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Future tourism trends: Utilizing non-fungible tokens to aid wildlife conservation

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Abstract

The era of transformation powered by digitization, improvements in information and communication technology, machine learning, robotics and artificial intelligence is upon us. Today, we are able to solve complex problems with the aid of technology. That notwithstanding, animal populations globally are under threat, with the extinction of species taking place at a far accelerated pace than can be reversed, thus making wildlife conservation a critical issue of our time. Along with wildlife extinction currently underway, there remains a chronic financial shortage for wildlife conservation and the funding shortfall is expanding annually. This research contends that blockchain, the technology underpinning cryptocurrencies such as Bitcoin can be utilized as a catalyst by the development of cryptowildlife non-fungible tokens (NFTs), which are provably scarce, unique and programmable digital wildlife collectible assets. These could be used to finance wildlife conservation as a supplementary source of revenue.

Keywords: tourism, blockchain, non-fungible tokens, wildlife conservation, collectibles

Introduction

Today, the world is undergoing an era of profound transformations powered by digitization, constant improvements in information and communications technology, machine learning, robotics and artificial intelligence (Syam and Sharma, 2018: 135). Mr. Pololikashvili, Secretary-General of the United Nations World Tourism Organization (UNWTO) (2018) underscored the critical role technology plays in aiding to better manage social, cultural and environmental impacts. The author notes that the effective usage of technological advances can act as an agent for positive change and spur on the sustainable management of tourism. Notwithstanding the previous assertion, only a small portion of the earth remains untouched by humanity as population growth drums up at an unprecedented rate and the need for land and its value soars, leaving less room and resources for wildlife. As a result, global animal populations are under threat, making wildlife conservation a critical issue of our time (Abotsi et al., 2016: 394). This urgency has, however, done very little to curb the devastating human-induced extinction event currently underway, with the extinction of species taking place at a far accelerated pace than can be reversed (Lindsey et al., 2004: 339; Hein et al., 2013: 87). Globally conservation efforts are dramatically losing the fight for the preservation of wildlife and biodiversity in general, due to the severe shortage of funds for conservation activities (Waldron et al., 2013: 12144; Li et al., 2013: 296; Baral and Dhungana, 2014: 60; Kay, 2018: 175).

Berghöfer et al., (2017: 2) notes that there is a chronic financial shortage for biodiversity conservation and the financing gap is set to expand. According to the Convention on Biological Diversity (CBD), the financial resources needed for global implementation of the Aichi Biodiversity targets have been estimated at 440 billion per year (Maclean, 2015: 1; Berghöfer

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et al., 2017: 2). However, at a global scale only a fraction (20%) of the required funding is currently available, and the funding shortage remains immense, acute and chronic, more especially in developing countries as well as countries with economies in transition (Berghöfer et al., 2017: 2). It will however take more than traditional donors as well as governments to bridge the funding shortfall and this requires a major shift in funding to investigate and incorporate new potential sources of capital (Maclean, 2015: 1).

Could technology play a greater role in aiding to better manage social, cultural and, for the purpose of this research, environmental impacts?

A particular focus has recently been placed on digital innovations in finance and distributed ledger technology (DLT), a by product of the Semantic Web is a first of such developments and has ushered in a wave of impactful technological innovations (Mills et al., 2016: 3). In the last decade, Bitcoin has emerged as the first decentralized, global cryptocurrency. Its meteoric rise has not only seen attention focused on cryptocurrencies but also their underlying technology known as blockchain (Chen, 2018: 567). Transactions between persons and organisations are currently centralized and controlled by third parties such as banking institutions (Yli-Huumo, 2016: 1). Blockchain technology is characterized by decentralization, immutability, security, auditability and availability. Blockchain works in a decentralized environment removing the need for middlemen institutions such as banks which can greatly save costs and improve efficiency (Underwood, 2016: 15; Zheng et al., 2017: 3). Besides empowering digital currencies, Chen (2018: 567) notes that Blockchain technology has allowed innovators the capability of creating digital tokens to represent scarce assets with the potential to reshape the landscape of entrepreneurship and innovation.

Authors (Chow et al., 2014: 108; Baron, 2015: 218; Challender et al., 2015) already note that wildlife populations have been left desecrated, with an increasing number of species nearing extinction. Given the public choice problems present today, funding for conservation will remain in short supply, exacerbating biodiversity loss (Ando and Shah, 2014: 323). And on that premise, wildlife can be regarded as a “scarce asset”.

