The Blockchain Challenge for Higher Education Institutions

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Abstract

Blockchain technology is argued to be the next "big" digital technology trend that will challenge a number of organizations, including higher education institutions. In contrast, higher education institutions have a history of being slow to adopt new digital technologies in the organizational apparatus. The question that remains discussing is whether universities will approach blockchain technologies in ways that are different from traditional research and education. This paper intends to discuss three particular ways in which blockchain may challenge higher education institution. The paper questions whether blockchain technologies can democratize and automate learning process, reduce costly bureaucracy and be adopted in higher education institutions. In sum, the intent is to invite to a discussion on blockchain and address whether or in what ways higher education institutions should adopt blockchain technologies as a digital technology.

Keywords: blockchain, universities, digital technologies, governance

Introduction

In 2008, the pseudonymous person Satoshi Nakamoto (2008) introduced the outline of a new protocol where he envisioned a new peer-to-peer digital currency system, using a cryptocurrency we now call bitcoin. Although a complex technology, the basic idea is to exchange currency between persons and organizations by omitting a *trusted third party*. Now, anyone can use a distributed network consisting of a series of blocks where data is recorded indefinitely and is unchangeable by using impregnable cryptography code. As Tapscott and Tapscott write: "Blockchain enable us to send money directly and safely from me to you, without going through a bank, a credit card company, or Pay Pal" (2016:6). Other understandings are one record. For example, a blockchain can be described as digital record keeping of ownership (in history and real time) and a method of value transfer that people can fully trust when they carry out a transaction over the Internet. This is possible because the trust is baked into the technology. The blockchain technology expands the current practice of sharing information over the Internet, as in sending a copy of a file to several recipients and keeping the original, and allows for the sharing of assets, intellectual property, music, art, things of value that cannot be copied, but must be handed over, in presumably safe and trusted ways from peer-to-peer online, without a middle man or third party. The latter is described as a solution to the "double spend problem" that trusted institutions like banks, universities, credit card companies carry out today.

Blockchain technology is argued to be the new disruptive technology (Christensen, 1997) that will challenge a number of organizations and institutions in society at large, bringing widescale social, cultural, economic and political permutations rendering the once powerful nation-state somewhat powerless. The proponents of blockchain technology describe various affordances, like that the technology can democratize the distribution of wealth and bring prosperity to all social strata of society across countries in the world, and that transactions will be much faster and cheaper. Today, the challenge is that the powerful elites monopolize resources in societies and countries, and that organizations size and accumulate wealth by unfair mechanisms of redistribution. Instead, by using "smart contracts", one has the possibility to redistribute resources and revenues to the benefit of all members in the global village. Moreover, blockchain is hypothesized to be the new underlying technology framework for how anything of value is exchanged among persons and organizations over the Internet and is the new protocol peer-to-peer system claimed to solve for example the so-called double-spending-money

problem in currency transactions. Complex code and transparency of records of all transactions eliminate the possibility of a transaction being copied, keeping all information absolutely safe and un-hackable.

Indeed, these arguments are very powerful, as they address major issues of interest to many stakeholders. First, the idea that blockchains are transparent and unbreakable due to complex and encrypted code, addresses the complex human *issue of trust in technology*. Second, the notion that transactions can be performed over the Internet on *a new technology platform without the use of a trusted third party* – which in many cases means social institutions or organization – is argued to seriously undermine the activities and operations of several organizations enjoying great trust and legitimacy in our daily lives. Third, the idea that the blockchain architecture is fundamental *to reducing friction*, creating trustworthy records of any asset transfer and entailing personal ownership of data, speedy transactions and reduced transfer cost.

Universities or *higher education institutions* (HEI) are enjoying great trust among people and civic society. With blockchain technology, HEI are forced to question changes in society to the benefit of research and education. Grech and Camilleri (2017) suggest several uses of blockchain-based technology in the domain of digital accreditation and management of intellectual property. Sharples and Domingue (2016) go as far as to propose a permanent distributed record of intellectual effort and associated reputational reward, based on a blockchain that instantiates and democratizes educational reputation beyond the academic community. Likewise, Turkanović, Hölbl, Košič, Heričko, and Kamišalić (2018) suggest a global blockchain-based higher education credit platform that will process, manage and control credits (c.f. European Credit Transfer and Accumulation System (ECTS) that students gain from completed courses, and that will be used by students, HEIs and other stakeholders. Kandaswamy and Furlonger (2018) identified four types of blockchain initiatives: (1) Blockchain disruptor – to be used as an education and academic publishing platform, (2) Digital asset market – to be used for student payment and funding and rewards, (3) Efficiency play – to be used as lifelong learning passports, and (4) Record keeper – to be used for intellectual property management and automatic recognition of credits.

