

Editorial: Blockchain

Chris McPhee, Editor-in-Chief

Anton Ljusic, Guest Editor

From the Editor-in-Chief

Welcome to the October 2017 issue of the *Technology Innovation Management Review*. This month's editorial theme is **Blockchain**, and it is my pleasure to introduce our Guest Editor, **Anton Ljusic**, a training and development specialist in the domains of IT security and former Professor at Champlain Regional College in Saint-Lambert, Canada.

For special issues scheduled for publication in 2018, we are currently seeking contributions for the themes of Entrepreneurship in India, Inclusive Innovation, Frugal Innovation, and Cybersecurity. We welcome suggestions of themes for future special issues in addition to queries from potential guest editors.

For upcoming regular issues, we are accepting general submissions of articles on technology entrepreneurship, innovation management, and other topics relevant to launching and growing technology companies and solving practical problems in emerging domains. Please contact us (timreview.ca/contact) with potential article topics and submissions.

Chris McPhee
Editor-in-Chief

From the Guest Editor

Great inventions lead to unexpected consequences. Consider how the invention of electricity triggered rapid innovation and transformation in telecommunications – first came the telegraph and the telephone, then radio, television, and finally, digital convergence over the Internet. These innovations transformed war, politics, education, shopping, and countless other aspects of modern life. But it is often the social, economic, and even cultural effects of electricity that truly help inventions go far beyond what could have been expected by their inventors. The music industry exploded with the gramophone, health was transformed with radiology and imaging, the airline industry owes its existence to cheaper aluminum, while urban landscapes were transformed by elevators and subways. Each of these examples shows the importance of electricity as a “general purpose technology” – a technology “that can lead to the creation of many sub-inventions” (Gordon, 2017).

And that is precisely what blockchain is: a general purpose technology.

As its name suggests, blockchain is a chain of blocks of information, usually called digital ledgers. These ledgers are chronologically linked and replicated in a distributed database. Information can be added, but never removed; any change is witnessed and validated by the chain and is always available for verification. Each block is protected by cryptography, and only those authorized can access the information in the ledger. Although private blockchains exist, a typical blockchain is public, has no central authority, and is said to be “decentralized”. Thus, the introduction of blockchain is resulting in a move from highly centralized, single-point-of-failure systems to those that are closer to being user-controlled and that provide an auditable trail for moving things of value.

The Internet is about information exchange. Blockchain adds a totally new dimension: the exchange of value between potential strangers in the absence of trusted relationships. Replacing the dependency on

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trust with cryptography means that most verification, identification, authentication, and similar forms of assurance, accreditation, certification, and legalization of identity, origin, competence, or authority of persons or assets can now be guaranteed by mathematics. And once trust is replaced by reliable cryptography, there can be disintermediation of all the layers of “middlemen”.

The contributors to this issue of the TIM Review show that blockchain technology has already permeated many areas of human endeavour. None of them claims to know where the impacts will end, but they give us a convincing picture of a revolution in the making. The reason is that blockchain incorporates a number of characteristics that are useful, unique, and unavailable elsewhere.

In the first article, **Melanie Swan**, a technology theorist from Purdue University in the United States and author of the best-selling book *Blockchain: Blueprint for a New Economy* (Swan, 2015), introduces, defines, and elaborates on the key concepts of the new blockchain technology. Swan highlights both the potential economic benefits and major challenges facing the future of blockchains.

Next, **Philippa Ryan**, Barrister and Lecturer in the Faculty of Law at the University of Technology Sydney, Australia, examines “smart contracts” and the legal implications of their proliferation on the blockchain. Ryan systematically examines some of the legal and practical problems that smart contracts could raise and proceeds by showing how to avoid or bridge them. Her overall conclusion is that smart contracts lead to key improvements in online transactions thanks to the nature of blockchain technology.