In 1993, Weitzman developed the theory of diversity and applied it within conservation. Weitzman’s diversity theory posited that the diversity value of a species was determined by its genetic proximity to other extant species within its clade as well as the probability of extinction faced by both the species and its closest living relative. Weitzman was effectively saying that endangered species which where genetically linked to abundant species (with a low probability of extinction) were far less valuable than endangered species with no close relative and faced the possibility of extinction, which would result in the irreversible loss of an entire clade (Conrad, 2018: 60). On that premise, it can therefore be considered that Weitzman’s diversity theory informs the logic around wildlife collectables and trading because the rarer the specie the more valuable they become.

Underscoring that fact, Hobbs (2018) notes that people have traditionally placed their money in collectibles that were scarce or rare and had a deemed value for example wine, trading cards, and comic books. It was, however, not possible to economically capitalize on digitally tradable assets due to their lack of perceived value in contrast to their counterparts in the real-world, as a result of the ease with which digital assets could be replicated. This remained the case until the introduction of the Blockchain and non-fungible tokens (NFT’s).

Scholars have begun to translate lessons learnt from financial theory into more efficient conservation management strategies to better address how effective conservation may be undertaken. Modern Portfolio Theory (MPT) utilizes information regarding covariance for explicit targeting of management investments. Modern Portfolio Theory combines joint probability distribution of outcomes regarding assets in a portfolio in order to select the best method of reducing risk. Risk diversification is the cornerstone of MPT, because it advances the idea that exposure risk spread around acts as a buffer against bad performing assets. Effectively MPT echoes in financial terms the idiom that states "don't put all your eggs in one basket" (Liang, 2018: 1). Economists recognized that organizations would be able to ameliorate their risk by acquiring diverse assets whose returns were not perfectly correlated (Alvarez et al., 2017: 25). While in finance assets may represent stocks, bonds and commodities, within environmental contexts, "assets" may be associated with genes, populations, species and landscapes that have inherent risks and returns (Ando and Shah, 2014: 334). This research will explicitly focus on wildlife as an "asset" or rather a provably scarce, unique and programmable digital wildlife-based token commonly referred to as a NFT.

Blockchain-enabled tokens incentivises entrepreneurship by providing entrepreneurs with new ways to raise funds and engage with their stakeholders (Chen, 2018: 567). A blockchain enabled economy can act as a catalyst for growth and could provide a platform where innovative borderless practices are allowed to thrive and create a truly collaborative global economy built on shared values and objectives for the benefit of the wider community (Buchanan, 2018: 1). Based on MPT and its premise of risk diversification, could Blockchain-based games form part of investment portfolios within conservation-based organizations and be considered viable sources for augmenting resources meant for marketing and financing wildlife conservation?

This is a desktop based-research study, which is strictly observational and makes use of literature to support its premise, findings and conclusions.

Wildlife cloning

Since the dawn of the 21st century, only a small portion of the Earth remains untouched by humanity. As population growth drums up at an unprecedented rate and the need for land and its value soars, less room and resources are left for wildlife. As a result, global animal populations are under threat, making wildlife conservation a critical issue of our time (Abotsi et al., 2016: 394). Natural habitats, biodiversity and individual species provide and enhance the value of humanity (Ando and Shah, 2014: 322). Ando and Shah (2014: 322) denote that biodiversity has intangible value and benefits society through increasing ecosystem services such as the natural control of agricultural pests, and a wide range of economic and recreational benefits provided by wetlands, wildlife and forests. However, a devastating human-induced extinction event is currently underway, with the extinction of species taking place at a far accelerated pace than can be reversed (Lindsey et al., 2004: 339; Hein et al., 2013: 87). Species and habitats are largely threatened and destroyed by human activities (Ando and Shah, 2014: 322). Activities such as urban development, intensive water usage, over-hunting, overgrazing and over harvesting drive specie populations to incredibly low levels or in extreme cases lead to their extinction (Ando and Shah, 2014: 322).

Based on the worsening scenario presented above, Wright (2018: 58) makes an interesting preposition noting that due to the large scale predicted extinction of the world's animal species, humans will in 2070, begin cloning animals for tourism, consumption and conservation purposes. Wright (2018: 64) lays out the argument that, despite societies' frustration with the vast number of animals that risk extinction due to animal sports hunting and poaching, these continue to this day. One scenario he proposes is the cloning of animals, which get reintroduced to their natural habitats and are used for sports hunting, for a hefty fee.

These propositions are naturally not without criticisms as noted by Wright himself, such as:

- "Cloning of endangered species has a low success rate and animals that are cloned often have shorter lives and are unable to reproduce";
- "Cloning does not tackle the reasons as to why many animals become endangered in the first place, such as hunting, habitat destruction and global warming;

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- "Species is more than just the sum of its genes. What use is a cloned animal if we have no more space where the species can live? And that, the money would be better invested on direct aid to maintain habitats,".

