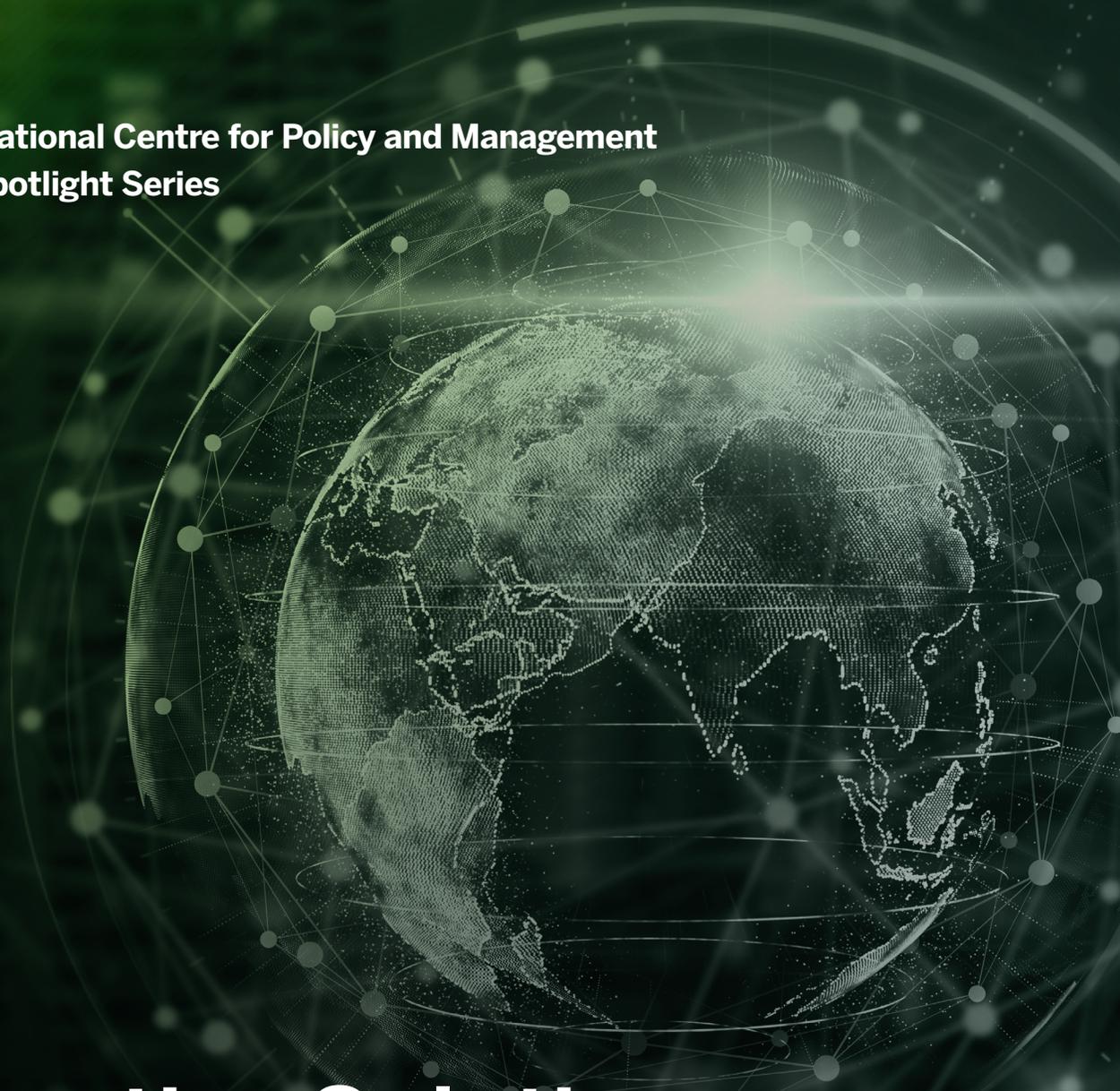


Lawrence National Centre for Policy and Management
Research Spotlight Series



Disruptive Solutions to Disruptive Challenges

Fighting counterfeit using blockchain technology and policy



Lawrence National Centre
for Policy and Management

Research Brief
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Executive Summary

The production and sale of counterfeit products around the world are causing disruptions in many industries.

