

Modern art, NFTs, and games: The value of images

Kevin Reay Wrobetz

Abstract

The board game *Modern Art* (Knizia, 2019) is a competitive game in which players become art dealers trying to make the most profit by influencing the value of a limited selection of five artists' work through the process of auctioning. This game was used in a pedagogical intervention designed to help students enrolled in business-oriented EFL courses at a Japanese university understand the process of value creation for images through game-driven utility mechanics. This process allows for the proof of ownership of an image to represent a value independent of the image and can itself undergo value appreciation. Non-fungible tokens (NFTs) are an emerging digital market in which intrinsically fungible digital images may be provided with a non-alterable proof of sale through blockchain technology. This proof of ownership allows for novel value creation of digital images in much the same way that the buying and selling of fine art creates value through the game mechanics of the auction. This research presents the results of a curriculum designed to teach about the value of images in a game of asset trading.

I. Introduction

The value of images

What is it that makes an image valuable? Why do people pay large sums of money to own specific images? When defining the concept of value, some traditional metrics use the concept of utility (Stigler, 1950). Utility theory in contemporary economics essentially posits that value may be modeled as a function of individual consumer preferences over a set of choices (Edgeworth, 1987). The value of an object is fundamentally subjective and therefore, to use the old adage, one man's trash is another man's treasure. When applying utility theory to the economic world of fine art, one could easily conclude that the value of an image is based on the emotive quality which drives the consumer to desire it over other images. How-

ever, this conclusion that the valuation of an image is all about the preference of the image over others is misleading and overly simplistic.

Edvard Munch's *The Scream* was sold for the record price of approximately \$120 million USD at Sotheby's in 2012 (Crow, 2012). Aside from subjective value determinations, supply and demand may be used to analyze how the price of an image is determined. For the case of Edvard Munch, the supply of Munch's works is by definition limited as he died in 1944. Therefore, when demand (i. e., enough people find utility in owning a Munch work) exceeds supply, then the price associated with obtaining a Munch work will rise. Indeed, as is often the case, the price of relevant works within the economic sphere of art increase dramatically upon the death of the artist (Ekelund, Ressler, & Watson, 2000). While the supply side of the equation in the case of Munch is easy to comprehend, the case of why demand (i. e., value) is so high is more ambiguous.

Returning to the discussion of whether the value of an image is based in the emotive quality of the image to drive consumers to desire it over other images, for Munch's *The Scream* to reach such a staggeringly high price tag, the image must drum up strong emotional responses in its viewers. This does seem to be the case as *The Scream* is "one of art history's most famous icons for the last three-four decades." (Pettersen, 2022). It is of little wonder then that the image has been reproduced countless times and graces museum walls as replicas, dormitory rooms as posters, and coffee mugs on breakfast tables across the globe. Therefore, if the value of an image is the image itself, then in the case of *The Scream*, supply greatly outpaces demand. In other words, if the goal of the consumer was to own the image, this can be accomplished for a price affordable to everyone. However, seeing how *The Scream* was sold for \$120 million USD, there must be other factors at play when determining the value of this image.

One possible answer to the question of why the value of *The Scream* is so high may be found in brand name appeal. For products with brand name appeal, the value of the product is not necessarily in the product itself, but in the authenticity of the product and what that authenticity represents. Don Norman has proposed that brand name appeal stems from reflective valuation, whereby the consumer may be driven to value certain brand name products more than others based on what the name of the brand says about the person who purchases their products (Norman, 2013). For example, there are countless watches which look similar to and function just as well as a Rolex, so the case may be argued that the consumer

who purchases a Rolex is not doing so to purchase a high quality watch per se but rather they are purchasing the authenticity of a Rolex to reflect a part of themselves to other people that they wish to convey. Therefore, the consumer with the Rolex values what other people understand about what it means to own a Rolex, namely that you need a lot of money to buy a Rolex.

