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A Study on the Effect of Patents, Technical White Papers, and Source Codes on the Financing Performance at Initial Coin Offerings*

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Abstract

Purpose: The objective of this research was to investigate how blockchain ventures can optimize their wealth through Initial Coin Offerings (ICOs). Drawing upon signal theory, this study examined the impact of technological capabilities on the performance of ICOs in blockchain ventures. Given the highly technical nature of companies involved in ICOs, the technical proficiency of venture companies can have a significant influence on the success of ICOs. Specifically, three potential indicators of technological capability - patents, white papers, and source code - were analyzed. **Research design, data and methodology:** To accomplish this, a database was constructed by coding the relevant variables from various sources for 514 companies that launched ICOs. This study conducted hierarchical regression analysis for the hypotheses test. **Results:** The results indicated that a blockchain venture with a patent had a positive effect on the performance of the ICO. Additionally, publishing source code had a positive impact on ICO performance. **Conclusions:** This study identifies crucial factors for ICO success, emphasizing the importance of technological capabilities. Companies should enhance these to boost investor confidence, transparency, and outcomes. This research offers valuable insights for businesses and policymakers in the evolving cryptocurrency market, aiming to maximize ICO performance and success.

Keywords: Blockchain, Initial Coin Offerings, Ventures, Cryptocurrency

JEL Classification Code: F20, F30, G10

1. Introduction[12]

According to Block et al. (2018), financial resources are crucial for the success of new and innovative ventures. One emerging method for raising funds is through Initial Public Offerings (ICOs), where tokens or cryptocurrencies are sold to multiple investors as a digital value transfer medium based on Distributed Ledger Technology (DLT), which is mainly based on blockchain technology. As blockchain technology and cryptocurrencies become increasingly popular in finance and technology fields (Elnaj, 2018), ICOs are gaining traction in corporate finance as well. Through the ICO process, investors purchase tokens, and the venture company receives the purchase proceeds, which are intended to provide new functions such as financial tools, ownership, and loyalty in the venture project. ICOs are an attractive option for startups as they allow them to rai

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se substantial funds with minimal effort and little to n o internal strife or brokerage costs (Sameeh, 2018). W hile existing studies on ICOs have mainly focused on the concept, functions, and regulations of ICOs (Swan, 2015; Long, 2018; SEC, 2017; Shifflett & Jones, 201 8; Nakamoto, 2008; Kastelein, 2017; Kastelein, 2017; Poutintsev, 2018), there is very little research conducte d from an entrepreneurial financial perspective. Specifi cally, there is little research on what factors affect fin ancial performance at the ICO stage. Some studies foun d a positive correlation between confidence and the a mount of funds raised through ICOs, controlling for v enture and offering characteristics (Huang et al., 2022). Hence, this study aims to investigate the fundamental question of the ICO phenomenon, i.e., what factors de termine the size of funds raised through ICOs. An em pirical research method based on research related to c orporate finance is used.

