

TRANSFORMING PLASTIC POLLUTION USING BLOCKCHAIN

**Toward a World Without Single-Use Plastic
Packaging Waste**

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INSEAD

August 2019





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Realizing the new promise of the digital economy

In 1994, Don Tapscott coined the phrase, “the digital economy,” with his book of that title. It discussed how the Web and the Internet of information would bring important changes in business and society. Today the Internet of value creates profound new possibilities.

Don and Alex Tapscott launched the Blockchain Research Institute to help realize the new promise of the digital economy. We research the strategic implications of blockchain technology and produce practical insights that will guide our members in achieving success.

Our global team of blockchain experts is dedicated to exploring, understanding, documenting, and informing leaders of the strategies, market opportunities, and implementation challenges of this nascent technology. Research projects are underway in the areas of financial services, manufacturing, retail, energy and resources, technology, media, telecommunications, healthcare, and government as well as in the management of organizations and the transformation of the corporation.

Our findings, conclusions, and recommendations are initially proprietary to our members and are ultimately released under a Creative Commons license to help achieve our mission. Each research publication includes a video introduction by Don and an infographic for members’ use in communicating these ideas throughout their organizations. To find out more, please visit www.blockchainresearchinstitute.org.

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Foreword

In January 2018, the European Union announced an initiative to ensure that every piece of plastic packaging in Europe be either reusable or recyclable by 2030.¹ Speaking to the media, the vice president of the European Commission, Frans Timmermans, said Brussels' priority was to clamp down on "single-use plastics that take five seconds to produce, you use it for five minutes, and it takes 500 years to break down again."² A key driver of this initiative was China's ban on importing 45 percent of the world's plastic waste since 1992, which took effect in January 2018.³

At the same time, the Coca-Cola Company announced an ambitious goal "to help collect and recycle a bottle or can for every one we [Coca-Cola] sell by 2030. Regardless of where it comes from, we want every package to have more than one life. This is our vision for a 'World Without Waste.'"⁴ In June 2018, Coca-Cola European Partners engaged a team of researchers from INSEAD, among them the very capable Michael Peshkam, author of this piece. The team's goal was twofold: to challenge the company by envisioning a world without beverage packaging waste in Western Europe and identifying pathways to achieve the vision by 2030.

This research highlights the salient points of the Coca-Cola study and makes the case that its findings, recommendations, and the potential blockchain solution described here are equally applicable across the single-use plastic packaging industry.⁵ Michael told us, "The beverage industry in general and brand owners in particular have an opportunity to create their own Uber moment"—that is, to build a platform for using underutilized assets—thereby transforming their industry and crafting entirely new customer value propositions.

What Coca-Cola does with the findings of the study remains to be seen. What is clear is that one organization cannot act alone. Much work is needed, and now is the time! Victor Hugo said, "Nothing is stronger than an idea whose time has come."⁶



DON TAPSCOTT

*Co-Founder and Executive Chairman
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Case in brief

Blockchain technology can support a more equitable and sustainable plastics business by bridging the gap between each item of packaging and the parties that use it.

- » The widespread use of plastics has left us with over 6.3 billion metric tons of waste. By 2050, we will have deposited about 12 billion metric tons of plastic waste in landfills or our environment. If we fail to implement sustainable change, then our impact on the planet and our global economy will be significant.
- » Blockchain technology can support a more equitable and sustainable plastics business by bridging the gap between each item of packaging and the parties that use it. In addition to finding resourceful end uses for recyclable material, blockchain allows parties to share information securely without intermediaries.
- » Blockchain technology is disruptive by nature and could unlock the value in plastic waste. But breaking the perceptions and norms of treatment of plastic will require strong leadership, systematic change across the industry, and the resources and talent.
- » New business models could emerge to capture this unlocked value. Start-ups such as Circularise, Empower, Litterati, and Plastic Bank are pioneering several of them. Working together, industry leaders can use blockchain to attach value to every piece of packaging and transfer this value to consumers upon product purchase.
- » The industry needs greater openness and transparency to overcome accusations of greenwashing. True champions of change must call a global public to action and garner support from the blockchain community so that they can build a circular economy for plastics.

The problem of unsustainable waste

To date, mankind has produced an estimated 8.3 billion metric tons of virgin plastic, and 380 million tons in 2015 alone.

To date, mankind has produced an estimated 8.3 billion metric tons of virgin plastic, and 380 million tons in 2015 alone.⁷ For its 2018 statistic of the year, the Royal Statistical Society (RSS) selected this: 90.5 percent of plastic is never recycled.⁸ This waste has not only profound environmental implications but also economic ones: the value of this waste is over \$7 trillion—enough to buy one of the tech giants.⁹

Since the use of plastic became widespread in the mid-20th century, more than 6.3 billion metric tons have become waste: nine percent was recycled, 12 percent incinerated, and 79 percent ended up in landfills or scattered about Earth. At this rate, by 2050, our planet will bear the burden of roughly 12 billion metric tons of plastic waste, which will outweigh all the fish in the ocean.¹⁰





Garbage Environment Beach Pollution Waste by H. Hach (hhach), 2016, used under Pixabay license, accessed 7 July 2019.

