```
mirror_mod.
mirror_mod.
mirror_mod.use_z = False
elif _operation == "MIRROR_Z":
  mirror_mod.use_x = False
  mirror_mod.use_y = False
  mirror_mod.use_z = True

#s              e en    add back the deselected mirror
mirror              ct= 1
modifier_ob.select=1
bpy.context.scene.objects.active = modifier_ob
print("Selected" + str(modifier_ob)) # modifier ob is the
  #mirror_ob.select = 0
```

Web 3.0 Opportunity Unchained

Tejarah Talks

THE EVOLUTION OF THE INTERNET FROM WEB 1.0 — HEY, HAVE YOU HEARD ABOUT THIS EMAIL THING?... TO WEB 3.0 — 'HEY, MY TOASTER JUST MESSAGED MY WATCH THAT BREAKFAST IS READY.

PROFESSOR CHRISTOPHER KIRBY
Eastern Washington University

About Tejarah Talks

Tejarah Talks is organized by Oman Business Forum in association with the Ministry of Commerce, Industry & Investment Promotion. With a firm focus on Oman's current and future business, export and investment environment, Tejarah Talks is a series of informal, interactive evening discussions that brings together some of Oman's most inspirational and innovative thinkers and doers to share their stories, insights and ideas with an enthusiastic crowd. It is a platform for positive interaction.

منتدى عمــان للأعمال
OMAN BUSINESS FORUM

Sultanate of Oman
سلطنــة عمــــان
وزارة التجارة والصناعة وترويج الاستثمار
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Tejarah Talks 'Web 3.0: Opportunity Unchained' 13 September 2023 was moderated by Jamal Al Asmi, Executive Producer, RealityCG. The panellists were Ghada Al Kharusi, Manager, Innovation Department, Central Bank of Oman; Azzan Al Kindi, CEO and Co–founder, Rihal Data Migration & Services; Thuraya Al Harthi, Acting Director, Government Digital Services Unified Portal, Ministry of Transport, Communications & Information Technology; and Saud Al Zakwani, Head, Digital Transformation, Petroleum Development Oman.

1

Setting the Scene

Web 1.0 marked the early stages of the internet's evolution – mainly characterized by static web pages, limited user interactivity and a lack of dynamic content. The internet during this time was a collection of simple HTML pages linked together, often serving as an online brochure rather than an interactive platform.

The transition to Web 2.0 represented a significant shift in how the internet was used. Coined by Darci DiNucci in 1999, and later popularized by Tim O'Reilly and Dale Dougherty, the term Web 2.0 described a new era in which the web became a platform for collaboration and user–generated content. From the early days of 1.0, when the internet was primarily used for sharing text–based information, to today's 3.0 era, where we can share and interact with rich media content such as audio, video and images, the web has greatly evolved to meet user needs. Web 3.0 has the potential to transform many aspects of our online lives. Indeed, its full realization is likely to be a complex and gradual process, with ongoing development and refinement over time.

WEB 1.0
Read–only

WEB 2.0
Read–write

WEB 3.0
Read–write–own

Roots in the 50s
Contrary to popular belief, Artificial Intelligence (AI) and Machine Learning (ML) are not new technologies – AI can be traced back to a 1956 Dartmouth College summer workshop where researchers were exploring "every aspect of learning or any other feature of intelligence." The workshop was driven by the belief that machines could be made to simulate human intelligence, spurring a wave of research and innovation.[1] Fast forward three years to 1959 and the concept of ML – a subset of AI – made its debut. Arthur Samuel, a pioneer in computer gaming and AI, coined the term "Machine Learning" to describe the ability of a machine to learn from its experience. This was further developed by Frank Rosenblatt with the creation of the Perceptron, the first algorithm that modelled the human brain's neural structure.

1956

AI can be traced back to a 1956 Dartmouth College, summer workshop

"Machine Learning"
describes the ability of a machine to learn from its experience.

Arthur Samuel
Computer Gaming & AI Pioneer

2

Invasive Web 2.0

In the world of Web 2.0, where connectivity and information–sharing are at the core, a new reality has emerged. Major tech giants like Google and Meta have developed the capacity to know users at an intimately detailed level. Consider the seemingly innocuous act of hitting the 'like' button on Facebook. This simple interaction, multiplied by the numerous likes a user may dish out across various posts, becomes a rich data mine. They can be used to predict with a high degree of accuracy various characteristics of their users: ethnicity, religious and political views, personality traits, intelligence, happiness, use of addictive substances, parental separation, age and gender.[2] This insight into the private life of an individual, gleaned from something as simple and everyday as a 'like,' is both profound and, for many, deeply disturbing.