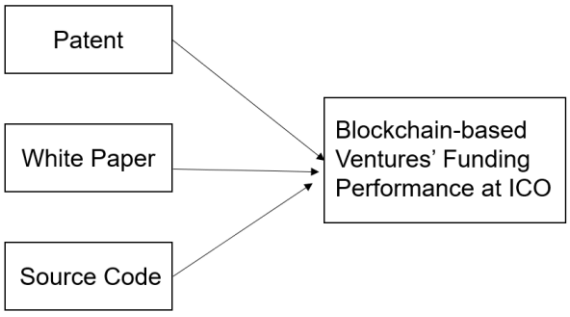

Figure 1: Research model

This study is to utilize the signal theory to addre ss crucial questions about ICOs, with a focus on ident ifying a method to mitigate information asymmetry am ong investors (Spence, 1973). Information asymmetry c an become a significant issue in the ICO stage, partic ularly for early-stage venture companies, which can le ad to an abundance of false information (Shifflett & J ones, 2018). Despite warnings from the US Securities and Exchange Commission (SEC) regarding the high i nvestment risk associated with ICOs (SEC, 2017), they are a common phenomenon in innovative technologies. Signal theory suggests that skilled venture capitalists o ften provide information about high-performing venture s to investors, which can attract more attention from p otential investors (Connelly, 2011). Other studies have used signal theory to explain information asymmetry i n the ICO process (Colombo et al., 2022; Campino et al., 2022; Yen et al., 2021; Felix & Eije, 2019; Momt az, 2020; Chitsazan et al., 2022; Fisch, 2019; Momtaz, 2020). Fisch et al. (2021) found that ICO investors va lue technical incentives the most, followed by financial and ideological incentives. Given the highly technical nature of companies participating in ICOs, their techni cal capabilities can significantly impact ICOs. Therefor e, this study proposes patents, white papers, and sourc e code as potential indicators of technological capabilit y. Figure 1 shows our research model.

2. Theoretical Background and Hypothesis Development

2.1. Signaling Theory

The theory of signals pertains to diminishing information asymmetry in the scenarios of venture capital (Busenitz et al., 2005), angel investment (Elitzur & Gavious, 2003), and crowdfunding (Anglin et al., 2018). The signal theory, as per the prominent study by Spence (1973), posits that high-tech startups can signal their elevated value to potential investors. This, in turn, can attract more investment by reducing information asymmetry. The signal theory conceptually comprises a signal sender, a signal receiver, and the signal itself. Since the signal transmission process involves internal information that cannot be ascertained from the outside, it offers an excellent perspective on the fundamental worth of the evaluation target. The signal sender determines to disseminate the knowledge he possesses to the outside. The signal can be understood as a yardstick for measuring the basic value of startup companies, as it provides measurement information about factors that are difficult to gauge for external parties (Connelly et al., 2011). According to the signal theory, signals can effectively reduce information asymmetry as long as two criteria are met. The first criterion is that the receiver must be able to observe the signal to decrease the information asymmetry. The second criterion is that the signal must be understandable, and it should incur unexpected costs such as money, time, effort, and reputation to be effective. If a signal's production and transmission costs are not high, it can be easily duplicated, and therefore, such a signal would not have a positive impact as its basic value would be low (Connelly et al., 2011). It is assumed that a signal that has the same value may have different costs in assessing the value of a venture company. This assumption is referred to as a separate equilibrium (Spence, 1973), which implies that a relatively low-quality signal may be expensive. In general, a rational receiver will only select high-level signals, but distinguishing between high-level and low-level signals is not an easy task as the two are separated, and the receiver evaluates the venture company based on the signal, not the cost. When the expected information from the signal is confirmed, a balance is established against the cost of the signal (Bergh et al., 2014).

To apply signal theory to the context of ICOs, a more comprehensive understanding of the signal itself (such as the characteristics of venture companies conducting ICOs) and the transmission behavior is necessary. Since venture companies can only utilize ICOs that operate on DLT technology, which is an innovative technology (Swan, 2015), it is crucial for companies conducting ICOs to possess a deep understanding of the technical complexity and DLT application (Long, 2018). Moreover, investors are required to have the technical expertise or at least a willingness to familiarize themselves with the technology background or application offered by such ventures. The Investor Handbook provides information on these techniques, which is considered essential prior knowledge for making investment decisions in ICOs (Schwartzkopff, 2018).

ICOs are known to carry high investment risks (SEC, 2017), mainly because they are typically conducted during the early stages of a venture company's life cycle (Kaal & Dell'Erba, 2018), and tokens often lack practical use or value during the ICO stage (Russo & Kharif, 2017). Additionally, investors may encounter issues with cash liquidity since cash is usually the primary investment method in ICOs (SEC, 2017). It is worth noting that ICO investors tend to have a higher tolerance for risk compared to general investors, and they are less likely to be intimidated. If investors perform proper due diligence before investing, these risks can be mitigated more effectively.

