

The 4th Industrial Revolution Powered by the Integration of 5G, AI, and Blockchain

Panel

Abstract

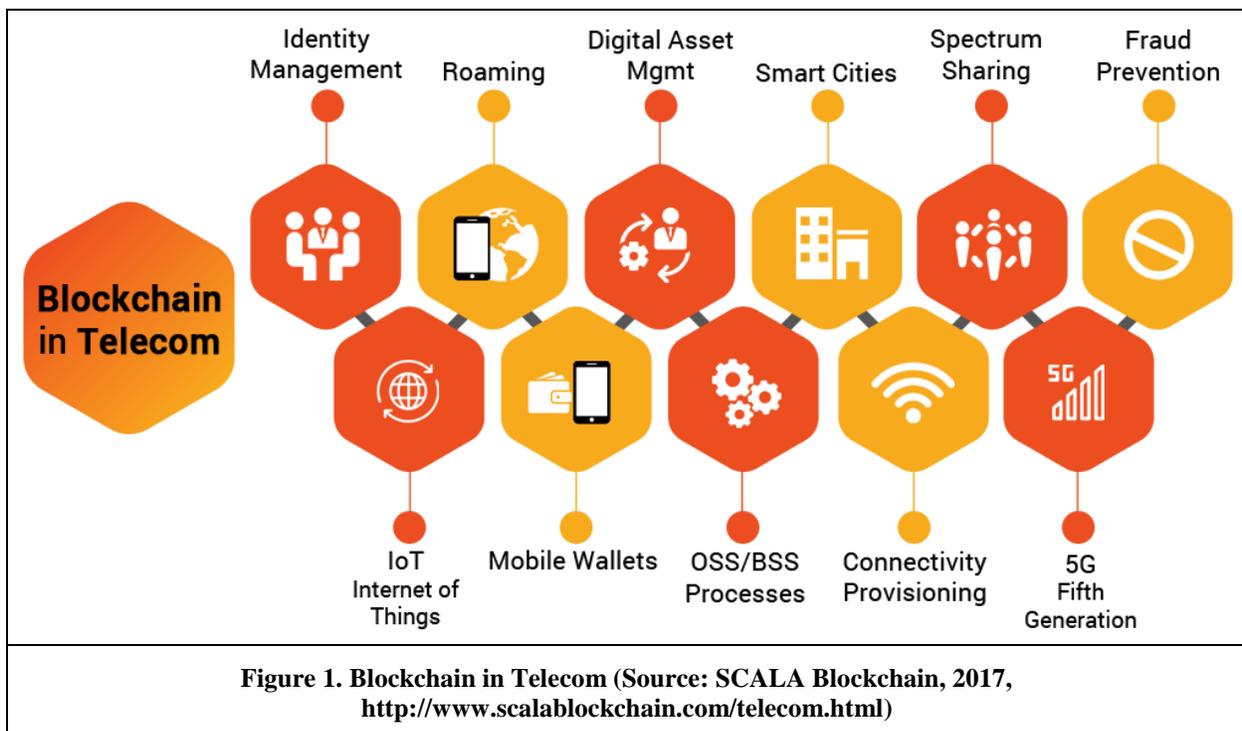
The fourth industrial revolution is characterized as the integration of technology axiomatically transforming organizational and societal actions and behaviors. Blockchain, artificial intelligence, and 5G are the technologies providing the foundation of this digital convergence. The invited panelists will provide the perspectives of these emerging technologies and how their integration will provide new opportunities, threats, and digital disruption with both organizational and societal effects.