Political Views

Intelligence

Personality

Like

DATA MINE

Ethnicity

Gender

Age

Happiness
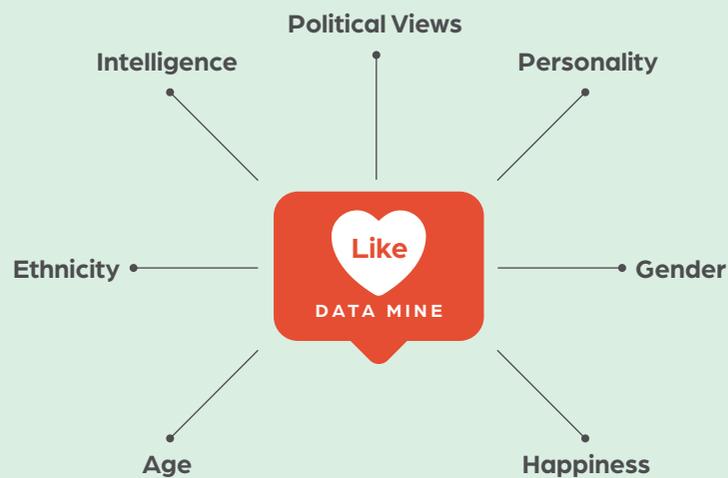
Now, expand that idea to the vast array of other online interactions we engage in daily. Search keywords typed into Google, online clicks, posts and reviews – each of these actions creates a digital footprint. These footprints are analysed, dissected and interpreted by proprietary AI algorithms designed to extract insights into user behaviour, preferences and even deeply personal attributes. If knowledge extracted from a simple 'like' can reveal so much, what does the broader tapestry of online activity say about us? How are these insights being used and who has access to them? What are the ethical considerations of such invasive data mining?
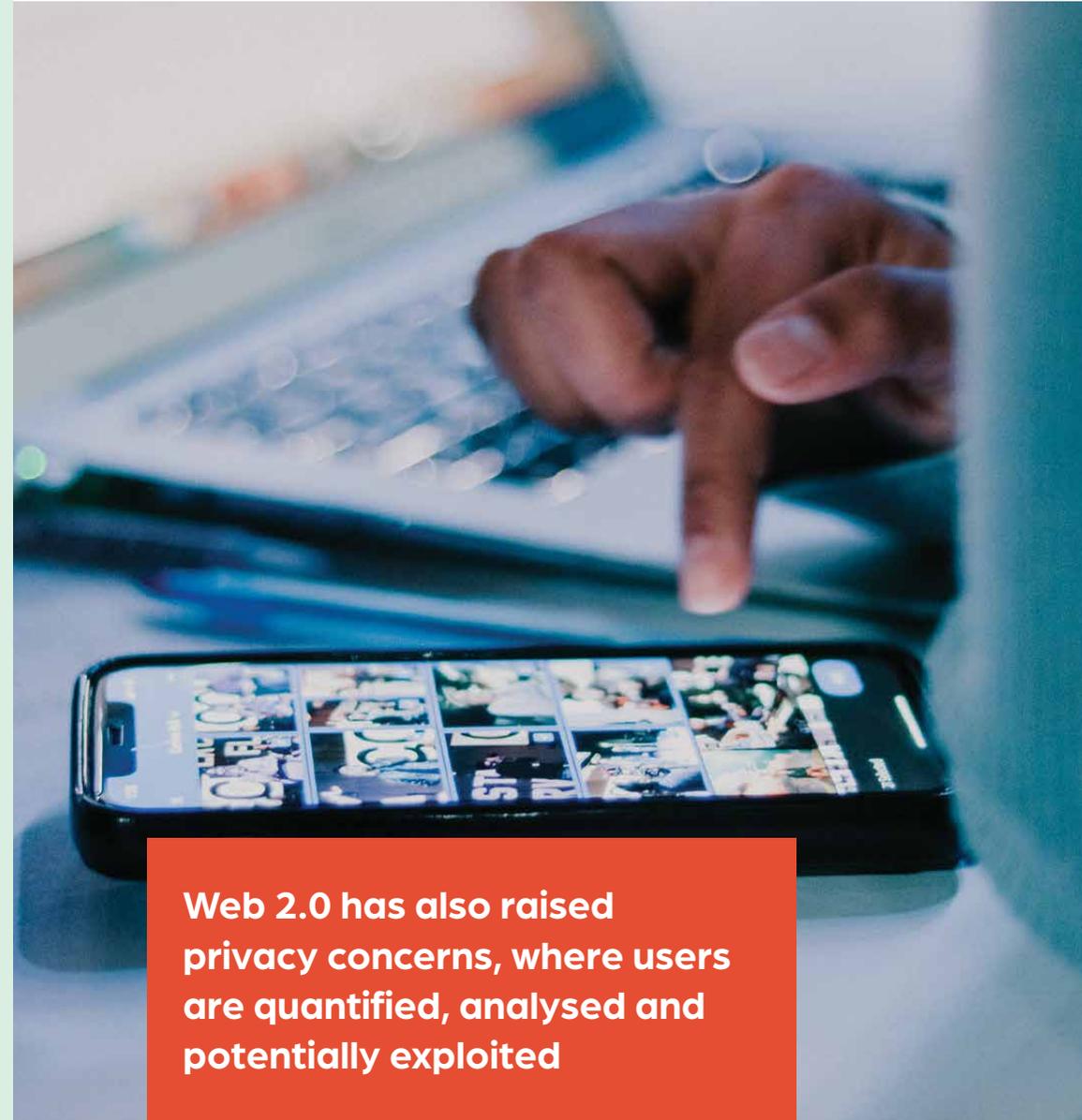
Web 2.0 has also raised privacy concerns, where users are quantified, analysed and potentially exploited

While Web 2.0 has brought the world closer together, providing unprecedented access to information and the ability to connect across the globe, it has also raised privacy concerns, where users are quantified, analysed and potentially exploited. The relationship between convenience and privacy is at a tipping point, forcing society to grapple with what it means to be known in the digital age, not just by family and friends but by the platforms we engage with every day. The dialogue surrounding these questions will shape the future of the internet, user rights and the responsibilities of those who hold the keys to our digital lives.

Web 3.0 Non-invasive?

In a digital age where the invasiveness of Web 2.0 has become a concern, Web 3.0 emerges as a bold response, a new model designed to restore user control and privacy. At its core, Web 3.0 seeks to reverse the trends that allowed likes of Google and Meta to analyse, predict and exploit users' personal information. By leveraging technologies like blockchain, decentralization and cryptography.

Web 3.0 aims to put the power back into the hands of the people.

Here is how Web 3.0 is countering the invasiveness that has become synonymous with Web 2.0.

Decentralization

By moving away from centralized servers and databases, Web 3.0 disperses information across multiple nodes. This ensures no single entity can control or access vast amounts of personal data. Users interact directly with each other, cutting out middlemen, reducing the risk of mass data exploitation.

Data Sovereignty

In Web 3.0, users own their data. Instead of relinquishing control to large platforms, individuals can decide how and with whom they share their information. This model empowers users to control their digital identity, choosing what to reveal and to whom.

Secure Transactions

Blockchain technology is a fundamental part of Web 3.0, offering a secure and transparent way to conduct transactions. Every action is recorded on a decentralized ledger, providing transparency without sacrificing privacy. It is a system that fosters trust without requiring users to reveal sensitive information.

Privacy by Design

Many Web 3.0 applications are designed with privacy as a core principle. Technologies like zero-knowledge proofs enable verification without disclosure, allowing users to prove their identity or meet criteria without exposing the underlying data.

Reduced Reliance on Big Tech

By embracing decentralization and promoting user-centric models, Web 3.0 minimizes the dominance of tech giants. It opens up opportunities for new platforms to flourish, where user privacy and control are paramount.

The emergence of Web 3.0 is a turning point, a conscious shift away from an era marked by data exploitation and invasiveness. It is a reimagining of the internet that prioritizes user autonomy, privacy and empowerment. Indeed, the promise of Web 3.0 is a web where individuals are no longer products but participants, engaged in a digital space that respects their rights and identity. In a world grappling with the implications of digital surveillance and data commodification, Web 3.0 offers a hopeful vision of a more respectful and humane online future.

By embracing decentralization and promoting user-centric models, Web 3.0 minimizes the dominance of tech giants

Blockchain
The Backbone

Blockchain, the underlying technology of cryptocurrencies like Bitcoin and Ethereum, has today expanded beyond digital currencies, enabling secure and transparent peer–to–peer transactions, removing intermediaries and reducing costs. Businesses are using blockchain for supply chain management, IP protection and identity verification. They are also facilitating efficient and auditable cross–border transactions.

Despite the potential benefits of Web 3.0 and blockchain technology, many small businesses remain unaware of and how it works.
This lack of awareness could potentially slow down the adoption of blockchain–based solutions, as companies remain hesitant to invest in tech that is not well understood by customers.
Moreover, the technical complexity of blockchain technology can also make it difficult for people to understand and use. This might hamper the growth of the Web 3.0 blockchain market. How can this issue be tackled?

