

Blockchain: harnessing its potential in travel

An Amadeus Innovation foresight paper



Innovation

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Foreword

I am fortunate that my role as Head of Innovation grants me access to the people and technologies changing how the travel industry and wider world operate. From autonomous drones to the latest in artificial intelligence, my team keeps a watching brief on innovation in all its forms.

However, when it comes to innovation, focus matters. This is why we are focusing our innovation activities on six themes which we believe will deliver value to both our customers, and travellers alike. Blockchain is one of our six themes, along with others such as extended content, disruptive forces and improved conversion.

Blockchain is a development that Amadeus has been watching, and engaging with, for some time now. Our teams have developed live prototypes and we are cultivating a network of specialist partners to experiment with this new technology, some of which are discussed in this paper. Amadeus Ventures, our corporate investing arm, has also been actively monitoring the space.

The promise of blockchain has captured many people's attention. However, when it comes to managing mission critical systems in the travel industry Amadeus takes its commitment to thorough testing and due diligence extremely seriously. Similarly, we are committed to fully understanding the data security and privacy implications blockchain presents. Whilst this new approach to handling data excites us, we also recognise it is still extremely early in its development.

This whitepaper is designed to help shine a light on the many different areas of the travel industry where blockchain is beginning to have an impact in addition to providing a window into the wider development of the blockchain industry itself. We hope you find this paper valuable and it contributes to greater understanding of blockchain's potential.



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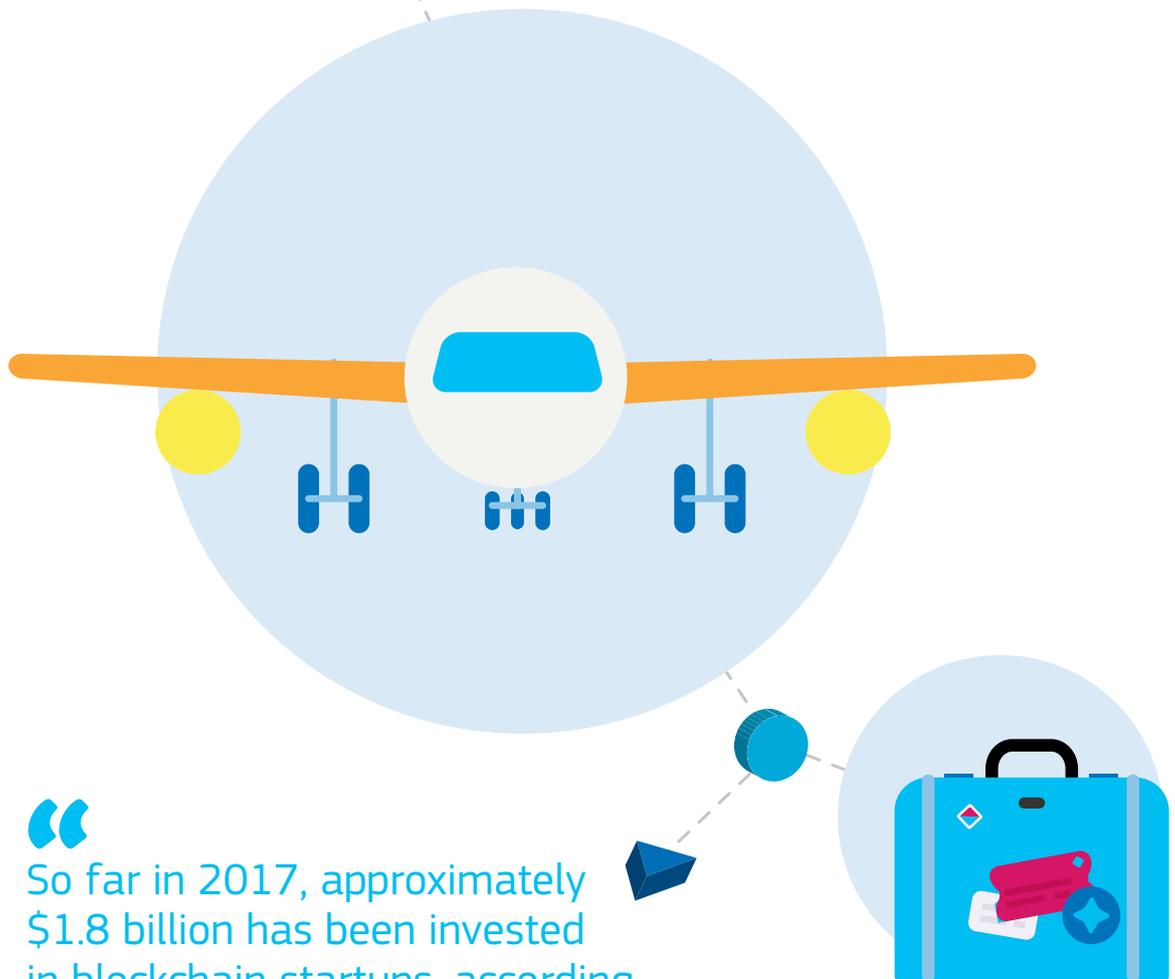
Blockchain: more than just a database?