Plastic packaging constitutes 42 percent of this total; of that portion, food and beverage packaging is 55 percent.¹¹ In addition, the consumption of oil to produce plastics will increase from eight percent in 2015 to 20 percent in 2050 with the associated carbon footprint growing from one percent to 15 percent.¹²

The value of the material “left in the ground” is considerable, however; and several innovative projects have already shown potential for putting plastic waste to better use. For instance, the Dutch city of Zwolle developed the world’s first bike lane made from about 500,000 plastic bottle caps.¹³

Plastic roads are one example of what we might do with unrecycled plastic waste. The potential solutions are diverse, ranging from new plastic materials that are edible, compostable, and degradable, to new mechanical and chemical recycling technologies powered by digital technologies, and reusable and refillable containers embedded with radio frequency identification (RFID) chips.¹⁴

Rajan Kasetty, partner at the 22 Fund, explained how recycling works, from a local viewpoint, and how technology could disrupt an otherwise unsustainable cycle:

For the past several years, the onus of separating and collecting recyclable trash has been mostly on consumers and municipalities. These loosely organized efforts had little accountability. Recycling business needs the kind of disruption that we have seen decimating the taxi business. Technologies like [Internet of Things], blockchain, and [artificial intelligence] need to be brought into play to design new models all the way from production to distribution, retail, usage, disposal, collection, and recycling.¹⁵

The Dutch city of Zwolle developed the world’s first bike lane made from about 500,000 plastic bottle caps.



To get rid of waste, one must either stop producing waste or stop considering it waste.

The INSEAD research team asked whether workable solutions were already available and why plastic waste was continuing to mushroom. They conducted nearly 40 in-depth interviews, and their systemic analysis of responses revealed three dimensions of the problem.¹⁶

- » *The magnitude of the problem requires a collaborative solution.* As the World Economic Forum's *Global Risks Report 2019* highlights, many of the biggest problems facing society today are global and fiendishly complex.¹⁷ To solve such problems, we need cooperation among all stakeholders, and the large scale of cooperation inevitably makes change difficult.
- » *The application of solutions is siloed and fragmented.* This collaboration is vital as currently many stakeholders in the plastics value chain are operating in silos. As the innovation charity Nesta reminds us, true systemic change can occur only when stakeholders work together toward a common purpose.
- » *Waste is viewed as worthless.* To get rid of waste, one must either stop producing waste or stop considering it waste. Single-use plastics were and continue to be promoted as efficient, convenient, and cheap packaging product in the food and beverage industry. Consumers dispose of packaging after consumption of the product like any other household waste, and this is largely because no one has assigned monetary value to the packaging.

Two researchers from the University of Southern California Viterbi School of Engineering showed that blockchain has considerable potential to facilitate a marketplace for plastic packaging and other goods.¹⁸ Their system utilizes smart contracts to allow multiple stakeholders to transact both data and money, often directly surpassing any intermediaries. Harvard Business School's Thales Teixeira regards this disintermediation as the second wave of innovation wrought by the Internet, and blockchain technology fundamentally supports such transactions because of the elevated levels of trust built into the technology.¹⁹

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Dr. Rudy Koopmans, director of the Plastics Innovation Competence Center, explained the role of digital technologies:

Addressing a "zero-waste" plastic packaging scenario requires the connectivity between the people disposing their plastic product after use and the people receiving it with the additional knowledge that the plastic product has a value. It means that the value perception of plastics products needs reinforcing, as it is currently considered waste. Therefore, exploiting the digital capacity of blockchain, artificial intelligence, and social media will play a crucial role. This requires an open platform, where everybody can engage and contribute to creating a zero-plastic-packaging-waste society/environment through exchange of ideas, open innovation, and entrepreneurial drives as citizens become part of the solution.²⁰



Blockchain, a potential game changer

In a nutshell, blockchain is software that allows value to be shared easily between people online.

Blockchain can play a pivotal role in creating a world without plastic packaging waste. It can provide the means to connect packaging to consumers and marry economy with ecology and society. Michiel De Smet, former policy officer of the European Commission, DG Research and Innovation, and now finance program lead at the Ellen MacArthur Foundation, put it this way:

Digital technologies, such as blockchain, can support secure sharing of information, which enables packaging to be treated as an asset across the value chain. As a result, these technologies can play a crucial role in driving innovation in new circular business models, such as packaging reuse or pooling systems.²¹

As the University of Southern California's Bhaskar Krishnamachari and Aditya Asgaonkar said, blockchain has the power to facilitate peer-to-peer transactions that disintermediate the waste management process and unlock the huge value currently tied up in waste packaging.²²

In a nutshell, blockchain is software that allows value to be shared easily between people online. "For the first time ever we have a digital medium for value, through which we can manage, store, and transfer any asset—from money and music to votes and Stradivarius violins—peer to peer in a secure and private way," wrote Don Tapscott and Alex Tapscott.²³



Safety Net Spirit Network Plastic Waste by A_Different_Perspective, 2018, used under Pixabay license, accessed 7 July 2019.



We need an outright transformation of consumer behavior, one that could possibly be powered by blockchain technology.

So, why blockchain? Beyond finding creative end uses for recyclable material, we must do more to close the tap leaking plastic packaging waste into the environment in the first place. We need an outright *transformation of consumer behavior*, one that could possibly be powered by blockchain technology.

The technology allows parties to share information securely peer to peer—no intermediaries involved. It incorporates technologies such as distributed computing and cryptography, and the decentralized nature of blockchain makes it incredibly secure.

On the technical front, as the layer of the Internet that enables the secure transfer and storage of digital assets, blockchain is a disruptive technology that provides the unique architecture around which a new kind of economy could be built, specifically relevant at the points of sale, and at the points of disposal or return, of plastic packaging materials. According to Hilary Carter, managing director of the Blockchain Research Institute, “Blockchain technology, as the transactional layer of the Internet, could readily power the framework needed to incentivize people and their entire communities to dispose of waste properly.”²⁴

Blockchain technology could therefore play a crucial role in supporting a more equitable and sustainable economy for plastics than we have today. It could associate each item of packaging with the consumer and apportion the appropriate value to the packaging via a quick response (QR) code printed onto the packaging or through digital watermarks or RFID tags, thereby connecting them to the Internet of Things (IoT) and tracing them through the supply chain.

