

How Can Taiwan's Venture Capital Industry Develop Ethical Decision-Making Mechanisms for Investing in Biotechnology Startups?

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Abstract

This study investigates the ethical challenges faced by Taiwan's venture capital (VC) industry when investing in biotechnology companies and proposes mechanisms to address these issues. Using a literature review, case analysis, and expert interviews, the study identifies dilemmas such as information asymmetry, uncertainty, and conflicts of interest. Findings reveal that excessive pursuit of profits often leads VC firms to overlook social responsibilities, increasing ethical risks and harming industry reputation. To mitigate this, the study recommends that VC firms establish dedicated ethical committees to audit risks and provide guidance. It also suggests creating investment guidelines to define acceptable practices and integrating ethics, morality, and legal compliance education into the biotechnology sector. These recommendations aim to help Taiwan's VC industry effectively address ethical challenges, enhance social responsibility, and support sustainable industry growth.

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1. Introduction

In recent years, the biotechnology industry in Taiwan has risen gradually and become an important driving force for economic growth. According to the 2024 Biotechnology Industry White Paper published by Taiwan's Industrial Development Bureau, the industry's total revenue in 2023 reached \$25.26 billion, reflecting an 8.12% increase from \$23.36 billion in 2022. Among the sectors, the pharmaceutical industry was a major contributor to this growth, with revenue reaching \$4.3 billion in 2023, marking a remarkable 34.34% year-over-year increase. The medical devices sector generated \$4.9 billion in revenue, growing by 2.3%. The applied biotechnology sector reported \$4.57 billion in revenue, an increase of 2.46%, while the health and wellness sector achieved \$9.65 billion, growing by 4.51%. Notably, the digital healthcare sector experienced the highest growth rate, with revenue of \$1.83 billion, up 9.56% from 2022. As of the end of 2023, on the OTC market, 128 biotech companies had been listed; furthermore, the overall market value had exceeded NT\$ 1 trillion.

Among them, industries such as medical equipment and appraisals, biotechnology pharmaceuticals, agricultural biotechnology, and environmental protection are the main areas for the development of the biotechnology industry of Taiwan. The commercial application of biotechnology has contributed to the establishment of new companies, fostering new industries. Many countries have emphasized the biotechnology industry as a key area for commercial opportunities in emerging industries. They have invested resources and implemented industrial blueprints to accelerate its development, expecting it to become a mainstay driving economic growth.

Taiwan has listed biotechnology as an emerging technology project and has formulated various biotechnology policies. The goal is to create an excellent investment environment for the biotechnology industry and guide companies and manufacturers to invest in it. This will lead to the development of surrounding related industries, complete the supply chain system, and accelerate the overall growth of Taiwan's biotechnology industry. Supported by the government policies, the biotechnology industry of Taiwan has continued to grow and attracted a large amount of domestic and foreign investment. Government policy can have a powerful influence on venture capital investment, because it can help passing regulatory standards and stimulate investment during recessions (Jeng and Wells, 2000).

Biotech industry has attracted a huge amount of investment every year, pouring strong vitality for Taiwan's economy. Furthermore, the biotech talent pool has gradually increased, universities and institutes related to biotech have also been established continuously. The implementation will not only provide professional talents related to the biotech industry, but also advance the capability of innovative research and development, making the biotech industry of Taiwan have more competitive capacity. The development of the biotech industry of Taiwan has been developing well, and is expected to become one of the key industries for the

country's economic development in the future.

Biotechnology, which covers genomics, tissue engineering, molecular biology, pharmacy and nanotechnology...etc., is widely applied in the field of life sciences. When one enters the field of biotechnology, she/he requires an understanding of holistic concepts and an in-depth study of related technical fields. Biotechnology is not only applied in the cultivation of animals and plant cells, gene performance and DNA recombination, but also widely used in environmental medicine, pharmaceuticals and cosmetics, etc.

Industrial Technology Research Institute (ITRI) of Taiwan has released the key trend of the biomedical industry, 2023, which points out that the biotech medical industry is expected to become a new industry opportunity. The medical industry is divided into "precision medicine", "regenerative medicine", and "AI medical device and materials" three categories. Protein degrader medicine has become the mainstream of new medicine development, regenerative medicine has turned to allogeneic cell therapy, and off-the-shelf and automated production has become new kinetic energy.

In addition, the treatment of neurological and cognitive diseases has become a new business opportunity for AI medical devices and materials. ITRI recommends that the biotech industry should participate in the research and development of research institutes at an early stage, make good use of the institutional region for verification, and actively join industry alliances in order to propel and launch more comprehensive biomedical solutions and continuously improve the biomedical production value of Taiwan.

Venture capital industry of Taiwan has been very active in investing in biotech startups. According to 2024 statistics, in Taiwan's biotech industry, there are more than 500 start-up companies. In Taiwan, the biotechnology industry is one of the most important investment areas of the venture capital industry, and more than 50 % of new biotechnology startups have received investment from the venture capital industry. The main reason for the venture capital industry of Taiwan to invest in biotech startups is that the growth potential and development prospects of the biotech industry are very promising.

In the past few years, the biotech industry of Taiwan has continued to improve and grow, and successfully has developed many important biotech products, including gene therapy, anticancer medicine, antiviral drugs, vaccine research and development, precision medicine, etc. Besides, the Taiwanese government also actively supports the development of the biotech industry, provides various incentives and subsidy measures, and attracts more investors to join in. Due to product research and development requiring longer time and high cost, the operation risk also is very high for biotech startups. Therefore, when investing in biotech startups, the venture capital industry usually has careful evaluation for risk and return ratio, and when choosing investment targets, the venture capital industry also emphasizes technology and R&D capabilities, market prospects and product innovation level of invested objects.