Due to the lack of mandatory disclosures for ICOs and the absence of regulatory requirements regarding information disclosure, venture capitalists face difficulties in obtaining necessary information (Kaal & Dell'Erba, 2018; Kastelein, 2017; Shifflett & Jones, 2018). Moreover, since the privacy of development is one of the key drivers for DLT, including cryptocurrency (Nakamoto, 2008), the DLT development status, including ICOs, is often anonymous (Kastelein, 2017). For instance, in many ICOs, personal information is not disclosed, and the owner's identity, necessary to verify account transactions, remains unknown or fraudulent (Kastelein, 2017). Although some companies have adopted the KYC framework to verify sales participants, the standard is decentralized, slow, and not readily accepted by investors concerned with ensuring anonymity. This creates a high level of information asymmetry between venture firms and investors, leading to increased uncertainty about venture firms. The reasons for the increase in uncertainty can be classified into three categories. According to Natarajan et al. (2017), the overall development and acquisition of Distributed Ledger Technology (DLT) is often unclear due to the technical complexity of Initial Coin Offerings (ICOs). Because investors typically lack technical expertise, they may struggle to comprehend the DLT technology presented by venture companies, especially if they lack investment experience or do not invest significant effort. Additionally, these ventures are typically in the early stages of start-up development and may not have fully developed projects, or may even be fraudulent (Kaal and Dell'Erba, 2018; SEC, 2017). Moreover, due to the high anonymity requirements in ICOs, objective information disclosure is limited, making it difficult for investors to assess ICO-related ventures using general information such as a company or founder history, investment prospects, and other relevant factors. Although some start-ups disclose information about their teams, it is often wrapped in overly positive language or inaccurate, leading to a false intrinsic profile (Shifflett & Jones, 2018).

This information asymmetry creates a greater demand for signals (Kotha et al., 2018). Since the level of venture firms' technical ability is often challenging to observe directly, investors evaluate them based on observable characteristics (Stuart et al., 1999). Therefore, the signal theory provides an appropriate framework for explaining how venture firms reduce information asymmetry and attract investment, especially in the context of ICO investor relations.

In the context of the ICO process, the signal theory has been used by previous studies to explain information asymmetry. These studies have also suggested various factors that can affect ICOs in such situations. For example, Colombo et al. (2022) found that CEO's facial expression can be a factor, while Campino et al. (2022) and Yen et al. (2021) identified the importance of investor relation activities such as white papers, pre-funding, and social media promotion. In addition, Felix & Eije (2019), Momtaz (2020), Chitsazan et al. (2022), and Fisch (2019) have highlighted other variables that can influence ICOs, such as the contents of the ICO, the ICO environment, and the internal and external business environment of ICO companies. Furthermore, Fisch et al. (2021) have classified the incentives for investing in ICOs, revealing that investors are mainly driven by ideological, technological, and financial factors, with technological incentives being the most significant.

Despite the lack of overall information on ICOs, there is an abundance of technical information available on the ICO situation, which is influenced by technological drives such as technology development. In the ICO context, technical information tends to be relatively objective, even if it is anonymous. Three indicators, namely patents, technical white papers, and source code, are commonly used to demonstrate the high level of technology associated with ICO-related venture companies.

2.2. Hypotheses Development

ICOs are deemed appropriate for businesses utilizing Distributed Ledger Technology (DLT), a cutting-edge

innovation that requires significant technical expertise, as noted by Swan (2015). As such, ICO ventures must possess the necessary technical knowledge and skills to utilize DLT, according to Long (2018). Similarly, investors are required to comprehend the technical background and application areas of each venture, as stated in the investor's guide, with the assumption that this understanding is essential for informed decision-making when investing in an ICO, according to Schwartzkopf (2018). Despite being labeled as high-risk investments by the Securities and Exchange Commission (SEC, 2017), ICOs are favored by investors, with a significant influx of investment even in the early stages of a venture when tokens do not have a relative valuation or actual usage, as reported by Russo and Kharif (2017) and Kaal & Dell'Erba (2018). ICO investors are often perceived as taking on more risks than non-investors, though thorough due diligence can help mitigate these risks.