Consumers could manually scan the QR code with a smartphone using a specific app, or the app could automatically communicate with the packaging via a suitable digital technology and generate a “crypto credit” for the consumer. The credit could be reputational or economic, like a crypto refund or a carbon credit. Ideally, solutions would combine all three dimensions. The consumer would then become owner of the packaging and accountable for disposing of it. Smart recycling bins, for example, could automatically record proper disposal of the packaging and the equal credit to the consumer.

The key to adopting blockchain is not only to create value and to credit a consumer for recycling but also to trace the packaging digitally from “cradle to cradle.”

The key to adopting blockchain is not only to create value and to credit a consumer for recycling but also to trace the packaging digitally from “cradle to cradle.”²⁵ Blockchain offers the possibility of creating a “material passport” for each item of packaging. This passport could contain valuable information about the packaging, such as its composition, the proportion of raw versus recycled plastics, the origin of the material, and other credentials that help to understand the nature of the item. In other words, we could trace the entire supply and value chain.



Unique capabilities of blockchain technology

Blockchain offers several unique qualities that can prove vital to the success of developing a more sustainable approach to packaging.

Blockchain offers several unique qualities that can prove vital to the success of developing a more sustainable approach to packaging, not the least of which is the unique ownership of each piece of packaging as an asset or data. This ensures that once an individual becomes the owner of a piece of data, no one else can duplicate it. This inherent security functionality is then reinforced by the ability of the data owner and *only* the data owner to transfer ownership to someone else. For packaging to have its true value attributed to it, this functionality will be key and will underpin a transparent system of exchange.

Producers also benefit by accurately tracking resources, while consumers and collaborators benefit from the ability of blockchain to underpin both financial, social, and eco incentives that can support sustainable behavior. This ability to provide a reliable currency can also facilitate collaboration between stakeholders, especially when a willingness exists to share data and test business models to support the reuse, recycling, and design of sustainable packaging.

Innovative applications in plastic packaging waste

Here we look at four blockchain-based start-ups in the space: Plastic Bank based in Vancouver, Circularise in the Netherlands, Empower out of Norway, and Litterati headquartered in Oakland, California. They illustrate blockchain's potential for creating markets in plastic packaging waste, supplying incentives for mass participation, and changing the public's view of waste as valuable—addressing all three dimensions of the problem.

Plastic Bank

Plastic Bank buys waste at source through its blockchain-based app. The public can take its plastic packaging waste to one of Plastic Bank's collection centers and receive credits through the app and then exchange the credits for basic goods such as food, clothing, cooking fuel, and more. The app uses smart contracts to ensure that every transaction is secure and recorded in real time.

The app also functions as a digital wallet for collectors and collection center operators, many of whom have never had a bank account before. By storing currency digitally with blockchain, Plastic Bank's app eliminates the danger of fraud and corruption that frequently inhibits development in impoverished regions. Said David Katz, founder and CEO of Plastic Bank:

The world is demanding authenticity; when we marry the environment and the blockchain, we have the ability to truly exemplify those that are creating good for the world. [To] those who are building a regenerative society, sustainability is passé now. We are moving into a regeneration to which organizations are exhibiting regenerative business models.²⁶



Plastic Bank uses Hyperledger Fabric, a permissioned, open-source, enterprise-grade blockchain platform that is frequently deployed in supply chain contexts.

Plastic Bank uses Hyperledger Fabric, a permissioned, open-source, enterprise-grade blockchain platform that is frequently deployed in supply chain contexts. The process of validating transactions—in this case, the exchange of plastics for digital credits, and the exchange of digital credits for basic goods such as food, clothing, cooking fuel, and more—is conducted by a group of trusted peers who certify or endorse the transactions taking place, grouping them into blocks. Unlike public blockchains such as Bitcoin and Ethereum, which run on an energy-intensive consensus mechanism known as proof of work, Hyperledger’s suite of private blockchains are regarded as more environmentally friendly.



Plastic Bank Member Collecting Plastic in the Philippines © 2019 Plastic Bank.
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Circularise

Jordi de Vos, founder and CEO of Circularise, said, “Plastic waste is a problem only because the production costs of plastic are very low; and, until today, recycling plastic is often not a profitable business model. Through the use of blockchain, recycled plastic can be certified and marketed as a more sustainable alternative.”²⁷

Circularise is developing a blockchain-based open-source communications protocol to promote value chain transparency without public disclosure of datasets or supply chain partners (Figure 1, next page). Think of a digital room with all the suppliers, manufacturers, and recyclers, where they can share data in a secure way. Parties share data through “smart questioning.” For example, questions on a product (e.g., does it contain mercury?) are directed upstream and a yes/no answer is returned. A question is posed by scanning a product’s anchor and an answer is communicated automatically, based on a hashed bill of materials verified in advance by a third party. This prevalidation guarantees data accuracy without the need to disclose sensitive company or product information.