While there are countless images of *The Scream*, there is only one authentic version created by Edvard Munch himself (assuming we disregard the three other authentic versions that Munch produced). It is therefore this level of authenticity combined with what it means to own an original Munch which is the primary driver of value, not the image. In the case of fine art, value is clearly not a subjective determination based on individual consumers' preferences over a set of choices but rather based on a collective determination of the social standing that is afforded through the ownership of authentic works of established and relevant artists (i. e., brand names) and the opportunities that such social standing presents. When defining the value of images as being dependent on a collective determination of relevance, the world of fine art starts to look more like a game, wherein the value of certain objects is determined by a group of people playing by the same rules.

The value of NFTs

Non-fungible tokens (NFTs) are a contemporary phenomenon of the ever-growing digital marketplace. When defining what NFTs are, it helps to start by defining what the term fungibility means in an economic system. Fungibility can be defined as “replaceable” or “interchangeable” and fungible products are therefore mass-produced or otherwise copyable products which are virtually indistinguishable from one another (i. e., a bottle of soda). The value of fungible products would therefore be highly influenced by individual consumer preference. Conversely, something which is non-fungible is not replaceable or interchangeable and is therefore a little trickier to define. In real estate, for example, a house may very well be fungible by virtue that you can copy a house, but the value of a house becomes non-fungible by virtue of where it is built, what is built around it, and its transactional sales history (i. e., processes which influence value which cannot be replicated). The value of two identical houses built in two separate cities would therefore follow different value trajectories whereas the value of two identical bottles of soda sold in two separate cities would be more or less the same. The value of non-fungible products would therefore be highly influenced by a col-

lective determination of the value of that object.

Returning to the discussion of the value of Munch's *The Scream*, the image itself is entirely fungible, meaning that you can reproduce nearly identical versions indefinitely. Much of the value of the image is therefore produced in the confirmed authenticity of the original version coupled with the non-fungible collective determination of value which that specific original version has gone through (i. e., auction sales). The fungible replicas and reprints of *The Scream* do not rise in value in the same way that bottles of soda do not rise in value. Contemporary art, however, continues to incorporate digital technologies to produce images. How do we value works of art which are completed in an entirely digital medium, which is by definition fungible? Furthermore, excluding the possibility of keeping the original digital file hidden and limiting viewing to a single printout or just selling fungible reprints, what is the value of an image which is viewed on a computer? Even if the consumer pays for access to the digital file, once the image has been accessed or downloaded, the image can then be freely distributed. This fungible property of digitization is also a problem that has plagued other industries such as music (Peitz & Waelbroeck, 2004). An interesting solution to the fungibility issue of digital images has been to incorporate blockchain technology to essentially copy and paste a non-fungible stamp of authenticity onto the identity of the image. In other words, an NFT is a nonreplicable bill of sale for a specific brand of digital images.

Blockchain technology is essentially a decentralized (i. e., spread out across a peer-to-peer network of computers), chronological, and encrypted ledger of financial transactions (Schlegel, Zavolokina, & Schwabe, 2018). Financial transactions conducted with blockchain technology are therefore nearly impossible to remove or modify once the transaction is complete. One way in which this technology has been used is to sell fungible digital images to consumers, the financial transaction of which becomes non-fungible. The proof of purchase of a digital image (i. e., the NFT), once certifiably authentic, can then undergo similar non-fungible processes which can trigger changes in the value of that token such as through auction sales. NFTs can and do sell for large sums of money. The famous gif known as *Nyan Cat* depicts a cat with a Pop-Tart body flying through a star-filled sky leaving a rainbow trail in its wake as an upbeat theme song plays on repeat in the background (Nyan Cat, 2011) and sold for approximately \$600,000 USD as an NFT (Kay, 2021). The answer to the question of why anyone would pay such a large sum of money to “own” a gif which anyone with access to the internet can view at any time can again be found in the rationalization that it

is not the image which has value (just as with *The Scream* which anyone with access to the internet can also view at any time) but rather the collective determination of the relevance of that image to people playing the same game as the NFT consumer.

