

Augmented Reality Enhanced NFT Arts to Raise Awareness of the Endangerment of Thai Tokay Geckos

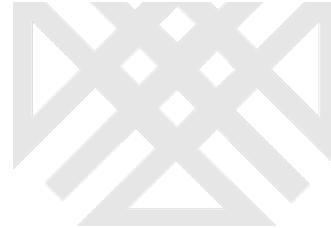
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Abstract

Non-fungible tokens (NFTs) are a type of digital asset intended to indicate ownership of a unique item, such as an artwork or collectible. They are stored on a blockchain, which enables their secure and transparent purchase and sale. NFT art is not only a new medium for creative economics, but it can also be utilized creatively to draw attention to significant causes. The Thai Tokay gecko is a gecko species indigenous to Thailand. Unfortunately, the Thai Tokay gecko is threatened by habitat loss and degradation, as well as collection for the pet trade. In addition, the species is occasionally harvested for traditional medicinal purposes. The goals of this study were to: 1) analyze NFT as a new creative economy platform; 2) produce a collection of NFT arts based on the Thai Tokay gecko to raise awareness about the species' extinction; and 3) assess the effectiveness of the augmented reality-enhanced Thai Tokay gecko NFT arts. To collect qualitative data, a total of 12 expert interviews were conducted. The expert interviews provided significant insights and a thorough overview of the Thai NFT art landscape. These data were utilized to create the Thai Tokay gecko NFT collection, which included 30 artworks embedded with an augmented reality message concerning the species' endangerment. 178 questionnaires were distributed online and inquired about respondents' opinions on the NFT artworks.

Keywords: NFT Arts, Thai Tokay Gecko Endangerment, Raising Awareness, Augmented Reality Enhanced NFT

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Introduction

NFT art (non-fungible token art) is a digital asset that exists only in the intangible universe. An NFT cannot be touched because it lacks physical properties, but it can be owned. The NFT Art is a global phenomenon with thriving markets. Some contend that the advent of NFT art inaugurated a new era of creative economics (Clark, 2021). Thai artists have embraced NFT art since the beginning of 2021. A Facebook page devoted to NFT art, "NFT & Crypto Art Thailand," has gained over ten thousand members in a matter of months. Some Thai NFT artists claimed to have made millions of baht through the sale of their intangible works on NFT markets. A piece of NFT could be made more engaging by the use of technology such as augmented reality, which could provide an additional layer of concealed, interactable information.

From its distinct culture and traditions to its unique environment and animals, Thailand is replete with materials suited to NFT subjects. The Thai Tokay gecko, a huge gray nocturnal lizard with orange spots and a loud croak, is a native species of Thailand. By consuming insects and rodents, the species favorably impacts its habitat. The species once thrived in both urban and rural environments. Alternatively, some persons believe that its meat can cure illnesses. Due to these purported therapeutic qualities, the Tokay gecko has become an endangered species. In 2012, more than 1,434,600 Tokay geckos were slaughtered and exported. According to a survey by the Animal Wildlife Institute, the United States imported over 180,000 live Tokay geckos for the exotic pet trade between 2007 and 2016. The majority of these geckos were captured in the wild in China, Vietnam, Thailand, Myanmar, Indonesia, the Philippines, and Bangladesh, where Tokay gecko populations have declined by as much as 50 percent during the past several years (Fishman, 2020). Even though the Tokay gecko is not one of the ten gecko species protected by law, if this tendency continues, the species as a whole may be in danger.

Based on the benefits of NFT and augmented reality technology mentioned above, we could use the tactics to bring attention to the Thai Tokay gecko instead of abusing the animals.



Research Objectives

This research consisted of three objectives:

- 1) research NFT as a new creative economy platform;
- 2) create a collection of augmented reality enhanced NFT arts based on the Thai Tokay gecko to raise awareness about the species' endangerment; and
- 3) assess the efficacy of augmented reality enhanced Thai Tokay gecko NFT arts.



Research Methodology

1. Samples

The samples consisted of

- 1) Experts in NFT with a sample size of 12 (N=12)

Purposive sampling method was adopted. The sample criterion is an NFT artist who has earned at least 3 Ethereum through the creation and sale of NFT artworks.

