

**WINSTON MA, KEN HUANG**

FOREWORD BY ANTHONY SCARAMUCCI, CLAY LIN AND YALE YUHANG LI

# BLOCKCHAIN AND WEB3

**BUILDING THE CRYPTOCURRENCY, PRIVACY, AND  
SECURITY FOUNDATIONS OF THE METAVERSE**

DAO

METaverse

DEFI

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# Table of Contents

[Cover](#)

[Title Page](#)

[Copyright](#)

[Dedication](#)

[Foreword](#)

[Great Leap Forward into Web3](#)

[The Opportunities and Challenges of Metaverse](#)

[Blockchain: The Building Blocks of a Trusted Metaverse](#)

[Acknowledgments](#)

[Winston Ma](#)

[Ken Huang](#)

[About the Authors](#)

[Winston Wenyan Ma, CFA & Esq.](#)

[Ken Huang](#)

[Preface](#)

[Terminology in This Book](#)

[Part I: Mega Convergence of Digital Technologies in Metaverse](#)

[Part II: Blockchain Breakthroughs](#)

[Part III: Three-Way War among Open Metaverse, Big Tech Walled Gardens, and Sovereign States](#)

[PART I: Mega Convergence of Digital Technologies in Metaverse](#)

[CHAPTER 1: Metaverse: Convergence of Tech and Business Models](#)

[Metaverse, Omniverse, and Human Co-Experience](#)

[Big Tech vs. Web3](#)

[Seven Layers of the Technology Stack](#)

[Business Models Converging in Metaverse](#)

[Building a Better Internet for the Creator Economy](#)

## [CHAPTER 2: Blockchain, the Backbone of Web3](#)

[Basic Blockchain Concepts](#)

[Blockchain's Four Key Components](#)

[Mega Convergence of Data Technologies](#)

[Blockchain and Cybersecurity](#)

[Five Challenges of Blockchain Adoption and Possible Solutions](#)

[Why Blockchain Is Essential for Metaverse](#)

## [PART II: Blockchain Breakthroughs Set the Transaction, Privacy, and Security Foundation for the Digital Economy](#)

### [CHAPTER 3: Cryptocurrencies and Tokenomics](#)

[Virtual Lands, Virtual Currencies](#)

[Why Metaverse Needs Crypto and Blockchain-Based Transactions](#)

[Bitcoin: The Beginning of Cryptocurrency and Trust](#)

[Ethereum: Smart Contract Execution Platform](#)

[Bitcoin versus Web3 \(Pure Decentralization vs. Modified Decentralization\)](#)

[Visa and Mastercard: Tokenomics Going Mainstream](#)

[Metaverse Outlook: Crypto Beyond Currencies](#)

## CHAPTER 4: DeFi (Decentralized Finance): Bankless Metaverse

Fintech 2.0: DeFi vs. CeFi

Governance Tokens and Revenue Sources

Stablecoins: Bridging DeFi and CeFi

Layered Protocols and DeFi Security

Bumpy Road to Mass Adoption

Conquering New Territory: DeFi + NFT, Game,  
and Social Network

## CHAPTER 5: NFTs, Creator Economy, and Open Metaverse

2021 – The Year of the NFT

Co-Evolution of Art and Tech

NFT and Generative Art

Creator Economy: Beyond the Bored Apes

Going Mainstream with Brands and Fashion

Challenges to the NFT Metaverse

## CHAPTER 6: Blockchain Gaming in Metaverse

From Gaming into 3D Interactive Metaverse

Tech Convergence, Media Convergence

Epic Games and Fortnite

Roblox Human Co-Experience

P2E Blockchain Gaming – GameFi with NFT

Blockchain Gaming: Gaming First? Crypto  
First?

