BLOCKCHAIN IN AVIATION

EXPLORING THE FUNDAMENTALS, USE CASES, AND INDUSTRY INITIATIVES.

WHITE PAPER | OCTOBER 2018

IATA

Disclaimer

1 Foreword

In the IATA study "Future of the Airline Industry 2035"[1], Blockchain has been identified as one of the technologies that may have a major impact on the future of aviation, among other drivers of change such as new modes of consumption or the privatization of infrastructure.

IATA has been conducting research and development on this technology for the past five years, starting with prototypes and in some cases testing in production environment where there was a strong use case. In parallel several airlines and their partners have been experimenting with the Blockchain technology on a variety of use cases. The initial progress is tangible enough to encourage further developments and to look beyond prototypes.

The rise of new technologies often comes hand in hand with a lot of hype. To some extent, Blockchain is showing signs similar to the beginning of the Internet and the potential to have a comparable disruptive impact as it gains more maturity. Whereas the promise of the web was to enable sharing of information across the world; the promise of Blockchain is to enable the exchange of value across digital channels without friction. The approach we have taken, is to start with the needs of customers, address the pain points and opportunities to create more value.

This first Blockchain white paper is intended to raise awareness on the potential of this technology for the aviation industry and to guide the industry towards the most promising business opportunities, while being mindful of the potential risks and challenges.

Sincerely yours,

Eric Léopold
Director Transformation,
Financial and Distribution Services
IATA

[1] Future of Airline Industry 2035:
https://www.iata.org/policy/Documents/iata-future-airline-industry.pdf

2 Executive summary

The Blockchain technology is currently going through a phase in which it is gaining more maturity and the concrete benefits are becoming clearer. However, it is still not trivial how to leverage the benefits within the context of an appropriate use case where this technology is the most suitable solution. Classification of a wide range of use cases, consistently shows formation of clusters around a few areas of application, with many specifically leveraging Tokenization and Smart Contracts[12].

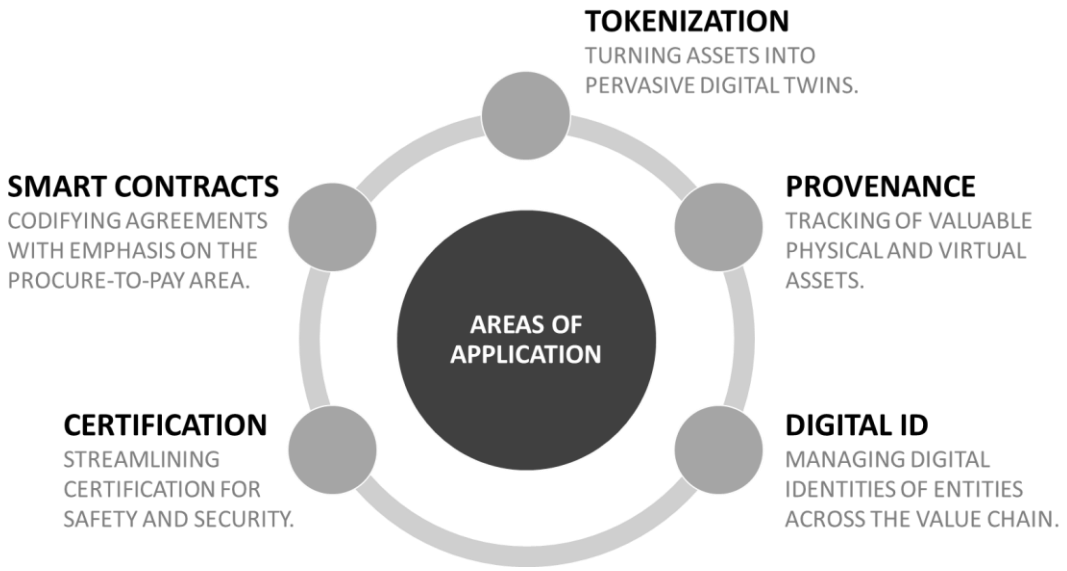

Figure 1: Areas of Application (©IATA)

While there are many reasons why this technology is uniquely positioned as a solution to many problems in business and beyond, there are still a few key challenges that need to be dealt with before adoption gains traction. Scalability, governance and cost of usage have been identified as the main obstacles.

The value chain across the aviation industry is inherently very collaborative with many partnerships between providers to collectively orchestrate the delivery of travel products and services. Smart Contracts have a high potential to enable streamlining of business to business interactions. In particular to disrupt processes such as invoicing, reconciliation, settlement and accounting.

Blockchain comes with tangible benefits, however, in order to leverage its benefits, the approach from the outset should be a solution driven discovery, investigation and implementation, while maintaining an open mindset about alternative solutions throughout the entire process. Additionally, there are many design options related to the type of, and configuration of Blockchain that need to be carefully considered and compared. The recommended approach is to include Blockchain as one of the potential solutions to be considered.