- 2) NFT artists with a sample size of 178 (n=178)

Volunteer sampling method was adopted.

Gathering data for this study, a total of 12 expert interviews were conducted with individuals who have in-depth understanding of NFT and its issues. In addition to these interviews, 178 questionnaires were distributed to a diverse sample of individuals within the NFT community, with the goal of collecting qualitative data on their experiences and perspectives.

2. Research Instruments

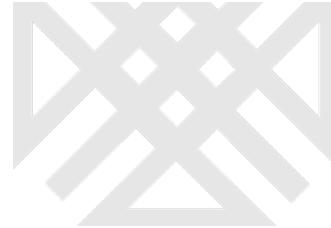
The research tools included a collection of Thai Tokay gecko NFT arts, an expert interview form, and an NFT evaluation form. Content analysis was used to examine qualitative data. The validity of the research instruments was evaluated by three experts, and its IOC was 0.95.

3. Data Collection

The following were the steps in data collection. The methods for developing the research tools were discussed as follows:

The expert interviews were conducted using a semi-structured format, allowing for





flexibility in the discussion while still ensuring that key themes were explored. The interviews were conducted in person, over the phone, or via video call, depending on the preference and availability of the interviewee. Each interview lasted approximately one hour and covered a range of topics, including the individual's background and experiences within the NFT art community, and their thoughts on its potential. The questionnaires were distributed online and could be completed anonymously. The questionnaires covered two topics of interest, including the efficacy of the NFT arts in raising awareness about Thai Tokay gecko, and their satisfaction level with the aesthetic of the artworks.

4. Data Analysis

Overall, the expert interviews and questionnaires provided a wealth of data on the experiences and perceptions of individuals within the community. The expert interviews provided valuable insights from individuals with a deep understanding of the community and its issues, while the questionnaires provided a more general overview of the perspectives of a diverse group of Thai NFT community members. The expert interview sessions were reviewed to determine the most suitable approach to develop Thai Tokay gecko NFT arts. The questionnaires results were used to assess the efficacy of the NFT artworks and the overall satisfaction level toward the artworks.

5. Ethical Considerations of Human Research

This article is a report of the research entitled "The Age of Intangible Creative Economy: A Research on Creating Thai NFT Art Collection based on Thai Tokay Gecko," which has been authorized by the Ethics Review Board of Silpakorn University and assigned the approval number REC 65.0718-109-5969 on its Certificate of Approval.

Research Results

The results were presented according to the research objectives as follows:

1. NFT as a new creative economy platform

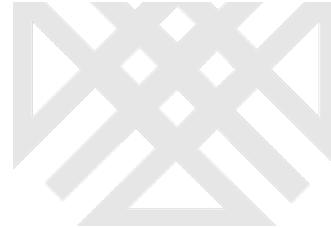
1.1 NFT art in a new creative economy era

Non-fungible tokens (NFTs) are digital assets that indicate ownership of a unique item or piece of content, such as a digital work of art, song, or video game item. The NFTs are held on a blockchain, a decentralized and transparent digital record that enables the

secure and verifiable transfer of ownership. The origins of NFT art may be traced back to the early days of the internet, when digital art gained legitimacy as a form of artistic expression. NFTs are intertwined with cryptocurrencies; Bitcoin, the first blockchain-based cryptocurrency, was established in 2009. (Nakamoto, 2009). NFTs did not become more prominent until the broad adoption of Ethereum (Buterin, 2014), a blockchain platform that permits the construction of smart contracts, in 2015. In recent years, the usage of NFTs in the art world has garnered considerable interest. In 2021, an NFT of a digital artwork by artist Trevor Jones sold for over \$69 million at Christie's, the first NFT artwork to be sold at a major auction house. In 2017, artist Beeple sold an NFT of one of his digital artworks for \$100,000. (Gompertz, 2021). Overall, the concept of NFTs marks a substantial shift in how digital asset ownership is understood and validated, and has the potential to revolutionize how digital content is bought, sold, and collected.