Ask even the most technically-savvy expert to succinctly explain blockchain and it is a bit like trying to solve a Rubik's cube. The reason for that is that there are several dimensions to the concept including technological, business, economic and, many believe, even social.

What is clear is that this emerging technology holds tremendous promise to change the way we can 'exchange value' digitally. Just as the internet's design has allowed us to exchange information very easily and quickly, so blockchain could open the door to a new iteration of computing that allows 'value', often financial, to be exchanged between businesses, governments and individuals.

Interest in blockchain began with Bitcoin, the decentralised digital currency that rose to prominence amid the first huge surge in its price in 2011. The original promise of Bitcoin was of a new currency, a digital payment mechanism outside the traditional fiat currencies endorsed and managed by the world's governments. However, Bitcoin adoption today remains modest at best as the network underpinning the currency struggles to cope with the transaction volumes needed. Today, Bitcoin is capable of processing only five transactions per second, compared to the many thousands processed by the likes of MasterCard and Visa. The cost of accepting Bitcoin as a payment mechanism has also risen significantly in line with the appreciation of Bitcoin's value. Today, holding Bitcoin is primarily a speculative exercise.

Despite Bitcoin's lack of adoption, the technological and cryptographic concepts pioneered by the digital currency have been broadly embraced by startups and even trialled by some governments and central banks. Perhaps the most significant aspect of Bitcoin's design is the blockchain database, a distributed digital ledger that is used to record transactions across many computers so that the record cannot be altered retrospectively. A digital ledger shared between multiple parties is a compelling concept that makes it easier for various parties to trust each other because 'consensus' is reached regarding each transaction. New public blockchains have since emerged that seek to improve Bitcoin's design to harness the power of Bitcoin's underlying technology, most notably Ethereum which also introduced the smart contract concept.



So far in 2017, approximately \$1.8 billion has been invested in blockchain startups, according to Smith & Crown, a specialist blockchain analyst firm. »

The technology is already being deployed to address real world problems. Major companies including Accenture, IBM and other IT services firms are busy working to ensure blockchain is ready for real world adoption. For example, the Bank of England has conducted trials with Ripple blockchain technology for inter-bank payments and settlements. NASDAQ has enabled trading using blockchain, and Innogy, the innovation division of power company RWE, has trialled payments between its fleet of electric cars and charging stations in Germany.

The potential applications for the travel industry are numerous. Blockchain could significantly improve the way we handle traveller identity today, making it simpler to navigate the airport. The technology is on the verge of transforming how loyalty schemes operate, making it much easier for travellers to redeem loyalty points across various providers. And of course, the ability to settle payments between different players in the travel value chain more efficiently is a big opportunity.

So far in 2017, approximately \$1.8 billion has been invested in blockchain startups, according to Smith & Crown, a specialist blockchain analyst firm. At the time of writing the overall crypto-currency market was worth in excess of \$150 billion as noted by CoinMarketCap.

The unique characteristics of blockchain technology

Blockchain is inspiring technical communities the world over due to its unique properties and innovative new take on database structure.