Current solutions to combat counterfeit, such as manufacturing processes and RFID tags, have been largely ineffective and industries and governments around the world are looking at blockchain as an alternative solution. This report explores the issue of counterfeit, the effectiveness of current strategies versus blockchain solutions, and the role of government in creating policies conducive to blockchain adoption. It features pioneering research by Ivey's Professor Hubert Pun, who has published academic articles and practitioner cases on the topic.

Manufacturers are considering blockchain technology adoption due to the economic, supply chain transparency and brand reputation benefits it provides. However, the cost of implementing blockchain and the associated privacy concerns can lead to suboptimal adoption of blockchain in fighting counterfeit. Thus, robust privacy laws and subsidies can be valuable to encourage blockchain adoption by firms and manufacturers.

While Canada has been a leader in developing many new technologies, it is behind its peers in blockchain solutions for industries, raising the call for developing policy and strategy in exploring and implementing such solutions. In particular, this report highlights the need for a broader legal framework, developed swiftly, thoughtfully and collaboratively between industry and government to build a strong foundation of consumer trust and confidence.

Introduction

Businesses around the world have had to confront a number of challenges within the everchanging global supply chain.

A fragile global economy, geo-political tensions and the COVID-19 pandemic have all contributed to a tenuous environment for firms and governments alike, requiring innovative shifts in policy development and decision making every step of the way. Counterfeiting, a persistent challenge to industries and policymakers around the world, has continued to evolve and create havoc on global supply chains. The phenomenon is being felt across many industries, with the fashion and electronic parts sectors experiencing annual combined losses of approximately \$267 billion USD.ⁱ Aside from traditional counterfeit products like handbags and watches, consumers also risk purchasing counterfeit food products such as milk, coffee, and unregulated medications. But what can be done to tackle counterfeiting?

Current strategies being employed to combat counterfeit, such as manufacturing processes, hologram tags, and changing consumption habits have been inadequate at addressing the core issue head on. Governments and businesses are turning to technology adoption to solve increasingly difficult problems, looking for disruptive solutions to disruptive challenges. Blockchain, widely recognized as an emergent technology with the potential to disrupt many industries and business practices, is now finding its use in combating counterfeiting in some industries.

As part of the Lawrence National Centre's Spotlight Series, this report explores the issue of counterfeit, the effectiveness of current strategies versus blockchain solutions, and the role of government in creating policies conducive to blockchain adoption. It features the pioneering research on the topic by Ivey's Professor Hubert Pun, who grew up in Hong Kong and has witnessed firsthand the dangers of counterfeit on the local economy.

Significance of Combating Counterfeit

Counterfeiting is a major business threat to multiple industries and sectors. Simply put, when notorious markets sell deceptive counterfeit products, the original manufacturing brands lose sales.

The clothing, cosmetics, handbags and watches industry has seen an estimated loss of \$98 billion USD. Comparably, the electronic parts industry has seen an estimated loss of \$169 billion USD.ⁱⁱ During the COVID-19 Pandemic, many industries, including tech, pharma, and clothing, were severely affected by counterfeiting. In fact, the production of counterfeit products increased during the pandemic to an all-time high due to increased household spending on consumer products.ⁱⁱⁱ

The negative impacts of counterfeit products are not just limited to financial or economic matters. Knock-off skincare products are considered a major cause of skin-related diseases among females.

Moreover, counterfeit automotive parts, smartphones and even vapes can cause serious personal injuries and even death.^{iv} These consequences have a severe negative impact on the brand reputation of the original manufacturer and consumer trust. If deceptive knock-off goods fail to deliver the promised results, consumers will blame the authentic brand and will also lose their trust in the product's retailer.

With the rise of e-commerce and social media, the lines between authentic and counterfeit products have become fuzzier. Unfortunately, many online retailers don't have the knowledge or tools to filter counterfeit products. As a result, it's more important than ever for businesses to protect themselves and their consumers from the harms caused by counterfeit products.

What Are Counterfeit Products?