1.2 NFT market places

There are a variety of NFT marketplaces where non-fungible tokens are bought and sold. Among the most important NFT marketplaces are: OpenSea is a decentralized marketplace for NFTs that enables users to buy and trade a variety of NFTs, such as art, collectibles, and virtual real estate. Rarible is an online marketplace for the purchase and sale of NFT art and other creative works. It is a decentralized platform that permits artists and creators to directly list and sell NFTs. SuperRare is a marketplace for the purchase and sale of non-fungible artwork, with a concentration on digital art and visual media. It includes a selected collection of artists' works and enables users to buy, sell, and exchange non-fungible tokens. KnownOrigin is a market for the purchase and sale of digital art as NFTs. It includes a selected collection of artists' works and enables users to purchase and sell non-fungible tokens directly from the artists. Foundation is an online marketplace for buying and selling non-profit art and other creative works. It allows users to buy, sell, and trade non-fungible tokens (NFTs) and showcases a variety of works from artists and creators around the world. In addition to these, there are numerous other NFT marketplaces, and the environment is continuously changing as new platforms are launched and old ones grow. Additionally, it is difficult to ascertain the market shares of various NFT marketplaces because this information is often not made public. In addition, the market for non-fungible tokens is continuously moving and changing, with new marketplaces appearing and current ones gaining and losing appeal.



1.3 NFT scenes in Thailand

As the use of non-fungible tokens (NFTs) to represent and sell digital art is a relatively new phenomena, the history of NFT art in Thailand is quite recent. In recent years, there have been a number of noteworthy breakthroughs and events pertaining to NFT art in Thailand. The “NFT Art Show” exhibition held in Bangkok in 2019 represented one of the earliest examples of NFT art in Thailand. This show exhibited the work of Thai artists experimenting with the use of non-fungible tokens to market their digital art. In 2020, the Jamjuree Art Gallery in Bangkok hosted the inaugural NFT art auction in Thailand. Zhus Art, a blockchain-based art platform, organized the auction, which featured pieces by Thai and foreign artists. Several artists and galleries have experimented with the usage of NFTs to sell their art and other creative works in Thailand since then. In 2021, for instance, the “NFT Art Show 2” event was organized in Bangkok, showcasing the work of Thai artists who were using NFTs to sell their artwork. Overall, the history of NFT art in Thailand is still in its infancy, but it is evident that interest in and experimentation with the usage of NFTs are increasing on the Thai art scene. It is probable that the role of NFTs in the Thai art world will continue to increase and change as their use evolves and becomes more widespread.

1.4 NFT for raising social and environmental issues

Using NFTs to bring attention to critical topics can be an effective strategy. It is also an excellent method for artists to utilize their skills to create significant and influential pieces of art. For instance, the artist Trevor Jones developed “The Social Sustainability Collection” for the NFT, which comprises 3D renderings of worldwide landmarks and famous structures. Each image is accompanied by facts regarding social and environmental issues, including climate change and inequality (Meears, Crypto, & Hunter, 2019). A 2021 NFT artwork titled “Black Lives Matter” was created by an artist named XCOPY. It depicts a black fist raised in protest and the white letters “BLM.” All earnings from the sale of the NFT were donated to the Black Lives Matter movement by the artist (XCOPY: Crypto Art Pioneer, n.d.). The NFT artwork “The Great Barrier Reef” was produced by an artist named Matt Kane and depicts a computer recreation of the renowned Australian monument. Kane contributed a share of the revenues from the sale of the NFT to the Great Barrier Reef Foundation, an organization dedicated to protecting and preserving the reef (Merritt, 2022).

2. NFT arts based on Thai Tokay gecko

2.1 Thai Tokay gecko

The Tokay gecko (Gekko gecko) is a large, nocturnal reptile native to Southeast Asia, including Thailand (Figure 1). It is known for its distinctive vocalizations, which sound like “to-kay! to-kay!” and give the species its common name (Zug, Vindum, & Vindum, 2004). The Tokay gecko is an important species in the ecosystem because it helps control pest populations like cockroaches, flies, and rats (Fishman, 2020).

Figure 1
Thai Tokay gecko



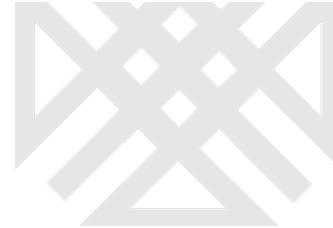
Note. Photograph in the herpetofauna of Timor-Leste: a first report (Kaiser et al., 2011).