These are interesting propositions laid out by the author and equally valid criticisms raised. The costs of doing this would not only be immense, the ethical considerations of doing something like this would present a continuous debate. With the reality of wildlife extinction and the severe wildlife conservation funding gap in mind, Mofokeng and Matima (2018) propositioned the use of NFT's, a form of digital cloning, as an additional revenue model for wildlife financing and conservation. This paper seeks to clarify and further advance that proposition.

Collectables

Collectables are sometimes referred to as "emotional assets" or "investments of passion" and they form part of investor portfolio's globally (Dimson and Spaenjers, 2014: 1). According to France and Butters (2015: 375) collectible items have the potential to appreciate in value over time as they become rare and desirable. Grable and Chen (2015: 79) note that nearly every hobbyist who purchases and holds collectible assets does so with two objectives in mind: the first being immediate satisfaction through the ownership of the asset and the second being to later sell the asset at a much higher price. Since the beginning of the twentieth century, however, people have always wondered whether their collectible assets, such as artworks, could possibly present them with a decent financial return in addition to the pleasure they derive from the ownership of the asset (Oosterlinck, 2017: 2665). As noted by Hobbs (2018) and Tomaino (2018), people have traditionally placed their money in collectibles that were scarce or rare and had a deemed value, for example wine, trading cards, and comic books. Wildlife has also been collected, bred and traded. It is commonly referred to as wildlife or game farming and investing in wildlife has become a lucrative investment, yielding great returns for wildlife farmers.

Wildlife collectables

The inception of wildlife farming was purely for economic reasons, nevertheless, conservationists have hoped that competition with black market wildlife traders would decrease poacher profits and the economic motivations of harvest wildlife animals (Tensen, 2016: 288). In South Africa, game farming has developed into a major subsector of the agricultural economy, converting from livestock and crop farming. This has largely been precipitated by the spike in wildlife demand which is traded privately at wildlife auctions (Kamuti, 2014: 190; Pasmans and Hebinck, 2017: 440). Another reason for the increases in wildlife farming is risk diversification. Wildlife, as opposed to crops, is considered an excellent way in which to diversify without negatively impacting production or productivity (du Preez, 2016: 38). Challender et al., (2015: 129) and Tensen (2016: 288) highlight the fact that the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) notes international trade of wildlife as severely threatening biodiversity conservation, while prohibiting the commercial trade of endangered species. However, unlike real-world wildlife, could it be possible to effectively breed and trade digital, provably scarce, unique and programmable wildlife replicas as a means of funding conservation without negatively impacting wildlife numbers?

Digital assets have always lacked the perceived value of being a collectable when compared to their real-world counterparts due to how easy digital assets would be to replicate, however, this all changed with the introduction of blockchain-based NFT's (Hobbs, 2018).

Of critical importance in understanding NFT's, is the understanding that there are various blockchain platforms upon which they are developed such as the EOSIO Blockchain, the NEO

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Blockchain and the Ethereum Blockchain. NFT's are cryptographically unique, non-replicable digital assets created through smart contracts.

Ethereum Blockchain and smart contracts

The sharing economy has emerged as an important driver over the last decade (Bogner et al., 2016: 177). The Ethereum blockchain is a smart contract and decentralized application platform that was proposed in 2013 by Vitalik Buterin (Ethereum Homestead, 2018; Ethereum White Paper, 2018). It is a programmable blockchain that "serves as a platform for many different types of decentralized blockchain applications, including but not limited to cryptocurrencies". The concept of smart contracts was first proposed by renowned cryptographer Nick Szabo in 1996 in a paper titled - "Smart Contract: Building blocks for digital markets" (Szabo, 1996). In it, he describes smart contracts as "a set of promises, specified in digital form, including protocols within which the parties perform on the other promises" which improve contract execution of four basic contract objectives: observability, verifiability, privacy and enforceability (Gord, 2016).

Ethereum set out to be a programmable blockchain with a fully trustless smart contract platform that is turing-complete with it's own programming language called Solidity (Ethereum Homestead, 2018; Ethereum White Paper, 2018). A programming language is said to be turing-complete if it can perform any calculation that a turing machine can, which is named after computer scientist, cryptanalyst, logician and mathematician Alan Turing (Esolangs, 2011). Contrary to some held beliefs, Bitcoin does have a concept of "smart contract", albeit limited (Ethereum White Paper, 2018).

According to Pustišek and Kos (2018: 413), Ethereum is regarded as one of the leading Blockchains in terms of innovation because a majority of projects on the Blockchain aiming beyond simple value transactions and coin offerings are based on Ethereum. Ethereum also has the second largest market capitalization after Bitcoin.