Here, we look at the five reasons that make blockchain unique:

- 1 Transparency and immutability:** Once an entry is registered on a public blockchain then it is apparent for the world to see. It cannot subsequently be altered and therefore provides a time-stamped version of 'the truth'. It is this quality that leads many to believe the blockchain is ideal for registering ownership of assets such as houses, cars or financial holdings.
- 2 Cryptographically secure:** There are various mechanisms for securing blockchains ranging from Bitcoin's original Proof of Work (PoW) to the more recent Proof of Stake (PoS). What each 'consensus mechanism' has in common is an extremely high threshold for cryptographic security. This inherent security is essential to maintaining the integrity of a ledger shared between multiple parties.
- 3 Decentralised:** Opinions vary regarding the importance of blockchain's decentralised nature. Many believe that by sharing a decentralised copy of the blockchain database across different machines there is the ability to remove the need for trusted 'middle men'. However, we are already seeing the rise of 'permissioned' or private blockchains between industry actors that seem more practically applicable. Decentralisation also means no single point of failure which adds to the resiliency of the network, making it harder to attack.
- 4 Data integrity:** Blockchain data is always complete, accurate, trustworthy and widely available because as a transaction is processed all computers on the blockchain operate an algorithm to reach consensus regarding the validity of the transaction. Once consensus is reached the transaction cannot be altered by any single party and the outcome of the transaction can then be publicly viewed by all. In certain situations, a single public ledger can replace several proprietary ledgers leading to a clearer shared version of the truth. Imagine if investment banks shared a single ledger within which they recorded and reconciled trading activity. We could envisage significant improvements in settlement and reconciliation.
- 5 Efficiency and cost reduction:** By reducing the reliance on centralised record-keeping entities the technology has the potential to lower costs and improve the efficiency of business processes in certain circumstances. For example, in 2016 Sweden's land registry the Lantmäteriet began registering property ownership on the blockchain and the agency has forecast €100 million in annual savings for tax payers as much of its record keeping role becomes automated.

Ethereum and the rise of smart contracts

The Ethereum public blockchain emerged in 2014 as an open source project and alternative to the Bitcoin blockchain — specifically designed to be ‘the world’s super computer’. Through the introduction of ‘smart contract’ capability, applications built on Ethereum can automate a range of business dealings between parties. In theory, without the need for human intervention from a legal perspective.

Smart Contracts are not actually a new concept, with theoretical work having been undertaken in the 1990s. However underlying blockchain technology has made them a reality today. With smart contracts it is possible to hardcode the stipulations of an agreement between parties into a self-executing blockchain programme. For example, ‘If the price of Bitcoin surpasses \$5,000 party A pays party B a fee’. This is a very basic example of a financial legal contract that could be coded and automatically executed using a smart contract. In the travel industry we might imagine commissions between hotels and aggregators being settled in such an automated manner in the future.