Education & Awareness Campaigns
Government, industry leaders and educational institutions can come together to create awareness campaigns. These should focus on simplifying complex concepts related to blockchain and Web 3.0, breaking them down into digestible and relatable information for business and the general public.

Training Programs
Create training programs for SMEs to help them understand how blockchain technologies can be integrated into their existing operations. These programs could be part of broader initiatives to boost digital skills within Oman's business community.

Showcase Real–World Applications
By showcasing real–world applications of blockchain technology within various industries, Omani businesses can relate to tangible benefits. Case studies, success stories and demos can be powerful tools.

Industry Standards
The development of clear industry standards and guidelines can provide businesses with a roadmap for implementation. Knowing that a technology complies with accepted industry standards can instil confidence.

Financial Incentives
Government grants or incentives for businesses investing in emerging technologies can help offset the perceived risk. These incentives can make experimentation with new technologies more appealing.

Build Trust
Technology providers must be transparent about the benefits, limitations and risks associated with blockchain and Web 3.0. Honesty can build trust and make adoption more likely.

Web 3.0 in Action
Web 3.0 is here and it is changing the way we use the internet. It is more than just a new version of the web; it is a brand new way of doing things that impacts on how we live, work and play.

Manufacturing

With the help of the Internet of Things (IoT) and edge computing, Omani manufacturers are becoming smarter. Machines can talk to each other and make decisions on their own. For example, if one machine breaks down, another can take over without human intervention. According to research, in 2022, the estimated market value of IoT in manufacturing was US$209 billion globally. The market value is forecasted to reach US$397 billion by 2026.[3]

**IoT Forecasted
Market Value 2026**

US$397 bn

Logistics

Tracking shipments and managing inventory has never been easier thanks to blockchain and smart contracts. These technologies make the shipping process more transparent and automated. For example, working with Accenture, DHL created a blockchain-based serialization prototype with nodes in six geographic locations to track drugs throughout the supply chain – tracing the end-to-end path of pharmaceutical products from origin to consumer, preventing manipulation and error.[4]

Benefits of IoT in Omani Manufacturing

Cost reduction
Reduce operational costs through inventory management, optimizing assets, reducing machine downtime, improving energy efficiency and optimizing operations.

Safety improvements
Ensure a safer workplace for employees through automation and remote monitoring and maintenance.

Faster to market
Enable shorter time-to-market for products by improving the speed and efficiency of manufacturing and supply chain operations.

Better decision making
Leverage IoT generated data to make decisions in near real-time to benefit the bottom line, employees and customers alike.

Greener operations
Through the use of IoT, implement programs for waste reduction, water consumption reduction and energy efficiency.

Customer satisfaction
Boost quality through automation. By reducing the commercial distribution of defective goods, manufacturers can improve overall product quality and customer satisfaction, leading to reduced numbers of product returns.

Tourism

VR and AR are adding new dimensions to travel experiences. Now tourists can take virtual tours of a location before even booking a trip. For example, the British Museum offers virtual tours, allowing visitors from around the world to explore its galleries from the comfort of their homes.[5]

Education

Online learning is evolving with the help of Web 3.0. Virtual classrooms and AI-driven personalized learning paths are becoming more common. Harvard, for example, has integrated AI into its introductory computer science course which will answer student questions and help fix errors in code, allowing students to learn at their own pace with round-the-clock access to tools and resources.[6]

Renewable Energy

Smart contracts and Decentralized Autonomous Organizations (DAOs) are being used to manage and distribute renewable energy in a more efficient way. For example, New York's Brooklyn Microgrid was one of the first communities to be provided with a microgrid, through a collaboration between start-up LO3 Energy and Siemens.[7]

The initiative offers communities the ability to buy and sell power, through blockchain technology. The basic principles of a grid apply, but to ensure it is fair on both the supply and the demand — and given that a unit of power such as 1kWh is the same everywhere — a blockchain ledger is utilised as the method of accounting, specifically via smart contracts. Through this system, a major utility company is not required as the middleman. Instead, everyone connected to the microgrid acts as an independent verifier of all buy/sell power transactions and keeps an independent, verifiable record. Forecasts suggest the global microgrid market will reach US$79 billion by 2028. Key factors propelling the market growth include the surging demand for decarbonization by governments, increased demand for reliable, uninterrupted power supply and growing usage of microgrids for rural electrification.[8]

Web 3.0's revolutionary power comes from the way it uses new technologies like blockchain, VR, AR, smart contracts and more to make people's lives better and more connected. It is a big step towards a more decentralized and democratic internet. By making information sharing safer and more transparent, it is also helping build trust in the digital world. These examples demonstrate how Web 3.0 is already making a difference in many areas of our lives.

4

The Metaverse

While some think the metaverse will drive the next big technology paradigm shift, others are still trying to understand it.[9] In the simplest terms, the metaverse is the 3D evolution of the internet. It is a virtual space where people interact and engage with each other and virtual objects, environments and user-created content. The metaverse is an always-on, persistent space accessed by computers, smartphones, or immersive wearable devices, such as the Oculus Quest or HoloLens. It may be difficult to grasp today, but Gartner predicts that 25% of people will spend at least one hour per day in the metaverse by 2026.[10]

Analyzing the Real World
Researchers and companies are already exploring the industrial metaverse. With its close link to the physical environment, the industrial metaverse can be used to simulate and analyze the real world. This is done through the use of digital twins, replicas of physical objects and systems or processes that collect real-time data from IoT sensors, cameras and other sources.

Digital Twins
The possibilities for digital twins to inform decisions, improve performance and optimize operations are endless. Consider the digital twin of a factory in the industrial metaverse. Sensor data from machines, light sources and AC systems in the physical factory provide real-time input to the same assets in the metaverse. When a sensor detects vibration on a machine, simulations in the metaverse can help companies dig deeper and using predictive and prescriptive analytics, provide insight into long-term impacts on the machine's health for smarter maintenance decisions.

Transport
In the transportation sector, the metaverse can bring together data on buyers, sellers, shippers, carriers and factors such as weather, traffic patterns and road closures to create a real-time, single source of truth and an environment where AI can optimize logistics. The metaverse provides an entirely new level of engagement in which every participant in the value chain can visualize logistics and the dependencies and relationships between them. While the industrial metaverse is still in its early stages of development, it has the potential to revolutionize the way processes are conducted, offering significant benefits over traditional physical methods.

Retail
3-D technology is opening up new opportunities for Omani retail and online businesses. Businesses selling clothes, cosmetics and furniture can now create virtual storefronts or demonstrations offering immersive product and shopping experiences to customers. Customers can now try on clothes using augmented reality (AR) technology to better visualize potential purchases.

