

**GUEST-
EDITED
SECTION**

*The Emerging
Blockchain
Revolution and its
Implications for
Cyprus*

Dear Readers,

As the fourth industrial revolution gets under way, a number of exponential technologies are emerging and moving fast toward commercial maturity. A wide range of technologies – blockchain, artificial intelligence, biotechnology, nanotechnology, robotics, augmented and virtual reality, drones, decentralized autonomous organizations, computational medicine, the internet of things, autonomous vehicles – will start reaching commercial viability by 2020. Most of these technologies are foundational in nature, in the sense that they can provide the infrastructure on which further specialized applications can then be built. Each of these technologies on its own has the potential to completely transform the digital world of today. However, when viewed as a whole, their applications can really redefine the limits of what is considered possible today.

Cyprus has, fortunately, been at the forefront of academic research, education and training, as well as practical development of applications around these technologies. For example, the University of Nicosia was the first university in the world to offer a full academic program on Blockchain (MSc in Digital Currency, offered since 2014) and has recently launched the Institute For the Future (IFF) to explore the hypothesis that technological progress will cause rapidly accelerating societal change over the coming decades. The goal of IFF is to push students, researchers, policy-makers and business leaders to prepare for these changes and to aim for societally beneficial outcomes.

As part of IFF's work, this special section of *The Cyprus Review* presents a collection of five papers authored by IFF faculty and researchers, showcasing the potential of exponential technologies (with an emphasis on Blockchain), but also the challenges associated with their successful implementation and incorporation in Cyprus.

Spyros Makridakis kicks off the special section with a thought-provoking paper on the future direction of artificial intelligence. Complementary to the popularized future of AI replacing human labor, Professor Makridakis offers a perspective of co-existence between artificial and human intelligence. Under this scenario, the author presents a future of intelligence augmentation (IA) in which machines will allow humans to transcend their own biologically limited intelligence boundaries and to reach new levels of understanding, perception, cognition and perhaps even conscience. Further to a thorough analysis of our possible IA-augmented futures, the paper goes on to discuss the place and role of a small country, like Cyprus, in the ongoing competitive wars between the world's superpowers to dominate the artificial intelligence landscape. According to the author, Cyprus does not stand to lose so much in the early stages of AI/IA, due to the island's focus on services, as opposed to more easily machine-replaceable manufacturing jobs. The challenge facing Cyprus would instead be to upgrade its service sector to keep ahead of developments and to improve its competitiveness through specialized, niche applications. The author goes on to offer insight and suggestions on two dimensions: research spending on AI/IA and dedicated academic institutions to build know-how and world-class expertise locally.

The second paper is by Professor Maria Michailidis, who focuses on the challenges and

opportunities that blockchain and artificial intelligence will bring to human resource management, with a special emphasis on recruitment practices. The paper discusses how these technological developments will impact employment and the ways in which companies hire their future workforce. According to the author, blockchain and AI are revolutionizing the way HR practices are performed, as they can automate the verification of information, resulting in more accurate approaches to hiring employees. Applications like automated validation of curriculum vita, smart contracts specifying hiring and compensation terms, and cryptocurrency utilization for international payrolls, will disrupt the status quo of future HR practices. The paper concludes by looking into the emerging patterns of income inequality and how these will affect future societies, an issue of significance for Cyprus.

The third paper, by Christodoulou et al., adopts a technical viewpoint to present a specific example of how applications like the above can be implemented in practice. The authors present a prototypical smart contract and an associated decentralized application (dApp) to investigate the potential impact of blockchain on logistics operations. Further to demonstrating the potential (as well as the current technological limitations) of such applications, the paper also provides an analytical exposé of the various design challenges that software developers may face when implementing such applications. The paper is also important in that it shows the expertise currently existing in Cyprus for the implementation of such applications and how these can be used to leverage Cyprus into becoming a world-leader in the blockchain-enabled global supply chain management and logistics industries.

The fourth paper, by Professor Marinos Themistocleous, remains in the application domain to showcase the potential of Blockchain in enabling applications related to the domain of land registries. The author presents an extensive list of the current problems associated with the proper recording and processing of land and building ownership on a national level, before discussing how blockchain can be employed to address these problems in an open, transparent, fair, trusted, accurate and cost-effective fashion. After presenting examples from other countries that have been early adopters of blockchain-based land registries, the author concludes by providing specific directions in which Cyprus could move to realize the benefits of blockchain to this important to the Cypriot economy application area.

The fifth and final paper in this section, by Themistocleous et al., continues on the path of Blockchain applications in areas of interest to Cyprus and discusses the results of research that showcases how blockchain can be combined with the Internet of things (IoT) and artificial intelligence (AI) to disrupt the energy sector, with emphasis on solar energy. The paper goes beyond theory to demonstrate a working application in which the Ethereum platform was employed to develop smart contracts to handle agreements between different parties and reduce the role of the middlemen in energy trading from solar panels. The results show how the current ecosystem and business models in the sector can be disrupted, with new roles (like the prosumer) emerging to replace previous business models. At the same time, the paper discusses the role of regulators to provide a fertile ground for the proliferation of such application by instituting a clear and favorable legal and regulatory framework in Cyprus.

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Guest Editor