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INDUSTRY 4.0 & LUXURY BRANDS

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> "Luxury brands face pressure to reach a younger customer base spending more time online, produce goods in a sustainable manner, and combat forgery."

I. Artisans and Craftsmanship

Many luxury brands create refined bespoke products that are far removed from the digital world. They are crafted by artisans, reflect decades if not centuries of accumulated knowledge and are defined by exclusivity and rarity. The idea of automating, streamlining, mass producing and democrazing these brands is anathema. At the same time, pressure to reach a younger customer base, produce goods in a sustainable manner, navigate a consumer base that spends more time online and combat forgery all present challenges for these brands. As a result, many are considering ways of remaining true to their core mission while adopting new tools and technologies that can help them remain competitive in the digital age.

The adoption of digital technology by luxury brands is far from new. Over the past two decades – and further accelerated by the Covid-19 Pandemic – many have created sumptuous online environments that draw users into captivating worlds where they can immerse themselves in the lifestyle of these brands while buying a wide range of goods from scarves to cars. Most brands have seen tremendous return on investment from creating these online consumer environments. While continuing to invest in these spaces will remain essential, the next horizon of digital transformation will be driven by adoption of Industry 4.0 standards that will increasingly be powered by blockchain technology. While this process will begin at the level of production, it will ultimately unlock a new type of consumer environment, ways of engaging and marketing to consumers, ways of remembering and ways of valuing a wide range of objects.
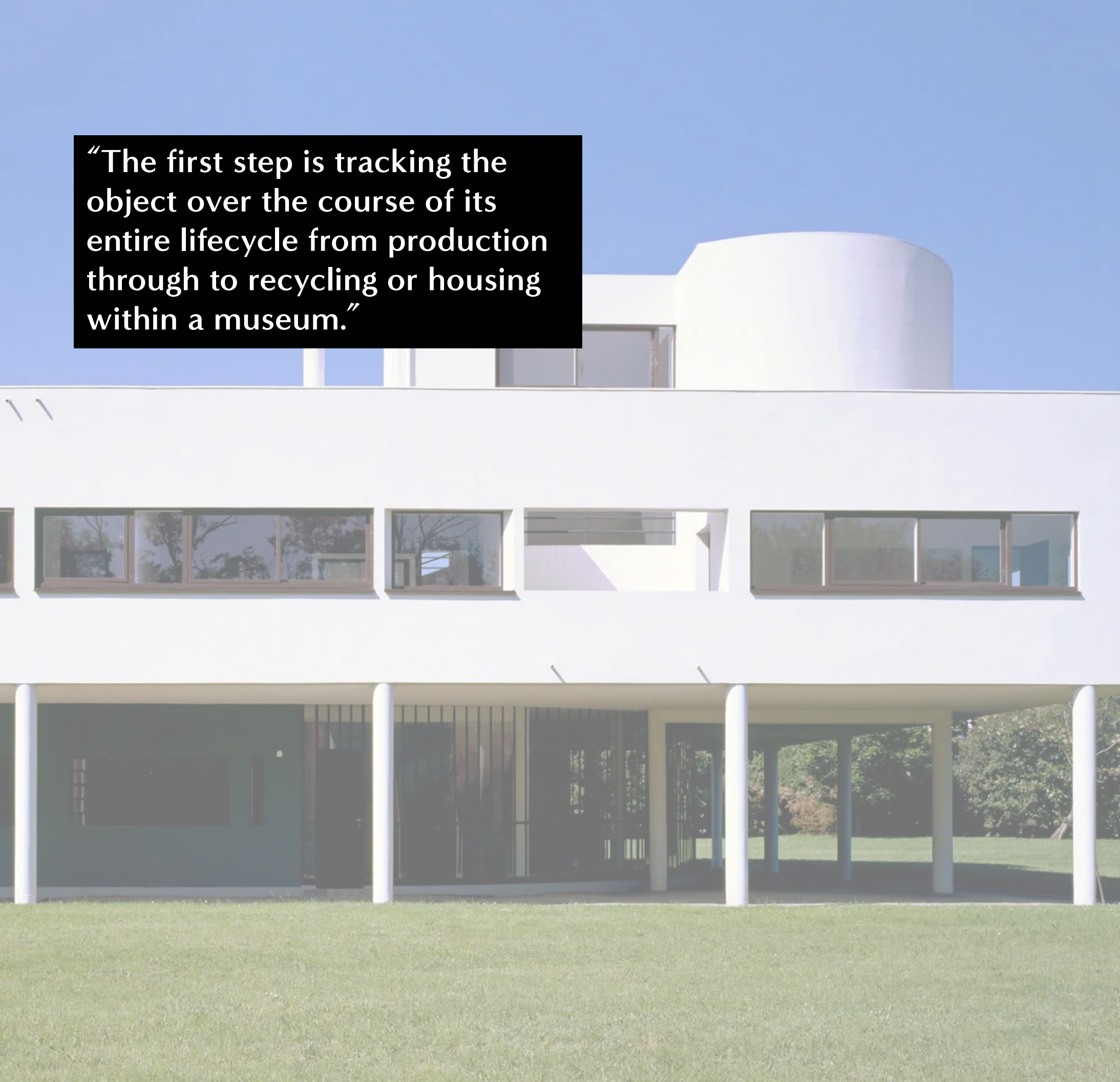
II. The Architecture of Industry 4.0