According to Shifflett and Jones (2018), there exist limited formal requirements for disclosure in ICOs. As compared to IPOs, the standards for determining what information should be disclosed are minimal, which often leads venture capitalists to reveal only minimal information, as noted by Kaal and Dell'Erba (2018). Moreover, Nakamoto (2008) highlights that the ability to execute anonymous transactions is a crucial driver of the development of DLT, particularly for cryptocurrencies, resulting in a historical emphasis on anonymity in DLTs, including ICOs, as observed by Kastelein (2017). For instance, some ICO teams prefer to remain anonymous and avoid disclosing their details. Despite most ICOs not knowing the identity of their account holders, and enabling transaction tracking, it could be a fraudulent scheme, cautions Kastelein (2017). Recently, some firms have introduced KYC (Know Your Customer) frameworks to identify individuals participating in sales, among others, which has captured the attention of ICO communities interested in privacy and anonymity, according to Poutintsev (2018). Although the implementation of KYC standards has been gradual and uneven, it appears to be a crucial factor for ICO investors to consider due to concerns regarding anonymity.

ICOs possess certain characteristics that lead to a heightened level of uncertainty and information asymmetry between investors and ventures. The causes of such uncertainty can be categorized into three main areas. Firstly, the technical nature of ICOs results in uncertainty, as the overall development and implementation of distributed ledger technology by the invested company remains unclear even after the investment has been made. Investors who lack technical expertise may find it challenging to comprehend the technology being proposed by the venture, and considerable effort may be required on their part. Secondly, as these ventures are usually in their nascent stage, there is a high likelihood of fraudulence, with no successful development projects to date. Thirdly, the absence of any official disclosure requirement and a strong demand for anonymity leads to a dearth of objective information available for ICOs, and the amount and type of information disclosed varies significantly from one company to another (Kaal & Dell'Erba, 2018; SEC, 2017; Natarajan et al., 2017).

In the context of Initial Coin Offerings (ICOs), the use of general information that investors typically rely on to evaluate ventures such as venture business experience, founder history, and financial outlook is not effectively utilized. This is due in part to the fact that the information provided by startups regarding their teams can often be unreliable and inaccurate. Given the high level of information asymmetry that characterizes the investor-investor relationship in ICOs, there is a strong demand for signal transduction in general. To address this, signal theory can be employed as a suitable framework to explain how ventures can reduce information asymmetry and successfully raise funds. Because the quality of a venture's technology is not directly observable, investors must rely on observable characteristics that indicate the underlying quality of the venture. Despite the overall lack of information surrounding ICOs, there is a relatively abundant amount of technical information available, which is particularly important given that venture investments in Distributed Ledger Technology (DLT) are primarily driven by technology and often profile the results of technological developments. Therefore, technical information is a suitable evaluation index in the technical environment of ICOs, which requires objectivity and anonymity.

In previous studies, a patent has been identified as the most commonly used signal by venture companies to demonstrate their high technological capabilities and be important in early-stage financing as well. Patents meet the criteria for a valid signal in several ways. Firstly, patents are publicly available and can be observed by ventures, although investors may not be able to easily observe them unless the venture company declares its possession of a patent. Secondly, generating patent signals is expensive, and requires considerable effort and time, in addition to direct costs such as application and renewal fees. Companies with lower technological prowess must invest more to develop technology that can lead to successful patent applications. Thirdly, patents are granted only to novel and differentiated inventions, which requires ventures with high technological capabilities to invest more to meet the necessary standards. As a result, there is a separate equilibrium where only ventures with high technological capabilities apply for patents, making it an effective signal to potential investors. (Hsu & Ziedonis, 2013; Hoenen et al., 2014; Colombo et al., 2018).

The decision to apply for a patent is a complex process

that involves considering various factors that contribute to its signaling value. For instance, companies with limited technological capabilities may invest in low-level patented technologies, unlike those with advanced technology. Additionally, startups with sufficient expertise may not pursue patents as they may not meet the criteria for novelty and obscurity, which are often associated with patents. As a result, only highly advanced ventures can obtain patents, making it an effective signal for attracting potential investors interested in high technology (Hsu & Ziedonis, 2013; Hoenen et al., 2014). In the context of initial coin offerings (ICOs), patents can serve as an equally effective signal to reduce information asymmetry between startups and investors. Based on this rationale, this study proposes the following hypotheses.

