Implications of Blockchain Data Architecture: Research and Teaching an Emergent Innovation

TREO Talk Paper

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Abstract

As both researchers and educators, it is incumbent on us to explore new innovations and communicate their implications to our colleagues and students. All innovations are new concepts or technologies, and thus their communication is hampered by the fact that they are rarely fully understood. The need to both communicate and gain understanding is particularly daunting when dealing with emergent innovations. Emergent innovations are characterized by potentially being both radical in nature and sweeping in their impact. When dealing with emergent innovations, the dual challenge of dealing with a phenomenon that is both difficult to understand and important to communicate is present. It is widely suggested that the Blockchain distributed data architecture will be important with wide ranging applications whose impact may be impossible to fully appreciate. Unfortunately, just because it will be difficult to teach and research this emergent innovation, doesn't mean it can or should be avoided.

The Blockchain structure takes advantage of cryptography, redundancy, and self-validation to create an amazingly robust, secure, and potentially anonymous distributed data structure. Data is put through a hash function that produces a fixed length 256 bit block. This block is unique, compatible with related blocks, and potentially anonymous. A new block is compared to the other blocks in that chain and, if valid, will be added. These chains can then be replicated in other nodes for further validation of replicate chains. The security of the structure has been proven in the extreme environment of cryptocurrency. Blockchain is the basis of bitcoin. While Bitcoin has become a legitimate currency accepted in thousands of stores, its true test of data security is that it has been accepted in some of the least reputable transactions in the world.

While the technology behind hash functions and Blockchains can take some effort to understand and the application of bitcoin is radical, the true impact of the Blockchain architecture is far from known. It has been called a "trustless" technology, not because it is not trustworthy but because it reduces or eliminates the need for parties to trust each other and the need for banks, governments, or other 3rd parties to verify data and transactions. The ability to have absolute confidence in data and transactions without a centralized clearinghouse can radically affect accounting, auditing, risk management, information systems, banking, financial services, national sovereignty, currency markets, supply chains, marketing, privacy and may form the backbone for the heralded "internet of things".

As researchers and educators, we will need to study and communicate understanding of this emerging technology. We will need to act as filters, synthesizers, and analyzers for our students and colleagues, even as we educate ourselves on changing developments. In the initial period, research will be driven by theory construction, case study, and content analysis until enough applications emerge to provide more empirical investigations. In the classroom we will be challenged to convince our students of the relevance of applications that may not exist and equip them to be flexible to respond to unanticipated future opportunities.

The presentation will frame teaching and research strategies based on experience of teaching and researching emergent technologies over the past thirty years.