The internet of things (IoT), digital twins, and distributed blockchain ledgers comprise the primary innovations associated with Industry 4.0 that will be relevant to the luxury consumer goods industries. The first step in introducing these technologies will be to set up means by which the object that is produced is tracked over the course of its entire lifecycle from production through to when it is recycled or housed in a museum. This will involve tagging and tracking the raw material, parts and labor that go into these objects through methods such as RFID, scanners and geolocators. At the same time, a digital twin of the object and its production process can be implemented to better track and visualize how the object is created, how it moves, how it is sold and eventually how it is used.

Securely tracking and recording this process is essential. This can be accomplished through tokenizing the asset and recording changes to that token on a distributed secure blockchain ledger. Such ledgers can be used to record a range of information, can point to information that is not recorded on the blockchain, and can have a range of levels of privacy, security, and transparency. The movement of the object throughout its lifecycle will characterize a token journey that touches everyone from suppliers to partners, insurers, banks and consumers. Designing the appropriate token journey for the luxury industry will be essential and will help to determine the appropriate blockchain and Industry 4.0 architecture for each specific luxury brand while also opening the door to enhanced interoperability across these industries.

There are a number of challenges to achieving this vision. Many of them lie around how legacy manufacturing and data systems interact with each other and how they might come to interact with IoT devices and with blockchain record keeping. At the same time, while many organizations have

"The first step is tracking the object over the course of its entire lifecycle from production through to recycling or housing within a museum."

adopted EA and ERP solutions, they may lack a common framework of analyzing and evaluating data related to their objects to drive strategy, customer engagement, and ongoing product development and improvement. In many ways, the tokenization of the object on a blockchain can serve as the focal point and index of an organization's activity. The object becomes the cipher or point through which data must pass for it to be intelligible. These connections can extend to 3rd parties such as banks and insurance providers. This tokenization provides radical accountability and traceability. In the process, interoperability across the organization is supported.

This interoperability ultimately translates to a richer and more personalized user experience that starts when the object is desired and then purchased. The owner now has access to and partial control of this data. They can connect to data associated with other objects either within their collection or a broader community of owners. This process begins at the origin point of the design with the intent of the designer. It extends as a kit of parts, tools, fabrication techniques, and suppliers through to distribution, display, sale, ownership, collecting and eventual recycling or memorializing. Through the use of digital twins and AR / VR, this entire process can become immersive while new horizons open for how that object is collected, displayed and incorporated within an economy of memory.

In order to achieve this interoperability, means of moving data between different devices and points of storage will be essential. This will involve building connections – or, as they are called in the blockchain ecosystem, oracles – that connect and record data on the blockchain that has been designated to house the token journey. Choosing the blockchain and designing these oracles will be a function of cost, privacy, security and what is being recorded. In making this connection, it will be essential to understand the value that is being added as well as how this value is being tracked. This is ultimately a question of how the latent value of the data is being unlocked through the ability to relate it within and across industries. This data set ultimately drives machine learning and predictive analytics that can fuel market efficiency, mitigate risk and define insurance needs. At the same time, it will be essential to ensure ongoing interoperability through redundancy to avoid risk of digital obsolescence. Concurrently, standards of regulation, data privacy and jurisdiction will also have to be defined.