H1: Patents held by blockchain-based ventures will positively impact their funding performance at ICO.

The publication of the Bitcoin white paper by Nakamoto in 2008 marked a significant milestone in the development of blockchain technology and cryptocurrency. Subsequently, most venture companies have followed suit by publishing white papers, which serve as a crucial factor in their ICO campaigns by providing necessary information to the public. While these white papers may not adhere to the same format as the Bitcoin white paper, they commonly include technical descriptions of the venture project and its applications. Evaluating these technical reports in white papers is recommended to identify successful ICOs, according to Blockchain Investor Guides (Reiff, 2018).

White papers are a reliable source of technical expertise, and writing guides recommend ventures provide detailed descriptions of their technology. While potential investors may not comprehend all the technical details in a white paper, they can use them to infer a venture's technical capabilities. Consequently, it is argued that a technical white paper, also known as a "yellow paper," serves as an indication of a venture's fundamental technical capabilities. As white papers have become the standard for ICOs, holding and distributing technical white papers has become a common practice among ventures.

Writing a technical white paper is a challenging task that demands significant technical knowledge, effort, and time, especially when it comes to explaining the highly complex technical background of blockchain technology and outlining how to build and extend it. The importance of white papers in the context of initial coin offerings (ICOs) cannot be overemphasized, given that many blockchain startups are still in the early stages of development and lack actual projects at the time of ICO. Nevertheless, it is worth noting that not all blockchain projects provide technical information in their white papers (Russo & Kharif, 2017).

Our study proposes the following hypotheses, based on the observation that low-tech ventures may find it challenging to create technical white papers that include detailed descriptions of their technologies and infrastructure implementation, as such a task can be expensive. As a result, these ventures may opt to allocate a significant portion of their white papers to non-technical sections, such as the venture team or business model. This creates a separate equilibrium, where only high-tech ventures can use technical white papers as effective signals.

H2: White papers held by blockchain-based ventures will positively impact their funding performance at ICO.

Cohney et al. (2018) assert that blockchain-based development, facilitated through programming activities, relies heavily on the source code of the venture. This code is considered a crucial element of the technical competence of the blockchain venture. Typically, startups confirm the existence or absence of their source code by posting it online, primarily on the open-source GitHub platform. The source code's importance is further amplified by the fact that ICO search sites and venture communication channels frequently reference it. Consequently, it is widely acknowledged that evaluating a venture's GitHub profile is vital before investing in an ICO. While source code disclosure is becoming the norm, it is not an effective indicator of a high-tech venture. Instead, the quality of the code can serve as a distinguishing factor. Creating high-quality source code requires substantial technical expertise, making it an expensive proposition for startups with low technical capabilities. In contrast, experienced ventures can reduce the cost of developing high-quality source code, resulting in a separate equilibrium where only highly skilled ventures produce high-quality code.

Inexperienced investors may struggle to assess the quality of a venture's source code due to their limited programming expertise. However, the source code repository on GitHub contains aggregated metrics that can provide insights into code quality without requiring investors to have programming knowledge. These metrics, commonly based on commit history, are used in computer science research to infer code quality by tracking defects or bug fixes. The number of defect correction changes is inversely proportional to the number of defects in the source code, and ventures with a higher number of revisions are likely to have higher-quality source code. This approach can be useful for investors who lack programming expertise, as they can rely on these metrics to evaluate code quality without having to understand the actual code. The cost of fixing code flaws may vary between ventures, with those having lower technical capabilities requiring more time and resources to fix defects. In contrast, high-quality ventures

can address code issues more efficiently, thus balancing the cost of providing high-quality source code with bug fixes. Based on these observations, this study proposes several hypotheses.

H3: Source codes held by blockchain-based ventures will positively impact their funding performance at ICO.