Figure 2
Dried Tokay geckos as Chinese medicine.



Note. Photograph in Ecologists find evidence that pet and medicine trades bring Tokay geckos from across Asia into Hong Kong, impacting resident gecko populations and highlighting local and global conservation needs (Dufour et al., 2022).

However, the species has become increasingly endangered in recent years due to habitat destruction and over-collection for the pet trade. In Thailand, the Tokay gecko is considered a sacred animal by many people, and it is believed to bring good luck and protect against evil spirits. As a result, the species has played a significant role in Thai culture and folklore for centuries. Despite its cultural significance, the Tokay gecko is facing a number of serious threats to its survival. Habitat destruction, particularly due to deforestation and urbanization, has significantly reduced the availability of suitable habitat for the species. In addition, the demand for the Tokay gecko as a pet has led to over-collection, which has further reduced the population. To address these threats, the Tokay gecko has been listed as an endangered species in Thailand, and the government has implemented



measures to protect the species and its habitat. In addition, a number of conservation organizations are working to raise awareness about the importance of protecting the Tokay gecko and other endangered species in Thailand.

2.2 Experts' insights regarding developing Thai Tokay gecko NFT arts

The twelve experts provided insights about how one should proceed developing NFT art based on Thai Tokay gecko. According to the experts, there are a number of factors that can make NFTs more desirable to collectors. Some of the main factors that can contribute to the desirability of an NFT include:

- 1) Rarity: NFTs that are rare or unique are often more desirable, as they are less likely to be available for purchase elsewhere and may be perceived as having a higher value.
- 2) Quality: NFTs that are of high quality are often more desirable.
- 3) Style: NFTs that are of unique style are often more desirable, as they may be perceived as being more valuable and more likely to hold their value over time.

2.3 Experts' opinions regarding NFT art practices

Table 1

NFT experts' opinions regarding NFT art practices

No.	Topic	Frequency (N=12)	Percentage (%)
1	NFT market place of choice		
	OpenSea	9	75
	Foundation	3	25
	Rarible	0	0
	SuperRare	0	0
	KnownOrigin	0	0
	Other		
2	NFT art format of choice		
	Still image	8	66.6
	Animation	4	33.4
	3D model	0	0
	Other	0	0
3	NFT art style		
	Thai style	0	0
	Manga/Anime style	0	0
	American style	4	33.3
	European style	0	0
	Realistic style	0	0
	Pixel art style	0	0

Abstract style	1	8.3
Realistic style	0	0
Personal unique style	7	58.3
4 Single vs collection		
Single	3	25
Collection	9	75

In-depth interviews were used to get the thoughts of NFT experts about their practice. According to Table 1, nine (75%) of experts utilize OpenSea as their primary NFT marketplace, while three (25%) utilize Foundation. As for the deliverables, eight (66.6%) selected static images, while four (33.4%) selected animation to represent their NFTs. Seven experts (58.3%) would portray NFT using a unique style, whereas four experts (33.3%) would use an American style and one expert (8.3%) would use an abstract style. Nine experts (75%) decided to create their NFT works as collections, while three experts (25%) decided to sell their work individually. Upon closer inspection, these results align with the platforms they selected.

2.4 Experts' opinions about the development of Thai Tokay gecko NFT arts
As shown in Table 2, ten NFT specialists concurred that the Thai Tokay gecko is an appropriate topic for NFT and has the capacity to raise awareness about the crisis. Two experts were unsure whether or not the creature was a suitable starting point for NFT development. Seven experts (58.3%) chose a cartoonish style (Figure 5), four experts (33.3%), a semi-realistic style (Figure 4), and one expert (8.3%) a realistic style (Figure 3). Figures 3-5 were created between May 2022 and June 2022 to assess the most suitable style for developing the NFT arts.