3 Table of Contents

4 Purpose of this Document

This document is intended to:

- Raise awareness on the Blockchain technology;
- Expand on how this technology can be of benefit to the aviation industry;
- Present use cases currently being investigated and implemented;
- Expand on the main challenges associated with this technology;
- Present the current Blockchain landscape within the travel industry.

5 Introduction

The Blockchain technology started gaining significant traction when Bitcoin[2] was launched and became popular. Blockchain is the underlying technology of Bitcoin and other digital currencies such as Ethereum. While these cryptocurrencies have unlocked innovation in the digital currency space, there are many use cases leveraging the Blockchain technology for non-currency related areas.

We are very much used to exchanging information across the Internet, e.g. emails, documents, pictures, but when it comes to exchanging value through the Internet, we are just scratching the surface with Blockchain. Things of value are naturally more prone to fraud and theft and in case of some digital assets, measures need to be put in place to prevent double-spending[3]. In this context, Blockchain is sometimes referred to as the enabler of Internet of value.

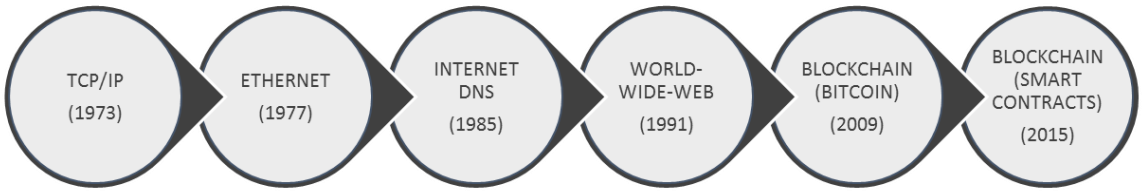

Figure 2: Evolution of the Internet and Blockchain (©IATA)

Transactions are part of most people's daily lives – even if they do not realize it. It could be a credit card company recording the purchase of a flight ticket, a government registering the ownership of a property title, or Apple iTunes recording the purchase of a movie. Blockchain is a technology that, amongst other things, enables two or more people or organizations to confidently and securely transfer value (e.g., money, data or a digital asset) electronically from one person or organization to another without or with less intermediaries (e.g. a bank).

The Blockchain technology comes with bold promises, evidence of value through traction in some use cases; but also with signs of a wave of hype. This technology provides the environment to manage information and more importantly the movement of value through digital channels. While there is a lot of focus and coverage related to cryptocurrencies, which are built on the Blockchain technology; the range of use cases go well beyond digital currencies. As a general rule of thumb, Blockchain fits well in areas where there is a need to establish trust between multiple parties.

[2] "Bitcoin is a decentralized digital currency created by an unknown person or group of people under the name Satoshi Nakamoto and released as open-source software in 2009. It does not rely on a central server to process transactions or store funds":
https://en.bitcoin.it/wiki/Bitcoin

[3] Double-spending is a potential problem unique to digital currencies because digital information can be reproduced relatively easily:
https://www.investopedia.com/terms/d/doublespending.asp

6 Blockchain Fundamentals

The Blockchain technology is fascinating, innovative and impactful; and conceptually it is **a type of database**. Whilst traditionally data resides on a central infrastructure, with back-ups and redundancy measures, the Blockchain technology embraces a distributed architecture. In simple terms the Blockchain technology is a decentralized database, additionally leveraging crowd computing and infrastructure, e.g. mining[4].

Google is amongst the first companies who pioneered distributed architecture when creating the MapReduce[5] in 2004[6]. This algorithm enabled them to handle large number of queries of large and complex data sets ("Big Data"). It is perhaps one of the most important building blocks, or what inspired the inventor(s) [7]of the first Blockchain. MapReduce was later open sourced to Hadoop[8] by the Apache Software Foundation.

6.1 Different Types

At a high-level, from a simplified perspective; there are 4 possible types of Blockchain, otherwise known as "Advanced Ledgers". The classification starts with whether the chain can be accessed by the public, and on a lower level, whether the chain can be validated with (i.e. permissioned) or without (e.g. permissionless) permission.

Figure 3: Blockchain types (©IATA)

Current Blockchain platforms are either centralized or decentralized, and the choice of the Blockchain type is strongly dependent on the use case and the associated requirements. Every variation of this technology has its advantages and disadvantages. Decentralized platforms have certain challenges that are covered in this paper, such as scalability. On the other hand, centralized models also have certain drawbacks.

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[4] Bitcoin mining explained:
http://www.youtube.com/watch?v=GmOzih6I1zs
[5] MapReduce is a two-phase paradigm for crunching large data sets in a distributed system:
http://www.youtube.com/watch?v=Clgh9q4k92A
[6] MapReduce: Simplified Data Processing on Large Clusters
https://storage.googleapis.com/pub-tools-public-publication-data/pdf/16cb30b4b92fd4989b8619a61752a2387c6dd474.pdf
[7] "Satoshi Nakamoto is the name used by the unknown person or people who developed bitcoin, authored the bitcoin white paper, and created and deployed bitcoin's original reference implementation."
https://en.wikipedia.org/wiki/Satoshi_Nakamoto
[8] Hadoop explained:
http://www.youtube.com/watch?v=9s-vSeWej1U

6.2 Consensus Mechanism

Consensus is a critical component in the context of Blockchains. It is when the majority of the nodes holding a copy of the database determine what the single version of the truth is. The Bitcoin Blockchain arrives at consensus when the majority of the validating users ("Miners")[14] have the same version of the database; more specifically the database is a chain of data blocks which are tightly coupled through a cryptographic hashing algorithm.