However, ethical decision-making has its importance when the venture capital

industry invests in biotech startups. First of all, the biotech industry often gets involved in high-risk and high-return cases. If there is a lack of ethical norms, probably there will be a negative influence on investors and the public, resulting in social and commercial risks. Some biotech companies are related to some issues such as animal experiments, human tests, and personal privacy. If a biotech company lacks ethical norms, it may lead to moral doubts and public resentment, and ultimately affect the company's operation, and development. Ethical decision-making can help investors have a better assessment of a company's long-term risks and opportunities. When investing in a biotech company, the venture capital industry not only considers some factors such as technology and business models, but also evaluates the company's ethical, legal and social risks and opportunities. If these issues are not properly handled, the result will cause company failure or be subject to legal and moral condemnations.

Ferrell and Fraedrich (2021) pointed out that ethical decision making refers to the process of making choices and actions when enterprises face ethical issues. Ethical decision -making plays an important role in enterprise, organizations, medical institutions, etc., because it is involved in the influence of individuals, groups, and society. Ethical decision-making often includes various values and interests and needs to consider various factors and find out the best solution. (Bartlett, 2003; Bazerman and Moore, 2012; Crane, et al. 2019; Trevino and Nelson, 2021).

When making ethical decisions, one needs to respect human dignity and rights, follow fundamental moral principles, and consider the well-being of individuals, groups, and society (Wu, 2002; Husted and Allen, 2008; Crane, et al. 2019). Ethical decision-making has various characteristics and challenges in various situations. In enterprises, ethical decision-making may involve how to balance between corporate profitability and social responsibility (Schwartz, 2017; Trevino and Nelson, 2021). In medical institutions, ethical decision making may relate to how to balance the development of medical technology and patients' rights. In government, ethical decision-making may refer to how to balance public interests and individuals' rights.

In order to ensure the fairness and legitimacy of ethical decision-making, organizations and institutions usually establish ethics review committees or ethics experts to assist in solving ethical issues. Furthermore, there are some models and tools for ethical decision-making such as ethical judgment and ethical risk assessments, which can help organizations and individuals make better ethical decisions (Ford and Richardson, 1994; Bartlett, 2003; Tenbrunsel and Smith-Crowe, 2008; Bazerman and Moore, 2012; Schwartz, 2017). Ethical decision-making is a complicated and important process that requires respecting the rights and interests of all parties and following basic moral principles to reach the best solutions (Ferrell and Fraedrich, 2021).

Ethical decision -making can enhance social images and brand values of companies. In today's society, the social images and brand values of enterprises have become important factors affecting whether enterprises can be successful or not (Wu, 2002; Schwartz, 2017; Crane, et al. 2019; Trevino and Nelson, 2021). If biotech

companies can establish good ethical images, comply with moral norms, obey laws and regulations, and respect personal privacies, these factors can enhance public trust and support toward companies, and improve the brand values of companies and market competitiveness. Only by establishing good ethical norms and respecting social values can a sustainable business and industrial ecosystem be established.

The study topic of the thesis is to explore the ethical decision-making mechanism of the venture capital industry of Taiwan investing in Taiwan's biotech startups. The study's purposes include realizing the ethical issues and solutions faced by the venture capital industry of Taiwan when investing in biotechnology startups, exploring the ethical factors that venture capitalists consider when making investment decisions, and analyzing the actual performances of the ethical decision-making mechanism of venture capitalists and evaluating its effectiveness. The final conclusion of the study provides recommendations to help venture capitalists further improve the ethical decision-making mechanism to promote the sound development of biotech startups in Taiwan.

2. Basic Concepts of Ethical Decision-Making and Literature Review

2.1 Business ethical decision-making

Ethical decision making refers to the process of making choices or judgements based on the consideration of moral principles or values in certain actions or decisions. Ethical decision-making is a long-standing concept and an important manifestation of human pursuit of morality and values (Bartlett, 2003; Schwartz, 2017; Crane, et al. 2019). In modern societies and organizations, ethical decision-making has become a necessary ability and attainment that can help people make better choices and judgments (Ritter, 2006; Husted and Allen, 2008).

The concept of ethical decision-making is widely being used, especially in the fields of commercial and organizational management. In these fields, ethical decision-making is often related to corporate social responsibility, professional ethics, and organizational culture. In recent years, ethical decision-making has become more complex and challenging as society's values have been changed. (Loe, et al. 2000; Wu, 2002; Bartlett, 2003; Trevino and Brown, 2004; Husted and Allen, 2008; Crane, et al. 2019).

The concept of commercial ethics decision-making originated from business ethics in the early 20th century. During the period, the scale of commercial activities had expanded continually, and the sense of social responsibility became stronger and stronger; therefore, moral issues and ethical decisions in commercial activities gradually received attention by the public. Ferrel and Fraedrich (2021) indicated that commercial ethics decision-making refers to the process of evaluating behaviors or decisions that may affect the company or society in a business environment and selecting options that match ethical standards. Issues that need to be considered in business ethics decision-making may include product safety,

environmental protection, financial transparency, employee welfare, consumer rights, anti-corruption and anti-unfair competition, etc. (Isaak, 2017; Schwartz, 2017; Crane, et al. 2019; Trevino and Nelson, 2021).

Business ethics decisions are particularly important when the venture capital industry invests in biotech startups. As emerging companies in the field of biotechnology may involve human life, privacy, and sensitive personal messages, investors need to evaluate more carefully whether the commercial conducts and decisions of these companies correspond to ethical standards, and whether they follow the relevant laws and regulations. Woiceshyn (2011) and Bazerman and Moore (2012) pointed out that as a seasoned manager of a venture capital company, it is very necessary to value business ethics decision making. When an enterprise makes decisions, if it can pay attention to the ethical decision-making mechanism, many benefits will be brought to the company (Wu, 2002; Crane, et al. 2019; Trevino and Nelson, 2021).