Kamišalić, M., Mrdović, and Heričko (2019) identified two basic types of approaches to blockchain-based solutions within the HE environment: 1) A student-centric approach, where the responsibility and control over received credentials is placed on students, thus eliminating the need for a verification process by an intermediary. Student can then stream evidence of achievement to stakeholders. 2) An institution-centric approach, where the primary goal is to facilitate and streamline activities of educational institutions, like for example, payment, accreditation processes, international collaboration and joint degrees, licenses and certificate accreditation of learning goals. The authors stress that both approaches are faced with different challenges, e.g. organizational, legal, administrative, etc., and that special attention should be placed on the data privacy challenge. In their review of 25 exiting research on blockchain implementation, they found that the trend is to use blockchain additionally in order to support organizational processes within the institutions.

One may argue that blockchain technology constitutes a potential threat to the universities' monopoly of formal accreditation (in courses and study programs). Therefore, we outline three challenges for HEI to consider in their approach to blockchain technologies. The first addresses how HEI blockchains democratize and automate various forms of available university data. The second concerns the various ways in which blockchains can be a way to minimize costly and expanding university bureaucracies and supportive systems. The third relates to what we call technology gaps in the adoption of blockchain technologies.

Three challenges

Challenge 1: Democratizing and automating HEIs

We argue that blockchain might have the potential to democratize and automate administrative routines and work processes that are an integral part of research and educational processes at universities. Blockchain may serve to make these processes more available and transparent to learners, educators, researchers and other important stakeholders. It is not uncommon for administrative systems, showing an overview of learning education and research processes, to be protected from free and open access. In other words, HEI may disapprove of giving external actors access. That said, we observe that supra-national bodies of government like the EU, acknowledge the affordance of blockchain. For example, Grech and Camilleri (2017) argue that blockchain will disrupt any field of activity that is founded on time- stamped record-keeping of titles of ownership. They highlight several possible benefits of blockchain technology, like award of qualifications, licensing and accreditation, management of student records, intellectual property management and payments. Grech and Camilleri

predict that "the main beneficiaries of the adoption of blockchain- based technologies in education are likely to be networks of educational organizations and learners" (2017:10).

Immediately, there are a number of areas of applications in which blockchain technology can be used in HEI. Much of this concerns making records from administrative systems that are under central control, transferable to blockchain design on platforms. We mention a few examples. First, universities have large records of costly, manually processed *student grade transcripts*. They can be encrypted and assigned to a ledger, easily accessible and visible to everyone. Second, learners' actual competence can be made more detailed, accurate and truer than with grades only. Based on the assumption that students engage in and use *badges* as certificates of knowledge, these badges can be deposited in a large decentralized network in an open badge passport. Third, we believe blockchain technology may have the potential to master the *digital identity* of learners. Today's widespread use of various learning apps and services, as well as fake university degrees and students cheating on exams and term papers, are related to identity management. Such challenges can be removed as blockchain technology makes the identity of the students absolutely true. Fourth, MOOC learners interact and learn across various online course platforms, which are either national or international. To avoid that certain online platforms obtain a global oligopoly position, students can use blockchain to rideshare between the platforms and design their own degrees more freely.

An important argument to consider concerning blockchain technology is how the global forces of digitalization challenge and push HEI to consider data management in greater detail. This relates foremost to data as "the new oil of the digital era". Universities might be (or are) in the same position as companies that process and store vast amount of personal user data. Alphabet, Apple, Amazon, Facebook and Microsoft, are the most valuable firms in the world, due to their access to sellable data, provided for free by their users in exchange for using their services. Universities are also handling huge amounts of data that are produced by students and staff for free in LMS and technological infrastructure made available in the institutions. In HE, data is widely used to inform research, but there is so far few system in place for researchers to share and compare datasets across silos and institutions. Data is also used to assess students and provide automated feedback, but metadata can also be used by educators, to improve teaching and formative assessment, which we think is not that common. Finally, data/metadata can be used by the institutions to attract students to the university, to inform policy and their business strategy for life-long learning. In this sense, HEI need to develop clear strategies for data mining.

