many other crowdfunding platforms were focused on single countries and/or geographical regions. However, we know that there are other rights different from the Service&Access one that are granted by tokens sold in ICOs that are, in many cases, more similar to the equity-based crowdfunding, so a possible further research could compare the ICOs, maybe a sub-sample of ICOs offering governance and profit rights, to crowdfunding campaigns launched on an

equity-based crowdfunding platform or even comparing all the ICOs to a sample composed by crowdfunding campaigns from different crowdfunding platforms and, so, putting together reward-based crowdfunding, equity-based crowdfunding and other crowdfunding techniques to have a sample in which the different typologies of crowdfunding could be aligned to the different rights granted by the tokens to their holders.

Finally, the last possible further development, could be the comparison of the ICOs to another financing technique, this time a more conventional one such as the bank loans or the venture capital funds to understand if the same determinants that in our analysis pushed the entrepreneur to select or not an ICO have the same effect when the decision is between the ICO and a more traditional technique or even to see if there are determinants related to the fact of being financed both through an ICO and by a venture capital fund or another conventional technique.

To conclude, we hope that this work could contribute to achieve a better understanding of the ICO phenomenon, that is still not understood by many people, and of its relationship with the other financing techniques.

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