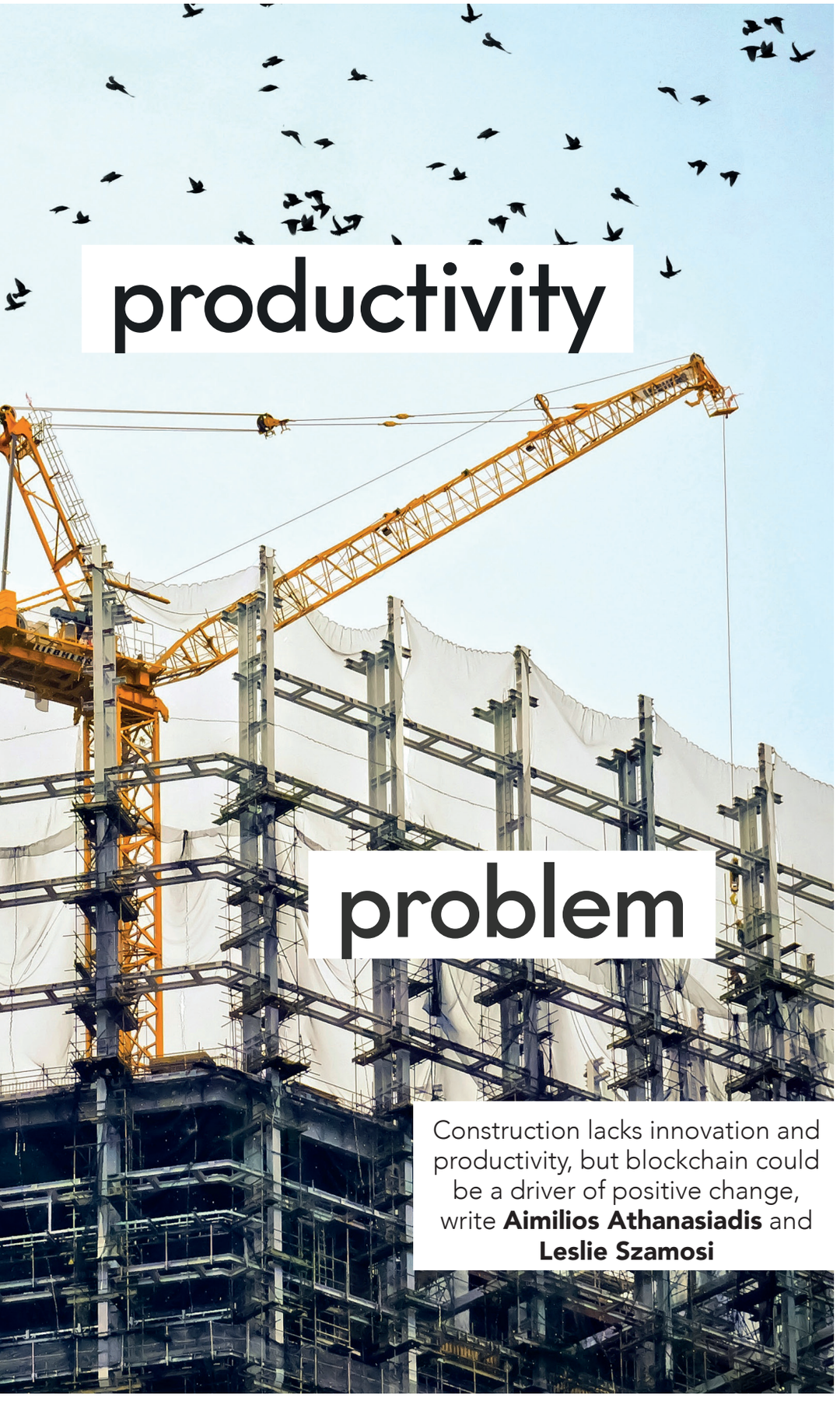
TECHNOLOGY

Solving infrastructure's

productivity problem



Construction lacks innovation and productivity, but blockchain could be a driver of positive change, write **Aimilios Athanasiadis** and **Leslie Szamosi**

In an era of austerity that has no end in sight, one of the most challenging issues facing countries and cities today is when and how to undertake key infrastructure projects. Within the developed world, gone are the days of large projects created by governments to spur employment and garner local votes; today, funds available for investment in infrastructure are minimal, as is the public appetite for being saddled with additional debt burdens when already being squeezed through taxes.