The ethical decision-making mechanism can let enterprises be more prudential when dealing with commercial issues, avoid damages caused by inappropriate behaviors or behavior conduct, improve the quality of decision-making; then, raise the corporate image and public trust (Schwartz, 2017). When an enterprise is considered to obey the highest standards of ethics and social responsibilities, it is more likely to win the trust and support of customers, employees, investors, and other stakeholders. Generally, these individuals are more willing to do business with the enterprise. Clients are increasingly concerned about the ethical responsibilities of enterprises, especially toward the environment and society (Isaak, 2017; Crane, et al. 2019; Ferrell and Fraedrich, 2021).

When an enterprise adopts ethical behavior, it is easier for customers or other business associates to build trust in the company, thereby improving customers' confidence and satisfaction with the company's products or services. This kind of trust and support can convert into higher market share and better acceptance of new products or technologies. Through the ethical decision-making mechanism, enterprises can demonstrate their commitment to social responsibility and care for customers; then, it can enhance customers' trust and loyalty to the company (Bazerman and Moore, 2012; Trevino and Nelson, 2021).

Employees hope to have an assured moral standard and an ethical guideline at the company in which they work, and the ethical decision-making mechanism can ensure enterprises can comply with these guidelines at all levels (Ritter, 2006; Bouckennooghe, et al. 2015). The ethical decision-making mechanism can let employees feel the values and culture of the enterprise, and improve employees' job satisfaction and loyalty (Bartlett, 2003; Callanan, et al. 2010). Employee recruitment and retention rates can be improved. Following ethical decision-making mechanisms can also establish the accurate corporate culture; then, improve employees' morale. Employees will have more trust and respect for such a company; therefore, they will probably stay with the company. Enterprises should value ethical decision-making and establish corresponding decision-making mechanisms and cultures to ensure their long-term success and sustainable development

(Trevino and Brown, 2004; Crane, et al. 2019).

Obeying ethical decision-making mechanisms can help enterprises comply with laws and regulations. When an enterprise makes a decision, it considers ethical factors which can avoid improper behaviors and reduce the legal and reputational risks faced by the enterprise. This is very important for enterprises as violations of laws and regulations can result in heavy fines or lawsuits.

Ethical decision-making mechanism can allow enterprises to focus on long-term development instead of just emphasizing immediate interests, thereby promoting long-term corporate development (Schwartz, 2017; Ferrell and Fraedrich, 2021; Trevino and Nelson, 2021). For an ethically responsible enterprise, its business relationship and culture are generally more stable and sustainable (Trevino and Brown, 2004; Crane, et al. 2019). This can help enterprises gain competitive advantages as they are more likely than other enterprises to succeed and grow in the long run. Many investors and consumers are concerned about corporate ethics and social responsibilities; therefore, through the implementation of ethical decision-making mechanisms, companies can attract more investors and consumers, thereby bringing commercial benefits. Enterprises; therefore, have higher stock prices and return on investment (ROI) (Bazerman and Moore, 2012; Trevino and Nelson, 2021).

2.2 Investment ethics decision-making in venture capital industry

As the research on entrepreneurship and commerce ethics has gradually matured, research on the intersection of entrepreneurship and ethics has also received more and more academic attention (Harris, et al. 2009). Bankers, venture capital fund managers and angel investors have different investment criteria. Bankers emphasize the financial aspects of proposals, with less emphasis on market, entrepreneurs, and or other issues. As equity investors, venture capital fund managers and angel investors have very different measures, emphasizing market and financial issues. Compared with venture capital fund managers, angel investors emphasize more consideration of entrepreneurs and “investor matching”. Identically, bankers, venture capital fund managers, and angel investors also will have different views on ethical investment decisions. As far as entrepreneurs are concerned, this means they must tailor their business plans according to whether they seek funding from banks, venture capital funds, or angel investors (Mason and Stark, 2004).

Shepherd, et al. (2015) indicated that in the field of management, judgment and decision-making research is a traditional research topic, and it is also a very important part of the field of entrepreneurship. Although there are many relevant studies in the field of organizational behavior, psychology and market research, there is a lack of corresponding research in the field of entrepreneurship. However, the decision-making situations faced by many entrepreneurs are very extreme, such as high uncertainty, time pressure, emotional intensity and high importance. These decisions may involve ethical issues, which are very important for venture capital companies and entrepreneurs.

Almost in all daily operations of companies, unethical behavior against entire stakeholder groups can be seen (Fassin, 2005). Ferrell and Fraedrich (2021) paid attention to the topic of ethics and introduced the concept of ethical decision-making and how to solve ethical issues. Ferrell and Fraedrich (2021) mentioned the part of investment ethics in the venture capital industry, mainly exploring and discussing the ethical issues that may be involved in investment decisions such as whether the investment objects match ethical standards, and whether the investment behaviors meet ethical and moral requirements, etc. Furthermore, the book also introduces the ethical guidelines that the venture capital industry needs to follow in investment decision-making, and how to solve possible ethical issues.

These contents can help practitioners in the venture capital industry realize how to make ethically and morally correct decisions and avoid risks in practice. Maxwell, et al. (2011) pointed out that venture capital or angel investors require new entrepreneurs to have strong professional ethics, sound business understanding and realistic concepts. Xu (2015) mainly discussed the uncertainty in multi-attribute decision-making and also discussed the investment ethics of the venture capital industry, which mainly discussed how investors made reasonable investment decisions in the face of uncertainty. The investment ethical issue is when investors face uncertainty. For example, in the lack of sufficient information, investors should know how to balance risks and benefits, how to avoid moral hazard in investment, and how to ensure the fairness and transparency of investment decisions, etc.