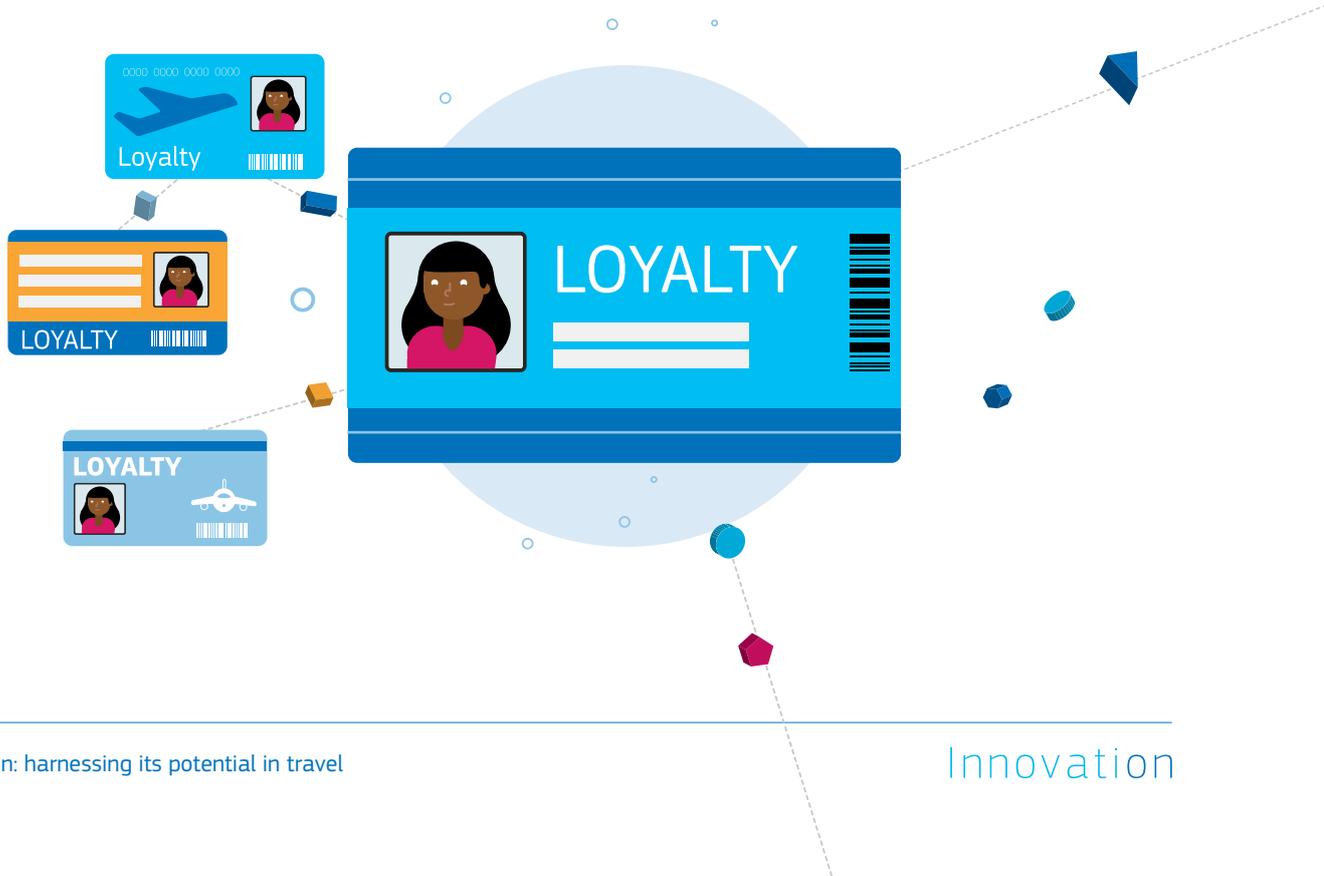
Blockchain in the travel industry

Despite blockchain technology being much discussed, in reality the technology remains at a very early stage in its development. For example, we believe there are no live systems in production today in the travel industry. However, the industry is in an experimental phase with various actors investigating potential use cases for the technology and much progress is being made.

i. Making loyalty schemes more user-friendly

Today's loyalty schemes have evolved over time, mostly based on proprietary technology and the basic concept of rewarding travellers for their continued purchasing of a travel product. Loyalty schemes have become a key marketing tool for hotels, airlines, credit card companies and retailers.

The challenge for the traveller is often the complexity of redeeming loyalty points. Although some schemes have forged partnerships allowing points to be widely redeemed it is still true that in general an airline loyalty point can't be used beyond booking flights. This can be frustrating for travellers and is also a problem for the industry. Any unspent loyalty points must reside on an airline's balance sheet as a liability, which can hamper capital raising and investment.





Loyyal: transforming loyalty programmes with blockchain

Loyyal is a San Francisco based startup focused on applying blockchain and distributed ledger technology to improve today's loyalty systems. The company has developed its platform on IBM Fabric, offering a permissioned environment for program operators to manage program currency and logic amongst partners.

Today, if a scheme wishes to partner with another there is a complex and costly set up procedure as well as an ongoing file transfer and settlement process happening in the background. For a traveller wishing to transfer points between airlines in the same alliance it can often require a phone call and may take up to six weeks. The Loyyal platform seeks to address this challenge by improving interoperability between schemes. All loyalty schemes can share its single ledger on blockchain, which makes transferring a traveller's points simple, fast and cost-effective.

Loyyal is currently working with an international airline in the Middle East showing the benefits of such interoperability. In addition, real-time invoicing and payment between partners executed automatically using blockchain-enabled smart contracts is in scope of this pilot.