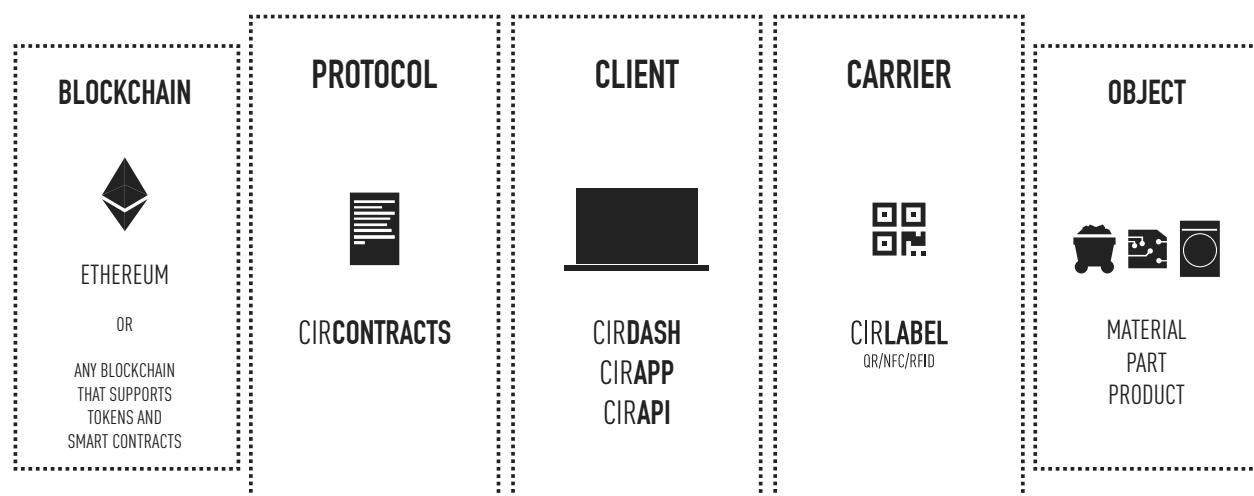


Circularise is developing a blockchain-based open-source communications protocol to promote value chain transparency without public disclosure of datasets or supply chain partners.

In essence, Circularise enables trusted information exchange between participants in value chains while allowing them to (a) remain anonymous, (b) easily fine-tune and update the amount of disclosed information, (c) determine access rights, and (d) validate information in an easy and efficient way. Circularise's functionality is underpinned by the Ethereum blockchain, a type of cryptographic operating system on top of which applications can be built. It also uses protocols such as the InterPlanetary File System (IPFS), a decentralized network used for storing larger amounts of data off-chain. The company chose the Ethereum public blockchain so that transparent and immutable record-keeping could be achieved, and trust more readily established through this transparency.

Circularise also uses smart contracts and zero-knowledge proofs (verification tools which prove values without disclosing further information). Its blockchain architecture serves to facilitate data gathering, and the exchange of other value points between participants while allowing them to remain anonymous. The one concern about the functionality of Ethereum is its ability to scale to the point where it can process an increasing number of transactions

Figure 1: The Circularise smart questioning system



PROTOCOL

The Circularise protocol consists of a set of smart contracts. Through a decentralized application, users can conduct business without intermediaries. Anyone can see and verify the inner workings of the contracts, and anyone can propose changes to the core system.

CLIENT

There are three interfaces. The first (CirDash) enables professional users to generate carriers, read/write data, and use smart questioning functions. The second (CirApp) provides product information and serves as a touchpoint between consumers and manufacturers. The third (CirAPI) is an application programming interface for existing or new apps.

CARRIER

Users of the protocol can create unique identifiers (CirLabels) and attach them to materials, parts, and products. Carriers include QR codes, RFID tags, near field communication, or any IoT-enabled device, provided that users have an offline backup identifier in case of damage.

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per second. “Circularise may require millions of transactions on your average Monday. The current state of Ethereum does not support this scale.”²⁸ For this reason, the company is keeping its blockchain options open.

Empower operates based on donations to the Empower Plastic Waste Fund and uses EmpowerCoins (EMP) to pay people to clean up plastic waste.

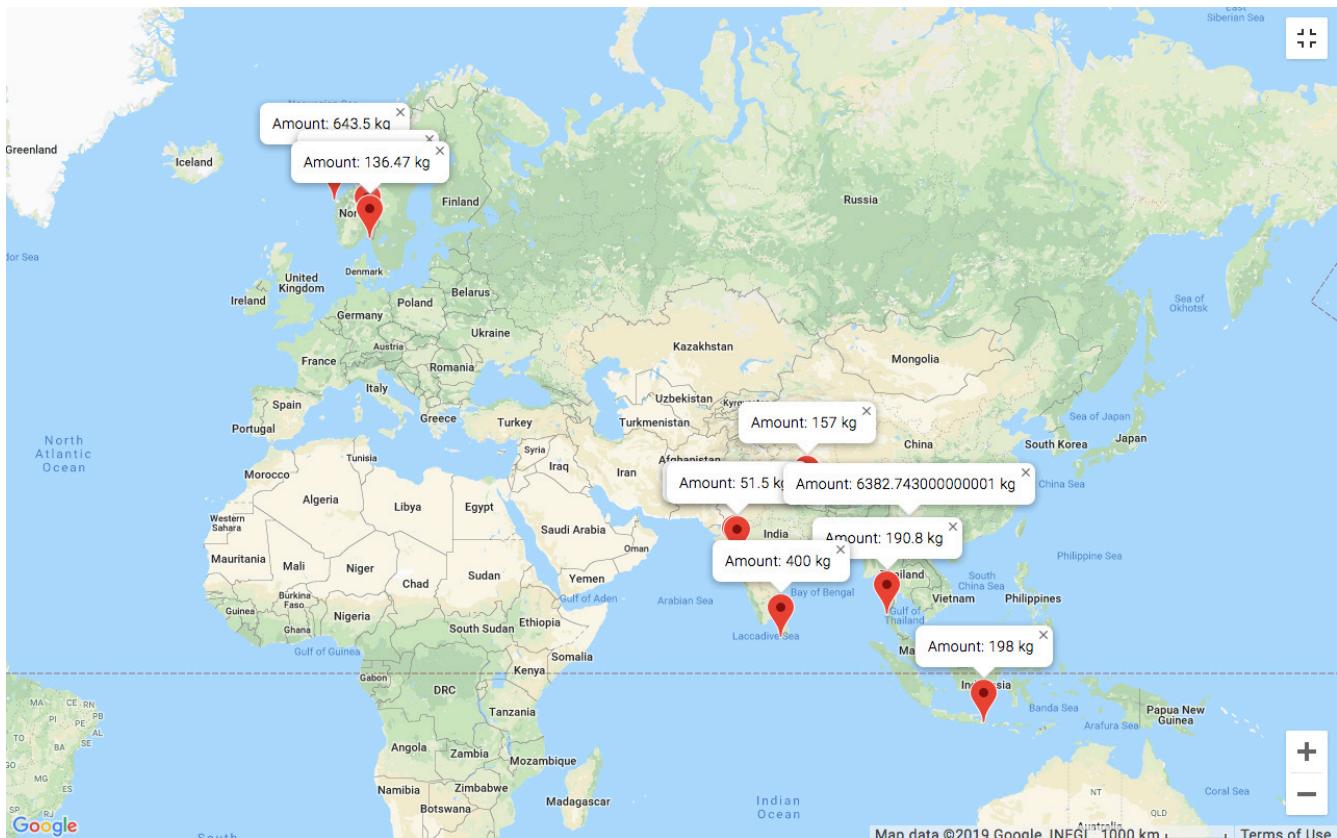
On top of this foundational layer, Circularise enables the use of product identifiers such as QR codes and other IoT devices, tracking the valuable data generated along the life cycle of the product—such as the number of times plastic has gone through the recycling process—and storing it onto their blockchain network. These elements are the foundational blocks on top of which parties can build circular economies.

