

Table of Contents

Blockchain: a Janus Bifrons Looking at the Past and the Future	XI
Introduction	1
1 What is the Blockchain?	5
1. Blockchain: the background history	5
1982: Ecash (David Chaum)	6
1997: Hashcash (Adam Back)	6
1998: B-money (Wei Dai)	7
1998: Bit Gold (Nick Szabo)	7
1999: Auditable, anonymous Ecash (Tomas Sander, Amnon Ta-Shma)	7
2008: Bitcoin (Satoshi Nakamoto)	8
2. The Blockchain: definition and technical pillars	8
Distributed network	9
Advanced cryptography	11
Data architecture	14
Decentralized consensus	15
3. The blockchain tools	17
Digital tokens	17
Smart contracts	18
2 Blockchain Dimension Analysis	21
1. Approach	21
2. Governance aspects: types of blockchain from the ownership perspective	23
3. Technical aspects: protocol independence	24
4. Technical aspects: decentralized consensus Practical Byzantine Fault Tolerance (PBFT)	26
	27

Proof-of-Work algorithm (PoW)	29
Proof-of-Stake algorithm (PoS)	31
Federated Byzantine Agreement (FBA)	33
Proof of Elapsed Time (PoET)	35
An analytical comparison of the main consensus algorithms	36
5. Blockchain – applications	38
3 Blockchain Applications	41
1 Cryptocurrency	42
2. Data certification	44
3. Digital advertisement	48
4. Digital identity	49
5. Digital voting and governance	50
6. Energy management and distribution	51
7. Financial payments platform	52
8. Gaming	55
9. IoT platform	57
10. P2P content distribution	59
11. P2P resource distribution	61
12. Prediction markets	63
13. Smart contract platform	64
4 Market Overview	67
1. Background	67
2. Cryptocurrency – permissionless use cases	69
Focus: bitcoin protocol	69
Other permissionless use cases	73
3. Data certification – permissionless use cases	75
4. Digital advertisement – permissionless use cases	78
5. Digital identity – permissionless use cases	80
6. Digital voting & governance – permissionless use cases	82
7. Energy management & distribution – permissionless use cases	84
8. Financial payments platform – permissionless use cases	86
9. Gaming – permissionless use cases	89
10. IoT platform – permissionless use cases	92
11. P2P content distribution – permissionless use cases	95
12. P2P resource distribution – permissionless use cases	98
13. Prediction markets – permissionless use cases	101
14. Smart contract platform – permissionless use cases	104

TABLE OF CONTENTS	IX
Focus: the Ethereum protocol	104
Other permissionless use cases	107
5. Blockchain Business Implications	109
1. Blockchain as a new IT architecture: description and business implications	109
Blockchain business model continuum	114
2. Decision making framework	117
6. Conclusions	119
Acknowledgments	123
Bibliography	125