The value of games

The definition of a game used in this research is a framework of rules which exert influence over the behavior of players as has been defined in the field of Game Theory (Fudenberg & Tirole, 1991). Games can simulate a social structure which can exert influence over the utility of products. Returning to the staggeringly high valuations of *The Scream* and *Nyan Cat*, if it is not the images themselves which are worth that much money, then what is it that was purchased? If the brand value of the artists (i. e., their popularity) remains relevant to the group of people (i. e., the players) who purchase images for large sums of money (i. e., the game), then the purchased images may be thought of as financial assets with the possibility of value appreciation. In this sense, as long as other players continue to play the same game of purchasing images as financial assets and the players have collectively conferred the relevance of specific brands of images, then purchasing images has more in common with asset trading than the simple purchasing of images. It is precisely this game-like structure in art valuation which makes the game *Modern Art* (Knizia, 2019) an ideal pedagogical tool to provide instruction on the utility of images, the economic world of art trading, and the emerging digital market of NFTs. Moreover, when the language of instruction is not the students' native language (as would be the case in EFL courses), using games can simplify these concepts through multimodal instruction which may have a host of benefits in second language acquisition from vocabulary to motivation to engage with games in the target language (Wrobetz, 2022a).

II. The game *Modern Art*

Game overview

The game *Modern Art* is a competitive game in which players become art dealers with the goal of having the most money at the end of the game. Players engage in a series of auctions during which works from five artists are bought and sold between one other. The process of buying or selling the work of any artist raises their popularity, which in turn increases the base value of each artist's works. As the game progresses, the value of an artist may con-

continue to rise until the artist loses popularity, after which their value returns to zero. The overall goal of the game is to predict the demand for the artists' works during any given round, fortify those artists' popularity by actively buying and selling their works, all while trying to avoid owning the works of artists whose popularity is not high enough to maintain their value when it comes time to sell what you have acquired.

Game rules

The game (CMON, 2019) is played between three to five players over a series of four rounds. There are a total of 70 works of art from five artists, each of whom have a different starting supply value (12, 13, 14, 15, and 16). Each player starts the game with \$100,000 and is dealt a specific number of artworks at the start of rounds one, two, and three. At the start of each round, each player will in turn put one piece of artwork they have been dealt up for auction. Each piece of artwork will have one of five specific auction types which will determine how the auction is conducted. The money spent to purchase the auctioned artwork will go directly to the player who auctioned it (i. e., the auctioneer) unless it is purchased by the auctioneer, in which case the money goes to no one (i. e., it simply “disappears” back into the communal bank). Each time an artist's work is auctioned off, the artist earns one popularity point. As soon as an artist reaches five popularity points, the round ends without the fifth painting being sold at auction (i. e., the value of the fifth painting is sacrificed to end the round).

At the end of the round, the three most popular artists are ranked to determine the value at which their paintings may be resold to dummy purchasers. The artist with whom the round was ended is determined to be the most popular (at five points) and their paintings are determined to sell for \$30,000 each. The works of the second most popular artist for that round sell for \$20,000 each and the third most popular for \$10,000 each. In the event that two artists are tied for either second or third place, the artist with the lower starting supply value (e. g., 12, 13, 14, 15, or 16) will be determined to be more popular. This tie-breaking determination allows for higher value determinations when demand outpaces supply. After each artist's value has been determined, each player sells their acquired art during the round to dummy purchasers and collects either \$30,000, \$20,000, \$10,000, or nothing for each piece from the communal bank depending on their respective value determinations.

Rounds two, three, and four are played in identical fashion to round one except that each

artist's brand value may rise. Should an artist who placed either first, second, or third in round one again place either first, second, or third in round two, then the two valuations are added together. Therefore, if an artist who placed first in round one places third in round two, then their value is \$40,000. On the other hand, if an artist who placed in round one does not place in the top three most popular artists in round two, then their brand valuation returns to zero; however, if such an artist makes a comeback in either round three or four, then the artist's brand value rises. This stacking valuation mechanic therefore prioritizes the total value of the brand as opposed to the performance of the brand during a single round and allows for novel utility judgements. For example, even if an artist looks likely to place third in round two, the value of that artist's works sold during the round may still be worth more than the artist who is likely to place first if the former artist placed first in a previous round and the latter did not. After all four rounds have been completed, each player sums up their total profit and the player with the most money wins the game.