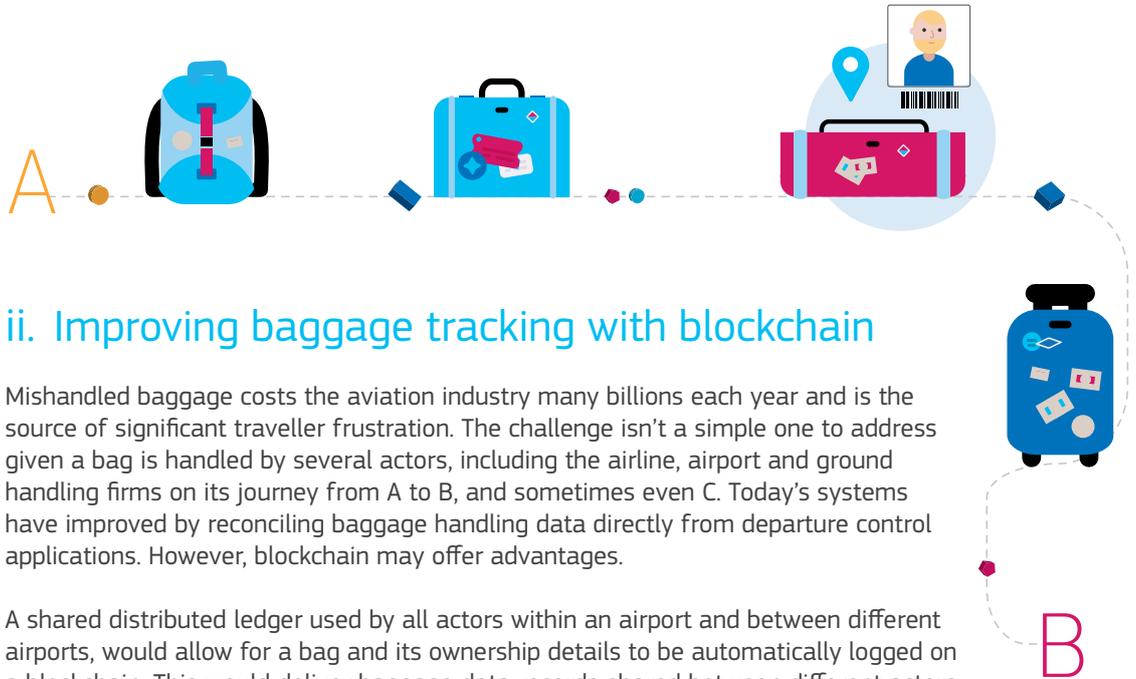
In the future, Loyyal's vision sees travellers accessing loyalty points in real-time. Imagine landing from a long flight and having points credited to an app immediately that could then be used to pay for a ride sharing service from the airport. Interoperability will increase to such an extent that a loyalty scheme for an independent hamburger restaurant could easily integrate with major schemes, reducing friction, improving the consumer experience and encouraging commerce. In essence, enabling access to the 'long-tail' for loyalty schemes.

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In addition, any points issued via Loyyal technology are unique, are registered on the blockchain and can therefore be tracked. They are no longer just a 'point' like any other. This means scheme providers can collect much more powerful data on how travellers spend points via partner schemes. For example, an airline could see how a passenger spends points with a luxury retailer and send a personalised offer to their mobile phone for a lounge experience. Or if someone is buying beachwear in winter issue an offer for a beach holiday.

Similarly, Loyyal is enabling its loyalty schemes to offer micro-cost redemptions which are cost prohibitive using existing technology, say a film on a flight or digital assets for in-game purchases. This will encourage travellers to redeem points at rates that will be low enough to shift the focus from breakage to customer satisfaction and 'loyalty'.

Destinations are also interested in applying blockchain technology. Smart Dubai, a government entity with the vision of making Dubai the happiest city on Earth, is working with Loyyal on how it can incentivise behaviour. For example, can people be rewarded with points for driving during non-peak times or can people be incentivised to pick-up litter. Again, the vision is to achieve interoperability and use low cost point issuance and transfer using automated rules.



ii. Improving baggage tracking with blockchain

Mishandled baggage costs the aviation industry many billions each year and is the source of significant traveller frustration. The challenge isn't a simple one to address given a bag is handled by several actors, including the airline, airport and ground handling firms on its journey from A to B, and sometimes even C. Today's systems have improved by reconciling baggage handling data directly from departure control applications. However, blockchain may offer advantages.