Keywords

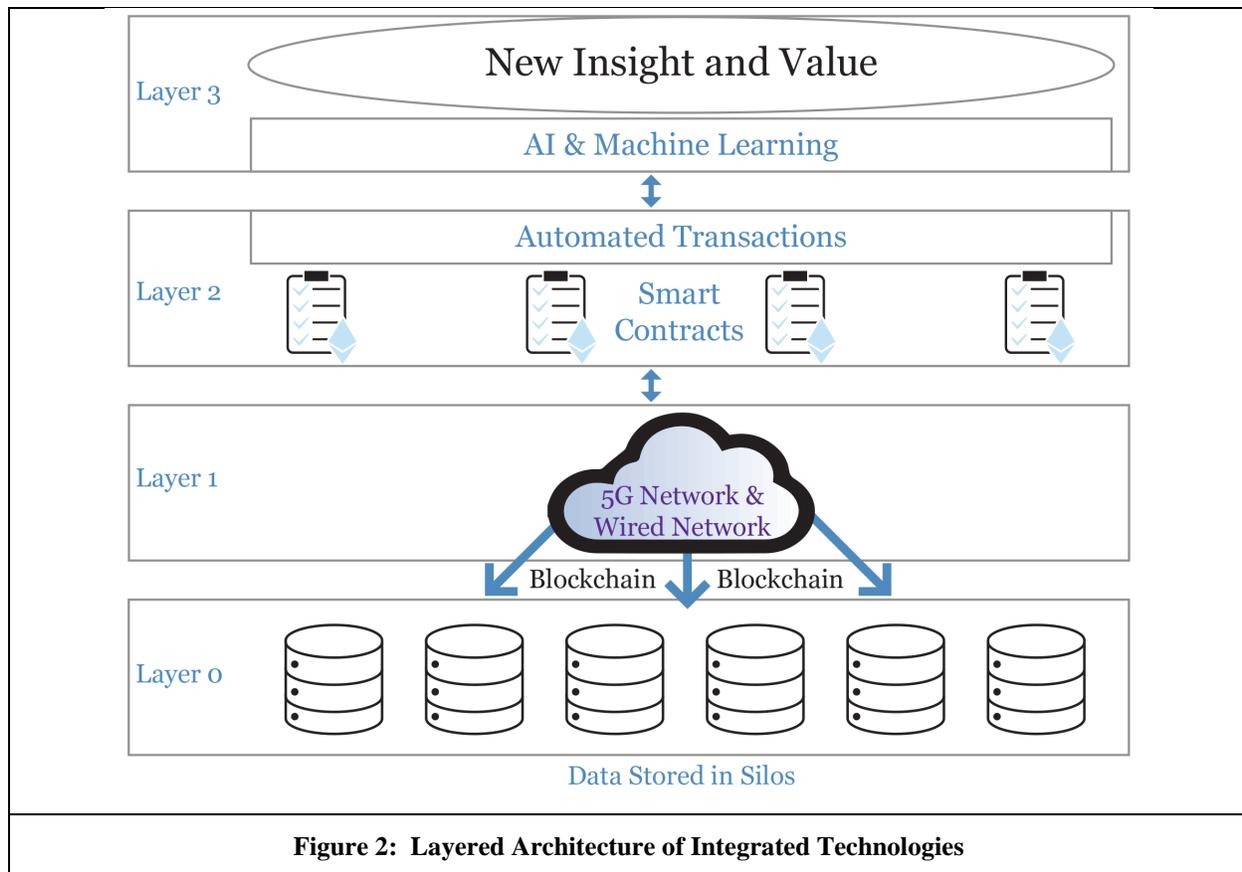
4th Industrial Revolution, 5G NR, Artificial Intelligence, blockchain

Introduction

The fourth industrial revolution is characterized as the integration of technology axiomatically transforming organizational and societal actions and behaviors (Schwab, 2016). The culmination of increased mobile network capabilities provided by 5G, blockchain technology which is redefining the way we transact, and artificial intelligence (AI) supporting cognitive automation will be the foundational technologies driving this revolution. The result is a ubiquitous high-speed distributed network creating a hyper-connected web of devices and people that intelligently share information and knowledge in a secured and trusted manner. Figure 1 illustrates numerous areas that can be impacted through the amalgamation of these technologies.



The benefits of a high-speed mobile network and AI are well known. The blockchain technology adds to them reduced transaction cost, increased security, and reduced fraud risk (Budko, 2018). Benefits created through blockchain technology can be expanded with the integration of 5G service and AI. A layered view of all integrated technologies shown in Figure 2 further illustrates how combination of these technologies provide benefits that can be realized by many industries (Houlding, 2017).



While blockchain and AI consist of independent technologies, they share many core components that complement each other, creating a natural merger of technologies. There are three core tenants that AI and blockchain have in common such as data sharing, security, and trust (Budko, 2018). The potential of blockchain technologies to make data transparently available offers an excellent starting point for AI powered analyses across different industries. It has been well documented how blockchain can provide benefits to the banking industry and provide stand-alone cryptocurrencies, but other areas where blockchain can have significant impacts include connected and autonomous cars, supply chain and logistics, legal agreements, virtual reality and new virtual worlds such as Decentraland, and more.