III. Methodology

Course details

Modern Art was used as an instructional tool in two business oriented EFL courses at a Japanese university during the spring semester of 2022 (April to September). Each course was identical in course design and spanned 15 weeks. The classes met once weekly for 90-minute sessions. A total of nine students participated in the course all of whom were majors in the field of business administration. Eight of the nine students were Japanese nationals or otherwise native Japanese speakers, and one of the students was a Chinese national. There was a wide range of English proficiency in the student population spanning novice low to intermediate high according to the American Council on the Teaching of Foreign Languages (ACTFL) guidelines (Breiner-Sanders, Lowe, Miles, & Swender, 2000). Each of the students participated in this research in exchange for course credit. All students were informed of the intention to publish the results of this course, to which all students agreed upon the condition that all participant data are handled anonymously. In the event that a student did not agree to the publication of their data, an alternative course was devised, however this alternative coursework was not utilized in this study.

Curricular goals and student evaluation

The present courses' curriculum was designed to last seven weeks of the fifteen-week semester and provide instruction on the concepts of utility theory, art valuation, brand value, blockchain technology, NFTs, and the potential economic future of NFTs in digital gaming. This course was also designed to improve students' general English listening, speaking, reading, and writing skills, expand upon students' vocabulary within subject matters relevant to majors in business administration, and utilize multimodal instructional material to supplement in-class discussions. Students' grades were based on weekly participation in the course program, defined as actively playing the game and taking part in in-class discussions/activities (60% of their total grade), completion of a vocabulary test (20% of their total grade), and completion of comprehension worksheets based on in-class activities (20% of their total grade).

Course materials

In order to work towards the above-stated curricular goals, several in-class instructional materials and methods were utilized. First and foremost, the board game *Modern Art* was used to not only provide simplified and interactive lessons on utility theory, art valuation, and brand value, but also as a way to encourage English reading (i. e., through the rulebook), speaking and listening fluency (i. e., through the interaction with other players). In conjunction with *Modern Art*, students were exposed to a documentary on NFTs (Johnny Harris, 2022) and an article on how NFTs are being absorbed into the digital gaming economy (Cristea, 2022). Finally, students were required to complete comprehension worksheets (Wrobetz, 2022b; Wrobetz, 2022c) and a vocabulary test (Wrobetz, 2022d) based on the course materials and in-class discussions/activities.

Procedure

The curriculum started by giving the students approximately 10 minutes to skim through the rulebook of *Modern Art*. While skimming, the students were instructed to upload all unknown vocabulary onto a communal database. After skimming the rulebook, the students were evenly divided up into either two or four groups, depending on the class size, and the instructor became the third or fifth player, again depending on the class size. After all groups had been decided, gameplay commenced with the instructor guiding gameplay and using the

rulebook to explain the process. The students were therefore largely learning how to play the game by playing the game. No specific strategies were given to the students before or during gameplay and were left to discover and refine their own strategies while playing the game.

The game was played for approximately the first 45 minutes of every class throughout the seven-week curriculum, after which in-class discussions of utility theory, art valuation, and brand value took place. On the third week of the curriculum, the NFT documentary was screened and in-class discussions of blockchain technology and NFTs took place. While watching the documentary, students were instructed to again upload any unknown vocabulary onto a class database. On the fourth week, a comprehension worksheet (Wrobetz, 2022b) based on the content of the curriculum to date was assigned. From weeks 5–7, an article on NFT gaming was read and in-class discussions on the economic future of NFTs within the digital gaming industry took place. Before reading and discussing the article as a class, students were again instructed to skim the article for approximately 10 minutes and upload any unknown vocabulary onto a class database. All unique entries (i. e., all non-duplicate entries) in the class vocabulary database formed the basis of the vocabulary test (Wrobetz, 2022d). On the seventh and final week, a comprehension worksheet (Wrobetz, 2022c) based on curricular content from weeks 5–7 was assigned. The following section will detail the results of the curriculum.