In the third article, **Mark Engelhardt**, a partner at Ovodenovo Intellectual Property Consulting in Ottawa, Canada, relies on a number of participant interviews to identify research and development directions in the healthcare sector. Indeed, one of the areas where blockchain is likely to cause significant changes is healthcare and healthcare services – from the way medical records are kept to the administration of medication and the delivery of dental care. The decentralized nature of blockchains “puts the patient at the centre” and in control of, or at least an equal participant in, the healing process. Another relies on the blockchain’s anonymity and encryption of records to provide greater control of access to information by the patient, which paradoxically

might lead to more data being available to researchers. As well as preserving confidentiality, blockchain also guarantees the integrity of records given that any tampering is detectable. Lastly, blockchain might eliminate waste and therefore reduce cost in a sector sorely burdened with expensive overhead that absorbs a large share of national resources.

In the fourth article, **Greg Wolfond**, CEO of SecureKey in Toronto, Canada, argues that blockchain-based solutions have the potential to make government operations more efficient and improve the delivery of services in the public and private sectors. Drawing on SecureKey’s efforts to develop digital identity technologies and through its collaboration with the Digital ID & Authentication Council of Canada (DIACC; diacc.ca), Wolfond’s contribution emphasizes the importance of an ecosystem-based approach within the Canadian context.

Finally, **Hugh Rooney, Brian Aiken, and Megan Rooney** answer the question “Is Internal Audit Ready for Blockchain?” Hugh Rooney is a member of the Tendermint/COSMOS team who are building blockchain infrastructure, Brian Aiken is an External Board Member of the Audit Committee to the Auditor General of Canada, and Megan Rooney is law student at Osgoode Hall in Toronto, Canada. Thus combining their audit/legal/blockchain expertise, the team offers practical advice to help organizations prepare their internal audit teams to be “blockchain ready”. They argue that blockchain technology is coming rapidly and many levels of government in Canada are already on board. Internal auditors must prepare to deal with new data formats, acquire proficiency with big data analytics to reduce business risk, improve performance and maximize value, work more collaboratively across organizations, and understand that some current work will become redundant. The authors briefly describe six steps that must be taken by internal audit practitioners, and they conclude that blockchain has the potential “to enable numerous new digital solutions to many of the challenges governments and other large organizations face”.

The articles in this special issue offer only a high-level introduction to what has been described as the greatest invention since the Internet (e.g., Naughton, 2016; Torpey, 2016). There are far too many application cases for anybody to list and far too much technical detail to cram into a review such as this. A recent Juniper Research study revealed that over half of large

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corporations are studying the use of blockchain (Holden & Moar, 2017). Two-thirds of the same companies said that they expected the technology to be integrated into their systems by the end of 2018. Our contributors have, instead, covered a fairly wide area of developments, describing leading-edge cases from healthcare, a transformative identity verification and control for Canadians, and preparation required of internal auditors for working with blockchain. Questions were raised, definitions advanced and legal and economic effects of blockchain examined. We thank you for your interest. We hope that you will follow some of the leads on your own.

This story has only just begun.

Anton Ljusic
Guest Editor

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About the Editors

Chris McPhee is Editor-in-Chief of the *Technology Innovation Management Review*. He holds an MASc degree in Technology Innovation Management from Carleton University in Ottawa, Canada, and BScH and MSc degrees in Biology from Queen's University in Kingston, Canada. Chris has nearly 20 years of management, design, and content-development experience in Canada and Scotland, primarily in the science, health, and education sectors. As an advisor and editor, he helps entrepreneurs, executives, and researchers develop and express their ideas.

Anton Ljusic is a futurologist with many interests, having been a professional musician in Germany, a programmer at IBM Rome, a professor of Economics and an early Internet telecommunications enthusiast and consultant in Montreal, a Head of the Government of Canada's IT Security Learning Centre, and the founder and chair of the government's Interdepartmental Committee on Security Training. He was founder and editor in the early 1990s of one of the earliest Internet ezines, *Glosas News*. He is a member of Blockchain Association of Canada (BAC) and a believer in political and economic decentralization through blockchain. He holds a Master of Arts degree from Carleton University in Ottawa, Canada, and a Diploma in Economics from the University of Zagreb, Croatia.

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