Empower

Empower launched in 2018. It operates based on donations to the Empower Plastic Waste Fund and uses EmpowerCoins (EMP) to pay people to clean up plastic waste.²⁹ For every dollar donated on Empower’s website, Empower commits to clean up the same amount of plastic waste by weight (Figure 2). For example, if Nestlé donated \$1,000 to the cleanup fund, Empower would promise to collect 1,000 kilograms (\$1/kg) of any Nestlé plastic packaging waste. Nestlé would

Figure 2: Empower’s funded cleanups

As of 5 July 2019, the total cleanup was 16,508,995 kilograms of plastic.



© 2019 Google Maps. Empower Funded Cleanup. Used according to terms of service, as of 5 July 2019.



market the idea globally to its consumers to collect the waste and take it to participating centers where they would receive an EMP token. Wilhelm Myrer, founder and CEO of Empower, said:

Blockchain has the potential to play a key role when it comes to tackling plastic and general packing waste, primarily because of its ability to be a trusted and open platform for moving data and value. Using the right networks, the technology can cost-efficiently provide incentives, trust, transparency, and traceability, thus it can be used for incentivizing cleanups as well as digital deposit systems and ensure a transparent value chain for the plastic/packaging collected.³⁰

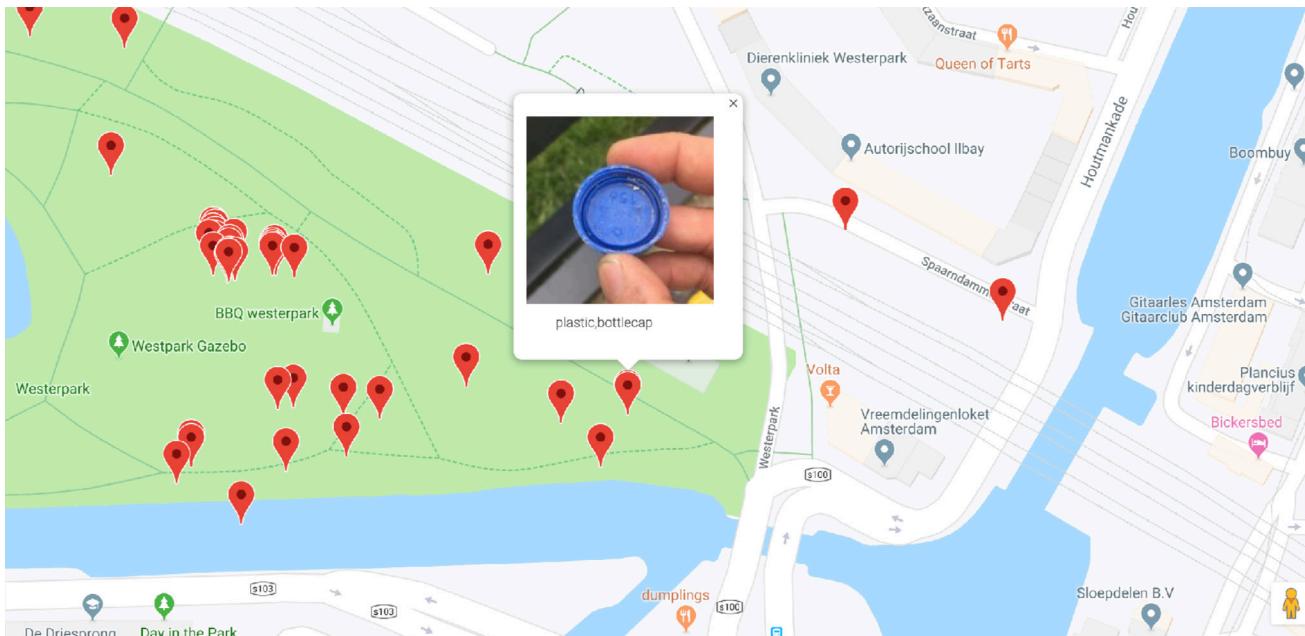
Empower uses the Stellar blockchain, a platform designed to facilitate inexpensive payments in a variety of currencies.