Public-private partnerships have provided a solution of sorts to the above, but much more needs to be done. So, how can we undertake necessary infrastructure improvements and start to consider new projects in the current climate?

In this article, we consider whether blockchain technology could be an enabler, boosting the productivity of the infrastructure sector, while simultaneously attracting and retaining the human talent required to work within it.

The current infrastructure dilemma

Global demand for infrastructure delivery has been growing exponentially at a compounded growth rate over the past 15 years. Major capital delivery programmes have become a tricky area in which to operate for all parties involved, prime construction contractors are struggling with low margins, reactive government policies on procurement, and collaboration with the delivery bodies. Hence, the productivity and the success of major capital programmes of any financing scheme (public-private, privately funded or publicly funded) are at risk.

More than 80% of infrastructure globally is delivered over budget and outside the scheduled timeframe. The millennial generation, meanwhile, is questioning whether the benefits, or scope, of major infrastructure projects and programmes are delivering on their promises. According to a 2017 opinion piece in *The Economist*, 'the construction industry has been afflicted by such problems for decades,' while in the words of McKinsey in its 2015 report *The Construction Productivity Imperative*, 'since 1995, the global average value added per hour has grown at around a quarter of the rate in manufacturing.'

This suggests an important 'gap' in infrastructure that needs to be addressed.

While digital disruption means that, every six months, forecast rates are outdated across different sectors, infrastructure construction seems to be much less affected, proceeding at its own glacial pace of change. In 2017, KPMG reported that a lack of innovation is the main factor.

Could new technologies and digitisation help reinvent the sector in order to innovate and aid in resolving its productivity problem? Could a digitisation strategy lead to better margins and a rise in innovation and productivity? Would a sector rethink help it to attract and retain top talent and make it a lucrative area, with innovation as a core value?

Blockchain is NOT Bitcoin

While blockchain technology is not 'simple', its core idea is premised on the fact that it is effectively a 'database' that is validated by a wider community, rather than a central authority. It is a collection of records that a crowd oversees and maintains, rather than something which relies on a single entity, like a bank or government, and which most likely hosts data on a particular server.

Of course, a physical database kept on paper could never be managed by tens of thousands of peers and this is where computers, and more specifically, the internet, come in.

Each 'block' represents a number of transactional records, and the 'chain' component links them together through a hash function. As records are created, they are confirmed by a distributed network of computers and paired up with the previous entry in the chain, thereby creating a chain of blocks, or what we now know as a 'blockchain'.

This is then retained on the aforementioned network of computers, meaning that no one individual has control over its history, an important component, because it certifies everything that has happened previously in the chain and it means that no one person can go back and change things. In this way, the blockchain is a public ledger and one that cannot be tampered with easily. It offers a built-in layer of protection that is not possible with a standard, centralised, database of information. But, what are the applications?

Current blockchain technology applications

Many sectors have realised efficiencies, developing new operational concepts through the use of blockchain technology which can be translated into future financial savings. Blockchain technology is also supported by shareholders, due to the transparency it can offer to different business areas. Transparency benefits are sector-differentiated but business operational transparency is near the top of the agenda in many boardrooms, and shareholders are pressuring directors to understand the underlying business operations and what lies behind the annual report and the financial statements.

The energy market is one of the sectors leading the way in the use of blockchain technology, from energy grid owners to energy providers and traders, each of which is developing different applications.

In 2018, the World Economic Forum (WEF) focused on three key benefits that blockchain technology can offer (delivering security, low-cost transactions and automation) stating: 'We believe the unique features of blockchain – when employed using alternative approaches for validating transactions that avoid mining – can stimulate an Internet of Energy that meets our needs more sustainably.'