Regarding ethical issues, the challenges that entrepreneurs or social entrepreneurs may encounter include how to balance social and economic targets, how to avoid misuse of resources, how to handle relationships with donators, and how to maintain the credibility of the organizations, etc. (Zahra, et al. 2009) However, regulatory restrictions and difficulties in obtaining venture capital have frustrated many people when starting businesses (Isaak, 2017). Hannafey (2003) noted that entrepreneurs face uniquely complex ethical and moral issues that are related to fundamental justice, human and customer relationships, distributional dilemmas, and other challenges.

An inherent issue faced by many entrepreneurs in the early stages of their businesses is attracting external capitals due to lack of collateral and sufficient cash flow as well as significant information asymmetry with investors (Schwienbacher and Larralde, 2010). Fassin (2005) pointed out that ethics in enterprises and entrepreneurship requires not only corporate governance and enterprises' social responsibilities. Corporate ethical management should not be limited to major strategic issues, but should also be applied to small practical issues in everyday business life. The relationship between entrepreneurship and ethics is often described as the opposite. Surie and Ashley (2008) developed a conceptual model that combines pragmatism with ethics to show that both are not incompatible and that ethical action must be taken in order to establish legitimacy and sustain the value creation of entrepreneurial leadership.

Payne and Joyner (2006) analyzed the ethical choices made by entrepreneurs during the process of creating and developing businesses. They emphasized that

entrepreneurs must consider ethics and social responsibilities when making decisions for new ventures. Entrepreneurs make four distinct categories of decisions that have ethical or social responsibility components, including decisions related to the personal value of an entrepreneur, organizational culture/employee welfare decisions, customer satisfaction and quality decisions, and external decisions of accountability. Rutherford, et al. (2009) considered that start-up entrepreneurs may adopt aggressive strategies to gain initial legitimacy from key stakeholders, and that these strategies may sometimes include suspected ethical behaviors such as misrepresenting legitimacy that is deliberately misrepresenting facts. However, venture capitalists tend to choose enterprises with good social responsibilities as investment objects, or refuse to invest in companies whose behaviors cause harm to society or the environment (Scholtens 2006).

Isaak (2017) indicated that the venture capital industry can consider environmental and social factors in investment decisions, and use them as a factor to evaluate the long-term success of enterprises. At the same time, the venture capital industry can also use the methods of evaluation and supervision toward enterprises before investment, and perform supervision toward green and social responsibility to ensure the long-term success of enterprises and the sustainable development of society.

3. Cases of Biotech Venture Capital Violating Ethical Decisions

In order to illustrate the importance of the ethical decision-making of the venture capital industry in investing in biotech startups, the study specifically cites two cases of the world-renowned ethical decision-making in the venture capital industry.

3.1 A drop of blood defrauded the venture capital industry in Silicon Valley

The Elizabeth Holmes scam story shocked the world. In 2003, she dropped out of Stanford University at the age of 19 and started her own business, Theranos, a blood testing company. Her idea was to launch a revolutionary machine which could test for more than 200 diseases from a few drops of fingertip blood, drastically reducing the cost of testing. Elizabeth Holmes' talent and self-confidence enabled her to quickly receive support from venture capital funds and top investors. With her strong family connections and personal charm, she was able to raise funds from bigwigs, celebrities, and politicians from various backgrounds. These included former US Secretary of State Henry Kissinger, Oracle founder Larry Ellison, former US Secretary of Defense James Mattis, media tycoon Rupert Murdoch, and others. As a result, the company's market value reached its peak in 2014, soaring to 9 billion US dollars.

Deliberately shaping her image, Elizabeth Holmes was once hailed as the "Female version of Steve Jobs" and became a model of female entrepreneurs who boldly broke through the boundaries. However, the fact turned out that the technology which she advertised was impractical, and people began to suspect that it was a lie.

Elizabeth Holmes became a billionaire starting from scratch, but was kicked out of fake and knocked off her pedestal.

In 2015, the technology was questioned by two medical professors, and then investigative reporters at Wall Street Journal began investigation about the blood test. In addition, employees in the company began to break the news, which led to Theranos facing a series of judicial investigations in 2016. Theranos's so-called revolutionary new technology is purely fictitious and Elizabeth Holmes has been charged with 12 counts of fraud. If she is found guilty, she will be sentenced to up to 20 years in prison. This affair has not ended. It has continued to affect the startups and venture capital circles in Silicon Valley. Whether investors have a preconceived impression of Holmes' seemingly perfect background or blindly believe and follow the endorsements of those prominent dignitaries behind her.

The core reason is actually those investors chose to believe in her. Some female start-up entrepreneurs were also affected by the incident. Alice Zhang, founder of Verge Genomics, a San Francisco-based AI medical start-up, said that investors and partners asked Holmes more than once at fundraising events after Theranos was accused of fraud in 2018. Julia Cheek, founder of Everly Well, a start-up for home medical testing, is a blond, white woman of the same age as Holmes, who is often compared to Holmes by insiders of the industry. It is relatively difficult for female entrepreneurs to raise capital, and Theranos makes the obstacle even stricter. Based on the mentality of projective analogy, venture capital companies want to confirm that the enterprises of these female entrepreneurs will not be "the next Theranos".

The scandal of Theranos founder, Elizabeth Holmes is seen as the dark side of Silicon Valley's entrepreneurial culture. Elizabeth Holmes's behavior is not only a deception to investors and consumers, but also an insult to the medical industry. In the process of pursuing commercial success, she unscrupulously reported the results falsely, and even put people's lives and health in danger. The event also exposed some of the problems in Silicon Valley's entrepreneurial culture, including an excessive pursuit of quick success and unscrupulous competitive environment. At the same time, the event also reminds us to choose carefully when investing and consuming and we should conduct investigation and analysis detailly on the products that we invest in or consume to ensure the legitimacy and reliability of products and companies. In the event, Elizabeth Holmes was charged with four counts, which has also become an important issue of ethical decision-making in business. Through the incident, we can have a deeper understanding of the importance of ethical decision-making in business and the serious consequences of violating ethical principles.