> In analogy, imagine each block as a box with some valuable content inside of it. Once the first box is locked with multiple locks, one of the keys is thrown into the next box, which in turn is locked and one of its keys is thrown into the following one, etc. In other words, access to an individual box is dependent on the rest of the boxes, i.e. if a box is taken out, the chain breaks.

In some private Blockchains, it may be unnecessary to have a crowd consensus mechanism for the purpose of establishing the single version of the truth. In particular, when the data is in a private environment, and it is shared across a defined set of users.

In addition it may also be unnecessary to tightly couple the data blocks through cryptographic hashing, because assurance of data integrity is only of relevance to public and distributed ledgers.

6.3 Initial Coin Offering (ICO)

The Blockchain technology is riding a wave of hype making it difficult for companies to maneuver in this space. Initial Coin Offerings[9] (ICO) have become a new crowdfunding mechanism resulting in a significant number of these projects happening across a wide range of industries.

ICOs are generally organized by a group of people who try to solve an existing problem and propose a solution that is leveraging the Blockchain technology. In practice, an ICO requires a website, whitepaper and efforts to reach and engage a wide audience. ICO investors are usually people who may not know the problem, the industry and the dynamics. A significant number of ICOs has never delivered on the promises made during the campaigns.

Regulatory compliance is another area of challenge for this new crowdfunding mechanism. Regulators are slowly moving towards understanding this emerging trend and taking measures to protect consumers, governmental institutions and companies.

For example in Switzerland, according to the Swiss Financial Market Supervisory Authority (FINMA), there has been a significant increase of ICOs, and given the lack of a strong legal and regulatory

[9] Initial Coin Offering (ICO) explained:
https://www.investopedia.com/terms/i/initial-coin-offering-ico.asp

framework, the FINMA has recently published ICO guidelines in February 2018, providing a more transparent regulatory framework.

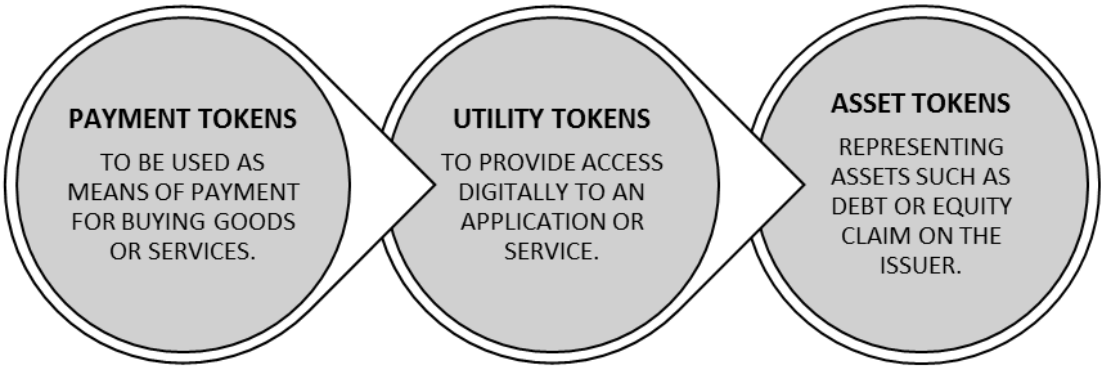

Figure 4: Tokens classified by Swiss Financial Market Supervisory Authority FINMA[10]

[10] Swiss Financial Market Supervisory Authority (FINMA) ICO Guidelines: https://www.finma.ch/en/~/media/finma/dokumente/dokumentencenter/myfinma/1bewilligung/fintech/wegleitung-ico.pdf?la=en

7 Generic Areas of Application

The Blockchain technology has many areas of applicability regardless of the industry. The classification of a wide range of use cases has led to the following non-exhaustive generic areas of application.

7.1 Smart Contracts

The commercial aviation value chain involves many entities (e.g. aircraft manufacturers, airlines, travel agents, airports, ground handlers, and other industry suppliers) who depend on each other for products and services to serve the customers. The Blockchain technology is suitable to streamline the procure-to-pay[11] process through the use of Smart Contracts[12].