Empower uses the Stellar blockchain, a platform designed to facilitate inexpensive payments in a variety of currencies. Like Circularise, Empower stores larger transaction data on the IPFS; and the Empower application, available on iOS and Android, serves as the interface with the public. Within the application, EMP tokens can be traded peer to peer and donated back to Empower or to a charitable foundation such as UNICEF.³¹

Litterati

Litterati has deployed artificial intelligence (AI) in its app. Users pick up waste, photograph it, and upload their photos via its app. AI software then reviews the photos and identifies the objects in each, in terms of both the type of item and its brand name, before geotagging and displaying them on the app's map. The app also visualizes the data on waste so that policy makers can identify

Figure 3: Plastic bottle caps collected and tracked in Amsterdam



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While Litterati taps into people's intrinsic desire to make a positive contribution, it is integrating blockchain into the app as potential for extrinsic motivation.

areas demanding immediate attention (Figure 3, previous page). While Litterati taps into people's intrinsic desire to make a positive contribution, it is integrating blockchain into the app as potential for extrinsic motivation—such as social recognition and economic incentives—which may amplify the impact. Jeff Kirschner, founder and CEO of Litterati, said:

We're exploring how blockchain can incentivize a peer-to-peer network to eradicate litter. This is critical for solving problems of the global commons, where trusted public-private partnerships can both unlock capital and empower communities. Imagine someone picking up 100 pieces of litter, which then unlocks a smart contract whereby the person receives payment from a city, a brand, or another individual.³²

Opportunities for change

The interviewees unanimously stressed the need for a major overhaul of the beverage packaging industry to make systemic changes and the need for a global leader to champion the change. There clearly are tremendous opportunities and potential to transform the beverage industry using blockchain and disruptive digital technologies, just as much as other industries are being transformed by them today. Michel Fontaine, president of the French Packaging Council, summed up France's approach:

The French government is going to make circular economy (CE) to become a law in 2020. It has already agreed with brand owners to recycle plastic 100 percent by 2025. The French Packaging Council has just published its most recent comprehensive study.³³ It proposes that, to achieve full CE, initially we must be realistic and consider both closed loop CE (bottle to bottle) and open loop CE (bottle of another product). The latter requires pull market and guarantee of the material

Table 1: Start-ups at a glance

	Plastic Bank	Circularise	Empower	Litterati
Headquarters	Vancouver, Canada	Den Haag, Netherlands	Oslo, Norway	Oakland, California, USA
Year founded	2013	2018	2018	2012
Type of blockchain	Hyperledger Fabric	Ethereum	Stellar	None yet
Cryptocurrency used	Yes (name unknown)	CIRCOINS	EmpowerCoins (EMP)	To be determined
Website	plasticbank.com	circularise.com	empower.eco	litterati.org



Interviewees revealed that key stakeholders are struggling to determine a new direction and new ways to solve the problem of plastic waste.



Plastic Bottles Fishing Net Netting Bottle Beach by Matthew Gollop (matthewgollop), 2014, used under Pixabay license, accessed 7 July 2019.

supply. This is where digital technologies and blockchain may play an important role in dealing with traceability of [post-consumer recycled] raw material and continuous supply of the material in the open loop CE.³⁴

The Ellen MacArthur Foundation has championed the circular economy since 2012 and forged a “brains trust” by bringing together global actors to address the problem of plastic waste.³⁵ Through its New Plastics Economy Global Commitment initiative, it has united more than 350 organizations behind a common vision for a circular economy for plastics.³⁶

Despite this, interviewees revealed that key stakeholders are struggling to determine a new direction and new ways to solve the problem of plastic waste. While we have many pioneering and innovative solutions—from start-ups such as CupClub, Cuantec, and RePack, and edible plastics ventures like Biotrem, Evoware, and Loliware—we need leadership for reaching consensus on how best to select, adopt, and scale solutions that meet the *magnitude* of generated waste.³⁷ Interviewees are looking for global leadership to champion the change by founding not another “think tank” but an “action tank” to initiate the transformation.

The champion needs to be an active member of the change initiative at all stages.³⁸ It plays a crucial role in establishing the vision for change, facilitating the change, and supporting stakeholders in integrating the change.³⁹ While it’s common to believe the champion needs to be the biggest member of the industry, this need not be the case.⁴⁰ Whoever steps forward to take on this role will be fundamental to the success of creating a world without plastic packaging waste.⁴¹

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Here again lies the opportunity for the industry to achieve an enduring change that also is in harmony and lockstep with the pace of change in the Fourth Industrial Revolution.

The interviewees further stressed that the entire plastic packaging industry, not just beverage packaging, needs a systemic overhaul along the entire supply and value chain to achieve CE. To effect such a systemic change, the late Wharton School Professor Russell Ackoff said, "Focus on the interactions of the parts rather than their behavior taken separately."⁴²

Here again lies the opportunity for the industry to achieve an enduring change that also is in harmony and lockstep with the pace of change in the Fourth Industrial Revolution.⁴³ How to achieve such an enduring change divided the interviewees into two schools of thought.

Interviewees in the first school of thought were mainly engaged in the day-to-day management, operations, and issues related with plastic packaging. They focused on innovative means to:

- » Create greater collaboration among key stakeholders and develop new models for better unifying and sharing diagnostics driven by policy and industry
- » Transform consumer behavior to drive change from the bottom up
- » Optimize sorting and collection systems across municipalities to close the leakage of plastic waste into the environment

In a sense, the existing system was seen as the biggest barrier and, at the same time, the greatest opportunity to *make systemic*



Plastic Bottles Bottles Recycling by Hans Braxmeier (Hans), 2013, used under Pixabay license, accessed 7 July 2019.



Successfully breaking the norms that have evolved around our perception and treatment of plastic waste is no small undertaking.

changes. Interviewees in the second school of thought were primarily engaged in the daily management, operations, and issues related to:

- » Driving entrepreneurship to accelerate the process of innovation
- » Implementing digital technologies to underpin and empower innovation
- » Creating open innovation ecosystems to allow innovations to thrive and entrepreneurial start-ups to proliferate

They, too, stressed the need for seeking innovative solutions along the entire supply and value chain: "*cradle to cradle*." However, they emphasized that digital technologies and digital networks must play a central role in making systemic changes and achieving a world without plastic packaging waste.

