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Future tourism trends: Virtual Reality based tourism utilizing Distributed Ledger Technologies

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Abstract

Tourism destinations are always seeking new and innovative ways to better market tourism offerings and increase tourism revenues. This paper seeks to highlight a future tourism marketing trend through the use of virtual environments (VE) backed by Distributed Ledger Technologies (DLT's) such as Blockchain. VE is the umbrella term referring to virtual reality (VR), augmented reality (AR) and mixed reality (MR), also known as merged reality. The virtual reality market is said to be the next frontier in digital marketing and in recent years the tourism industry has slowly taken advantage of developments in the virtual space. On the other hand, DLT's such as Blockchain technology is bound to revolutionize and disrupt various business sectors such as the financial and supply chain management sectors, among many. An indicator of this is the number of Fortune 500 companies that are members of the Enterprise Ethereum Alliance – an alliance that is seeking to build enterprise-grade software on the Ethereum Blockchain. The analysis suggest that VR based tourism utilizing DLT's can positively impact the tourism industry and provide a means for additional revenue.

Keywords: tourism, virtual reality, digital marketing, Distributed Ledger Technology, Blockchain technology.

Introduction

History is littered with myopic businesses that have, to their detriment, failed to adopt technological innovations as disrupters within their respective industries (PricewaterhouseCoopers (PWC) 2016: 4). The tourism industry is today one if the fastest growing industries globally and one of the sectors best poised to benefit from technological advancements (Eckhaus, 2017: 274). The industry owes its growth through turbulent economic times to the developments in information and communication technologies (Acosta et al., 2017: 262). During the initial stages of mass internet penetration and adoption, the travel industry witnessed the development of new travel markets and consumer behaviour with customers empowered to purchase travel experience directly online and bypassing intermediary companies (Pilkington, 2016). Technological advances in online services have increasingly and strategically been targeted to achieve sales and marketing objectives often taking priority over offline and traditional resources (Eckhaus, 2017: 275). Technology today is evolving at an unprecedented rate and constantly seeking to elevate the user experience. Technologies such as Blockchain, augmented reality, virtual reality and big data are flourishing in the market (Ghanchi, 2017). This paper will therefore underscore the current links between

VR, Blockchain technology and tourism as well as the future application of VR backed by DLT's such as Blockchain within the tourism industry.

Methodology and approach

This is an observational (desktop-based) research study. Observation is a data collection method wherein researchers observe a specific research field. When analysing data in qualitative research, you go through the process of identifying themes and describing what you have found out during your interviews or observation rather than subjecting your data to statistical procedures (Kumar, 2011: 36).

The paper first offers definitions around VE, of which VR is one and underscores the relationship between VR and the tourism industry. This is followed by detailed information regarding DLT's of which the focus of this paper is Blockchain technology. The paper then proceeds to present a link between Blockchain and tourism and further highlights the potential impact the technology might have on the industry. Thereafter, VR sectors utilizing Blockchain technology are briefly discussed with the aim of indicating DLT's such as Blockchain's potential as a disrupter not just within the financial sectors as has been wildly covered, but its possible application across various industries. The paper concludes by making a proposition on a future tourism trend: the use of VR based tourism backed by DLT's such as Blockchain. To underscore the papers proposition, a blueprint of how implementation would practically take place is presented by drawing inspiration from wildlife conservation.

VR Technology

In 2017 the World Economic Forum (WEF) (2017) declared that society was at the cusp of a major revolution from mobile to immersive computing. Developments in VR have today captured the imagination of many users but the technology is by no means new. The first wave of VR technology was introduced in the early 1960's and gained traction in the 1990's when industries were being inspired by the development in gaming, however, the user experience then was quite unpleasant and excitement quickly fizzled (Tussyadiah et al., 2017; Parvinen, 2018: 1395). The recent consumer VR revolution is suggested by Lai et al., (2017: 409) to have started in 2012 when Palmer Luckey launched a campaign for the Oculus Rift, a leading developer of VR technology. The company was subsequently purchased by Facebook in 2014 for $2.1 billion. Since then, Facebook has gone on to acquire a further 11 AR/VR companies, underscoring the companies view that AR/VR will be the new frontier (WEF 2017).