This event has let investors be suspicious of the entrepreneurial culture in Silicon Valley, and think that startups often do not have been strictly supervised and reviewed by systems, and it is easy to cultivate some irresponsible and immoral entrepreneurs and investors. This is a very serious problem for Silicon Valley, as Silicon Valley has always been the center of global innovation and technology, and investment also is one of very important driving forces for innovation and technology development. The event has made investors for Silicon Valley more

cautious, and paid more attention to scrutiny and supervision. Prior to the incident, investors in Silicon Valley tended to quickly invest a large amount of money in high-risk but high-reward startups, but the Theranos event has alerted them to begin evaluating and selecting investment items more carefully.

In the end, the incident is a great lesson for startups and investors of Silicon Valley. It reminds them that entrepreneurship is not only about pursuing high returns and success, but more importantly, it should be based on integrity and responsibility, should insist on the bottom line of morality, and should avoid pursuing success in an irresponsible and unethical way.

3.2 Stool testing once again deceived a bunch of venture capital elites

uBiome is a microbial genetic company whose headquarters is located in San Francisco, USA. The company claimed that it could help people understand their gastrointestinal microbiota through simple DNA testing, and then helped people improve their health. The company was co-founded by Jessica Richmad and Zachary Apte in 2012, and they conducted Series C financing in 2016, and had a financing amount of US\$143 million. The company is known as the “Unicorn” in the field of biotechnology.

However, as the company grew, it also began to receive various allegations and investigations in early 2018. On April 25, 2019, the Federal Bureau of Investigation (FBI) conducted a raid investigation of the company, and searched for documents related to the company’s financial and business operations. On May 2 of the same year, the company released a statement announcing dissolution of management and reorganization of the company and dismissed the founders, Jessica Richman and Zachary Apte from the board of directors. The action caught the attention of the market, and the stock price of uBiome fell from a peak of \$27 per share to almost \$0.

The event was caused by the company which was accused of misreporting revenue and other improper business practices. According to reports from the media, when doctors and patients performed genetic testing, the company used an ill-conceived way of dealing with health insurers, allowing the company substantially increased its revenue. In addition, the company was also accused of other improper business practices, such as exaggerating the effects and results of the test when promoting products. At present, uBiome is still going through the process of restructuring and investigation, and there are still many uncertainties about the company’s future.

The incident has aroused attention and reflection from the public on biotechnology companies and has also put forward higher requirements for the standards and requirements of biotechnology companies in terms of business operations and ethical responsibilities. Perhaps some people in the venture capital industry think that compared with the Theranos event, uBiome’s fraud is not as serious as Theranos. Theranos claimed to have innovated a revolutionary blood testing technology. However, the reality is that the technology cannot be effectively implemented. On the other hand, uBiome's microbial testing technology is actually

feasible, but the company resorted to improper and illegal actions to increase its revenue. However, both uBiome and Theranos have exposed financial and ethical problems among biotech companies. These events have raised alarms for the biotech and investors, reminding them to be cautious about the statements and financial reports of these companies.

The uBiome incident once again accentuates the risks of startups, especially when companies rely on innovative technology or skillfulness. It reminds investors to further understand the company's technology and business model before deciding to practice investment, especially in the field of biotechnology. Additionally, the event of uBiome has raised questions about how startups handle fundings and liabilities. Some believe that uBiome misused the funds excessively after obtaining financing, and did not solve its financial problems in a timely manner. This shows that investors need to carefully consider companies' financial statuses and management capabilities to avoid companies going bankrupt or facing legitimate problems due to financial issues. The uBiome event provides a useful lesson for the Silicon Valley venture capital industry, and reminds investors to further evaluate business models, technology, financial statuses and management capabilities of startups before practice investment.

3.3 The enlightenment of Silicon Valley venture capital investments in Theranos and uBiome events to Taiwan venture capital

The events of Theranos and uBiome have brought important revelations to the venture capital industry of Taiwan. These incidents once again remind investors that they should strictly manage the businesses and technologies of biotech enterprises and can't be bewildered by the short-term success and high -returns of venture capital. Investors should further strengthen the supervision and risk control of companies, especially in the fields of medical technology, drug research and development, and biotechnology.

The investment case of the Silicon Valley venture capital industry in Theranos and uBiome shows that these venture capital companies sometimes can't make reasonable ethical decisions in terms of investment decisions. In Therano's case, the company claimed to have developed a revolutionary blood-testing technology but it never reached usable levels. The potential value of technology fascinated investors but executives of the company were hiding its shortcomings. Theranos was eventually debunked, and investors lost billions. In the uBiome case, the company was accused of fraudulently increasing the company's value by giving away products to incentivize sales, falsely reporting revenue., etc. uBiome eventually went bankrupt and executives were charged with multiple crimes. Theranos was eventually debunked, and investors lost billions. In uBiome's case, the company was accused of fraudulently increasing the company's value by giving away products to incentivize sales and falsely report revenue, etc. uBiome eventually went bankrupt and executives were charged with multiple crimes. These incidents underscore the importance of transparency and integrity.

Companies should openly and transparently present the real situation of products and technologies to investors and customers, so as not to cause a crisis of trust and ultimately damage the brand image and return on investment. These events show that enterprises and entrepreneurs should focus on the real value of technology and products, rather than just pursuing short-term market success or return on investment. While pursuing business success, enterprises should uphold the values of honesty and professionalism to build a solid business foundation.

These incidents indicate that venture capital companies need more transparency and monitoring to ensure their investment decisions are based on reasonable and ethical principles rather than greed. In addition, venture capital companies also need to pay more attention to the operational risks and moral hazards of startups, and conduct sufficient investigation and monitoring to ensure that the technologies of the companies and products are truly usable and valuable. Before investing, venture capital companies should fully understand the business models of companies, market demands and competitive environment to avoid overly optimistic estimates of the companies' values.