Real Estate
Real estate agencies that incorporate high-quality virtual reality (VR) content into their marketing campaigns can generate more leads, boost overall client engagement and drive more traffic to their websites and social channels. A Realtor study revealed that real estate listings that feature virtual tours receive over 40% more clicks compared to those using photos alone.[11]

5

Cryptocurrency

Cryptocurrency is a digital currency using top–grade encryption and safeguarding transactions based on blockchain technology. There is no need for a regulatory body or central issuing authority to complete crypto transactions. Blockchain is used to track how much cryptocurrency is in circulation and who owns it. Crypto is a digital entry, with each being linked to a certain online database. Cryptocurrencies are held in digital wallets and exchanged via crypto markets like Binance and Coinbase. New cryptocurrencies emerge monthly. Yet, the notable ones to mention are: Bitcoin, Ethereum, Polkadot, Solana and Cardano. The current market cap for Bitcoin alone is about US$567 billion, which speaks volumes about the business value of this Web 3.0 technology.

| Bitcoin | Ethereum | Polkadot | Solana | Cardano |

Digital Payments

People's payment behaviour is changing at an unprecedented speed: over the past three years, cash payments in the euro area have dropped from 72% to 59%, with digital payments becoming increasingly popular. In the Netherlands and Finland, for example, cash is used only in one fifth of transactions.[12]

New Kid on the Block

Cryptocurrency is challenging the monetary sovereignty of states and has inspired the creation of central bank digital currencies (CBDCs) which have the potential to transform the global trade and settlement system. For example, China launched a digital renminbi (e–yuan) pilot in 2020,[13] while in October 2021, the European Central Bank initiated a CBDC project with an investigation phase that will run until October 2023.[14]

Previously, banks in different countries needed an intermediary to communicate and execute transactions, the most dominant being the SWIFT financial messaging system which is overseen by the G–10 central banks – Belgium, Canada, France, Germany, Italy, Japan, The Netherlands, UK, US, Switzerland and Sweden as well as the European Central Bank. CBDCs could potentially make this mechanism obsolete. International transactions will no longer require any third party. This would mean that imposing unilateral financial and economic sanctions such as freezing assets or excluding a country from SWIFT would become ineffective.

2022 Crypto Winter

2022 was the year of the crypto winter. This bear market for cryptocurrency saw precipitous drops early in the year when stablecoins Luna and TerraUSD crashed in May. The trading platform Voyager filed for bankruptcy in July along with crypto hedge fund Three Arrows Capital. According to its bankruptcy filings, Three Arrows Capital faced US$3.5 billion in creditors' claims.[15]

Historically, the cryptocurrency market has been volatile, seeing significant price spikes and drops. For example, the period from 2012 to 2014 saw Bitcoin trading at US$13.28, rise as high as US$1,237.55, and fall to around US$687. [16]
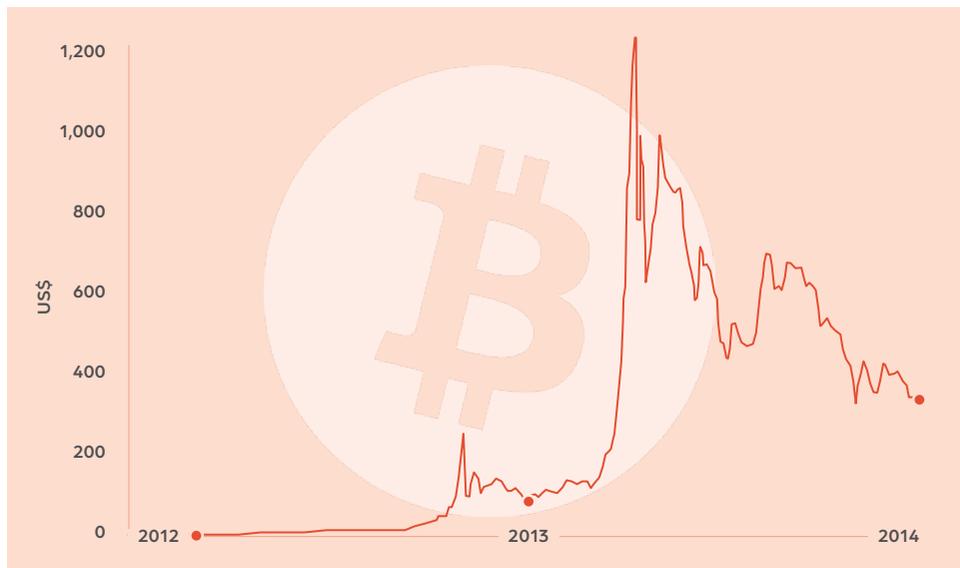
During the COVID–19 pandemic, the crypto market experienced a meteoric rise, jumping from US$6,635.84 to over US$64,000. Many mainstream companies began getting involved in the crypto market, with investment firms offering crypto exchange traded funds or direct investments in cryptocurrencies. Crypto–focused companies, such as FTX, also began bringing in large amounts of money and becoming well–known among the public rather than solely among crypto or tech enthusiasts. FTX, a crypto exchange, was one of the most important entities behind 2022's crypto crash.

The company was founded in May 2019 and quickly became one of the largest exchanges. It even made high–profile investments in its marketing, sponsoring the Miami Heat's basketball arena, Major League Baseball and the Mercedes–AMG Petronas F1 team.

Sam Bankman–Fried
CEO, FTX

FTX Collapse

On 2 November, Coinbase, another cryptocurrency business, published an article revealing that a trading firm owned by FTX CEO Sam Bankman–Fried held a large portion of FTX's own crypto, FTT. This could artificially boost the coin's value. Binance, a competing exchange and FTX investor sold its FTT holdings in response. This led to a price crash. Many FTX users rushed to withdraw their money from the exchange, which created a liquidity crisis and left investors unable to withdraw funds.

A Bloomberg report on November 9th revealed the SEC and Commodity Futures Trading Commission were investigating FTX and Bankman–Fried. FTX and 100 of its affiliates filed for bankruptcy 11 November. It is estimated the exchange had debts exceeding US$8 billion.

Crypto Prices in 2022

Unsurprisingly, the events that destroyed one of the world's largest exchanges had a significant impact on cryptocurrencies' value. Bitcoin started the year at US$47,733.40. It bounced up and down through early April when it began a steady fall. It hit a low of US$15,760.10 on 21 November but then rebounded. As of 29 September 2023, it sits at US$26,968.

FTX and various crypto collapses were not the only factors behind the 2022 price drop. Economic uncertainty, the war in Ukraine and persistent inflation mixed with interest rate hikes also contributed to pessimism about investing in crypto.

Beginning of the End

Were the events of 2022 the beginning of the end for crypto or just a bump in the road? After all, crypto saw large price crashes before but continued to move to greater heights. It is worth remembering that even at its lowest point in 2022, Bitcoin's value was still higher than it ever had been before 2020. Since the trough at the end of last year, Bitcoin has recovered a significant amount of its value.

6

Non–Fungible Tokens

Non–fungible tokens (NFTs) are digital tokens that use blockchain technology to verify their authenticity and ownership. They are unique, one-of-a-kind digital assets that can be bought and sold like any other piece of property. In the world of virtual reality, NFTs can represent anything from virtual real estate to in–game items to digital art. They allow for the ownership and transfer of unique digital assets, something that was not possible before the advent of blockchain technology.