VR is defined as a computer generated simulation of 3D environments that users engage with in a seemingly real or physical way through the use of mounted head displays fitted with sensors (Zhang et al., 2018: 138). A clear distinction in the concepts needs to highlighted as many terms related to virtual environments often get used interchangeably (Goh, 2017):

- VR: attempts to fully replace the sights and sounds of the real-world with a digital world;
- AR: adds a layer of digital content over the users real-world whilst the user remains engaged with the real-world; and
- MR: is augmented reality with integration where the real-world interacts with digitally created content.

Currently, high-end VR systems such as the Oculus Rift and HTC Vive which offer high quality and realistic feel of immersion remain tethered which limits user mobility and are a potential safety hazard. Recent developments in mobile VR systems solve the challenge brought on by tethering; however, mobile VR systems today can only support VR apps with low graphical quality which sometimes breaks the illusion of immersion due to a constrained computational resource (Lai et al., 2017: 411). The mainstream use of VR technology will at first be slow due to a number of reasons (Goh, 2017):

- Uncertainty in user experience over wearing a headset to view content;
- The costs of VR headsets; and
- The availability of VR content.

Nevertheless, technological advances in the delivery of high quality VE's are said to grow in leaps and bounds to an estimated $95 billion strong market by 2025 (WEF, 2017). VE's are expected to transform numerous sectors such as education and healthcare but the travel industry is among those to best benefit from the technology experience (Goh, 2017).

Tourism and VR

VR has been touted as one of the important contemporary technological development which will greatly impact the tourism industry (Tussyadiah et al., 2017). According to Goh (2017) VE's are expected to transform several sectors with the tourism industry set to capitalise on the development of these technologies. Travel companies and destinations are tapping into digital realities for marketing purposes thereby providing customers with a multi-sensory engagement experience with the destination before trips are even booked. VR has long been suggested as a substitute for travel and consuming travel experiences (Tussyadiah et al., 2017). In 2014 Marriot Hotels launched what they called the "4D VR experience" depicted in figure 4.1, as part of their travel brilliantly campaign, which allowed customers to experience the destination whilst inside a "Teleporter station" (Parker, 2015; Goh, 2017). The immersive experience allows the customers to smell the ocean when seeing visuals at a beach location or the shaking of the ground when moving through wormholes.

Figure 4.1: Marriot Hotels immersive 4D experience

(Source: Munshower 2015)

In 2015 Qantas (depicted by figure 4.2) become the first airline to offer inflight VR entertainment to its guests in its first class cabins on selected A380 services (Velan, 2016).

Figure 4.2: Qantas inflight VR entertainment

(Source: Velan 2016)

Travel agency Thomas Cook in 2015 partnered with Samsung and VR filmmakers to create a series of short films of several destinations and within three months reported a 40% return on investment from branch store utilizing VR technology (Graham, 2016).

In 2015 Marriot Hotels tested out a service they termed “VRoom Service” (depicted by figure 4.3) which allowed guests to order VR experiences that could be enjoyed from the comfort of their own rooms (Nafarrete, 2015).

Figure 4.3: Marriot Hotels’ VRoom Service

(Source: Nafarrete 2015)

In 2016 Qantas Airlines introduced a VR application that was available for download on either IOS or Android devices with the aim of allowing future travellers the ability to explore their destination, in particular Australia, even before they arrive. Footage included never before seen aerial videos of Uluru and Kata Tjuta (Qantas, 2016).

And in 2018 First Airlines a Japanese company has designed dream vacations for their guests utilizing VR (Street, 2018). Essentially the company believes that they can provide passengers with constrained finances or health issues the ability to experience their dream vacations

whilst remaining stationery in Tokyo. Packages (as depicted in figure 4.4) include a two-hour flight in a state of the art Airbus seat, surrounded by décor and mimics for maximum realism. The inflight service also includes music for every destination and delicious meals, drinks and snacks served by air stewards (Street, 2018).

Figure 4.4: VR-based vacations by First Airlines

(Source: Street 2018)

The big opportunity for tourism companies utilizing VR is in helping their customers make decisions about where to travel and VR also allows marketers access to a more efficient marketing tool (Graham, 2016).