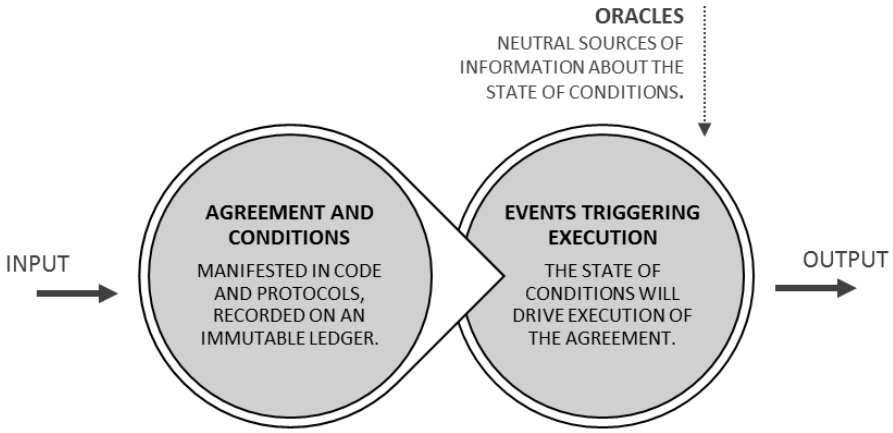

Figure 5: Illustration of Smart Contracts (©IATA)

For example to manage payment upon delivery of services by encoding the amount to be paid, the services to delivered, and the conditions (e.g. date, service level agreement) in a smart contract. To avoid disputes, automated neutral data sources (i.e. Oracles[13]) can be used to confirm the delivery of the service and the conditions. This could eliminate the need for monitoring, invoicing, reconciliation, and the settlement process.

In analogy, the vending machine as a concept is the closest thing to a smart contract, i.e. if certain amount of money has been inserted, and certain item number has been entered, a certain product is pushed out and delivered. The process is autonomous and the contract has been pre-defined in the algorithm of the vending machine.

[11] "Procure-to-pay is a term used in the software industry to designate a specific subdivision of the procurement process.":
https://en.wikipedia.org/wiki/Procure-to-pay
[12] Smart Contracts explained:
https://blockchainhub.net/smart-contracts/
[13] Blockchain Oracles explained:
https://blockchainhub.net/blockchain-oracles

7.2 Tokenization

Tokenizing assets has the benefit of easing the accounting and reconciliation, but it also prevents digital assets from being double spent, e.g. a compensation voucher given to a passenger should not be spent more than once. Compensation vouchers, and in particular frequent flyer loyalty points, remain on the balance sheet as a liability until the passenger has used them.

7.3 Provenance

Blockchain has the capability to facilitate the tracking of the status and location of valuable assets that change custody with a high frequency; such as bags of passengers, cargo, spare parts, and even the aircraft, and in particular if the parties don't trust each other or the individuals and entities within the process. Blockchain technology offers a simple and easy way to record events in a way that is immutable and tamper-proof.

7.4 Certification

Blockchain has the capability to streamline the certification process of individuals, equipment and others, helping the industry to maintain high standards for safety and security, which are top priorities of airlines and the wider value chain.

The certification would support the authentication process of:

- Own staff members, e.g. crew, pilots, airports staff, security, etc.
- Partners across the value chain, e.g. ground handlers, fuel into-plane service providers, maintenance repair and overhaul providers.

7.5 Digital Identity

Doing business in the digital space is becoming the norm across the commercial aviation industry and beyond. Businesses want to expose their products and services and benefit from a large distribution reach while knowing who they are doing business with and manage the risks associated with those interactions. The inherently robust security properties (e.g. integrity, immutability) of the Blockchain technology make it very suitable as the underlying technology for digital identity management solutions.

8 Challenges

In case of mineable Blockchains such as Bitcoin and Ethereum, there are often mining pools[14] that in theory have the authority to collectively make changes to transactions or prevent new ones from being confirmed[15]. Both Bitcoin and Ethereum have experienced multiple hard forks[16] since their launch, which is a manifestation of strong disagreements between the users or nodes of the network.

8.1 Scalability

Purely decentralized Blockchains often have a structure that hinders them from achieving high transaction speed levels. For example recently Bitcoin's transaction rate has been around 2.8[17] transactions per second. Scalability is therefore a major challenge and has not been resolved by the leading decentralized platforms. Vitalik Buterin, the founder of Ethereum recently announced some tweaks[18] (i.e. sharding and plasma) that are envisaged to boost the performance. Those tweaks could allow Ethereum to reach close to 100-150 transactions per second. To put that in perspective; Visa handles 24,000[19] transactions per second.