Finally, these events also remind entrepreneurs and investors of Taiwan to strengthen their understanding and professional capabilities in the field of biotechnology. The biotechnology industry of Taiwan has a gigantic potential to develop, but the products or technologies that are developed by each startup have very huge discrepancy. Therefore, venture capital companies must evaluate the real status of projects more professionally in order to achieve long-term development goals.

4. Research Method and Implementation Steps

4.1 In-depth interview with experts

In-depth interview is an important method of data collection in qualitative research. Usually the method is used to explore specific topics, phenomena or situations, and to obtain in-depth understanding and descriptions from participants' experiences, opinions and ideas. In-depth interviews emphasize free responses and detailed descriptions of participants, aiming to understand participants' perspectives and experiences. In-depth interviews usually adapt semi-structured or unstructured methods, in which the researcher asks open-ended questions to the participants and allow participants to explore their ideas and perspectives freely. The researchers in due course will also guide the participants and ask more in-depth questions to obtain more detailed information. The questions of in-depth interviews are usually designed according to the research purposes and research questions, and can be adjusted and revised during the interview processes.

Another important feature of in-depth interviews is the emphasis on the live experiences of participants and situations and place them at the center of the research. Researchers need to understand the sociocultural backgrounds, experiences, and values of the participants in order to obtain a richer and deeper understanding. Therefore, during in-depth interviews, researchers need to respect

the views and values of the participants, and avoid evaluating or belittling the views of the participants. In-depth interviews are a method of collecting qualitative data which can help researchers receive insight into the perspectives, experiences, and values of participants. The success of an in-depth interview depends on the interview skills of researchers and shows respect and understanding to the participants.

4.2 Reliability and validity of in-depth interviews

In depth interview is a commonly used method in qualitative research, which is used to understand the view, feelings, experiences of interviewees, etc. on a specific topic, phenomenon or experience. During in-depth interviews, interviewees can freely express their ideas and explore deep perspectives and experiences; therefore, abundant information can be obtained. However, in-depth interviews also have some problems in terms of reliability and validity that need to be focused on. Reliability refers to whether the results that are obtained during the research can be repeated or not. In in-depth interviews, researchers need to ensure that the process and content of the interviews are consistent and stable in order to improve the reliability of the research.

Researchers can design a detailed interview guide that can ensure every interviewer is asked the same questions. At the same time, the guide can ensure that the interviewer is able to remain calm and professional during the interview without affecting the respondent's responses. Performing repeated interviews will ensure the reliability and consistency of the study results.

Validity refers to whether the research results are representative, reliable and valid. During in-depth interviews, interviewees who are chosen may affect the representativeness and validity of the study. The researchers need to ensure that the selected respondents are appropriate to the research purposes and questions. The design of interview questions needs to consider the research purposes and questions to ensure the validity and representativeness of the questions. Besides, the researchers may influence the answers of the respondents during the interview process, leading to distortion of the research results. Researchers need to keep neutral and objective attitudes and can't guide the answers of respondents during the interview process. Accurate and complete records of interviews are important for research validity.

4.3 Objects and steps of in-depth interviews

The eleven experts invited to be interviewed in this research have professional knowledge, abundant practical experience and the ability to express their perspectives and ideas clearly in the relevant fields. We selected venture capital practitioners and industry experts who have rich experiences in the field of venture capital and have successfully invested in biotechnology start-up companies to conduct interviews. In addition, these experts also possess the sensitivity and emphasis on ethical decision-making in order to be able to provide deep and

meaningful insights and explanations on the research topic. This study mainly raises two questions to the interviewees: the first issue is the ethical issues faced by the venture capital industry of Taiwan in investing in biotechnology start-ups, and the second issue is how the venture capital industry of Taiwan establishes an ethical decision-making mechanism. The list of interviewed experts is shown in Table 1.

Table 1: Basic data of interviewed experts in in-depth interviews

Serial Number	Job title	Gender	Age	Seniority (years)	Expertise
1	Chief of Investment Officer	Male	45	20	Investment and risk management of biotechnology
2	Chief of financial officer	Female	45	15	Evaluation, capital operation of biotechnology start-up company
3	Investment manager	Male	41	12	Investment evaluation for biotechnology market analysis
4	General Manager	Male	50	25	Venture capital and risk management
5	Chief of Investment Officer	Male	42	18	New drug research and development, investment evaluation of biotechnology
6	Investment Manager	Male	39	13	Industry analysis and market research of biotechnology
7	General Manager	Female	48	22	Investment and management of biotechnology start-up companies
8	Chief of Investment Officer	Female	40	12	Industry development and risk management of biotechnology
9	Investment Manager	Male	47	19	Investment and operation management of biotechnology start-up company
10	Vice President	Male	52	26	Market analysis and product development of biotechnology
11	Senior Researcher	Female	49	20	Industry research of biotechnology

The operation steps of open-ended expert in-depth interviews in this study can be divided into the following steps. In advance, interviewers need to confirm the research questions and formulate the interview outline, let the interview questions become important, meaningful, and relevant, and make the interview questions correspond to the research purposes. Through appropriate methods, such as

searching the internet and contacting venture capital associations, interviewers look for relevant experts from the venture capital industry. At the same time, interviewers pay attention to the professional category, experience, viewpoint and stand points of the interviews. According to the research questions and research purposes, interviewers select relevant interview objects. According to the job titles, working seniority, expertise, and other conditions, interviewers choose the interviewees. Make appointments by telephones, emails, or other methods and determine the time and place of the interview.

Before the interview, interviewers should detailly read the related articles such as venture capital, biotechnology companies, and relevant ethical decisions to ensure sufficient understanding and realizing the background of the field. At the same time, the interview outline should be given to the interviewees in advance so that they have time to fully prepare. When conducting interviews, the interviewers should create an atmosphere of openness, trust and safety, allowing the interviewees to feel comfortable and liberal. During the interview, firstly interviewers introduce the purposes of the research to the interviewees, and let the interviewees understand the importance of the research, and simultaneously the interviewees feel respected and trusted. Askers remain neutral and avoid implying their own views or expected answers in their questions. During the interviews, interviewers should listen and follow the outline of the interview, while they should be flexible in responding to responses of the interviewees.