Non-fungible tokens

In order to define NFTs, it is important to define the terms that underpins them. According to Nash (2017)

"Fungibility is, essentially a characteristic of an asset or a token in this case, that determines whether items or quantities of the same or similar type can be completely interchangeable during exchange or utility"

Currently, the most well-known and well-used non-fungible token standard is by far Ethereum's ERC-721 standard. There is another NFT standard that has been proposed for Ethereum, the ERC821 standard (Ordano, 2018). There are, however, other NFT standards for other blockchains, such as NEO and EOS. A sample of the function code is supplied to indicate the difference in their construction.

Non-fungible token standards

Ethereum NFT standard	NEO NFT standard
Contract ERC721 { *// ERC20 compatible functions* *function name() constant returns (string name);* *function symbol() constant returns (string symbol);* *function totalSupply() constant returns (uint256 totalSupply);* *function balanceOf(address _owner) constant returns (uint balance);* *// Functions that define ownership* *function ownerOf(uint256 _tokenId) constant returns (address owner);* *function approve(address _to, uint256 _tokenId);* *function takeOwnership(uint256 _tokenId);* *function transfer(address _to, uint256 _tokenId);* *function tokenOfOwnerByIndex(address _owner, uint256 _index) constant returns (uint tokenId);* *// Token metadata* *function tokenMetadata(uint256 _tokenId) constant returns (string infoUrl);* *// Events* *event Transfer(address indexed _from, address indexed _to, uint256 _tokenId);* *event Approval(address indexed _owner, address indexed _approved, uint256 _tokenId);* }	Token Operations: *- allowance(tokenid): returns approved third-party spender of a token* *- approve(owner, spender, tokenid, revoke): approve third party to spend a token* *- balanceOf(owner): returns owner's current total tokens owned* *- circulation(): returns current number of tokens in circulation* *- decimals(): returns number of decimals of token* *- mintToken(owner, ROData, RWData, URI): create a new NFT token* *- modifyRWData(tokenid, RWData): modify a token's RW data* *- modifyURI(tokenid, URI): modify a token's URI* *- name(): returns name of token* *- ownerOf(tokenid): returns owner of a token* *- symbol(): returns token symbol* *- tokenOfOwnerByIndex(owner, idx): returns one token from owner's collection* *- tokenROData(tokenid): returns a token's RO data* *- tokenRWData(tokenid): returns a token's RW data* *- tokenURI(tokenid): returns a token's URI* *- transfer(from, to, tokenid): transfers a token* *- transferFrom(from, to, tokenid): transfers a token by authorized spender*
Ethereum (ECR721) NFT standard functions: Available at: https://medium.com/crypto-currently/the-anatomy-of-erc721-e9db77abfc24	NEO NFT standard functions: Available at: https://github.com/Splyse/neo-nft-template/blob/master/nft_template.py