Gaming, the Foundation of Metaverse

## CHAPTER 7: Metaverse Privacy: Blockchain vs. Big Tech

Privacy in a Parallel Digital Universe

[Future Data Privacy Model in Metaverse](#)

[WEF Data Governance Model](#)

[Zero-Knowledge Proof and Secure Multiparty Computation](#)

[Homomorphic Encryption and Federated Learning](#)

[NFT “Cookies”: When Web3 Tech Meets Web2.0 Legacy](#)

[Surveillance Economy and Dystopian Society](#)

## [CHAPTER 8: Metaverse Security](#)

[Blockchain and Metaverse: Marriage in Heaven?](#)

[Identity in Metaverse: Wild Wild West?](#)

[Metaverse Data Security: Chronic Pain](#)

[Smart Contract Security: Maybe Not So Smart](#)

[Ransomware Attack in Metaverse: Is It Possible?](#)

[Supply Chain Software Risks: A Real Danger?](#)

[Quantum Computing: Challenges and Opportunities](#)

[Extended Reality \(XR\): Novel Security Risks](#)

## [PART III: Three-Way War among Open Metaverse, Big Tech Walled Gardens, and Sovereign States](#)

## [CHAPTER 9: Public Crypto, Government CBDC, and Big Tech Coin](#)

[Three-Way Currency War in Metaverse\(s\)](#)

[China's e-CNY Push at 2022 Winter Olympics](#)

[Crackdown on the World's Largest Crypto Market](#)

[Digital Rupee, Digital Ruble, and Bitcoin](#)

[US Bellwether: CBDC R&D and Crypto Regulation](#)

[US-China Consensus: Stablecoins in the Regulatory Spotlight](#)

[Big Tech Coin: The Rise \(and Fall\) of Libra](#)

[CHAPTER 10: Web3 Creator Economy on Blockchain](#)

[Constitution DAO and Web3 Governance](#)

[Redesign Corporations in the Metaverse](#)

[YGG and Open Metaverse vs. Big Tech Platforms](#)

[Challenge 1: Interoperability and the “Internet of Blockchains”](#)

[Challenge 2: State-Backed Metaverse](#)

[Challenge 3: Will Web3 Startups Become New “Big Techs”?](#)

[Creator-Verse: Future Creator Economy](#)

[Glossary \(alphabetical\)](#)

[Index](#)

[End User License Agreement](#)

## List of Tables

Chapter 4

[Table 4.1 DeFi vs. CeFi](#)

Chapter 5

[Table 5.1 Differences between Fungible and Non-Fungible Tokens](#)

[Table 5.2 Co-Evolution of Tech and Art](#)

[Table 5.3 Different Industry Ecosystems at Different Phases of Art History...](#)

## Chapter 10

[Table 10.1 Unprecedented Gaming M&A and Partnership Transactions in 2022...](#)

[Table 10.2 Monopoly Power by Web3 Dominant Players](#)

# List of Illustrations

## Preface

[Figure 1 Ukraine's Vice PM Tweeted Crypto Wallet Addresses for Donations](#)

[Figure 2 Ukraine's Vice PM Urged Crypto Exchanges to Sabotage Russian Users...](#)

## Chapter 1

[Figure 1.1 Big Techs' \(Different\) Visions for the Metaverse](#)

[Figure 1.2 Personal Data - Key Resource for the Digital Economy](#)

[Figure 1.3 From Basic Internet to Web3 \(Token Economy\)](#)

[Figure 1.4 The Seven-Layer Architecture for Metaverse](#)

[Figure 1.5 Meta - AI, AR/VR, Big Data, Social Network, and UGC Converging...](#)

[Figure 1.6 Roblox - 3D Communication, Social Network, AR/VR, and NFT Converging...](#)

[Figure 1.7 Soul - Social Network, AI, and Digital Coin Converging](#)

[Figure 1.8 Loot - NFTs, Creative Ideas, Art, Derivatives, and Games Converg...](#)

[Figure 1.9 SocialFi - Social Network, Game, Finance, Payments, and NFTs Conv...](#)

[Figure 1.10 The Metaverse "Creator Economy"](#)

[Figure 1.11 Users Controlling Data Privacy, Security, and Value in Metaverse](#)

## Chapter 2

[Figure 2.1 Blockchain's Four Key Components](#)

[Figure 2.2 Public Key Encryption in Bitcoin Transaction](#)

[Figure 2.3 Blockchain Converging with AI, Cloud, and IOT](#)

[Figure 2.4 Ethereum Scaling at Three Layers](#)

[Figure 2.5 Blockchain Technology Empowers Metaverse](#)

## Chapter 3

[Figure 3.1 Historic Price of Bitcoin](#)