The WEF's research suggests that the fusion of these three blockchain characteristics can allow for the integration of a grid of centralised power plants alongside distributed renewables, batteries, and flexible load, at minimal expense and without

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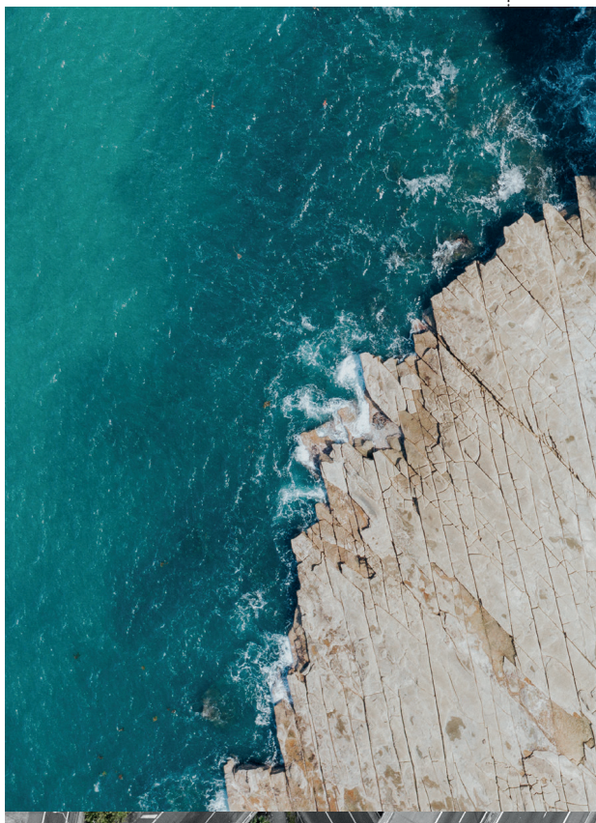

'This transition in the infrastructure sector will not happen overnight'

sacrificing reliability. A blockchain-based platform enables the user to balance the grid from both ends at the same time, increasing asset utilisation in a capital-intensive network that frequently runs at 50% of capacity.

In shipping, a heavily distressed sector in which overcapacity is the critical problem, Maersk, the global leader in container ships, and IBM, are developing a new blockchain technology concept that could revolutionise the industry. They have produced an end-to-end shipping solution that would give all parties involved in global trade a single view of where cargo is, and allow authorities to give electronic approval for its movement. This platform could save the industry billions of dollars a year by replacing the current electronic data interchange and paper-based system which can leave containers idle for weeks at a time. Blockchain will enable a single view, via a virtual dashboard, of all goods and shipping information for all parties involved (from manufacturers and shippers to port authorities and government agencies).

As an 'immutable' distributed ledger, blockchain technology can also improve security, according to Michael White, former president of Maersk Line in North America, and CEO of the company formed in collaboration with IBM, TradeLens. Blockchain's native immutability as a distributed ledger will create an automatic audit trail for regulators, something with which the industry has struggled.

Blockchain technology can employ smart contracts or self-executing workflows determined by the goods being shipped and the authorisation they require while in transport. The key issue is how to eliminate or minimise delays and shorten the length of time people are waiting for information or documentation, and for cargo to move efficiently.

KPMG recently developed an application called FundsDLT, a new blockchain-powered platform allowing fund managers to sell directly to the investor (or via advisors) while also digitising the entire distribution value chain. This allows asset managers to mutualise a significant number of fund processes, dramatically reduce the cost of transactions, and radically cut down the time taken for process transactions.

For the first time, investors are able to use a blockchain-based platform to purchase real fund shares with real cash, a revolutionary distribution chain for this industry.


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Construction

Can blockchain help revitalise the infrastructure sector?

From our examination of infrastructure's problem areas, we have concluded that the sector currently has three focal 'pain points', which need to be addressed by both the private and public sectors in order to revamp the sector and realise economic benefits at a global scale. These pain points are:

- **a funding gap** based on global infrastructure demand
- **a lack of innovation and productivity in engineering and construction** compared with other sectors (and,in particular, compared with manufacturing, due to the commonalities between the two sectors)
- **a talent gap**; combining the two areas above, infrastructure is not yet a 'magnet' sector for creative top talent and does not yet appeal to the 'digital generation'.

In other words, we need to upgrade and update the way we:

- **finance infrastructure**
- **process capital projects (design, delivery, maintenance and/or disposal)**
- **attract new talent but also upgrade the skill set of current employees.**

Blockchain can address the above pain points within a typical infrastructure asset's lifecycle.

