Postdigital Science and Education (2020) 2:280–288
https://doi.org/10.1007/s42438-019-00091-6

COMMENTARIES

Postdigital Prospects for Blockchain-Disrupted Higher Education: Beyond the Theater, Memes and Marketing Hype

Shane J. Ralston[1]

Published online: 4 December 2019

Blockchain and the Postdigital

Following the steam engine, electricity and Internet technology, Blockchain has been heralded as no less than *the* breakthrough technology of the 'Fourth Industrial Revolution' (Chung and Jaehyoun 2016; Schwab 2017). In 2008, digital network designers sent shock waves through the financial sector by chain-linking thousands of nodal points as immutable blocks of data (Nakamoto 2008). Blockchain, or Distributed Ledger Technology (DLT), permits peer-to-peer payment, smart contracts and perfect recordkeeping, thereby eclipsing most traditional financial instruments in terms of privacy, reliability and efficiency.

With DLT's success in driving the development of cryptocurrency (such as Bitcoin), the technology bridged to a myriad of knowledge-based applications, most notably in the areas of commerce, industry and government (Underwood 2016). In the language of technology sector insiders, these areas were 'disrupted' by Blockchain. Some higher education analysts, technology industry insiders and futurists have claimed that Blockchain technology will inevitably disrupt higher education in a similarly dramatic fashion (Sharples and Domingue 2016; Chen et al. 2018). The aim of this commentary is to introduce a healthy dose of realism into the hype-filled atmosphere of the Blockchain-for-higher-education narrative. A postdigital approach is taken because it treats digital and non-digital technologies as having equal material and cultural standing as candidates to transform higher education (Jandrić 2019).

A Blockchain Primer

Probably the simplest way to describe Blockchain technology is as a noncentralized account of digital happenings. A blockchain is itself data connected or chained together

✉ Shane J. Ralston
philsphizer@gmail.com

[1] Wright College, Woolf University, Valletta, Malta

from computer to computer, where the next piece of data can only be appended after all participating users reach consensus. Blockchains can be either public or private, and designed for specific purposes, such as the mining and trading of digital money or cryptocurrency (Tschorch and Scheuermann 2016). The decision procedure for determining whether a block of data has the right pedigree and therefore should be added to the chain is the so-called distributed consensus method. Users' computers must undertake substantial computational work ('proof of work' or 'mining') to add blocks to the chain. A disadvantage of this mining process is that computers must utilize significant amounts of electricity in order to demonstrate proof of work and build the blockchain (Nakamoto 2008).

Every block of data (approximately 1 MB) securely carries information that is distributed between multiple computers, only accessible with a cryptographic key. Once the parameters of the key are set, they cannot be altered, even by the original author. Each record receives a time stamp, so that the authenticity and time of submission is permanently preserved (Kraft 2016). Bockchain's recordkeeping function makes the technology beneficial for educational administration, especially permanent storage of and access to certificates, diplomas and other credentials. Another instrument of DLT is the smart contract (SC), algorithmic computer code that automatically triggers a transaction when specific preconditions have been satisfied. Once parties register their consent, business and legal contracts modelled as SCs can be instantaneously executed online, without requiring excessive paperwork or third-parties (e.g. witnesses or signatories). Payments, invoicing and accountancy can also be handled with less bureaucracy and administrative support (Wang et al. 2016).

Blockchain in Higher Education

Blockchain technology has a myriad of applications in higher education. While most universities and colleges have not altogether embraced the technology, DLT consultants, technologists, futurists and some higher education professionals (including faculty) have predicted its widespread future adoption. Innovators in the Blockchain higher education space include Massachusetts Institute of Technology, Holburton School and the University of Nicosia (Clark 2016; Durant and Trachy 2017). DLT can assist higher education institutions in the following areas:

1. Academic degree management (Watters 2016);
2. Summative evaluation of learning outcomes (Grech and Camilleri 2017);
3. Storage and access of degree records and certifications (Durant and Trachy 2017);
4. Reduction of diploma and credentials fraud (Yardy 2018);
5. Monetization of academic skills and reward for scholastic achievement (Chen et al. 2018);
6. Reducing administrative waste and expense by increasing process efficiency in such areas as admissions, registration and time-to-degree reporting (Sharples and Domingue 2016).