[Figure 3.2 Key Milestone Events of Bitcoin](#)

[Figure 3.3 Blockchain Myths vs. Reality](#)

[Figure 3.4 Market Cap of Major Cryptocurrencies \(2013-2022\)](#)

## Chapter 4

[Figure 4.1 DeFi Innovation vs. CeFi Establishment](#)

[Figure 4.2 Total Value Locked in DeFi System \(March 2022\)](#)

[Figure 4.3 Wall Street Embraces DeFi](#)

[Figure 4.4 Decentralized DeFi Players Emerging](#)



## Chapter 5

[Figure 5.1 Major NFT Projects \(by the end of 2021\)](#)

[Figure 5.2 Example of Sharing Income from a Digital Artwork](#)

[Figure 5.3 Amateur Creators \(instead of Professionals\) Dominate Metaverse...](#)

[Figure 5.4 NFT example – The Creator Evolution Timeline](#)

## Chapter 6

[Figure 6.1 1.3 Billion Gamers, Globally](#)

[Figure 6.2 Gaming Is the Next Social Network](#)

[Figure 6.3 GameFi Empowers Free Trading of In-Game Cryptos](#)

[Figure 6.4 Axie Infinity's P2E Ecosystem](#)

[Figure 6.5 Axie Infinity Popular in Emerging Markets](#)

[Figure 6.6 Gaming Is the New Technology Paradigm](#)

## Chapter 7

[Figure 7.1 Different Degree of Privacy Protection of Four Governance Models...](#)

[Figure 7.2 Metaverse Privacy and Governance Reference Model](#)

[Figure 7.3 Leading Privacy-Preserving Computing Methodologies](#)

[Figure 7.4 Zero-Knowledge Proof Algorithm Illustration](#)

[Figure 7.5 How Homomorphic Encryption Works](#)

## [Figure 7.6 Federated Learning Architecture](#)

### Chapter 8

#### [Figure 8.1 The CIA of Blockchain](#)

#### [Figure 8.2 Self-Sovereign Identity \(SSI\)](#)

#### [Figure 8.3 Creators of CryptoPunks Apologize for V1 NFT Sales](#)

#### [Figure 8.4 Illustration of Ransomware](#)

#### [Figure 8.5 Illustration of AR/VA/MR/XR](#)

#### [Figure 8.6 XR Smart Hardware Market Grows Rapidly Post-Covid](#)

### Chapter 9

#### [Figure 9.1 Crypto-Based Payments link Virtual and Physical Worlds](#)

#### [Figure 9.2 Three-Way Currency War in Metaverse](#)

#### [Figure 9.3 How Is DCEP Designed?](#)

#### [Figure 9.4 Timeline of China's Digital RMB](#)

#### [Figure 9.5 Stablecoin Empowers Meta Empire](#)

### Chapter 10

#### [Figure 10.1 DAOs Formed for Various Purposes](#)

#### [Figure 10.2 Corporations vs. DAOs in Creator Economy](#)

#### [Figure 10.3 Smart Contracts Expand the Implementation of DAOs](#)

#### [Figure 10.4 Internet of Blockchains - Cosmos IBC Hubs and Zones](#)

#### [Figure 10.5 Metaverse-related Trademarks Mushroomed in China](#)

[Figure 10.6 BSN – The State-Backed Network](#)

[Figure 10.7 Five Major Parts of BSN Framework](#)

[Figure 10.8 State-backed Metaverse Infrastructure has “3C” Advantages...](#)

[Figure 10.9 The Three Waves of “Creator Economy”](#)

[Figure 10.10 Game Value Shift – Top-down vs. Bottom-up](#)

[Figure 10.11 Evolution of the Decentralized Web, Web1.0 to Web3](#)

## **Praise for *Blockchain and Web3***

“A thoughtful guide to the role blockchain and crypto assets play in the world-changing internet transformation – and how one accelerates the other.”

— **Anthony Scaramucci, Founder & Managing Partner  
of SkyBridge**

“Provides a colorful account of how things like gaming, blockchain, NFTs, AR/VR, DAOs, and DeFi have converged and ultimately presented to us this whole package called metaverse.”