8.2 Governance

Every time Bitcoin and Ethereum experience a hard fork, there is usually a period of uncertainty before the fork takes place and once the fork has taken place, there is potentially major impact on the users

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[14] Estimated top miners:
https://www.etherchain.org/charts/topMiners

[15] "51% attack refers to an attack on a blockchain – usually bitcoin's, for which such an attack is still hypothetical – by a group of miners controlling more than 50% of the network's mining hashrate, or computing power. The attackers would be able to prevent new transactions from gaining confirmations, allowing them to halt payments between some or all users. They would also be able to reverse transactions that were completed while they were in control of the network, meaning they could double-spend coins."
https://www.investopedia.com/terms/1/51-attack.asp

[16] List of bitcoin forks where the protocol has changed:
https://en.wikipedia.org/wiki/List_of_bitcoin_forks

[17] The number of Bitcoin transactions added to the mempool per second:
https://www.blockchain.com/en/charts/transactions-per-second?timespan=1year&daysAverageString=7

[18] Vitalik Releases Partial Proof-of-Concept for Ethereum 'Sharding' Tech:
https://www.coindesk.com/vitalik-releases-partial-proof-concept-ethereum-sharding-tech/

[19] Visa acceptance for retailers:
https://usa.visa.com/run-your-business/small-business-tools/retail.html

of the platforms. The governance structure around these platforms is developing, however it is currently not very mature.

8.3 Cost of Transaction & Volatility

Using decentralized platforms such as Bitcoin and Ethereum can be costly in terms of transaction fees. The chart below shows the evolution of the Bitcoin transaction fee, which in 2017 peaked above $50[20] per transaction. The volatility in the transaction fee may be one of the reasons why mass adoption has not happened yet.

Figure 6: Bitcoin transaction fee[20]

8.4 Operational Efficiency

Bitcoin consumes a lot of electricity (more than Republic of Ireland [21]) to perform complex mathematical calculations; these computations are needed to ensure there is a secure and tamper-proof consensus.

[20] Bitcoin average transaction fee:
https://bitinfocharts.com/comparison/bitcoin-transactionfees.html
[21] Article about Bitcoin's energy usage in the Guardian:
https://www.theguardian.com/technology/2018/jan/17/bitcoin-electricity-usage-huge-climate-cryptocurrency

8.5 To Blockchain or not to Blockchain

The choice to consider Blockchain as the solution to a problem is not trivial. The hype and fear of missing out, both play an unwanted role, and as a result the decision making could become slightly biased and focused on the technology. On the other hand, there are many use cases where the technology is very uniquely positioned and could be an ideal solution.

As a general rule of thumb Blockchain fits well in areas where there is a need to establish trust between multiple parties. This role may currently be occupied by incumbent middlemen. While disintermediation may have a heroic connotation, it does not always make sense to take a middleman out; particularly in cases where there is competition, choice and valuable services being delivered. In addition intermediaries often carry certain liabilities and responsibilities that businesses may have outsourced for strategic reasons. The following decision diagram[22] is a tool intended to explore use cases and assess whether Blockchain is an appropriate solution to the problem being considered.

