Full METL Research to Faster Miracles:

The Biphasic Network Effects of Distributed Science

Sean T. Manion, Ph.D.
Chief Executive Officer of Science Distributed
Baltimore, MD; The Bronx, NY
Co-Founder, Blockchain in Healthcare Global – IEEE ISTO
Vice President, American College of Military Public Health

Science is one of the most critical human endeavors for our continued advancement. Its complexity and scale have outgrown its current institutions and processes. By breaking the scientific process into its component parts using a mission essential task list (METL) method, science can be approached in a new way. This will allow for an increased engagement of scientists across current silos. The emerging blockchain technology can provide the framework for trust for these scientists engaged via a platform marketplace for gig science. This will provide both direct network effects from the blockchain network as it grows, along with indirect network effects from the platform model for pairing scientists with funding and ideas with those scientists with skills, availability, and time. In the health sciences, this will lead to better science, cheaper research, and faster miracles.

Keywords—Science, health, health science, blockchain, distributed, distributed ledger technology, research, platform business

I. INTRODUCTION

The introduction of blockchain/distributed ledger technology to science will deliver better science, cheaper research, and faster miracles. Scientific research is the systematic investigation of the world around us. This process has provided the foundational knowledge upon which discovery and advancement in medicine has made strides forward; the human-driven miracles that save lives.

Science is a critical, but its complexity and scale has outgrown the institutional structure and standard execution of the process. This has resulted in less than fully utilized resources, slowing of advancement compared to investment, and an incentive system that often rewards the trappings of discovery rather than the value of discovery itself.

The military has an effective way of dissecting complex missions and prioritizing tasks and resources in the form of a mission essential task list (METL). Applying this METL template to scientific research breaks the process down into essential task, sub-tasks, sub-sub-tasks, etc. These tasks can then be evaluated for complexity of execution with many being able to be automated or executed outside the traditional laboratory/clinic silos.

II. CURRENT STATE

There is currently no widely used gig-platform for health science. There are some limited science forums and a smattering of health science research opportunities on larger sites like Upwork, but gig work has not become common in the health sciences. This is despite 50% overhead costs on research grant money at most universities, significant delays in full-time hiring, and a hugely underemployed highly skilled population of scientists outside of the traditional academic setting.

The main challenges to a widely used platform for gig science are 1) difficulty in separating out simple, outsourceable tasks from what has traditionally been an idea-to-publication role for principal investigators and small, contained teams and 2) a lack of trust in sharing certain parts of the process based on concerns of "getting scooped" or losing intellectual property control.

METL for research allows us to dissect the sub-tasks that can be automated or outsourced. But we still need a framework for trust. Blockchain/distributed ledger technology is maturing at the right time to be the trust framework for gig science and much more. This will create a network of distributed science for better science, cheaper research, and faster miracles.

III. NETWORK EFFECTS

A network of distributed science will have biphasic network effect enhancing its value and impact. There will be a direct network effect of bringing blockchain to science. The more people who become involved in networks applying blockchain to administrative, peer-review, data management and particularly data sharing, the greater the impact and value will be. This will come from less costly and more rapid grant review via smart contracts, weighted crowdsourced publication peer-review for faster review with less bias, auditable and automated data management, and more rapid data sharing and expanded analysis with tracking of intellectual property contribution.

Beyond this, there will be an indirect network effect of the platform for gig science that blockchain can help facilitate with its trust framework. As more aspects of research are achieved across the platform, more trained scientists not fully employed in the field, as well as nascent gig science workers, will be available to contribute. As cheaper research costs allow for more to be done, this platform market will grow in indirect network effect.

The current environment of health science research requires 17 years to go from 'bench to bedside,' or idea to cure. While some of this time is critical for the appropriate testing and

experimentation, significant portions are artifacts of an antiquated system. Reduction in grant, regulatory, and publication review time could reduce this time by 2-5 years. Reduced costs can afford more research to occur in parallel, allowing for an expanded network effect of shared data. Expanded gig science opportunities will grow the available two-sided platform market of funded researchers with developed hypotheses to test along with available gig researchers with skills to contribute.

IV. Future state

Currently there is a lack of infrastructure to support either a platform for science or the application of blockchain. The challenge is to develop these things in parallel to help bolster the implementation of each. The widespread use of a platform for gig science will gain more traction with the trust of blockchain. And the value proposition of blockchain for health sciences research will be optimized with the existence of more expanded use across a broad distributed network.

There are some nascent efforts to bring this blockchain technology to different aspects of science by various startups and established pillars in the scientific publishing industry. Science Distributed looks to align these efforts to create a network of distributed science. At the foundation of this will be a platform for gig science focused on the deconstructed METL areas primed for outsourcing from the traditional scientific silos. Bringing together funded researchers with ideas and money, and available researchers with skills, interest, and time under the framework of blockchain trust framework will provide both direct and indirect network effects to give better science, cheaper research, and faster miracles.

V. Challenges

The effort to create a network for distributed science is in a very early stage. There are a few challenges to the creation and implementation of this effort. First there is the culture of science, which has long standing investment in its current structure and function. It will take a proper tracking of the current system and its multi-layered incentive system to plan the proper strategy for success. On the other side, the complexity of the science incentive system may delay the adoption of blockchain technology in some areas of science where questions, mission, and non-monetary incentive structure are more powerful drivers than money. The key will be to map the motives, incentives, and goals of the broader scientific community and ensure introduction of this new technology is in line with these values.

VI. conclusion

Science is one of the most valuable efforts of humanity. We have made great strides with what has become a $2.5 Trillion annual cross-industry research and development effort. But our return on that investment has been dwindling. Thankfully, we have the tools and emergent technology to drastically improve the value of research. Across the health science community, there is opportunity and desire to bring better science, cheaper research, and faster miracles to society. This can be done and compounded with the direct and indirect network effects of blockchain technology and a platform for bringing researchers together.

Acknowledgment

The author would like to acknowledge Lauren Long and John Reusing to contributing to this vision, along with Felicia Qashu for exploring the METL breakdown of research, and the myriad advisors who have contributed along the way.