III. The Benefits of Adopting Industry 4.0

While the challenges of adopting Industry 4.0 production, distribution, and consumption standards are significant, the rewards are compelling and merit further exploration by leaders in the luxury consumer goods industries. Data collected between 2009 and 2015 from Fortune 500 companies, however, suggests positive impact within firms that applied the Internet of Things ("The impact of internet of things implementation on firm performance," Tang et al.). Some of these positive impacts lie around a new capacity to market products and reach consumers through objects that genuinely exist at the intersection of the physical and the digital via IoT, digital twins, ongoing tracking, immersive AR/VR, and new ways of collecting and conserving objects through networked digital spaces where those objects are valued and even traded on secondary markets to which the producer has an increasing connection.
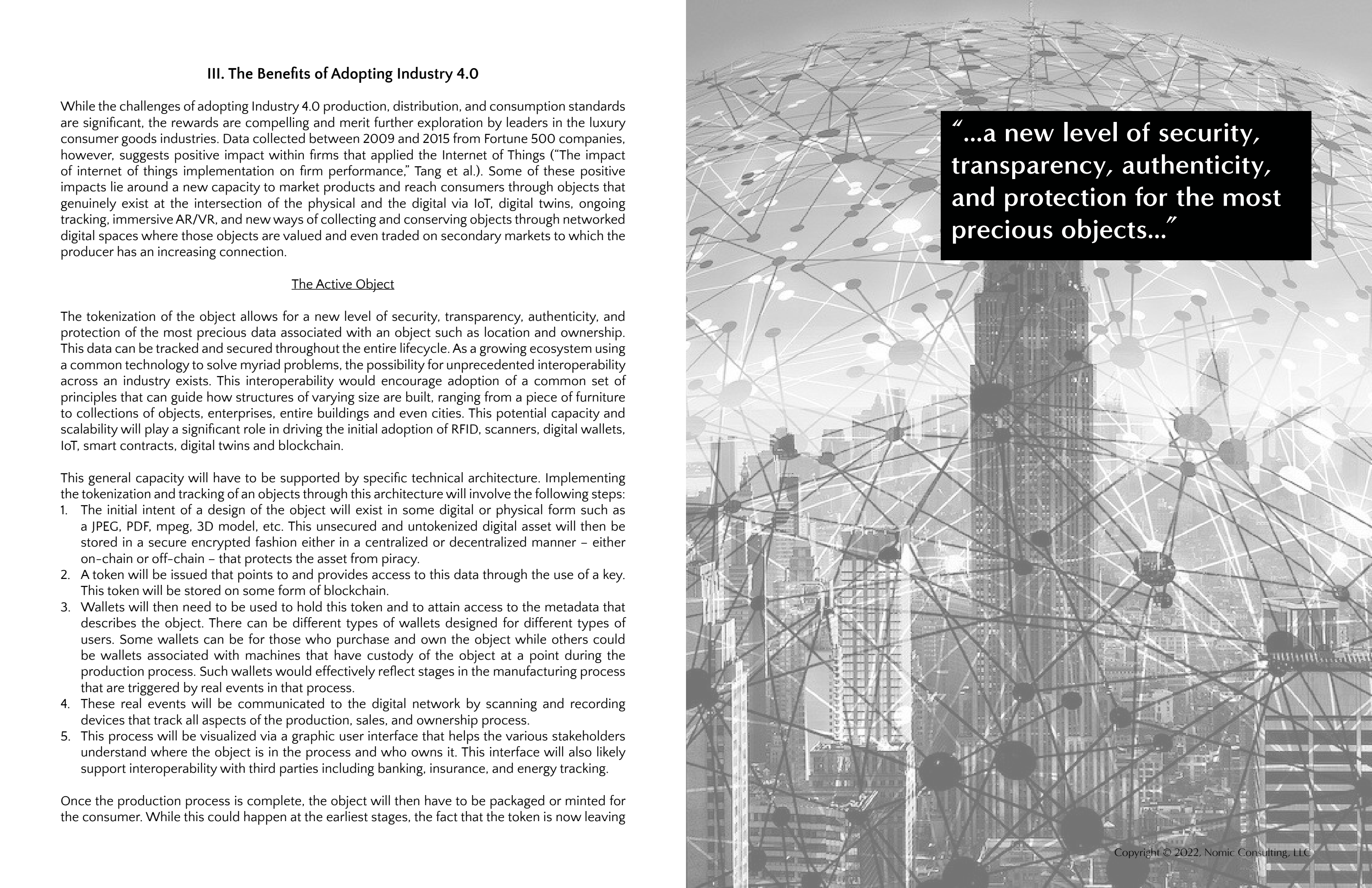
<u>The Active Object</u>