CryptoPunks
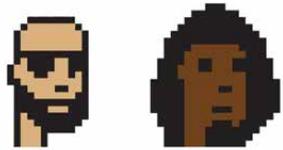
Market Explodes

The market for NFTs exploded in 2021, as cryptocurrency prices surged and technology enthusiasts bet that digital assets would become highly–valued in online virtual environments. In 2021, auction houses Sotheby's sold US$65 million of NFTs, while arch–rival Christie's sold more than US$100 million – accounting for about 5.5% of their contemporary art sales.[17] Transactions hit US$4.7 billion in Q1 2023, compared to just US$1.9 billion in the previous three months, though this was still a long way off the US$12.6 billion recorded Q1 2022.[18]
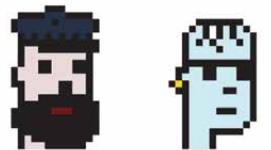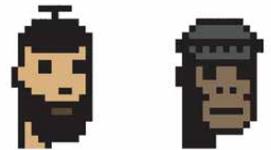
Things Head South

One of the main issues that have plagued NFTs is the distrust of their safety. Although considered secure, recent instances have created doubts. According to a report published by London–based blockchain analysis company Elliptic, over US$100 million worth of NFTs were publicly reported as stolen between July 2021 and July 2022.[19] The study also revealed the value of stolen NFTs based on scams increased from US$3.2 million to US$15.4 million between Q1 and Q2 2022.[20] This type and volume of theft has impacted the trust of investors and collectors.

Problems Persist

In July 2023, NFT trading volume declined 29% with the number of sales dropping 23% on the previous month, while the floor prices of top–tier collections like Bored Ape Yacht Club – a cartoon monkey shooting green lasers from its eyes – sold for US$822,730 – and Azuki – unique, hand–drawn digital avatars including samurais and skateboarders – sunk to two–year lows. Only Gods Unchained and CryptoPunks saw increases in floor prices, but each grew less than 1%. Comparing these numbers to those at the beginning of 2023 puts things into an even worse perspective: In January 2023, there were 7.36 million sales of NFTs, while July netted 3.7 million – a 49% drop.[21]
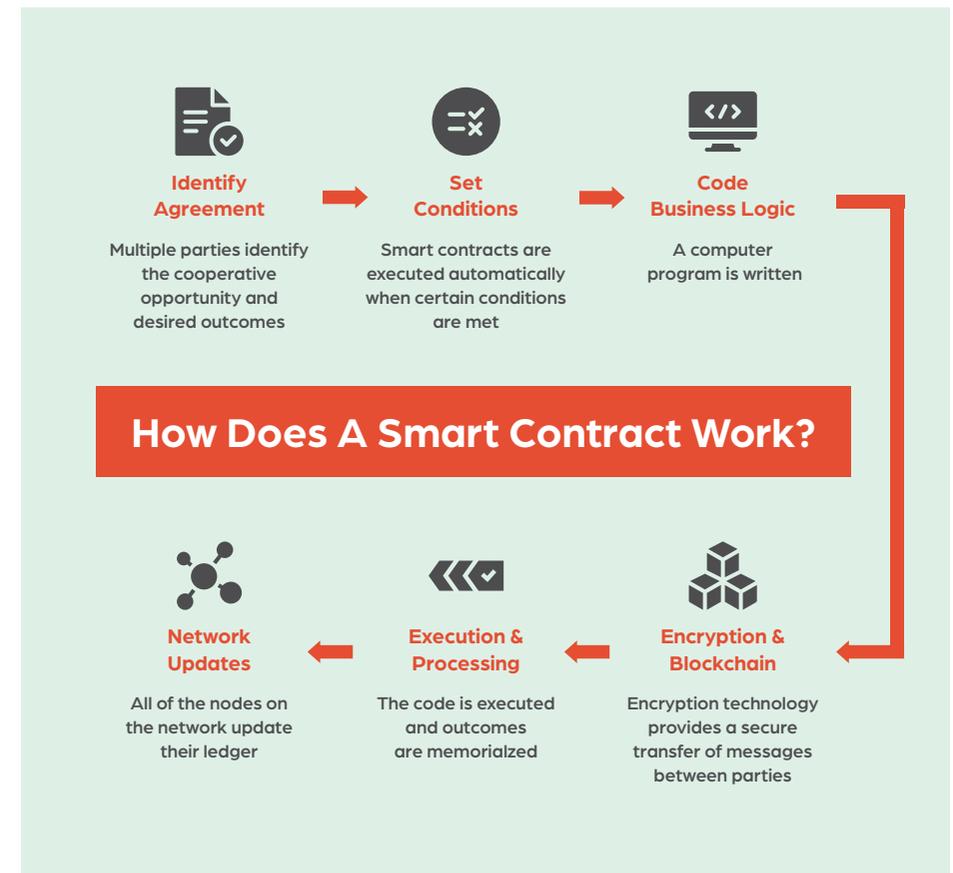
7
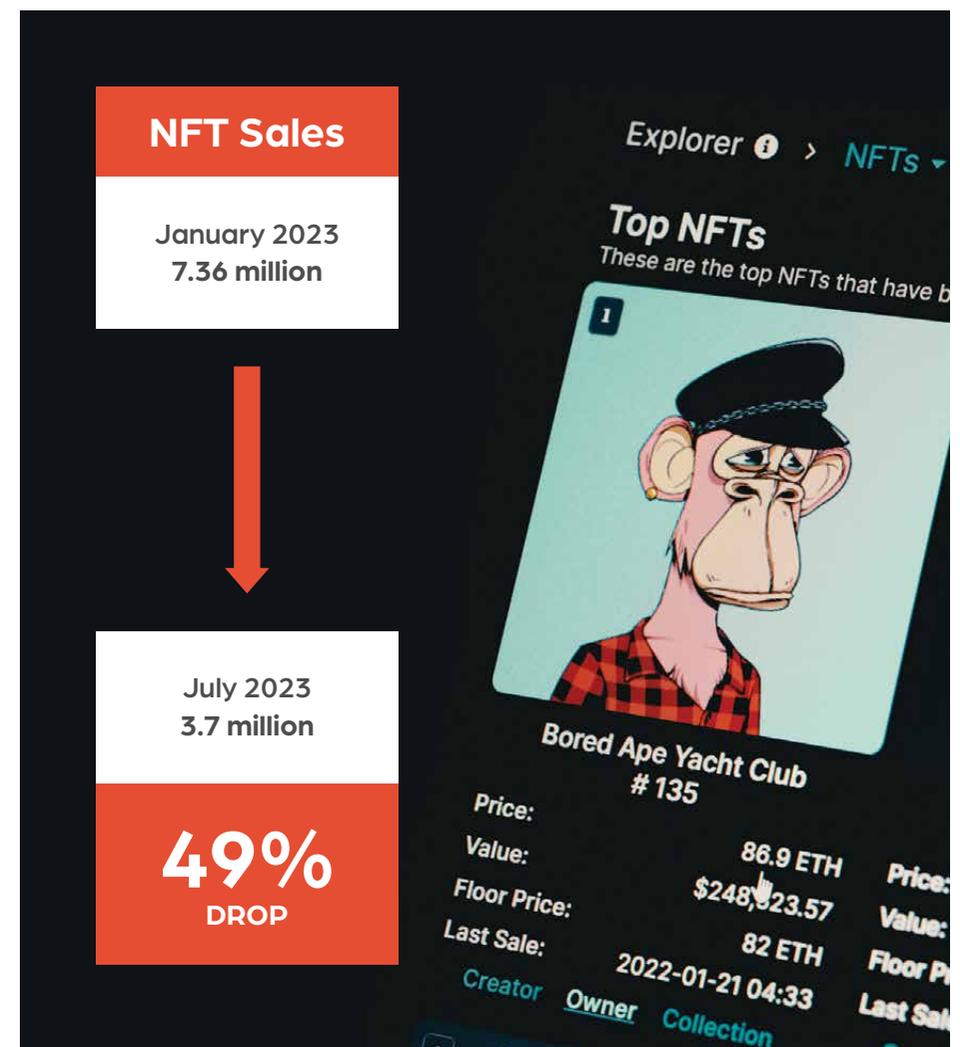
Smart Contracts