The current panel discussion contains several researchers who are experts in the various topics related to blockchain, AI, and 5G technology. Each panellist will discuss various aspects of the technologies introduced and advancements made from development and integration of these technologies. Various perspectives will be explored by the group of panelists related to industrial and societal effects of these technologies based on positive and negative impacts. For example, what if cryptocurrencies replace currencies regulated by governments? Who will be responsible for these distributed networks? Can society fully function on blockchain (i.e. business, currency, data, commerce, connected and autonomous cars, etc)? Despite the potential of these technologies, what are the consequences? These questions and other views will be discussed to provide a holistic view of the integration of these emerging technologies.

Perspectives of Technology

5G and Technological Deployment (Note: JP Shim)

5th generation (5G) technology is one of the enablers of numerous emerging technologies. 3GPP (3rd Generation Partnership Project) completed 5G New Radio (NR) specification of Release 15. Multiple-input, multiple-output (MIMO) orthogonal frequency-division multiplexing (OFDM) is the dominant air interface for 4G and 5G wireless communications. It achieves the greatest spectral efficiency and delivers the highest capacity and data throughput. Mobile industry reports estimate 5G wireless standards is 100 times faster than the current 4G LTE network. 5G speeds and low latencies are essential in meeting the increasing connectivity requirements, such as virtual reality (VR), augmented reality (AR), autonomous vehicles, and drones, in ultra-reliable and low latency services. Three primary 5G NR use cases defined by 3GPP are 1) Enhanced mobile broadband (eMBB), 2) Ultra-reliable low-latency communications (URLLC), and 3) Massive machine type communications (mMTC).

Decentralized Value-Chains through Blockchains (Note: Marten Risius)

The recent decade has seen the rise of the digital platform as a highly effective means of distributing innovation to a large un-coordinated community of contributors, who via the platform reach app end-users. The transformative force of digital platforms is in the process of disrupting several industries and has delivered millions of phone and tablet apps to Apple and Google successful smartphone platforms. If we imagine the infrastructural hosting of blockchain technologies on a 5G digital IP-based infrastructure with high bandwidth, low latency, and flexible edge-server computational arrangements, then this could represent the next wave of challenges to existing organizations. Such digital infrastructure can provide even further decentralization into lean, trusted, and distributed value production through innovative reconfigurations of activities. In the context of an increasing diversity of connected devices – the Internet of Things – this could offer lean, flexible, and decentralized exchanges between people and devices linking to service and goods providers.

Blockchain Integration with AI (Note: Bridge between Marten and Kai)

Blockchain is a new trust-promoting technology that enables dataflow outside the firewalls and makes the Internet a value exchange platform across business sectors and countries. It has the potential to change business and economic relationships. Blockchain as a technology can support both decentralized autonomous organizations and centralized organizations by using different decision-making paradigms. The integration of Blockchain with AI provides automated real time analytics and responsive networks that can learn and grow organically creating new opportunities that will impact organizations and society alike. The essential challenge in terms of the fourth industrial revolution will be to identify use cases when to implement blockchain on which AI can build upon.

Organizational Impacts of AI (Note: Kai Larsen)

AI requires that organizations make explicit the values of the firm and firm stakeholders – and how these values inform and shape the management and use of algorithms and insights. In recent years, there has been a dramatic shift in data and analytics governance that extends past compliance and regulation into ethics, and which now includes AI (Wixom and Markus 2017). AI also requires that organizations rethink customer, employee and other people relationships regarding data exchange and the way AI learns, services and influences.

Current State of AI and Blockchain (Note: Hemant Jain)

Research on Robotic Process Automation (RPA) and Cognitive Automation (CA) finds that most enterprises use these tools to automate dreary, repetitive tasks so that they can redeploy human talent to more value-added tasks. Among more than 100 cases, no layoffs resulted from automation; however, scaled implementations did slow recruiting or ratchet down headcount through natural attrition or early retirements. Among 7 surveys analyzed, the most common uses of RPA and CA was to redeploy labor to value-added tasks within the same work unit, to take on more work without adding more services, or to redeploy employees to other work units. Blockchains are a different story. Among interviews in 30 enterprises, 2 surveys, and participant observation, it was shown that most organizations were still experimenting with these technologies in sandboxes. Standards, regulations, new business models, and enterprise mind shifts will all take time before wide-scale adoption.