The last point that we wish to raise, is how smart contracts can be used to distribute, acknowledge and secure intellectual property in HEI. Universities are creators and distributors of intellectual properties. To fairly secure academic intellectual property rights, like course content, textbooks and research, they can be made assessible on blockchains by the use of smart contracts. The practice allows for constructive collaboration, transparency, sharing and educational empowerment in HE. Smart contracts are, however, only as good as the people who program them, and the code will always be susceptible to human error or avarice (Botsman, 2017). We believe that universities have the sufficient amount of trust to make academics make the trust leap that is required to share various kinds of intellectual properties with other stakeholders.

Challenge 2: Reducing costly university bureaucracy

The second challenge is within the field of governance of universities as organizations, where we argue that blockchain technologies can be used to redirect the focus towards research and education. Over the years, universities have grown to become large bureaucracies. It can be argued that the growth is in the number of administrative rather than academic staff and can be attributed to New Public Management (NPM) practice (Hood, 1991). In short, an NPM management approach implies that universities are managed according a "businesslike" management strategy. HEIs are experimenting with decentralized organizational structures with increased focus on financial control, efficiency and ongoing monitoring and auditing of researchers and educators. Focusing on learners, such measures aim to make HEIs more effective. In practice, there are other experiences. The hierarchical organization of higher education, where policy makers regulate institutions, institutions regulate departments and departments regulate staff is bureaucratic and slow. This also applies to the way staff document their research activities, accreditation and course evaluation, as well as the way they apply for funding and reimbursement through the hierarchy. Likewise, for students, documenting their formal and non-formal learning when applying for a job or further studies may also be a bureaucratic obstacle to succeed and prosper. Bureaucracy steals precious time and attention from core activities in HE. In some Nordic countries, about half the budget is spent on administrative and supportive positions in some HEIs (NSD, 2018). This is money that could have been spent on students' learning and research. In effect, HEIs have become ineffective top-down and hierarchical organizations that have implemented new power structures that undermine academic freedom and autonomy and predetermine learning paths for

students. In HEIs, time and attention are limited cognitive resources that should mainly be used to conduct research and cater for students' formal and non-formal learning to the benefit of society and people's well-being.

Digital technologies can be used to make HEIs much more effective than they are today. For example, we observe the emerging use of artificial intelligence in chatbots and robots to carry out routine jobs in HR and to communicate with citizens. Such technologies can easily be adopted. Moreover, Tapscott and Tapscott (2016) argue that blockchain technologies can be used within the field of government and to promote democracy. They present some interesting ideas, claiming that many of the digital solutions used in the field of e-governance, where for example citizens can vote over the Internet, access their tax records, and have a single secure digital identity, are examples of what blockchain technologies can be in a prospective future, where organizations are managed as virtual organizations on blockchain platforms. Increasingly, one should meet their digital optimism with skepticism. A networked blockchain-based technology may, however, contribute to eliminating bureaucracy in HE. One example is to use blockchain in platform-based formal and non-formal learning to issue credentials. Another example is to use blockchain in libraries to administer books. And surely there are other undiscovered possibilities.

Challenge 3: Lagging behind in technology adoption

The third challenge relates to the adoption of blockchain technologies in HEIs. This raises the interesting question whether universities will transform their internal organization and change their priorities to adjust to a changing external environment, which is an ongoing trend in other larger organizations. Blockchain is currently a disruptive innovation that is closely monitored by organizations like banks, corporations and Internet-based companies, meaning that innovative uses of blockchain grows resilient as the "fail fast, fail forward" approach develops. The clearest example is how large financial institutions address the potential and get involved in the actual development of the technology. For example, Tapscott and Tapscott (2016) argue that powerful players like the Commonwealth Bank of Australia, Société Générale, Nordea and Wells Fargo are investing or forming consortiums where they address issues related to future technology development and needs. The emerging pattern from these initiatives is that hierarchical and centralized organizations focus on technology trends and ideas that, to a large extent, are driven by grassroot enthusiasts. There are many examples of blockchain start-up companies being bought by large organizations and of developers from such companies joining powerful organizations.