A smart contract is a self-executing contract with the terms of the agreement directly written into code. These are stored and replicated on the network and supervised by a network of computers that run the underlying blockchain. They automatically execute the terms of a contract when predefined conditions are met, without the need for intermediaries. For example, in a supply chain, products often pass through a number of hands from the manufacturer to the end consumer. Each step may involve various contracts, agreements and payments. By using smart contracts, these agreements can be automated and enforced in real-time.

Big Boy Adoption
In manufacturing, several large companies have embraced smart contracts to enhance efficiency and collaboration. For example, IBM has partnered with food manufacturers to streamline the food supply chain through smart contracts. By setting predefined conditions in the contracts, payments are automatically triggered when goods are received, ensuring a smooth flow of transactions.[22]

Bosch, a leading global supplier of technology and services, has also implemented smart contracts in its manufacturing processes. By integrating IoT devices with smart contracts, Bosch ensures quality control standards are met, triggering automatic payments upon successful inspection of goods. [23]

Identify Agreement
Multiple parties identify the cooperative opportunity and desired outcomes

Set Conditions
Smart contracts are executed automatically when certain conditions are met

Code Business Logic
A computer program is written

How Does A Smart Contract Work?

Network Updates
All of the nodes on the network update their ledger

Execution & Processing
The code is executed and outcomes are memorialzed

Encryption & Blockchain
Encryption technology provides a secure transfer of messages between parties

Mixed Response
However, the response to smart contracts from many manufacturers has been mixed, reflecting both enthusiasm and caution. Manufacturers appreciate how smart contracts can streamline processes, reduce paperwork and automate transactions which translates into cost savings and faster execution.
The transparent nature of smart contracts ensures all parties have a clear and unchangeable record of the agreement, reducing the likelihood of disputes. However, implementing smart contracts requires an understanding of both the legal aspects of contracts and blockchain technology, which can be daunting for some manufacturers.

While blockchain is renowned for its security features, any coding errors in a smart contract can lead to financial loss or other issues, so manufacturers have been cautious in their adoption.
Another concern is the regulatory landscape around smart contracts and blockchain which is still evolving, leading to some uncertainty and caution among manufacturers.

8

Decentralized Finance

What would a world without banks look like? That is the premise of decentralized finance (DeFi), a US$48 billion market that has been touted as a more efficient alternative to traditional banking.[24]

In a DeFi world, cryptocurrency–backed transactions are executed automatically and blockchain–based smart contracts allow people to trade directly with each other without oversight of big banks – or any banks.

The distributed ledger technology at the heart of cryptocurrency and DeFi is a core innovation that can potentially change the architecture of our existing financial set–up. Historically, intermediaries – such as commercial and investment banks, stockbrokers and pooled investment funds – played a critical role in the financial system. Now, this new financial infrastructure proposes to remove the intermediaries and institutions and replace them with a network of decentralized participants on the blockchain. In fact, it is a revolutionary movement that is already having an impact on people and businesses around the world. Through blockchain and cryptocurrency, DeFi is providing alternatives to traditional banking, with real–world examples illustrating its transformative power.

Borrowing & Lending Platforms
Platforms like Compound and Aave have allowed people to lend and borrow crypto–assets without needing a traditional bank. For example, a small business owner in a region with limited banking access can take out a DeFi loan, using cryptocurrency as collateral and expand their operations.[25]

Accessibility & Inclusion
DeFi services like Uniswap have enabled people in unbanked or underbanked regions to access financial services through a smartphone. In places like rural Africa, where traditional banking might be scarce, DeFi offers access to savings, investment and insurance.

Yield Farming & Liquidity Provision
Farmers and liquidity providers are earning returns by participating in DeFi protocols. A farmer in Southeast Asia might take part in yield farming on PancakeSwap, turning idle assets into productive capital, helping supplement their income.

Insurance Services
Nexus Mutual offers decentralized insurance solutions. A business can use this service to protect against smart contract failure, providing a safety net that might not be available through traditional insurance providers.

Cross–Border Payments
Platforms like Ripple enable quicker and cheaper cross–border transactions. For a freelancer in South America working for a European company, DeFi makes receiving payments faster and without the fees typical of traditional banking systems.
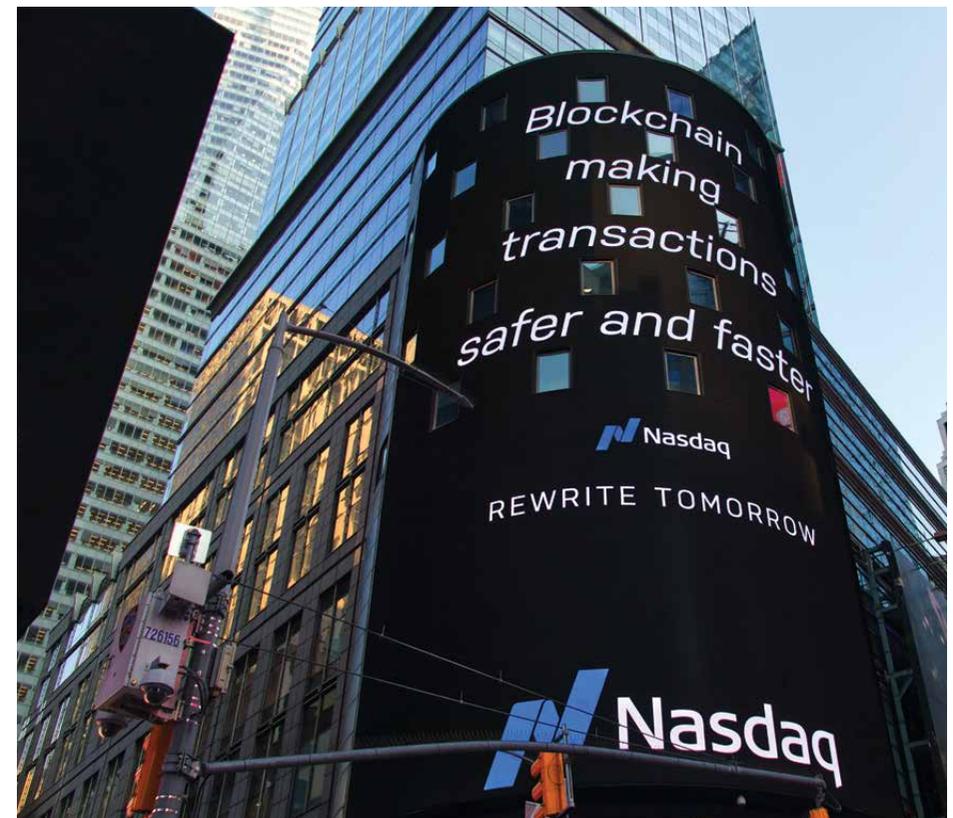
DeFi's Impact