IV. Results and discussion

Observations on game-driven utility mechanics

Perhaps one of the most interesting outcomes of how the game mechanics of *Modern Art* affect the utility of individual works of art featured in the game is how subjective utility becomes divorced from collective utility. Returning briefly to the discussion of *The Scream* and *Nyan Cat*, the value of each of these cultural phenomena is not in the images themselves but the popularity of these images within a collective of people willing to play the same valuation game as the purchaser. This supposition of game-driven utility mechanics was observed during gameplay. Of the five artists featured in *Modern Art*, a player may find more utility in one artist over the others based on nothing more than image preference when not playing the game (i. e., when the utility of that artist is not tied to specific gameplay mechanics). However, this utility is subject to change when the gameplay mechanics confer collectively

determined valuation upon any given artist which differs from subjective utility. This supposition is supported not only in observations in the author's own personal preferences of the five artists in both in-game and out-of-game contexts but also in student data from the comprehension worksheets.

Question 1 (Wrobetz, 2022c): When you are playing the game *Modern Art*, who is your favorite artist? Why?

Student 1: Sigrid Thaler. That is because, she has a second value of rarity in all artist and that balance is convenience to play the game.

Student 2: I like Manuel Carvalho, because there is a game changer.

Question 2 (Wrobetz, 2022c): If you weren't playing the game *Modern Art*, would your opinion of which artists featured in the game are the best change?

Student 1: Rafael Silveira, that is because he drew a lot of paintings.

Student 2: I think I like Daniel Melim. Because the picture looks good.

In both of the student responses above, their preferences for artists while playing the game heavily favored artists with lower starting supply values (Manuel Carvalho starts the game with 12 artworks, Sigrid Thaler starts the game with 13). As a result of their lower starting supply values, these two artists have an edge on other artists with higher supply values in situations in which the popularity points are equal. Consequently, both of these artists are quite valuable within the context of the game. However, the students' preferences differ in out-of-game contexts, for which their utility is determined largely by the image and not the collectively determined value within the structure of the game. Another example which demonstrates how the gameplay mechanics in *Modern Art* helped students understand how the value of art is collectively determined by non-fungible processes were observed in comprehension worksheet responses.

Question 1 (Wrobetz, 2022b): In the game *Modern Art*, what determines the value of any given painting?

Student 1: Auctioneer's intension and the rarity of painting. (Due to the scarcity of the author's work)

Student 6: auction

Student 7: The value of painting depends on the popularity of its artist for the round.

All the responses above identify processes which increase the value of the artwork and which have absolutely nothing to do with the quality of the images themselves. Indeed, the

students correctly observed that it is the process of buying and selling which drives up the popularity and is in turn weighed against the supply of that particular brand. Again, the value of the artworks do not necessarily correlate with what the images are but rather with the liquidity of a particular brand in specific circumstances. Finally, when discussing how NFTs can be worth so much money when they do not even occupy physical space in our reality, the game mechanics of *Modern Art* arguably helped students identify parallels between the valuation processes of fine art and NFTs.

Question 5 (Wrobetz, 2022b): Why do you think the first “tweet” ever sent (by Twitter co-founder Jack Dorsey) sold for approximately \$3 million?

Student 4: Because it’s popular with a bunch of people who think it have value.

This answer encapsulates much of what the curriculum was trying to provide instruction on. It probably goes without saying that most people would agree that the first tweet has some kind of historical importance and therefore some kind of intrinsic value. With that being said, however, there are probably few people who would pay money for something that they cannot hold and can view on the internet at any time. However, thinking about how the purchase of the first tweet as an NFT may constitute a calculated move in a game which other people are also playing helps demystify the concept of NFT utility. The answer to the question of why someone would pay \$3 million USD to “own” the first tweet, as is supported by the curricular content presented in this study, is that the person is buying it with the intention of selling it again at a higher price.