The EOSIO NFT standard

```
class nft : public contract {
public:
nft(account_name self) : contract(self), tokens(_self, _self) {}

/// Creates token with a symbol name for the specified issuer account.
/// Throws if token with specified symbol already exists.
/// @param issuer Account name of the token issuer
/// @param symbol Symbol code of the token
void create(account_name issuer, string symbol);

/// Issues specified number of tokens with previously created symbol to the account name "to".
/// Each token is generated with an unique token_id assigned to it. Requires authorization from the issuer.
/// Any number of tokens can be issued.
/// @param to Account name of tokens receiver
/// @param quantity Number of tokens to issue for specified symbol (positive integer number)
/// @param uris Vector of URIs for each issued token (size is equal to tokens number)
/// @param name Name of issued tokens
/// @param memo Action memo (max. 256 bytes)
void issue(account_name to,
asset quantity,
vector<string> uris,
string name,
string memo);

/// Transfers 1 token with specified "id" from account "from" to account "to".
/// Throws if token with specified "id" does not exist, or "from" is not the token owner.
/// @param from Account name of token owner
/// @param to Account name of token receiver
/// @param id Unique ID of the token to transfer
/// @param memo Action memo (max. 256 bytes)
void transfer(account_name from,
account_name to,
id_type id,
string memo);

/// @notice Burns 1 token with specified "id" owned by account name "owner".
```

```
/// @param owner Account name of token owner
/// @param id Unique ID of the token to burn
void burn(account_name owner,
id_type token_id);

/// Structure keeps information about the balance of tokens
/// for each symbol that is owned by an account.
/// This structure is stored in the multi_index table.
// @abi table accounts i64
struct account {
asset balance;

uint64_t primary_key() const { return balance.symbol.name(); }
};

/// Structure keeps information about the total supply
/// of tokens for each symbol issued by "issue" account.
/// This structure is stored in the multi_index table.
// @abi table stat i64
struct stats {
asset supply;
account_name issuer;

uint64_t primary_key() const { return supply.symbol.name(); }
account_name get_issuer() const { return issuer; }
};

/// Structure keeps information about each issued token.
/// Each token is assigned a global unique ID when it is issued.
/// Token also keeps track of its owner, stores assigned URI and its symbol code.
/// This structure is stored in the multi_index table "tokens".
// @abi table token i64
struct token {
id_type id;          // Unique 64 bit identifier,
uri_type uri;        // RFC 3986
account_name owner;  // token owner
asset value;         // token value (1 SYS)
string name;         // token name
```

```
id_type primary_key() const { return id; }
account_name get_owner() const { return owner; }
string get_uri() const { return uri; }
asset get_value() const { return value; }
uint64_t get_symbol() const { return value.symbol.name(); }
uint64_t get_name() const { return string_to_name(name.c_str()); }

uuid get_global_id() const
{
uint128_t self_128 = static_cast<uint128_t>(N(_self));
uint128_t id_128 = static_cast<uint128_t>(id);
uint128_t res = (self_128 << 64) | (id_128);
return res;
}

string get_unique_name() const
{
string unique_name = name + "#" + std::to_string(id);
return unique_name;
}
};

/// Account balance table
/// Primary index:
///owner account name
using account_index = eosio::multi_index<N(accounts), account>;

/// Issued tokens statistics table
/// Primary index:
///           token symbol name
/// Secondary indexes:
///           issuer account name
using currency_index = eosio::multi_index<N(stat), stats,
indexed_by< N( byissuer ), const_mem_fun< stats, account_name, &stats::get_issuer> > >;

/// Issued tokens table
/// Primary index:
///           token id
/// Seconday indexes:
```

```
///        owner account name
///        token symbol name
///        issued token name
using token_index = eosio::multi_index<N(token), token,
indexed_by< N( byowner ), const_mem_fun< token, account_name, &token::get_owner> >,
indexed_by< N( bysymbol ), const_mem_fun< token, uint64_t, &token::get_symbol> >,
indexed_by< N( byname ), const_mem_fun< token, uint64_t, &token::get_name>
```

EOSIO NFT standard functions: Available at: https://github.com/unicoeos/eosio.nft

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A crypto collectable is non-fungible, a cryptographically unique, non-replicable digital asset (Hobbs, 2018). NFT's are unique and distinguishable tokens, mostly implemented on (but not limited) to the Ethereum Blockchain utilizing the ERC-721 standard which have individual traits and identities. It is NFT's trustless nature and scarcity that is their unique selling point and an attractive reason for their ownership (Pelnik, 2018). Table 1. presents the differences between fungible and non-fungible tokens.

Table 1: Difference between fungible and non-fungible tokens

Fungible tokens	Non-fungible tokens
Interchangeable A token can be exchanged for any other token of the same type e.g. a dollar bill may be exchanged with another dollar bill with no effect to the holder.	**Not interchangeable** A Non-fungible token cannot be replaced with another non-fungible token of the same type e.g. a non-fungible token is akin to a birth certificate it cannot be exchanged with another individual's birth certificate.
Uniform All tokens of the same type are identical in specification, each token is identical to another	**Unique** Each token is unique and different to all other tokens of the same type.
Divisible Fungible tokens are divisible into smaller units and it doesn't matter which units one obtains as long as the value is the same e.g. The value remains the same if one holds a single $10 bill or ten $1 bills.	**Non-divisible** Non-fungible tokens cannot be divided. The elementary unit is one token and one token only.

(Source: 0xcert 2018)

One interesting characteristic of NFTs is extensibility, which is the ability for one NFT to be extended with another NFT, creating a completely new NFT. This feature allows, for example, a NFT-based wildlife character to breed and create a new NFT-based wildlife character while retaining the properties of a NFT. This extensibility further explores the possibilities that can be done with NFT-enabled digital assets. One such example of these features may be found in the blockchain-based game known as CryptoKitties (Ordano, 2018). CryptoKitties are NFT-enabled collectible digital cats that are wholly owned, breedable, and tradable by users for monetary value (CryptoKitties, 2018). In the case of CryptoKitties, which are NFT-enabled collectible digital cats, they have been extended with Kittyhats, which are accessories for users CryptoKitties (KittyHats, 2018). Making use of this extensibility could allow for the exploration of new experiences and additional revenue for conservation areas.