So far, DeFi remains in its infancy and has had little impact on banks' profitability or market share, though this may change in the future. The DeFi industry's size was estimated at US$11.9 billion in 2021 while it is expected to reach US$231.19 billion in 2030.[26] With further adoption of digital financial services and acceptance of services enabled by blockchain, the young industry is expected to expand. However, DeFi assets remain far below those of traditional banks. For comparison, the Industrial & Commercial Bank of China is the largest bank in the world and its current assets are over US$5.5 trillion.

There are several ways DeFi could grow in the next few years. For example, the tokenizing of real–world assets, especially those like real estate that have historically been illiquid, could allow these assets to be used as collateral or traded on a public blockchain. This would give businesses and investors the ability to take advantage of their long–term assets to earn more while investing. It could also make transactions related to these assets faster and more efficient.

DeFi could also lead to digitizing traditional bank functions like lending, borrowing and saving. Smart contracts can lend funds based on criteria written into the code. They can also facilitate deposits and make interest payments without human intervention. By digitizing these functions, and virtually eliminating overheads, banking could be more accessible to those who have been traditionally excluded.

There are some that believe DeFi will replace the current financial system with one that does not require financial companies or banks to act as intermediaries. Others believe DeFi and traditional financial companies will coexist but operate independently, viewing each other as competitors.

No matter what you believe, it is clear DeFi is here to stay.

9
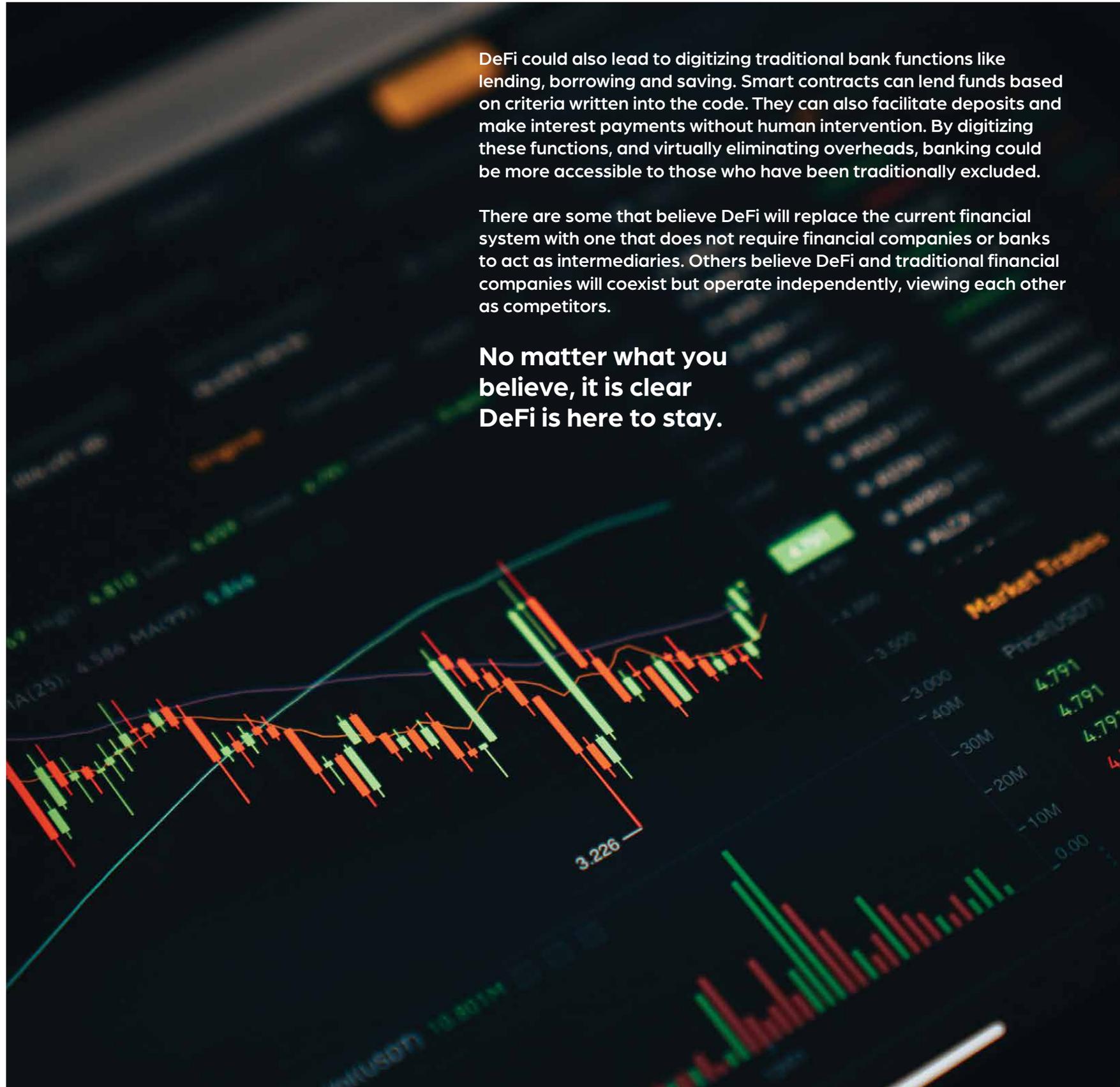
Edge Computing & Small Business

Edge computing is a distributed computing model in which computing takes place near the physical location where data is being collected and analysed, rather than on a centralized server or in the cloud. This new infrastructure involves sensors to collect data and edge servers to securely process data in real–time on site, while also connecting other devices, like laptops and smartphones, to the network. Storing and processing data locally can also enhance security by reducing the exposure of sensitive information to potential breaches in centralized data centres. Businesses are leveraging edge computing in various ways to enhance operations, streamline processes and provide better services.
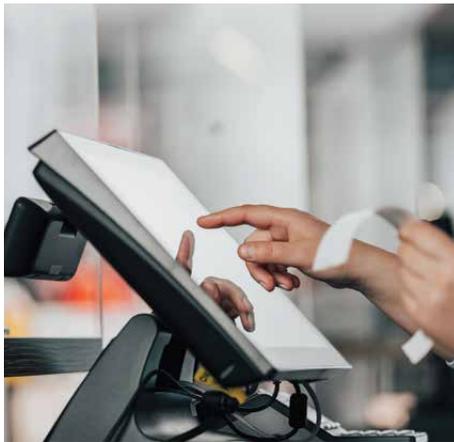
Retail
By using edge computing, local retail stores are implementing real–time inventory management. This ensures stock data is processed instantly at the store level, providing accurate and immediate updates.