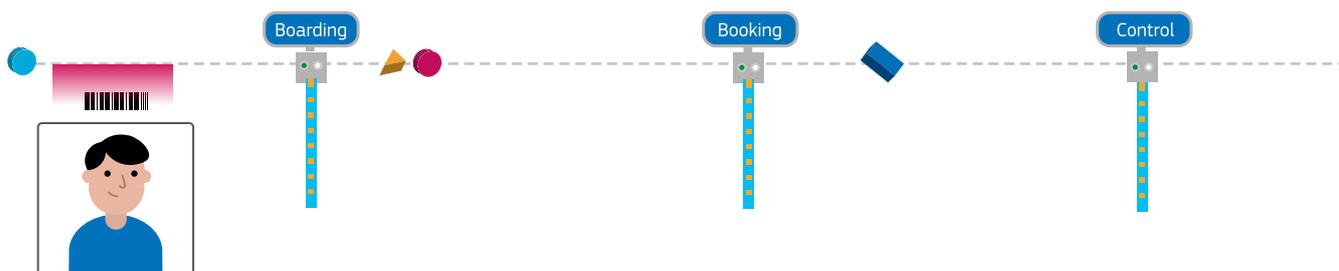
A shared distributed ledger used by all actors within an airport and between different airports, would allow for a bag and its ownership details to be automatically logged on a blockchain. This would deliver baggage data records shared between different actors and make it much more straightforward to track bags as they move with a traveller throughout their journey.

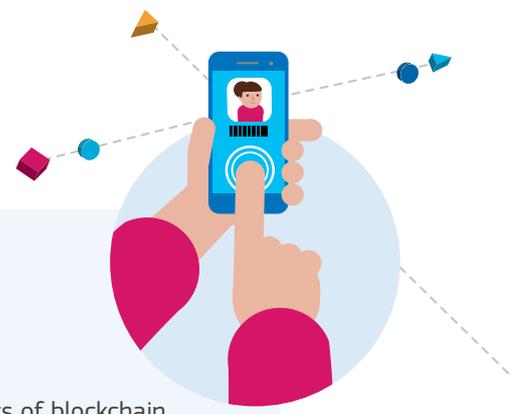
iii. Simplifying settlements in the travel value chain

The travel industry operates in a value-chain based on collaboration and therefore many areas of the industry rely on settlements between parties. Consider a hotel booking where an aggregator, OTA and the hotel need to settle cash and commissions based on pre-defined agreements. Today, this is an extremely complex process and the introduction of blockchain based smart contracts could automate settlements in many areas of the industry. Being able to instigate a trusted execution facility between a travel provider and travel intermediaries promises reduced cost, enhanced efficiency and faster reconciliation at scale.

iv. Improving identity management in travel

The highly trustworthy and immutable nature of blockchain also makes it ideal for improving the way travellers are identified during their journey. Traveller IDs are required at booking, when changing a booking, at security, the boarding gate, duty free shopping and at a hotel. Imagine how much easier travel would be if you didn't need to use a passport at all these points in the journey. It is possible that blockchain technology can deliver a much more frictionless experience for proving a traveller's identity.





Civic: solving the identity dilemma with decentralisation

Civic is an innovative startup harnessing the immutable trust aspects of blockchain to help people prove their identity. Today, proving your identity is necessary when opening a bank account, moving residence, taking out a new utility agreement and, of course, throughout the travel experience. Identity when travelling has long been a pain-point with paper documentation, passports and boarding passes needed at regular intervals.

Civic aims to address this by enabling people to store and share their own verified identity credentials in a secure, user-friendly app. Key to the company's platform is the ability for individuals to be in control of their identity; storing and sharing their identity credentials, verified by companies and governments.