3. Methodology

3.1. Sample

Since there is no general-purpose database for ICOs yet, this study will collect ICO-related samples directly and obtain data from several sources. First, the empirical analysis of this study is based on CoinSchedule's ICO list. CoinSchedule is a relatively popular and widely known ICO data source (Roose, 2017). It showed the ICO site, sector, deadline and expected amount in USD through the website. Second, additional information not disclosed on CoinSchedule was investigated on other ICO search sites (www.icodrops.com, www.icobench.com, www.coinmarketcap.com, www.tokendata.io, www.tokenmarket.net). These sites also provide information about various ICOs. When signal information was not collected from various ICO-only search sites, data was collected secondary through venture company sites, Twitter, GitHub, etc. The completeness of the data was improved by cross-analyzing the information collected from various ICO search sites and website information. Third, white papers published by venture companies were collected and analyzed from the website or ICO search site. Through this process, this study collected the necessary data from 514 companies. The characteristics of the companies that collected data in this study are as follows. By type of blockchain business, blockchain technology accounts for 20%, payment service 22%, blockchain platform 25%, decentralization technology 15%, and commerce 18%. And, 77% of companies received venture capital investment before ICO. 78& had patents, 96% presented white papers, and 65% disclosed source codes.

3.2. Measurement

3.2.1. Independent Variables

Patent. If a blockchain venture has patents, the code is 1 and 0 otherwise. **White paper**. If a blockchain venture has a white paper, the code is 1 and 0 otherwise. **Source code**. If a blockchain venture has source code, the code is 1 and 0 otherwise.

3.2.2. Dependent Variables

ICO performance. It is measured by the total amount of tokens procured by the blockchain venture by selling tokens during the ICO process. This study measured this variable by applying LOG (10) for scaling.

3.2.3. Controls

Industry-specific characteristics. The characteristics of specific sectors within the same industry affect the length of venture capital investment and the length of time required to disclose a company (Chang, 2004). This study divided the sub-businesses into five categories: blockchain technology (1), payment service (2), blockchain platform (3), decentralized technology (4), and commerce (5). The average price of Ethereum at ICO. It means the average price of Ethereum on the first day of the ICO of Blockchain Ventures. Bitcoin and Ethereum are used as key currencies to trade tokens issued by blockchain ventures. Among them, token traders prefer Ether over non-coin because Ethereum offers more features than Bitcoin. And the price of these key currencies affects the price of individual tokens. This study measured this variable by applying LOG (10) for scaling (Bland & Altman, 1995; Altman, 1991; Deeks et al., 2004; Nunnally & Bernstein, 1994). Venture capital investment. Code 1 for venture capital investment firms and 0 for those not invested.

4. Results

4.1. Relationship Between Variables

Table 1 summarizes the Pearson correlation test res ults between variables and reports the degree of multi-collinearity between independent variables. The minimu m tolerance of 0.612 and maximum variance inflation factor (VIF) of 1.634 shows that the statistical signific ance of the data analysis was not compromised by mu lti-collinearity. As a result of calculating the VIF for each variable, the VIF values of all variables were fo und to be less than 2, which did not exceed the perm issible range of 10 (Chatterjee et al., 2000).

4.2. Hypotheses Testing

This study conducted hierarchical regression analysis for the hypotheses test, varying the composition of the control variables and the variables explaining the technological capabilities. Table 1 summarizes the main analysis results.

First, model 1 is the basic model and contains only control variables. Among the control variables, industry 2 (β = -.212, at the level of $|P| < 0.01$), industry 3 (β = -.192, at the level of $|P| < 0.01$), industry 4 (β = -.212, at the level of |

P | <0.01), industry 5 (β = -.133, at the level of | P | <0.05), and venture capital investment (β = .132, at the level of | P | <0.05) were found to have a statistically significant positive relationship with ICO performance. In model 2 - 4, hypothesis 1-3 was tested by inputting the technological capabilities. The results showed that if a blockchain-based venture has a patent, it positively impacts its financing performance at ICO. (at β = .098, | P | <0.01). It supports hypothesis 1. And, the results showed that if a blockchain-based venture provides source code, it positively impacts its financing performance at ICO (at β = .160, | P | <0.01). It supports hypothesis 3. However, the results showed although a blockchain-based venture provides a white paper, it does not impact its financing performance at ICO.

