Transforming the art industry with Blockchain

April 10 2019

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Sometimes an art forgery is so sophisticated, it fools even the experts. For example, in 2011, Sotheby's brokered a deal for a darkly coloured gentleman's portrait said to be by 17th century painter Frans Hals the Elder. The buyer paid roughly AU$15 million (US$10.9 million). In 2016, amid a string of similar scandals, this work was discovered to be made partially of synthetic paint, making its supposed provenance impossible.

This was not an isolated case. In the past decade, many other prestigious London auction houses and New York galleries have also been caught out selling paintings, purportedly by artists ranging from old masters to modern abstract expressionists, which have been shown to be fakes.

Swinburne researchers have developed an [electronic system](#) that promises to make life more difficult for art forgers. Professor Yang Xiang, Dean of the Digital Research Innovation Capability Platform, and his colleagues in the Data Science Research Institute, are using the same cyber security approach used by Bitcoin to guarantee the provenance and [authenticity](#) of works of art.

The system should not only improve logistics for the art trade—an $82 billion dollar annual global market—but provide additional benefits to artists, such as ongoing royalties.

Swinburne and its partner, Melbourne-based start-up ArtChain Global, announced the secure art-trading platform in 2018. "We anticipate this new system will be a game-changing technology," Xiang says. "The Swinburne-developed secure digital technology underpinning the platform has applications far beyond the art world, potentially ranging from logistics to healthcare," he adds.

ArtChain enters the market

Xiang's partnership with ArtChain Global came about in late 2017, when the Melbourne-based group approached the cyber security researcher to ask if Swinburne had any capabilities with a computer technology called [blockchain](#). "We have a number of researchers working on R&D blockchain projects, so it was a perfect fit," Xiang says.

Blockchain is best known in the context of Bitcoin and its competitor online virtual currencies. Blockchain creates the secure environment within which these 'cryptocurrencies' can be stored and traded. "Cryptocurrencies are the first real-world application of blockchain technology," Xiang says.

"To describe how blockchain works, I like to use a marriage ceremony as an example," Xiang says. On the big day, friends and family all witness the event and can each verify that the ceremony took place.

In the case of a cryptocurrency transaction, a distributed network of invited computers act as the witnesses, each recording that an exchange of funds took place. Just as everyone invited to the wedding remembers the event, the computers all hold an identical copy of the transaction record. If anybody tried to fraudulently manipulate a cryptocurrency record, the doctored copy would no longer match all the other computers' version and the change would be rejected. "Bitcoin is the first application that shows blockchain's potential," says Xiang. But the same idea could underpin almost any type of transaction, he says.

Including the trade of art. "Although there are so many high-value transactions, one of the key problems in this industry is the authenticity of the artworks and collectables," he says. Developing an art-trading platform based on blockchain would eliminate that concern. Using blockchain would be akin to having multiple witnesses on hand to observe the artist selling a piece to a dealer or collector, and then witnessing each onward sale of the piece.

Technologically, adapting blockchain code for a new application is not too difficult, as there are several open source blockchain platforms available for use, says Xiang. The biggest challenge has been developing protocols to robustly connect the physical artwork to its digital blockchain record. The team has applied cutting-edge electronic technologies to overcome this challenge, Xiang explains.

The first level of security comes from attaching to the object a smart, internet-enabled electronic tag, connecting the artwork to the internet of things (IoT). These tags, which give the artwork a unique online identify, can also be integrated with GPS tracking modules, so its physical location is always known.

As a further security measure, the team has developed an artificial intelligence (AI) program that analyses high-resolution camera images of the real artwork. "If there is a fake, very minor features not recognisable by human eyes can be detected by AI," Xiang says. AI, which is based on deep learning algorithms, was trained to spot fakes by allowing it to analyse a huge library of images. Attributes such as colour saturation, brightness and depth are all analysed to detect minor differences between the real version and the copy. The system is already working quite well in the lab, says Xiang. Real-world testing began in 2018.

The art-trading platform will integrate all these new technologies into a single interface. "We have developed a combined system that utilises AI and IoT, plus the blockchain," Xiang says. "So the whole system involves multiple new technologies, all done at Swinburne."

Ongoing royalties

John Young, a Melbourne artist and studio owner, has been consulting for ArtChain Global as the platform was developed. "I am very optimistic about its possibilities," says Young. "There are several areas

where this is clearly a very good thing." Not least, of course, is confirming the authenticity of an artwork.

Although forged work, claimed to be painted by figures such as Jackson Pollock, tend to grab headlines, these high-profile cases are the tip of the iceberg when it comes to art copying. A more prevalent threat for today's working artists is having online images of their artworks copied and used without permission, attribution or payment.

"I have had people lift work from my website, then blow it up to full size and use it as a shop window display," Young says.

Registering a work on ArtChain would be a safeguard, providing a timeline and proving that Young was the creator of the work.

Aside from its security credentials, the other key feature is the way the blockchain record grows over time. Each time an object is traded—be it a Bitcoin or a painting—a new line item (or 'block') is added to the end of the existing record file. The record itself therefore serves as a chronological history of the object's ownership and its provenance.

"For the art market, provenance is very important," Young says. "A work held in a collection for 50 years is sometimes seen as more valuable than a piece that has been continually traded on the secondary market."

The growing blockchain record has other potential advantages for the art trade. It allows for royalty payments for the artist for each onward sale of their work. Items sold by artists early in their career can significantly increase in value over time as the artist makes a name. "Traditionally the artist cannot get any benefit from that, says Xiang. "In the blockchain platform, we embedded a new royalty system. Because blockchain cannot be manipulated or changed by third parties, the artist can collect the royalties many years later," he says.

Artists will need to be educated about blockchain based art transactions before they are likely to embrace it, Young says. "Like any start-up technology, users need some convincing in terms of trust." But Xiang says the reception to the system so far has been positive among artists.

ArtChain also plans to expand into Asian countries.

From art to antimalarials

For Xiang and his team, the blockchain-based art-trading platform is just the beginning of their work in this area. "The fundamental technology is applicable to many other areas, in particular in supply chains," says Xiang.

Their system for combining, AI, IoT and blockchain could be readily adapted for the trade of other collectable items, such as jewellery.

The technology could also become an indispensable tool in stemming the expanding trade in counterfeit medicines.

Fake versions of antimalarial drugs, containing little or no active ingredient, are of particular concern, according to the World Health Organization, which found that substandard and counterfeit medicines may cause up to 116,000 malaria deaths each year in sub-Saharan Africa alone.

Developing countries are particularly vulnerable to fake drug imports, as they often lack the resources to detect the crime. But, even in tightly regulated countries such as Australia, a small number of counterfeit medicines can sometimes be slipped into the healthcare system.

The same blockchain-IoT technology Xiang has developed to record the authenticity and provenance of artworks could be used to secure the

pharmaceutical supply chain, providing traceability of each drug carton back to the original manufacturer. A blockchain-based platform like this could augment efforts to control the problem by regulators and pharmaceutical companies, which already includes making packaging harder to fake.

"In the next few months we will have connections with other industries, particularly in the area of healthcare, education, transportation and logistics," Xiang says.

Provided by Swinburne University of Technology

Citation: Transforming the art industry with Blockchain (2019, April 10) retrieved 26 April 2024 from https://phys.org/news/2019-04-art-industry-blockchain.html