Blockchain Technology

According to Richardson (2017) and (Braunstein 2017), a DLT is:

> "A consensus of replicated, shared, and synchronized digital data geographically spread across multiple sites, countries, or institutions. There is no central administrator or centralised data storage"

Examples of DLT's are Hedera Hashgraph and the Tangle, a distributed network powering IOTA cryptocurrencies. Blockchain is a type of DLT that uses cryptographically linked lists of transactions in blocks (Braunstein, 2017). For this particular paper, the focus will be on Blockchain as a type of DLT. Blockchain is the innovative technology underlying Bitcoin and other cryptocurrencies, which have in the past three years gripped the world's attention and disrupted the financial services sector (Zheng et al., 2017: 2). According to PwC (2016: 8) there are eight essential technologies that will impact the way business is conducted in the immediate to near future and two of those technologies are VR and DLT's such as Blockchain. Blockchain may be referred to as a form of (PwC, 2016: 6):

> "Distributed electronic ledger that uses software algorithms to record and confirm transactions with reliability and anonymity. The record of events is shared between many parties and information once entered cannot be altered, as the downstream chain reinforces upstream transactions"

Currency transactions between persons and organizations are currently centralized and controlled by third parties such as banking institutions (Yli-Huumo, 2016: 1). Blockchain technology is characterised 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). Yli-Huumo et al., (2016: 1) denotes that digital payments or currency transfers require banks, credit card providers or middlemen to complete transactions and Blockchain technology was designed precisely to solve this very issue. The aim of Blockchain technology is to create a decentralised environment where there is no control of transactions nor data by any third parties. The technology is immutable, transparent, and increases trust which allows for quick, transparent solutions that can either be public or private (Underwood, 2016: 15). The Institute of Development Studies (IDS) (2017: 1) identifies in Table 1 the differences between traditional ledgers with the Blockchain.

Table 1: Comparing traditional ledgers with the Blockchain

Ledgers of intermediaries e.g. Bank Account	**Blockchain**
Centralised: Single owner such as a bank makes these ledgers vulnerable since they have a single point of failure that can be hacked.	Distributed: Nobody/everybody owns it. Because it is distributed across millions of users it has no single point of failure making it especially difficult and economically unfeasible to hack.
Opaque: Only authorised users can view them or have access to them.	Transparent: Anyone can view or access the entire ledger, which is updated in near real-time.
Alterable: Errors can be corrected by (internal) users with overriding privileges.	Immutable: Transactions cannot be reversed.
Subject to identity theft: Accounts are often hacked.	Encryption and pseudo-anonymity: This makes it very difficult to hack Blockchain.
Time lag: Can take days or even weeks to complete transactions.	Near-real time: Transactions completed in ten minutes (on average).
Borders: Varying international and conversion fees that can cost up to 20%	Borderless: Same low fees everywhere (usually a few US cents).

(Source: IDS 2017: 1)

According to Zheng et al., (2017: 3) Blockchain is enabled by integrating several core technologies such as cryptographic hash, digital signature and a distributed consensus mechanism. The potential of Blockchain technology is so significant, its impact is believed to in future resemble that of computers and the invention of the internet (Saberi et al., 2017: 80). It is one of the most promising technologies for the next digitally connected generation (Zheng, 2017: 3). So significant is the Blockchain technology that some of the world's biggest firms (also known as Fortune 500 companies) have established an initiative referred to as the Enterprise Ethereum Alliance which is wholly dedicated to developing technology that changes society and provides solutions to complex challenges (Enterprise Ethereum Alliance, 2018). It is believed that within 20 years DLT's such as Blockchain will disrupt society more profoundly than the disruption to communications and media by the internet (IDS, 2017: 1).

Blockchain is mostly known for its relation to Bitcoin crypto-currency, however, Blockchain is used in other environments such as smart contracts, smart property, digital content distribution, and peer-to-peer (P2P) broadcast protocols. This shows that Blockchain technology is not limited to crypto-currencies but can be applied to various other applications in different industries (Yli-Huumo et al., 2016: 21; Zheng, 2017: 19). In support of the latter

statement the IDS (2017: 2) also highlights the potential use of Blockchain as a development tool in the following ways:

- Microfinance: Cryptocurrencies are the equivalent of an online bank account, in the form of a cryptocurrency wallet. Creating a cryptocurrency wallet is free and available to anyone with access to the internet (this is also a downside especially for poor communities in developing countries). Setting up a wallet does not require any identification and there are no maintenance fees or minimum balance requirements.
- Remittances and international payments: Blockchain transactions are borderless. Transactions are not subject to change depending on where the transactions originate from thus saving users transaction fees.
- Digital registries: As an immutable ledger, the Blockchain can be used as a tool to prove ownership. There are already initiatives by Bitfury in Georgia and Factom in Honduras that aim to use Blockchain to register land, improve property rights and ownership.
- Tracking aid: The Blockchain can help governments and taxpayers ensure that aid funds reach their intended beneficiaries in real-time. This would assist in reducing the misappropriation of funds.
- Smart contracts: Smart contracts are self-executing contracts, stored on the Blockchain that come into effect once the terms of the agreement or arrangement are met.
- P2P aid: Donation can be made via Blockchain without the help of aid organisations. This would ensure that a larger share of donations reach beneficiaries, and smart contracts can be built-in to ensure the money is used as intended.