While Blockchain offers a permanent record of a degree or certificate's existence, it does not substantiate the academic credential's validity. Authenticating documents

requires subjective human judgment. So, peer review and reputation management must complement any DLT degree management system, so as to prevent academic fraud and misuse of official records (Chen et al. 2018). Assessing learning outcomes also demands human intervention. A subjective human element must feature in any evaluation of educational achievement. Monetizing skill development (so-called earn while you learn) by, for instance, indexing academic achievement to cryptocurrency earnings, might offer learners increased incentives to study more and perform better (Sharples and Domingue 2016). However, it could also have the deleterious effect of making academic institutions, which are already widely criticized for imitating corporate structures, mere appendages of capitalist enterprises.

Blockchain technology promises to streamline academic administration, yet greater efficiency also has its drawbacks. For instance, the automation of admissions, registration and degree-tracking functions would mean the reduction of duties in the job descriptions of admissions officers, registrars and academic advisors, and eventually the elimination of these staff positions. Widespread adoption of DLT also stands to reduce the economic footprint of universities in their surrounding communities, where they foster economic activity and are often the employer of choice.

Traditionally, the purpose of academic institutions, originally appendages of the Church, was to preserve civilization's shared knowledge and teach those fundamental skills that separate humans from non-human animals. For instance, during the Middle Ages, the three scholastic subjects of classic education—the so-called Trivium—were Grammar, Logic and Rhetoric. The ability to effectively communicate and reason (*Logos*) was seen as fundamental to our status as members of human communities, without which it would be ridiculous to claim that someone was broadly educated (Barr 1971). In the twenty-first century, the drive towards increasing automation substitutes for a desire to preserve and enhance what makes us human. Industry and innovation-driven disciplines have progressively displaced the Liberal Arts and Humanities in what might be called the modern Quadrivium: Science, Technology, Engineering and Math (STEM). Since Blockchain technology permits the quick and easy certification of individual learning accomplishments and the monetization of employment skills and qualifications, it supports the repurposing of colleges and universities for more vocational (and thus less scholastic) ends.

While the efficiency benefits of DLT contribute to the Blockchain-for-higher-education story-line, the narrative is mostly driven by prognostications of how the technology will transform higher education for the better. Predictions about how Blockchain will significantly disrupt the higher education space include the following:

1. DLT will stimulate greater research coordination and collaboration between private sector entrepreneurs and public higher ed. research institutions (Smith 2019);
2. Blockchain technology will change the subject-matter taught in higher education institutions, expanding degrees and certifications at the intersection of commerce and technology, for instance, in financial technology (Fin-tech), cryptocurrency and Blockchain itself (Busta 2019);
3. DLT will eliminate the labor-intensive process of administering Student Information Systems (SISs) and Learning Management Systems (LMSs) that track admissions, registration, degree progress and graduation, replacing them with Blockchain templates and smart contracts (Mathews 2019);

4. Blockchain technology will generate proof of intellectual work, thereby streamlining copyright, intellectual property and digital rights protection for scholars and artists at higher education institutions (Roebuck 2019; Sharples and Domingue 2016);
5. DLT will convert colleges and universities from degree-centric, two-level (undergraduate and graduate) institutions, preparing young adults for the workplace, to supply chain providers of education certifications (professional, continuing and online), providing learning and training opportunities throughout an individual's entire lifetime (Schroeder 2019).

The rush to embrace Blockchain technology has occurred in lockstep with this newfound urgency to reshape the mission of higher education institutions. According to the Blockchain-for-higher-education narrative, colleges and universities are in the midst of transitioning from conservators of civilization's knowledge to undergraduate and graduate degree managers to supply chain providers of trainings and certifications. If the transition is to be successful, then DLT must effectively disrupt the higher education space, marketing and selling learning opportunities to workers who feel perpetually inadequate in the face of overwhelming technological change. Their felt inadequacy is a response to the rapidly increasing complexity of commercial and digital technologies. Besides workers' felt inadequacy and the availability of Blockchain technology, the success of the transition also depends on outsiders viewing universities and colleges as failing to achieve their original mission, and thus in need of repurposing.