Positions and Exploration

The race to 5G has commenced with the United State currently in third behind China and South Korea. Blockchain has already established itself as a cutting-edge technology primed to disrupt industry and society alike. AI and cognitive automation are compliment to these networks to advance capabilities as we move towards increased autonomy. With great advancements in technology on the horizon, the exploration of the positive and negative effects to industry and society must be explored. Each panelist will take a position on the various technologies presented and explore the beneficial and adverse effects of these technologies as they relate to industry or society. Various questions will be explored such as the sustainability of large firms that do not embrace further decentralization, impacts of AI's continued implementation on job creation and sustainability, government regulation and legal boundaries, 5G standardization, benefits and consequences of the discussed technologies, and more.

Participation Statement

All panelists have made a commitment to attend and contribute to the conference and serve on the panel if the panel is accepted.

Discussion Format

The panel will use a roundtable discussion format to seek new insights about 5G, AI, and Blockchain in the information systems field. Aaron French will serve as the moderator of the panel discussion, taking 5 to 7 minutes to deliver an overview, with a few examples of digital convergence. The primary purposes of this panel are: 1) to disseminate new points of view and multi-faceted perspective these emerging technologies; and 2) to stimulate an engaging discussion and a healthy debate on potentially controversial topics. The panel will provide a fruitful and informative dialogue to the audience.

Following the moderator's introduction, the panelists will be given about 35-40 minutes to share their views of these technologies and implications of technological integration. The panel will be asked to draw on their expertise in the above scribed five multi-faceted perspectives of 5G, AI, and blockchain to address the two topics, as follows:

- Identification opportunities and threats through the integration of 5G, AI, and blockchain
- Organizational and societal impacts of these digital innovations and future directions

After the first round of discussion concludes, a second round of discussion will ensue where each panelist provides their perspectives on research implications and recommendations for future research. The second round of discussion will last approximately 15-20 minutes, followed Q&A from the audiences for another 15-20 minutes.

Finally, the moderator and the panelists will make brief closing statements (up to one minute each) for the remaining of the time.

Panelist Biographies

Aaron M. French is Associate Professor of MIS at University of New Mexico. He received his PhD from Mississippi State University. His research has been published in the *Journal of Information Technology, Decision Support Systems, Information and Management, Behaviour & Information Technology, Journal of Computer Information Systems*, and *Communications of the Association for Information Systems*. His research interests include Blockchain, Internet of Things, social networking, big data & analytics, and cross-cultural studies.

J. P. Shim is CIS faculty and KABC Director at Georgia State. He is Professor Emeritus and was Professor/Notable Scholar/John Grisham Professor at Mississippi State (MSU). He received grants on telecom/RFID/e-business from NSF, Microsoft, Small Business Administration, and Mississippi IHL. He has published books and 100+ articles. He taught at U of Wisconsin, New York University, Chinese U of HK, and MSU. He is WTS/IEEE Program/chair and was IoT Track/Panel/chair and AMCIS Program Co-chair. His current research interests are 5G NR, IoT cybersecurity, AR/VR, BYOD, and analytics.

Marten Risius is a senior lecturer in Information Systems at the University of Queensland in Brisbane, Australia. His research interests revolve around managerial and societal concerns regarding social media

and blockchain technologies. His articles have been published in various international journals and peer-reviewed conferences such as *Journal of Strategic Information Systems*, *Journal of Information Technology*, *Information and Management*, and *MIS Quarterly Executive*. He has been internationally recognized with various academic and industry awards as well as through research grants. His work is also featured in public media, for example, by The Boston Globe.

Kai Larsen is an Associate Professor of Information Systems at the Leeds School of Business at the University of Colorado, Boulder. He is also a courtesy faculty of Information Science, a Fellow of the Institute of Behavioral Science, and a Research Advisor to the Gallup organization. He earned his PhD at the Nelson Rockefeller College at SUNY Albany. Kai is most known for providing a practical solution to Edward Thorndike's (1904) Jingle Fallacy (Larsen & Bong, 2016) and for his contributions to the Semantic Theory of Survey Response (STSR).

Hemant Jain is W. Max Finely Chair and Professor of Data Analytics, in Rollins College of Business at University of Tennessee Chattanooga. His work has appeared in *ISR*, *MISQ*, *IEEE Transactions on Software Engineering*, *JMIS*, *IEEE Transactions on Systems Man and Cybernetics*, *Naval Research Quarterly*, *Decision Sciences*, *Decision Support Systems*, *Communications of ACM*, and *Information & Management*. He served as Associate Editor-in-Chief of *IEEE Transactions on Services Computing* and as Associate Editor of *JAIS* & *ISR*. He received his Ph. D from Lehigh University, a M. Tech. from IIT Kharagpur, and B. E. University of Indore, India.

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