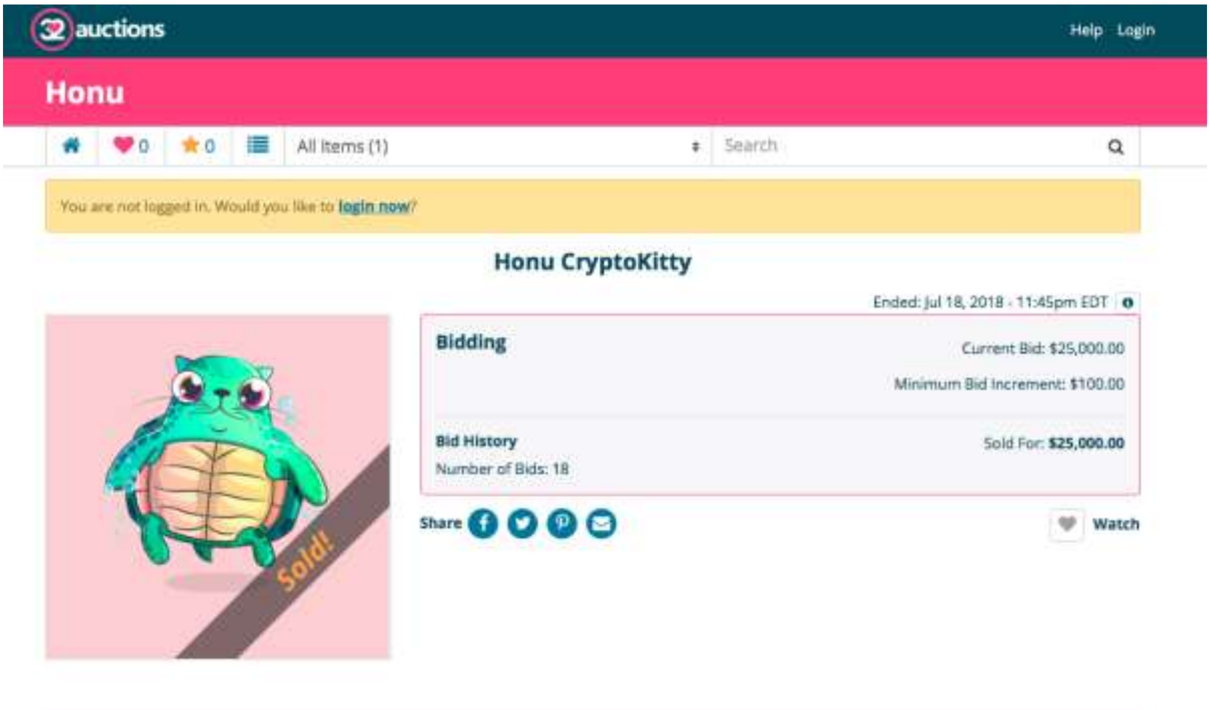
One such scenario could be running campaigns and creating skins or accessories for specific campaigns which will be sold to users for them to adorn on their cryptowildlife in support of campaigns such as the Rhinose day campaign, illustrated in figure 1, which is a red Rhino horn in support of anti-poaching (Rhinose Foundation, 2018).

Figure 1: Rhinose day campaign

(Source: Rhinose Foundation 2018)

There are already two projects that are using NFTs to tackle wildlife conservation and financing. On the 9th of July 2018, Axiom Zen, the company behind CryptoKitties created "Honu" a sea turtle-inspired CryptoKitty in partnership with non-governmental organisations Ocean Elders and ACTAI Global. Honu was auctioned with the aim of raising money for sea turtle conservation in the Caribbean by supporting the Sea Shepherd Conservation Society. On the 18th of July 2018, Honu, as evidenced in Figure 2 was sold for $25 000.00 (R330 000 at the time) (Tahir, 2018).

Figure 2: Honu CryptoKitty



(Source: 32auctions.com)

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Another project, Panda Earth, aims to conserve endangered wildlife, in particular the panda through the use of NFTs. The project is authorized by the China Conservation and Research Centre for the Giant Panda **(**Panda Earth, 2018**)**. The project was launched on the 4th of May 2018. At the time of writing this article (17 August 2018) the decentralised application had recorded 1177 transactions and the transaction volume processed was worth 66.97 Ether, which based on the current exchange is worth +/- R294 649 (Dappradar, 2018).

NB: Applications developed on Web 2.0 platforms are commonly referred to as Apps, whereas, Web 3.0 based applications are referred to as decentralized applications, also known as DApps (Zmnaznev, 2017: 16).