— **Clay Lin, Chief Information Security Officer (CISO),  
World Bank Group**

“Ma and Huang provide the essential handbook on the transformative power of Web 3 – taking you on a ride from the basic fundamentals of the blockchain protocols to the vast possibilities of the metaverse – and the immense impact it could bring. An educational and entertaining must-read for anyone interested in the next, programmable and immersive, web.”

— **Lila Tretikov, deputy Chief Technology Officer  
(CTO), Microsoft**

“An essential breakdown of the most important recent developments in the blockchain space. Unlike many other writers, Ma and Huang look beyond mere financial speculation to uncover the true productive potential of blockchains, smart contracts, DAOs, DeFi, the metaverse, and more.”

— **Neel Mehta, Author of *“Bubble or Revelation?: The  
Future of Bitcoin, Blockchains, and  
Cryptocurrencies”***

“A remarkable convergence of digital economy with blockchain and Web3, depicting the true merits of the metaverse in relinquishing the impending daunted horizons of the information technology.”

— **Mehdi Paryavi DEA<sup>®</sup>, Chairman, the International Data Center Authority (IDCA)**

“A clear picture of the complex ecosystem that enables the next-generation internet. Readers will become “Web3 smart” netizens, educated participants, and even adept game changers.”

— **William Zhang, Security Architecture Lead, World Bank Group**

“Provides a valuable window into metaverse and covers the important building blocks for a trusted metaverse.”

— **Yale Li, Chairman, Cloud Security Alliance - Greater China Region (CSA GCR)**

“Metaverse, Web3, and blockchain are among the cutting-edge technologies of the new digital economy. Focused on security, privacy, and data governance, this book discusses the paramount aspects of how these new technologies are used in the real world.”

— **Yao Qian, Ex-Head of China's Digital Yuan Effort, now Director of the Science and Technology Supervision Bureau of China Securities Regulatory Commission**

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KEN HUANG

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*To Angela - I love you dearly.*

*- Winston Ma*

*To Queenie Ma, Grace Huang, and Jerry Huang, for your  
unwavering love, support, and encouragement.*

*- Ken Huang*

# Foreword

## Great Leap Forward into Web3

In September 2017, JPMorgan Chase (America's largest investment bank firm) CEO Jamie Dimon called Bitcoin a “fraud.” “It's worse than tulip bulbs. It won't end well. Someone is going to get killed,” Dimon said. Now, its wealthiest clients can invest in the asset on the bank's own platform. The dramatic shift of JPMorgan is a significant milestone for the Bitcoin, as well as broad cryptocurrencies, as an asset class.

Various financial institutions like JPMorgan, both on Wall Street and in international governments, have had a very complicated relationship with cryptocurrency as a whole since Bitcoin (together with blockchain technology) first crashed onto the world stage 10 years ago. But as digital finance has accelerated by the pandemic, institutions actively explore new avenues to get involved in the crypto space. This institutional adoption has benefited not only Bitcoin but also the entire crypto asset industry, helping break barriers all across the board.

For example, Morgan Stanley, which has the country's largest wealth management unit with nearly \$5 trillion in assets under management and advisement, has created Bitcoin products on its platform for ultra-high-net-worth investors. U.S. Bank, which is part of U.S. Bancorp, the fifth-largest bank in America announced a new cryptocurrency custody product. Goldman Sachs and other Wall Street banks have started looking into how to use bitcoin as collateral for cash loans to institutions.

Going beyond crypto investments and trading, Bank of America recently released a major research report, stating that they see a massive opportunity in the *Metaverse*, and that it could spur the wider adoption of the crypto industry. One of their top strategists said that he expects large traditional financial companies to enter the space once crypto assets gain wider adoption and usage in the metaverse, and it will finally cause cryptocurrencies to start being used widely for transactions.

In short, Bitcoin, crypto assets, and decentralized technologies (including blockchain) are much more than its financial origins, and this is becoming apparent around the world. Instead, it's about a new, better internet known as Web3. Digital assets and Web3 projects are radically changing how we invest, strategize business models, and deploy products and services. These projects have not only disrupted the thinking of institutional and professional investors, but also have inspired global brands and entrepreneurs to develop new products and services for both the physical and virtual worlds.