Counterfeit products are goods, often of inferior quality, made or sold under the original manufacturers' brand name without the brand owner's authorization. Counterfeit products are generally divided into two categories: non-deceptive and deceptive counterfeits.

Non-deceptive Counterfeits

These are described as fake products which consumers can distinguish their difference from the original product. Some consumers may decide to buy such counterfeit products due to economic reasons. For example, patients with Hepatitis C disease require a medicine called Sovaldi, which costs \$84,000 for a 12-week cycle of treatment. Due to the high price, some patients buy counterfeit drugs from unregulated online pharmacies at costs that are less than \$900 a cycle. Although these fake

medicines are less effective, they still mimic the authentic drug to some extent, convincing some patients to use them instead. Canada generally has a very safe supply of drugs and the likelihood of purchasing counterfeit medicine at a local pharmacy is low, however, over the recent years fake medicine has been finding its way into online shops and even neighborhood pharmacies in Canada.^v Illegal internet pharmacies that source their medications from China, India, and Singapore account for most of the counterfeit drugs on the market.^{vi}

Deceptive Counterfeits

Deceptive counterfeits are goods that look identical to the original product, and the customer cannot differentiate between the two product types. For example, there are many deceptive fake drugs that are sold in developing countries. Consumers cannot distinguish between the real and the fake products. Deceptive counterfeits are the most dangerous type of counterfeits, which Professors Pun's research focuses on and provides possible solutions for combating them.

Current Solutions for Combating Counterfeit Products

Manufacturing processes, RFID and hologram tags are currently the most popular methods used to combat counterfeit products. Nonetheless, these methods are not fully effective and have their own flaws.

Manufacturing Processes

(MATERIAL & MANUFACTURING QUALITY)

Many luxury brands use high quality manufacturing techniques to operate as a differentiating factor between itself, other luxury brands, and counterfeits. For example, Hermès uses a specific mouliné linen thread coated in beeswax for stitching on

their handbags.^{vii} The process is time consuming and labour intensive. Other small quality quirks like the use of gold leaves, linen threads, print clarity, and product numbers are difficult to spot and authenticate. The process requires keen eyes and knowledge of specific details to be effective. Identifying unique manufacturing identifiers is a challenge for experts and therefore even more so for consumers.

RFID or Hologram Tags

Technologies such as radio frequency identification (RFID) or hologram tags were utilized for addressing counterfeiting. However, these solutions have two major problems. First, it is possible for counterfeiters to copy the genuine product's tag. Second, product authenticity can no longer be guaranteed once a product has been purchased since tags are removed at the sale counter. Therefore, second-hand purchases cannot be easily verified.

Changing Consumption Habits

Information campaigns have been rolled out by industry groups, private companies, and regulators to create consumer awareness about manufacturing processes and counterfeits. An example is Comité Colbert's partnership with the French National Anti-Counterfeiting Committee to educate consumers that the purchasing of counterfeits constitutes a criminal act.^{viii} Despite such efforts and French consumers having the strongest awareness of European IP law in the EU, counterfeit products sold online and seized by French customs grew by a factor of 20 over five years leading up to 2011.^{ix}

Using Blockchain to Combat Counterfeit

Blockchain solutions can be more effective in combating counterfeit than the above existing strategies.

Information held in blockchains exists as a shared and continually reconciled database. In this context, the terms block and chain refer to digital information (the block), which is stored in a private database (the chain). Transactional data and history of transactions are captured and stored in a cloud-based blockchains, which can then be retrieved by a customer, usually through a mobile application by scanning a QR code on the product. This approach addresses some key challenges observed in other anti-counterfeit strategies.