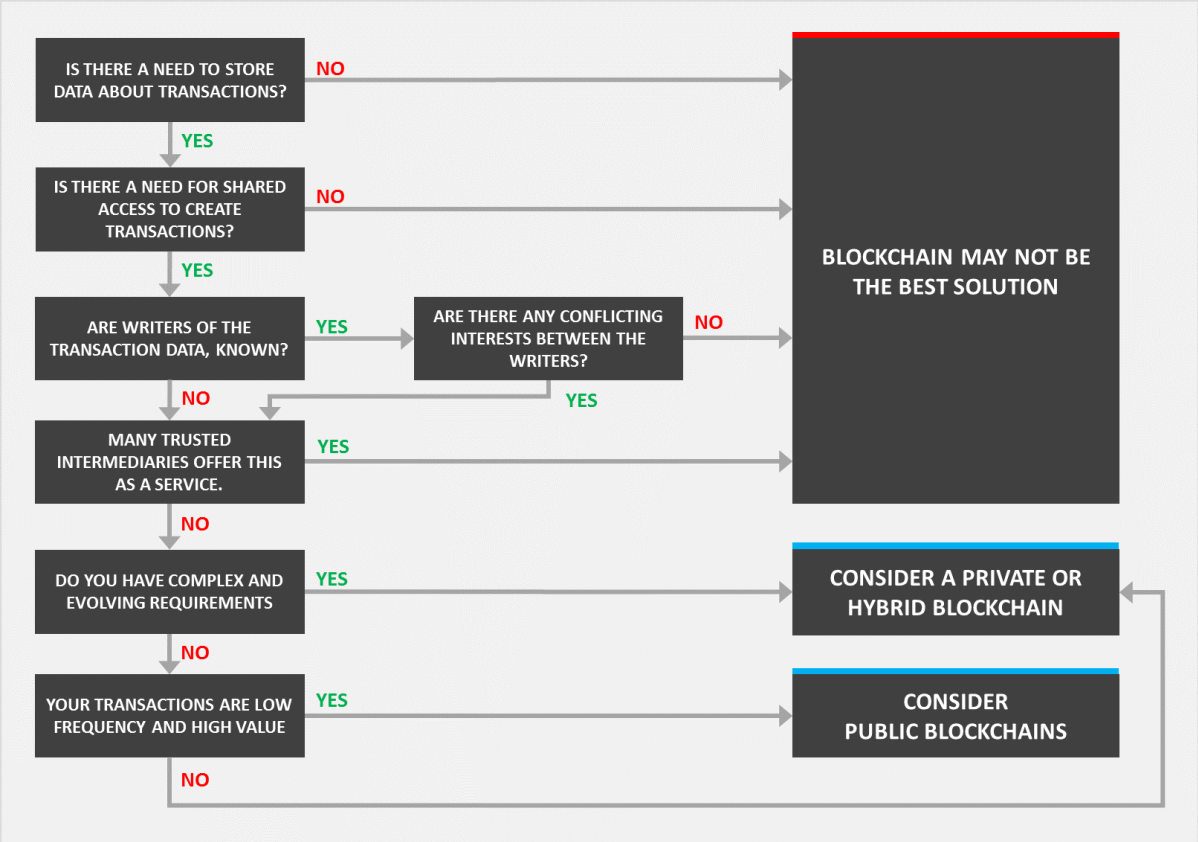

Figure 7: Blockchain solution assessment diagram (©IATA)

[22] This diagram has been developed by IATA. The following article expands on a few other Blockchain decision models:
https://medium.com/@sbmeunier/when-do-you-need-blockchain-decision-models-a5c40e7c9ba1

9 Other Industries

Blockchain is currently being considered in many industries, and in some cases has already been implemented in a lot of different business and functional areas.

Some non-exhaustive examples include:

- **Finance:** Blockchain has already been well investigated in the financial space and there are a number of industry initiatives[23] aiming to streamline both business to consumer as well as business to business financial processes, particularly focusing on cross-border payment.
- **Insurance:** Blockchain has proven to have a high disruptive potential across the insurance space, specifically around: fraud detection and risk prevention; claims prevention and management; Internet of Things[24]; and reinsurance.
- **Transport & Logistics:** According to a DHL study[25] key Blockchain use cases in logistics are: Faster and leaner logistics in global trade; improving transparency and traceability in supply chains; and automating commercial processes in logistics with Smart Contracts.

10 Opportunities in Aviation

The commercial aviation industry is a highly complex space, where a large of number of entities are involved in the delivery of travel products and services, which is sometimes manifested in a single product from a customer perspective. These actors are often collaborating and partnering to be able to co-deliver value and meet the expectation of customers. From the moment passengers search online for an air ticket to the time they arrive at their destination, the airline is just one of around 26 business partners involved in the aviation chain[26].

10.1 Frequent Flyer Points

Blockchain has the capability to significantly streamline the earning, spending, accounting and reconciliation of frequent flyer points by tokenizing these assets into becoming digital and pervasive. While the continuous rise of passenger load factors[27] is good news, it makes it more difficult for airlines to facilitate the redeeming of points for tickets. In addition to the balance sheet liability issue, the process of earning, redeeming and exchanging points is ripe for innovation, in particular across alliances.

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[23] *"R3 is an enterprise Blockchain software firm working with a broad ecosystem of more than 200 members and partners across multiple industries from both the private and public sectors"*
https://www.r3.com

[24] What is the Internet of Things?
https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot

[25] Blockchain in logistics, Perspectives on the upcoming impact of Blockchain technology and use cases for the logistics industry:
https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-blockchain-trend-report.pdf

[26] Blockchain can rebalance the value chain to benefit airlines and passengers:
https://airlines.iata.org/blog/2017/09/blockchain-can-rebalance-the-value-chain-to-benefit-airlines-and-passengers

[27] IATA Passenger Market Analysis 2018:
https://www.iata.org/pressroom/pr/Pages/2018-05-03-01.aspx

10.2 Baggage, Cargo and Spare Parts

Blockchain facilitates tracking of the status and location of valuable assets such as passenger bags, cargo and aircraft spare parts in a very reliable and immutable manner as these assets change custody. This provides an opportunity to enhance visibility and transparency as these type of items move across the value chain. These new capabilities could potentially unlock new product development areas, support the streamlining of the process and equip the providers to deal with disruptions.

10.3 Distribution and Payment

Blockchain allows airlines, travel agents, and others across the distribution space to better collaborate while co-delivering travel products and services. The anticipated changes could expand the distribution reach of all parties involved, and increase the efficiency of how travel products and services are aggregated. It also has the capability to move payment towards being more transparent, real-time and low-cost.

10.4 Passenger and Crew Identity Management

Blockchain could streamline the identity management of passengers, enhancing the experience, protecting privacy, and also enabling airlines and the wider value chain to do business in digital environments.

10.5 Smart Contracts across the Travel Value Chain

Airlines and other actors across the value chain trade products and services and spend significant efforts on contracts, execution of contracts, monitoring the fulfillment stage, reconciliation, invoicing and settlement. All these efforts can either be eliminated or considerably simplified leveraging the concept of Smart Contracts. Smart Contracts could be programmed to be self-executable, triggered by neutral data sources and pre-defined conditions.