After the interview, interviewers transcribe the interview recordings into a text file, or organize the notes into an electronic file. Carefully confirm the correction of the transcribed or organized materials. Conduct detailed analysis of the categorized data, such as thematic analysis or semantic analysis, to understand the viewpoints and experiences of the interviewees on the research questions. Finally, integrate the analyzed data and combine similar themes for subsequent report writing and analysis.

5. Ethical Issues Faced by Venture Capital Industry of Taiwan Investing in Biotechnology Startups

Besides traditional thinking conditions, the venture capital industry needs to consider evaluation criteria that differ from investing in other companies when investing in biotechnology start-ups. After all, the products and technologies of biotechnology companies are related to complicated and various fields. The following is a list of the ethical decision-making issues that venture capital industry may face when investing in biotechnology startups, according to the interviewed experts.

- a. The risk of products and technologies:** Biotechnology is a very high-risk field. Due to the uncertainty and low predictability of technology, investors need to bear higher risks when investing in biotechnology companies; this is a high requirement for investors to have risk assessment and management abilities. When investors invest in a biotechnology company, it is developing new drugs

or medical devices that may have adverse effects on human bodies. Under such circumstances, venture capital companies must carefully assess the risks and potential impacts of these products, and ensure that the development and use of these products comply with ethical and moral standards.

- b. Information asymmetry:** The R&D and commercialization process of biotechnology company is very complicated. It is difficult for non-professional investors to make a comprehensive evaluation of biotechnology companies; therefore, they often face the risk of information asymmetry. This requires investors' in-depth understanding of the industry and abundant experiences in order to effectively avoid the risks of information asymmetry.
- c. Conflicts of investment interest:** The R&D process of startups of biotechnology is relatively complicated and takes a long time, and it requires a lot of financial and resource support. As a provider of funds, the venture capital industry may also face conflicts of interest and ethical dilemmas. When products of biotechnology companies may bring risks to the environment or public health, the venture capital industry, whether it should continue to support the research and development of the company, or pay attention to environmental and health risks, may be impacted by the economic profits.
- d. Ethical issue risk:** The R&D process of biotechnology companies often involves some issues of ethical content such as human and animal experiences. This requires investors to evaluate and analyze the company's research and development process and methods when practicing investment. Investment companies also need to consider whether the company complies with research ethics, such as ethical requirements for human trials, understanding situations and consents, and privacy protection, to ensure that the R&D process of the company complies with relevant laws, regulations, and ethical standards.
- e. Risks of business models:** The business models of biotech companies also have certain risks such as whether they can get enough market recognition and benefits in the process of product commercialization, and whether the companies have enough funds to support long-term R&D and commercialization. Therefore, investors need to conduct a comprehensive assessment of the business models of biotech companies to ensure that the risk of investment is controllable.
- f. Geopolitical risks:** Biotechnology is a highly politically sensitive field, and investing in biotechnology companies may also face geopolitical risks, such as policy changes, trade restrictions, and international relationships. These risks may have adverse effects on the business patterns and development of biotechnology companies. Therefore, investors need to be aware of the international and domestic political environment.
- g. Controversy over talent resources:** The operating model of biotech start-ups is different from that of traditional enterprises, especially in terms of talent recruitment and management. The venture capital industry may participate in the recruitment and training of new start-up companies. However, during this process, it is important for the venture capital industry to also prioritize the

protection of the interests and rights of employees within the invested companies. This is necessary to avoid potential ethical and moral risks.

- h. Issues of intellectual property right and patent:** In the research and development process of biotech start-up companies, intellectual property right and patent issues may be involved. The venture capital industry needs to understand the intellectual property rights of the company during the investment process to avoid infringing on the patent rights of others, and also to protect the company's intellectual property rights to ensure the sustainable development of the company.
- i. Intellectual property rights and patent issues:** In the research and development process of biotechnology start-up companies, intellectual property rights and patent issues may be involved. The venture capital industry needs to understand the company's intellectual property rights during the investment process to avoid infringing on the patent rights of others, and also to protect the company's intellectual property rights to ensure the company's sustainable development.

6. Ethical Decision-Making Mechanism of Venture Capital Industry

When investors make investment decisions, ethical decision-making is very important and requires attention throughout the investment process. Through screening, evaluation, ethical considerations in the decision-making process, and follow-up management, ethical decision-making can ensure that the business ethics and social responsibilities of enterprises meet the standards, and help managers of venture capital companies make correct investment decisions. This study finds that venture capital firms, after noticing the importance of ethical decision-making, will take a series of measures to ensure that ethical factors are also taken into account when making investment decisions. The following is a list of matters or steps that should be paid attention to when formulating an ethical decision-making mechanism expressed by the interviewed experts.

- a. Preliminary screening:** When conducting preliminary screening of the industry, investors need to pay attention to the business ethics and moral hazard of the enterprises. This includes the operation methods of the businesses, professional ethics, social responsibilities, legal compliance, etc. It is necessary to avoid investing in companies that may have negative impacts on society and the environment.
- b. Professional evaluation:** Before making an investment decision, a professional evaluation is required. This can include evaluating the finance, management, and market condition of a company. Biotechnology companies have high technical risks, and they need to evaluate and analyze their technologies to avoid investing in technologies that are not commercially viable. Simultaneously, it is necessary to further evaluate the business ethics and risks of enterprises to ensure their compliance with ethics and laws.