The tokenization of the object allows for a new level of security, transparency, authenticity, and protection of the most precious data associated with an object such as location and ownership. This data can be tracked and secured throughout the entire lifecycle. As a growing ecosystem using a common technology to solve myriad problems, the possibility for unprecedented interoperability across an industry exists. This interoperability would encourage adoption of a common set of principles that can guide how structures of varying size are built, ranging from a piece of furniture to collections of objects, enterprises, entire buildings and even cities. This potential capacity and scalability will play a significant role in driving the initial adoption of RFID, scanners, digital wallets, IoT, smart contracts, digital twins and blockchain.

This general capacity will have to be supported by specific technical architecture. Implementing the tokenization and tracking of an objects through this architecture will involve the following steps:
1. The initial intent of a design of the object will exist in some digital or physical form such as a JPEG, PDF, mpeg, 3D model, etc. This unsecured and untokenized digital asset will then be stored in a secure encrypted fashion either in a centralized or decentralized manner – either on-chain or off-chain – that protects the asset from piracy.
2. A token will be issued that points to and provides access to this data through the use of a key. This token will be stored on some form of blockchain.
3. Wallets will then need to be used to hold this token and to attain access to the metadata that describes the object. There can be different types of wallets designed for different types of users. Some wallets can be for those who purchase and own the object while others could be wallets associated with machines that have custody of the object at a point during the production process. Such wallets would effectively reflect stages in the manufacturing process that are triggered by real events in that process.
4. These real events will be communicated to the digital network by scanning and recording devices that track all aspects of the production, sales, and ownership process.
5. This process will be visualized via a graphic user interface that helps the various stakeholders understand where the object is in the process and who owns it. This interface will also likely support interoperability with third parties including banking, insurance, and energy tracking.

Once the production process is complete, the object will then have to be packaged or minted for the consumer. While this could happen at the earliest stages, the fact that the token is now leaving

> "...a new level of security, transparency, authenticity, and protection for the most precious objects..."

"An experience at the intersection of the physical and digital integrating AR/VR will help brands grow."

the confines of the producer and entering the marketplace presents an opportunity to consider whether the token remains on the same chain. Such considerations are important because the frequency of recording events will diminish after it is purchased while the need for security might increase. In this sense, it is worth considering how multiple chains can record data in parallel and whether there is one chain that is the primary chain indexing all the data.

Beyond the blockchain architecture, the general public will have to become more comfortable with owning a digital wallet and how to effectively handle the key that provides access. They will need to understand both the power of this system as well as the risk of total loss of the object should they lose their key. In the process, they will learn the difference between cold vs. active storage, self managed vs. service managed. The business involved in driving such broad adoption will have to explore the benefits of redundancy that could help mitigate some of these challenges while also balancing these concessions with the lower level of security. It will likely be possible to design sets of blockchain architectures whose costs and security level are appropriate value and rarity of the objects as well as the community involved in consuming and / or collecting it.

The Active Consumer or
the Gamification of Consumer Experience

It will be important for companies to support a compelling experience at the intersection of the physical and digital. Such a stage would be powered by AR/VR while also including physical installations to support that experience. It will foster an entertaining environment rich with content driving consumption and brand allegiance. It will also require and generate considerable amounts of data. Architecture to process this data will be required as well as setting up bridges by which that data, and these experiences more broadly, are connected to the tokenized object. This would likely involve recording coordinates on a blockchain as an index that point to a place off chain where this data is stored that can't be changed, but that allows for new data associated with new states to be added. This will lay the groundwork for tracking the object with a high level of security and transparency over its lifecycle. Data could be used both within this environment as well as used in other graphic interfaces to further spread the brand's message on everything from new products to overall sustainability. In this sense, blockchain ultimately will be a navigation and coordination tool of the meta // and physical world.

It would also lay the groundwork for recording the state of a system immutably at a point of time. This capacity is a crucial feature of games. By extending this capacity over a large territory and across time to an increasingly large user base, it becomes possible to track how a customer base relates to a specific product and a brand. It becomes a communication vehicle for the brand to directly engage their customer.