11 IATA Blockchain Industry Initiatives

11.1 IATA Coin

The IATA Coin is a concept of an industry owned supranational digital currency. This project is focusing on leveraging the Blockchain technology in IATA Settlement Systems, in particular the IATA Clearing House. It is the continuation of research and development around cryptocurrencies that commenced in 2014. In 2018, the pilot has expanded by onboarding more airlines, more currencies (USD, EUR, and GBP) and the use of Smart Contracts.

11.2 IATA Digital Certification Authority

IATA is already the certification authority for many things (e.g. IOSA[28]). Now IATA is entering into the digital era. The Digital Certification Authority (DCA) concept is a platform to facilitate digital ID management in the commercial aviation distribution space (e.g. agents, airlines, aggregators, passengers) leveraging emerging technology such as Blockchain, Artificial Intelligence and Biometrics. The DCA is envisaged to work and be compatible in the current and future environment (e.g. NDC[29], One Order[30] compatible).

In order to sustain the financial health of the member airlines, IATA is working to build a solution that will provide real time access to trustworthy high quality data to enable partners in the value chain to do business in a safe and secure manner.

The envisaged DCA scope includes:

- Identity management of entities (e.g. travel agent ID)
- Facilitating integrity of content (e.g. integrity of the airline offer)
- Availability of the certification verification platform.

11.3 Digital Finance

The Digital Finance initiative is an exploration of how to best use existing new technologies such as Smart Contract supported by the Blockchain technology to reduce the airline direct operational back office cost and increase back office efficiency. This initiative has been supported by the IATA Financial Development Working Group. This is mainly envisaged to happen through the use of Smart Contracts disrupting the procure-to-pay process between airlines and suppliers such as the airport, ground handler and other airport service providers. The benefits are expected to come from simplification of the contract, contract enforcement, preventing disputes by having a single source of the truth,

[28] IATA Operational Safety Audit (IOSA):
https://www.iata.org/whatwedo/safety/audit/iosa/Pages/index.aspx

[29] NDC (New Distribution Capability) will enable the travel industry to transform the way air products are retailed to corporations, leisure and business travelers.
https://www.iata.org/whatwedo/airline-distribution/ndc/Pages/default.aspx

[30] ONE Order aims to modernize the order management process in the airline industry. This industry-led initiative intends to replace the multiple and rigid booking, ticketing, delivery and accounting methods, using the data communications advances made possible by the implementation of the New Distribution Capability.
https://www.iata.org/whatwedo/airline-distribution/Pages/oneorder.aspx

monitoring of service delivery during the fulfillment stage and introducing real time service acceptance, in addition to streamlining the process of accounting, reconciliation, invoicing and settlement.

11.4 The Travel Grid

Following IATA studies, research and development efforts, the Travel Grid concept is being architected in collaboration with partners across commercial aviation. This concept is about the creation of a common grid that would allow the proliferation of a democratic, yet fast, efficient and flexible environment that provides Blockchain capabilities that can be leveraged by the industry. In analogy, technology giant Apple has created an ecosystem and platform for application developers to build solutions.

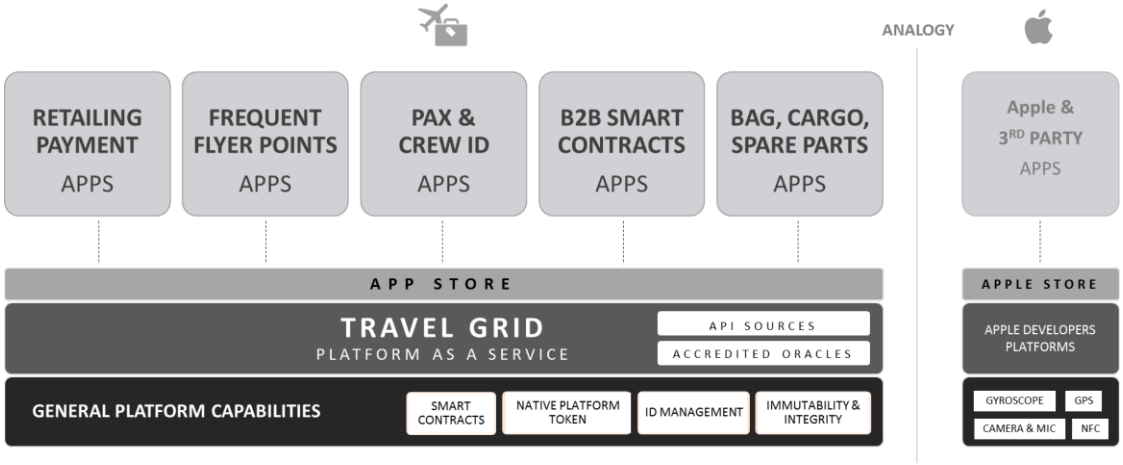

Figure 8: IATA Travel Grid Concept (©IATA)

- The Travel Grid vision facilitates real-time digital interactions, and minimizes the cost of financial transactions, alleviating airlines, travel agencies, hotels and others from high costs.
- The Travel Grid would become the infrastructure for the digital identity management supporting industry transformations such as NDC and One Order.
- Travel Grid could significantly simplify the procure-to-pay end-to-end processes, such as managing agreements, monitoring and enforcing delivery, reconciliation, corrections, invoicing and settlement.
- The Travel Grid allows digital assets to seamlessly float across the value chain unlocking new retailing opportunities, more efficient operations and a seamless passenger experience.