For example, Civic is working with a top five utility company in the US and Citibank. An example use case is consumers proving their identity to Citibank by providing 'attested' data by the utility company, for example the data in a utility bill. The genius is that the consumer provides the trusted data directly to Citibank, not the utility company providing the data on behalf of the consumer. Citibank can trust the data received from a consumer since Civic's platform verifies authenticity, ownership and validity of the data.

Due to the decentralised design, Civic's Secure Identity Platform need not store identity data. This approach 'unlocks' identity verification that consumers have already provided with trusted organisations, such as the US State Department and many others that can attest to a person's identity. Often Civic enables multiple organisations to attest in this way, increasing trust further.

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Civic sees a world of opportunity to apply its approach to the travel industry. Imagine arriving at a hotel and being able to skip check-in altogether? With Civic your hotel could request identity information via QR code, near field communication or Bluetooth, with the traveller scanning their fingerprint to open the Civic app and digitally provide requested identity data. The hotel could then even provide a digital room key, safe in the knowledge it's going to the right person.

In the future, the technology could be used to provide key identity data simply and securely to online travel agents that want to know who you are before providing a tailored range of options. Civic envisions a 'Book with Civic' button that will be displayed on OTA sites.

At the airport, a Civic QR code could be added to a traveller's bag for a simple scan to access key data about the owner, helping with baggage tracking and security for any suspicious bags. By relying on the biometric capabilities built into smartphones today, Civic helps airports avoid the need to roll-out costly biometric scanning hardware. Although identity is an issue that affects all industries, the Civic team is particularly focussed on helping to deliver a more seamless travel experience.

Blockchain's new funding mechanism: tokens

Another recent development to emerge from the world of blockchain is a new model for raising capital. The 'Initial Coin Offering', or ICO, also known commonly as a 'token sale' is drastically changing how startups raise funds.

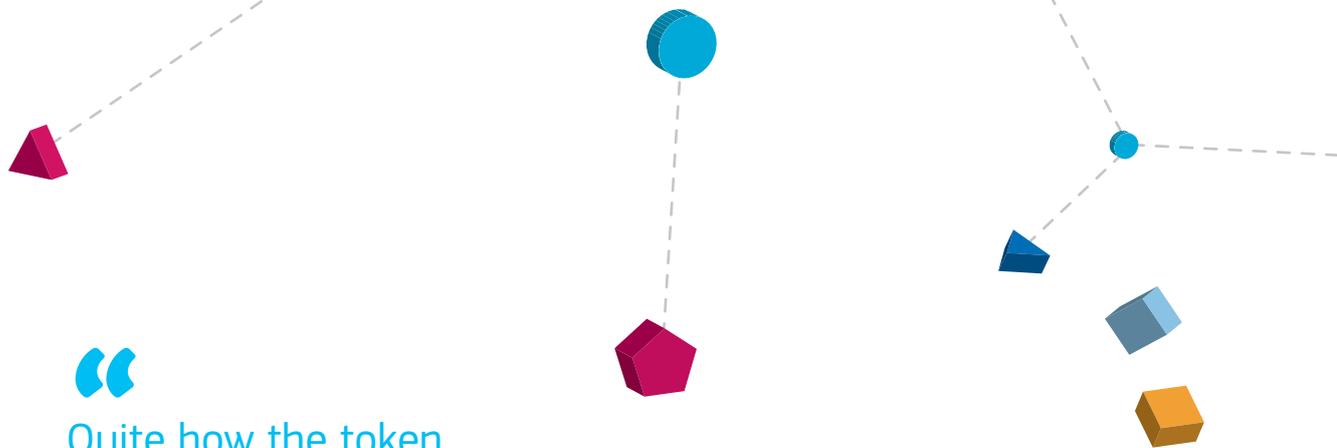
Traditionally, a startup would seek funding from VC firms but now, thanks in large part to blockchain technology that facilitates token sales, it is possible to raise large sums directly from retail and institutional investors by selling tokens. So much so, that Goldman Sachs has found that more money was raised via token sales in the past quarter than from traditional VC funding.