This state knowledge becomes essential in personalized marketing. It allows brands to enter directly into the world of their consumer and create a game like space. By creating incentives to manipulate that state, users might gain rewards and levels of access to the luxurious nature of the world from which the objects stem while also driving the collecting and consumption of those objects both digitally and physically. In this sense, a gamified cinematic experience should ground the metaverse and support an increasingly rich meta / physical experience based on how much one consumes. The result is the gamification of consumer experience as a new business model available to luxury brands.

<u>Economies of Utopia and Memory</u>

Our vision of the future is informed by past experiences. After several decades prioritizing what is happening now and the next innovation, the power of tokenization and blockchain to inscribe an asset with massive amounts of data creates a new opportunity for past records to directly inform how we imagine future states as well as what actually comes to pass.

A token can be issued that records a vision for a future state. In doing so, a record is created of something or someone towards which an organization can work. This goal can become a means of providing rewards for efforts by team members or a community who work towards this vision. In the process, existing data can be aggregated and made sensible via how it relates to or supports that vision. In this sense, a token imagining a future state can be a way of navigating data by giving order to a massive amount of data through how it functions towards realizing a vision. Such future tokens can drive a client and customer development strategy. They can hold the ideation of future products and, ultimately, the archive of the organization that produces objects and experiences. In this sense, they can hold the past and the future – before it is realized and after it is no longer in frequent circulation.

A vision for the future should be informed and directly connected to a detailed and diverse record of the past. This correlated economy of memory and rarity could be supported by a similar architecture. By ensuring that users had full control of their data and could participate in rewards associated with how this data is used by third parties, they would be encouraged to participate in a generative process. As privacy becomes a greater concern and cookies a bigger problem, localizing data around the object and consumer interaction with capacity for user and producer to directly monetize that data for advertisers becomes more attractive. They would share data associated with objects, experiences, and memories, add to that data through comments, editorials, and related objects and memories. In doing so, they participate in the creation of an immutable network that makes sense of these objects for others. All of this data would always be connected back to the physical objects and sites where this collection is experienced. Doing so would effectively use the digital sphere to enhance the physical world where luxury brands have historically thrived – ultimately creating a more robust and enjoyable environment.

Giulio Camillo's Theatre of Memory (1519-1544)

"A token records a vision of the future - creating something towards which an organization can work."

IV. Measuring Success

As luxury brands consider investing in Industry 4.0 standards, it will be essential to track how they can support an enhanced user experience while also refocusing the organization around the assets they produce and how they can be better tracked throughout their lifecycle to support greater efficiency. It will also be important to consider a number of the more traditional metrics that are standard across industries so that the adoption of new technology is driving the profitability, growth, and sustainability of the brand. In her article "Reflections of Digitization on Accounting: the effect of industry 4.0 on financial statement and financial ratios," Mellisa N. Cagle proposes the following criteria that she then goes on to track across a number of firms adoption IoT standards:

- Reaching operational excellence (cash conversion cycle, employee productivity ratio, fixed asset turnover)
- Enhancing error detection (scrap ratio)
- Improving maintenance activities (maintenance ratio)
- Improving production line efficiency (inventory turnover ratio)
- Production capacity improvement (fixed asset turnover)
- Improving stakeholder relations (market value added)
- Conducting digital planning / innovation / tech infrastructure (R&D ratio)
- Improving workforce efficiency (employee productivity ratio)
- Achieving inventory optimization (inventory turnover ratio, stock to sales)
- Achieving expense efficiency (Overhead ratio)
- Achieving logistics efficiency (inventory turnover ratio, accounts payable turnover, accounts receivable turnover)
- Improving profitability (return on assets, return on equity, profit margin, EBITDA)
- Achieving investment efficiency (return on investment)
- Achieving sustainable growth (sustainable growth ratio)
- Reaching alternative markets (global sales ratio)

It will be essential for organizations to establish effective accounting, tracking, and reporting methods to ensure that the investment is yielding the desired results and for course corrections to be taken as necessary. As mentioned earlier, preliminary findings point to positive results of adopting Industry 4.0 standards. The true success of this adoption, however, will be measured by the leaders who guide these organizations and the effective digital transformation strategies that they employ. They will also be driven by continuing to remember that this investment must remain in service of creating an extraordinary relation to the objects produced and collected within an immersive meta / physical experience characterized by great content that drives engagement, brand allegiance, consumption and value.

"Preliminary analysis of Fortune 500 companies point to positive results of Industry 4.0 standards."

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