Blockchain is the backbone of Web3, which may be the next major platform in computing after the World Wide Web (Web1.0) and mobile internet (Web2.0). It is poised to revolutionize every industry and function, from finance and health care to media entertainment and real estate, creating trillions in new value – and the radical reshaping of society.

Ma has produced a terrific and highly accessible field guide to understanding how the digital economy is accelerating in the Web3 metaverse. A nationally certified software programmer as early as 1994, Ma has published many books on global tech revolution, including *The Hunt for Unicorns: How Sovereign Funds Are Reshaping Investment in the Digital Economy* (2020) and *The Digital War – How*

*China's Tech Power Shapes the Future of AI, Blockchain, and Cyberspace* (2021). For both, I made similar book recommendations to major financial institutions, asset managers, hedge funds, as well as other key players and stakeholders.

As an investor, attorney, author, and adjunct professor in the global digital economy, Ma addressed the crypto-based Web3 metaverse from various perspectives, together with his co-author Ken Huang, a blockchain security expert. The authors' extensive, hands-on involvement in the deals and operations of this mystical world lends vibrancy as they recount practical, illustrative examples in a non-pedantic style. Together, their unique perspectives and differing approaches have produced a nuanced roadmap to the little-known past and exciting prospects of blockchain internet.

Sometimes a book sheds light on a little-known but powerful force. Sometimes it is timely because it catches the world at an inflection point. Rarely does a book accomplish both. With the arrival of *Blockchain and Web3* from Winston Ma and Ken Huang, we have that rare beast: a book that, against the backdrop of the world-altering coronavirus epidemic, provides a thoughtful guide to the role blockchain and crypto assets play in the world-changing internet transformation – and how one accelerates the other.

Anthony Scaramucci  
Founder and Managing Partner of SkyBridge

## **The Opportunities and Challenges of Metaverse**

Covid-19 has accelerated digital transformation across the globe, from virtual meetings and electronic signatures to

digital payments and remote supervision, just to name a few. In the meantime, another strong force is shaping up the next-generation internet, or Web3. We often hear the ingredients of Web3: blockchain, decentralized finance or DeFi, nonfungible tokens (NFTs), and most recently the metaverse. We hear the opportunities as well as challenges these emerging technologies bring about to individuals, organizations, and regulators, and become anxious every day.

As a fast-evolving field, Web3 and its enabling technologies are developing very rapidly. This makes it hard for people to stay current and make informed decisions as to how to take advantage of the opportunities, how to manage the risks, or simply, how to participate.

Luckily, Winston Ma and Ken Huang have provided readers of this book a very detailed picture of the current Web3 landscape. Having been practitioners in this space for many years, Winston and Ken give us a vivid account of the major events and players in each of the fields in the Web3 ecosystem, from technology innovation, new business models, participation by established companies whose current business may be disrupted, the various types and stances of cybersecurity hacks, to reactions from government regulators. This holistic view is beneficial for people to understand the development of this dynamic and complex ecosystem before they can take informed actions.

The year 2021 was marked as the year of the NFTs, when it became a buzzword for the masses and brought us landmark deals worth multimillion dollars. But many people do not understand what exactly they are getting into when they purchase an NFT generated from things like digital art. The recent story of the avid NFT collector, who paid \$2.9 million for an NFT in 2021 but was not able to even get a bid close to \$10,000 a year later, shows that people

have different perceptions of what an NFT represents and what its intrinsic value is. [Chapter 5](#) of the book provides the audience with useful information on this topic.

As Facebook changed its name to Meta in 2021, and Microsoft acquired gaming company Activision Blizzard for \$68.7 billion in early 2022, many are puzzled about the value proposition of the metaverse, and what it means for them. The book provides a colorful account of how things like gaming, blockchain, NFTs, AR/VR, DAOs, and DeFi have converged and ultimately presented to us this whole package called metaverse. The chapters also present the challenges and opportunities that metaverse faces, prompting the audience to think about what these mean for their organization and for themselves.

Congratulations to Winston and Ken on a comprehensive and easy-to-read book that offers so much information and presents so many intriguing open questions for the audience to ponder and act on. Their research will elevate the level of understanding of Web3 by the blockchain and fintech communities and trigger actions that will help shape the next-generation internet for the benefit of humanity!