Implementation challenges

History is littered with examples of great ideas and great technologies that have failed to materialize, and systemic change of the nature required to solve the plastics challenge may succumb to the *tragedy of the commons*. Successfully breaking the norms that have evolved around our perception and treatment of plastic waste is no small undertaking, but the aforementioned start-ups have all made positive steps in the right direction.

Looking for leadership

Implementation challenges are many, and detailing them in this research is not feasible. However, the biggest challenge starts with leadership, or the absence of it. Said Niccolò Machiavelli:

There is no more delicate matter to take in hand, nor more dangerous to conduct, nor more doubtful in its success, than to be a leader in the introduction of changes. For he who innovates will have for enemies all those who are well off under the old order of things, and only lukewarm supporters in those who might be better off under the new.⁴⁴

We need an organization to rise to the occasion, fill the leadership void, and make change happen.

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Driving systemic changes

The second biggest challenge is making systemic changes across the entire industry. This marks a shift from more traditional forms of change that look to tackle individual parts of a system, usually in isolation from all that surrounds them. Systemic change agents don't wish away the interdependencies between those parts of the



system, but instead tackle them head on. Systemic change can indeed be challenging for executives honed on traditional theories of organizational change.⁴⁵ They may be tempted to fall back on outdated practices, which fail roughly 70 percent of the time.⁴⁶

Achieving digital transformation

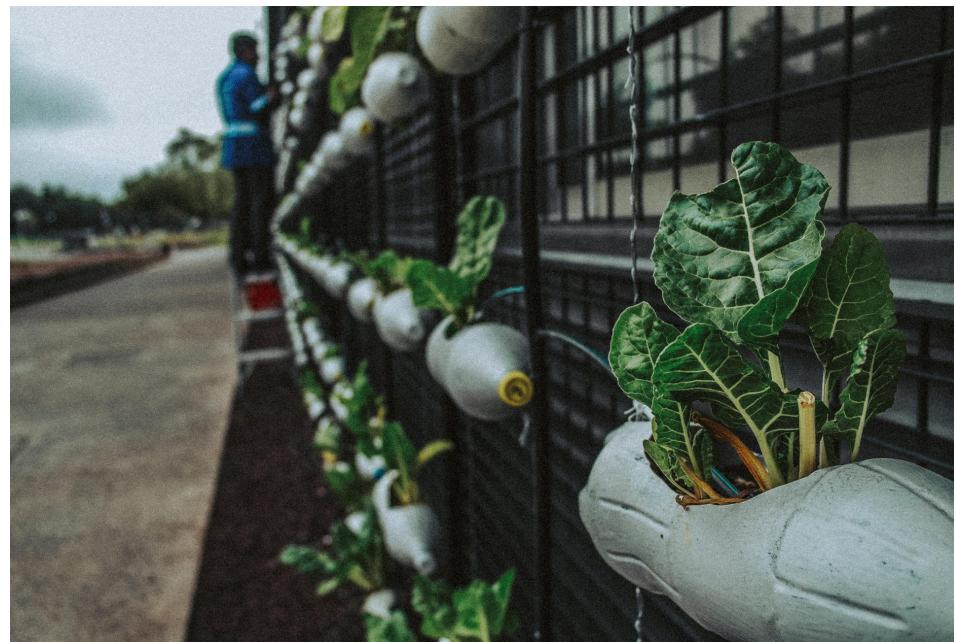
The nearly zero value of plastic packaging waste today represents an insurmountable hurdle to igniting this entrepreneurial verve.

The third biggest challenge is transforming the industry digitally, using blockchain to make markets and monetize plastic packaging waste. According to the technology company Couchbase, 90 percent of digital transformation projects fail.⁴⁷ Industry data suggests a lack of talent is a major barrier, both at board level and further down the business.⁴⁸ The Accenture data also highlights the importance of having a well-developed ecosystem, which would need to include collaboration around technological standards, especially for delivering the kind of systemic changes required.

Implications of the transformation

The implications of connecting packaging (i.e., a physical asset) with blockchain and marrying economy with ecology and society goes beyond transforming the plastic packaging industry and creating a world where plastics will never become waste.

The nearly zero value of plastic packaging waste today represents an insurmountable hurdle to igniting this entrepreneurial verve. Yet, with trillions of dollars' worth of waste cluttering our environment, this status quo is increasingly nonsensical. By unleashing this value,



Selective Focus Photography of Green Leafed Plant by Juanjo Menta, no date, used under Pexels license, accessed 7 July 2019.



A number of complex systemic issues have utilized "citizens' assemblies" to ensure that the public is not only on board with the changes proposed but has had a leading hand in crafting them.

the industry stands a chance of making the systemic change that the public demands of it. Jordi de Vos, founder and CEO of Circularise, said:

Our cooperation with customers has shown that a company's step to start using certified recycled material is a huge marketing success. In case of small or no differences in price, consumers are increasingly choosing for more sustainable options. Blockchain can therefore create a business model for recycling most applications of plastic and encourage collection of plastic waste.⁴⁹

For starters, implementation of the proposed model globally can positively affect the UN Sustainable Development Goals. By unlocking the value of plastic waste, we can reduce poverty around the world and make a direct contribution to improving the health, well-being, and educational prospects of people in the poorest communities. The clearest link is with goal 12, "ensure sustainable consumption and production patterns," which aims to decouple economic growth from resource use.⁵⁰

A number of complex systemic issues have utilized "citizens' assemblies" to ensure that the public is not only on board with the changes proposed but has had a leading hand in crafting them. Indeed, part of the global wave of demonstrations by Extinction Rebellion consisted of a call for a citizens' assembly to help tackle climate change.

Couple such a citizens' assembly with an active and vibrant *global open innovation and entrepreneurial ecosystem* that uncovers and supports innovation from around the world and you will tap into the undoubted energy for change that currently exists. It is the role of the change champion to channel that energy and ensure that the possible bold changes are actually taken.