Figure 9: Travel Grid Benefits[31] (©IATA)

[31] IATA fact and figures: 2017 revenues of $754 billion
https://www.iata.org/pressroom/pr/Pages/2017-12-05-01.aspx

12 Travel Industry Blockchain Initiatives

This section expands on a non-exhaustive list of projects across the travel industry leveraging the Blockchain technology.

12.1 Aeron

Aeron claims to be the Blockchain for Aviation Safety. The initial case on which they build their business model is to provide Pilot's flight logs, to boost security when hiring licensed private pilots or dealing with aircraft owners.

12.2 Loyyal

Loyyal claims to be reinventing the creation, reward and management of customer incentives. It envisages to allow the extension of the partner network while also reducing the cost associated with reconciliation and settlement. Furthermore it claims to allow the expansion of marketing capabilities by enabling personalized offerings with real-time insights.

12.3 Ozone

Ozone has been positioned as an alternative distribution system for air transportation. The concept addresses specifically the need to overcome the restrictions of legacy systems and to enable a whole new range of products. Ozone seeks to enable a secondary marketplace with many distributors and customers.

12.4 SITA FlightChain

SITA has partnered with a number of airlines and airports, looking into maintaining a shared ledger on flight information with participation of delegated authorities. SITA Lab has issued FlightChain[32], a paper that expands on the results of the research and development by SITA in partnership with British Airways, Heathrow, Geneva Airport and Miami International Airport into Smart Contracts.

12.5 TravelBlock

TravelBlock proposes to create an alternative to the traditional Global Distribution System (GDS) by using the Blockchain technology. TravelBlock claims to bring cost savings, enhancing security and creating more visibility and transparency for the consumers.

12.6 TravelChain

TravelChain claims to be an open source Blockchain envisaged to be managed by all market players across the travel industry players. It is envisaged to have provisions to allow for sharing information about services as well as ratings and reviews.

[32] FlightChain: 'smart contracts' for shared control of data
https://www.sita.aero/resources/type/white-papers/flightchain-shared-control-of-data

12.7 TripBit

TripBit Smart cryptocurrency for travel is proposing a mechanism to facilitate payment across the travel industry leveraging cryptocurrency and the Blockchain technology. It is envisaged to include payment for Flights, Hotels and Events in its scope.

12.8 Trustabit

TrustaBit offers services to airlines to help customers get compensation for cancelled or delayed flights. This is done through the usage of Smart Contracts on the Blockchain to issue vouchers automatically to passengers when there is a flight disruption.

12.9 Winding Tree

Winding Tree aims to disrupt distribution and inventory management for the travel industry, with flights and hotels in its scope. The concept is envisaged to use a distributed and decentralized ledger, creating a marketplace where transactions related to travel bookings will be recorded. They envisage and claim to be able to create a channel in which there is direct access to the inventory of travel product and service providers.

12.10 Other Initiatives

- Singapore Airlines KrisFlyer Frequent Flyer Program is leveraging Blockchain to streamline redeeming of points amongst other benefits[33];
- Brussels Airport BRUcloud is an open data sharing platform leveraging Blockchain[34];
- Air France KLM has been testing Blockchain technology for aircraft maintenance[35];
- Boeing has filed a patent on using a Blockchain-based anti-spoofing GPS system[36].

[33] KrisFlyer Launches Innovative Miles-Based Digital Wallet, KrisPay: https://www.singaporeair.com/en_UK/sg/media-centre/press-release/article/?q=en_UK/2018/July-September/ne2518-180724&affc=ebefbc33-8d3d-406c-8d34-d4da90e35cee

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13 Recommendations

While the value of Blockchain is concrete in certain use cases, the approach should start with a specific problem and remain solution oriented throughout the process to avoid Blockchain becoming a solution that is looking for problem to solve. When there is a use case for Blockchain, all design options (e.g. public versus private, permissioned versus permissionless) should be carefully analyzed to arrive at the most suitable solution.

Fundamental use case agnostic understanding of the Blockchain technology is often a great advantage to be able to timely assess whether it is a suitable solution for a specific problem. In addition, existing knowledge can be very valuable when engaging with potential solution providers during the discovery and investigation phase.

Finally it is recommended to validate Blockchain as a solution by conducting low risk and low cost testing outside of production environments through prototyping. Open source Blockchain solutions are recommended for early stage prototyping purposes and in some cases for more advanced prototypes and even production solutions.

14 Enquiries and Feedback

For enquiries and feedback about this white paper you can contact IATA at **blockchain@iata.org**.

15 Acknowledgement

This white paper is the result of a series of research and development efforts by IATA in collaboration with airlines and the wider value chain.

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