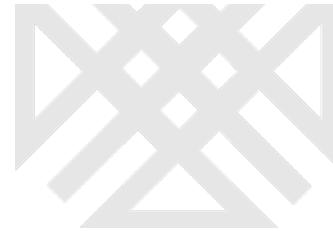


Table 2

NFT experts' opinions about the development of Thai Tokay gecko NFT arts

No.	Topic	Frequency (N=12)	Percentage (%)
1	Suitability of the subject		
	Highly unsuitable	0	0
	Unsuitable	0	0
	Neither suitable nor unsuitable	2	16.6
	Suitable	0	0
	Highly suitable	10	83.3
2	Appropriate style		
	Figure 3. Realistic style (2022)	1	8.3
			
	Figure 4. Semi-realistic style (2022)	4	33.3
			
	Figure 5. Cartoon style (2022)	7	58.3
			

2.5 The development of the Thai Tokay gecko NFT arts

The researcher decided to construct the Thai Tokay gecko NFT arts in a cartoon style as an NFT collection to be listed in OpenSea based on the insights provided by the NFT experts. Thirty unique Thai Tokay gecko NFT artworks were produced (Figure 6-7).



Figure 6

Thai Tokay gecko NFT arts #1-15



Note. Artworks listed on OpenSea platform.
(Own work, 2022)

Figure 7

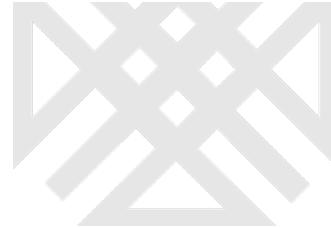
Thai Tokay gecko NFT arts #16-17



Note. Artworks listed on OpenSea platform.
(Own work, 2022)

3. Augmented reality and NFT

3.1 Augmented reality (AR) is a technology that combines digital information and images with the actual environment. Using computer-generated imagery to superimpose virtual items on top of the actual world to create the appearance of a virtual environment. Augmented reality systems can be implemented in a variety of methods, but the majority involve a device that can collect and display video of the actual world, such as a smartphone or a head-mounted display (Caudell & Mizell, 1992).



3.2 Adding a message to the artworks via augmented reality

The researcher deployed Artivive, a mobile application for augmented reality, to incorporate a message concerning the endangerment of the species. When the NFT artworks were scanned using the Artivive app, a horrifying photograph of dead geckos being exploited in the notion that they might cure ailments (Figure 9) would replace the friendly looking artworks (Figure 8).

Figure 8

Thai Tokay gecko artwork in Artivive platform



Note. Artivive can be accessed on
<https://artivive.com/> (Own work, 2022)

Figure 9

Artivive mobile app reveals the AR message



Note. Artivive can be accessed on
<https://artivive.com/> (Own work, 2022)

3.3 Displaying Thai Tokay gecko artworks in an NFT exhibition

Five pieces from this series were chosen for the "NFT Creative Art Exhibition," exhibited at the DEC Gallery, Silpakorn University, from 31st October to 5th November 2022. (Figure 10). Professor Emeritus Preecha Thaothong, the National Artist of Thailand, presided over the show (Figure 11).

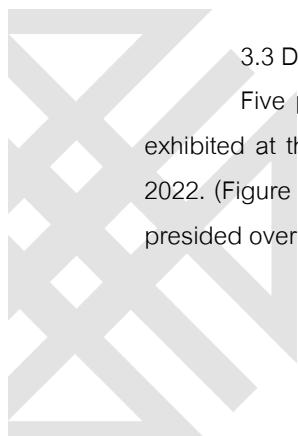


Figure 10
“NFT Creative Art Exhibition” poster



Note. The exhibition was held at the DEC Gallery, Silpakorn University, from 31st October to 5th November 2022.

Figure 11
Prof.Em.Preecha viewing Tokay gecko art



Note. Dr. Thanatorn Jiarakun (the dean of decorative arts), Professor Emeritus Preecha Thaothong (the national artist), and the researcher attended the exhibition on 31st October 2022.

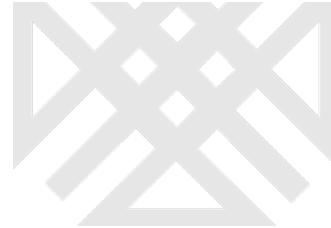
4. Evaluation of the Thai Tokay gecko NFT arts

185 anonymous questionnaires were utilized to collect responses from viewers concerning the Thai Tokay gecko NFT artworks. However, 7 entries were incomplete, leaving 178 total valid entries. Table 3 shows demographic information of the samples.