Financing: Infrastructure has been a longstanding choice for public-sector organisations, when it comes not only to fuelling economic growth and the regeneration of cities, but also for private investment with respect to steady, long-term returns. Issues around capital projects going over time and budget have always been the key problems when it comes to securing financing, undermining confidence in project delivery. A recent example is Europe's largest infrastructure project (London's Crossrail initiative) which is now around £600m over budget and has moved its delivery date from December 2018 to sometime beyond autumn 2019.

Combining the Internet of Things, smart devices, virtual reality, building information modelling, robotics, big data tools and real-time analytics from the design stage, through delivery and operation can provide additional levels of confidence, providing real-time information backed by intelligence tools (for example, artificial intelligence and machine learning). This means that decision makers can make the best decisions by analysing all the information from a single source of 'truth'.

Processing capital projects: Linking the required technology to an infrastructure asset or any capital project demands an appropriate corporate strategy, organisational structure and an understanding of the technology requirements. It also rests on having the capabilities needed for an organisation to fully realise the digital era's potential benefits to the infrastructure sector.

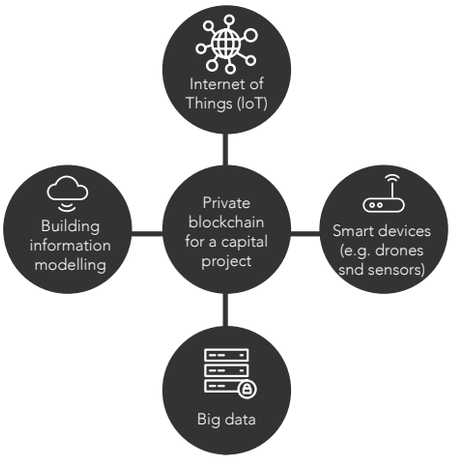
Setting up corporate strategy and project teams ready to embrace technology applications and process automation necessitates a deep understanding of technology requirements. Therefore, organisations must empower and embed their technology office in the end-to-end of everyday procedures. For private-sector organisations in the infrastructure sector, empowering the chief technology officer (CTO) in corporate governance requires organisations to 'step back' and realise long-term strategy and organisational purpose in the digital era against their competition as well as traditional and non-traditional competitors and partners (for example, sub-contractors and third parties).

Once the organisation has a strategic business plan, supported by the relevant organisational structure and governance, the transition to the digital era can be phased in. Each phase needs to support the enablement of capabilities and processes to adopt new technologies, but also achieve departmental synergies (for example, real-time project progress reporting) through establishing a blockchain project which can provide sufficient information for the finance department to conduct forecasting and incorporate dynamic financial planning and analysis.

In a sector where margins are low and project risks high (and have inherent financial impact) embracing the transition to the digital era can help organisations allocate their working capital more efficiently and, even more importantly, with greater confidence.

For all this to happen, organisations need the right people: Making infrastructure great again and attracting 'brains' to fuel innovation in the sector will enable it to transition to a new era and have a societal impact by creating a new digital workforce for infrastructure design and delivery.

The transition to the digital era, however, needs to be adopted by those on the frontline of capital projects delivery. Upskilling current workforces to embody this new day-to-day delivery culture and understand technologies



(such as virtual reality – useful for health and safety – and mobile applications) that can capture critical data.

Storing this data safely, and using it to provide critical insights for the project's progress against building information modelling, is how blockchain can make a difference at a corporate and societal level.

Next steps

Organisations must rethink their technology roadmap and understand that digital transition is a change that needs to straddle both their operations and corporate strategy, supported by the appropriate capabilities and internal governance. We understand that this transition in the infrastructure sector will not happen overnight, but senior leaders should embrace this much-needed change as soon as possible.

A successful transition should begin with the formation of a core in-house team, with partners that can help blend the organisation's current capabilities and operations with this new strategic direction.

Nevertheless, leadership 'buy-in' and the development of an organisational culture that can embrace the new strategic roadmap is the initial step that will underpin the foundations of a new direction and vision within this sector.

The global infrastructure sector is thirsty for change. The question is, are stakeholders willing to jump on board and learn how to control the waves of digital change ahead, or will they simply be swept under?

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