Clay Lin  
Chief Information Security Officer (CISO)  
World Bank Group

## **Blockchain: The Building Blocks of a Trusted Metaverse**

Metaverse was predicted 30 years ago in Neal Stephenson's novel *Snow Crash*, where people interact as avatars within a high-definition virtual environment projected onto special goggles. Today, new digital

technologies like blockchain will gradually join up and form the building blocks of the future metaverse, which could be the next generation of internet capable of transmitting 3D holograms and a lot more.

However, there are numerous potential obstacles – from technological and economical to political, security, and many other aspects – we must overcome to pave the way of the metaverse. From cloud computing's perspective, the majority of metaverse platform components will have to run on a secured cloud environment, which enforces zero trust and embraces blockchain innovations such as privacy preserving computing, decentralized storage, and decentralized identity as described in this book.

This book provides a valuable window into metaverse and covers the important building blocks for a trusted metaverse. Particularly, it explains blockchain as a critical technology to converge with metaverse. Cryptocurrencies, DeFi, NFT, gaming tokens, and other usage scenarios are discussed extensively in the book. Security and privacy have always been challenges to the internet and the digital world, and fortunately, they are paid full attention in the book as well. I have no doubt that you would enjoy state-of-the-art knowledge and insights on the metaverse from the book, whether you are a businessperson, tech investor, technical professional, government official, or student at college.

The authors of this book are senior experts Ken Huang and Winston Ma in the industry and academia. For many years, I have been very impressed with Ken's research leadership as VP of Research at CSA GCR. Being a recognized technology leader in blockchain field, Ken has published many standards, white papers, and training contents. In 2021, he won the award of “60 Blockchain Leaders” in China. I truly believe that no one else could share the

convergence of blockchain and metaverse better than Ken and Winston.

Happy Reading,  
Yale Yuhang Li  
Foreign Member, Ukrainian Academy of Engineering  
Sciences  
Chairman, Cloud Security Alliance – Greater China  
Region  
(CSA GCR)  
Seattle, Washington USA



# Acknowledgments

## Winston Ma

In the middle of 1990s, the early days of China's tech and internet boom, I majored in electronic materials and semiconductor physics at Fudan University in Shanghai. Aiming for graduate studies in the United States, I diligently studied English for the TOEFL and GRE exams, and I also took a national exam for a professional certificate that is no longer relevant two decades later – “software programmer.”

Back then, China had so few software programmers that the central government organized national qualification exams to encourage the young generation to study computer science. Sensing the tremendous potential of China's tech revolution, I sat in a one-day exam to solve coding problems in C, Fortran, and Pascal languages before I became a “nationally certified software programmer.” Today, however, those programming languages are “old” for coding, and there is no need for such a national exam because numerous college students graduate from computer science majors, driven by the mobile internet boom started last decade and the Web3 revolution emerging post-Covid-19 pandemic.

That's why my 2022 book focuses on *Blockchain and Web3*, after my pentalogy on China's digital revolution and tech power in the previous five years, because we are entering into a new global era of digital transformation. A book on such a complex and fast-moving topic would not have been possible if I had not been blessed to partner with an industry leader like Ken, who has over 20 years of

cybersecurity and blockchain technology experience in cloud security, identity and access management, and PKI and data encryption.

\*\*\*\*\*

My deepest thanks go to Dr. Rita and Gus Hauser, the New York University (NYU) School of Law, and John Sexton, the legendary dean of NYU Law School when I was pursuing my LL.M degree in Comparative Law. My PE/VC investing, investment banking, and practicing attorney experiences all started with the generous Hauser scholarship in 1997. During his decade-long tenure as the president of NYU, John kindly engaged me at his inaugural President's Global Council as he developed the world's first and only GNU (global network university). My NYU experience was the foundation for my future career as a global professional working in the cross-border business world.

My sincere appreciation to both Mr. Lou Jiwei and Dr. Gao Xi-qing, the inaugural chairman and president of China Investment Corporation (CIC), for recruiting me at its inception. One of the most gratifying aspects of being part of CIC is the opportunity to be exposed to a wide range of global financial markets' new developments. The unique platform has brought me to the movers and shakers everywhere in the world, including Silicon Valley projects that linked global tech innovation with the Chinese market.