First, blockchain-based solutions provide better authenticity than any other alternatives. Retailers can easily and reliably verify the product's authenticity by using a friendly user interface on a website or a mobile app, thus limiting counterfeit manufacturer's ability to sell their products. Second, private blockchains provide a much more secure record of transactions associated with a product. The blockchain database is not stored in any single location but is hosted by multiple computers simultaneously, hence making it decentralized. Once a transaction is recorded on the ledger, it is nearly impossible to change due to the decentralized

nature of blockchain technology. This nature of the blockchain platforms make them a great way for authenticating products, as they cannot be hacked or copied by the counterfeit manufacturers.^x

In addition to combating counterfeit products, the digital and irreversible nature of the blockchain technology removes the difficulties related to recording and storing supply chain-related transactions and provides transparency on every level of the production process. With the use of this technology, retailers and manufacturers can share some of the sale and production data with real-time accuracy. Many industries, including the dairy industry, have already started using this technology in China and Australia.^{xi} Finally, the use of this technology can also help with tracing the sustainability efforts of organizations. For instance, coffee users can track their coffee beans to see whether or not they are coming from a farm that uses sustainable and environmentally friendly practices.

Cases: Blockchain Adoption to Fight Counterfeits

Some of the most prominent uses of blockchain include decentralized finance, digital voting, digital IDs, tax regulation and compliance, food safety and medical tracking. As a result of its high customizability and proven security, many countries like China and Australia have supported companies in incorporating blockchain technology into their operations. Some prominent examples include the adoption of blockchain technology by Diamond manufacturers in China and the dairy industry in Australia.

The diamond supply chain is extremely complicated and involves multiple parties including miners, gemological scientists, processors, manufacturers, certifiers, regulators, shippers, wholesalers, designers, retailers, insurers, and others. Traditionally, the information was not shared across the entire network, leading to multiple versions of the same documents, which had to be reconciled. Since stones change hands many times along the supply chain, fraud can occur either intentionally or unintentionally.

Blockchain is typically applied in the diamond industry to track the movement of raw materials (rough diamonds) from the miner to the refiner or gem cutter, then through the distributor and manufacturer to the retailer, and, finally, to the consumer.^{xii} Instead of being logged on paper, the raw material is assigned a serial number, and data is entered into a digital ledger as the raw material moves from place to place throughout its transformation. Since blockchain systems cannot be edited, they are extremely secure. As a result, it becomes difficult for unwanted or illegal additions to be introduced into production and distribution systems.

Mined diamonds (real) and lab-grown diamonds (fake) can then be easily distinguished from one another. Further, blood diamonds (diamonds mined in a war zone and sold to finance an insurgency, an invading army's war efforts, or a warlord's activity) can also be tracked by using information of suppliers from the blockchain.

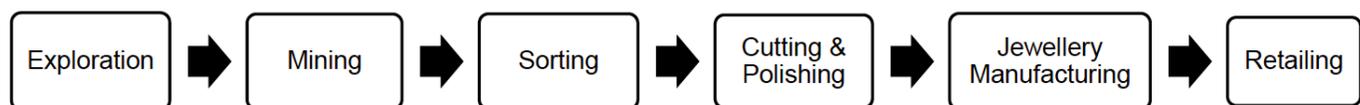
In China, Chow Tai Fook Jewellery Group Limited (CTF), one of the most popular jewellery chains, was among the first to incorporate blockchain technology for diamond certification and production tracking. Over the past couple of years, other diamond manufacturers have also adopted blockchain technology. De Beers, Signet Jewelers Limited and Russia's PSJC Alrosa have all adopted a supply chain traceability platform called Tracr that uses the Ethereum blockchain framework. The Canadian mining company Lucara Diamond Corp has also developed a digital sales platform called Clara that uses blockchain technology, however, the adoption rate of the platform is nowhere near some of its international competitors.

In Australia, organizations in the dairy industry have also started using blockchain technology to overcome supply chain difficulties. Blockchain Australia is among the first companies to provide such a service. Blockchain Australia works to eradicate the need for intermediaries who constantly verify transactions and ensure security in the supply chain.^{xiii} It achieves this by synchronizing all data and transactions across a decentralized, peer-to-peer network.

This cross-checking makes the network secure, reliable, and unable to be exploited by third parties or cybercriminals. Smart contracts can also be integrated to eliminate the prevalence of payment delays. In specific regards to the dairy industry and its supply chain, blockchain technology has been proven to enable data collection at every stage of the supply chain, from the herd level all the way to the point at which the milk bottle hits the supermarket's shelves. Production practices can be incorporated into this data, giving the manufacturer and consumer more information about animal welfare considerations, environmental practices, carbon footprint impacts and antibiotic applications. This information works to increase consumer confidence and strengthen the relationship between dairy producers and the general public. Walmart China is also adopting a similar technology to guarantee the food safety of its consumers.