Apportioning proper value to packaging is crucial if a thousand innovative ideas and business models are to take hold and scale successfully. The current near-zero value of packaging waste makes business model innovation almost impossible, and so all stakeholders in the packaging sector must shift their thinking so that they collectively value packaging appropriately.

The current near-zero value of packaging waste makes business model innovation almost impossible.

Entrepreneurs and entrepreneurially minded executives could design new business models to capture this unlocked value, if the industry worked together to ensure that each piece of packaging has value attached to it. Via blockchain, this value can then transfer to the consumer upon purchase. The value becomes positive credit upon disposing of the packaging in the right container. Otherwise it becomes a negative credit.

For example, manufacturers or retailers could add—or governments could require—a small surcharge of a few cents to the total price of each beverage product. With 480 billion plastic bottles produced every year, this would create a multibillion-dollar annual investment



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fund for innovation and entrepreneurship start-ups targeted to solving plastic packaging or to achieve circular economy objectives.⁵¹ The same surcharge can be applied to almost any single-use plastic packaging. The funding generated would become even more staggering.

Just as microcredits have transformed development, the simple act of assigning value to packaging has the potential to transform how we manage waste today. It has the potential to light a fire under entrepreneurial activity by supplying clear incentives to do things differently, whether in terms of collecting, sorting, recycling, repurposing, or innovating new materials. As Nobel laureate Muhammad Yunus said, "There are roughly 160 million people all over the world in microcredit, mostly women. And they have proven one very important thing: that 'we are all entrepreneurs.'"⁵²

Key takeaways

Brands must move sustainability to the center

The recent Board Agenda and Mazars survey, *Leadership in Corporate Sustainability—European Report 2018*, revealed a growing consensus that organizations need to up their game in terms of sustainability.⁵³ Unfortunately, it also showed a considerable gap between what organizations want to achieve and their ability to achieve it. It's a classic example of what Stanford University's Bob Sutton and Jeff Pfeffer called the *knowing-doing gap*.⁵⁴

The study conducted for Coca-Cola aimed to unblock that mindset by plotting several pathways for the company and its ecosystem to follow. With so many trillions of dollars currently tied up in plastic waste, the economic and social incentives are certainly there.

The champion can help to drive concerted and coordinated change and overcome any of the accusations of greenwashing that so often accompany sustainability initiatives.

We need true champions of change

Despite the consensus, we should be under no illusion that change is easy. Direct action has not yet resulted from the clear mandate for change given by citizens. While promising projects have emerged on the margins—such as plastic bottle recycling facilities in supermarkets or scientists developing more sustainable packaging for the beverage industry—these projects need a change champion with global reach and clout to really move things forward.

This champion can help to drive concerted and coordinated change and overcome any of the accusations of greenwashing that so often accompany sustainability initiatives. They can also help to ensure that citizens are a key part of the process.



Citizens, enterprises, governments, and academia all have roles to play.

We must fully develop the infrastructure

While the drivers of change must come from non-tech stakeholders, the blockchain community can do much to support change:

- » Showcase the strong blockchain use cases to drive more sustainable commerce
- » Help these use cases scale so that there are a multitude of case studies of the technology working at scale
- » Develop a financial infrastructure to support these steps
- » Collaborate with the waste sector so that they understand what is possible and how change could unfold

We must call the global community to action

Citizens, enterprises, governments, and academia all have roles to play. We have no time for iterative improvements or marginal gains. We need a great transformation in how the industry packages food and beverages. This shift will undoubtedly require companies to take on greater risk than they are accustomed to bearing, but the risk to humanity is already far greater. As Greta Thunberg told the UN Climate Change COP24, "In the year 2078, I will celebrate my 75th birthday. If I have children, maybe they will spend that day with me. Maybe they will ask me about you. Maybe they will ask why you didn't do anything while there still was time to act."⁵⁵

Now is that time!



Green Coast Reuse Fish Fischer Sea, no date, used under Maxpixel license, accessed 7 July 2019. Cropped to fit.





About the author

Michael Peshkam, PhD, is executive in residence at INSEAD. He is a seasoned C-suite executive, academic, and serial entrepreneur with over three decades of experience in transforming organizations from conventional to innovative, from informational to digital, and from attrition to growth globally. Michael's drive to bridge business, academic, and entrepreneurial worlds has made him a rare systemic change agent. He has transformed dozens of multinational organizations, small to medium-sized enterprises, academic institutions, and tech start-ups around the world.

This rich career journey has given him unique synthesis capabilities to separate signal from noise, connect the dots, generate insights, and create "Uber moments." In the 1990s, he instilled an entrepreneurial mindset and created the first intrapreneurial practices in Mouchel (now WSP), a century-old company. As chief science technology and innovation officer for 27 offices around the world, Michael led the company's innovation and transfer of technology, and the company became number one in Europe. The systemic changes he initiated led to tenfold growth in as many years.

As a former associate professor in information technology, strategic management, and entrepreneurship, Michael is sought after to deliver lectures and run executive education courses on topics related to digital transformation, open innovation, entrepreneurship, business strategy, human capital transformation, and how to lead "intelligent" digital business of the future. He draws parallels from his experience as CEO, CIO, COO, and CTO.

Acknowledgments

The author thanks Dr. Michiel De Smet, Jordi de Vos, Michel Fontaine, Rajan Kasetty, David Katz, Jeff Kirschner, Professor Dr. Rudy Koopmans, and Wilhelm Myrer for their rich interviews. Special thanks to Hilary Carter for her interview and contributions to the work.

Disclosures

As of this writing, the author has no paid relationship—as employee, consultant, board member, or investor—with any of the companies using blockchain and featured in this report.



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