Ethical considerations for teaching about NFTs

One aspect of the NFT market that should be addressed by educators discussing NFTs in educational environments is the potentially unethical situation of portraying the NFT market as anything other than an emerging economic trend which is riddled with risk, rampant with fraud, and potentially damaging to the environment. In other words, educators need to take special care that they do not inadvertently encourage their students to engage with NFT investment without knowing the potential pitfalls. First and foremost, the meteoric rise of the NFT market is more than likely being driven by short-term hype and has been likened to the dot-com bubble (Belk, Humayun, & Brouard, 2022). In fact, this bubble may have already burst as many NFT lines have lost nearly all their value and thus investors should be well aware of the high level of risk (Adab, 2022). Second, many NFT games such as *Axie Infin-*

ity (Sky Mavis, 2018) have been accused of being thinly veiled pyramid schemes (Delic & Delfabbro, 2022; Gach, 2022). Furthermore, NFTs (and fine art for that matter) are often used by criminals and organizations to launder money and regulation of this emergent market is virtually non-existent (Jordanoska, 2021; Weeks, 2020). Finally, the cryptocurrencies which NFTs require to create non-fungibility have been routinely identified as being a major contributor of CO2 emissions (Schinckus, 2021).

Future considerations

The results of this study which identified an effect of the gameplay mechanics in *Modern Art* to influence the subjective utility of the featured artists was interesting and should be explored in future studies. In particular, larger sample sizes coupled with pre-game and post-game utility valuations of the five featured artists could potentially reveal statistically significant shifts in subjective utility pre to post-game.

Conclusion

Images play a large part in the social construction of reality (Gamson et al., 1992). It is precisely because of the importance of images in our life and society that it is easy to understand how images may be valuable to people. With that being said, it may be too far of a jump for most people to go from the statement, “I would pay money to own an image” to, “I would pay hundreds of millions of dollars to own an image.” This may especially ring true in the modern world, in which we have instant access to virtually any image you could possibly imagine in your pocket. This may make the emerging NFT market especially bewildering to some people, mainly due to the intrinsic fungibility of digital images. However, the parallels between how value is created for fine art through the game of auctioning is not at all dissimilar to what has been happening in the NFT market. As educators, we have the duty to help prepare our students for the world they will inherit. Despite recent setbacks in the cryptocurrency markets, this will not likely be its death knell and will continue to play a role in future economic markets (Smith, 2022). This research presented how the board game *Modern Art* in conjunction with other instructional material can provide meaningful instruction on the value of images in our modern world.

References

- Adab, A. (2022, November 16). The NFT bubble has burst, but the value for creators is just heating up. *Rolling Stone*. <https://www.rollingstone.com/culture-council/articles/the-nft-bubble-has-burst-but-the-value-creators-is-just-heating-up-1234631057/>
- Axie Infinity [Video Game]. (2016). Sky Mavis.
- Breiner-Sanders, K. E., Lowe, P., Miles, J., & Swender, E. (2000). ACTFL proficiency guidelines-Speaking (Revised 1999). *Foreign Language Annals*, 33(1), 13.
- Belk, R., Humayun, M., & Brouard, M. (2022). Money, possessions, and ownership in the Metaverse: NFTs, cryptocurrencies, Web3 and Wild Markets. *Journal of Business Research*, 153, 198-205. <https://doi.org/10.1016/j.jbusres.2022.08.031>
- CMON. (2019). *Modern art rulebook*. https://cmon-files.s3.amazonaws.com/pdf/assets_item/resource/80/MA_Rulebok_Artbook_v18-low.pdf
- Cristea, M. A. (2022, June 23). How are blockchain and NFTs turning gamers into investors? *Business Review*. <https://business-review.eu/money/how-are-blockchain-and-nfts-turning-gamers-into-investors-232337>
- Crow, K. (2012, July 11). An art mystery solve: Mogul is 'Scream' buyer. *The Wall Street Journal*. <https://www.wsj.com/articles/SB10001424052702304373804577521240470769420?KEYWORDS=the+scream>
- Delic, A. J., & Delfabbro, P. H. (2022). Profiling the potential risks and benefits of emerging "play to earn" games: a qualitative analysis of players' experiences with Axie Infinity. *International Journal of Mental Health and Addiction*, 1-14. <https://doi.org/10.1007/s11469-022-00894-y>
- Edgeworth, F.Y. (1987). Numerical determination of the laws of utility. In *The new Palgrave dictionary of economics*. Palgrave Macmillan. https://doi.org/10.1057/978-1-349-95121-5_1822-1
- Ekelund Jr, R. B., Ressler, R. W., & Watson, J. K. (2000). The "death-effect" in art prices: A demand-side exploration. *Journal of Cultural Economics*, 24(4), 283-300.
- Fudenberg, D., & Tirole, J. (1991). *Game theory*. MIT press.
- Gach, E. (2022, April 16). Crypto gaming 'landlords' upset they can't keep exploiting all the players quitting. *Kotaku*. <https://kotaku.com/axie-infinity-nft-crypto-hack-landlord-scholar-pokemon-1848800557>
- Gamson, W. A., Croteau, D., Hoynes, W., & Sasson, T. (1992). Media images and the social construction of reality. *Annual Review of Sociology*, 18(1), 373-393.
- Johnny Harris (2022). *NFTs, explained*. YouTube. https://youtu.be/Oz9zw7-_vhM
- Jordanoska, A. (2021). The exciting world of NFTs: a consideration of regulatory and financial crime risks. *Butterworths Journal of International Banking and Financial Law*, 10, 716.
- Kay, G. (2021, February 24). 'Nyan Cat' flying Pop-Tart mem sells for nearly \$600,000 as one-of-a-kind crypto art. *Business Insider*. <https://www.businessinsider.com/ethereum-nft-meme-art-nyan-cat-sells-for-300-eth-2021-2>
- Knizia, R. (2019). *Modern art* [Board Game]. CMON Global Limited.

- Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.
- Nyan Cat (2011, April 6). *Nyan cat [original]*. YouTube. <https://youtu.be/QH2-TGulwu4>
- Peitz, M., & Waelbroeck, P. (2004). The effect of internet piracy on CD sales: Cross-section evidence. In *CESifo working paper, No. 1122*. Center for economic studies and ifo institute. <http://hdl.handle.net/10419/76503>
- Pettersen, P. (2022). Edvard Munch – The Scream. *International Journal of Conservation Science*, 13, 1405-1420.
- Schinckus, C. (2021). Proof-of-work based blockchain technology and Anthropocene: An undermined situation? *Renewable and Sustainable Energy Reviews*, 152. <https://doi.org/10.1016/j.rser.2021.111682>
- Schlegel, M., Zavolokina, L., & Schwabe, G. (2018, January). Blockchain technologies from the consumers' perspective: What is there and why should who care?. In *Proceedings of the 51st Hawaii international conference on system sciences*.
- Smith, S. S. (2022, December 7). FTX is not the end of centralized exchanges. *Forbes*. <https://www.forbes.com/sites/seansteinsmith/2022/12/07/ftx-is-not-the-end-of-centralized-exchanges/?sh=1500ab9e7cc7>
- Stigler, G. J. (1950). The development of utility theory. I. *Journal of Political Economy*, 58(4), 307-327.
- Weeks, S. (2020, August). A freeport comes to Luxembourg, or, why those wishing to hide assets purchase fine art. *Arts* 9(3), 87. <https://doi.org/10.3390/arts9030087>
- Wrobetz, K. R. (2022a). *Single-player RPGs as a medium of instruction in formal foreign language education* [Doctoral dissertation, Kyoto University]. Kurenai. <https://doi.org/10.14989/doctor.k24301>
- Wrobetz, K. R. (2022b). *Comprehension worksheet 3*. https://docs.google.com/forms/d/e/1FAIpQLSfgUBtlagMTvD7Plhu0rwTL373GxEp8_iw_yjNj6tKWt1nOIQ/viewform
- Wrobetz, K. R. (2022c) *Comprehension worksheet 4*. https://docs.google.com/forms/d/e/1FAIpQLSdcAfW_TMkTD4ghO_A35qnKOTUjroGh_UWIUNK3yEu2g7u6cQ/viewform
- Wrobetz, K. R. (2022d) *Modern art vocabulary test*. https://drive.google.com/file/d/1GH2jJ6K-y1imFVD1Kb194bdhSWLQLGR_/view?usp=sharing