The same thanks go to Chairman Ding Xue-dong and President Li Ke-ping, who I reported to at CIC in recent years. Similarly, thanks to Linda Simpson, senior partner at the New York headquarters of Davis Polk & Wardwell, and Santosh Nabar, managing director at the New York headquarters of JPMorgan. Those two former bosses on Wall Street gave me a foundation to develop a career in the global capital markets.

Many thanks to Mr. Jing Liqun, president of Asian Infrastructure Investment Bank (AIIB) and formerly the supervisory chairman of CIC. He educated me about the works of Shakespeare, as well as guiding me professionally. The readings of *Hamlet*, *Macbeth*, and *King Lear* improved my English writing skills, and hopefully the writing style of this book is more interesting and engaging than my previous finance textbook *Investing in China*.

For such a dynamic book topic, I benefited from the best market intelligence from a distinctive group of institutional investors, tech entrepreneurs, and business leaders at the World Economic Forum (WEF), especially the fellows at the Council on Long-Term Investing, the Council for Digital Economy and Society, and the Young Global Leaders (YGL) community. Professor Klaus Schwab, founder and executive chairman of the World Economic Forum, has a tremendous vision of a sustainable, shared digital future for the world, which is an important theme of this book.

The WEF Council on Long-Term Investing has gathered the most forward-thinking leadership from major sovereign wealth funds and public pensions, and I learned so much from the dynamic discussions with them for this book's coverage on the sovereign digital currency. They include Alison Tarditi (CIO of CSC, Australia), Adrian Orr (CEO of NZ Super, New Zealand), Gert Dijkstra (chief strategy of APG, Netherlands), Hiromichi Mizuno (CIO of GPIF, Japan), Jagdeep Singh Bachher (CIO of UC Regents, USA), Jean-Paul Villain (director of ADIA, UAE), Lars Rohde (CEO of ATP, Denmark), Lim Chow Kiat (CEO of GIC, Singapore), Reuben Jeffery (CEO of Rockefeller & Co., USA), and Scott E. Kalb (CIO of KIC, Korea).

My gratitude goes to many other outstanding friends, colleagues, practitioners, and academics who provided expert opinions, feedback, insights, and suggestions for

improvement. For anecdotes, pointers, and constant reality checks, I turned to them because they were at the front line of industry and business practices. I would particularly like to thank my partners at CloudTree Ventures (a VC fund focusing on the technologies driving interactive entertainment and the metaverse), Trevor Barron, Jeffery Schoonover, and Adam Smith, as well as the friends at Capgemini, where I am a member of its advisory board, including Cornelia Schaurecker (Global Group Director AI & Big Data of Vodafon), Lila Tretikov (deputy CTO of Microsoft), and Mishka Dehghan (SVP Strategy, Product, & Solutions Engineering of T-Mobile).

On its journey from a collection of ideas and themes to a coherent book, the manuscript went through multiple iterations and a meticulous editorial and review process by the John Wiley team led by the book commissioning editor Gemma Valler. Our long-term collaboration started with my 2016 book, *China's Mobile Economy*. During the pandemic, we released *The Hunt for Unicorns: How Sovereign Funds Are Reshaping Investment in the Digital Economy* (2020) and *The Digital War - How China's Tech Power Shapes the Future of AI, Blockchain and Cyberspace* (2021). The managing editor Purvi Patel and copyeditor Cheryl Ferguson contributed substantially to the final shape of the book. Special thanks to Gladys Ganaden for her design of the book cover and figures.

And last in the lineup but first in my heart, I thank my wife, Angela Ju-hsin Pan, who gave me love and support. You are a true partner in helping me frame and create this work. Thanks for your patience while I wrecked our weekends and evenings working on this book.

**Ken Huang**

At the end of 2016, I resigned from my role overseeing blockchain technology strategic research and fintech product development at Huawei. The main reason for my resignation is that decentralization technology and its associated innovation cannot happen inside Big Tech companies.

That is the main theme of this book. As I worked with my co-author, Winston Ma, to develop the contents of this book, it became even more clear that blockchain technology innovations will happen in a metaverse, led by many small startups.

I am very thankful for Winston Ma, who has come up with the initial idea of the book and developed the book contents as decentralization technology and tokenomics innovations have sped up during the global pandemic.

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