Therefore, there is a need to address the question of the role and positioning of HEIs in the blockchain technology landscape. Not surprisingly, HEIs approach blockchain technologies as they often approach new issues; they study the phenomenon through *research* and disseminate the result through research informed *education*. Only recently, some large and prestigious American elite universities have taken a different approach; Harvard, Stanford, MIT are silently investing in crypto funds (Cointelegraph, 2018). HEIs are notoriously slow on the uptake and integration of new technologies in their organizational apparatus and we can only assume that it will take some time before we will see the advent of blockchain, or new technologies for that sake, either on or off campus or in international collaborative initiatives. For example, European universities seem to struggle to develop adequate technological infrastructure and digital agency (Passey et.al.2018) at all levels in the institutions. Also, they are facing growing competition from tech-savvy actors in, for example, the course and online education market (c.f. Future Learn, EdX, Coursera). Case studies might cast a light on this matter. In a study of universities in a Nordic country, Fossland (2014) found that the drivers of digital change are not placed on top of the hierarchical structure, but rather in sub-groups, among enthusiasts, in the organization. This contests the idea of centralization. At a European level, R. Pinheiro and Stensaker (2014) argue that both internally (through management) and externally (through policy pressures), the university is becoming more tightly coupled so as to embody the role of a strategic actor that rationally creates and follows strategic, linear plans, often with unintended consequences. This convergent approach is in contrast to the more divergent innovative approach described by Fossland (2014) and raises the question how universities can adopt blockchain technology as resistant organizations, unwilling to make room for trial and error in technology adoption.

A contemporary model to describe successful universities can be found in Seville's (2016) work and concept; *resilient organizations*. R. Pinheiro and Young (2017) expand the term by bringing a more nuanced perspective, framing successful universities as *adaptive resilient organizations*. In doing so, they propose an alternative understanding of how universities can evolve and adapt to external demands and circumstances in the long run. Pinheiro and Young build on complex systems theory, which takes as a starting point that the system is more than the sum of the individual parts and involves self-organization, non-linearity and co-evolution. Consequently, they turn away from a physics-model of understanding (strategic management) to a biology-based one (complex organization). Pinheiro and Young, who expand on Morçöl (2013), understand complex systems as non-linear, dynamic and characterized by many sub-entities and multiple connections or

linkages between them, and argue that European universities are capable of digital change, as long as these features are intact. The assumption is based on the existence of *internal complexity*; the existence of multiple semi-autonomous sub-entities or -groups that interact with other outside actors and form loose couplings, and *external complexity*; the competitive landscape created by policy initiatives and social, technological and economic forces, which force universities to position and re-position themselves. According to Pinheiro and Young's (2017) approach, universities that function as complex, adaptive and resilient organizations are more likely to overcome or absorb major disturbances and still retain their basic function and structure.

In this context, universities may evolve to become adaptive resilient organizations with the capability to address disruptive technologies such as blockchain technology, while maintaining a certain level of resistance (strategic institutions), which in this case is understood as traditions and ways of education and research that constitutes the core activities in universities. Based on the assumption that major change will emerge from blockchain technology, the adaptive resilient organizational approach has certain implications for governance in HEIs. For example, the emergence of innovative uses of blockchains in HE must be rooted in innovative research and development over time, involving drivers of change, with complementary competences and digital agency from across silos, loose connections to other agents and strong support from management and national authorities.

Concluding remarks

In this article we have discussed the possible value of blockchain technology in higher education and suggested some areas where the technology can enhance speed, efficiency and transparency. It remains to emphasize that there are many issues related to the implementation of blockchain technology. General aspects that will have to be considered are for example: the environmental cost - the amount of electricity that is needed to run complex code across many computers, the time aspect – as blockchains grow, they might be slow and cumbersome, the trust aspect – it will take time for end users to make the trust leap and trust the technology, and the legal aspect – the slow regulation of the value-based transfer of value over the Internet by the use of blockchain networks invites fraud. The proponents of blockchain technology portray the technology as powerless, unharmful and with benefits for all. This might be true, but there are also many unanswered questions associated with the use of blockchains in this respect. In fact, we rest assured that it is not enough to simply trust a blockchain, because it is double-safe and encrypted. Relying on such assumptions is to believe in false realities, as we can be sure that, one day, the vital encryption code will fail. For most universities, there are also other issues. Universities may also have a vested interest in the failing of blockchains to protect themselves from being exposed to competition. Trust in certification and accreditation has for example so far been vested in universities. We believe, however, that there is an ongoing trend where stakeholders make use of a variety of datapoints in addition to ECTS issued by universities to determine employment. Another difficulty lies in the considerable amount of organizational autonomy that HEIs will have to render, or, to be more precise, surrender, to a self-organized and autonomous algorithm or a digital decentralized technology that we do not fully understand the extent of.

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