- c. **Ethical considerations in the decision-making process:** In the investment decision-making process, the issue of corporate ethics and social responsibilities needs to be further considered. To illustrate, whether the company has a clear social responsibility and environmental protection plan and whether it respects the rights and interests of employees and so on.
- d. **Regular reviewing investment portfolios:** Venture capital companies should regularly review their investment portfolios to ensure that biotech companies in their investments still remain in line with the values and ethical standards of companies. If behaviors or practices of one company do not match these standards, venture capital companies should take appropriate responding actions such as supervision or divestiture investment.
- e. **Establishing clear partnerships:** The venture capital companies and companies in which venture capital companies invest should establish clear partnerships with clearly defined expectations and responsibilities between each other. This clear relationship can help to ensure these companies uphold high standards of ethical conduct and corporate responsibilities in their business implementation.
- f. **Cultivating corporate culture:** Venture capital companies can help their portfolio companies establish superior corporate cultures by setting up positive partnerships and emphasizing embedding ethical principles into the core of their cultures.
- g. **Active supervision:** Experienced venture capital managers need to be aware that they have oversight responsibilities for the companies in their portfolios. If there are signs of misconduct or lack of ethical behaviors, venture capital companies should take corresponding measures, such as monitoring through accounting firms, or requiring companies to make improvements.
- h. **Inspecting corporate management:** Whether an investment company has good corporate management, such as if there are independent directors, appropriate internal control and supervision mechanisms, etc. An excellent corporate management will not only affect the company's operating performance, but also affect the rights and interests of investors. As the representative of investors, venture capital companies should protect the rights and interests of investors, such as ensuring investors' equity and rights to know current situations.
- i. **Considering social influence and legal regulation:** the products and services of biotechnology companies may have an influence on society; for example, the application of biotechnology may cause moral and social controversy. Therefore, investors should consider the social influence of products and services from investing companies, and evaluate whether they meet ethical and legal standards. Venture capital companies should abide by relevant laws, regulations and ethical standards, such as respecting intellectual property rights and personal privacy, and obeying advertising laws.

7. Conclusions

The paper explores and discusses the ethical issues and challenges that venture capital industry encounters when investing in biotechnology companies. We propose many recommendations and schemes to formulate ethical decision-making mechanisms for investing in biotech companies.

First of all, we suggest that the venture capital industry should implement ethical education and training regularly to enhance the sensitivity and awareness of ethical decision-making. In addition, the venture capital industry should set up a special ethics committee or team to review and supervise the legality and morality of investment decisions. The venture capital industry should take into account the missions and prospective values of companies when formulating mechanisms of investment ethics decision-making.

Venture capital companies should involve ethics and social responsibilities into the core values of their investment decisions to ensure that their investment behaviors are in line with their missions and values. In addition, we recommend that the venture capital industry should follow professional and transparent investment standards, such as assessing a company's technical feasibility and business prospects. At the same time, the industry needs to take into account the company's ethics and social responsibility. Venture capital industry of Taiwan needs to consider its special nature in the field of biotechnology. Venture capital companies should conduct risk assessments in detail and due diligence before investing. This assessment and investigation should include factors such as scientific and technological feasibility, sustainability of business models, qualities of the management teams, and the ethical and social responsibilities of companies.

We suggest the venture capital industry should encourage and support biotech companies to conduct transparent and reliable experiments. For example, companies should be required to disclose experimental results and data, while ensuring that experiments comply with legal and ethical standards. Investment in the field of biotechnology has higher risks and uncertainties, and has higher requirements for ethics and social responsibilities. Therefore, venture capital companies need to adopt stricter standards and procedures to ensure the rationality and legality of their investment behaviors.

Finally, we emphasize when investing in biotech companies, the venture capital industry should always keep in mind its responsibilities and commitments to the public. At the same time, the venture capital industry should maintain a good reputation and image of the industry. Taiwan's venture capital industry needs to establish a transparent and effective regulatory mechanism to ensure the transparency and rationality of its investment behavior. The regulatory mechanism should include internal audit, external audit, independent directors, and other independent regulatory agencies. The suggestions and schemes put forward in the study can help the venture capital industry of Taiwan to formulate a more reasonable and feasible ethical decision-making mechanism, and simultaneously, provide better protection and support for the development of the biotechnology industry.

The main contribution of the study is to formulate a systematic analysis of the ethical decision-making mechanism of Taiwan's venture capital investment in biotechnology companies, and discuss the challenges and possible solutions that the venture capital industry of Taiwan encounters when formulating ethical decision-making mechanisms. This study provides a concrete framework of recommendations, which covers the ethical factors that should be considered when selecting investment targets, the establishment of corporate governance mechanisms, and regular supervision, which will help the venture capital industry to have better ethical guidelines that can be followed when practicing investment. In view of the special risks and challenges of biotechnology companies, the study corresponds with suggestions put forward, such as requiring biotechnology companies to conduct more transparent and scientific clinical trials, strengthening education and training in bioethics and laws, etc., which will help decrease risks and increase return on investment.

The study suggests that succeeding related research can compare the ethical decision-making mechanism of venture capital industry in various countries or regions, so as to understand the differences in the ethical considerations of investment in biotechnology companies in different regions, discussing and exploring the reasons.

The paper also discusses the influence of biotech companies on the ethical decision-making of venture capital companies, such as how to actively raise ethical considerations in negotiations with venture capital companies that biotech companies make, or how to attract more investment by adhering to ethical standards. The paper focuses on the ethical decision-making of biotechnology companies. It examines how these companies navigate the balance between profits and social responsibilities during the R&D and listing process. Additionally, the paper explores the importance of establishing transparent communication channels to enhance understanding of their ethical decisions among investors, regulatory institutes, and the public. The study discusses the influence of the ethical decision-making of the venture capital industry on the biotechnology industry, such as the influence of ethical decision-making on the selection, development and market competitiveness of biotechnology companies, as well as the influence on the entire biotechnology industry ecosystem.

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