The IDS (2017: 4) does however underscore that the rigid nature of the code has the potential to limit or hider developmental efforts and Saberi et al., (2017) notes that circumspection and cynicism are definitely warranted regarding the employment of this technology due to its infancy, however, not to the extent of limiting its use. Zheng et al., (2017: 16) does indicate that as an emerging technology Blockchain currently faces multiple challenges:

- Scalability: The increasing number of transactions place a heavy burden on the network, slowing the processing of transactions. This affects some Blockchain's abilities from processing millions of transactions in real-time. Although, there are advances on various Blockchain platforms that are working towards fixing the scalability issue such as, for example, the lightning network for Bitcoin and Litecoin Blockchains.
- 51% attack: Proof of Work (POW) based Blockchains are predisposed to attacks by a group of miners, who with over 51% computing power could halt payments to users by preventing confirmations or revers transactions that have already been processed.

Although challenges remain Zheng et al., (2017: 16) does note that efforts have been proposed and development is ongoing to better secure the technology.

Tourism and Blockchain technology

The use of DLT's such as Blockchain technology and crypto-currencies as a method of payment were identified as future trends to impact the tourism industry (Pilkington, 2016). According to Pilkington (2017: 2), in Thailand, the tourism industry is a driver of the crypto-currency market growth with fraud-weary tourists increasingly seeking merchants who accept Bitcoins as a means of payment. According to Kassem (2018), Dubai Tourism, the marketing arm of the Emirates government that promotes leisure travel in the region is within the next 24 months introducing Blockchain in a business-to-business market place in a bid to boost tourism numbers as the country moves away from reliance on oil revenue. In Russia, the head of the Federal Agency for Tourism, Oleg Safonov has predicted that Blockchain technology will transform Russia's tourism market (Sundararajan, 2017). Pilkington (2017: 7) also notes that medical tourism which is a $100 billion industry can greatly benefit from Blockchain

technology enabling doctors to access patient's medical records regardless of where they choose to seek treatment; this practice is already being pioneered in Dubai.

There are a number of benefits Blockchain technology can accrue to the travel industry (Ghanchi, 2017):

- It is a form of currency that does not require ATM transactions or currency conversion.
- It eliminates the hassle for travel agencies to pay extra transaction fees.
- It allows consumers to purchase goods and services quickly and easily.
- It eliminates the long waiting times for travellers.
- It is beneficial to the travel agencies to flourish their business financially.
- It allows travel agencies to interact and use multiple currencies.
- It is highly authenticated and secured.
- It makes it easy and convenient for travel agencies to book tours.
- It is also a great way to develop brand loyalty amongst market segments.

The development of new technologies such as Blockchain will allow tourists to work directly with service providers thus eliminating the need for intermediaries (Sundararajan 2017). Keane (2017) also reports that Aruba has identified the use of Blockchain technology as a means of retaining tourism revenues on their shores. Aruba is a small Caribbean Island that relies heavily on tourism. The island has a population of 100 000 inhabitants but receives roughly 1.2 million tourists annually. With such tourism numbers Keane (2017) underscores that the travel industry is dominated by internationally based travel agencies and airlines who are responsible for price determination and as a result a significant amount of Aruba's tourism revenue gets deposited offshore.

VR-based sectors utilizing Blockchain technology

There are currently a number of applications embarking on the use of VR backed by Blockchain technology. A few of these are highlighted:

Music industry

- The demands today for iconic musical artists to perform at live events exceeds their ability to do so and to mitigate the situation companies such as CEEK have stepped-up to allow users the ability to virtually take part in sold out concerts from mega-super stars the likes of Katty Perry, Lady Gaga, U2 and many more. This is made possible through the purchase of tokens powered by the Ethereum Blockchain. This ensures that musical performers don't lose out on possible revenue and supporters don't lose out on the experience of watching their favourite musicians performing live (CEEK, 2018).

Video gaming industry

- Gaming is a collective experience. CryptoCarz is a multiplayer, VR enabled racing experience powered by Blockchain technology. The game would allow users the ability to customise their own cars and test their skills on the racetrack (CryptoCarz, 2018).