Innovation Theater and Blockchain Memes

The exciting story about how Blockchain will inevitably disrupt higher education, gifting it with a level of efficiency without precedent in the scholastic world, is what I have termed the 'Blockchain-for-higher-education narrative'. Its telling and retelling in so many voices and from so many engaging perspectives might be thought to confirm its truth. However, popularity and hype should not be confused with truth. Many of the advantages of DLT are exaggerated by way of clever marketing, whether through institutional exercises in innovation theater or the repetition of so-called Blockchain memes in Internet forums and on social media platforms. The phrase 'innovation theater' was recently coined by Steve Blank in a Harvard Business Review article (2019). Blank observes how organizations start out as scrappy innovators, but over time reduce investments in innovative products (software, hardware, consumer goods etc.), substituting investments in processes (compliance, contracts, management etc.). Eventually these organizations institute three strategies for responding to external threats (e.g. reduced consumer demand, increased market competition, declining investor interest, an inhospitable regulatory environment):

1. Hiring consultants to reorganize the company in ways that produce only short-term gains—what Blank calls 'organizational theater';
2. Implementing innovative organization-wide activities such as 'hackathons, design thinking classes, innovation workshops' to drive culture change—what Blank terms 'innovation theater'; and

3. Adopting an increasing number of processes and data metrics that have the unintended effect of blocking genuine innovation—what he coins 'process theater'. (Blank 2019)

The effect of these three types of theatrical performance in modern organizations is to produce the mere appearance, rather than the reality, of change and adaptation. Innovation theater is perhaps the most manipulative of the three because the supposed change agents substitute false displays of tech-savvy innovation for bonafide technological progress. They orchestrate a side-show of choreographed performances meant to impress boards of directors and potential investors, rather than to catalyze genuine organizational change.

So, how does innovation theater play out in higher education institutions, and what is the role of Blockchain technology in these performances? Two commentators attempt to answer the first part of this question in their article 'How Universities Can Avoid Learning Innovation Theater' (Maloney and Kim 2019). Innovation theater at colleges and universities involves investing in technology for the declared purpose of enhancing student learning, such as distributing iPads to all students and faculty, investing in more smart classrooms and introducing Massive Open Online Courses (MOOCs). The problem with innovation learning theater is that its players' performances rarely lead to genuine improvements in teaching and learning outcomes. Maloney and Kim explain:

> Institutional investments in technology in the name of promoting innovation will have little impact if the foundational structures in which teaching and learning occur remain unaltered. No technology will compensate for an institutional faculty strategy that prioritizes the hiring of adjunct and other contingent faculty over the investment in tenure-track positions. Technology will be ineffective in improving student learning if the educators doing the teaching are not well supported and securely employed. (Maloney and Kim 2019)

In other words, genuine learning innovation associated with digital technology presupposes basic non-digital conditions: fairness in faculty hiring, sufficient teaching support and employment security for teachers and staff. Without satisfying these conditions, higher education investments in digital technology amount to meaningless performances, idle process enhancements or innovation theater. So what is the relationship between DLT and innovation theater in higher education? Blockchain technology can either disrupt and improve the educational environment or descend into learning innovation theater. In a similar vein, Gregory Barber (2019) asks what Blockchain is actually good for if it is adopted as a marketing gimmick. By oversaturating the higher education space with Blockchain memes, the result can be Blockchain fatigue—that is, users and observers tiring of the hype-filled atmosphere surrounding DLT simply because the messaging is perceived as disingenuous (the moral equivalent of propaganda), rather than an anticipation of the kind or degree of organizational change and social impact associated with genuine innovation.

Injecting Blockchain technology into higher education processes (degree management, learning outcomes evaluation, admissions, registration etc.) can also generate waves of innovation theater. Even if DLT temporarily streamlines educational administration in the

short term, over the long term, state controls and regulations may render the efficiency gains from DLT nugatory. Even in the absence of expected efficiency gains, though, once adopted the technology will persist, in most cases justified by prior investment (sunk costs) and promises of future payoff given its early adoption (entreprenuerial impact). However, the truth is that Blockchain's advantages in the higher education space do not always justify the technology's adoption and persistence. Without certain basic non-digital preconditions in place (quality instructors, just working conditions, healthy learning environments etc.), innovative DLT can have an inconsequential effect on the primary mission of colleges and universities: namely, to educate students.