Table 1: Variables' Correlation Coefficient and Other Statistics

Constructs	Ave.	SD	1	2	3	4	5	6	7	8	9	10	11
1. Industry 1	.20	.21	1										
2. Industry 2	.22	.24	-.10	1									
3. Industry 3	.25	.19	.21	.19	1								
4. Industry 4	.15	.09	.19	.34	-.51	1							
5. Industry 5	.18	.31	.31	-.28	-.24	-.23	1						
6. Venture Capital Investment	.77	.42	.41**	.14**	.31**	.19**	.31**	1					
7. The Average Price of Ethereum at ICO	1.56	.88	-.36	.24	.31	.27	.29	.34	1				
8. Patent	.78	.15	.22*	.34*	.52*	.32*	.43*	.22*	.18	1			
9. White Paper	.96	.07	.02*	.18*	.20*	.71*	.14*	.32*	.19	.23*	1		
10. Source Code	.65	.08	.32*	.12*	.10*	.11*	.21*	.22*	.11	.09*	.31*	1	
11. ICO Performance	10.44	.91	-.22**	-.18**	-.34**	-.06**	-.07**	.11**	.44	.32**	-.13	.22**	1

Table 2: Result

Variables	Model 1	Model 2	Model 3	Model 4
Control Variables				
Industry 2	-.212*	-.201*	-.177*	-.143*
Industry 3	-.192**	-.188**	-.181*	-.162*
Industry 4	-.212**	-.198**	-.188*	-.168*
Industry 5	-.133*	-.123*	-.111	-.088
Venture Capital Investment	.132*	.122*	.110*	.101*
The Average Price of Ethereum at ICO	.023	.013	-.006	-.023
Independent Variables				
Patent		.098*	.077*	.063*
White Paper			-.021	-.021
Source Code				.160*
R^2	.088	.091	.110	.139
Adj. R^2	.061	.069	.071	.092
F	3.818**	3.878**	3.901**	4.021**

Note: |P|<0.05: *, |P|<0.01: **

5. Conclusions

5.1. Discussion

The objective of this study is to investigate how technological capabilities influence the performance of ICOs in blockchain ventures. From the perspective of resource dependence, the technological capabilities of blockchain ventures can compensate for the lack of justification, thereby enhancing the IPO performance. Among the technological capabilities' variables, patents are found to have a positive correlation with ICO performance. Emphasizing patent ownership in ICOs highlights the distinctiveness and stability of blockchain technology. Although blockchain technology offers the advantages of decentralization and security, its open-source code is freely available to everyone, making it easy for competitors to replicate. However, if a blockchain technology venture holds a patent, it has exclusive rights to the technology, and competitors must obtain a license to use it. This confers a competitive advantage on the blockchain technology venture by increasing the difficulty of entry for competitors. Therefore, patent ownership emphasizes the technology's differentiation and competitive advantage, leading to a positive effect on ICO performance. ICO investors will perceive blockchain technology as more stable and distinct, and recognize that competitors cannot easily catch up, which can bolster investor confidence and increase ICO performance.

One of the variables that explain the technological capabilities and positively correlates with ICO performance is the source code. The disclosure of a blockchain technology venture's source code is crucial in ensuring transparency to the investors who contributed funds through an ICO. By publicly disclosing the source code, investors can gain insight into the company's operations and how it is utilizing the funds. This enhances the credibility of blockchain technology ventures, reduces unnecessary suspicion or anxiety, and enables investors to make more informed decisions. Moreover, from a technical standpoint, the disclosure of source code is significant. Developers can analyze the stability and security of blockchain technology by scrutinizing the source code, which can guide future technological advancements and foster the implementation of more dependable blockchain technology. Hence, the disclosure of source code is a pivotal factor that positively affects the ICO performance of blockchain technology ventures, facilitating more confident decision-making by investors and the development of more trustworthy blockchain technology by technology developers.