Tokens are best thought of as a stake in a future economy, where the token is essential to the functioning of a system. If the startup is successful, and adoption of its technology increases, then there is usually a concurrent rise in demand for the token that powers its ecosystem. Take IOTA, the distributed ledger technology designed to enable transactions in the Internet of Things, as an example. If in the future, we see machines transacting with one another, say an electric car paying for its own charge automatically, then there's a good chance the IOTA token will be used as the means of exchanging that value. In such a scenario, early buyers of IOTA's tokens would stand to benefit as the utility of the token rises and so too its financial value.

There are many such examples of underlying blockchain infrastructure and application firms raising money in this way. Tezos, a new take on blockchain with automated governance, raised over \$250 million from its ICO and Civic too raised funds during its successful token sale. Kik, the successful messaging app which is already valued at over \$1 billion is, at the time of writing, currently planning an ICO to raise \$175 million — issuing tokens that will form the financial exchange and loyalty currency within its own messaging ecosystem.

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Kik's ICO is a particular case in point. It is the first time we've seen a major existing business raise funds via a token sale. Industry observers are now speculating that we might begin to see many more traditional web firms offer token sales as a means of securing an exit for existing investors and to encourage greater network effect amongst users. It is this network effect of motivated token holders contributing to the success of a blockchain project that was born from blockchain's open source nature.



Quite how the token sale craze will play out is unclear but there's no doubt it is reshaping the world of venture capital. 

Recently regulators across the world have been examining the practice to determine if some token sales may contravene securities law. Notably, the Securities and Exchange Commission in the US has provided guidance to effect that 'some' tokens may constitute a security if they are structured in such a way as to effectively return company profits to token holders. 'Utility tokens' however, where the token has a function within a system, appear not to have drawn such regulatory attention. Quite how the token sale craze will play out is unclear but there's no doubt it is reshaping the world of venture capital.



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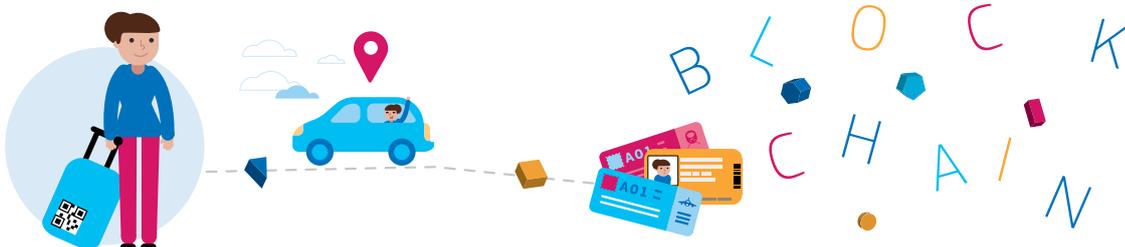
Recommendations for the travel industry

It is likely that as blockchain technology continues to develop it will gradually make its way into existing industry applications. A big bang switch to the technology is unlikely, despite its promise.

Therefore, depending on your place in the industry, it isn't likely your firm will need to take specific action to benefit from blockchain and much will depend on technology partners integrating the technology into their systems.

However, we would recommend travel companies all look at five areas:

- 1 Understand:** The pace at which decentralised technology is moving is significant and it's prudent for firms of all types to build the knowledge and capabilities to understand its impact. This is particularly important when it comes to gaining senior management buy-in for possible projects further down the line.
- 2 Explore:** At this stage in the evolution of blockchain nobody has all the answers. We recommend arranging workshops and consulting with experts in how data technologies apply to travel in order to investigate how the technology could theoretically be deployed.
- 3 Collaborate:** Blockchain is inherently a system that requires collaboration between industry partners, and even competitors, for its true value to be realised. Take the potential for enhanced settlements in travel as an example. This requires players to remain open and collaborative.
- 4 Experiment:** If the right opportunity presents itself then conduct a trial, perhaps alongside a technology partner, to build awareness and understanding within the organisation.
- 5 Recruit:** As with other emerging technology fields such as cybersecurity, the pool of blockchain technical talent is limited today. If decentralisation is likely to be important to your organisation then the time to secure the right talent and relationships with technology partners is now. It might not make sense for many travel firms to hire technical experts given the pressures of delivering on core business but business people able to liaise with technical partners are also challenging to find. Competition for such skills from sectors such as financial services is already fierce.



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