EXHIBIT 1

Diamond Supply Chain Process ^{xiv}



Risks and Security Concerns

Similar to other digital technologies, there are risks related to consumer privacy and cyber security associated with blockchain adoption.

Consumer purchases recorded using blockchain can raise identity and privacy concerns. Information stored in blockchain is not anonymous, rather it is pseudonymous. MIT Technology Review recently featured a study exploring the growing ease of connecting blockchain's pseudo-identity to real-life identity when using bitcoin. The report details how analytical data leaked throughout the purchase process via web trackers, and cookies can provide

information to hackers to crack the pseudonymous privacy wall that blockchain provides.^{xv} Another recent study has indicated that hackers can infer the actual transaction inputs with 80% accuracy because the sampling method in the blockchain is not truly random. Such hacking can reveal all the previous transactions consumers have made, and many consumers might not be comfortable using the technology due to privacy concerns.^{xvi}

To address these challenges, governments should consider policy around how consumer data is collected, processed and erased. The right to erasure, for example, gives consumers the right to ask organizations to remove their personal information. Such consumer rights have been incorporated into laws in the European Union and Argentina.^{xvii}

The Role of Policy in Blockchain Adoption

Professor Hubert Pun's research uses an economic tool called Game Theory to analyze the competitive interaction between manufacturers and counterfeiters, and the role of government policy.^{xviii}

Pun's research suggests that when the counterfeit quality relative to the manufacturer's product is low, the manufacturer can use tactics such as price differentiation to signal its superior quality; and when the counterfeit quality is extremely close to the quality of the manufacturer's product then differentiation makes little sense as such strategy can only encourage price wars. Thus, manufacturers are most likely to consider adopting blockchain technology when the counterfeit quality is intermediate. Manufacturers themselves may adopt blockchain technology due to the economic, supply chain transparency and brand reputation benefits it provides.

However, the cost of implementing blockchain and the associated privacy concerns can lead to suboptimal adoption of blockchain to fighting counterfeit. Thus, privacy laws and subsidies can be important to encourage adoption of blockchain to fight counterfeits. Consumers are better off because they get authentic products for cheaper, and should they choose to resell those products in the secondary market, they can signal their products to be authentic as well through the blockchain. Supporting policies for blockchain adoption will be particularly important in industries where social and economic consequences of selling fake products are catastrophic, like food and pharmaceutical industries.

Canada Trailing Behind

Despite the high presence of blockchain start-ups in Canada, the country has yet to fully utilize the potentials of the technology.

Canada has over 250 start-ups operating in the blockchain industry with over 1600 employees.^{xix} About 60% of these firms offer services related to Cryptocurrencies, Finance & Fintech, or Blockchain Consulting. Only 4% are in supply chain management. Further, the majority of Canadian businesses have yet to adopt the new technology, due to financing issues or lack of trust and proper knowledge about the technology. Even in terms of cryptocurrency adoption Canada lags behind the majority of developed countries and is ranked 45th on the global blockchain adoption list done by Statista.

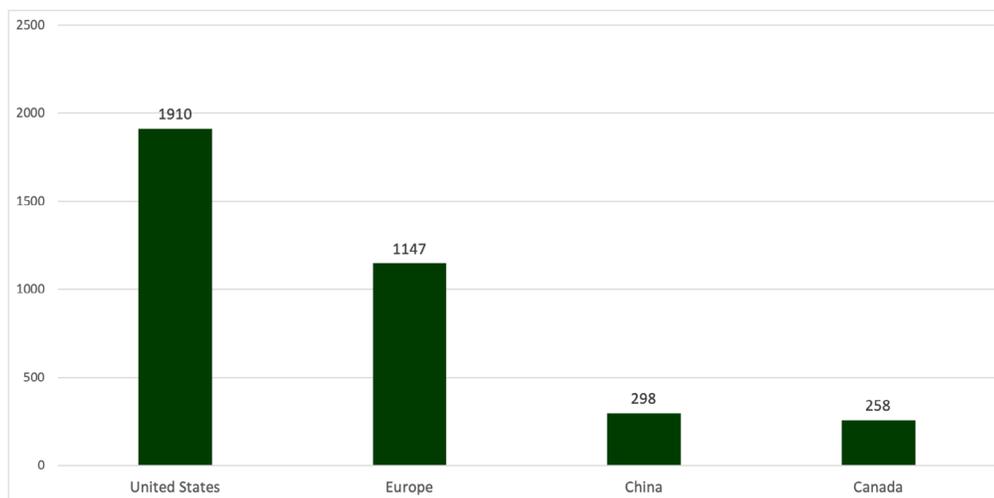
Currently, Canada is working on the token economy regulation, and the Canadian Securities Administrators (CSA) has named addressing blockchain as one of its strategic business goals for 2019-2022. While blockchain-related policy is