The white paper did not affect the performance of the ICO. There are multiple reasons why a white paper on blockchain technology ventures fails to positively influence the performance of an ICO. Firstly, the white paper provides a hypothetical projection of future events and is usually ambiguous, necessitating further research and development before it can be translated into practical plans. Secondly, although the white paper may contain detailed technical descriptions, it does not directly address the business models, marketing strategies, and competitive strategies required for venture company management. Thirdly, the white paper is designed to obtain funding for technology development, but there are other means of fundraising besides ICOs, and the white paper itself does not guarantee to fund. Finally, the white paper does not solve the actual problems faced by venture companies. Hence, even in the absence of a white paper, blockchain ventures can be successful through sound ideas, implementation, continuous development, and collaboration. Consequently, the white paper does not have a direct impact on the performance of blockchain technology ventures, and excellent vision and execution, innovative ideas, and continuous development and cooperation are crucial in determining performance.

The present study's findings differ from previous related research conducted by Fisch (2019). The main discrepancy between Fisch's paper and this study is that the dependent variable is distinct. Fisch's study employs the total amount raised through ICO as the dependent variable, whereas this study uses the total amount of tokens issued through ICO as the dependent variable. Fisch's research measures the effectiveness of raising more funds during the ICO process, which cannot be considered a valid financial indicator since the funding amount can fluctuate depending on the company's value during the ICO process. Conversely, the total amount of tokens issued through ICO is a suitable financial indicator as it accurately reflects a company's performance since companies aim to raise funds by issuing more tokens during ICO, despite having different corporate values. Thus, the total amount of tokens issued through ICO is a reliable financial indicator for evaluating the success of ICO when compared to the total amount raised. As a result, even if the same independent variable is utilized, the research outcomes between Fisch's paper and this study differ since they utilize different dependent variables. Therefore, this study's results are valid because the dependent variable used is a financially accurate indicator.

5.2. Research Contributions and Practical Implications

The present research makes significant contributions to both academia and industry. It advances existing knowledge by investigating the fundamental drivers of Initial Coin Offering (ICO) performance, a novel and underexplored area of research. While earlier studies have established that third-party endorsements, such as strategic alliances, can augment the performance of Initial Public Offerings (IPOs), this

research adopts a resource-based approach and underscores the crucial role of technological capabilities in creating a superior performance for blockchain startups. These capabilities are difficult to replicate, providing blockchain ventures with a distinct competitive edge. The empirical analysis lends support to this claim.

From a practical viewpoint, firms seeking to launch ICOs should accord priority to developing their technological competencies to enhance their ICO's chances of success strategically. Furthermore, management education programs must incorporate training on investor relations and promotional strategies to educate potential investors about ICOs, highlighting the market's favorable aspects to encourage investment.

5.3. Research Limitations and Future Research directions

Although this study pays close attention to hypotheses and tests, it acknowledges some research limitations. First, the actual size was not known by measuring the technological capabilities in a dichotomous way. Therefore, studies to increase the explanatory power by varying the measuring method of variables to measure the actual size of the technological capabilities will be needed in the future. Second, since only investment capital is measured regarding venture capital, it is possible to explain the effect of endorsement more specifically. There is a need for further analysis of venture capital's reputation, investment amount, and IPO performance. Third, the methodology of this study has limitations in not considering geographical variables as factors. Related research shows that ICOs occur more frequently in countries with advanced financial systems, open stock markets, and advanced digital technologies (Huang et al., 2020). Therefore, future studies need to include these geographic factors. Finally, this study used traditional statistical methodology. However, recent studies are introducing artificial intelligence analysis methodologies such as machine learning (Meoloi & Vismara, 2022). Future research needs to use state-of-the-art analytical techniques such as machine learning.

In addition, based on the results of this study, this study intends to emphasize the need for research on stakeholders, functions, regulations, emergence, and development of the ICO market suggested for future research related to ICO in a related study (Block et al., 2020). This study was confined to identifying the information factors that affect ICO performance. However, to understand the ICO market more specifically, it is necessary to identify the factors that affect the mechanism of the ICO market. Thus, future research is needed to help entrepreneurs, investors, and policymakers understand these differences. Otherwise, ICOs cannot reach their full potential as funding tools.

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