Table 3

Demographic information of the samples

No.	Demographic information	Frequency (n=178)	Percentage (%)
1	Sex		
	Male	127	71.3
	Female	51	28.6
2	Age range		
	20-29	103	57.9
	30-39	45	25.2
	40-49	27	15.2
	50-59	3	1.6
	>=60	0	0



The demographic information of the samples is displayed in Table 3. 127 (71.3%) of the total 178 participants were male, while 51 (28.5%) were female. 103 participants (57.9%) were aged 20-29, 45 samples (25.2%) were aged 30-39, 27 samples (15.2%) were aged 40-49, and 3 samples (1.6%) were aged 50-59.

Table 4

Efficacy and Satisfaction level of the NFT arts

No.	Demographic information	Frequency (n=178)	Percentage (%)
1	Sex		
	Male	127	71.3
	Female	51	28.6
2	Age range		
	20-29	103	57.9
	30-39	45	25.2
	40-49	27	15.2
	50-59	3	1.6
	>=60	0	0

The researcher used a Likert scale to assess the opinions of the samples regarding the efficacy of the augmented reality-enhanced NFTs as a means to raise awareness about Thai Tokay gecko endangerment. 91 participants (51.1%) chose "efficient," 55 participants (30%) selected "highly efficient," and 32 participants (17.9%) voted "neither efficient nor inefficient." As for the audience's satisfaction toward the aesthetic of the NFT artworks, 107 participants (60.1%) chose "satisfied," 56 participants (31.5%) selected "highly satisfied," and 15 participants (8.4%) voted "neither satisfied nor unsatisfied." As shown in Table 4, the results indicated that the NFTs of the Thai Tokay gecko are efficient means to raise awareness about the species' problem.

Discussion

The results of the study indicated the following:

1. Values of an NFT art

There are several factors that can contribute to the success and desirability of an NFT (non-fungible token) art piece. Originality and uniqueness are important factors that make an NFT piece stand out. NFT art piece that is well-made and visually appealing is more likely to be desirable. An NFT art piece that is rare or limited in quantity is more likely

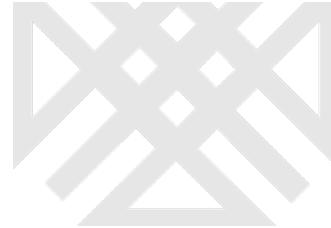
to be sought after. In addition, an NFT art that is tied to a significant event or a cause may be more desirable to collectors. To add value to Thai Tokay Gecko NFT arts, the researcher created thirty distinct-looking and stylistic Tokay Gecko characters, ensuring their rarity and uniqueness.

2. Applications of augmented reality and NFT

Augmented reality (AR) can be an interesting and innovative feature to incorporate into NFT art pieces. Augmented reality allows users to view the art piece through their phone or other device and see an interactive, digital element superimposed onto another object. This can add an additional layer of immersion and engagement for the viewer. This study uses augmented reality to add information about the threat to the survival of the Tokay Gecko to every NFT artwork. This method raises awareness of the species within the intended audience.

Conclusion

NFT art is a potential solution for the creative economy since it enables artists to sell one-of-a-kind, digital works of art that cannot be duplicated or counterfeited. NFT art also allows artists to reach a larger audience, as it is easily accessible and shareable online. The confluence of these variables renders NFT art an alluring option for artists seeking to market their work in the digital era. The incorporation of augmented reality into NFT art can add depth and significance to the piece. In this study, augmented reality-enhanced NFTs help raise awareness about the endangerment of Thai Tokay geckos. This can add a social or environmental message to the art, which can make it more meaningful and impactful for the viewer. Using augmented reality in this manner can also make the artwork more interactive and engaging, as the viewer can interact with augmented reality features and learn more about the subject matter through the artwork. This can create a more immersive and memorable experience for the viewer and potentially inspire them to take action on the issue.



Suggestions

As NFT arts can be utilized to increase awareness of social and environmental issues, the concept can be applied to a wide range of topics, making such NFT art projects significant and valuable. Augmented reality can bring an exciting new dimension to the artwork. Developers can construct interactive augmented reality, such as mini-games, to enable a deeper level of viewer participation, thereby making the experience more enjoyable and engaging. In addition, the characteristics of the original artworks should be reflected in the augmented reality so that they can be identified.

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