being determined, several industry consultants noted that regulatory uncertainty has disincentivized several blockchain companies from staying in Canada, including prominent industry player Ethereum.

The OECD reports that Canada had 8 uses of blockchain in the public sector as of March 2018, placing it in the top 10 of nearly 50 countries analyzed.^{xx} Since the OECD study, Canada has announced that it intends to involve blockchain technology and AI in digital transformation within government departments, through its Policy on Service and Digital, effective April 2020.^{xxi} Provincial governments in Canada are also beginning to explore blockchain, such as a Government of British Columbia project, OrgBook BC, which has taken inspiration from blockchain technology to create a verifiable identity and registration management service. Although the public sector and government related initiatives are doing fairly well in blockchain adoption, Canada is behind in blockchain technology adoption in important industries relative to its peers.

EXHIBIT 2

Number of Blockchain Start-ups by Country



Graph created using data from Crunchbase

Call to Action

Blockchain solutions are becoming effective in combating counterfeit and have potential to improve consumer welfare, especially in industries with catastrophic and socio-economic impacts.

If Canadian suppliers don't adopt blockchain, they run the risk of falling behind leading countries who are rapidly incorporating adoption strategies into their respective supply chains. Implementation of blockchain has costs and consumer data risks. Adoption is not likely to be immediate or automatic and would require robust policy support. Canada may have been a global leader in developing new technologies, but is behind in blockchain adoption, especially among manufacturing supply chains. Given Canada is trailing behind, there is an urgency to act. Policymakers and Industry leaders can forge ahead in two specific areas to move the needle on blockchain adoption in Canada.

Legal Framework

Canada's federal government set out to modernize digital privacy legislation last year through Bill C-11. The act calls for the creation and implementation of a new 'Digital Charter,' modernization of the Consumer Privacy Protection Act, and reform aspects of the Personal Information Protection and Electronic Documents Act (PIPEDA). However, with the most recent session of Parliament dissolving in August 2021, the future of these legislative changes is unclear. The government needs to move forward with a clear and robust legal framework, while working in coordination with key stakeholders to ensure speedy implementation and avoid preventing the adoption of blockchain solutions. The legal framework needs to provide trust for consumers who will feel supported and able to fully utilize a digital

system prone to risk. Having digital rights which are enforceable will provide consumer confidence and allow for future adoption of blockchain solutions. In the EU, digital privacy legislation, GDPR, can offer important lessons for Canada as it establishes its own model and due diligence. In sum, the creation and implementation of a broader legal framework is important for the future adoption of all digital technologies, including blockchain, to provide consumer confidence when utilizing innovative digital platforms for purchases and resale of goods.

Collaboration

Government agencies and departments, in collaboration with industry, can be key players in strategically identifying which industries would benefit from adopting blockchain to combat counterfeit while improving coordination and efficiency in the supply chain. Within these areas, further collaboration can be fostered to identify specific challenges and barriers of future adoption and which policy support would be required to adopt technologies in a responsible way. It is critical for governments and industry to work together to spur progress, curate solutions and establish a competitive future for Canada within the global supply chain. Without collaboration, blockchain adoption strategies, and technology adoption writ large, face the risk of a slow and incomplete implementation process.