A Dose of Postdigital Realism

Blockchain's marketing as a cure for higher education's woes demands a dose of realism. A postdigital approach offers an invaluable counterweight to the Blockchain-for-higher-education narrative, since it treats digital and non-digital solutions as materially and culturally equivalent. A postdigital critique refuses to privilege the digital in virtue of unwarranted claims or marketing hype about the inevitability of technological progress (Fawns 2019; Feenberg 2019).

To begin the postdigital critique, the benefits of pre-programmed smart contracts are often overstated. Insofar as these self-executing agreements rely exclusively on endogenous inputs, or data confined to the Blockchain, they are thereby limited in what they can accomplish. In other words, the system is constrained by how plentiful the data is in the Blockchain. When data is in short supply or the kind of data in demand begs for human subjectivity, available solutions are quickly exhausted. For instance, in reviewing learning outcomes and learner behaviors (e.g. classroom presentations and essay writing), Blockchain cannot produce evaluations with the same depth and quality that human instructors can (Chen et al. 2018). A far superior alternative is a system that integrates exogenous mechanisms. Project management protocols such as Agile aim to separate processes into smaller segments for the sake of efficiently completing tasks (Moran 2015). Artificial intelligence (AI) can eliminate inefficiencies by introducing machine learning that imitates human creativity and common sense (Musser 2019). Communities of inquiry can integrate diverse sources of human opinion and evaluation, aggregate expert intelligence, and resolve problems through cooperative problem solving (Shields 2003).

Blockchain technology is not designed to settle axiological or value-based disputes, such as disagreements over educational access, affordability and accountability (Gunn 2015). These highly politicized and value-laden matters demand human subjectivity and normative intervention. In terms of technology, they beg for non-digital approaches such as face-to-face diplomacy, group deliberation and collective inquiry. In terms of pedagogy, a more effective way to reach students is not through an efficiency-maximizing technology like Blockchain, but through more kinetic or hands-on instructional techniques. Students regularly complain about the intervention of digital technologies that fail to enhance the learning experience, such as Powerpoint slides that instructors merely read to the class rather than use as aids to transformative pedagogy (Supiano 2009). To counter this digital dumbing down of the taught curriculum, an increasing number of university faculty are integrating non-digital alternatives, such as the practical activity of gardening, into the curriculum (Ralston 2011). Archaeological evidence of enclosed spaces for agricultural development as far back as

10,000 B.C. indicates that gardening is one of the oldest (non-digital) technologies—sometimes referred to as eco-technology (Hughes 2004).

Another 'old' or non-digital technology (with potential for digital application) is teaching by one-on-one tutorials, a method first adopted at Oxford University and Cambridge University in the early 1880s (Markham 1967). Students meet with tutors weekly, presenting their research and receiving instant feedback from the tutor. Educational scholars have debated whether the tutorial system is simply a 'sacred cow' of British higher education or a genuine pedagogical innovation (Palfreyman 2001). Recent research points to its time-tested advantages over large lectures and examinations, ensuring student accountability and instantly verification of knowledge uptake (Beck 2007). Tutorial instruction is a postdigital technology insofar as it has both digital and non-digital applications. While tutorials can be conducted with video chat software, the technology is only incidental to the method, neither enriching nor detracting from it, so long as the medium preserves the same high-quality interaction between tutor and student occurring in face-to-face meetings.

Transcending Blocks and Chains

In the current discourse over educational technology, there is a tendency to value all innovation exclusively in terms of its digital pedigree. Non-digital alternatives are deemed as less valuable even when they offer equally effective or more sustainable technological solutions. As the pre-Socratic philosopher Heraclitus observed, it is impossible to step in the same river twice. Likewise, with technological development occurring at such a rapid pace, the perpetual flux of experimentation and growth mean that no technological innovation, even DLT, can be treated as an Archimedean or fixed point.

Since other technologies will eventually displace Blockchain, a far-reaching evaluation of DLT's capacity to disrupt higher education should consider the entire field of possibilities. Alternatives for higher education disruption include non-digital technologies—for instance, a wholesale return to the tutorial system or educating through practical hands-on activities, such as service learning or school gardening. Given that nothing about change is inevitable except the continued existence of change itself, a postdigital approach to Blockchain entertains the bonafide possibility that the educational technology space will one day transcend blocks and chains, perhaps even embracing non-digital technological alternatives.

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