Figure 3: Illustrations of various CryptoPanda

(Source Panda Earth 2018)

A further analysis of the Panda Earth reveals the following statistics as presented in Table 2.

Table 2. Panda Earth DApp performance

	Average daily users	Cumulative Monthly users	Transactions volume in Ether	Transaction volume in Rands
May 2018	13	350	17,39	R76 511,22
June 2018	30	912	21.27	R93 582,15
July 2018	23	730	15,09	R66 391,85
August 2018	37	586	13,22	R58 164,36

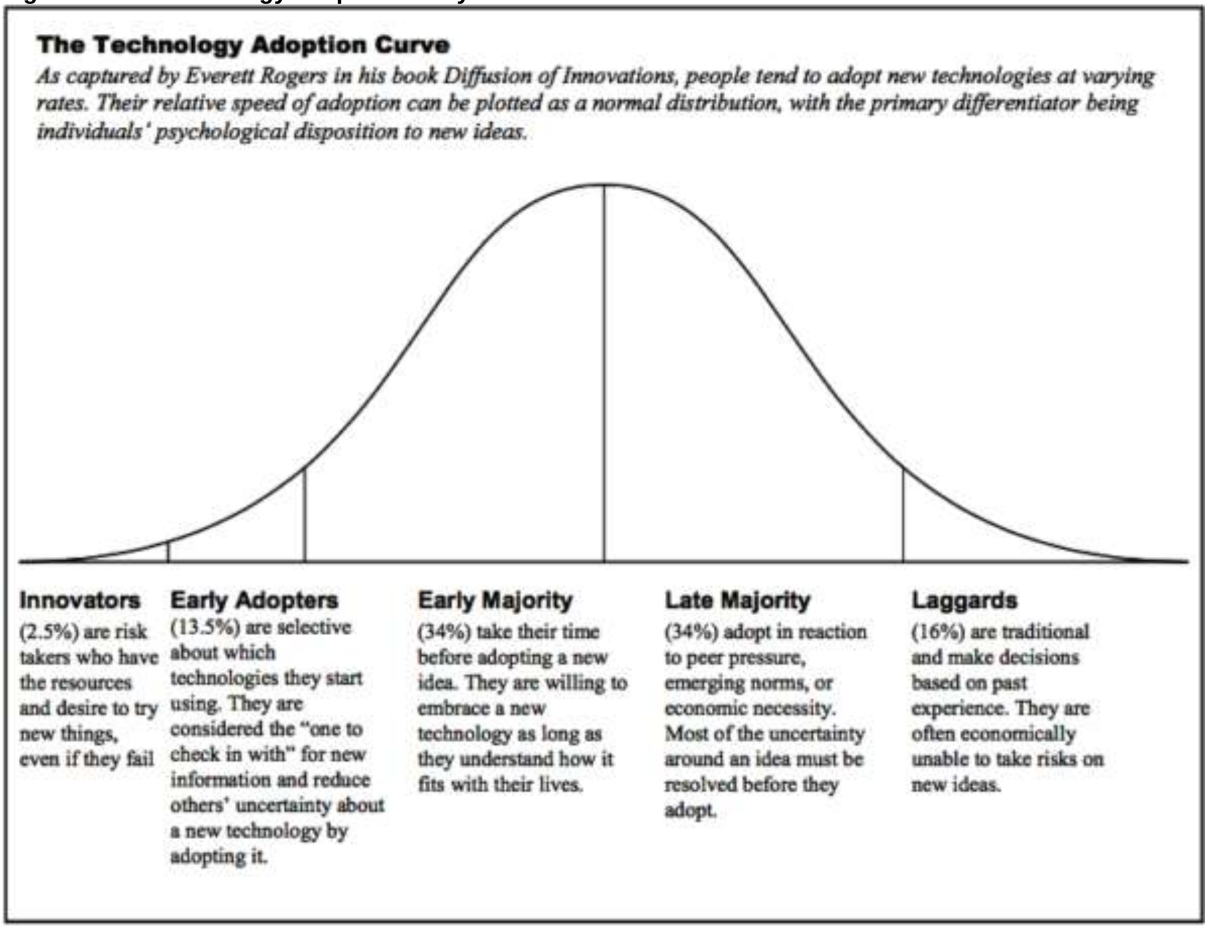
(Source Dappradar 2018)

NB: Earth Panda analysis represents data from the 4th of May 2018 till the 17th of August 2018 and is based on current Ether to Rand value (1 Ether = R4399,72). Prices within the crypto environment are quite volatile as evidenced by the price of Ether to Rand which on the 17th of July 2018 was 1 Ether = R6688.76.