Canada has confronted many innovative and challenging policy questions in its history. The emergence of new technologies like blockchain offers an opportunity for Canadian policy makers and industry leaders to come together and create a strategic, cohesive and creative plan to build consumer trust while establishing a competitive edge in the global community.

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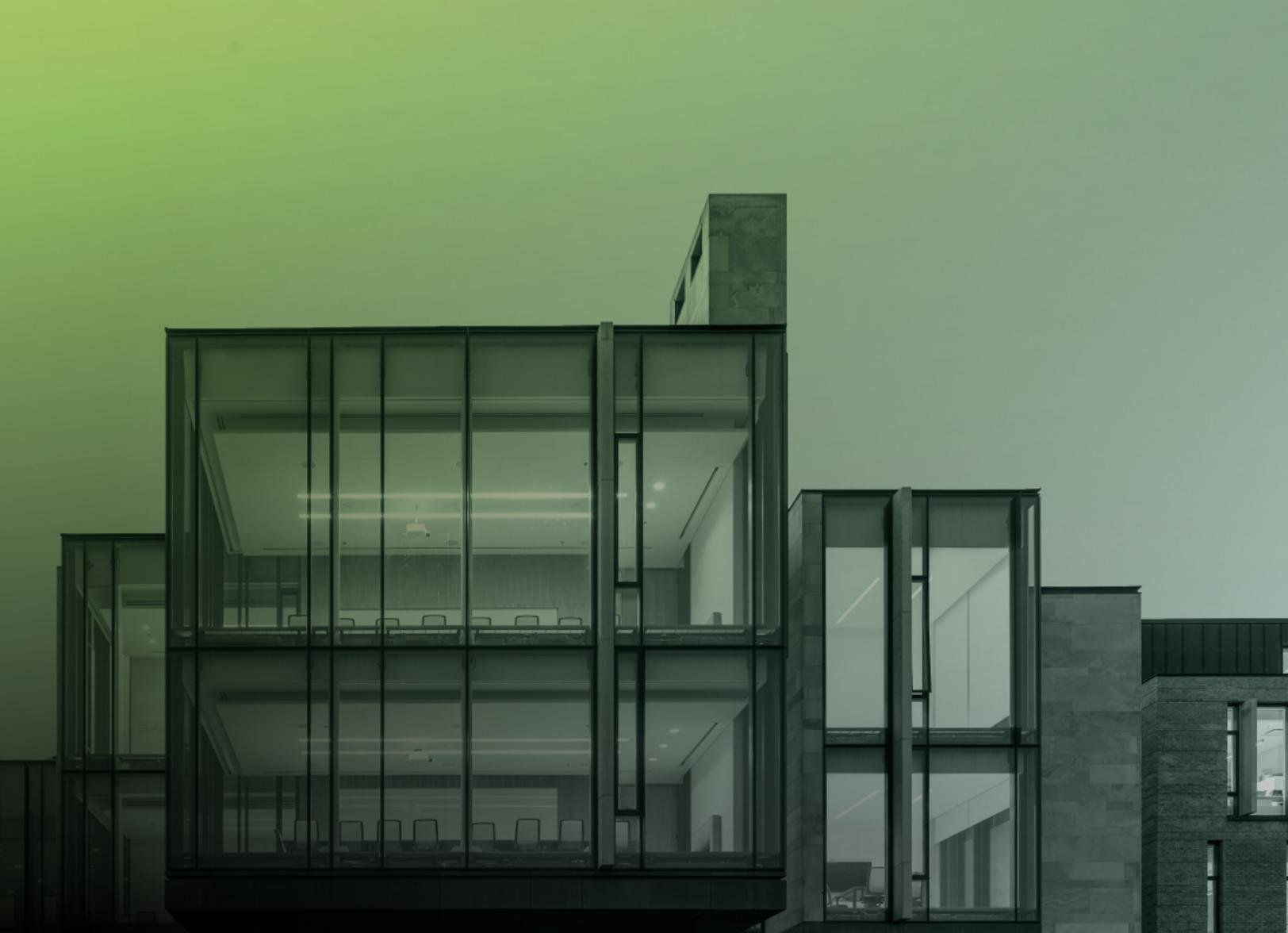
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