Agriculture
Small farmers are adopting edge computing with IoT devices tomonitor soil conditions, weather and equipment. Local processing allows for immediate adjustments to irrigation or equipment, optimizing yields.

Food Outlets
Edge computing aids in providing customized customer experiences. For example, a local restaurant could use it to analyse customer preferences on–site and suggest personalized menu items or discounts on the spot.

TEMPO

Micro–manufacturing
Edge computing is also playing a major role in the world of micro–manufacturing, allowing small–scale manufacturers to process data on–site and make real–time decisions. By analysing information closer to where it is generated, manufacturers can enhance efficiency, quality and customization. Manufacturers like San Francisco–based Tempo Automation, specializing in electronic circuit boards, utilize edge computing to perform real–time quality checks. By analysing data directly on the production line, they can immediately detect and correct defects, ensuring higher product quality without significant delays.

Predictive Maintenance
Edge computing enables companies like Nevada's Filament, a provider of industrial IoT solutions, to offer predictive maintenance for micro–manufacturers. By monitoring equipment on–site, they can identify potential failures before they occur, reducing downtime and maintenance costs for small–scale producers.

Customization & Agility

Brooklyn's Voodoo Manufacturing, a micro-factory specializing in 3D printing, leverages edge computing to enable high customization and agility in production. By processing data on-site, they can quickly adapt to custom orders, delivering tailored products with shorter lead times.

Energy Efficiency

Micro-manufacturers are using edge computing to monitor and optimize energy consumption. By investigating usage patterns directly on-site, they can adjust processes in real time, contributing to both cost savings and sustainability goals.

Supply Chain Optimization

Micro-manufacturers in the food industry are using edge computing to track and monitor supply chain data. This allows for real-time adjustments to inventory and sourcing, ensuring fresh ingredients and minimizing waste.

Enhanced Collaboration & Automation

Massachusetts's Tulip Interfaces provides edge computing solutions that enable micro-manufacturers to create interactive shop floor applications. By studying and sharing data in real time, they facilitate collaboration between machines and human workers, leading to enhanced automation and efficiency.

For many micro-manufacturers, edge computing is a vital tool in a competitive marketplace. It allows businesses to operate with the agility, efficiency and customization typically associated with larger enterprises. From real-time quality control to predictive maintenance, the application of edge computing in micro-manufacturing illustrates a democratization of technology, making advanced data analytics accessible and beneficial even to smaller players. The success stories of companies like Tempo Automation, Voodoo Manufacturing and others underscore the transformative potential of edge computing in levelling the playing field and fostering innovation in micro-manufacturing.

10

Final Word

Web 3.0 represents a shift in how we interact with the internet – bringing together technologies like AI, blockchain and decentralized networks to make the web more intelligent, personalized and user–centric. For Omani businesses, this evolution opens up a range of new opportunities:

Enhanced Personalization
Web 3.0 promises smarter algorithms and more intuitive interactions. For businesses, this means a higher level of personalization in offering products or services. Imagine an online retailer that does not just recommend products based on previous purchases but understands your preferences and needs, providing suggestions that feel genuinely personalized.

Decentralization & Trust
Blockchain technology, a cornerstone of Web 3.0, provides a transparent and secure way of handling data. For Omani organizations dealing with sensitive information, this fosters greater trust. Clients can transact with confidence, knowing their data is secure and not controlled by a single entity.

Impact on Advertising
Web 3.0's focus on user control and privacy may impact the way businesses advertise. As users gain more control over their data, targeted advertising may become more challenging. Businesses will need to find new ways to reach customers without invading their privacy.

Embracing Virtual Realities
With a rise in VR and AR technologies, Omani businesses can offer immersive experiences. Whether it is a virtual tour of a Duqm hotel room or a 3D view of a Rusayl–made battery, these technologies will redefine how businesses showcase and sell products.

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Footnotes

Page		Footnote
7	1	Dartmouth College, Artificial Intelligence Coined at Dartmouth
8	2	Bruegel, The dark side of artificial intelligence: manipulation of human behaviour
15	3	Research & Markets, IoT in Manufacturing Global Market Report 2023
	4	DHL and Accenture Unlock the Power of Blockchain in Logistics, Accenture
16	5	How to explore the British Museum from home, The British Museum
	6	CS50 Will Integrate Artificial Intelligence Into Course Instruction, The Harvard Crimson
17	7	Brooklyn's Blockchain Power Grid: The Future of Clean, Green, Community Energy? RESET
	8	Bloomberg, Microgrid Market worth $79.0 billion by 2028 – Exclusive Report by MarketsandMarkets
18	9	Sci–fi writer Neal Stephenson created the term to describe the dystopian world depicted in his 1992 novel Snow Crash
	10	Gartner, Gartner Predicts 25% of People Will Spend At Least One Hour Per Day in the Metaverse by 2026
19	11	Why Home Sellers — and Buyers — Love 3D Virtual Tours, Matterport
20	12	The digital euro: our money wherever, whenever we need it, European Central Bank

Page		Footnote
21	13	China Is Doubling Down on its Digital Currency, Foreign Policy Research Institute
	14	Digital euro, European Central Bank
22	15	Not–So–Stablekwon, Mashinsky Makes Banks Great Again & More Epic Fails of 2022, The Chainsaw
	16	How Has Crypto Recovered from the Crash? The State of Crypto in 2023, Due.com
24	17	Insight: The New Masters: How auction houses are chasing crypto millions, Reuters
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25	21	DappRadar, The NFT Market Slump: An Emerging Trend or a Temporary Dip?
26	22	IBM, About IBM Food Trust
	23	Why Bosch is jumping on the Ethereum blockchain, Decrypt
28	24	Value Locked in Defi Descends Below $50B Range 9 Days After 2023 High, BitCoin.com
	25	Aave vs Compound: A DeFi Lending Platform Comparison, OKX.com
30	26	Eye–opening DeFi Statistics & Facts for 2023, Bankless Times