Real estate/Creative industries

- Decentraland is a VR platform powered by the Ethereum Blockchain enabling users to own a piece of virtual real estate. Users are able to create, experience and monetize content as well as applications. This would allow those in the creative industry to develop their own virtual content and sell the experience directly to consumers (Decentraland, 2015).

Proposition

Based on the presented literature, the researchers' viewpoints are advanced to detail possible future trends regarding tourism utilizing DLT's such as Blockchain technology. Examples to real-life situations will be used to ensure the theory is more relatable.

VR-based tourism with utility tokens as a form of revenue generation

Besides other applications of VR and Blockchain in various sectors, one sector which stands to gain from the amalgamation of these two technology platforms is the tourism wildlife sector. The use of utility tokens on the VR-based, Blockchain-powered tourism wildlife sector could serve as an alternative revenue stream as well as marketing opportunity. Utility tokens are akin to casino tokens. Casino tokens are tokens used in lieu of real currency. The tokens are utilized within the casino and are worthless outside of it. In the same way, utility tokens are utilized on the Blockchain platform to provide utility to the user. These utility tokens would be worthless outside of that particular Blockchain platform, unless they are traded for other tokens.

Virtual reality experiences of, for example, wildlife, combined with the utility token and distributed aspects offered by the Blockchain could enable game reserves/conservation parks to monetize and expose their wildlife to a broader audience without requiring their physical presence. This could boost the reserves/parks revenues stream whilst simultaneously ensuring that the wildlife experience is accessible to a global audience.

Crypto-wildlife collectibles as a form of conservation and revenue generation

Another yet to be explored area is wildlife conservation and revenue generation through crypto-collectables.

Crypto-collectables are defined as (Farr 2017):

"A crypto-collectable is a cryptographically unique, non-fungible digital asset."

Unlike cryptocurrencies which require all tokens to be identical, each crypto-collectable token is unique or limited in quantity. Typically, crypto-collectable are visualized as real-life objects such as pets or avatars. Each token has variations in specific attributes and there are limits of tokens that may be generated.

Decentraland and CryptoKitties are examples of crypto-collectables where, in the case of CryptoKitties, users get to buy/breed/sell their CryptoKitties collectables. These cats are unique and non-fungible. In the same way that wildlife is sold for huge amounts of money due to their rarity, the same concept can be applied to crypto-wildlife. Collectables could be bred by reserves/parks themselves and sold to game enthusiasts. The rarer the animal, the higher the price for that crypto-wildlife collectable.

On the 20th of March 2018, news broke that the world's last male northern white rhino had died (Karimi 2018). If, for example, the Ol Pejeta Conservancy had a crypto-wildlife collectable of that white rhino on the Blockchain, they could sell it and generate extra revenue for the conservancy due to the high amount it would have sold for due to its rarity. Due to the extinction of the northern white rhino, the owner of the crypto-wildlife collectible would arguably have in his position a rare piece of history that would appreciate in value.

To underscore the popularity of CryptoKitties collectables, by the 11th of December 2017 the game had racked in sales of up to $12 million dollars or roughly R140 million at the time of writing having just launched two weeks earlier (Young, 2017; Farr, 2017). As a contrast, the

most expensive real-wildlife in South Africa was a Cape buffalo which sold for R40 million (BusinessTech 2014).

Table 2: Most expensive game sold in South Africa

Game		Value
1	Cape Buffalo	R40 million
2	Buffalo	R26 million
3	Buffalo	R18 million
4	Sable Antelope	R11 million
5	White Impala	R9.7 million
6	East African Buffalo	R8.1 million
7	White Saddle Blesbuck	R7.8 million
8	East African Buffalo	R6.5 million
9	Matetsi Sable (pregnant)	R4 million
10	Buffalo (Pregnant)	R3 million

(Source: BusinessTech 2014)

Crypto-wildlife could bring more revenue or act as an additional revenue generator for the OI Pejeta Conservancy compared to only showing screenings to visitors of the animal whilst it was still alive.

Conclusion

VR and DLT's such as Blockchain seem poised to take tourism to the next level provided the technology reaches a significant level of mainstream adoption and is implemented appropriately. Additional avenues of revenue may be explored with utility tokens and crypto-wildlife collectables, the latter also serving as a form of digital wildlife conservation. The amalgamation of these two technologies could also serve the purpose of growing the tourism wildlife market by ensuring it becomes accessible to people who would otherwise not be able to engage in it due to their geographic disparity.

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