The analysis from the Earth Panda DApp indicates that they have a very low user base, despite the DApp's high transaction volume, and this is largely due to how novel the use of NFT's as tradable assets are within the gaming and cryptocurrency community. This innovative technology still has a long way to go before it achieves mass user adoption.

In 1995 Rogers introduced the theory of "diffusion of innovation" and it formed the foundation for conducting innovation acceptance and adoption. The theory states that different people accept and engage technological innovation at different points in time (Lai, 2017: 22). In terms of blockchain technology adoption, and NFTs in particular, this field is in the early majority stage as indicated by the technology adoption life cycle in Figure 6.4 (Vanig, 2018; Coin Bureau, 2018).

Figure 4: The technology adoption life cycle



(Source: Jump Associates 2018)

Non-fungible tokens and interoperability

Current blockchains operate as islands, disconnected from each other and all competing for market share and value (Ray, 2018; Komodo, 2018). There are currently marketplaces that exist for NFTs such as Rarebits (Rarebits 2018), however, one noticeable aspect of NFTs on platforms such as these is that they are largely based on Ethereum's standard for non-fungible tokens - ECR721.

This is as the result of Ethereum's developer market share and other blockchains having not yet finalized their NFT proposals (Rowley, 2018). This means that there is currently a barrier with regards to NFTs. For example, if users were to trade or buy a NFT on the Ethereum blockchain, it would remain within the Ethereum blockchain and could not be moved to another blockchain such as NEO, EOSIO or any other blockchain that supports NFTs. Interoperability of blockchains is thus vital in order for blockchain technology to reach its full potential (Ray 2018).

Blockchain projects such as Worldwide Asset eXchange (WAX) (2018a), Komodo (2018), Cosmos, AION, Polkadot and Ark (Ray 2018), are on track to find a solution for this very issue of interoperability. According to Arielle (2018) the WAX ExpressTrade allows users to trade

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any NFT for any other NFT. And their Blockchain Bridge Service, allows owners of NFTs to transfer items to and from other blockchains (WAX 2018b).

In light of the premise and proposition of this research, this effectively means that should “conservation area A” elect to develop a cryptowildlife NFT on any other blockchain (NEO, EOSIO, etc.) while “conservation area B” elected to create a cryptowildlife NFT on the Ethereum blockchain, users and supporters of either conservation area A or B’s wildlife would not be bound to a single blockchain for their interaction within the broader cryptowildlife ecosystem; neither would they be confined to a single blockchains’ campaign.

Another interesting development within the blockchain digital assets space that can benefit cryptowildlife NFTs could come from Aventus, a blockchain ticketing platform, which aims to solve, among other things, the so called “reseller market” e.g. when a digital asset is sold, the developer has no say so and derives no benefit when that digital asset is resold in secondary markets (Pandji, 2017). This could allow game reserves to have enforceable rulesets within their cryptowildlife NFTs that say, for example, “If an NFT bought from Game Reserve A is resold to a user on Game Reserve B who then resells it to another user on Game Reserve C (whether on the same blockchain or different blockchains), 2% of the reseller costs must go back to Game Reserve A, while 98% goes to the reseller.” This would ensure a continuous revenue stream for wildlife conservation efforts through these reseller markets as opposed to one-time costs that happen when a cryptowildlife is first bought.

Conclusion

This research posited that Blockchain-based NFT’s could be utilized as an alternative means for wildlife conservation and financing. It contends that, due to the unique capabilities provided by blockchain technology, wildlife can be ‘cloned’ with all their unique characteristics, and preserved on the blockchain. The non-fungible aspect brought by blockchain technology could ensure that conservation areas hosting rare and endangered wildlife could benefit from the sale of their cyptowildlife NFT that would be bred, bought and traded on the blockchain. This could provide an alternative revenue model with a focus on conservation.

This cryptowildlife archetype can also be extended further to not just wildlife but to game reserves as well via virtual worlds. With virtual reality combined with blockchain technology, as in the case of Decentraland (Decentraland, 2018), and others like it, game reserves themselves could exist on the blockchain, along with all the characteristics and wildlife that make those game reserves unique. This opens up game reserves and tourism to a whole new market of online gamers, blockchain enthusiasts and tourists alike, accessible to anyone, anywhere around the world with internet access.

The same payment options or facilities that are present within real-world game reserves such as game driving, sightseeing, etc. can also be made available on the blockchain combined with virtual reality. These can be accessible via normal web browsers such as WebVR or virtual reality goggles. Virtual reality as a technology has long been used in the tourism sector, however, it hasn’t been used in combination with blockchain technology which enables verifiability, extensibility, scarcity and accessibility, elements which were up until now not possible.

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